

The Creation and Maintenance of Safety in Nursing Medication Administration Practice

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Submitted in accordance with the requirements for the degree of Doctor of
Philosophy PhD

The University of Leeds
School of Psychology

September 2025

IPR Statement

The candidate confirms that the work submitted is their own, except where work which has formed part of a jointly authored publication has been included. This relates to the publication of a systematic review, part of thesis chapter 2.

Title "Resilience in nursing medication administration practice: a systematic review with narrative synthesis", published in BMJ Open Quality on 28 October 2024 available at doi:10.1136/ bmjoq-2023-002711 (Kellett et al., 2024).

The contribution of the candidate and other authors has been explicitly indicated in the statement below.

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Acknowledgments

First and foremost, I would like to acknowledge my PhD supervisors Jonathan Benn, Bryony Dean Franklin and Susie Pearce for their unwavering thoughtful guidance and encouragement throughout this PhD study.

I would like to thank the University of Plymouth for agreeing to part fund this study and the amazing support I have had from work colleagues and friends.

I am profoundly grateful for the cheerleading from personal friends and family and am thankful to those who have passed away throughout my PhD journey who are still very present in my heart.

The thesis was proof-read before submission by a third-party proof-reader. The PGR confirms that the third-party proof-reading undertaken was in accordance with the Postgraduate Researcher Proof-reading Policy.

Abstract

Medication errors are a significant challenge to patient safety. Over half of medication errors occur during administration, largely a nursing role. A focus on what works well rather than what goes wrong, called 'safety II' views necessary adaptations in the work environment as resilient mechanisms to achieve safety.

This PhD study aimed to explore how resilience is created and maintained in nursing medication administration. A systematic review supported iterative development of three study objectives: to review 'work as planned' in local and national guidelines; to explore how it differs to 'work as done' and any consequences of changing practice; and to examine nurse perceptions of risk, resilience and factors that drive changes in practice.

A nine-month qualitative interpretive ethnographic study on two wards of an NHS hospital collected data through observation, interview, and document review. The analytical framework was reflexive thematic analysis with an abductive approach.

Main findings included establishing wider contextual pressures and local dynamic factors influencing medication administration practice. Key safety concepts, labelling and relatedness are explored using a safety II lens, progressing understanding in this specific study area. Development of a model of relatedness summarising safety practices, and a typology of variations, have potential to strengthen future error terminology and explorative research.

There is sparse literature linking triggers and pressures to adaptive safety mechanisms in this arena. Linking these to identified or inferred safety outcomes progresses understanding of adaptations as individual or team expressions of resilience. Categorisation of resilient characteristics theory-builds from existing models of resilience in healthcare to include reactive and proactive strategies which more accurately represent compensatory adaptations during drug rounds. Finally, a model of resilience and a framework of necessary factors for achieving resilience successfully address this study's aim by generating new understanding of the creation and maintenance of safety resilience in medication administration.

Table of Contents

IPR Statement.....	I
Acknowledgments	II
Abstract	III
Table of Contents.....	IV
Table of Tables.....	XIII
Table of Figures	XIV
Table of Abbreviations	XV
Chapter 1 Introduction: Contextualising the research	1
1.1 Introduction.....	1
1.2 Positionality.....	3
1.2.1 Reflexive commentary: reflections on the impetus and direction of this study.....	4
1.3 Research context.....	6
1.3.1 Safety in nursing practice	6
1.3.2 The medication administration task.....	7
1.3.3 Medication errors	7
1.3.4 Medication administration safety	8
1.4 Conceptual approaches & glossary.....	9
1.4.1 Safety I in healthcare	12
1.4.2 Safety II in healthcare	12
1.4.3 Human error and systems failure	13
1.4.3.1 Work as Planned (WAP) and Work as Done (WAD)	13
1.4.3.2 Systems failure	14
1.4.3.3 Normalisation of deviance	14
1.4.4 Resilience as part of systems safety	14
1.4.4.1 Systems safety	15
1.4.4.2 Adaptations.....	16
1.5 Research opportunities.....	16
1.5.1 Evolution of approaches in safety science and the implications for contemporary research	17
1.5.2 Opportunities linked to new and emerging concepts	18
1.6 Research aims and thesis structure	19
1.6.1 Research aim.....	19
1.6.2 Thesis structure.....	25
1.7 Conclusion.....	26

Chapter 2 Systematic review: synthesis of evidence for the application of resilience principles and practices in nursing medication administration practice	27
2.1 Introduction	27
2.2 Methods.....	27
2.2.1 Design.....	28
2.2.2 Search methods	28
2.2.2.1 Eligibility criteria	28
2.2.2.2 Information sources	29
2.2.2.3 Search strategy	29
2.2.2.4 Study selection	30
2.2.2.5 Data extraction	32
2.2.2.6 Quality appraisal.....	32
2.2.2.7 Synthesis of results	32
2.3 Description of included studies.....	33
2.3.1 Identification of selected studies	33
2.3.2 Characteristics of included studies.....	33
2.3.3 Study methods and quality of evidence.....	34
2.4 Findings: Generated themes and synthesis of existing research ..	43
2.4.1 Resilience as a response to working with, or around, the introduction of technologies.....	49
2.4.2 Resilience enhanced by education.....	50
2.4.3 Resilience through critical thinking and problem-solving.....	50
2.4.4 Responding to distractions and interruptions	51
2.4.5 Responding to uncertainty or novel situations.....	52
2.4.5.1 Augmenting decisions	52
2.4.5.2 Enhancing communication.....	52
2.4.5.3 Double checking	53
2.4.6 Reported suggestions for change and future practice	53
2.4.6.1 Environment	53
2.4.6.2 Resources	53
2.4.6.3 Professional development	54
2.4.7 Summary of main findings.....	54
2.5 Discussion	55
2.5.1 Evidence for the effectiveness of resilience strategies	55
2.5.2 “Workarounds” as resilience strategies	56
2.5.3 Interpretation of resilience in the work system	56

2.5.4	Implications for practice	57
2.6	Reflexive commentary: reflections on submission and publication of the systematic review	58
2.7	Conclusion.....	60
Chapter 3	Research framework and methodology	62
3.1	Introduction	62
3.2	This researcher's position.....	62
3.2.1	The subject under investigation.....	62
3.2.2	The research participants.....	63
3.2.2.1	Reflexive commentary: reflections on the drive to explore errors and patient safety	64
3.2.3	Positionality & professional identity	64
3.2.4	Choosing a study design while recognising positionality and reflexivity	65
3.2.5	Researcher's methodological position.....	67
3.2.6	The reflexive researcher	67
3.2.7	The non-participant observer	69
3.2.8	Orientation: Ontological perspective	70
3.2.9	Orientation: Epistemological position	71
3.2.10	The ethnographic method	73
3.2.10.1	The ethnographic stance	74
3.2.10.2	Approaches to data analysis.....	75
3.2.11	Supervision as part of the research process	76
3.3	The research method: context and process	77
3.3.1	Study setting	79
3.3.1.1	Reflexive commentary: reflection on study approval	79
3.3.2	Sample and participant recruitment.....	81
3.3.2.1	Reflexive commentary: reflections on the route to recruitment.....	82
3.3.2.2	Data saturation	84
3.3.3	Eligibility criteria	85
3.3.4	Observation sampling (workstream1).....	87
3.3.5	Interview sampling (workstream 2).....	87
3.3.6	Sampling techniques	87
3.3.7	Methods of data collection	87
3.3.7.1	Observation data collection (workstream 1).....	88
3.3.7.2	Ethnographic data collection (workstream 1).....	89

3.3.7.3	Semi-structured interview data collection (workstream 2)	89
3.3.8	Method of data analysis	90
3.3.8.1	Data storage and transport	92
3.3.9	Ethical considerations	93
3.3.9.1	Participants and design	93
3.3.9.2	Anonymity and data protection	94
3.3.9.3	Confidentiality	94
3.3.9.4	Safeguarding and patient safety	95
3.3.9.5	Consent	96
3.3.9.6	Patient notification	96
3.4	Reflexive commentary: reflections on the realities of data collection and analysis	96
3.4.1	In the field: collecting the data from the participants and the role of the observer	97
3.4.2	The process of analysing the data	99
3.4.3	Introducing document data	100
3.4.4	Supervision: perspectives on data interpretation	100
3.5	Conclusion	101
Chapter 4	Contextualising ethnographic findings	102
4.1	Introduction	102
4.2	Local contextual factors	102
4.2.1	Setting characteristics	103
4.2.2	Ward 1 characteristics	103
4.2.3	Ward 2 characteristics	104
4.2.4	The dynamic environment of the wards	104
4.2.5	Drug trolleys	105
4.2.6	Drug preparation rooms	106
4.2.7	Acuity	107
4.2.8	Characteristics of the handover	107
4.2.8.1	Safety brief	108
4.2.8.2	General patient handover	108
4.2.8.3	Team patient handover	109
4.2.8.4	SAFER meeting	110
4.3	Wider contextual factors	110
4.3.1	Strikes	110
4.3.2	Pandemics	111

4.3.2.1	Reflexive commentary: reflection on the impact of pandemics on data collection	111
4.3.3	Access to central functions.....	112
4.3.3.1	Pharmacy	112
4.3.3.2	Doctors	114
4.3.4	Staffing.....	114
4.4	Introducing the participants	116
4.4.1	Demographics	117
4.4.2	Description of data collection occurrences.....	121
4.4.2.1	Observation workstream 1	122
4.4.2.2	Interview workstream 2.....	122
4.4.3	Training in medication administration and human factors ...	123
4.4.3.1	Medication administration training	124
4.4.3.2	Human factors or patient safety training	124
4.5	Discussion	125
4.6	Conclusion.....	126
Chapter 5 Findings: variations within and from normative models of nursing medication administration practice		128
5.1	Introduction.....	128
5.2	Introduction to normative models, analysis and clarity	129
5.2.1	Normative models shaping nursing medication administration 129	
5.2.2	Reflexive commentary: reflections on this researcher's position – struggling with showing the 'what? and how?'	130
5.2.3	Gaining conceptual clarity for definitions	131
5.2.4	Analytic steps	133
5.2.5	Reflexive commentary: reflections on this researcher's position – struggling with deductive frameworks	135
5.3	Participant reflections on normative models for practice and the reasons for variations	136
5.3.1	Theme 1: Background and context	137
5.3.2	Theme 2: Approaches: Describing current systems and processes.....	138
5.3.3	Theme 3: Sources of variation and challenges	139
5.3.4	Theme 4: Impact on safety	139
5.3.5	Theme 5: Professional accountability.....	141
5.4	Observed variations: process stages, types, purpose and functional outcomes or safety implications	142

5.4.1	Variations in checking the drug chart	144
5.4.1.1	Finding the patient drug chart	144
5.4.1.2	Reading the drug chart	145
5.4.2	Variations in preparing medication	146
5.4.3	Variations in administering medication	149
5.4.3.1	Locking the drug trolley	149
5.4.3.2	Checking patient identity	150
5.4.3.3	Observing patient taking medication	152
5.4.4	Variations in recoding the dosage	153
5.4.5	A typology of variations	154
5.5	Participant reflections on strengthening medication safety	157
5.6	Discussion	170
5.7	Conclusion	174
Chapter 6 Findings: Triggers, pressures, and adaptive strategies		176
6.1	Introduction	176
6.2	Conceptual clarity	176
6.3	Analytic steps	177
6.4	Theme findings	178
6.4.1	I am a problem solver	179
6.4.2	There's a person inside this patient	180
6.4.2.1	Patient preference	180
6.4.2.2	Patient need	181
6.4.3	Finding what I need	183
6.4.3.1	Unavailability of medication	184
6.4.3.2	Missing or lack of equipment	186
6.4.4	Pre-emptive actions	186
6.4.5	Ready, steady	191
6.4.6	...Go Go Go! From preparation to administration	191
6.4.6.1	Time constraints	192
6.4.6.2	Multi-tasking in the time warp	193
6.4.7	Disturbances in the status quo	196
6.4.7.1	Self-checking	196
6.4.7.2	Managing safety and risk	197
6.4.8	Teamwork makes the dream work	199
6.4.8.1	Collaboration	200
6.4.8.2	Communication	201

6.5	Findings across the data set.....	203
6.6	Discussion	208
6.7	Conclusion.....	211
Chapter 7 Discussion: research findings in the context of previous work, and study strengths & limitations		213
7.1	Introduction.....	213
7.2	Conceptualisation and synthesis of safety and resilience.....	214
7.2.1	Framing safety	214
7.2.2	Where are we with safety culture?	215
7.2.3	Work as Planned (WAP) versus Work as Done (WAD)	217
7.2.4	The grey area of normalised deviance	217
7.2.5	Resilience, safety and quality care	219
7.2.5.1	Pressures and triggers	220
7.2.5.2	Three systems levels	223
7.3	Synthesis of systems functioning at macro, meso and micro levels 224	
7.4	Synthesis: towards a model of resilience for patient safety in nursing medication administration practice	227
7.5	Knowledge dissemination.....	232
7.5.1	Knowledge exchange.....	232
7.5.1.1	Reflexive commentary: reflections on knowledge exchange.....	233
7.5.1.2	Formal PPIE panel	233
7.5.1.3	Reflexive commentary: reflection on informal discussion with former patients	234
7.5.1.4	Knowledge exchange: Participant reflections on strengthening medication safety	235
7.5.2	Knowledge transfer	235
7.5.2.1	RCN International Conference: 8 September 2021 (online)	236
7.5.2.2	The Southwest Clinical School Conference 'Developing a research Skilled Workforce': 29 November 2023 (Plymouth)	236
7.5.2.3	Study participants (including local collaborator – associate director of nursing and professional practice).....	237
7.5.2.4	Undergraduate students	237
7.5.2.5	Postgraduate students research conference	237
7.5.2.6	Reflexive commentary: reflections on knowledge dissemination.....	238

7.6	Strengths and limitations of this research	238
7.6.1	Methodology.....	239
7.6.2	Methods	239
7.6.2.1	Data collection	239
7.6.2.2	Data analysis	241
7.6.3	Bias	242
7.6.4	Findings and transferability	242
7.6.4.1	Findings.....	242
7.6.4.2	Transferability	243
7.6.4.3	Novelty and confirmation	244
7.7	Conclusion.....	246
Chapter 8 Conclusion: Looking forward, implications & recommendations for practice		247
8.1	Introduction.....	247
8.2	Practical implications for practice	247
8.2.1	Reflexive commentary: reflection on making a difference ...	247
8.2.2	Implications	248
8.3	Translating evidence into improvement: barriers and recommendations for practice	251
8.3.1	Recommendations operating at individual (micro) level	251
8.3.2	Recommendations operating at ward (meso) level	253
8.3.3	Recommendation operating at organisation (macro) level ..	254
8.3.4	Recommendations for future research	256
8.4	Reflexive commentary: reflection & evaluation of study write up ..	258
8.5	Looking forward: dissemination strategies & research opportunities 260	
8.6	Thesis conclusion	261

Bibliography	265
Appendix A	289
Appendix B	290
Appendix C	296
Appendix D	297
Appendix E	299
Appendix F	300
Appendix G	301
Appendix H	304

Table of Tables

Table 1.1 Glossary of Specialised Terms and Concepts	10
Table 1.2 Matrix: PhD Study Aim and Objectives.....	20
Table 2.1 Inclusion and Exclusion Criteria	29
Table 2.2 Search Strategy	30
Table 2.3 Characteristics of Data Collection, Study Design and Methodological Quality Score	35
Table 2.4 Resilience Interventions, Effectiveness Measures and Results	45
Table 2.5 Implications for Practice	57
Table 2.6 Article Publication Timeline.....	58
Table 3.1 Getting from The Research Question to The Study Design (Vogt, 2008)	66
Table 3.2 Purposeful Sampling Technique	81
Table 3.3 Participant Sample Eligibility Criteria	86
Table 4.1 Study Participants Workstream 1 (Observations)	118
Table 4.2 Study Participants Workstream 2 (Interviews).....	120
Table 4.3 Observation Drug Round Participants, NHS band, and Drug Round Time	122
Table 4.4 Interview Participants, Mode of Interview, and NHS Band...	123
Table 4.5 Implications for Practice	126
Table 5.1 Typology of Variations in Medication Administration	155
Table 5.2 Participant Reflections and Suggestions for Strengthening Medication Safety	159
Table 5.3 Implications for Practice	173
Table 6.1 Theme Summary.....	178
Table 6.2 Strategies, and Adaptation Description Related to 'Disturbances in the status quo' Theme	199
Table 6.3 Overview of Resilience in Nursing Medication Administration Practice.....	205
Table 6.4 Implications for Practice	211
Table 7.1 Systems Story Logic Model.....	228

Table of Figures

i Figure 2.1 PRISMA Flowchart	31
ii Figure 3.1 Summary of Research Process	78
iii Figure 3.2 Participant Recruitment and Study Workflow Stage 1: Site Recruitment.....	80
iv Figure 3.3 Participant Recruitment and Study Workflow Stage 2: Participant Recruitment to Work stream 1 (Observations)	83
v Figure 3.4 Participant Recruitment and Study Workflow Stage 3: Participant Recruitment to Work stream 2 (Semi-Structured Interviews)	84
vi Figure 3.5 Participant Recruitment and Study Workflow Stage 4.....	91
vii Figure 4.1 Participant Ethnicity	121
viii Figure 5.1 Normative Models Ruling Nursing Medication Administration Practice.....	129
ix Figure 5.2 Model of Key Concepts and Relatedness Between Error and Safety Terminology in Variation or Adaptation Type	132
x Figure 5.3 Four Hierarchical Process Steps of Medication Administration	133
xi Figure 5.4 Codes Mapped to YCFF Contributory Factor Themes	135
xii Figure 5.5 Coding Framework Applied to Participant Reflections of Normative Models in Medication Administration Variations.....	137
xiii Figure 5.6 The Four Hierarchical Task Process Steps with Selected Sub-Tasks.....	143
xiv Figure 6.1 Linking Triggers and Adaptive Strategies to Safety Outcomes	177
xv Figure 7.1 How Resilience is Created and Maintained in Nursing Medication Administration: A Roadmap of Resilience.....	229
xvi Figure 7.2 Necessary Factors for Building Resilience	231

Table of Abbreviations

5 R's	The Five Rights
ADN	Associate Director of Nursing
CD's	Controlled Drugs
GP	General Practitioner
HCA	HealthCare Assistant
HRA	Health Research Authority
HTA	Hierarchical Task Analysis
IRAS	Integrated Research Application System
IV	Intravenous
LFPSE	Learn From Patient Safety Events
MAR	Medication Administration Record (drug chart)
MMAT	Mixed Methods Appraisal Tool
NBM	Nil By Mouth
NGT	Nasogastric Tube
NHS	National Health Service
NIHR	National Institute for Health Research
NMC	Nursing and Midwifery Council
OPEL	Operational Pressures Escalation Level
PSIRF	Patient Safety Incident Response Framework
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
R&D	Research and Development
RCN	Royal College of Nursing
RiH	Resilience in Healthcare
RN	Registered Nurse
RPS	Royal Pharmaceutical Society
RSV	Respiratory Syncytial Virus
RTA	Reflexive Thematic Analysis
SAFER [meeting]	Seen, Aim, Flow, Early discharge, Recovery

SEIPS	Systems Engineering Initiative for Patient Safety
SWiM	Synthesis Without Meta-analysis
The Code	[NMC] Code of professional practice
TTA	To Take Away [medication]
WAD	Work As Done
WAP	Work As Planned
WHO	World Health Organisation
YCFF	Yorkshire Contributory Factors Framework

Chapter 1

Introduction: Contextualising the research

1.1 Introduction

The World Health Organisation (WHO) states that patient safety is an indicator of quality in healthcare and has a direct effect on well-being and health outcomes while at the same time having a significant impact on personal and financial costs.

In 2009, WHO created an internationally agreed document with key definitions for use worldwide. An outcome of which was a definition of patient safety as:

“the absence of preventable harm to a patient and reduction of risk of unnecessary harm associated with health care to an acceptable minimum.”
(WHO, 2009)

In the broader healthcare systems context, a definition of patient safety was agreed as:

“A framework of organized activities that creates cultures, processes, procedures, behaviours, technologies and environments in health care that consistently and sustainably lower risks, reduce the occurrence of avoidable harm, make error less likely and reduce impact of harm when it does occur.”
(WHO, 2023).

Introducing a broader context is crucial because the hospital environment itself poses many risks to patient safety, so this latter definition is applied throughout this PhD thesis. Environmental risks convey the complexity of the environment. Such risks include an unsafe physical environment and organisational risks such as staff shortages and an immature safety culture. Additional risks are specific to patients and include vulnerable patients and disparities in care (NHS England, n.d-b). However, it is how healthcare staff manage the essential care tasks for each patient that is the critical component of safe, effective high quality care and patient experience.

Patient safety incidents in the National Health Service (NHS) in England are reported by the Learn from Patient Safety Events (LFPSE) national reporting system, logging over 3 million real-time patient safety events annually (NHS England, 2024). Recent adverse event and prevalence studies report the extent of the problem of harm in healthcare. A study of patient reported harm through treatment or care concludes that 9.7% of the British population reported harm caused by the NHS, with the most common location for harm being the in-patient setting. The reported degree of impact of harm ranged from 17.5% (of 10,287 participants) reporting no harm or mild impact,

37.6% of participants reporting moderate impact, and 44.8% reported severe impact (Crocker et al., 2025).

Keeping patients safe from harm is part of the NHS Patient Safety Strategy launched in 2019, which aimed to save 1,000 additional lives and £100 million each year. Progress to June 2023 reports being halfway to achieving this aim, this being the latest available evidence on NHS England's website (NHS England, 2025).

A 2021 analysis of prevalence and economic burden of medication errors in England reported 237 million medication errors annually across all stages of prescribing, dispensing, administration, and monitoring. The costs to the NHS of these avoidable adverse drug events being £98.5 million annually, contributing to 1,708 deaths (Elliott et al., 2021).

The latest update of the NHS Patient Safety Strategy in April 2025 highlighted maximising learning and responding to safety incidents through the Patient Safety Incident Response Framework (PSIRF), growing patient safety culture, and improving prioritising and responses to safety events; while the update on medicines safety stated that 1,900 deaths have been prevented through medicines safety initiatives (NHS England, 2025).

Nurses play a critical role in medication safety by adhering to the requirements of the Nursing and Midwifery Council (NMC) Code of professional practice (the Code), specifically to 'preserve safety' (NMC, 2018). The latest freedom of information request available for the number of medication errors resulting in death in the 2016/2017 financial year (NHS England, 2017) shows 72 medication incidents resulting in death, 53 of which were in hospital settings. The drive to explore medication administration safety resulted in the development of a PhD proposal by this researcher (see section 1.2.1 reflexive commentary).

Although it is easy to be drawn into the emotional arena of drug errors, an approach that looks at how and why so much goes right is crucial to learning and prevention of future safety-relevant events. This approach, known as safety II (Hollnagel, 2018a; Hollnagel, 2017), recognises complexity in healthcare and the learning that can be gained from examining all safety-relevant events, and not simply the ones that cause harm.

This PhD study explores nursing medication administration practice as a source of reliability and resilience. In this study reliability is defined as:

"failure free operation over time" (Resar, 2006).

Resilience is defined as:

“The intrinsic ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions” (Hollnagel, 2013)(Hollnagel et al., 2013: XXV).

This first thesis chapter continues with a positionality statement (section 1.2) providing the impetus for starting a PhD and grounding this research in the context of nursing medication administration practice.

Summarising the research context, identifying the current position of nursing practice in healthcare, medication error and safety is the focus of section 1.3; with key conceptual approaches to patient safety outlined in section 1.4. Areas where research in medication administration safety is limited are identified as opportunities to build on existing work and link to emerging concepts (section 1.5). The outcome of exploring research gaps and opportunities is this study’s aim and objectives in section 1.6. The chapter closes with an introduction to the thesis structure and a short conclusion.

An analytic story arc starts here and is woven through the following thesis chapters showing the research process, the understanding, the interpretation, the synthesis of findings and the future impact of this study. This version of an analytic story arc (Braun & Clarke, 2022) is directed and driven by this PhD student researcher. They are the ‘author’ positioned within the study and a key component of reflexive thematic analysis (RTA), the identified method for data analysis in this study (Braun & Clarke, 2022).

1.2 Positionality

Positionality indicates the researcher’s adopted position in a study (Wilson et al., 2022) acknowledging that researchers are not neutral to the research process (Braun & Clarke, 2022; Byrne, 2022), important for a study of this kind due to the interpretive nature of qualitative research. Positionality (further explored in chapter 3) enhances reflexivity for this researcher by reflecting on how their professional identity and experiences have influenced interactions with study design, participants and interpretation of the study data.

Positioning this researcher as a nurse and as a PhD student in the reflexive commentary below addresses why this study and study design were chosen.

1.2.1 Reflexive commentary: reflections on the impetus and direction of this study

Wrestling with drug errors – a reflection on the impetus for a PhD study

"I've been wrestling with drug errors my whole nursing career. As a student on my first ward, I heard whisperings that someone had made an error during a drug round. It was all kept very secret and quiet, but everyone knew, and no one talked about it. In the 1980's this was the way things were done, there was no sharing, discussion, reflection or learning, just shame and embarrassment and pity for the poor nurse who had made an error.

In my second year as a student, I made a drug error with a controlled drug - we gave too much of the required dose to a patient. We reported it immediately to the doctor and night sister and it was dealt with by the night sister as troublesome, speaking to us kept her from her duties, she was irritated, not kind, made sure the patient was OK and then left. It was never spoken of again, but everyone knew, and I felt so dreadful I didn't sleep for weeks and couldn't talk to anyone about it.

I did reflect but missed the final step [of Gibbs' reflective cycle] about moving forward having identified my learning. So, I went round and round reflecting and analysing what I did wrong and how bad I was. However, it did make me much more cautious, and I had another 18 months before registration to integrate what I had learned in terms of being a reliable, consistent and safe practitioner in the way I prepared and administered medication. Through the years I knew that other people wrestled with the same thing on a regular basis – we want to get it right and sometimes it goes wrong.

I think this is why I still wrestle with drug errors and safe administration, but more from an academic stance now, and I have always been interested in how we can maintain safety. It seems so easy, do the 5 rights (right drug, right patient, right dose, right time, right route) and you can't go wrong, can you?

It wasn't until I did a human factors two day workshop as a more senior nurse practice educator, that I heard about human factors. Suddenly I realised that we work in an environment that impacts on how we practice, think and behave and that we are connected to this in an array of ways, and they all impact each other. We are not alone, and when it goes wrong it is never just 'us'.

Learning about human factors helped me to recognise and acknowledge the internal and external influences that affect our practice, but I could still not explain to myself why we can't stop making errors. Again, I returned to 'if you do the 5 rights then you should get it right'. So, my broadening understanding of drug errors was still focussed on being safe and reliable which did not help much when a mistake was made, because mistakes are not safety.

However, recognising and (finally understanding) that the ever increasing complexity of the clinical environment and the fast pace of the nurses' work, with rapid patient turnover and caring for people with increasingly complex multiple health conditions and needs, has a huge impact on how we practice leading to more clarity. I started to believe that where errors happen it is often where some variation in standard practice has occurred. The work of Reason and others name these 'violations' or 'deviations' – even the nomenclature is loaded with blame and shame, and this is from people exploring and researching to explain human behaviour.

Researchers like Amalberti and Vincent started to apply a systems safety model to healthcare. And yes, somehow, violations and deviations became 'adaptations', 'variations' and 'compensations' when the lessons from industry were translated to health care; because there was recognition that using a manifest and a list of linear instructions in a car factory or before flight take-off does not represent the complexity of health care.

So evolved my interest in looking at healthcare safety slightly differently. Acknowledging the complexity, examining it and then realising this: isn't it amazing that more doesn't go wrong? Yes, patient safety in healthcare is a critical necessity, but shouldn't we just acknowledge and explore how we get it right so much more than how we get it wrong? What is it that keeps us getting it right most of the time? And here the focus on safety II emerged. We have wrestled with drug errors for years, but over the years we haven't managed to reduce them in a significant and meaningful way. So, looking at what we do well could serve to share good practice, amend old practices that no longer have relevance or are unworkable, and recognise that such a dynamic system as healthcare and within this, medication administration, needs a lens, a spotlight, to explore and learn. So, this is where the wrestling started me on this PhD journey.

After considering and writing multiple options for study design as I refined and defined the focus of study with my supervisors, we decided an ethnographic approach was most suitable. I had earlier written ethnography as an option for study design into my research proposal for my university to consider my application for PhD funding. We really had come full circle as, after my first year as a registered nurse, I decided I wanted more. The result of my nursing course in 1983 was a Certificate in Nursing, and I felt I hadn't had the opportunity to explore and question enough. Doing a degree in social anthropology fulfilled these personal requirements. I returned to nursing after a ten year break, did a 'return to practice' course and worked as a cardiac nurse, clinical skills nurse and practice educator. I then realised I wanted to pursue my love of education to teach student nurses. I have been a university lecturer in nursing now for 12 years. I wasn't to know that nearly 40 years after becoming a state registered nurse, I would register for a PhD and finally be able to address my unresolved question – 'why do we still make errors?' through my own research."
(Reflection on 'looking back', July 2019)

Following the very personal positionality statement above, the background to this researcher's own experience with medication error explains the drive to study nursing medication errors and safety and the impact on this PhD. In response to this reflection two 'needs' drove the continuation to explore safety in medication administration in the following reflection.

Wrestling with the why and what to do about it – a reflection on the direction of the PhD study

"I need to find answers to my unresolved question 'why do we still make errors?' and I need to have an impact on nursing practice and my profession."
(Reflection on 'looking back', September 2021)

To address these needs, understanding of existing theory and key literature was the first step to gain insight into why errors occur, which helped narrow down that 'what I can do about it?' question.

“An important part of this was wanting to make a difference, a positive impact, on nurse medication administration practices.” (Reflection on ‘looking back’, September 2021)

The reflexive commentary provides rationale for why a study in the area of medication administration was chosen and the significance to this researcher of it being a study by a nurse, about nursing, and with nurses as participants. To direct this study in a direction where it could make the most impact, exploring nurse’s perceptions and perspectives was a crucial element of the study design.

Being introduced to Vogt’s work (Vogt, 2008) was integral to moving forwards from the study focus towards the study question and design (described in the chapter 3).

1.3 Research context

Context is outlined here as background for this study, describing three areas: safety in nursing practice, the medication task, and medication safety. Key conceptual approaches in section 1.4 follow.

Patient safety is a foundational dimension of the quality of nursing care through meeting required standards of practice and focussing on harm prevention and risk minimisation for patients.

1.3.1 Safety in nursing practice

Four core principles of the Code are to prioritise people, practice effectively, preserve safety and promote professionalism and trust (NMC, 2018). Nurses are seen as the largest safety-critical profession in healthcare (Nursing Workforce Academy, n.d.). Current issues in nursing that impact patient safety are workforce shortages leading to larger workloads which increase error risk (NIHR, 2019); concerns around safety (Agbar et al., 2023), such as medication errors (Patrician et al., 2024); and systemic issues, for example under developed safety cultures (Finn et al., 2024; Parker, 2009).

Medication administration is predominantly a nursing function (Shepherd, 2020; Wulff et al., 2011) and a key part of the nursing role, taking between 11.8% (Michel et al., 2021) and 29.1% (Keohane et al., 2008) of nurses’ time. There are differences between countries in who prepares medication prior to administration; for example, in the UK preparation is generally part of the nursing administration process.

Almost every patient in hospital is given medication as part of their treatment (Wheeler et al., 2021). Worldwide nurses are accountable for the safe use of medications (International Council of Nurses, 2012; Martyn et al., 2019) and preserving patient safety (Vaismoradi et al., 2020). Despite international efforts to improve safety through

research, policy, and regulation (Drach-Zahavy et al., 2014; Slawomirski & Klazinga, 2022) it continues to be a global concern (WHO, 2021b).

1.3.2 The medication administration task

Nurses play a key role in the health care workforce, being the largest workforce in European hospitals (Aiken et al., 2013; Liu et al., 2018). Globally, a core responsibility of nursing practice is medication administration (Martyn et al., 2019).

The average number of prescribed medicines per inpatient in England is 4.78 (Elliott et al., 2021). Nurses administer the majority of these medications to their patients (Shepherd, 2020); studies suggesting that this can occupy a significant proportion of their time (Michel et al., 2021).

Medication administration is governed by national guidelines for legal and professional accountability (NMC, 2018), and national standards and local policy guidelines for practice. These represent 'work as planned' (WAP) which is how work is expected to be carried out. Actual work performed by nurses in real world conditions represents 'work as done' (WAD) (Hollnagel et al., 2015). This concept is introduced here and further discussed within existing literature in section 1.4.

The nursing team administer medication to their group of allocated patients on the drug (or 'medication') round, which is a structured process over the course of one day, where prescribed medication is administered at 8am, between 12 and 2pm, 6pm and 10pm. They review the drug chart (medication administration record) and select and prepare medications from a drug trolley for a single patient at a time; usually standing with the trolley in front of each patient. This enables the nurse to assess the patient, communicate easily with them, and confirm their identification and consent, followed by documenting in the drug chart that the patient has taken their medication.

In this PhD study, nurses as individuals administering medication to their group of patients act at the lowest level of the socio-technical work system, the inpatient ward or team being the next level, with the organisation (the hospital trust) operating at the highest work system level.

1.3.3 Medication errors

Within the context of inpatient hospital care, medication error rates have remained consistently unacceptable to patients and nurses since the turn of the century, with the drive to reduce error rates being largely ineffective (WHO, 2021a). This has motivated international and national patient safety strategies to examine and explore means to influence changes in clinical practice to ensure patient safety in this context is enhanced (WHO, 2017b, 2021b).

Medication errors are a sub-set of patient safety. The majority (54.4%) of medication errors in the inpatient setting occur during administration, with an annual estimate of the number of medication errors in England in one year being over 237 million (Elliott et al., 2021). An earlier international systematic review of medication administration errors from 91 studies, reported a median error rate of 19.6% of total opportunities for error (including wrong-time errors) (Keers et al., 2013). Similar results are reported in England, with a mean error rate of 18.6 % of total opportunities for error (Elliott et al., 2020).

The cost of errors is not simply economic, the impact on the patient can be very high, from death to longer hospital stay (Elliott et al., 2021) and, for nurses, loss of trust, guilt, moral distress and questioning competence (Mahat et al., 2022).

The NHS categorises degree of harm as the actual impact on the patient from safety incidents, using categorisation from the LFPSE framework (NHS England, 2024). The level of harm for both physical and psychological harm is graded at five levels, from no physical harm, through low physical harm, moderate physical harm, severe physical harm to fatal (NHS England, 2023b). In this study, the term 'safety-relevant events' is preferred to 'safety incidents', and this terminology is applied to relevant study data in this current research.

1.3.4 Medication administration safety

The patient safety principle in the Code focusses on minimising risk to patients and taking proactive steps to protect them from harm. This includes implementing measures to prevent errors and manage risk, and working within individual competency, laws, NMC guidance and relevant policies and guidelines (NMC, 2018).

WHO highlights medication administration as error-prone, identifying the need to understand and design systems and practices to be more resilient to risk (WHO, 2017b).

Safe medication administration is informed by protocols and guidelines which outline expectations for best safe practice. Professional guidance (NMC, 2018), and more specific guidelines from the Royal Pharmaceutical Society (RPS) and Royal College of Nursing (RCN) (Royal Pharmaceutical Society & Royal College of Nursing, 2019), provide nationwide guidelines for safe administration of medicines. Local trust-wide policies stem from these.

The internationally recognised framework of the '5 Rights' (5R's) provides a framework for safety in administration where the individual nurse makes sure the right patient gets the right medication and the right dose at the right time via the right route (Hanson &

Haddad, 2023). The 5 R's have received criticism for not acknowledging the human and systems factors that are inherent in medication administration (Institute for Safe Medication Practices (ISMP), 2007).

Having situated current medication administration in nursing practice within error and patient safety, the following section 1.4 explores key conceptual approaches to the key study foci described above.

1.4 Conceptual approaches & glossary

This section uses four subsections (safety I, safety II, human errors, and resilience) to explore relevant conceptual approaches that have been applied to this PhD study in medication administration safety. The subsections provide a broad conceptual apparatus for analysis of findings in this study. A glossary of specialised terms and concepts pivotal for understanding this PhD study is provided in table 1.1

.

Table 1.1 Glossary of Specialised Terms and Concepts

Term	Definition/explanation
Adaptation in the context of resilience	"The capacity to adapt to challenges and changes at different system levels, to maintain high quality care" (Lyng et al., 2021).
Five Rights	A foundational framework designed to reduce medication errors and ensure safe administration. The 5R's are the right patient, the right medication, the right dose, the right route and the right time.
Human factors	This approach views humans as a necessary resource for resilience in all elements of healthcare systems, such as the tasks, the environment and other people, by problem solving and being flexible (Hollnagel et al., 2015).
Normative	The planned model of work (Wiig et al., 2020)
Outcomes	"States or conditions resulting from the work process" (Holden, Carayon, et al., 2013)
Patient safety	"The absence of preventable harm to a patient and reduction of risk of unnecessary harm associated with health care to an acceptable minimum" (WHO, 2009).
Resilience (broad, generic) definition used throughout thesis	"The intrinsic ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions" (Hollnagel, 2013).
Resilience (operational)	Developed by supervisory team and used at the start of the systematic review to develop search strategy & classify available data: 'Adaptive or compensatory behaviour to maintain safe administration of medication in the face of variations and dynamic risks' (Kellett et al., 2024).

Term	Definition/explanation
Resilience (operational, contextual)	An outcome of the systematic review (chapter 2) providing a context specific definition of resilience for rest of thesis: ‘Physical or mental compensatory or adaptive practices responding to detection of risks to patient safety before, during or after the process of administering medications to patients, where the nurse changes or deviates from the planned model of work with the purpose of maintaining safety’ (Kellett et al., 2024).
Resilience in Healthcare (RiH)	A five year research programme across 5 countries including the UK, with a longitudinal protocol modelling adaptation to changes, variations and disruptions (resilience) A new approach to understand the complexity of healthcare and advance quality care (Aase et al., 2020).
Safety I	An approach to safety management that reduces harm by focussing on what goes wrong, causes, incident analysis and prevention of future recurrence (Hollnagel et al., 2015).
Safety II	An approach to safety management that focusses on what works well in everyday clinical work, where performance variability (resilient adaptation) responds to varying conditions, so things go right (Hollnagel et al., 2015).
Systems approach	“An approach for studying and improving health and healthcare. It describes how sociotechnical systems shape health-related work. Work processes, in turn, shape patient, professional and organisational outcomes”
WAD	How tasks are intended to be performed based on policies and guidelines
WAP	How work is actually performed in real-world conditions

1.4.1 Safety I in healthcare

Traditionally, safety management has focussed on freedom from unacceptable harm (what is now called Safety-I) (Hollnagel et al., 2015). Here, accidents such as failures linked to technology, procedures, or people have been seen as liabilities. Attempts to improve safety have tried to reduce risks to an acceptable level or eliminate them (Hollnagel et al., 2015). Safety relevant events are reduced by implementing patient safety principles that support reliability in healthcare, such as prevention of harm and quality improvement (Vaismoradi et al., 2020).

Safety I is an approach to safety management that focuses on compliance and risk elimination. However, absolute safety is not an achievable goal (Reason, 2008). An achievable goal is for an acceptable level of risk where as few things as possible go wrong, (Hollnagel et al., 2015). Core to safety I is what individuals do to support patient safety by adhering to procedures and protocols, with minor variations in practice that work well for them to promote safety. This orthodox approach to protective practices, named as safety I solutions (Braithwaite et al., 2015), shows that human error (including unsafe acts or active failures) and system errors (or latent failures) interact to allow error to occur (Reason et al., 1990).

However, identifying what goes wrong after a safety event using safety I solutions offering a 'find and fix approach' (Braithwaite et al., 2015), does not acknowledge the complexities of modern healthcare and what works well most of the time (Lawton, Carruthers, et al., 2012). The limited success of safety I results from the find and fix approach at the level of the individual (Anderson et al., 2016). It is the persistence of safety issues that have driven the need to improve safety in healthcare.

1.4.2 Safety II in healthcare

For some areas of healthcare, the safety I model has succeeded in enhancing patient safety, but the increasingly complex and frequently changing environment under which nurses practice makes being reliable harder. Safety issues from intractable complex and unpredictable processes are unfixable using the Safety I model (Braithwaite et al., 2015). Focussing on human error restricts learning and does not acknowledge that adaptations and adjustments made by individuals are what safeguard the system (Reason, 2008).

As systems become larger and more complicated, preserving safety requires more than just a focus on preventing recurrence of previous accidents. The concept of safety was therefore broadened to include safety II (Hollnagel et al., 2015). Here the focus is not just eliminating risk and preventing errors, but on producing safety in routine

practice. Focusing on how safety is preserved through constant adaptation to anticipated and emerging risks is a property that has been termed system resilience (Hollnagel, 2017).

Safety II takes a different approach to safety management than safety I by focusing on the importance of learning and adaptability. Safety II does not rely on people doing what they are supposed to do (WAP), it focusses on WAD and what goes right, where workers adjust their actions to reflect their working conditions when managing risk (Hollnagel et al., 2015). Here, mechanistic processes such as guidelines are inadequate and are sacrificed in response to threats (Vos et al., 2020).

1.4.3 Human error and systems failure

1.4.3.1 Work as Planned (WAP) and Work as Done (WAD)

Being a nurse demands accountability (NMC, 2018). This highlights tensions between policy and WAD and the need to balance decision making and critical thinking with accountability when adjusting practice (Lyng et al., 2021; Macrae & Wiig, 2019; Wiig et al., 2020).

Nurses adjust their everyday administration practices (work as done (WAD)) from what is written in standard protocols (work as planned (WAP)); and by doing so can either improve or worsen safety (Alper, 2012; Amalberti et al., 2006; Lyons et al., 2018). Named as 'violations', these practices contradict the very purpose of protocols, which are drawn up to reduce the risk of errors, and are seen as crucial for safe practice (NHS England, 2023a; Rixon, 2023). However, protocols cannot reflect the realities of clinical work to the degree that they dictate every action (Vos et al., 2020), with a subsequent lack of alignment between WAP and WAD. As a result, deviations and violations from guidance occur, arising as responses to wider complexity, local practices (Wiig et al., 2020) and systems dynamics (Amalberti et al., 2006; Anderson et al., 2020).

Violations and deviations are often considered harmful in healthcare, with an assumption that the fewer the better, and they are often seen as indicators of poor quality care (Bottle & Kristensen, 2024; van der Linde et al., 2024).

Although variations in practice are limited through policies and guidelines setting standards and expectations, they fail to acknowledge the context and realities of clinical work. This is considered a safety paradox (Reason, 2008)(Reason, 2000a) because it is complexity which drives changes and adaptations in practice, and limiting variation does not minimise error, instead it reduces the ability to adapt in response to dynamic risks inherent in healthcare.

A safety II approach looks at variations in everyday clinical work where nurses often adjust their practice or engage in adaptive or compensatory practices to cope with the vagaries of their complex working conditions. This WAD is a key source of resilience where it preserves safety in the face of dynamic risks. Whereas WAP set out in policies and protocols does not best represent resilience in everyday healthcare practice (Hollnagel et al., 2015).

However, lower policy and guideline compliance has been associated with medication administration errors and patient harm (Keers et al., 2013; Schutijser et al., 2018).

Therefore, understanding where variations in practice support safety is an important focus for current and future patient safety research. The mismatch between WAP in protocols, and WAD, is often related to the complex nature of the work itself (Iflaifel et al., 2020) and understanding how nurses spontaneously maintain safety is a key area for enquiry.

1.4.3.2 Systems failure

There is friction between standardised practice and supporting flexibility in systems safety management (Vos et al., 2020). When only immediate problems are fixed with reactive, in the moment solutions (conceptualised as ‘first order problem solving’), underlying issues are not addressed, these are conceptualised as second order problem solving (Tucker & Edmondson, 2003). This obstructs organisational learning and leads to tolerating systems failures (Tucker & Edmondson, 2003) resulting in a poorly functioning organisation which becomes vulnerable to safety-relevant events.

1.4.3.3 Normalisation of deviance

Normalised deviance occurs when adherence to safety standards are gradually reduced over time, becoming the ‘new normal’ in practice behaviours when no negative safety outcomes occur (Wright et al., 2021). Toleration of policy violations in clinical practice is influenced by normalised deviance (Amalberti et al., 2006; Vaughan, 1996) within a dysfunctional system and safety culture that tolerates this practice (Entwistle & Doering, 2024).

A deliberate violation from medication administration guidelines by a nurse breaches the Code (NMC, 2018) by not performing care according to set local policy guidelines. Routinised in practice over time, this leads to less awareness, and normalisation extends to the team with related safety issues.

1.4.4 Resilience as part of systems safety

In this study resilience is the main conceptual mechanism used to explore medication administration safety and has been defined in the glossary in table 1.1.

Resilience in patient safety terms is not synonymous with personal psychological resilience. Developed from safety science, resilience is a source of patient safety through adapting to challenges and changes to maintain quality care (Wiig et al., 2020). The application of human factors is instrumental in improving patient safety, and resilience is an integral part of this, showing how error recovery maintains safety in complexity (Ellis et al., 2019).

1.4.4.1 Systems safety

Resilient practices resulting from first-order problem solving are short-term fixes when the system fails, with second-order problem solving going beyond solving the immediate problem by escalating safety issues to those in the system who can manage them (Paparella, 2018; Tucker & Edmondson, 2003). Problem solving patient safety events at organisation and national level uses the NHS England's Patient Safety Incident Response Framework (PSIRF) for responding to events, with a focus on understanding contributory factors and how events occur (NHS England, n.d-a).

A systems approach to medication safety recognises medication administration (including preparation) occurs within a wider context (WHO, 2017a). Resilient Healthcare, a recent research arena looking to improve understanding in how systems adapt to ensure safe outcomes given changing conditions (Sanford et al., 2022a) offers a perspective on safety focussed on what works well, rather than what goes wrong (Hollnagel, 2018a; Ilaifel et al., 2020). Resilient Healthcare is a maturing paradigm, examining what goes right (Ellis et al., 2019) and the implications this has for safety (Hollnagel, 2018a).

Medication administration errors may be triggered by routine variations in the system as well as individual human level factors, so it is important to understand and design systems and practices that are more resilient to dynamic risks (WHO, 2017b). The challenge for nurses is to promote, support and learn from responsive adaptations that maintain safety during medication administration.

Two models from the safety science literature are particularly important for interpreting resilience in the work systems that underpin nursing medication administration practice in this thesis. The Systems Engineering Initiative for Patient Safety (SEIPS) 2.0 model, a human factors framework for understanding how socio-technical work systems produce processes which shape outcomes in resilient systems (Holden, Carayon, et al., 2013); and a framework examining resilience that emerges from individuals (internal resources) and organisations (external resources) (Aase et al., 2020) which was helpful in analysing findings in the systematic review (chapter 2).

Violations are unavoidable because system dynamics and deviance are markers of adaptation. They cannot be eliminated but they do need to be managed to ensure patient safety. Solutions focus on what Reason identifies as 'the edge' which lies between 'relative safety' and 'unacceptable danger' (Reason, 2000b). The mechanism for managing variation is to recognise violations, migration to boundaries and normalised deviance, and share acceptable and unacceptable deviations from policies and guidelines. 'Borderline tolerated conditions of use' are initially seen as beneficial because they enhance system performance but can lead to unsafe practices (Amalberti & Vincent, 2020; Rasmussen, 1997). Conceptual clarity for relating these practices has been further explored in chapter 5 where a model was developed by this researcher (figure 5.1).

1.4.4.2 Adaptations

Adaptations are expressions of nurse resilience made in practice for the purpose of maintaining safety, rather than simply error-prevention strategies. Nurses adjusting their practice when faced with competing priorities, unexpected situations and lack of detailed guidelines is an important contributor to safety II (Vos et al., 2020). Where nurses use their skills, experience, critical thinking and decision making to compensate for complex circumstances using strategies such as prioritisation, trade-offs and other informal practices, they contribute to patient safety and organisational resilience (Aase et al., 2020; Lyng et al., 2021; Wiig et al., 2020).

The opportunities for research in the study area of safety in nursing practices around medication administration are explored in the following section (1.5).

1.5 Research opportunities

To develop and progress this current PhD study beyond the research focus there was a need to identify the current research base, examining the empirical literature on safety, reliability, and resilience in the specific context of nursing medication administration practice. This took the form of a systematic review (chapter 2) which broadened the depth and breadth of insight, exploration of gaps or opportunities for research, and contributed to moving beyond existing understanding of nurses' practice promoting safety in medication administration.

To make things clear for the reader and provide a coherent structure and reference for the whole thesis, the research objectives are set out at the end of this chapter after the following sections (1.5.1 and 1.5.2) explore the research base and opportunities for further research.

1.5.1 Evolution of approaches in safety science and the implications for contemporary research

Exploring existing research helped establish knowledge or research gaps where new or further research could have an impact on resilience in nursing medication administration. Studies in this safety realm often still have a main focus on errors, and an approach that examines the role of individual risk behaviour (Alandajani et al., 2022; Vaismoradi et al., 2020). However, the focus is slowly changing following the publication twenty-five years ago of a seminal report on safer health systems, 'To Err is Human' (Kohn et al., 2000). This encouraged a shift towards more acknowledgement of system functioning and broader factors impacting medication administration safety. Examples of this focus are Martyn et al's appreciative inquiry on nurses' experiences of medication administration (Martyn & Paliadelis, 2019) and the factors that contribute to medication errors from a nursing perspective (Hammoudi et al., 2018).

It is the perspective of this researcher that the error language of safety I (viewing errors at individual level) can be pejorative and provoke individual blame, for example through such terms as violations, unsafe acts, failures, and adherence. This approach classifies nursing practice into varying degrees of poor practice (Lyons et al., 2018), blaming nurses for unreliability in their processes; and focus is maintained at the level of the nurse without understanding the context and complexity in which they practice.

Limitations here arise from lack of understanding about how nurses deal with dynamic, often competing priorities, and systems vulnerabilities beyond their individual control. Research in the last five years, particularly from Resilience in Healthcare (RiH) is developing an understanding of whole systems factors and safety, but this is still an underexplored concept (Øyri & Wiig, 2022; Wiig et al., 2020).

Using a safety II lens therefore meets an urgent need to examine wider factors than those that exist and impact medication practice at the level of the individual. This perspective exposes an opportunity to use this more contemporary lens to develop understanding of factors impinging on safety events in medication administration and how nurses' navigate these to create and maintain safety.

Acknowledging that research gaps are constructed by researchers rather than passively waiting to be discovered, and that these must be linked to a clear research purpose (Braun & Clarke, 2022), they provide an opportunity to develop broader theoretical explanations as well as investigate practice.

By starting with two spaces in patient safety literature where research gaps are slowly narrowing at organisation level (safety II and a whole systems approach), and layering on top a third space in understanding the reality of WAP and WAD, expressed as the

real world of everyday medication practice (as compared to expected or imagined practice outlined in policies and guidelines), the significance of this proposed study becomes apparent. Introducing the third, less examined area focussing on exploration of the operational difference between ‘the ideal and the real’ (Vincent & Amalberti, 2016), results in the construction of an opportunity to develop new insights and build on existing theory.

The focus on clinical work is a priority for managing risk in healthcare (Amalberti & Vincent, 2020) with the need to develop understanding of how nurses manage risk through resilient adaptive practices being a high priority. Exploring this area could contribute to medication safety and wider organisational resilience (Anderson et al., 2020) by ultimately suggesting areas for improving healthcare quality.

1.5.2 Opportunities linked to new and emerging concepts

“Designs are most effective and have the greatest potential for innovation when they are dictated by the nature of the research problem” (Vogt, 2008).

The persistence of care quality problems despite interventions and improvements is the driver for more effective quality improvement strategies (Anderson et al., 2016).

Adaptation contributes to resilience, and resilience results in high quality, safe care (Aase et al., 2020).

The gaps in research identified in section 1.5.1 above, are an opportunity to view violations and deviations as examples of variability in individual nursing performance. This has been and linked with the construct of WAP and WAD (Amalberti et al., 2006; Anderson et al., 2020). The opportunity to develop this concept further by building on previous work lies in deeper understanding of the micro level WAD during medication administration. Understanding practice variability in this context, what drives it and how it can positively impact on safety while integrating a safety II approach (Hollnagel et al., 2015) is an opportunity to theory build understanding of how nurse’s resilient adaptive practices support safety.

The prospect of exploring variability as both the individual’s reliable practice, and their adaptative strategies compensating for complexity at ward and organisation level and beyond, is an opportunity to clarify and develop emerging concepts.

There is a lack of conceptual clarity in some areas of theory, particularly problems with definitions. Theory building is a necessary part of studying resilience (Lyng et al., 2021), so an opportunity to define a context specific definition of resilience as it applies to medication administration has been taken in the systematic review (chapter 2) providing clarity for further research in this area.

Acknowledging the significance of systems levels approaches (Holden, Carayon, et al., 2013) and the influence of nurses' resilience practices to adapt and compensate for discrepancies and weaknesses in the system is worthy of further study.

1.6 Research aims and thesis structure

The previous four sections of this chapter described this researcher's positionality, the research context, core concepts relating to nursing medication administration safety, and the consideration of seminal and contemporary theory in patient safety research. The approach to meeting the research aim and objectives considered the systematic review (chapter 2) to be part of this PhD study. The addition of the systematic review provided additional learning and contributed to the identification of areas where gaps were apparent in certain aspects of the literature or were not fully supported by empirical studies, building on promising concepts in the literature as much as responding to gaps. This gave rise to justification for a broad aim with specific objectives as follows.

1.6.1 Research aim

The principal aim of this PhD study was to explore how resilience is created and maintained in nursing medication administration.

Four specific objectives provided a clear framework for this study. These are presented below in Table 1.2. **Matrix of Thesis Chapters linked to PhD Objectives & Intermediary Questions**

Table 1.2 Matrix: PhD Study Aim and Objectives.

PhD Aim To explore how resilience is created and maintained in nursing medication administration practice in the hospital inpatient setting			
Chapter	PhD Objective	Intermediary question	met or partially met
2	Objective 1 To review and synthesise existing published research and theory related to resilience in nursing medication administration practice		met (systematic review)
		Intermediary question 1 How might resilience principles be applied to nurses administering medication to hospital inpatients?	met (systematic review)
		Intermediary question 2 What is the evidence for the effectiveness of strategies linked to resilience principles in improving safety in nurses' medication administration?	met (systematic review)

4	Objective 3 To explore how observed nurse medication administration practice (works as done) might deviate from work as planned, the scenarios under which this occurs and any intended or unintended consequences		partially met
	Objective 4 To explore nursing staff perceptions of risk and resilience associated with medication administration practice and the factors that drive variations in behaviour		partially met
5	Objective 2 To review and document works as planned with national nursing medication administration practice guidelines and local organisational policy and guidelines		met
		Intermediary question a What are the variations nurses make during medication administration?	met
		Intermediary question d How can variations be compared to the normative model?	met

	Objective 3: To explore how observed nurse medication administration practice (works as done) might deviate from work as planned, the scenarios under which this occurs, and any intended or unintended consequences		met
		Intermediary question a What are the variations nurses make during medication administration?	met
		Intermediary question b What drives/triggers these variations?	met
		Intermediary question c How can these variations be classified? (typology)	met
6	Objective 3 To explore how observed nurse medication administration practice (works as done) might deviate from work as planned, the scenarios under which this occurs and any intended or unintended consequences		met
	Objective 4 To explore nursing staff perceptions of risk and resilience associated with medication		met

	administration practice and the factors that drive variations in behaviour		
7	Objective 1 To review and synthesise existing published research and theory related to resilience in nursing medication administration practice		met (further synthesis)
	Objective 2 To review and document works as planned with national nursing medication administration practice guidelines and local organisational policy and guidelines		met (further synthesis)
	Objective 3 To explore how observed nurse medication administration practice (works as done) might deviate from work as planned, the scenarios under which this occurs and any intended or unintended consequences		met (further synthesis)
	Objective 4 To explore nursing staff perceptions of risk and resilience associated with medication		met (further synthesis)

	administration practice and the factors that drive variations in behaviour		

1.6.2 Thesis structure

An analytic story arc is a coherent narrative of the iterative exploration of the PhD aim and objectives running through the thesis chapters. It builds as the thesis progresses, outlining the interpretation of findings and the final synthesis of findings to meet this study's aim.

One or more of the four study objectives are addressed in each findings chapter. As a reminder to the reader the table of this PhD study aim and objectives shared above (table 1.2) is presented here as a matrix.

Each findings chapter presents a table of bullet points summarising implications for practice that arise from exploration of study findings. These are later synthesised and discussed in chapter 8.

The thesis structure and components are now presented. Chapter 2 introduces the systematic review and presents the methods, a description of the included studies, the results and a discussion section. Following Vogt's framework (chapter 3, table 3.1) (Vogt, 2008) chapter 3 establishes the approach and study design as an ethnographic study with three methods of data collection, observation, interview and document review. The selected approach to data analysis using reflexive thematic analysis (RTA) (Braun & Clarke, 2022) is explored, demonstrating the significance of reflexivity and positionality to the analysis and interpretation of data.

Three findings chapters are then presented. Chapter 4 contextualises the ethnographic findings, identifying pressures that influence variation and adaptation, and introducing the study participants. Chapter 5 explores policy and guidelines informing professional practice, and perceptions of how and why WAD differs from established guidelines. This understanding is further explored in chapter 6, where nurses' intentional adaptive practices are investigated, responding to, and compensating for complexity in the work system.

In chapter 7 a synthesis of the findings chapters integrates findings from this PhD study with existing safety literature and empirical research exploring how resilience is created and maintained. A roadmap of resilience model with an accompanying system story shows how this is done in nursing medication administration practice in the inpatient setting, so meeting this study's aim and objectives.

Chapter 8 provides a more forward-focussed discussion of this study's implications and recommendations for future practice and research. An evaluation of thesis write-up follows, and a conclusion draws this thesis to a close.

1.7 Conclusion

This introductory chapter provides background context for this PhD study situating it in the field of nursing and medication administration practice and positioning this researcher within the study. Key conceptual approaches from relevant theoretical and research domains have been described to further locate the study, and opportunities for building on existing research has been explored.

Chapter 2 presents a systematic review of empirical research synthesising the evidence for the application of resilience principles and practices in nursing medication administration.

Chapter 2

Systematic review: synthesis of evidence for the application of resilience principles and practices in nursing medication administration practice

2.1 Introduction

Background to this systematic review chapter has been described in the introductory chapter 1. In order to address the first PhD study objective to review and synthesis existing published research and theory related to resilience in nursing medication administration practice, this chapter reports a systematic review. Given the novelty of the topic area, an important step in constructing a research design was to analyse the current empirical evidence in nursing medication administration as a means to refine the research question and methods.

Two specific intermediary questions linked to the first PhD objective are shown below and in table 1.2 (chapter 1).

- How might resilience principles be applied to nurses administering medication to hospital inpatients?
- What is the evidence for the effectiveness of strategies linked to resilience principles in improving safety in nurses' medication administration?

Starting with the systematic review methods (section 2.2), a description of included studies (section 2.3) and a findings section (2.4) follow. Next, the discussion section (2.5) synthesises and interprets the findings, and implications for practice from this review are summarised (table 2.5). A reflexive commentary on publication positions this researcher's learning insights, before the chapter ends with a conclusion (section 2.7).

The systematic review was published in the open access journal BMJ Open Quality on 28 October 2024 and is available at doi:10.1136/ bmjoq-2023-002711 (Kellett et al., 2024).

Having identified two review-specific questions and mapped them to the PhD objectives, the next section of this chapter addresses the systematic review methods.

2.2 Methods

The systematic review was registered with PROSPERO (registration number CRD42018087928). Search methods are described in seven subsections (2.2.2.1 to 2.3.2.7) after an overview of the review design below.

2.2.1 Design

A systematic review was conducted to meet the identified aim and two specific questions.

Resilience as defined in the introduction to chapter 1 is very conceptual as a construct and quite specific in its application for patient safety and safety II. Creating an operational definition of resilience in medication administration was necessary at the very start of this review for this researcher. Developing a definition based on relevant and recent evidence was important for two reasons. Firstly, it was essential for accuracy in developing an effective search strategy that was sensitive enough to retrieve a large number of relevant articles, yet specific enough to capture relevant articles and not retrieve irrelevant ones. Secondly it helped in study selection by classifying the available data. At this stage of the review only, the operational definition of resilience was referred to as:

‘Adaptive or compensatory behaviour to maintain safe administration of medication in the face of variations and dynamic risks’.

This definition and others can be found in the glossary (Chapter 1 table 1.1).

However, a limitation of this review’s method was that even with this operational definition of resilience and despite the sensitivity and specificity of the search strategy, it was possible that not all related evidence was captured if an alternative interpretation of resilience was used by the authors of the selected empirical studies. An outcome of the review was a more nuanced and focussed context specific definition of resilience in nursing medication administration (section 2.5.3) which is used throughout the rest of the thesis.

The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) checklist and reporting guidelines (Page et al., 2023) were followed. The Synthesis Without Meta-analysis (SWiM) reporting guidelines were used for quantitative interventional studies using alternative synthesis (Campbell et al., 2020).

2.2.2 Search methods

2.2.2.1 Eligibility criteria

All international peer reviewed published research meeting the aim using the eligibility criteria in table 2.1 were included.

Table 2.1 Inclusion and Exclusion Criteria

Context	Include	Exclude
Population	registered nurses, registered nursing associates	nursing students, any other healthcare professionals
Context	administration of any medication secondary care setting, any inpatient hospital setting, simulation of inpatient setting	studies of drug incompatibilities, studies that examine incident reporting any primary care setting, outpatients, day clinics, community drop-in centres, individual psychological resilience, studies using secondary analysis of existing data unless conducted by the original study team
Study focus	patient safety, resilience	studies only reporting prevalence, measurement and characteristics of errors, studies only reporting reliability (the consistent, safe administration of medication), studies where nursing medication administration was not the main focus of the research or where data relating to nursing medication administration could not be extracted from the results
Country	any country worldwide	
Publication type	English language, peer reviewed studies of any study design meeting definition of resilience	systematic reviews, non-empirical grey literature, conceptual articles, letters, non-English language, PhD and conference abstracts, PhD theses

2.2.2.2 Information sources

Four databases were searched between 14 August 2020 to 1 January 2021. The selected databases were: Medical Literature Analysis and Retrieval System Online (MEDLINE), Excerpta Medica Database (EMBASE), Psychological Information (PsycINFO) and the Cumulative Index of Nursing and Allied Health Literature (CINAHL).

2.2.2.3 Search strategy

Search terms were modified slightly depending on the database used. Boolean search terms were developed with assistance from a university subject information specialist, the final strategy is shown in box 1. Initial scoping searches of Ovid Medline refined the

search strategy. A faceted approach (Fagan, 2013) using “patient safety” (including resilience synonyms), “nurse medication administration”, and “hospital inpatient” fitted with the conceptual arena of resilience. The full electronic search strategy for Ovid Medline can be seen in table 2.2.

Table 2.2 Search Strategy

(Patient safety or safety II or safety-II or safety 2 or (safety adj2 (culture or climate)) or (reliab\$ or resilien\$) or (human adj2 (factor\$ or error\$)) or (workaround\$ or work around\$ or work-around\$ or circumvention or non-compliance or improvis\$ or shortcut\$ or double check\$ or Safety Management/or Medication Errors/ or (error adj3 (detect\$ or wisdom))).mp

AND

((Nurs\$ or Nursing) and ((medication\$ or medicine\$ or drug\$ or dose or dosage or dosing) adj5 administration)).mp

AND

((in-patient\$ or inpatient\$ or acute or secondary care or hospital\$ or Inpatient/ or Hospitals/)).mp

2.2.2.4 Study selection

Screening was undertaken with two stages of inter-reviewer reliability, confirmation of full-text inclusion, and quality assurance. See figure 2.1 for identification, screening and full text data extraction.

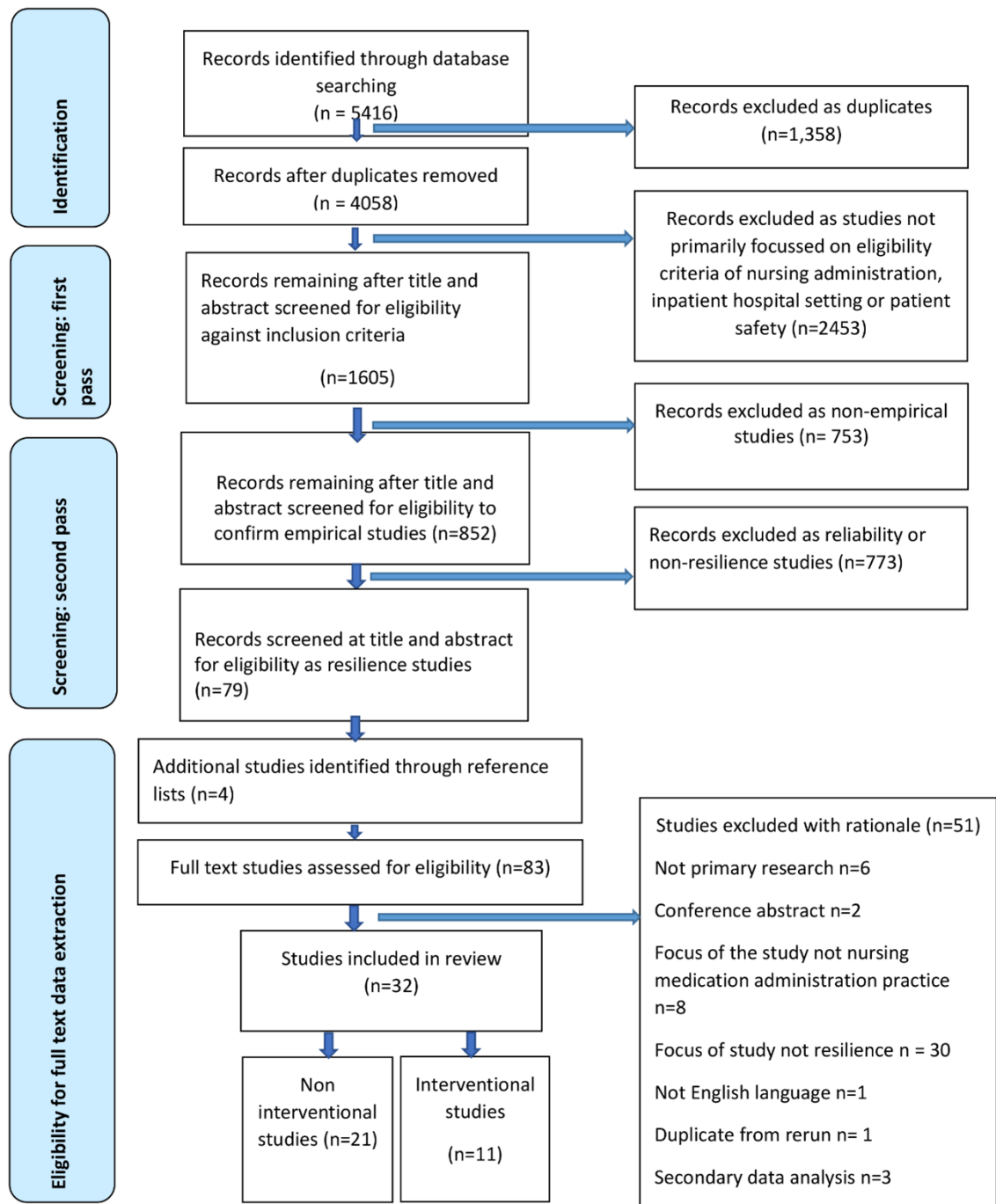


Figure 2.1 PRISMA Flowchart

A first pass eligibility assessment of title and abstract for all records by the primary author was confirmed for 5% of records with two reviewers confirming 2.5% each, with 97% agreement. Any disagreements were resolved by consensus and unresolved records saved for full text review.

A second pass title and abstract screen classified the records as empirical or non-empirical and confirmed resilience as the research focus. The focus of the literature review was resilience, with a search strategy and inclusion criteria aligned with this and therefore only identified and analysed resilience literature. Inter-reviewer reliability for classification and confirmation of 5% of these records was 95% and again, unresolved

records went through to the full text review. An additional reviewer was not required. Further exclusions by the reviewing team were made on subsequent examination of the full texts as some abstracts did not report sufficient detail, study type or focus. Final included studies were grouped according to whether they evaluated an intervention. The study identification process is summarised in figure 2.1 above.

2.2.2.5 Data extraction

Data were extracted using a bespoke data extraction spreadsheet developed through piloting and review with support from the supervisory team, presenting the following aspects:

- Core details: Country, speciality, application and definition of resilience (if any).
- Study background: aims, objectives, primary method of data collection, research design (both as specified by authors and using appraisal tool typology, (Hong, 2018))
- Results: resilience practices, intervention if applicable, findings/results, outcomes significant to the review aims.

2.2.2.6 Quality appraisal

Concurrent quality appraisal used the mixed method appraisal tool (MMAT) (Hong, 2018), appropriate for assessing quality of a variety of methodologies and designs. Studies with low methodological quality were not excluded, as advised by the appraisal tool authors (Hong, 2018). Study quality was reported descriptively and confirmed by two reviewers for 30% of included studies. Detailed information of extracted data is displayed in tables 2.3 and 2.4.

2.2.2.7 Synthesis of results

Meta-analysis of results was not possible due to heterogeneity in study outcomes and methodologies across the large collection of data. The aim was to develop the concept of resilience, and its effectiveness as applied to nursing medication administration by synthesising results from qualitative, quantitative and mixed methods studies. Selecting the most appropriate approach for results synthesis method used was an iterative process. Drawing from interpretive traditions, narrative synthesis was the final decision, used to summarise and explain findings from multiple diverse studies.

A process of recurring theme identification grouped disparate data (Lucas et al., 2007) using an iterative three stage approach of coding, descriptive themes and analytic themes (Thomas & Harden, 2008). This approach to synthesis generated descriptive

material to address the first review-specific intermediary question and the analytic themes to answer the second review-specific question in table 2.1.

As part of the screening process the included studies were differentiated by whether there was an interventional study design or not; however, during synthesis of the results this distinction became less discrete as the iterative themes evolved.

The following section 2.3 describes the final selected studies.

2.3 Description of included studies

In this section, how the included studies were identified, their characteristics, the study methods and quality of evidence are described.

2.3.1 Identification of selected studies

The identification of final included studies is summarised in figure 2.1. The database search yielded 5,416 records. After removing duplicates, the remaining 4,058 were screened in three phases. First pass screening yielded 1,605 records, excluding 2,453 for not meeting the primary inclusion criteria. The second pass excluded 753 non-empirical studies. The remaining 852 studies were screened for resilience, with 773 studies subsequently excluded due to their focus on reliability and adherence to standard practice rather than adaptive practices resulting from compensations to risks in situation or environment (resilience), leaving 79 studies. The final screening pass reviewed the full text of the retrieved 79 studies plus an additional four from hand searching the reference lists of included studies. Full text review of the 83 studies excluded 51 for reasons identified in figure 2.1.

2.3.2 Characteristics of included studies

Following screening, 32 studies met our inclusion criteria and underwent data extraction. The studies were published between 2005 and 2020 from five countries. All were conducted in developed countries, with sixteen (50%) from the United States, and the remaining 9 studies from Australia (28%), four from the Netherlands (13%), two from the UK (6%), and one from Norway (3%). Clinical specialities varied, with the majority 22 studies (70%) in the adult setting. Eight (25%) were in paediatrics, one (3%) was set in both adult and paediatric settings, and one (3%) was in a simulated clinical setting. Further study characteristics are outlined in table 2.3 below. Although all studies cited core safety science literature related to resilience, only three studies explicitly referred to 'resilience' directly within the full text of their published articles (Alteren et al., 2018; Holden, Rivera-Rodriguez, et al., 2013, Vos et al., 2020).

2.3.3 Study methods and quality of evidence

The methods used in selected studies to study resilience varied (table 2.3). Applying the MMAT's five categories of study design (Hong, 2018), 22 (69%) studies had a qualitative design, one (3%) was a randomised controlled trial, three (9%) had quantitative non-randomised designs, four (12.5%) were quantitative descriptive, in design, and two (6%) were mixed method in design.

The qualitative designs (n=22) often had more than one primary method of data collection, the majority of seven studies using observational data (22%) or interview data, six studies (19%); and others using both observation and interviews - four studies (13%), 3 focus group studies (9%), and one study (3%) using observation, interview and focus groups. Another single study (3%) using focus groups and debriefs as primary methods to collect data.

Three quantitative non-randomised studies (9%) also used a variety of data collection techniques, including one study using reports (3%) and one using a survey (3%) and one study using observation and error reports (3%). The four studies with a quantitative descriptive design mostly used surveys (9%) with one study (3%) using observation to gather data. The single randomised control trial (3%) was an experimental simulated study using observation. The two mixed methods studies (6%) both combined qualitative with quantitative descriptive approaches. One using observation with participant narratives and the other combining focus groups and surveys to gather data.

Methodological quality is rated from the lowest quality 0, through 25, 50, 75 to 100, the highest quality (table 2.3). Appendix H shows the breakdown of core criteria of quality assessment. The majority of studies were rated high quality. The lowest scoring design was an individual study in the quantitative non-randomised category which scored 25 (a quality and safety improvement project). Of the two mixed methods studies, one scored 100 and one 75. The four quantitative descriptive studies scored 75 and over. The twenty-two qualitative studies all rated as high quality designs scoring 75 or over, with 17 of these qualitative studies having the highest quality rating of 100.

Certainty of the evidence for the findings from the 11 evaluative studies is described as per study authors as well as the MMAT methodological quality tool (Hong, 2018). Methodological quality was rated consistently high in the qualitative evaluative studies. For the four quantitative studies, this was more varied, with one of lower quality (Freeman et al., 2013), two studies of very good quality (Holden et al., 2015; Tucker, 2016) and one of highest quality (Van Ornum, 2018).

Table 2.3 Characteristics of Data Collection, Study Design and Methodological Quality Score

First author (year)	Country of origin	Population	Study aim	Primary method(s) of data collection	*Primary category of study design [secondary category]	** Total score
Studies with an intervention						
Debono <i>et al.</i> , (2017)	Australia	Adult	To identify perceived barriers and targeted interventions to enhance appropriate use of electronic medication management systems.	Interviews	Qualitative Study [Qualitative description]	100
Durham <i>et al.</i> , (2016)	USA	Adult	To increase nurse sensitivity to potential error risk, improve behaviours, and reduce observed medication administration errors.	Observation	Qualitative Study [Process improvement]	100
Eisenhauer <i>et al.</i> , (2007)	USA	Adult	To document nurses' reported thinking processes during medication administration before and after implementation of point-of-care technology.	Interviews	Qualitative Study [Narrative research]	100
Freeman <i>et al.</i> , (2013)	USA	Adult	To reduce the number of interruptions during medication administration.	Observation and error report	Quantitative non-randomised study [Before and after time series study]	25

First author (year)	Country of origin	Population	Study aim	Primary method(s) of data collection	*Primary category of study design [secondary category]	** Total score
Holden <i>et al.</i> , (2013)	USA	paediatrics	To investigate how barcode medication administration alters nursing work, and the nature of problem-solving behaviour following its implementation.	Observation and interviews	Qualitative Study [Qualitative description]	100
Holden <i>et al.</i> , (2015)	USA	paediatrics	To assess the short- and long-term impact of bar-coded medication administration on nurses' mental workload as well as on perceived medication safety.	Survey	Quantitative non-randomised study [Before and after time series study]	75
McAlearney <i>et al.</i> , (2007)	USA	Adult	To explore nurses understanding of introduction and use of smart pumps	Focus groups	Qualitative Study [Qualitative description]	100
Nemeth <i>et al.</i> , (2014)	USA	adult medical & surgical	To evaluate the use of an infusion device among nurses.	Observation and interview	Qualitative Study [Ethnography]	100
Niazkhani <i>et al.</i> , (2011)	Netherlands	adult	To evaluate the problems and responses after introduction of computerized physician order entry system.	Interviews	Qualitative Study [Qualitative description]	75

First author (year)	Country of origin	Population	Study aim	Primary method(s) of data collection	*Primary category of study design [secondary category]	** Total score
Tucker, (2016)	USA	simulation lab	To investigate the impact of work design factors on responses to operational failures.	Observation	Quantitative Randomised Control Trial [Quantitative Randomised Control Trial]	75
Van Ornum, (2018)	USA	Adult	To improve barcode medication administration compliance.	Medication scanning reports	Quantitative non-randomised Study [Cross-sectional analytic study]	100
Non-interventional studies						
Boonen <i>et al.</i> , (2017)	Netherlands	adult	To explore the impact of nursing practice when working with bar-coded medication administration technology	Institutional ethnography Observation	Qualitative Study [Ethnography]	100
Boonen <i>et al.</i> , (2018)	Netherlands	adult	To assess how care is mediated through technology by analysing the interaction between nurses, patients, and a Bar Coded Medication Administration system.	Institutional ethnography Observation	Qualitative Study [Ethnography]	75

First author (year)	Country of origin	Population	Study aim	Primary method(s) of data collection	*Primary category of study design [secondary category]	** Total score
Boonen <i>et al.</i> , (2020)	Netherlands	adult	To determine how, from a standpoint of nurses, the use of bar-coded medication technology institutionally and textually mediates nurses' deliberations in the process of decision-making.	Institutional ethnography Observation	Qualitative Study [Ethnography]	75
Borrott <i>et al.</i> , (2017)	Australia	paediatrics	To examine how communication between nurses and doctors occurred for managing medications.	Interview, observation, focus group	Qualitative Study [Ethnography]	100
Jennings <i>et al.</i> , (2011)	USA	adult	To describe medication administration and managing strategies in everyday clinical practice.	Observation & interview	Qualitative Study [Ethnography]	75
Aydon <i>et al.</i> , (2016)	Australia	paediatrics neonatal ICU	To identify factors that influence nurse's decisions to question concerning aspects of medication administration.	Interview	Qualitative Study [Qualitative description]	100
Dickson & Flynn (2012)	USA	adult medical & surgical	To explore nurses' clinical reasoning and actions to intercept medication errors	Interview	Qualitative Study [Grounded theory]	100

First author (year)	Country of origin	Population	Study aim	Primary method(s) of data collection	*Primary category of study design [secondary category]	** Total score
Braaf <i>et al.</i> , (2015)	Australia	adult	To investigate what and how medication information is communicated during handover interactions.	Observation	Qualitative Study [Qualitative description]	100
Colligan & Bass., (2012)	USA	paediatrics	To identify types of interruptions and strategies for safe medication administration and interruption management.,	Semi- structured interview	Qualitative Study [Qualitative description]	75
Davis <i>et al.</i> , (2005)	Australia	paediatrics	To identify nurses' attitudes toward medication policies and perceived factors influencing nurses' adherence to the medication policy	Focus group	Qualitative Study [Qualitative description]	100
Johnson <i>et al.</i> , (2018)	Australia	adult	To examine the nature of interruptions during medication administration.	Focus group	Qualitative Study [Qualitative description]	100
Martyn & Paliadelis (2019)	Australia	adult	To explore nurses' medication administration experiences.	Observation & interviews	Qualitative Study [Qualitative description]	100

First author (year)	Country of origin	Population	Study aim	Primary method(s) of data collection	*Primary category of study design [secondary category]	** Total score
Sitterding <i>et al.</i> , (2014)	USA	adult acute	To describe situational awareness during medication administration, and interruption handling strategies.	Observation	Qualitative Study [Qualitative description]	100
Vos <i>et al.</i> , (2020)	England	mixed: adult & paediatric	To explore ways in which nurses contribute to system-level resilience when administering intravenous infusions.	Focus groups & debriefs	Qualitative Study [Qualitative description]	100
Martyn, Paliadelis & Perry (2019)	Australia	adult	To explore the participants' application of the five-rights of medication administration in practice.	Observation	Qualitative Study [Qualitative description]	100
Alper <i>et al.</i> , (2012)	USA	paediatrics	To assess the extent of violations in the medication administration process among nurses.	Cross- sectional survey	Quantitative descriptive Study [Survey]	100
Davis <i>et al.</i> , (2010)	Australia	paediatrics	To evaluate the importance of contextual and policy factors on nurses' judgement about medication administration practice.	Cross- sectional survey	Quantitative descriptive Study [Survey]	100

First author (year)	Country of origin	Population	Study aim	Primary method(s) of data collection	*Primary category of study design [secondary category]	** Total score
Halbesleben <i>et al.</i> , (2013)	USA	adult	To examine relationships between emotional exhaustion and potentially unsafe work practices (workarounds) in medication administration.	Survey	Quantitative descriptive Study [Survey]	100
Alteren <i>et al.</i> , (2018)	Norway	adult	To describe nurses' behaviours and interruptions during medication administration.	Observation	Quantitative descriptive Study [Incidence or prevalence study without comparison group]	75
McLeod <i>et al.</i> , (2015)	UK	adult	To identify system factors that facilitate and/or hinder successful medication administration focused on three inter-related areas: nurse practices and workarounds, workflow, and interruptions and distractions.	Observation & participant narratives	Mixed methods [Qualitative & Quantitative descriptive]	100
Rack <i>et al.</i> , (2012)	USA	adult medical & surgical	To determine the existence, frequency, and potential causes of nursing workarounds, and error reduction, when implementing a bar code medication administration system.	Focus group and survey	Mixed methods [Qualitative & Quantitative descriptive]	75

*Mixed Methods Appraisal Tool study design categories: Qualitative; Quantitative randomised controlled trials; Quantitative non-randomised; Quantitative descriptive; Mixed methods. ** Mixed Methods Appraisal Tool score: 0, 25, 50, 75 or 100 where 0= poor quality, 100 = high quality

2.4 Findings: Generated themes and synthesis of existing research

This review systematically reviewed and synthesised empirical research that addressed resilience in nursing medication administration practice. Thematic analysis of the thirty-two included studies enabled a range of practices and strategies to be linked to theoretical principles of resilience. This resulted in five conceptual themes identifying resilience triggers, 'technology', 'education', 'critical thinking', 'distractions or interruptions', and 'uncertainty or novel situations'. Two practices employed by nurses spanned two themes; 'workarounds' were reported as part of 'critical thinking' and 'working with technology'; and 'double checking', reported within the 'responding to uncertainty and novel situations' and 'distractions and interruptions' themes. The themes were partially informed by Aase et al's framework (Aase et al., 2020), identifying resilience intervention strategies as either an internal resource 'critical thinking', or external resources 'education' and 'technology'. The following sections present the five conceptual themes with double checking and workarounds described where implicated.

The eleven interventional studies included 4 quantitative and 7 qualitative studies. Table 2.4 outlines their interventions, effectiveness measures and results.

Study quality for the quantitative studies varied as reported in table 2.3 and Appendix H. Freeman et al's before and after time series study had an MMAT score of 25 (Freeman et al., 2013), Van Ornum's cross-sectional analytic study scored 100 (Van Ornum, 2018), and Tucker's quantitative randomised control trial study scored 75 (Tucker, 2016). Holden et al., also used a before and after time series study (Holden et al., 2015) as did Freeman et al., (2013), but used a survey as the primary data collection method, rather than the observation and error reports method by Freeman et al., (Freeman et al., 2013).

Of the four quantitative studies, three studies, (two quantitative non-randomised studies (Freeman et al., 2013; Van Ornum, 2018), and one quantitative randomised control trial (Tucker, 2016) evaluated the effectiveness of education interventions (theme 2.5.2) to respectively: reduce interruptions and errors, improve scanning compliance with barcode medication administration, and investigate the impact of work design on responses to missing medications. The fourth, quantitative non-randomised study (Holden et al., 2015) assessed the impact of bar code medication administration on nurse's mental workload, and perceptions of safety and error likelihood (theme 1). The metrics for these outcomes (table 2.4) are reported as provided by study authors because heterogeneity made standardising impossible.

The remaining seven qualitative studies with interventions were consistently high in quality and more exploratory in nature, with outcomes showing the impact of an intervention designed to build resilience or exploring it's use in practice (see also discussion section 2.6).

Table 2.4 Resilience Interventions, Effectiveness Measures and Results

Author (year)	Intervention [intervention type]	Study target outcomes	Relevant resilience findings/results with examples
Debono <i>et al.</i> , (2017)	Electronic medication management system [Technology]	1) Identification of nurses' use of electronic medication management systems in everyday practice 2) perceived barriers to appropriate use of electronic medication management systems using TDF*	Barriers to technology use were represented in 9 TDF domains. The major barriers were in domains 1 and 2: Domain 1 societal/professional role and identity, e.g. at night to avoid waking patients, nurse did not take computer on wheels to bedside Domain 2 environmental context and resources e.g. When nurses judged that taking the computer on wheels into a room created a falls or infection risk, they left it outside.
Durham <i>et al.</i> , (2016)	Medication safety programme [Education]	1) the frequency of error interception practices 2) reduction in medication administration errors	Immediately post-programme, 99% of 99 nurses agreed their awareness of potential error risk increased. 10 weeks post-programme, error interception practices increased by 92% in the acute unit and by 303% in intensive care unit; 61% of respondents were using brief breath mindfulness meditative exercise to gain situational awareness. The programme effect was significant if route errors are removed from the analysis. Observed medication errors decreased.
Eisenhauer <i>et al.</i> , (2007)	Bar code medication administration and electronic medication [Technology]	1) Documentation of nurses' reported thinking processes 2) effect on practice during medication administration	10 descriptive categories of nurses' thinking were identified including workarounds, anticipating problem-solving, assessment and evaluation. For example, workarounds included working around technology-related protocols to ensure a patient receives emergency medication. Anticipatory problem-solving included starting with a lower dose to enable assessment of patient's response to the dose before increasing. Most nurses' reported thinking did not change after

Author (year)	Intervention [intervention type]	Study target outcomes	Relevant resilience findings/results with examples
			the implementation of technology, except for the different types of checking it introduced.
Freeman <i>et al.</i> , (2013)	Bundle of safety measures (e.g. no interruption zone, phone call /pager triage, patient / family / MDT education, staff rounding, response to alarms) [Education]	1) Reduction in interruptions during medication administration 2) reduction in reported medication errors	Number of interruptions reduced by 2.11 per medication encounter. Reported total errors reduced by 28 incidents over 3 months when compared with the same period in the previous year. Anecdotal feedback indicated the medication room was much quieter post-implementation and nurses placed more importance on the process of medication administration which assisted to reduce interruptions.
Holden <i>et al.</i> , (2013)	Barcode medication administration technology [Technology]	The nature of new problem-solving behaviours	3 themes of new problem-solving behaviours: 1) invention of new problem-solving behaviour e.g. electronically sorting medications by name before printing, to enable quick access to that information by making a paper administration schedule. 2) intervention of technology blocked familiar problem-solving behaviour e.g. nurse collaborated with pharmacist to create 2 new orders (for 2 x 10mg of a drug) when a 20 mg dose not available. 3) technology created new problems, only some of which nurses were able to solve using familiar or novel problem-solving behaviours. e.g. turning on scanner in advance to account for slow booting.

Author (year)	Intervention [intervention type]	Study target outcomes	Relevant resilience findings/results with examples
Holden <i>et al.</i> , (2015)	Barcode medication administration technology [Technology]	Changes in perceptions of safety, error likelihood and mental workload	Confirmation of hypothesis that external workload (interruptions, divided attention and being rushed), but not internal mental workload (concentration, mental effort) was associated with the perceived likelihood of a medication safety event. Perceived likelihood of medication errors decreased in one clinical area following the intervention. Nurses' perception was that how they reacted to external pressures, such as feeling rushed, had a perceived impact on safety.
McAlearney <i>et al.</i> , (2007)	Smart IV pumps with decision support [Technology]	Improvements in understanding and challenges of additional decision support with smart pumps.	Challenges to smart pumps identified and nurses' workarounds in response to challenges identified, such as programming pump for extra volume to be administered to make sure all drug is given; using different modes to allow infusion of medications not listed in pump library.
Nemeth <i>et al.</i> , (2014)	Smart IV pumps with decision support [Technology]	Desirable and unforeseen outcomes of implementation of smart IV pumps	Nurse-pump interaction and pump interface variability created both desirable and unforeseen outcomes. Workarounds are used to cope with mismatch between smart infusion design and actual care requirements. Such as working around the pump options when prescribed drug was not programmed into drug library, so nurse enters more or less than the amount indicated on the bag.
Niazkhani <i>et al.</i> , (2011)	Computer physician order entry [Technology]	Medication-use process problems and workarounds	Some workarounds either eased or accelerated performance of tasks that support safety e.g. double checking for clarification of online orders, writing down verbal orders in records or notes and following up with a call to physicians to issue an electronic version, asking patients to bring in home medications

Author (year)	Intervention [intervention type]	Study target outcomes	Relevant resilience findings/results with examples
Tucker (2016)	Impact of work design factors on responses to operational failures [Critical thinking]	Responses to operational failures (missing medications) including 1) speaking up about the operational failure 2) contribution of a written improvement idea and 2) engagement in policy compliant workarounds	Nurses engaged in policy compliant workarounds only when it was easy to do so, but they are more likely to use the policy compliant workaround when they have high access to the process owner; otherwise, they used non-policy compliant workarounds. The inconvenience of the operational problem is what motivates them to contribute an improvement idea.
Van Ornum, (2018)	Leadership initiative [Education]	Nurses' medication scanning compliance	Improvement in medication scanning compliance from 95% to 98% of medications. Nurses identified technical problems, quickly corrected these and made changes in clinical workflow and communication to ensure medication administered in a timely fashion.

*TDF: Theoretical Domains Framework

2.4.1 Resilience as a response to working with, or around, the introduction of technologies

This researcher identified a range of implicit or explicit resilience practices labelled as workarounds, in the context of the introduction of technology to improve safety in nurse medication administration. Workarounds were often cited as being detrimental to patient safety, while some were adaptive practices that promoted safety. These were either deliberate responses to working with unworkable technology or triggered by contextual responses to situations in clinical practice in relation to the technology, with the potential to promote safety.

Eight studies illustrated workarounds where nurses adjusted their behaviour in some way when interacting with technology in the interest of preserving safety. The studies explored a range of outcomes such as identifying nurses' use and perceived barriers to the introduction of electronic medication management system, with some suggested targeted interventions (Debono et al., 2017), to documenting nurses' thinking processes (Eisenhauer et al., 2007), identifying their problem-solving behaviours or strategies (Holden, Rivera-Rodriguez, et al., 2013; McAlearney, 2007), perceptions of safety (Holden et al., 2015); frequency or causes of workarounds (Rack et al., 2012) or variability in practice (Nemeth et al., 2014) and process problems (Niazkhani et al., 2011) resulting from the introduction of medication related technology (table 2.4).

Examples of resilience workarounds were nurses adapting technology-related protocols to ensure a patient receives emergency medication for extremely low potassium (Eisenhauer et al., 2007). In Rack et al's (2012) study setting, during emergency situations the policy did not require patient barcode scanning, but in other situations such as wristband or scanner failure, or when the bar code on medication did not scan, nurses responded by workarounds to adjust the system (Rack et al., 2012).

Other adaptive workarounds involved technology process issues such as programming an intravenous pump for extra volume to be administered to make sure all the medication was given (McAlearney, 2007; Nemeth et al., 2014). In other examples nurses turned on the medication scanner in advance of use to account for slow booting (Holden, Rivera-Rodriguez, et al., 2013); manually wrote down verbal medication orders, later following up with a call to physicians to issue an electronic version (Niazkhani et al., 2011); or they used paper-based records to 'mediate' the technology (Boonen et al., 2020).

Contextual and human factors were found to play a role in perceptions of medication safety, linked by the 'fit' between the technology system and the nature of nurses' work. An adaptive workaround of using the option in the barcode medication administration

system to virtually extend a patient's hospitalisation was utilised to ensure analgesics could be administered to a patient in pain (Boonen et al., 2018).

These examples showed how workarounds contributed to safety by compensating for limitations when working with technology.

2.4.2 Resilience enhanced by education

Three nurse education programmes were identified in the literature as operationalising theoretical resilience principles. Firstly, Durham et al. described a multi-faceted medication safety programme including a 3-hour training session with video, patient story and case studies, safety science presentation, a simulation laboratory exercise, mindful meditation, and a ten-step checklist, aimed to increase sensitivity to error risk and reduces medication administration errors (Durham et al., 2016). Secondly, Freeman et al. introduced a bundle of safety measures (including lighted lanyards to indicate nurses should not be interrupted, making the medication room a No Interruption Zone, and using the electronic medication record during handover) to reduce interruptions (Freeman et al., 2013). Thirdly, a nursing leadership initiative refining a reporting system, and education of nurses about their scanning habits aimed to increase compliance with medication scanning (Van Ornum, 2018) (see also table 2.4).

Two of these education programmes reported only short term (less than 3 months) reductions in medication errors, with (Durham et al., 2016) finding an overall reduction in errors of 0.23% ($p < 0.003$) of total number of medications administered per day; and Freeman et al., finding that errors reduced by 28 incidents over three months, compared to the same timeframe the previous year (Freeman et al., 2013). The third study reported an improvement in medication scanning compliance and other nursing resilience safety practices, such as identifying and correcting technical problems, and making changes in clinical workflow such as ensuring patients receive timely medication prior to medical imaging or physiotherapy (Van Ornum, 2018).

2.4.3 Resilience through critical thinking and problem-solving

The literature demonstrated resilience through nurse's critical thinking in response to a range of triggers. One experimental study directly tested this in a simulated setting. Here, decision-making was tested in response to two simulated operational failures: missing medication from the medication cabinet and lack of insulin syringes (Tucker, 2016). In this study, nurses were found to choose a safer policy-compliant workaround rather than an unsafe one (using a syringe not designed for insulin), only when they had access to a manager (the 'process owner' for medication administration), and when given the right work design (closeness to pharmacy where the missing supplies

could be obtained). Under these conditions, nurses also contributed improvement ideas to enhance the future resilience of the system (Tucker, 2016).

Other critical thinking resilience principles such as operational problem-solving (Holden, Rivera-Rodriguez, et al., 2013) and professional vigilance (Eisenhauer et al., 2007) were explored in relation to the use of technology. Constant professional vigilance was found to remain unchanged after barcode implementation (Eisenhauer et al., 2007). However, the introduction of technology did result in new problem-solving behaviours. For example, the nurse using manual selection rather than the tethered scanner to identify a patient who was too far away to scan. Another example was a nurse collaborating with a pharmacist to modify a 'stat' or immediate prescribed medication order that needed to be given immediately. In this instance, the ordered dose of 20mg was only available in two 10mg doses, which was not able to be documented as such on the system (Holden, Rivera-Rodriguez, et al., 2013).

In exploring perceptions of safety, one study found that it was the external workload rather than the mental effort of the internal workload, that was associated with perceived likelihood of a medication safety event (Holden et al., 2015).

2.4.4 Responding to distractions and interruptions

Adaptations and responses to interruptions were explored in five studies, and to both distractions and interruptions in two studies (Dickson & Flynn, 2012; McLeod et al., 2015). Study authors identified an array of theoretical principles of resilience when responding to distractions and interruptions. These included 'prioritisation' to address more urgent need (Alteren et al., 2018; Colligan & Bass, 2012), 'blocking' to stop the interruption, and 'engagement' with the interruption (Johnson et al., 2018; Sitterding et al., 2014). Other resilience principles identified included 'prevention' of any potential interruptions (Johnson et al., 2018; McLeod et al., 2015), 'clarification' using open communication or 'critical reasoning' (Dickson & Flynn, 2012), 'multi-tasking' and 'mediating' by asking colleague to intervene (Sitterding et al., 2014). Nurses were also found to generate 'personal safety systems' such as using sticky notes or marking on paper medication cups to maintain safety when interrupted or facing compelling work demands (Boonen et al., 2020).

In an attempt to avoid distractions nurses found a quiet space to prepare medications before administration, to avoid distractions on the busy unit (Dickson & Flynn, 2012). Those nurses who were more 'task focused' tended to minimise interruptions and distractions (McLeod et al., 2015) by displaying a screen at the entrance to the clinical area. For predictable interruptions, Johnson et al., found nurses used preventive strategies such as timing their medication rounds to avoid ward rounds or taking

patients to the toilet prior to medication rounds. In unpredictable (usually emergency) situations, nurses were most frequently found to use the strategy of 'engagement' with the interruption by prioritising it. This was usually to avoid compromising wider patient safety, for example, when a colleague asked for help with a baby having difficulty breathing (Johnson et al., 2018).

2.4.5 Responding to uncertainty or novel situations

Resilience principles relating to this theme were explored in fifteen studies. Three sub themes: decision-making, communication, and double checking, were identified.

2.4.5.1 Augmenting decisions

Decision-making was used to preserve safety in seven studies. Examples included nurses giving greater attention to medications perceived as higher risk, for example insulin and chemotherapy (Davis, 2005; Vos et al., 2020), and when handling time pressure and demands from policy requiring medications to be given at even numbered hours e.g. 8am and 10 am. In this instance, nurses clustered medications by giving them together at 9am to facilitate timely administration (Jennings et al., 2011). In dimly lit areas, nurses used a smart phone light to check medication expiry dates, and an alarm reminder on their phone for administration times, to ensure safety and timely medication administration (Martyn et al., 2019).

Person-centred medication administration involved decisions to alter prescribed timings in response to the individual's need for pain relief (Boonen et al., 2018) or showing patients the medication chart to confirm that medications were appropriate (Martyn & Paliadelis, 2019). These resilience practices supporting safety and decision making were influenced by professional knowledge and patient data, while 'tinkering' and 'tailoring' medication to meet individual patient (Boonen et al., 2017).

2.4.5.2 Enhancing communication

Communication was a strategy to preserve safety in four studies. Examples included initiating and querying medication orders (Aydon, 2016), suggesting new medication along with the use of declarative language and closed questions (Borrott et al., 2017), using open communication and verification, such as asking 'is this what you want?' to gain clarity (Dickson & Flynn, 2012), and scanning the medication administration record during an informal verbal handover (Braaf et al., 2015). Subtle nuance was found between theming this communication subtheme and the following double checking subtheme.

2.4.5.3 Double checking

The resilient practice of double checking by nurses (performance of additional checks to those required by policy) was triggered across two conceptual themes. When responding to uncertainty or novel situations, or responding to distractions or interruptions, showing that the act of double checking as a resilience practice is context specific. However, the principle is conceptually the same as it serves to maintain safety. Examples of double checking are when nurses ask other staff members to double check (Alteren et al., 2018) or even triple check medication not routinely used (Colligan & Bass, 2012); when inviting patients to verify medicines (Alper, 2012; McLeod et al., 2015) or deciding to do another check of the patient and the drug (Davis et al., 2010) to alleviate uncertainty and promote safety.

2.4.6 Reported suggestions for change and future practice

Feedback from peer reviewers suggested including results from ‘improvements made’ following resilient practices in the selected studies. In the reflexive commentary (section 2.6) this opportunity and how it was handled is reported. Results from any improvements made from the selected studies were not reported. However, the included studies made various suggestions for change and future practice, signposting strategies supporting safety-II thinking themed here as environment, resources, and professional development.

2.4.6.1 Environment

Within the worked environment future suggestions included organisation-wide roll out of a piloted safety programme (Durham et al., 2016), use of a medication safety care bundle to reduce interruptions (Freeman et al., 2013), ensuring technology reflects nurse’s tasks and context (Holden et al., 2015; Nemeth et al., 2014; Niazkhani et al., 2011), and its usage at point of care (McAlearney, 2007). System re-design in medication administration was suggested for future consideration as a mechanism to prevent protocol violation during administration process steps (Alper, 2012). Finally, a recommendation for the use of super-users with additional expertise was signposted, with the aim to provide support when medication related technology was in place, and even when not in place, to more generally act as a support mechanism for nurses to promote satisfaction with medication administration (Halbesleben et al., 2013).

2.4.6.2 Resources

Resource focussed recommendations encompassed changes to design and usability of medication administration technology (Holden, Rivera-Rodriguez, et al., 2013), and increasing the availability of technology (Debono et al., 2017) and staff (Davis, 2005).

Stressing the importance of both understanding the complexity of medication administration (Boonen et al., 2020; Jennings et al., 2011; Martyn & Paliadelis, 2019) and understanding the impact of policy on clinical judgement to the organisation (Davis et al., 2010), were also suggestions for future focus. A final additional recommendation was to ensure there were sufficient staff resources during key points of use when using medication management systems, to ensure their appropriate use (Debono et al., 2017).

2.4.6.3 Professional development

Suggestions for nurse professional development focussed on role modelling of appropriate use of medication administration practice (Debono et al., 2017), communication (Braaf et al., 2015), including understanding of professional role and identities, (Borrott et al., 2017), and enhancing insight recognising that safety extends beyond rules and procedure requiring critical thinking and judgement as part of professional expertise (Alteren et al., 2018; Boonen et al., 2017; Dickson & Flynn, 2012; Eisenhauer et al., 2007; Freeman et al., 2013; Martyn & Paliadelis, 2019). A further suggestion was the use of education initiatives (Aydon, 2016; Boonen et al., 2018; Colligan & Bass, 2012; Johnson et al., 2018; McLeod et al., 2015; Rack et al., 2012; Sitterding et al., 2014; Tucker, 2016; Van Ornum, 2018; Vos et al., 2020).

2.4.7 Summary of main findings

Despite limited direct use of the concept of resilience in nursing medication administration in the selected literature, theoretically informed thematic analysis enabled the description and linking of adaptive clinical practices ('work-as done') to resilience. Identified themes described the conceptual triggers for resilient practices reported in the literature, and the adaptive responses triggered in the nursing medication administration context. The application of two conceptual frameworks, SEIPS 2.0 (Holden, Carayon, et al., 2013) and Aase et al., (Aase et al., 2020), enabled description and definition of the conditions for resilience principles and practices at individual level during the discussion and interpretation of findings. Resilience principles and practices were captured in relation to the themes of 'technology', 'education', 'critical thinking' and as responses to 'distractions or interruptions' and 'uncertainty or novel situations'. Assessing effectiveness of resilience adaptive practices was only possible when this was an identified outcome measure, such as for educational interventions.

Having outlined the main findings of this systematic review, the following discussion section (2.5) synthesised findings in three subsections. A table (section 2.5.4, table 2.5) outlines implications for practice from this chapter, followed by a reflexive commentary

in section 2.6, reflecting on the publication of this part of the PhD study. A conclusion draws this chapter to a close.

2.5 Discussion

2.5.1 Evidence for the effectiveness of resilience strategies

In reviewing selected evidence for the effectiveness of strategies to improve safety in nursing medication administration practice, two intervention themes were identified: external resilience (technology and education), and internal resilience (critical thinking). The types of findings sensitive to these kinds of interventions were identifying barriers to the use and acceptance of technology, measuring sensitivity to error risk and improving error rates, perceptions of safety, and changes in problem-solving behaviours. Outcome and effectiveness measures in terms of safety were less clear due to limitations in the selected studies due to either not assessing effectiveness or not measuring effectiveness over time. However, this systematic review generated understanding and findings relevant to safety in nurse medication administration.

Significantly, the data synthesis identified that most nursing resilience medication administration practices were unanticipated, short lasting and intermittent. This reflected first order problem-solving behaviours (Tucker & Edmondson, 2003) and 'find and fix' solutions to operational problems (Hollnagel et al., 2015). Findings highlight that resilience adaptive practices in medication administration are aimed at promoting patient safety by adjusting to the competing demands of everyday clinical work. This is supported by recent research (Vos et al., 2020) which concludes that system level resilience and adaptive behaviour is necessary for nurses' medication administration in highly complex healthcare settings. Where resilient compensatory adaptations relate to policies and protocols, some professional issues can arise for both nurses and the organisation.

Nemeth et al. suggest that resilience is not tied to measures or estimates of probability of adverse events (Nemeth et al., 2008) and this was confirmed during the examination of the effectiveness of resilience strategies in this current review. Only one selected study directly addressed resilience as a response to operational failure (Tucker, 2016), demonstrating nurses' capacity to adapt. Two education strategies had short term effects on error reduction (Durham et al., 2016; Freeman et al., 2013). Longer-term follow up would have further supported the significance of these studies. The impact of technology on nurses' operational practice during medication administration warrants further exploration particularly in regard to workarounds as positive practices to promote safety. Here, the broader message of designing work to be effective in strengthening safety which also considers 'work as done' is supported.

2.5.2 “Workarounds” as resilience strategies

This review found examples of workarounds during medication administration which were responses to working with technology, such as using alternative modes to allow infusion of medications not listed in the smart intravenous pump library, (McAlearney, 2007); or were triggered by a situational context which involved decision making or critical thinking, for example borrowing a missing medication from another patient’s medication drawer (Tucker, 2016).

Workarounds have been identified in this review as demonstrations of resilience, with the role of compensating for risk in the complex or unwieldy systems of nursing clinical practice. However, workarounds can be interpreted in two different ways: either as adaptive practices that promote safety and therefore offer resilient solutions; or as being detrimental to patient safety, as a source of risk and unstandardised variation. An insight from this analysis shows that in the identified circumstances workarounds are innovative, compensatory behaviours. They are triggered by local context, respond to blockages in workflow processes or perceived risk that can occur as part of routine, situational or exceptional circumstances, and have a role in preserving safety. These compensatory adaptations in practice are seen here as vehicles for maintaining safety (Alper, 2012; Vos et al., 2020).

As findings from this systematic review were further explored the nuance of labelling variations and adaptative practices deepened and became more focussed on understanding and interpretation of drivers and consequences so the term workarounds became less relevant.

2.5.3 Interpretation of resilience in the work system

Findings from this review identify resilient practices that serve to control the environment when responding to unexpected conditions such as interruptions, emergency or novel situations during medication administration. Nurses make choices in their adaptive practices depending on the context and triggers. For example, by blocking (ignoring) an interruption, nurses choose to prioritise administering medication. Yet Sitterding et al. found in their study that the majority of the time nurses engage with interruptions, stopping the primary task of medication administration (Sitterding et al., 2014). This researcher considers this to be an adaptive strategy that may support a broader system resilience by accepting a reduction in the quality of medication administration (Vos et al., 2020). When applying aspects of the SEIPS 2.0 model (Holden, Carayon, et al., 2013) the description of the application of resilience practices in the selected studies are found to be either anticipated or unanticipated, and largely reactive (or non-reactive in the case of ‘blocking’), short-lasting and

intermittent adaptations. An implication of the short time frame for these practices is that resilience is not stabilised and fully integrated into everyday work, so the opportunity to achieve a planned, consistent, and high reliability environment is missed. This has consequences for the safety of medication administration over time.

Findings from the selected studies also highlight that adaptations can occur when available standardised protocols do not match the reality of clinical work. These changes in practice can be seen as vehicles for maintaining safety (Alper, 2012; Vos et al., 2020).

This systematic review asked two specific intermediary questions linked to the first PhD objective (table 2.1). These intermediary questions were used to systematically explore how resilience principles have been applied by nurses during medication administration, and to explore the evidence for the effectiveness of resilience in improving safety in medication administration.

As part of addressing the two intermediary questions the need for a stronger conceptual basis for intervention and evaluation in this area arose. Building on the themes identified in the review and using guidelines from the Resilience in Healthcare programme (Wiig et al., 2020), a proposal for an operational and context specific definition of resilience in nursing medication administration practice was made:

“Physical or mental compensatory or adaptive practices responding to detection of risks to patient safety before, during or after the process of administering medications to patients, where the nurse changes or deviates from the planned model of work with the purpose of maintaining safety.”

2.5.4 Implications for practice

Some direct or emerging implications for practice specifically related to this systematic review chapter have specific implications for practice and are shown in table 2.5 below.

Table 2.5 Implications for Practice

	Implications for practice: Systematic review, chapter 2
●	Evidence of the direct application of resilience principles in nursing medication administration
●	Established a relationship between resilience and patient safety in medication administration
●	Evidence of the increasingly complex and frequently changing environment under which nurses practice
●	Nurses’ resilience practices show promise to improve healthcare quality, but short-lasting intermittent adaptations do not stabilise long-term resilience
●	The development of a context-specific definition of resilience in nursing medication administration practice provides a common conceptual framework of use in clinical practice

In the following section a reflexive commentary reports on the submission of the review for publication.

2.6 Reflexive commentary: reflections on submission and publication of the systematic review

A commentary on this researcher's learning from the process of performing the systematic review and peer reviewer feedback follows table 2.6 below summarising the systematic review journey to publication through four nursing journals before acceptance and publication with the journal BMJ Open Quality.

Table 2.6 Article Publication Timeline

Submitted to journal/process	Timeline
International Journal of Nursing Studies	submitted February 2023
Journal of Advanced Nursing	submitted April 2023
Journal of Clinical Nursing	submitted May 2023
Nursing Research and Practice	submitted July 2023
BMJ Open Quality	submitted December 2023
peer review #1	March 2024
peer review #2	May 2024
accepted for publication	September 2024
published	November 2024

Reflexive commentary: Reflection on submission & publication

"Following the processes of performing the review and publication, I am now able to conduct a review and teach students how to do so, which has significantly contributed to my confidence and future skills. Two types of feedback informed this systematic review; feedback during the review process and writing up the results; and feedback from peer reviewers once the article was accepted.

Initial feedback from supervisors supported the review process itself, ensuring a systematic approach throughout. When writing the review, I set up a clear structure using the IMRAD acronym. Refining this through supportive supervisions and many iterations meant that I developed my understanding of the process and the skills necessary for the presentation of results and analysis. Recognising this learning informed how I later coded and themed data. Understanding and adhering to author guidelines was a learning curve in

content and fine tuning my writing, as well as using the online submission portals. Submitting to four journals before finally being accepted by the fifth journal was a bit soul destroying, but supervisions helped me to manage my expectations and understand that this was often part of the process".
(Reflection on submission, January 2025)

Following acceptance of the systematic review in December 2023, external peer review and feedback was an additional layer of scrutiny which encouraged reflection on the existing submitted article, and how to improve it for future readers; ensuring a complete account (Page, 2021). The review went through two stages of peer review.

The first stage of peer review (March 2024) focussed on the method ('was a third person's opinion necessary for the data extraction process?') study limitations and opportunities for future research to be better explained; and a reminder to preferably keep references (other than those used in the review) to within the last 7 years and avoid using personal pronouns. The first reviewer requested me to consider the following:

"I think this is a valuable review of the literature on understanding and strengthening resilience for nurses to improve the safety of medication administration. Did any of the studies report improvements made by reporting these "resilient deviations"? It seems nurses must constantly juggle complex tasks and make judgement calls as to what to prioritize. Which of the papers reporting these challenges/observations, also reported on changes made to the system to make it more reliable and less apt to workarounds? I understand in the future research and conclusions sections that more research is needed but summarizing some the "changes made" would further align with the safety -II thinking." (Peer reviewer 1 comments to author 08.03.24)

My reply to this really useful feedback was: *"Thank you for this useful comment. No studies reported 'changes made' extending beyond the time of the research. The interventional studies reported impact of resilient strategies themed under introduction of technologies or education, and the strategy of critical thinking or problem solving; all three are described in the results section. Results and findings with examples of these studies are specified in Table 2.5 and discussed in the discussion section. However, all interventional studies were able to report on a variety of suggestions for change, without indicating changes made. However, as you suggest, there is relevance in reporting this, so we report examples of suggestions for change and future practice resulting from the studies, in a brief additional section to the findings section."* (Feedback to peer reviewer 08.03.24). Although the data suggested was not available to report, by acknowledging this useful feedback I refined the results section with an additional paragraph to report relevant evidence not previously included.

The second peer review (May 2024) offered feedback focussed on this researcher's lack of understanding of some of the terminology and instructions following initial submission documents, including layout, headings, statements, and summary box contents. The two results tables (2.3 and 2.4) were considered too long, so these were reduced and placed in supplementary files rather than in the body of the article.

Learning from the process of peer review was gained through the constructive feedback provided, which showed what was done well, and recognised the importance of the review to patient safety. The peer reviewer request to explore 'changes made' as mechanisms for assessing outcomes was a useful contribution to later analysis in this PhD study. Feedback also highlighted the priorities for article writing and publication, which led to this researcher's exploration of solutions and ways to meet the requirements from the peer reviewers on strengthening the analysis, and clarification and use of recent literature to present findings. Additional support was sought from supervisors to further guide and proofread the feedback to the peer reviewers; for example, developing a table for comments, actions, completion dates, and referencing to the proof manuscript facilitated evidence of the incorporation of reviewer suggestions. All these valuable opportunities for personal development were gratefully taken.

2.7 Conclusion

This conclusion draws chapter 2 to a close, completing the analytic story arc for this chapter which is picked up in the following chapter 3. The systematic review intermediary questions linked to the first PhD study objective (table 1.2) explored evidence for the application of resilience principles and practices and synthesised the evidence for the effectiveness of resilience in improving safety in nursing medication administration.

The non-interventional studies showed how resilience principles were put into practice. The eleven interventional studies included two studies which evaluated the effectiveness of education interventions. The other nine studies were more exploratory in nature, with outcomes showing the impact of an intervention designed or examined to build resilience.

Thematic analysis as part of the narrative synthesis method identified five conceptual themes (section 2.4). Resilience practices have been described and aligned with contemporary safety science theory, starting to establish the relationship between resilience and patient safety in medication administration. Analysis of review findings has linked adaptive practices during nursing medication administration with the theoretical concept of resilience. Although this concept was largely un-utilised in the selected studies, evidence of the direct application of resilience strategies in response to triggers in the complex sociotechnical environment (see summary of main findings 2.4.7) that threatened safety and productivity have been identified and analysed. The triggers showing 'work as done' helped to understand resilience in this specific nursing context. Some of these trigger themes have contributed to conceptual development and interpretive analysis in the other findings chapters (chapters 4, 5 and 6).

This review findings suggested that nurses' resilience strategies are compensatory responses to complexity, risk and the demands of their clinical work, demonstrating that nurses are active in maintaining patient safety. Greater clarity and understanding of resilient medication administration practices highlighted that nurses were proactive in maintaining patient safety, and their operational strategies were examples of resilience, responding to, adjusting to, and compensating for, the complexity, risk and competing demands of clinical work in healthcare. These strategies were often short-term, real-time adaptations to preserve safety. These findings are further investigated throughout the thesis, and the implications for practice from this review are summarised in table 2.5.

Outputs from the systematic review have informed the empirical research in this PhD study in a number of ways which can be seen throughout the thesis. Findings supported the development of this researcher's understanding, playing a significant role in presenting the findings in a clear, relevant and understandable fashion, both in the publication of the review and in later application to the data. Later, the contextual definition of resilience was instrumental in refining analysis.

Learning from the selected review articles supported clarification of the purpose of the ad hoc interviews, which was considered an important part of the validation of resilient practices, their relation to risk, and to clarify participant's thinking 'in-action'. This understanding provided insight and a positive impact on the later interpretation of the data, particularly when applying existing frameworks and theory during results synthesis.

In contributing to this PhD study's first objective, systematic review findings helped this researcher to explore appropriate methodological choices linked to this study's aim, a supportive bridge to exploring the research framework and methodology which follow in chapter 3. These choices are said to be an essential prior question to exploring a suitable method (Vogt, 2008).

Chapter 3

Research framework and methodology

3.1 Introduction

Chapter 1 ended with the identification of this PhD study's aims and objectives. The exploration of resilience and how it is created and maintained in medication administration is the focus of enquiry, identifying a research need to explore what nurses do right rather than what they do wrong in medication administration, as part of a safety-II perspective on healthcare resilience (Hollnagel et al., 2015).

Chapter 2 addressed the first PhD study objective with a systematic review synthesising published research and theory related to resilience in nursing medication administration practice, identifying adaptations as practices contributing to safety.

This chapter discusses the chosen research methodology and method in order to meet the PhD study's aim and objectives 2, 3 and 4 (see table 1.2).

The first section (3.1) explores the researcher's positionality, ontological and epistemological orientation, and approaches; the second section (3.2) describes the research method, and the third section (3.3) shares the realities of data collection and analysis through a reflexive commentary. The outcome of this chapter is a detailed account of the full research process.

3.2 This researcher's position

Positionality is how individuals look at their social world and recognises that people see their world in different ways. With research, this subjective positionality becomes about the chosen and declared position of the researcher (Wilson et al., 2022), existing assumptions about the phenomenon being studied, and researcher identities, especially about the research topic (Holmes, 2020; Wilson et al., 2022).

3.2.1 The subject under investigation

This PhD research seeks to further understand how resilience is created and maintained in the study population of nurses and nursing associates, and to contribute a detailed description of the cultural context and the circumstances of resilience to develop understanding specific to the UK setting. 'Causal inferences' (Vogt, 2008) were interpreted as insights on the existence of the mechanism of resilience in the systematic review literature, and the need to explore the relationships between triggers

for variation and adaptive practice, and the strategies and the outcomes of this at a granular level provided the rationale for the study focus.

A more personal outcome from the systematic review (chapter 2) was the realisation that much of the literature was not led by nurses, and many included studies did not have any nurse authors. To be transparent about positionality, this generated an impetus to develop research in this area, questioning how researchers who are not nurses could truly understand the lived experience and perspective of nurse medication administration practice.

It has been found that variations and adaptations exist as temporary solutions to system-wide complexities (Amalberti et al., 2006) and are seen to be a promising focus for future healthcare safety improvements (Anderson et al., 2020). However, safety literature identifies very few longer term, effective safety solutions. This study focus was refined from the researcher's own experiences with medication errors as a nursing student and registered nurse (RN), described in the reflexive commentary in chapter 1 (section 1.2.1). By developing an understanding of both the creation and maintenance of resilience, these positive safety attributes have been explored to advance understanding of minimising safety incidents and improving long-term safety and quality in medication administration.

3.2.2 The research participants

In this current study, the term 'nurse' is applied to both nurses and nursing associates for simplicity, as together they form the nursing team. The use of 'nurse' is limited to parts of this study that refer to existing evidence, or generic nursing or safety literature or documents.

The term 'participants', which could be confusing when applied to the nursing team rather than patients (as is most common in healthcare studies), is applied throughout this chapter, and to all nurses who have agreed to participate in this PhD study and signed a consent form to become study participants. Nurse participants in the following findings chapters are therefore referred to as a participant during findings, discussions and synthesis, and in any conclusions or other areas where data analysis and/or data extracts involving specific participants is identified or explored. The naming convention for study participants is described in section 3.3.9.3.

Nurses have been seen as the 'hazard' in medication administration safety, as perpetrators of errors and safety incidents. However, they have also been seen as the 'hero', the last step in the process of medication prescribing and administration, where they have the opportunity to prevent safety incidents by using their knowledge, skills and practice to prevent error (Reason, 2008). The constant failure to reduce medication

errors described in chapter 1 emphasised the need to investigate nurses' resilient solutions to create and maintain safety, meeting this PhD study's aim. Exploring and understanding the circumstances and insights of individual nurse strategies for creating safety within an organisational system are key elements of study objectives 3 and 4. This researcher's reflexive commentary below reflects how their nursing background impacted their decision to study nursing practice, suggesting a link between how their first drug error (reflection in chapter 1, section 1.2.1) impacted their nursing role, and drove the need to explore safety in medication administration and the choice of study participants.

3.2.2.1 Reflexive commentary: reflections on the drive to explore errors and patient safety

"As a practice educator I worked alongside nurses who had made errors and after some human factors training was able to view these in more holistic fashion – it is never about one person. I was able to incorporate this understanding and the emergent patient safety research into a philosophy of working with people who had made errors. I was using research and evidence to support my actions and also to stand up for colleagues in the way they were treated after errors. I had a stronger voice but still had not framed this into a coherent context – I lacked the depth that really studying the evidence gives you. Reflecting on this evolving learning shaped the direction of my future continuous professional development (CPD) leading me to academic enquiry and consequential dissemination through publication.

I needed to develop this alongside my practice educator role, so in 2010 I decided to do a Masters. With this what really excited me was being able to explore medication errors further. For my dissertation I did a literature review of double checking in medication administration. But I didn't just want to find out about it, I wanted my work to mean something. So, with the help of my MSc supervisor, we focussed the question down to 'what is the safest process to double check medication in an acute hospital setting'? And published an article with some recommendations for safer practice [<https://doi.org/10.7748/nm.21.9.16.e1310>]. Following completion of my MSc dissertation, I certainly knew a lot more about human factors, but it was also here that I started to look at the cross over between patient safety and human factors. In 2016 I registered for a PhD to explore patient safety and medication errors in nursing." (Reflection 2016)

3.2.3 Positionality & professional identity

Professional identity is described in the literature as a construct of values and attitudes, together with understanding the nursing role and profession (Rasmussen et al., 2021). Not a static concept, it relates to self-perception and external communication of the professional self (Neary, 2014; Wilson et al., 2022); and in nursing is found to include professional commitment over time (Rasmussen et al., 2021).

As a nurse, this researcher easily identified with the conceptual framework of elements of professional identity defined by Fitzgerald (2020), encompassing the attributes of actions and behaviours, knowledge and skills, values and ethics, and the influence of personal and group identity (Fitzgerald, 2020).

This researcher recognised that their professional identity and background strongly influenced the conception, aim, methodology, interpretation of results and synthesis of findings in this study. An additional significant element 'positionality', was used to conceptualise how this researcher's professional identity was expanded to encompass their identity as a researcher (Cornett et al., 2022; Wilson et al., 2022).

Examining positionality in terms of developing the research design, it is important to continue to explore the impact of this researcher's world view on this ethnographic study by including their ontological perspective and epistemological assumptions (sections 3.2.8 and 3.2.9). This researcher's positionality is also reflected in how the study was conducted, the study findings, and results synthesis in chapters 4-7, as outlined in Holmes's work on the influence of researcher positionality (Holmes, 2020).

Acknowledging beliefs when observing or listening to the accounts of participants, or gathering data from texts, cannot be identified as right or wrong, because participants' journeys and experiences are specific to them. Revealing this researcher's experiences and perspectives allows the reader to assess the effect of researcher positionality on the entire research process (Wilson et al., 2022).

3.2.4 Choosing a study design while recognising positionality and reflexivity

In the quest for the most effective research design to answer the study aim to explore how resilience is created and maintained in medication administration practice, the work of Vogt was influential in study method and design choices. The paper 'The dictatorship of the problem' identifies two positions for choosing a research method (Vogt, 2008). First, that the researcher's philosophical position drives the research question and approach; second (what is argued as the most innovative) is that the nature of the problem dictates the research design. In this study it was clearly the latter; however, recognising this researcher's philosophical position was also crucial to exploring positionality and reflexivity and influenced the final study design decision. The process of answering Vogt's 6 questions (Vogt, 2008) (table 3.1) provides clarity and rationale for the choices made in moving forward from the establishment of a research question to a study design.

Table 3.1 Getting from The Research Question to The Study Design (Vogt, 2008)

Justifying design choice questions, do you need to:
1. make causal inferences?
2. generalize to a broader group?
3. study your topic over time?
4. interact with human subjects?
5. generate your own data?
6. use more than one design?

The consistent failure to reduce medication error described in chapter 1, emphasised the need to investigate nurses' resilient solutions to create safety. Exploring and understanding the circumstances and insights of strategies for creating safety within the organisation are key elements of the study objectives. Consideration of experience-based co-design (EBCD), surveys, interviews and focus groups as potential study designs were appraised for their ability to effectively answer the research aims and objectives. It was possible that all these options could contribute to understanding, but only from the participant's perspective, which would not be a robust method for causality. Refining design choices with consideration of this researcher's own positionality and acknowledgement of bias served to strengthen the desire for a study design immersed in clinical practice.

Using nurses as the primary study subjects was necessary to meet the PhD study aim but had its own issues in terms of potential researcher bias and influencing participant's behaviour. In questioning the sources of evidence by examining the necessity of researcher interaction with study subjects and data generation (fourth and fifth questions in table 3.1) this researcher was not immune to the impact of their own bias or influence on participants during data collection and analysis. This has been widely explored throughout this chapter.

The following section explores how Vogt's approach to developing the study design was used for design choice (Vogt, 2008). The first question on 'causal inferences' helped justify the need for an observational study to establish insights and associations for drivers and triggers of adaptive behaviour. The addition of interviews as part of the study was considered important to triangulate and verify observed behaviour. In terms of making generalisations (question two in table 3.1), although observed practices were not representative of all nurses, individual behaviours were of interest to gain insight into the drivers for variation within, and from, practice norms, and any impact variations could have on safety.

By asking Vogt's third and fourth questions looking at studying the topic over time, the ethnographic approach found in-depth insights and drew conclusions from observing small groups of human subjects (nurses) in their professional world over a period of time.

Utilising a second and third data source (interview and document analysis), triangulated observed behaviour with nurse's perception and understanding, and document guidelines showed how medication practice was framed.

In answering the fifth question (table 3.1) both ethnography and EBCD use multiple methods with different styles of query and confirmation with participants, so either of these research designs could have contributed to the proposed broader study aim. However, the EBCD approach is very much focussed on improving patient experience, this is a significant aspect of the drive to improve safety in medication administration. Yet the need to gain more understanding of how nurses create safety in medication administration (as identified in chapters 1 and 2) was felt to be a necessary primary focus for this study. Future opportunities (discussed in chapter 8) to use EBCD as a next step in improving patient experience and safer outcomes could be co-designing an improved care pathway for medication administration that includes patients, prescribers, doctors, staff involved in equipment and supplies, pharmacists, and nurses.

3.2.5 Researcher's methodological position

In examining this researcher's position at the start of the research process insight showed this researcher had been professionally steeped in medication administration, reliability, errors and human factors for a large part of their nursing career. With a first degree in social anthropology, seeking understanding of how people live in societies and their patterns of behaviour was informative to this researcher's world view.

However, personal presuppositions and orientation were not initially evident because they were not a methodologist (Vogt, 2008), and barely a researcher. Nonetheless, a necessary part of being a researcher is examining the influence of perspective and professional background.

3.2.6 The reflexive researcher

The reflexivity of the researcher is a key part of ethnography and demonstrates their position in their study (Cresswell, 2013). Reflexivity is an ongoing reflective process of dialogues to make sense of, and transform practices (Muhaimin, 2019). How background and context contribute to the research process has been discussed above, but further exploration was achieved through reflexivity (Swaminathan & Mulvihill, 2018). Positioning the self in the study in terms of background and experiences, shows

transparency with the subjects of inquiry, and ultimately ensures trustworthiness; researchers need to be self-disclosing in their writing about their role and its impact on participants (Cresswell, 2013). This ethnographic study relied on field generated data, including naturally occurring data and data elicited through ad hoc and semi-structured interviews. A widely adopted trustworthiness framework (Lincoln and Guba, 1985) focusses on whether the account of the data is credible, dependable, confirmable, and transferable. This guided and ensured interpretation accurately portrayed the social world of nursing medication administration, and that the process of interpretation was clearly demonstrated through an analytic story arc. The mechanisms to ensure trustworthiness are described here and in chapter 7 (7.6.4.1).

Researcher reflexivity played a critical role in data collection and analysis to ensure their researcher biases did not affect data collection. This researcher had two specific concerns before starting data collection:

- 1) Could asking the participants involved to show their everyday clinical work during medication administration and taking fieldnotes during observing practices make the participants feel too exposed; and would they only reveal what they thought this researcher wanted to see.
- 2) Could this researcher's non-participant observer status damage the relationship with participants, and would it stop others being transparent?

These questions led to an examination of the role of the "Insider-Outsider" (Dwyer & Buckle, 2009). The production of ethnographic data and how it was collected and interpreted arises from the observer and produces empirical and theoretical knowledge. The inevitability of this knowledge being interpreted through the researcher, and not fully representing reality is clear in the qualitative literature (Dwyer & Buckle, 2009; Sapsford & Jupp, 2006).

This researcher recognised the need to make sure their field notes were not shaped by their bias and perspectives when obtaining representations of the participants' world (Sapsford & Jupp, 2006). Equally this researcher could view what the study participants could not, such as the impact of their environment so this researcher provided detailed descriptions of these. The observational data was triangulated and supplemented by data obtained from ad hoc interviews, trust documents, and semi-structured interviews.

This researcher became more confident about the accuracy and reliability of collected data through triangulation, by the systematic recording of observations; and by interpreting and analysing data systematically as a planned process (Sapsford & Jupp, 2006) with additional checks for validity with PhD supervisors.

A holistic account is significant in ethnography, helping develop a broad picture of resilience in medication administration to meet the study aim and objectives. Data gathered through ethnographic methods provided the bigger picture to the more individual observations and interviews, allowing for reporting of multiple perspectives and descriptions of the many factors that contribute to safety and resilience. As Cresswell states, although it is critical to recognise the importance of the complex interactions of factors and not be bound by cause and effect relationships (Cresswell, 2013), in terms of outcomes and impact of participant's practices, insights and associations, relationships and inference played a significant part of analysis and synthesis. This is explored in chapters 5-7, and in implications and recommendations for practice in chapter 8.

While observational studies are advantageous by not relying on distorted retrospective accounts (Sapsford & Jupp, 2006), there was a danger that the Hawthorne effect, where participants modify their behaviour because they are aware of being studied, could impact the reality of WAD in observed practice. A systematic review with a variety of study designs in health sciences found most studies reported some Hawthorne effect (McCambridge et al., 2013); however, the authors suggested further research on the effect or impact of the Hawthorne effect.

Observer effect is also seen as a source of bias. The positionality of this researcher was key because in the field, when collecting observational data on variations and adaptations in practice, some inferences were made to attribute practices and behaviours to resilience, both in-action by the researcher, and on-action when transcribing and analysing the data.

However, qualitative researchers are integral to the whole research process, including data collection and analysis (Galdas, 2017) and being close to the data is fundamental. Separation and distancing in ethnography is not a requirement for qualitative research, rather transparency and reflexivity are the focus.

Considering a large part of answering the research aim was explorative of individual participants and local or wider contexts across study sites, the methods of data collection, and what data was collected were found or observed by this researcher to reflect associations in certain areas that could be observed, stated or inferred.

3.2.7 The non-participant observer

Observing participants without actively participating in their daily activities allowed for a degree of separation and objectivity (while still recognising researcher bias). The inclusion of ad hoc interviews ensured clarity and rationale for the observed behaviour, and a sense check for meaning with the participant.

However, being unobtrusive was only possible for general ethnographic observations, but impossible for the 1:1 observations. In addition to physical presence, the participants could have felt that the researcher was there simply to observe their adherence to policies and guidelines or not want their practices to be observed in case they made a mistake and would be judged and punished for it. This is a realistic consideration in blame cultures, which was navigated by emphasis on the more positive stance of safety II in exploring what works well rather than what goes wrong.

This researcher needed to establish a position as an 'insider' in some way, as the insider status relates to group identity with the participants (Braun & Clarke, 2013). As this researcher and study participants were all registered nurses or registered nursing associates, they shared insider knowledge, and professional membership of the NMC with the remit to protect the public and preserve safety (NMC, 2018). Being an insider helped this researcher's belonging and credibility but could have made prospective participants initially reluctant to share their individual worlds. They could view observation as potentially harmful if practice inconsistent with the Code was observed or shared in ad hoc or semi-structured interviews.

3.2.8 Orientation: Ontological perspective

The nature of the phenomenon being studied interacts with various epistemological and ontological positions which are explored in the next two subsections.

The establishment of new and innovative knowledge in this PhD study started with the introductory and systematic review chapters 1 and 2, the results of which identified areas which merited further exploration in the understanding of resilience and its contribution to safety in nursing medication administration. The aims and objectives of this PhD and the development of the study design through the analytic story arc show how this led to approaches and informed the ontological stance.

This researcher's position is that reality is socially constructed, only real and true and correct to this researcher, so there is no 'true' version of reality (Illing, 2010). In acknowledging this and how it influences the lens through which this researcher sees nursing, nurse's actions become real to them, and this researcher gains understanding of nurse medication administration practice. This perspective has influenced the research methodology and how knowledge could be sought to address the PhD study aim.

This qualitative research is interpretive (also known as experiential) research. It is exploratory and open-ended to produce rich data. The methodology and method are ethnography. Here, participants' perspectives and practices are validated and accepted

(Byrne, 2022), and the data collected provides an interpretive framework as an outcome.

The explanation, rationale and suitability of this approach to explore understanding in this area is now discussed, showing how the ontological position supports the research question.

3.2.9 Orientation: Epistemological position

Epistemology is a methodological framework concerned with the nature of knowledge and ways of knowing and learning about social reality. Positioning the researcher with what is known or being studied, it follows and depends on how the ontological question is answered (Illing, 2010). This reflexive researcher brings beliefs about the social world, the nature of reality, conscious and unconscious questions and assumptions to the study which define their ontological position.

The specific area of research interest is the concept of resilience as it applies to nursing medication administration practice. Theoretical perspective is significant as it drives assumptions and influences the role of the researcher, how the research is conducted, and how its results are outlined and evaluated (Illing, 2010). Yet both Vogt and Braun and Clarke critique epistemologies, preferring 'philosophical orientation' and 'pragmatism' in methodology (Braun & Clarke, 2022; Vogt, 2008). The importance being that the chosen method leads to the progression of understanding and problem solving.

Vogt (Vogt, 2008) seems dismissive of research paradigms, but as a novice, this researcher needed to work through the existing prevailing thought in order to develop their own viewpoint. A single version of reality felt impossible because as a nurse this researcher has seen how perspective differs between nurses, patients, and even amongst their family members – everyone's realities are different.

Therefore, this was could not be a positivist quantitative study using experimental methods to collect objective data. Nursing practice cannot be fully objective as it is based on a systematic approach of critical thinking, patient-centred care, goal-oriented tasks and nursing intuition integrated with evidence based scientific truths (Toney-Butler & Thayer, 2023).

This study's data is empirically unverifiable and is excluded from a positivist paradigm, due to the epistemological position that research is objective (Illing, 2010). It has been argued that any perspective other than positivism is still evolving and so would be considered a 'theoretical perspective' rather than a paradigm (Illing, 2010).

An interpretivist approach identifies the basic principle that reality is socially constructed (Guba & Lincoln, 1994), a relativist position which this researcher believes aligns with nursing practice. Scientific theories can provide explanations of events, but this researcher queries whether positivist frameworks can successfully explain a phenomenon such as resilient practice within patient safety.

As a concept, resilience has been hard to define and has yet to be proven using a scientific positivist approach. Whether this is even possible or necessary is arguable, given that systems resilience is a particularly human construct, and resilient behaviours and practices exist in the social world. Exploring the concept of resilience and patient safety as it relates to medication administration is multifaceted and is enhanced by a theoretical concept that recognises the individual factors that support safety, particularly resilience. These beliefs are significant as they have driven and influenced the study focus, design, the role of the researcher and interpretation and evaluation of results (Illing, 2010; Vogt, 2008). Exploration of resilience in patient safety science maintains that resilience is the mechanism by which safety can be achieved (Wiig et al., 2020). Although some aspects of patient safety may be explored through scientific reasoning, the conceptual nature of resilience necessitates an alternative interpretivist lens.

Introducing some aspects from the critical realist philosophical approach at this point enables a broader exploration of the study aims to ensure results become meaningful outcomes of the research (Fryer, 2022), and not simply about nurse's experiences or perceptions. This approach incorporates understanding of the world in which nurses work and how this impacts clinical practice around medication administration. Engaging with this wider view, in addition to perceptions of safety, ensures an explanation of what resilient practices look like, how they arise, and how they serve safety, enabling exploration of associations. Identified as 'what makes the events occur', the barriers or triggers to safe practice during medication administration could be explored. As these events are contextual and not universal (therefore not a positivist stance), an interpretive approach allows for context to play a key part in establishing insights or associations.

These approaches created the framework for this study. In addition to acknowledging positionality, being explicit about participant multiple realities exposed the contradictions in various philosophical stances and has enabled a critique and description of where this researcher sits within theoretical positions.

3.2.10 The ethnographic method

Ethnography is both a method and a methodology where the method is data collection incorporating varying tools such as diaries and journals, video, focus groups, interviews and observation; and the methodology is justifying the chosen methods (Jones & Smith, 2017). Based in social sciences, ethnography studies beliefs, social interaction, practices, behaviours and perceptions in cultural systems (Cresswell, 2013).

Ethnography has been found to bring value to qualitative enquiry through the significance it places on context, and the significance of a variety of methods to synthesis findings (Savage, 2006). Identifying means to intercept medication errors has been highlighted as a key patient safety priority (WHO, 2021a), but the aim for this research was exploring how nurses create and maintain safety, rather than examining errors. A suitable method to understand this is through observation. Observational studies of medication administration demonstrate that nurses utilise an array of strategies to preserve safety, and a systematic review by this author identified triggers for resilience practices (Kellett et al., 2024). Yet there is more to be done, both to confirm these practices in the UK setting, and to explore adaptive resilience practices in relation to standard operating procedures, policies and professional standards.

Exploring beliefs, behaviours and values in a culture-sharing group through fieldwork, is the essence of the ethnographic method (Cresswell, 2013). Identifying an area of theoretical interest as a focus for exploration and looking for patterns in participant's emic (internal) perspective to filter and synthesise through the researcher's perspective develops the overall cultural interpretation (Cresswell, 2013). In this study the ethnographic method has been applied to exploring beliefs and practice behaviours expressed around resilience in medication administration through collected data of nurses as culture-sharing groups from observational fieldwork, interviews and document analysis.

Exploring culture and perceptions of safety and resilience within the social and organisational determinants of WAP and WAD (Hollnagel et al., 2015) examines assumptions of the extent that participants [nurses] are free agents or are determined by structures [organisations] (O'Reilly, 2012; Smith, 2006). O'Reilly has critiqued ethnographic research for not looking at wider structures that frame individuals and groups.

In order to fully explore and explain how nurses apply resilience to safety, ethnography with its variety of data collection methods has been drawn upon to enable full understanding in this PhD study in order to comprehensively meet the study aim and objective. Inductive reasoning from understanding so far might infer that the intended aim of nurses' adaptive practices was to preserve patient safety. However, this could

not definitively be stated to be the case, as it has not been possible to interpret the evidence from relevant literature to make such a definitive statement of outcome.

By observing everyday WAD it was possible to at least test this theory to see if the statement is demonstrable. Even studying the phenomenon in this research, it has not been provable that this statement was true. However, this research findings serve to challenge understanding about resilience in nurse medication administration, thus further exploring the promising focus of resilience for healthcare safety improvements (Anderson et al., 2020).

There are other means of inquiry to explore nurse medication administration practices within a patient safety lens. For example, counting how many errors are made or asking the patient's perspective on errors. It is questionable as to whether these methods could truly add to understanding nurses' everyday clinical work as they fail to recognise the complex system in which medication administration interplays and the nurse's perspectives.

This has been proven during iterative stages of analysis where different deductive frameworks were applied to the data and only partially helped develop understanding of variation and adaptive practice in medication administration (chapters 5 and 6). However, by utilising learning from the process of applying deductive frameworks and borrowing some of the language and concepts from these frameworks, it became possible to compare nurses' practice against a normative model of WAP (policy and guidelines) to map variations and adaptations necessitating the development of typologies, and a roadmap of resilience.

Ethnography served to fulfil this aim, and when used as a method to explore the theoretical perspective of resilience provided unique insights to address the PhD aim and objectives.

3.2.10.1 The ethnographic stance

The ethnographic stance of this interpretivist study draws on the perspective from institutional ethnography within the context of institutionally bound rules (Mackinnon, 2011; Smith, 1997). This helped explore the impact and possibility of power relations that come with professional registration and adherence to the NMC code (WHO, 2009) (NMC, 2018), as well as institutional documents that 'rule' WAP alongside the social and institutional determinants of WAD (Braithwaite et al., 2015).

This 'articulation' (McGibbon et al., 2010) of clinical work with organisation power relations synthesises aspects of institutional ethnography (Smith, 2006) with the safety II perspective, which examines the ability of organisations and individuals to ensure patient safety through adaptive behaviour and resilience practice (Hollnagel et al.,

2015). This acknowledged the impact of the wider structures of professional registration, and local and national policy and guidelines, which frame and organise the clinical (social) world of the nurse conducted within an institutional (hospital) setting, a worthy focus of exploration.

A holistic account is critical to this ethnographic study, allowing reporting of multiple perspectives from varying data sources, to explore the many factors that contribute to safe administration of medication in addition to insight and inferences of associations.

3.2.10.2 Approaches to data analysis

When exploring how reality is understood, the subjective researcher is found to be an asset rather than an obstacle (Braun & Clarke, 2022). With an epistemological awareness of how the researcher and participant influence each other alongside the values that impact the researcher's data interpretation and analysis, reflexivity is a means to explore the data (Braun & Clarke, 2022; Byrne, 2022). Positionality was questioned throughout, both reflecting in-action, and on-action, using a reflective diary incorporating consideration of reflexivity. Sharing and exploring these diary insights was a regular event at monthly supervision meetings. This ensured reflection on data interpretation from participant perspectives and this researcher's perceptions.

Ethnography supports this constructionist reality that data can be understood in quite different ways; and acceptance that this was an 'asset' (Braun & Clarke, 2022) was a feature of the approach to data analysis.

Organising patterns and themes inductively from the data, reflexive thematic analysis (RTA) (Braun & Clarke, 2022) generates increasingly abstract units of information (Cresswell, 2013), and ultimately, significant and comprehensive themes. A six-step process guided progression from familiarisation of data, generation of codes, generating initial themes, reviewing themes, to determining significance of themes, and finally reporting of findings.

Using RTA as the main approach to data analysis for this study, these six steps provided a clear guide for navigating analysis across all data sets.

Making sense of findings from fieldwork is, by definition, inductive. The deductive approach, starting with a hypothesis, is derived from existing theory which leads to exploration of the empirical world (O'Reilly, 2012; Wilson & Chaddha, 2009). However, Cresswell emphasises the deductive reasoning of researchers during qualitative research, namely constantly checking the data through the development of themes; this 'inductive-deductive logic process' is evidence of complex reasoning though the process of the research (Cresswell, 2013). This complex reasoning differs from a

deductive approach but does emphasise the significance of staying close the data when developing themes.

In order not to limit new findings and learning that could emerge from a blended approach to data analysis, a more progressive approach was used (Vogt, 2008). Abductive reasoning helps make sense of an array of phenomena to fill gaps in understanding (Zelechowska et al., 2020); and provides licence to explore a different perspective on the analysis and outcomes from the data. This approach supports the use of quantitative data expression and helps the data to link with relevant theory. The use of prior research contributed to finding a lens to view data by applying existing theoretical frameworks as deductive elements of interpretation in the analytical work in findings chapters (4, 5, 6 and 7).

Describing this researcher's position in the first half of this chapter has shown how positionality has informed this study's methodology and methods providing a transparent view of the choices made.

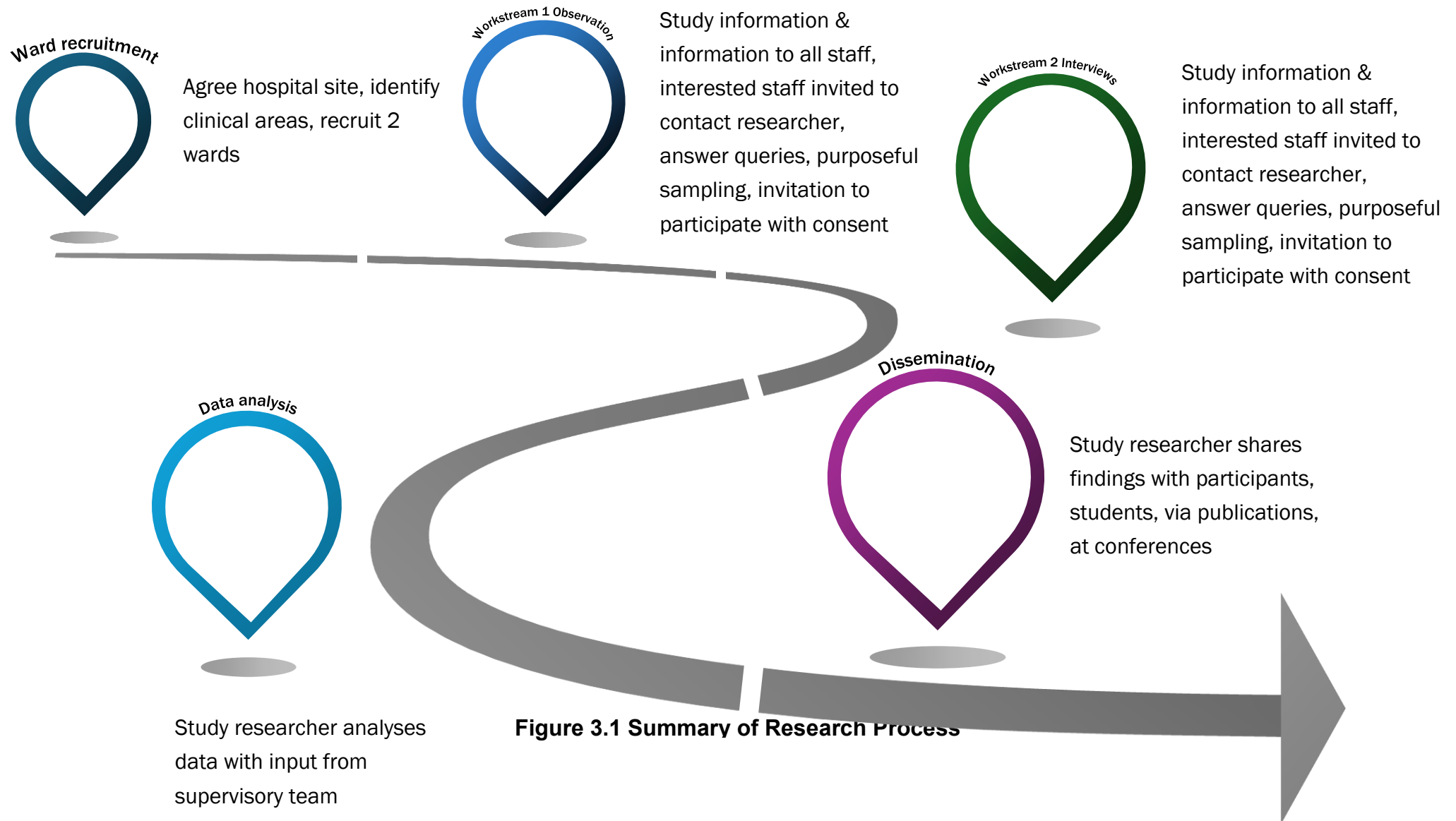
3.2.11 Supervision as part of the research process

It is a necessary part of ethnography for the researcher to be transparent in their position during the research process and analysis of the data (Vindrola-Padros & Vindrola-Padros, 2018). In order to support this researcher's transparency and development throughout the whole research process, monthly supervisions were set up. These critical conversations started with this researcher's self-location followed by reflexive and reflective discussions on this researcher's presumptions and experiences during data collection, analysis and the entire research process; an essential part of interpretation (Vindrola-Padros & Vindrola-Padros, 2018). The supervisory team reviewed the process of taking field notes and semi-structured interview protocol throughout data collection at the monthly supervisory meetings, as the researcher's perspectives and skills developed.

Longitudinal presentation of data collection, analysis and reflexivity using a continuous PowerPoint presentation helped record each step of data collection and analysis. Feedback supported development of the researcher's skills, evolution and thinking. A face-to-face two day workshop with the main PhD supervisor while livestreaming with co-supervisors at crucial intervals supported development of coding and initial themes through to theme development. This was followed by further monthly meetings for the final determination of significant themes and reporting of findings.

3.3 The research method: context and process

The second half of this chapter describes the research process, starting with the study context and finding a site, and ending with participant consent and patient notification. An overall summary of the main process is presented first in figure 3.1 below. The study research workflow is discussed in detail in four stages describing each key part of the research process, presented in figures 3.2, 3.3, 3.4 and 3.5



3.3.1 Study setting

An appropriate study site was chosen, meeting the specific core study requirements for a UK inpatient hospital with a variety of inpatient clinical areas, and with 24/7 nursing medication administration via a variety of routes. An acute hospital NHS Trust in the South-West of England met these requirements and agreed to host the study. The Trust had two hospital sites with 24/7 nursing care, with patients requiring a medication via varying routes: an acute and a community hospital representing the necessary variation for two different in-patient clinical settings. The local Research and Development (R&D) team and the Associate Director of Nursing (ADN) granted study approval having received the study protocol, all associated literature and approvals. Leeds University School of Psychology ethics committee had previously approved the protocol and were included in site agreements, approvals and updates in Integrated Research Application System (IRAS) and Heath Research Authority (HRA) protocols.

3.3.1.1 Reflexive commentary: reflection on study approval

“At my first meeting on Teams with the Associate Director of Nursing (ADN), my appointed local collaborator with responsibility for overseeing and supporting me in the clinical area, the second question she asked me was - was I a nurse? The first was to tell me about my research in 2 sentences. I said I was a registered nurse but had not worked clinically for 9 years since becoming a university lecturer in adult nursing. I told her that I had made a drug error as a student nurse and the memory of those feelings started me on my path to the PhD. I had prepared a 6 slide PowerPoint, but the ADN only wanted an ‘elevator pitch’, so I briefly summarised the rationale, design and process of the study. After a few minutes I knew I was in when she smiled and agreed to host the study and said that this would support her more strategic aims in exploring and supporting safety in medication administration. (Reflective diary June 2022).

The ADN did not like the term ‘clinical areas’ so despite using this term in approved study protocols, the use of ‘wards’ is continued throughout the thesis. Having passed through the initial gateway of agreeing the site, the next workflow steps were to identify clinical areas and recruit two wards to the study (figure 3.2).

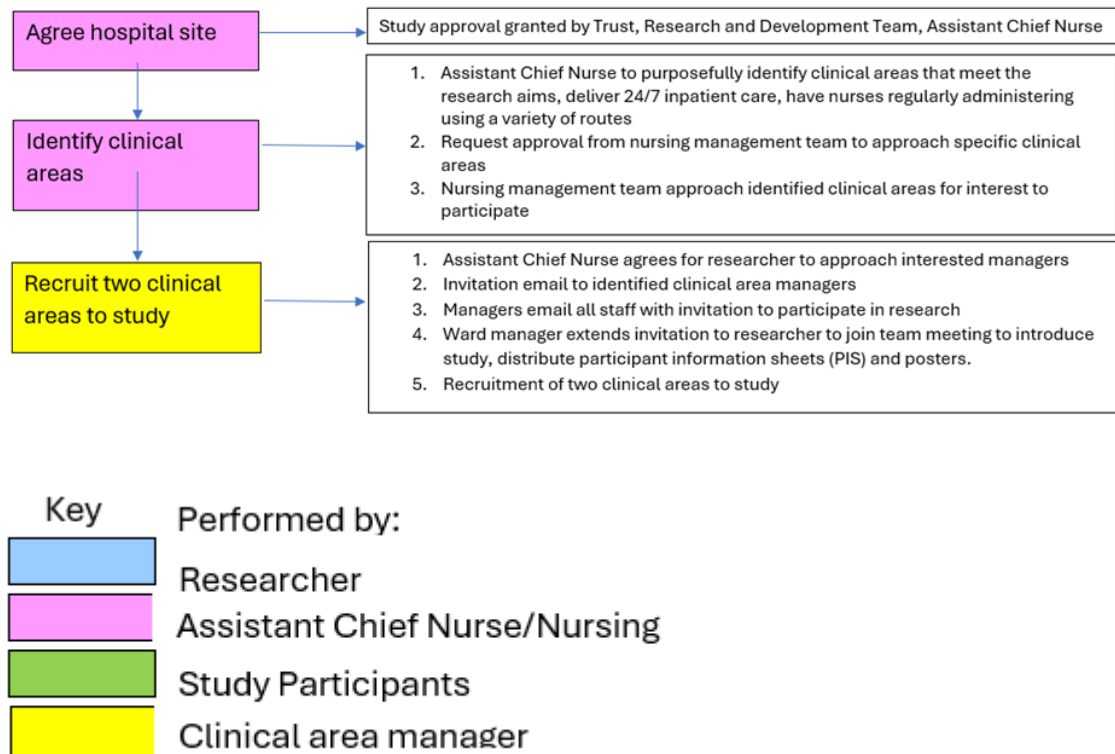


Figure 3.2 Participant Recruitment and Study Workflow Stage 1: Site Recruitment

Once study approval was obtained the ADN (who also agreed to be the site study collaborator), was invited to purposefully identify wards that could meet the study requirements. The ADN shared trust-wide brief information about the study in a meeting and via email to the senior nurse management team, matrons and ward managers. Approval to approach study areas who expressed interest was given. The ADN was invited to share study information (patient-facing poster (appendix A), participant information sheet (PIS) (appendix B), demographic data sheet (appendix D) and consent form (appendix E)) via an email prepared by the researcher, to the ward managers whose wards were in the purposefully identified group, inviting them to participate in the research. Copies of all relevant study information and participant information is available in the appendices which are found at the end of this thesis, after the bibliography. This email included details of where to get more information if had interesting in hosting the study on their wards. Expressions of interest and emails asking for more information were received from two ward managers. The researcher was invited to discuss the research with both the managers.

Following meetings with the two ward managers in response to their expressions of interest to hear more and have a 'no commitment chat' they both said outright that they wanted to be one of the participating wards. This researcher felt badly about not being

able to say yes straight away despite the pressures of wanting to gain access. This researcher explained the role of purposeful sampling in getting two areas of maximum variability, outlined in table 3.2 below. This researcher felt they needed to step back and be more objective about the need to elicit as broad an understanding of the culture and setting as possible through maximum variation in sampling and culture.

After a second mail shot yielded no new interest in participation, a discussion between the ADN and this researcher, and a consultation with supervisors, led to the decision that the purposive sampling was sufficient to gain maximum variation. The researcher was invited to join team meetings and visit the wards to introduce the study and distribute PIS's and patient-facing posters. Agreement and approval for the study to take place on their wards was granted by both managers, and recruitment to the study was approved. The next step was extension of a study 'invitation to participate in the research' email from the two ward managers to their staff, which included a study overview, PIS and poster.

3.3.2 Sample and participant recruitment

In the staff email, staff were encouraged to ask for more information and/or to raise any questions and concerns, and those who were interested in the study were invited to contact the researcher or approach the researcher on their wards to have any queries answered. If they asked for a paper copy of the PIS or consent form, this was provided. In conjunction with the ward manager, eligible prospective participants were purposefully sampled, (see table 3.2 for purposeful sampling technique), and those who agreed to participate were emailed an invitation to participate, with a consent form and demographic data form attached.

Table 3.2 Purposeful Sampling Technique

Sampling technique: Interested prospective nursing staff (comprising both nurse and nursing associate participants where possible) were purposefully sampled to identify an eligible sample of maximum variation in four key dimensions:
• years of experience in medication administration
• nursing grade (Agenda for Change banding structure)
• ethnicity

- gender

3.3.2.1 Reflexive commentary: reflections on the route to recruitment

Prior to recruitment several entries in this researcher's reflective diary about enrolment to the study were made:

'Prospective participants may well fear the consequences of my research, either because they have made errors on the past or may make them when being observed. Reading Sapsford and Jupp made me realise they may also fear the consequences of my research, that they may be judged as 'deviant' or may be hostile to the focus of the research (Sapsford & Jupp, 2006).

This reflection not only enhanced my awareness of my role in research but also directly informed further self-exploration around data protection to strengthen the credibility and transparency of my data collection and analysis.

'I am counting on an assumption that when they hear that I have flipped the focus of counting medication errors or how nurses make drug errors on its head and want to see how they create and maintain safety instead, they may be less fearful and more interested in participating'. (Reflective diary 14.07.22)

Persistent visits to both wards to introduce myself to everyone and briefly explain my project and elicit interest in participation took a while to yield commitment and the elusive confirmation of which shifts to observe. Developing the personal confidence to just turn up on the wards even though I had permission and encouragement from the ward managers to do this was not easy, but after several casual visits progress was made:

'I have been saying hello and introducing myself to all on the ward every time I visit the wards. I definitely feel that I am 'accepted' by the staff who have met me before and believe this had an impact on their willingness to participate. Today, there was a ward sister who I had met on online, and I felt that by popping in to say hello in the break rooms, and the healthcare assistant saying 'Oh hello Pollyanna', there was a level of acceptance to my presence that somehow influenced the ward sister to engage. This approach did pay off later as this sister later requested to be part of the study. (Reflective diary 15.07.22)

The recruitment process is summarised in two figures. Stage 2 participant recruitment to workstream 1 (observations) is shown in figure 3.3, and stage 3 participant recruitment to workstream 2 (semi-structured interviews) is shown in figure 3.4.

Active recruitment continued until the identified sample size was achieved (25 participants for observation and 15 for interview). However, two participants (one from each workstream) were ultimately unable to participate and were withdrawn.

Limitations and data saturation are discussed in following next section (3.3.2.2).

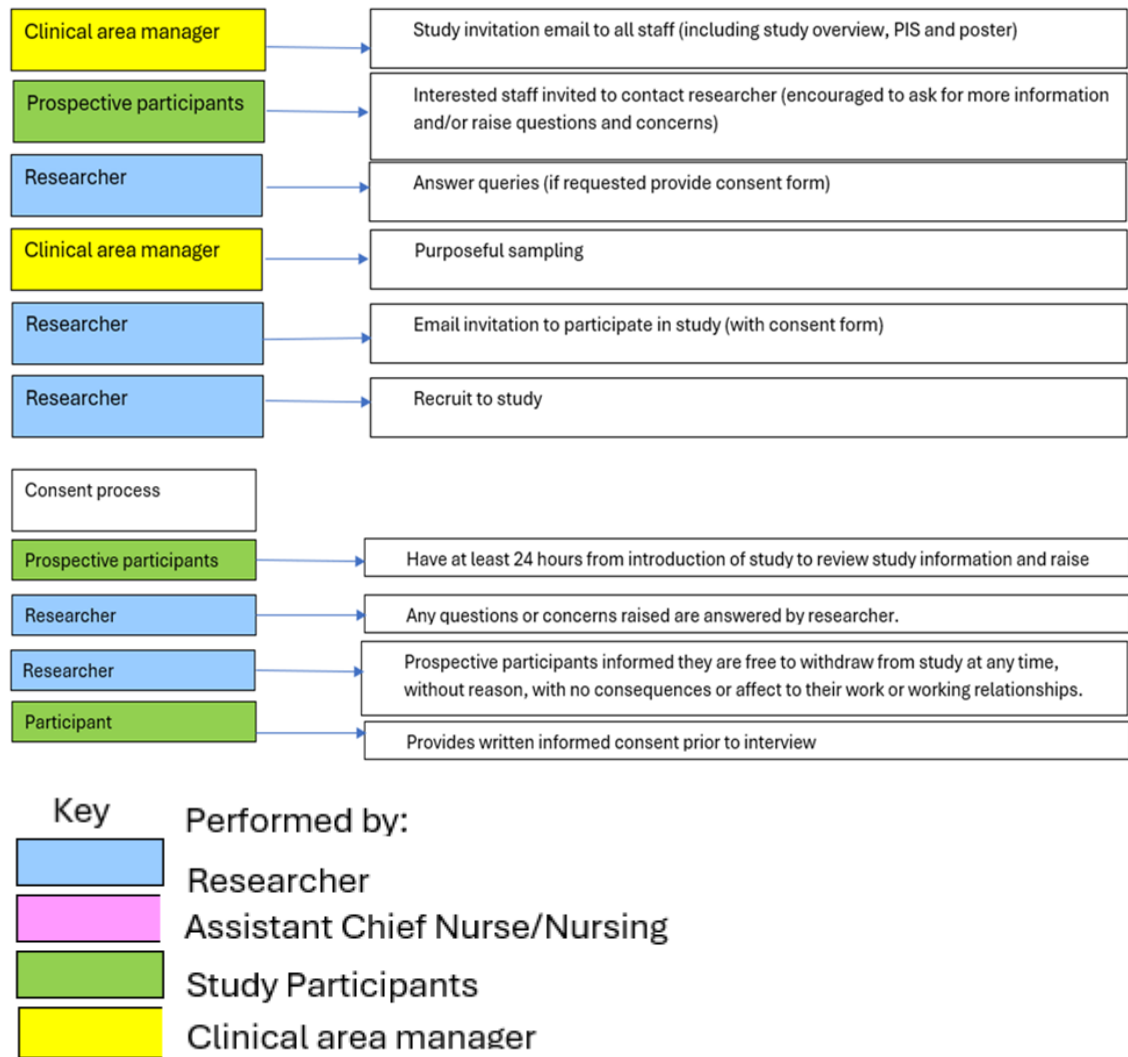


Figure 3.3 Participant Recruitment and Study Workflow Stage 2: Participant Recruitment to Work stream 1 (Observations)

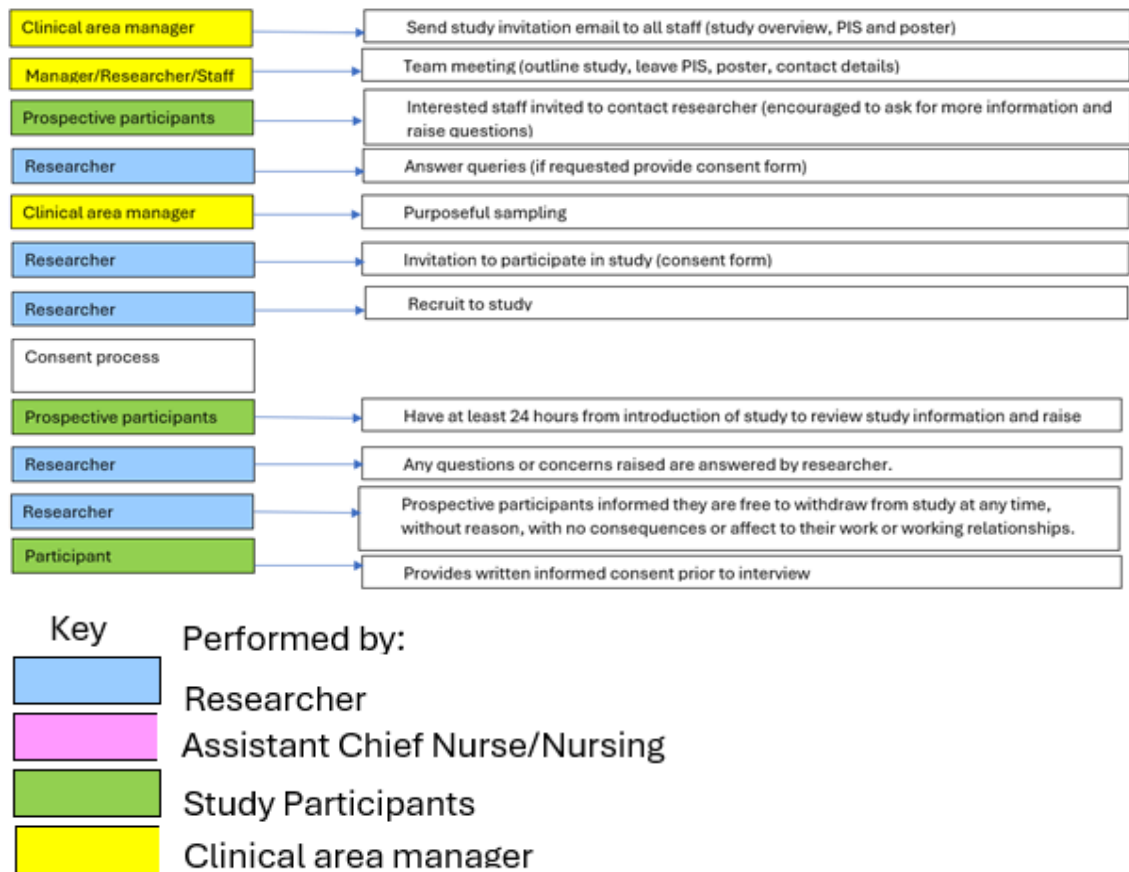


Figure 3.4 Participant Recruitment and Study Workflow Stage 3: Participant Recruitment to Work stream 2 (Semi-Structured Interviews)

3.3.2.2 Data saturation

The final two consented participants were forced to reschedule observation or interview three times due to sickness, shift changes and the nurse's strike. They were offered a time limit of a month to arrange for a fourth time. After several follow-up attempts via email and in person, a pragmatic decision was made after consultation with the supervisory team and ward manager to not pursue these participants due to the stressful conditions at the time.

This meant that the protocol projected numbers for participants was not achieved, with twenty-three participants rather than twenty-four for observation, and fourteen rather than fifteen participants for interview. Although this represented a limitation in method, exploring this situation in qualitative research literature supported a pragmatic approach.

Data saturation was discussed during the decision making to draw the data collection period to a close, in light of nursing and doctor strikes, staff sickness due to Covid-19 and flu causing several rescheduling of agreed dates for interview/observation. An element of pragmatism is recommended in ethnographic studies where ending data

collection due to time and resources is often the case (Streubert & Carpenter, 2011). Repetition of key initial themes with a large variety of codes expressed the breadth and depth of the opportunities for the data to demonstrate key research objectives was acknowledged. However, saturation due to data exhaustion cannot be assumed in qualitative research (Fusch & Ness, 2015).

Additionally, the sample was not representative of the overall UK nursing population but did find that the sample was adequate for the phenomenon being studied and found that the data did capture the diversity and nuance of resilience in nursing medication administration and as such showed content validity (Francis et al., 2010). Systematic review evidence of 23 empirical qualitative studies suggested a sample of 12-13 interviews generally reached data saturation (Hennink & Kaiser, 2022). Malterud's proposal to use the concept of 'information power' when determining sample size in qualitative studies was also considered (Malterud et al., 2015).

The ethnographic data collected from observations was an additional source of evidence, as were the ad hoc interviews, which supported high information power and the ability to extend understanding and present findings to effectively answer this study's aim and objectives.

3.3.3 Eligibility criteria

Any registered nurse or registered nursing associate, of any declared gender, age, ethnicity or socio-economic group who would usually administer medication at some point during a typical working shift through any route to any patient, and who worked on either of the study clinical areas as part of their substantive contract of employment, was eligible to participate. Included participants either administered medication to their allocated group of patients, or one patient if that person required 1:1 care, or who supported colleagues administering medications to patients requiring more than one registered nurse or nursing associate. For example, this included when second checking intravenous medication, double checking controlled drugs or any other high risk medication requiring an independent and/or second check according to local or organisational policy. The specific eligibility criteria are outlined in table 3.3 below.

Table 3.3 Participant Sample Eligibility Criteria

Eligibility Criteria
Participants from two inpatient clinical areas selected from among nurses and nursing associates willing to participate
Inclusion criteria
Any registered nurse or registered nursing associate, of any declared gender, age, ethnicity or socio-economic group who would usually administer medication at some point during a typical working shift through any route to any patient, and who works on either of the study clinical areas as part of their substantive contract of employment.
Included are participants who either administer medication to their allocated group of patients, or one patient if that person requires 1:1 care, or who support colleagues administering medications to patients requiring more than one registered nurse or nursing associate.
Exclusion criteria
Any nurse or nursing associate who does not work on the study clinical ward/area as part of their substantive contract of employment
Any nurse or nursing associate who is on the study ward in a handover/visiting/supportive role e.g. palliative care nurse, tissue viability nurse or outreach critical care nurse
Any nurse or nursing associate who do not usually administer medication at some point during a typical working shift on the study ward
Any doctor or pharmacist or pharmacy technician or any other healthcare professional who administers or supports medication related activity
Any student nurse or student nursing associate
Any nurse or nursing associate who declines to participate

Potential participants were excluded from participating in the study if they did not work on the ward as part of their substantive contract of employment, if they were on the study ward in a handover/visiting/supportive role e.g. palliative care nurse, tissue viability nurse or outreach critical care nurse, or if they did not usually administer medication at some point during a typical working shift on the study ward. Also excluded were any doctor or pharmacist or pharmacy technician or any other healthcare professional including student nurses or student nursing associates. Also excluded were any nurse or nursing associate who declined to participate.

The basic unit of sampling was the individual nurse or nursing associate administering medication. Selection used purposive sampling for maximum variation, using the strata outlined below in section 3.3.6.

3.3.4 Observation sampling (workstream1)

Episodes of medication administration practice focussed on the medication administration drug round, including preparation and any other associated activity. In total, 115 hours of the proposed 120 hours of observational data were collected, totalling 55 hours on ward 1 and 60 hours on ward 2. Data were collected in 5-hour periods over 23 separate episodes. One 1:1 observation took place in each 5-hour observation period. The target focus of the observation episode was the drug round during which medicines were prepared and administered to patients.

3.3.5 Interview sampling (workstream 2)

Selection for interview used the same purposive sampling for maximum variation, using the strata identified in section 3.2.6. Fourteen participants took part in the 1:1 semi-structured interviews.

3.3.6 Sampling techniques

Interested nursing staff (comprising both nurse and nursing associate participants) were purposefully sampled to identify an eligible sample of maximum variation in four key dimensions:

- years of experience in medication administration
- nursing grade (Agenda for Change banding)
- ethnicity
- gender

The initial approach was to accept any interested participant. As time progressed, variation in all dimensions naturally occurred and as representative sample as possible considering the ward's demographics was achieved.

3.3.7 Methods of data collection

Data collection for the study took six months. Prior to this, workflow stages 1, 2 and 3 were completed over the previous three months. Prior to data collection this researcher visited the two wards for familiarisation with medication related activities and context, introduction to the teams, and discussion with information provision about the research. These visits were designed to provide awareness of the context, promote trust and provide information about the research.

At the start of the study a document review of national and local medication administration practice guidelines and local organisation policies established what the nursing team were supposed to do when administering medications, to identify the

normative model of 'work as planned' (WAP). Document data included site mission statements, and policy, protocols and guidelines which comprise the normative models for professional and medication practice, including the NMC Code (NMC, 2018), nationwide medication administration guidance (Royal Pharmaceutical Society & Royal College of Nursing, 2019), and literature on the 5 Rights (5R's) medication administration safety framework.

Additional document data came from the NHS Trust's local organisational documents including policy and procedure guidelines, standard operating procedures and corporate intranet material. Further analysis of policies and guidelines occurred in later stages of the reflexive thematic analysis, particularly when reviewing themes and determining their significance. This was because the policies could not be seen as separate from everyday practice, and in order not to bias the data collection and initial stages of coding, it was important to stay true to work as done and not be influenced by this researcher's own recollections of policy.

The HRA and IRAS study protocols explained actions in case of any observed unsafe practice or error. In summary, reporting of this by the participant according to Trust guidelines was encouraged, support would be offered, and the researcher would report the issue to the chief investigator, supervisors and University of Leeds risk department.

During interviews a risk that participants might reveal information about experiences of deviations, unintended consequences, or variations in their behaviour could potentially breach safe practice policy or guidelines. The interviewee would be encouraged to raise the issue with their line manager and informed of the necessity of escalation by the researcher as above. Opportunities for a debrief and relevant support for any participant in workstream would be offered where necessary.

3.3.7.1 Observation data collection (workstream 1)

Two main data collection activities took place within the 5 hour observation period: observation including ad hoc interviews, and general ethnographic data.

Nurses and one nursing associate were observed by the researcher from a distance of 1-2 metres, while preparing and administering medications to patients. Non-participant observations took place at multiple points over the study period, acknowledging the 24 hour, 7-day working week. These periods were purposefully chosen for their high medication administration activity. Any medication administered by any route was observed. Unobtrusive and non-judgemental direct observation of the administration process started from the intention to administer medication with the opening of the drug chart, included any preparation and administration, and ended with documentation that the medication has been taken by the patient concerned. Collected data included

occurrences and characteristics of resilient behaviours and practices, including how observed nurse medication administration practice (WAD) might deviate from work as planned, the scenarios under which this occurred, and any intended or unintended consequences. Data was also collected on other medication-related activity outside of the medication round, such as once only, 'as required' or periodic administration of medication if directly related to the participant's medication workload. A short (10-20 minute) ad hoc interview with the participant at the end of the drug round or before the end of the shift, provided insight, clarification and rationale for observed professional behaviours and practices. Ad hoc questions occasionally took place within the drug round (e.g. when shadowing the nurse to the stock cupboard to get supplies) but usually after the drug round was completed, immediately after the last medication was given and sometimes after the nurse's break, but within the 5 hour observation period. The only exception to this was for one participant who was unable to answer ad hoc questions due to lack of time between end of drug round and handover. Her ad hoc interview took place the next time she was on shift, three days later (participant NS3).

The ad hoc questions were exploratory in nature; focussing on confirmation, clarity or explanation of behaviour and thinking from very recently observed behaviour. This ensured focused detail was gained, including the context at the time; and insights into participant thinking and perspectives helped explain observed behaviours.

3.3.7.2 Ethnographic data collection (workstream 1)

Outside the 1:1 observation period, general ethnographic data was gathered which included observation of activities and setting, in order to understand the context in which the nursing team worked, including culture and work environment. Data on matters such as finding stock, pharmacist or doctors rounds, and cultural aspects such as how busy or stressed the nursing team were, and how they worked together to support medication administration was noted.

All workstream 1 data was handwritten on a paper observation data collection fieldnote template (see appendix F) transcribed by this researcher. After transcription the original fieldnotes were destroyed. Transcripts were uploaded and stored to the secure University of Leeds OneDrive following the University of Leeds data management plan and HRA protocol.

3.3.7.3 Semi-structured interview data collection (workstream 2)

Qualitative semi-structured interviews explored participant perceptions of WAD, WAP, safety, risk and resilience associated with medication administration practice, and the factors that drive variations in behaviour. A prepared semi-structured interview guide

(see appendix G) was flexible enough to provide the opportunity for unanticipated discussion of issues important to them (Braun & Clarke, 2013). Semi-structured interview questions in the interview guide (appendix G) asked nurses to retrospectively reflect on five high level themes (background and context; describing current systems and processes; sources of variation and challenges; evaluation of impact on safety; professional accountability). This meant some generalisation, especially when being asked 'what do you normally do?'. However, participants also displayed more analytical thinking in the interviews, as they were able to take their time mulling over questions and formulating their responses.

Interviews were not tied to incidences of observed behaviour, they instead existed as a set of independent data collection activities. Participants from workstream 1 were invited to participate in workstream 2 if they wished to do so. The initial and follow up questions were piloted on a sample of two registered nurses. Following this, minor structural and wording adjustments were made after a review of the interview transcript with a supervisor prior to starting workstream 2.

Interviews were pre-arranged with participants (at least 24 hours in advance). Interview data collection was planned to take place outside working shifts. However, ward managers on both sites independently offered staff the opportunity to have their interviews during working hours where this was possible, either in the last hour of a short shift, or between 2 and 3pm on a long shift. This depended on workload, busyness and staffing levels, the agreement of the nurse in charge, and participant's satisfaction that this would not detract from necessary work or patient safety. All interviews were recorded using a handheld audio recorder, and according to participant's preference of either face to face or online. Face to face interviews necessitated a private room with a closable door away from the participants' immediate clinical area and took place according to participant's preference. Remote interviewing took place on-line, mostly on Microsoft Teams, this being the standard provision for NHS staff, or as desired. The participants identified both the time and place of the interview.

3.3.8 Method of data analysis

The final stages of the study workflow were data analysis, discussed in this section, and data dissemination which is addressed in chapter 7.

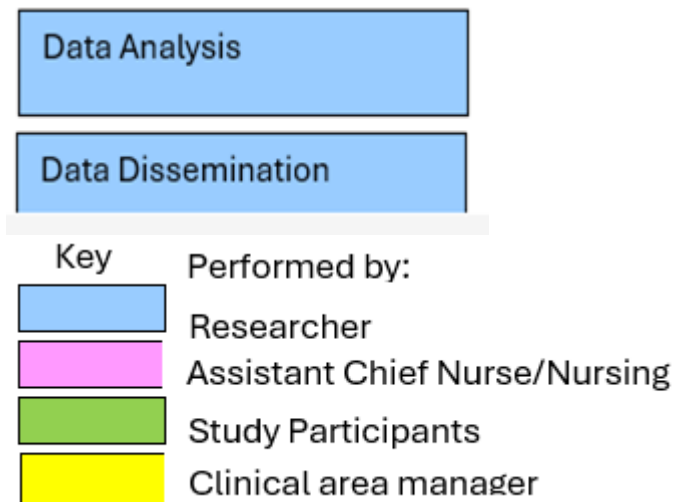


Figure 3.5 Participant Recruitment and Study Workflow Stage 4

The method of data analysis for this study was reflexive thematic analysis, and an abductive approach ensured application of a broader framework to the study data during interpretation and analysis. The abductive approach applied existing frameworks and models to different data sets across the findings chapters, giving licence to explore different analytic perspectives and findings outcomes. Examples of existing frameworks used in data analysis are shared below and summarised in ‘analytic steps’ sections of the findings chapters.

Hierarchical task analysis (HTA) is a human factors method for exploring complexity that has been used to explore resilient healthcare. Application of an existing medication administration hierarchical task analysis (HTA) from the work of Lane et al (Lane et al., 2006) was used to map administration process tasks and document variations; and a framework developed by this researcher to guide this study’s semi-structured interview data was used to analyse nurse perspectives on WAP and WAD (chapter 5).

The use of the Yorkshire Contributory Factors Framework (YCFF) derived from meta-analysis of factors that contributed to failures in care (Lawton, McEachan, et al., 2012), was a useful framework to apply when examining variations in practice (chapter 5).

The SEIPS 2.0 model, a theoretical model showing how works systems, process and outcomes affect one another (Holden, Carayon, et al., 2013), was applied to develop understanding and exploration of the impact of local and wider contextual factors on medication administration practice in chapter 4, adaptive strategies as mechanisms for resilience in chapter 6, and during synthesising findings in chapter 7.

Although this study only examined one distinct aspect of healthcare work, focussing on nursing medication administration, the value of the SEIPS systems approach offered an alternative lens to explore, interpret, analyse, and go ‘beyond the data’ (Coffey & Atkinson, 1996). This provided an opportunity to theory build in chapter 8, synthesising

theoretical constructs that identify factors contributing to patient safety from three perspectives, at individual, team and organisational level, acknowledging more than the nurse as the root of any patient safety incident. This analytical approach incorporates a contemporary safety II view in line with the PSIRF approach (NHS England, 2022) to learn from safety incidents, improve safety, manage risk, and inform future practice. Recommendations for practice from this study are driven by these stances (Chapter 8).

The approaches and methods of data analysis, embracing the abductive approach, built a coherent analysis related to the study aim and questions from the study objectives.

3.3.8.1 Data storage and transport

For both workstreams, any data concerning clinical sites, ward manager contact details, participant's names, contact details and clinical area, dates of visits/meetings/huddles, and the data collection plan for occurrences of data collection activities, were kept separately from the research data and as soon as possible, stored digitally. This information remained confidential and was not shared with anyone else.

Other physical data from both workstreams (consent form, demographic data sheet, fieldwork notes) was stored in a locked filing cabinet in the principal researcher's study, prior to being scanned and digitally uploaded to the secure University of Leeds OneDrive server, after which they were destroyed. Traveling to and from study sites, the field notebook was always kept on the researcher in a secure bag when not in use, and during observations was either in the researcher's hands or in the secure bag. As soon as practicable the field notes were typed up in a Word document and kept in a secure file on the University of Leeds OneDrive. The field notebook was secured in a locked filing cabinet. Application of pseudonymous participant codes occurred in the field and were utilised for data analysis.

Demographic data and the activities log were stored on an Excel spreadsheet. This information was kept confidential and not shared with anyone. Other digital data including some digital consent forms and the audio recorder for interviews during workstream 2, as well as other digital data such as local and national guidelines, protocols and policies relating to nursing medication administration, were stored on the secure University of Leeds OneDrive. Digital audio records were initially stored on the recording instrument and kept in a secure bag prior to transfer to a locked filing cabinet in the researcher's study and deleted once interview transcripts had been checked for accuracy by the researcher. Typed data was stored in separate files on the password-protected University of Leeds OneDrive. No personal data was attributable to individuals or clinical areas due to anonymity and use of participant identity codes.

Immediately following end of use, all digitally recorded data was archived according to University of Leeds policy in a secure location in the University of Leeds OneDrive. Research data will be stored for three years, according to University of Leeds data protection guidelines and in line with GDPR regulations.

3.3.9 Ethical considerations

A fundamental principle of being a nurse is care, and everything was done to ensure risks were minimised or managed appropriately within the context of sensitive nature of the research. The following considerations have been recognised: the ethical approach, the sensitive nature of research, consent, confidentiality, anonymity & data protection. Relevant study paperwork concerning ethical approval (appendix C) and consent (appendix E) can be viewed in the appendices at the end of this thesis.

Consideration of how this study fits into an ethical framework looks at process and outcomes (Braun & Clarke, 2013). There were two ethical codes to be considered for this research, the Code (NMC 2018), the University of Leeds ethical code. The researcher also needed to be compliant with their employee researcher code at the University of Plymouth. As a staff member, once HRA and Leeds University ethics were approved, the study protocol was registered with Plymouth Faculty of Health ethics committee.

As a registered Nurse (NMC Pin: 83J2097E) a research passport facilitated research at the chosen site. The NIHR Good Clinical Practice course was undertaken in August 2016 and updated in May 2021 and GDPR data protection training was updated September 2021. The study was approved through IRAS, project ID: 293041 (appendix C).

Core ethical requirements and the justification of solutions and actions to address these are presented in the following subsections.

3.3.9.1 Participants and design

This study aim focussed on how reliability is created and maintained when nurses adapt to dynamic risks (resilience) to maintain safety. To address the risk of disclosure of information concerning potentially unsafe grey areas of variations in practice, or information that could cause professional embarrassment or psychological distress, the researcher adhered to strict guidance on data confidentiality, anonymity and escalation.

Work in a professional organisational setting posed the risk of a sense of coercion or undue influence for staff to participate. To mitigate this, staff were allocated sufficient time for a thorough explanation of the study through briefings and the recruitment process, including emphasising the independence of the researcher and research data

from the host organisation. Enough time was given to prospective participants to have all their questions answered before they made their decision on participation and it was made clear that they did not have to take part in the research, were free to decline to answer any particular question, and they could withdraw their participation at any time in the process, up to the point where their data was anonymised in the analysis process. At the start of each episode of data collection it was ensured that participants understood they were able to do so without fear of any adverse consequences, without recrimination or effect on their professional role. Sensitivities to nurses on strike was inherent in organising and being flexible with booking and re-scheduling observations and interviews.

3.3.9.2 Anonymity and data protection

All participant personal data (including data such as contact details and shift patterns), consent forms and demographic data was kept separately from research data. This ensured that if there was a data breach it would be harder to identify collected research data to any individual participant. All participant identifiable data was collected on paper, stored in a locked drawer at the researcher's office and digitised as soon as possible (on the secure University of Leeds OneDrive) and paper copies were destroyed by shredding. The potential for anonymity to be breached was addressed by the provision of numerical codes in a logical file naming convention to collected data, stored on the OneDrive but retained until data analysis was complete. Research data will be stored and archived on University of Leeds OneDrive for 3 years, according to University of Leeds data protection guidelines and in line with GDPR regulations. There was no data sharing with the principal researcher's employing organisation.

3.3.9.3 Confidentiality

Ensuring confidentiality of data and research outputs was key to staff feeling comfortable. Although they were instructed to ensure that no directly identifiable information was recorded in their interviews this did happen occasionally and the researcher de-identified all the data on the transcripts, so any names, settings or other sensitive information was permanently deleted during initial transcript reading by the researcher. The researcher adhered to local Trust guidelines concerning data protection. The data was only accessible to the researcher and research team and saved on the secure two-stage password protected OneDrive Leeds University system, with built in network firewalls. Research outputs will maintain confidentiality by not reporting identifiable information and attributing quotes to generic roles at an appropriate level of abstraction.

When recruiting and following up for organising observations or semi-structured interviews, the researcher needed access to participant names and contact details, so this information was stored in one core excel file separate from the ethnographic data and only seen by the researcher. A naming convention only understandable to this researcher labelled participants by interview or observation, and in order of enrolment date. Paper consent forms were stored in a locked drawer separate to field notes, quickly digitised, returned to the participant then shredded and disposed of in line with local data protection procedures. Digitised consent forms were stored in a separate Word document folder on the secured OneDrive. Field notes were typed up within two weeks then destroyed by shredding and disposed of as above.

3.3.9.4 Safeguarding and patient safety

All participants were offered the option of a de-brief with the researcher after the episode of data collection. It was imperative that participants knew what would happen if they disclosed unreported occasions of past harm during interviews or revealed information about experiences of deviations or unintended consequences of their behaviour which might potentially breach safe practice or guidelines. An additional imperative was that participants knew that the observer would intervene in any incidents where they were observed or prevented from making an error if there was an imminent threat to patient safety. In these circumstances anonymity and confidentiality have limits and cannot always be guaranteed. This was specified in the PIS, so participants understood the professional and study's ethics committees obligation to report this to all relevant authorities and follow Trust reporting guidelines and systems. The actions relating to these were guided by the researcher and participant's professional code of practice and obligations to disclose patient safety issues. Participants were offered support from the researcher and encouraged to seek appropriate support through the line manager.

In the event of a breach in safe practice, the participant was informed of the need for the researcher to escalate the incident to the identified research site clinical lead, chief investigator, supervisors and University of Leeds risk department. Instances were dealt with sensitively and with empathy to minimise any distress.

Infection control was also a consideration when collecting data. The research collected data during a fourth wave of Covid-19 at a time of heightened infection control issues relating to Covid-19, influenza and streptococcus A. The researcher complied with all local infection control measures and the requirements of their letter of access relating to patient and staff safety.

3.3.9.5 Consent

Informed consent from nursing participants was required for both workstreams. It was ensured that staff understood participation was voluntary and if they chose to take part, they were free to withdraw with no negative consequences to them or their working relationships. Staff were given at least 24 hours after receiving the research materials to allow them to digest the information and were provided with contact information so any questions could be fully answered by the researcher prior to them providing their consent. If staff wanted to withdraw from the study after their data was collected, they would be asked if their data may still be used and provided their data had not already been processed and anonymised (within 2 weeks of collection), their data would not be analysed or reported.

The participants may have agreed to me taking general ethnographic notes, but they could 'fear the consequences' of my notes (Sapsford & Jupp, 2006). To ensure participants fully understood the ethical approach to the study, they were reassured that anonymity and confidentiality were an upmost ethical principle of this research.

3.3.9.6 Patient notification

Although data was not collected from patients and therefore did not require their direct consent, observations did take place during live medication rounds with patients as the end recipients. Participants approached the patients to let them know about the observations taking place during the process of their medication administration. The quality of the patient's experience of the study was maintained by verbally checking they were comfortable for allowing staff to be observed in their presence. Patients, staff and visitors were informed about the research going on in the clinical area through displaying multiple patient-facing posters (appendix A) on ward entrance doors, bay doors, noticeboards and in each bay. This explained what research was taking place, that patients were not the focus of the research, they would not be asked to be involved, and that no information about them would be used or shared. In instances where staff thought that in their professional judgement a patient's medication administration process was not suitable to be observed for any reason, the observation did not take place. How any patient was informed of any potential or actual safety event was guided by duty of candour guidelines within the Trust site. Transparency and openness of any issues were upheld according to the researcher's own professional code (NMC, 2018).

3.4 Reflexive commentary: reflections on the realities of data collection and analysis

The researcher's positionality, ontological perspective and epistemological position have been identified in sections 3.2, these have contributed to the study methods (section 3.3). However, the realities of data collection and analysis are a necessary part of reflective qualitative research (Braun & Clarke, 2013), so the final section of this chapter (section 3.4) is a reflexive commentary reflecting on the realities of four research areas: being in the field, the process of data analysis, introducing document data, and data interpretation.

3.4.1 In the field: collecting the data from the participants and the role of the observer

Observations took place from 16.09.22 to 11.02.23, with interviews starting on 01.12.22 and ending on 06.03.23. Starting with the observation stage of data collection had the benefit of raising my visibility and allowing the staff to get comfortable with an observer on the ward shadowing a colleague. As a non-participant observer, I felt that my professional credibility was secure as it was known I was an RN, (so perhaps a partial insider), and my research credibility was approved because I was a lecturer at the University doing my PhD. Recognising the influence of my insider (nurse) and [partial] outsider (researcher) I slightly modified my approach to ensure I was not becoming over friendly, clarifying my role during field work to reduce undue influence on participants to enrol in the study. Getting onto site and starting was important because the fifth covid wave was ending by June and the sixth was on the horizon and there was a real risk that I would not be allowed access to the site for the second time (2021).

Two of the early difficulties I encountered during observations was choosing which questions to ask during clarification of verbalisation and practices in the ad hoc interview; and closeness to the participants. Modifications and refinements to distance from participants were made from early reflections recognising the need to respond to being in the way and whether I was intruding into personal space. Steps were made to mitigate this by being more attentive to participants. Often on ward 1, a closer gap than the study protocol of 1 metre was necessary (with permission from the participant) to ensure I was not obstructing the normal functioning of the ward (particularly when in the patient bays). There were also times on both wards when I placed myself further than the protocol stated by observing the administration process from 3-5 metres away. This was in response to patient agitation where my presence could have added stress to the situation; if I read the situation for the patient to need privacy despite their agreement for me to observe; or if there were infection control restraints.

Making time for the ad hoc interviews after the observation was also difficult because the end of the drug round corresponded to the start of the nurse's breaks; or, for the

6pm drug round, to prepare their nursing documentation for handover. Also, awareness of my language choice included being conscious of the emotive language around safety, errors and risk:

'I think that because I so know my subject, I need to be careful about the words I use. I noticed this before but haven't formalised it into a coherent thought about how this is impacting my data collection. If I can't get the right prompts or questions then I cannot explore what I need to, so I need to think more about this. The trouble is, my inference that 'risk' is quite an emotional term for nurses, and my use of this term could have an impact on their drug rounds and what I am observing, so the Hawthorn affect becomes more apparent as they try to show me what they usually do.'

Allan describes emotions as the mechanism for people to act and interact (Allan, 2006), and there were some aspects to this in the probing ad hoc questions. Generally, as these occurred at the end of the drug round, the participants were found to be more natural, with freer, less considered answers.

'I believe this natural response reflects the true reality of their thoughts (well to a greater extent).'

Another issue with collecting data arose with not having enough time to ask all the questions this researcher had earmarked for participants.

'Sometimes I leave some of my ad hoc questions out completely because I only have them for a short period of time, 10 to 20 minutes if I'm lucky, and I can't ask them ALL the questions I note down. If I feedback this into my data collection going forward, I think it will balance the risk of inflation against the important information I need to collect, which is so hard to get right. But this needs to be balanced to ensure I have some rich data to work with and explore in later stages of data analysis'. (Reflective diary, September 2022)

Dean describes this balance as a trade-off of inflation against necessary data (Dean, 2017), but the reality of time and the need to explore and unpick what was seen meant a pragmatic approach of balancing the two was taken forward.

The semi-structured interviews in workstream 2 aimed to explore perceptions of risk, resilience and factors that drove variations in practice, and were planned to take up to one hour. Some participants requested these to take place on their days off, and some after a half-day shift (when participants were working 7.30 to 1.30pm). In changes to the planned protocol for interviews, some took place in work time and not outside work. These participants engaged their ward managers in discussion about the interviews, and the manager of ward 2 decided to give permission for interviews to take place during work hours, around 2pm, a generally quieter time on the ward, as long as safety and priorities were met. This was approved by the AND local collaborator, responsible for overseeing the research. This approval was shared with the manager of ward 1 who was also happy to support this approach. Both managers identified quiet private places for interviews off the ward or in a remote office. Some more senior nurses used this option because they felt they were accessible to staff in emergencies. Only twice were interviews interrupted. On each ward the emergency bell was heard during interviews

and the participants left for a short while to ensure safety. In both cases, the emergency bells were rung in error, with little consequence for the continuation of the interview.

3.4.2 The process of analysing the data

Approaches and methods for data analysis are outlined in sections 3.2.10.2 and 3.3.8.

Data familiarisation in reality was an iterative process:

'For familiarising myself with the data I tend to read through the work first – both fieldnotes and semi-structured interview transcripts and used the NVivo memos, with annotations and themes as a reflective/reflexive/musing activity. But some of my memos had feedback from supervisors that they were too much about trying to code the data, for example my comments like 'this looks like resilience' or 'this is adaptive practice' and I was encouraged to stay closer to the data.'

Familiarisation is a strong part of the RTA process, and an important preparation for coding (Braun & Clarke, 2022), so notes and sometimes annotations were made. This reflects another aspect of data familiarisation from RTA, which encourages capturing ideas about patterns, meaning, and questions across the whole dataset, so coding starts with critical engagement (Braun & Clarke, 2022). Orientating the data was initially inductive where coding and themes were driven by data, but feedback from sections of coding from supervisors showed their coding style to be more at the deductive end of the spectrum, where identification of practices and any existing theoretical construct showed the lens through which the data was read and coded.

Initially, coding was more semantic, more surface level and more obvious which likely made them more like themes, for example 'environment' and 'teamwork', but learning from supervisor feedback helped the development of more latent codes, identifying the implicit or analytical aspects of the code by making their codes longer and introducing the theory, for example 'resilience – seeking information', or 'risk – minimising by knowing the patient'.

The qualitative framework of this study is experiential in that the aim is to capture perspective and understanding, but in looking at meaning, there is a critical perspective when interrogating meaning around the creation and maintenance of resilience in medication administration practice. Unpacking the reality of nursing practice for this researcher is aligned to constructivist analysis, individually constructing their understanding of the world; but more deeply, this is also a realist approach because of the element of deductive analysis about truth that relates to previous evidence. However, the truth and reality this researcher is exploring exists within the culture and professional view of the nursing participants.

Ultimately then, a mix of approaches existing in the spectrum of RTA served to orientate the data and provide meaning to answer the study objectives. As Braun and

Clarke state, the aim is not to produce a simple, fixed truth, and uncertainty in analysis has nuance, partiality and messiness. Without this, this researcher risks being guilty of 'analytic foreclosure' by narrowing interpretation resulting in poor analysis (Braun & Clarke, 2022).

3.4.3 Introducing document data

The main purpose of the document analysis was to represent WAP serving as a comparison to WAD. Not designed to represent everyday practice, policy documents and guidelines formed the basis for guiding safety and variations in compliance, explored in the following chapter 4.

When starting document analysis with the Trust's medicines policy prior to recruiting the first participant to the study, difficulties in relating policy to practice arose:

'it is hard to see it as an operational document so I need to check this out again as the policy is operationalised in the field.' (Reflective diary 09/09/22)

Consequently I modified my approach, leading me to be more effective and efficient at noting variations in WAD from WAP. Access to Trust policies on the intranet was authorised by a temporary log in code, and this researcher found the approach of starting with a general familiarisation of national and local policies sufficient and then using them when questions or situations arose and referring to them before ad hoc interviews developed researcher enquiry. After a few participant observations were completed, familiarity was achieved and the gap between understanding practice and policy was closed, resulting in swift recognition of WAP and where it varied from WAD.

3.4.4 Supervision: perspectives on data interpretation

Monthly supervision meetings served as regular support and debriefings throughout the PhD. These meetings actively shaped the rigour, safety and reflexivity of the study. As the first observations took place, a rolling PowerPoint presentation was this researcher's mechanism for viewing, sharing interpretation, and study progress.

Supervision from June 2022 primarily helped with the process of participant recruitment and data collection, then in later months was used as a sounding board, mechanism for iterative reflexive analysis and dealing with any arising ethical and process issues. The main role of supervision throughout was to enable sharing, for support, for interpretation of the data offering multiple perspectives from their wealth of experience in the fields of patient safety, pharmacy, nursing and qualitative research. As a result of monthly supervisions reflexivity became systematic, acknowledging that my identity and actions shaped my fieldwork and interactions, and how my role and presence influenced what participants chose to show or share with me, and how they behaved. Recognising this helped me to become clearer about how my presence interacted with the data.

3.5 Conclusion

A detailed presentation of the researcher's positionality has been explored situating this researcher in their professional field, ontological perspective and epistemological position. The research process provides a comprehensive plan to meet the PhD study aim and objectives using the chosen ethnographic method. Some limitations in the method have been discussed, including not meeting the projected number of study participants, data saturation and limiting the study participants to nurses only. These are further discussed as overarching study limitations in chapter 7.

The ethnographic approach to data analysis has been explored from two angles, as part of researcher positionality, and as part of the study methods, exemplifying ethnography as a methodology and a method. The deductive application of an existing socio-technical framework of resilience has practice implications. By introducing a systems approach acknowledging safety-relevant events are influenced by three systems levels (and not simply at the level of the individual nurse) a broader understanding of error, human factors and organisational culture was introduced. This is analysed later in the thesis, specifically chapter 7

Presenting and discussing findings extends across the next three chapters, starting with the following chapter 4 which contextualises and interprets wider ethnographic findings, exploring the array of complexities which impact nursing practice during medication administration.

Chapter 4

Contextualising ethnographic findings

4.1 Introduction

Chapter 3 has described the methodological framework, the ethnographic method, the research process, and the approach to data analysis. Chapter 4 is the first of three findings chapters and acts as a link between the previous methodology chapter and focussed findings addressing the PhD study aim and objectives (table 1.2). This chapter contributes to this PhD study objective 3 by identifying local and contextual factors impacting on work as done (WAD); and study objective 4 by describing factors relating to medication administration that drive variations in behaviour. The description of variations were finessed and explored as either 'variations' or 'adaptations' during clinical WAD, explored later in chapters 5 and 6.

As described in the methods chapter, to preserve fidelity with the context of this ethnographic study the nurses who have consented to participate in this PhD study are referred to as 'participants'. This enables distinct identification from nurses in the generic sense. Data extracts as illustrative participant narratives (Braun & Clarke, 2022) are used to describe and interpret the wider contextual ethnographic data, a key element to meet the PhD study aim.

The context in which participants performed their medication administration duties had a significant impact on their practice, which provides rationale for a findings chapter contextualising the complexity of the clinical setting. Context provides cues for variation and adaptive practices; this served to ground the later interpretation in chapters 5 and 6 within the observed reality (Trueba, 1981). The analytic story arc for how resilience is created and maintained in medication administration practice continues, weaving through these next three chapters.

4.2 Local contextual factors

Local context is shared in the following eight subsections, starting with characteristics of the setting and wards, exploring the dynamic and fixed environment before discussing acuity and handovers as significant factors in safe care in medication administration.

4.2.1 Setting characteristics

The context and setting for the study were two inpatient wards at a district general hospital in the South-West. Ward 1 had capacity for twenty-eight patients and ward 2 for thirty patients. Ward 1 had four side rooms and four bays for six patients, and ward 2 had five bays for four patients, and ten side rooms. The ward manager for each ward worked business hours. Most of the registered nurses (RNs) (Agenda for Change bands 5,6,7), registered nursing associates (NAs) (band 4) and healthcare assistants (HCAs) (bands 2 and 3) worked 'long' thirteen-hour shifts (which included two thirty-minute breaks). Long day shifts were from 07.30 to 20.30, night shifts ran from 19.30 to 08.30. Shorter 7.5 hour shifts starting at 07.30 and ending at 15.00 (including a thirty-minute break) were an irregular occurrence, with only one participant working short shifts regularly due to health reasons. Night shifts were always long shifts. Visiting time was the same for both wards between. 2:00 and 4:00 pm and 6:30 to 7:30 pm. Protected mealtimes were between 11:00 and 1:00 pm and between 5:00 and 6:00 pm when no visitors were allowed.

4.2.2 Ward 1 characteristics

Ward 1, on the main hospital trust site, was an acute elderly care ward and was the appointed primary inpatient Covid-19/influenza ward prior to and during the study time period. The ward was on the sixth floor of a 1970's building which looked out of date in the newer, modern 21st century hospital.

Space proved challenging for ward 1. The four ward bays were distributed on one side of the ward. Each bay opened out from central doors which could be left open or shut. There were six patients in each cramped bay with very little room to manoeuvre for space around beds, lockers, bedtables and chairs for each patient. The cramped corridors were narrow and lined with notes trolleys, linen trolleys, small writing areas with desks, computers, and chairs. There were glass screens between the corridor and bays allowing a good view of all patients. Cleaning the ward was a continual process, and the equipment and noise compromised hearing and peace.

At night, visibility was compromised, especially when setting up infusions:

'The lights are left on until the team has completed the medications and observations and everyone is settled in the bay. However, after lights are turned off, there are only a couple of dimmer night lights from the ceiling, this makes visibility quite poor.' (Fieldnotes general ethnographic observation NS10)

When giving medication to patients, the bed areas were very confined, especially when patients were having personal care during the drug round:

'The nurse leaves the other tablets on the windowsill. The patient's bedside locker, table and windowsill are very crowded with washing bowl and

paraphernalia, cards, the medicines, and breakfast.’ (Fieldnotes general ethnographic observation NS11)

4.2.3 Ward 2 characteristics

Ward 2, part of a small community hospital on a separate site to the main hospital, was where all the central services were based, and about 20 minutes away from the main site by car. A 9-5, weekday only service for outpatients ran on the ground floor. Outside these hours the ground floor was closed, with access to the two first floor wards via a front door buzzer system. Ward 2 was one of these two inpatient wards. Mainly a stroke rehabilitation ward with 6 dedicated medical/post-surgical beds it was very spacious, with a short, wide entrance leading to the central nursing station/front desk. Behind the front desk were spaces for staff lockers and two large, shared multi-professional offices. A central open plan communal area leads from the front desk, with a kitchen opening onto a large dining area with enough tables and chairs for every patient, and a sitting area with comfortable chairs around a large television. Two wide corridors branched out in a Y-shape leading from this central space, with bays on one side of the two corridors, and side rooms on the other. Each corridor ended with a large room, one an office for the ward manager, the other a staff haven for breaks.

4.2.4 The dynamic environment of the wards

The dynamic environment showed walls covered with welcome posters, mission statements, staff photo introductions and patient safety information. This information showed the quality and safety goals for the Trust for example: avoidable deaths, reducing harm, excellence in clinical outcomes and ‘delivering what matters most to our people’; with professional and local accreditations e.g. ‘our values our behaviours’, ward council members, staff heroes awards, and ‘pathway to excellence’ information. The latter being an international foundation programme recognising positive practice environments and putting the nursing workforce at the forefront of this.

Ward 1 had much less space, was less tidy and organised, the visual displays had out-of-date information, and blue tack or sellotaped information posters crowded on nearly every wall space. The developing Covid-19 sixth wave and winter viruses influenced the removal of wall posters, storage boxes, and detritus on this ward, as they were known infection control risks. A potential study limitation was this researcher’s bias on reporting their personal perspective of a busy and overcrowded ward, designated as the primary site for Covid-19 or patients isolated to prevent infectious disease contagion. This researcher’s decision was to report the truth of what could be seen to all, and to not make comparisons with the other ward enrolled in this study. Examining their own inferences and focussing on the study aim to explore how resilience is

created and maintained in medication administration ensured an objective lens when collecting general ethnographic data.

Ward 2 was scrupulously tidy, with all posters, noticeboards and information laminated, within display boards with up to date information.

Patients call bells (buzzers) and ringing phones were a constant feature in the dynamic environment, also a constant distraction, especially when the ward clerk was not on duty or busy, or at times of staff shortages. Fieldnotes showed the dynamic nature of instances of noise and disturbances both during, pre- and post-the drug rounds:

'There is a lot of noise, there are buzzers going on and on for three patients in the ward, the bay is noisy'. (Fieldnotes general ethnographic observation NT7)

This participant was also asked in the ad hoc interview how she maintained her calm amongst the interruptions and the buzzers, she replied wryly:

"my non-verbal says I'm calm"..... (Observation ad hoc interview NT7)

'....but admits that what she says and how she looks are different.' (Fieldnotes observation ad hoc interview NT7)

There were times when things were quieter:

'a couple of buzzers go off; this is the first time I've heard them in ages.' (Fieldnotes general ethnographic observation NS3)

And, conversely, quietness was noted, for example during the usually busiest and longest drug round:

"As soon as all the nurses started their drug rounds and the HCAs were in the bays supporting patient care, all the buzzers went quiet. For most of the duration of the drug round I hardly heard one buzzer. The bay doors were not closed during the drug round as the nurse was going backwards and forwards to the drug trolley and the HCAs were going backwards and forwards with either breakfast or personal care materials. So, it was obvious that the ward was very quiet during this period of high activity." (Fieldnotes general ethnographic observation NS1)

Alarms from intravenous pumps, movement off the sit mats, air mattresses, patient emergency bells (in toilets) and ward emergency 'crash' bells all regularly disrupted the peaceful environment. One patient's response exemplifies the resigned attitude of many patients to noise:

'There is a pump alarm in bed 3 going off. She [nurse] says to the patient "[name] I'll do that for you in a minute", he [patient] says to her "they're playing our song."' (Fieldnotes general ethnographic observation NS9)

Coping strategies and addressing patient need are part of themes explored in the following chapters.

4.2.5 Drug trolleys

The medication 'drug' trolleys played a significant role in medication administration. Serving as storage for 'stock' (regularly used medications for the ward patient

speciality), they prevented the nursing team from having to go to the ward stock room every time they prepared medication for their group of allocated patients. Each ward had four trolleys, labelled for each bay and stored in the drug preparation rooms, doubling as storerooms. Patient's own drugs kept in small, locked cupboard (PODs) usually attached to each patient's bedside cabinet, were repositories for any medications the patient brought into hospital with them. These could be used if patients were in charge of their own medication regimes, or until ward stock was available for these patient specific medicines.

The drug trolleys were quite different on the study wards. Ward 2 trolleys were found to be:

'very organised, sharps bin on the side, open out cupboard. On the top is a small plastic carton with oral syringes, plastic medicine pots, spoons, pill cutters, coloured sticky post-it notes, and a small, laminated copy of 'high risk medications'. Accessed by a digital lock on the door with a passcode. The trolley opens out into 2 doors, with shelves inside each door. It is tidy and all the drugs can be stored in this one trolley.' (Fieldnotes general ethnographic observation NT11)

Ward 1 trolleys were more traditional wooden trolleys on larger wheels, with a lockable lid, and a small side drawer for rubbish. A ledge, extending across the front width of the trolley, was opened out when unlocking the trolley, and was used to lean on when reading, signing or writing in the drug chart; and provided more space when preparing medicines. The medications in their boxes or bottles were laid out in rows, but difficulties were encountered due to the different packaging shapes and sizes of tablets and liquid medicines. The larger, more wieldy drug trolleys made navigation around the bays and side rooms difficult:

'A patient wants to leave the Bay in his wheelchair, so she helps him by opening the double doors to give him space. But the drug trolley length extends over the open Bay door.' (Fieldnotes general ethnographic observation NS3)

Nurses often had to move their trolley out of the way, interrupting their flow and focus:

'the tea trolley needs to pass, the nurse has to move to the side of the trolley so the trolley can pass in the narrow corridor between the front desk and the patients bays.' (Fieldnotes general ethnographic observation NS3)

4.2.6 Drug preparation rooms

Ward 2 had a large, spacious storeroom for medicines and the drug trolleys, both accessible using a digital key code. The storeroom contained a drug fridge, the 4 drug trolleys, a sideboard workstation for preparation, and medication storage cupboards. This was a quiet and roomy space, located down a short side corridor.

Ward 1's storeroom was accessible by scanning the nurses' identity cards. This small, cramped room had stock laid down the right-hand side, where injectables, gloves, enteral syringes and feeds, and mobile oxygen cylinders were stored. A small counter acting as a drug preparation area had cupboards and shelving above, housing boxes of water-for-injection ampoules, and needles.

Above the workstations on both wards were cupboards for intravenous (IV) antibiotics and controlled drugs (CD's). The 'patients own' and 'stock' order books were available on the countertops. Both wards had a "medicine safety checklist" as an A4 poster, highlighting key checks, for example, having a locked drug trolley, checking controlled drugs and fridge temperatures. Both wards had large, locked cupboards for stock medicines labelled alphabetically, and 'To Take Away' (TTA) medications to be given to patients on discharge. Additional storage for dressings, venepuncture and canulation supplies, oxygen, and intravenous fluids were provided in the storerooms. Nutritional supplement drinks were kept in kitchen fridges.

4.2.7 Acuity

Patient acuity was measured using the Shelford 'SafeCare' tool to support nursing staffing levels (NHS England, 2023). Bed occupancy was significant, with ward 1 having an occupancy of 114.39% when two beds were closed for deep cleaning at the time of recording, and two patients were waiting for discharge while their beds had been taken by others.

4.2.8 Characteristics of the handover

Prior to handover, staff could see their patient allocation for their shift on white boards at the entrance to the ward (ward 2) and midway into the ward (ward 1). It was the role of the shift coordinator to update team patient allocation. Understanding patients' condition, and maintenance of previous care standards through handover is advantageous to resilient healthcare (Ifaifel et al., 2020).

The robust content and process of a three-stage handover, usually lasted up to thirty minutes. At the start of the two shifts (day and night), handovers were similar for both wards, each starting with a quick (five to ten minute) safety briefing followed by a general team handover from the shift co-ordinator (nurse-in-charge) (usually ten minutes), followed by a subsequent smaller team handover for the nurses and HCAs allocated to each of the 4 teams (around 15 minutes).

On ward 2 the handover took place in the central communal area, with staff seated on the dining chairs around tables, grouped in their allocated teams. This enabled a higher degree of privacy for information transfer and sharing amongst the teams than on ward

1. On ward 1, the main handovers took place around the central nursing station, with most people standing and hovering close, to enable hearing over ward noises. The staff who were not sitting in the five available chairs at the nurses' station used files to lean on to write their notes standing up.

4.2.8.1 Safety brief

A short safety brief started the team handovers. The same safety brief process was carried out on both wards, was performed by the shift co-ordinator, and both areas secured previous briefings in a red folder kept behind the nurse's station. The briefing templates were similar and reflected the differences in patient conditions, medication requirements and flow (admissions and discharges to ward). An example of how the safety briefing process is described is below:

"So the... first thing, when we start our handover, so we [nurse in charge of shift] read who are or not for resus, we read who are our End of Life, we read who are on IV antibiotics, who are on specific medications, so in that we do read like if the patient is on IV medications, how many IV are in each bay, so you'll get a track of like what you are doing that day, and who all are on insulin, who all are... it may not be like what insulin, but we'll say for example if I say bed 15 is on insulin, that will be noticed on that safety brief, so everyone has got that one on their list, like so that helps us." (Observation ad hoc interview, NS1)

Medication issues were high priority on the safety template for both wards, highlighting the importance of medication related messages:

"So, if there was any concern, if we're running short of medications, if the medications aren't available, I think back when we went through a phase where we couldn't get Metformin liquid for patients, and we had a lot of patients that were on tube-fed that needed it and things. So, it's things like that, just to say that this is the situation and what we had to do about it. And that's handed over, as I say, at the start of each shift, so, at the start of the day shift and the start of the night shift, that message is passed forward." (Interview iNT6)

4.2.8.2 General patient handover

A short higher-level general handover for the shift team followed the safety brief. The combined nursing and healthcare teams prepared to take handover in different ways.

In readiness for handover on ward 1, all individuals were observed taking lined 'patient record sheets' from the drawer by the front desk, numbering the paper with their allocated patient bed numbers, and making notes as they received information from the earlier shift. On ward 2, printed handover sheets were pre-prepared by the previous team, with every RN being responsible for updating their patients' essential information (including patient details, presenting complaint, nursing plan of care, treatment plan, dietary needs and relevant social and discharge information) on to a standard

handover template saved on the ward computers. The nurse-in charge performed a final check before printing off copies for all staff on the next shift. Staff coming onto shift then annotated the handover report during handover rather than having to write a new paper handover sheet each shift.

Nurses on ward 1 were observed coming in early to prepare for handover by checking their patient's VitalPACs (electronic system to monitor and analyse patient vital signs and Early Warning Scores) for information about their patients' state of health, with some adding this information to their handover sheet. This was interpreted as an anticipatory strategy serving to get ahead of information during a period of high cognitive burden, identify priorities, and recognise the sickest patients in this more acute setting (Fieldnotes general ethnographic observation NS10).

4.2.8.3 Team patient handover

After the general handover, the ward staff split into their patient allocated teams (named as teams A to D) for a more in-depth handover from the outgoing team, including patient status, outstanding or new care needs and progress. To reduce noise, teams huddled around the outside of their bays (ward 1), while ward 2 staff remained in the central open area or sat at the designated computer stations, affording increased confidentiality and comfort.

Unofficial handovers were observed on both wards prior to or after handover, taking place usually between the nurses-in-charge of each shift, or a team's RN and HCA staff:

'there is already an unofficial handover going on between staff as they are talking about their patients, this is prior to handover starting.' (Fieldnotes general ethnographic observation NS10)

This has similarities with 'the second secret handover' (Braithwaite et al., 2015; Sujan et al., 2015b) where the unofficial handover acts as a perceived way for nurses to improve quality and safety. Other examples of unofficial follow-up handovers initiated by staff were observed in the field. For example, an informal mid-morning handover:

'the two band 6's on the ward have a huddle, my nurse [NS6] is the one in charge but they have a huddle to update each other' (Observation NS6)

and a second handover at shift transition, where:

'The nurse in charge does another short handover with the nurse in charge from the day shift which is just ending. They discuss longer term issues and plans for discharging patients the following week' (Observation NT3).

These additional exchanges ensure quality, safe effective communication (Sujan et al., 2015b) and reflect resilient adaptive strategies to maintain safe effective care (Braithwaite, 2015).

4.2.8.4 SAFER meeting

The 'SAFER' (Seen, Aim, Flow, Early Discharge, Recovery) patient flow bundle is made up of five elements of best practice to reduce length of stay and enhance patient flow, specifically for reducing delays in adult in-patient settings (NHS Improvement, 2016). The SAFER meeting for both wards was at 9am which was usually in the middle of the 8am drug round, causing a break in the flow of the drug round and some delay to timely medication administration.

"We have the SAFER meeting as well, so that's obviously where we discuss and review all our patients, so the other morning, on Monday when I was doing the drug round I had one patient who had just come up overnight and I had absolutely none of their medications in the trolley, so that drug round took me nearly an hour and a half..... I had SAFER to contend with in the middle of that and that's just another... And then it's trying to get to a point where you think actually, you're aware there's pressures because the longer SAFER takes the slower the doctors are to get out so you really want to get in there quick and get out but you also think, well I need to actually leave my drug round at a point where I can remember where I'm up to, who I've done, you know, I don't want to leave it half way through. So yeah, so there's some unique complexities and some generic complexities, I think." (Interview INS5)

4.3 Wider contextual factors

Having identified the immediate local contextual factors impacting medication administration, key wider influences at the time of data collection are introduced.

4.3.1 Strikes

Data collection started on 16th September 2022 with the first five hour observation, at the start of the sixth Covid-19 wave. Strikes and the Covid-19 and flu pandemics ensured staff under constant pressure were observed. These contextual factors were pressures for a range of strategies to ensure patient safety. With the first two days of RCN strikes on 15/12/22 and 20/12/22, derogations had been made to maintain safe staffing on strike days by agreement with the RCN (and other professional unions serving healthcare workers such as ambulance crews and doctors). The first ambulance staff strike was the day after the second nursing strike day, and junior doctors continued to strike following five strikes which had taken place prior to the start of data collection. The sixth two-day doctors strike, a coordinated strike including consultants, ran from 20-22 September. Another strike occurred on 25 October followed by a six day strike over 3-6 January 2023 which was the longest in the history of the NHS.

The immediate impact of strikes was closure or reduction of some units (minor injury and urgent care treatment centres at the study site) to support both striking and non-striking nurses. The emotional and staffing impact of the first nursing strike was seen

first-hand, when gathering general observation data at a staff briefing from the ward manager which took place after handover:

'One nurse asks, "who will manage the ward?" and the reply was "This is not your problem, the organisation will manage that". The manager took the opportunity to ensure everyone has their FP10 masks fitted and to wear them if they have a patient on the ward with flu. The manager allows for some general discussion about covid and flu levels in the hospital causing considerable pressure.' (Fieldnotes general ethnographic observation NS6)

4.3.2 Pandemics

Local press releases from the start of data collection were seen on the internet, from the trust's webpage and local news sites. The pressures for the whole south-west were shared, followed by several 'help us to help you' posts. For staff view only, pandemic levels for both Covid-19 and flu were recorded on the Trust intranet SharePoint site, usually on the front pages, for example "Current response level: 2". Other confidential information such as Covid-19 situation reports, number of patients with Covid-19 in trust hospitals, and 30-day reports of Covid-19 levels across the trust, showing trends, were also shared for all trust employees. A link signposted more information about the 4 Covid-19 levels and actions, from business as usual to level 4 which signified expansion of specific Covid-19 wards.

At the start of January 2023 increasing numbers of Covid-19 and high numbers of influenza and respiratory Syncytial Virus (RSV) were reported in the South-West communities and hospitals, along with outbreaks of norovirus and diarrhoea and vomiting. Face mask wearing was re-introduced to all healthcare staff and patients and visitors in clinical and non-clinical areas to reduce the spread of infections.

4.3.2.1 Reflexive commentary: reflection on the impact of pandemics on data collection

'At 10:15 on my arrival on the ward I said hello to all the ward staff, including doctors, occupational therapists, physiotherapists, the discharge coordinator and the word clerk who has been off for the last few weeks. This behaviour of mine has influenced the ward team and has helped me to enter 'the space between' (Dwyer & Buckle, 2009) which is said to allow researchers to occupy the position of both insider and outsider rather than one or the other. For me, the most positive aspects of this are 1) I just generally feel that I am not intruding and that I am welcome with less suspicion; and 2) that this has had a positive effect on individual participation in the study. 3) Thirdly this has a big impact on my research data collection because I am so worried about another covid wave and not being able to access the wards to collect data.'

These reflections resulted in restructuring my time for observation and interview fieldwork and made me more attentive to participant shift changes, shaping a supportive approach to changes in agreed dates/times for data collection, and consequently a pragmatic adjustment to data saturation and sample size.

My temporary reduction in contracted hours will enable me to gather as much of the workstream 1 observational data as I can, as for this I need to be in person on the ward performing the ethnography. The impact of this is that I have tried to access the participants at the earliest dates they suggest, when in an ideal world I would spread this out further and give more time to do the transcriptions which is taking ages to write up. But I just feel in the current circumstances (covid rates have gone up this week nationally since the first time since June, and at the main hospital site there have been emails to hospital teams 3 times in the last 12 days of 'Opel alert'). This may very likely mean that I cannot access the site. As I have already interrupted my studies for 6 months from Dec 21-June 22 because of the last covid wave (and my recovery from long covid) I just don't want this to jeopardise my PhD. So, this is a good time to outline the impact of the organisation and the pandemic on my research. In some ways if I was allowed to visit the wards this would be the most positive situation in terms of being able to see how nurses manage risk from many areas when administering medications, but I don't want to even think about saying that this would be good for me – just a good opportunity to explore the skills of the nurses as they respond and adapt to situations that are bigger than safely administering medications.' (Reflective diary 29.09.22)

Escalation levels were at Operational Pressures Escalation Level (OPEL) 4 for extensive parts of the data collection period demonstrating the highest level of operational pressures necessitating local and national responses (NHS England, 2022).

4.3.3 Access to central functions

4.3.3.1 Pharmacy

All on-site services were available to ward 1, including the pharmacy and a dedicated pharmacist and pharmacy technician. A 24/7 access to critical care outreach and other specialist teams e.g. palliative care, out of hours and weekend cover provided by doctors and physicians assistants, and specialist and dedicated teams of occupational therapists, speech and language therapists and physiotherapists with weekend/out of hours services, was available. A discharge co-ordinator was also assigned to the ward, out of hours this role was covered by a senior matron.

As with ward 1, within working hours there were dedicated medical, occupational health, physiotherapy, and discharge teams available to patients on ward 2. However, out of hours or weekend cover from these teams were not accessible to ward 2. With no pharmacy on site, a pharmacist visited once a week, with a pharmacy assistant visiting Monday to Thursday. On Fridays and weekends, access to medicines was limited. Nurses were required to order medication (both ward stock and patient's individual non-stock medicines) by filling out a paper requisition form, scanning it, then emailing it to the central pharmacy on the other site by 10.30, with no guarantee of arrival on the same or even the next day. For any medication related urgent issues,

access to the on-call pharmacist was available. For example a nurse on ward 2 found issues with accessing medication a significant issue:

“the most difficult thing [about medication administration] is when we haven’t got the drug and it hasn’t been ordered....you’ve got to order it, it’s got to be sent, you wait for it and it doesn’t always come that day, so if it, you know, if you don’t give a drug whatever it may be, if it’s prescribed and you don’t give it, so it’s an error, it’s a drug error...it’s a nightmare, I do find that.” (Interview iNT4)

The idea that being unable to provide a patient with their medication means a drug error is uncommon and not correct. There are ‘non-submission’ codes and free text to write on the drug chart to explain non-submission, but this participant obviously felt the pressure of timely medication, triggering a stress reaction related to meeting professional values and local policy. This example shows how wider contextual factors and ward-level systems issues influence WAD, and shape outcomes. In this case an undesired outcome for this participant’s wellbeing, and what Holden et al. name their external but proximal misled professional mandate to preserve safety (Holden, Rivera-Rodriguez, et al., 2013).

‘On a Saturday morning 8am drug round, having decided to leave one patient to last on her drug round, nurse NT1 was torn between completing a patient’s medication administration via nasogastric tube and leaving the tube safely in place, and the pressure to send the pharmacy stock requests by the cut-off time. This patient was nil by mouth (NBM) and had three medications to administer including antibiotics.’ (Fieldnotes observation NT1)

It was important that the patient’s nasogastric tube (NGT) was re-taped:

“because it was peeling...this is going to end up really badly” [as the tube could dislodge if not properly secure]. “[the patient] is already poorly with aspiration pneumonia so I can’t just leave it like that.” (NT1 ad hoc interview)

This decision to first secure the NGT was a longer-lasting adaptive strategy to ensure safety of the tube. Submitting the pharmacy request highlighted further responsive behaviours:

‘The scanning took too long, so she walked to the next-door ward, who had a ward clerk and asked them to send it over. While there she asked a nurse if she could borrow her drug keys to see if they stocked a medication that was out of stock on own ward. She checked all four drug trolleys...but only found 120mg, her patient required 180mg - impossible to make up this amount. She did find the required strength in their stock cupboard. Then she had to find the nurse who she borrowed the keys from – couldn’t find her so left the keys with another nurse. This all took 6 minutes.’ (Fieldnotes observation NT1)

Prioritising safety, multi-tasking, and delegating were effective long-lasting adaptive strategies responding to two conflicting triggers (necessity to secure the NGT, and time), ensuring future and timely medication safety.

4.3.3.2 Doctors

Accessing doctors out of hours was an ever-present issue for ward 2. An external GP out-of-hours service was available for medical review or urgent escalation of deterioration. If a patient in these circumstances needed further tests (such as x-rays or scans) they were transported to the main Trust site via ambulance.

“We don’t have 24 hour doctor cover, so our doctor covers Monday to Friday days, with on-call who don’t attend the ward, so it’s quite difficult out of hours.”
(Interview INT7)

An example of this difficulty was when a conversation on ward 2 was observed on a weekend night shift at 11.30pm between the band 6 nurse in charge (NT4) and the external doctor on-call team. The day staff had earlier escalated a patient who required intravenous fluids:

‘at 11.30 the Dr rang back and wanted to give a verbal order for these, requiring two RN’s coming to the phone, the order being repeated to each nurse individually, them noting the order separately and comparing it to ensure it was clear and correct. Acquiring the correct email address to email the prescribed order through was problematic as there was a communication issue between the coordinator (who had a mid-European accent) and the Dr (who had a German accent). The Dr only had the general hospital email, but this was not reachable at this time by the ward nurses. So, the nurse read out the ward email and the Dr was not able to hear this clearly. The nurse then had to find another nurse for the Dr to speak to, to clarify the email address.’ (Fieldnotes observation NT4)

The trigger of non-availability of a prescriber on the ward created the need for a complex process to take place, outlined in the Trust policy. Over the phone verbal prescription of fluids involved two out of the three RNs on the ward being drawn into a convoluted conversation. Asking the second RN to come back again to support effective communication of an email address, led to a relatively simple outcome which was to reduce patient risk of dehydration. Despite it being common to call for out of hours doctor services, and for most of these to be for more serious needs, this example exemplifies the complexity and difficulties for nurses acquiring new medication for patients out of hours. It speaks to regular, short-term adaptations that although in the moment provide desirable outcomes, do not really serve longer term organisational resilience.

4.3.4 Staffing

Prescribed safe staffing levels for each ward were shown on the white boards next to the staff allocations. Safe staffing numbers for early shifts were 4 RNs, 5 HCAs and 1 Associate (band 4 nursing associate or assistant practitioner); for late shifts 4 RNs and 3 HCAs; and for night shifts 3 RNs and 4 HCAs. Identical staffing levels applied to both wards, but staff on duty did change frequently responding to patient need, for example:

'Today the ward is 1 x HCA down and at 09.15 the Site Manager rings to ask that one HCA go over to the other site as soon as possible to meet acute staff shortage on another ward.' (Fieldnotes observation NT7)

Staffing levels were a common issue raised by participants, heightened by strikes and pandemics. Managing staff and staffing levels are a contributory factors to safety incidents (Lawton, McEachan, et al., 2012). Generally, on a day shift, nurses were allocated a set number of seven or eight patients. Sometimes an additional ward co-ordinator, band 6 or 7, was present but would not take a patient load. When the wards came under pressure from less staff, there was an increase in workload, for example:

"At the moment, we tend to have either 3 or 4 [RNs] so you do end up, sort of, yeah, either taking a bay and co-ordinating or having a bay and a half. And then, yeah, it's not unknown to have two bays, it's happened a few times, yeah." (Interview iNS4)

When the 'floater', the ward co-ordinator, is removed the impact is clear and demonstrated a wider impact on medication administration and the whole ward, for example:

"lack of a floater - that is the challenge because actually if you have that co-ordinating role, they will often pick off things like... so if the bed team ring up saying can so-and-so go to the discharge lounge, it tends to be the co-ordinator that will pick that off and take that stress away and actually in a way that actually just allows you to focus on the medicines in the bay. You massively, massively notice when it's not there, usually because actually everything drags out, the knock-on effect drags out." (Interview iNS5)

Another participant framed this in terms of long-term safety:

"So, the easy part of maintaining safety is having, say, well, I don't know if it's more staff, but having those outside influences dealt with by other people. So, if the bells are going off, you know, having the HCAs, they're dealing with it erm.... you know, anything that happens when you're doing a drug round, if it could be dealt with by other people, then, yeah, that would be, you'd make it 100% safe, but that's not realistic. So, yeah, that's probably never going to happen." (Interview iNT4)

The impact of staff shortages was a trigger that put pressure on the ward system and influenced practice:

"so you kind of, how do you call it, you know, cutting the corners, you know, trying to go quickly and I must say in the practice.... I may.... leave this patient with these tablets in front of them." (Interview iNT2)

A study exploring the link between staffing and medication administration errors identified three contributory factors: inadequate staffing, workload pressures, and rushing (Harkanen et al., 2020). The following data extracts exemplify these three factors, demonstrating the array of practices used to mitigate the impact of less staff and any potential reduction in safety.

'I am greeted with a sigh... "How's it going?" I ask, "awful, we have no band 6's and staff sickness, we've got three nurses on, and only one nurse on duty tomorrow". (Observation NS7)

Fieldnotes from shadowing this participant (NS7) showed how human factors, the work system, and the internal and the external environment drove processes with different outcomes for the patient, the professional, and the organisation. This sits within the SEIPS 2.0 model (Holden, Carayon, et al., 2013):

'Throughout the shift the nurse periodically checks the off duty, speaks to the site manager and staff management team. He doesn't have access to the system to book extra staff because he is not a band 6, a usual requirement for ward co-ordination; but being the most senior of the band 5's he has taken this role. The third RN for the nightshift calls in sick at 4pm leaving 2 RNs for the night shift (usually 3).' (Fieldnote observation NS7)

'He hasn't taken a break, and it's only at the insistence of the team that he agrees to do so, but only after the other two nurses have had theirs so they could have safe staffing while he had a rushed break. The other two nurses had started their 6pm drug rounds a little early at 5 pm, to compensate for there being three teams instead of four, meaning each team has 9 or 10 patients to look after and provide with medications. Nurse NS7 started his drug round later at 5.40pm. He had difficulty focussing on the drug round, being constantly interrupted by medical staff (for updates on patients and a request for a viral swab), the discharge team (three discharges later today and ensuring the infection control issue on the ward wouldn't impact the three planned discharges for the next day), colleagues, and phone calls. He completed medication for the bay, and on entering the next bay was told by a colleague they had 'done the meds' for his extra patients. This means that his colleague had given medication for 13 patients.' (Fieldnote observation NS7)

The short-lasting teamwork strategy to support nurse NS7 contributed to timely medication for both teams (the drug rounds ended at 6.35pm), a positive outcome for patients. However, this questions the potential increase in risk for safe medication administration from such activity.

Latent conditions (Lawton, Carruthers, et al., 2012; Reason, 2000a), such as those identified in this section as arising from poorly designed equipment, inadequate staffing or lack of access to central functions are found in safety research to be contributory factors to patient safety events (Lawton, McEachan, et al., 2012). The pressure to maintain patient flow, ensure adequate staffing and access to medication prompted a series of reactive and proactive responses from the participants to support wider organisational function. These are further explored in the following chapters 5 and 6.

4.4 Introducing the participants

As described in the previous chapter 3, all members of the nursing teams were invited to participate in the study. Descriptions of the demographic data and the data collection occurrences follow.

4.4.1 Demographics

A realistic purposive sample of participants was achieved for variation across grade, experience, ethnicity, and gender, reflecting staff demographics across the two wards. Participant demographics are show in the following two tables (4.1 and 4.2). Table 4.3 presents the observation demographic data, and table 4.4 presents the interview demographic data.

Table 4.1 Study Participants Workstream 1 (Observations)

Ward	Date of observation	Identifier	Overall participant #	Gender	Age	Ethnicity	Qualification	NHS grade	Years registered with NMC	Years of experience in medication admin	Full or part time
1	03.11.22	NS2	2	f	29	White - British	BSc (Hons)	6	7	7	f
1	23.12.22	NS3	3	f	27	White - British	BSc (Hons)	5	2	2	f
1	21.01.23	NS4	4	f	42	White- British	BSc (Hons)	5	10	15	p
1	13.01.23	NS5	5	f	29	White - British	BSc (Hons)	5	2	2	f
1	07.12.22	NS6	6	f	29	White - British	BSc (Hons)	6	6	6	p (15 hours)
1	13.12.22	NS7	7	m	32	Filipino	BSc (Hons)	5	2	7	f
1	11.02.23	NS9	8	f	35	Asian	BSc	5	3.5	10	f
1	01.10.22	NS10	9	f	38	African	Diploma	5	1	13	f
1	21.01.23	NS11	10	f	61	Filipino/British	BA	5	22	22	f
1	07.01.23	NS12	11	f	29	Asian	BSc	5	1	8	f
2	16.09.22	NT1	12	f	40	White - other	MSc	6	14	16	f
2	20.09.22	NT2	13	m	49	African - Zulu	Diploma	5	1	20	f
2	22.09.22	NT3	14	m	30	Asian - Filipino	BSc	6	3	11	f
2	24.09.22	NT4	15	m	30	African	Diploma	5	3 months	4	f

2	29.09.22	NT5	16	f	29	Asian - Filipino	BSc	5	20 months	9	f
2	04.10.22	NT6	17	f	24	White - British	BSc (Hons)	5	1	1	f
2	25.10.22	NT7	18	f	47	White - British	BSc (Hons)	6	1	1	f
2	13.10.22	NT8	19	f	46	White - British	Post graduate Diploma	6	18	18	f
2	11.04.23	NT9	20	f	40	White - British	BSc (Hons)	6	15	15	p (15 hours)
2	19.10.22	NT10	21	f	25	Declined to state	Diploma	5	2 months	2	f
2	26.11.22	NT11	22	f	62	White -British	Diploma	5	16	16	p (33 hours)
2	12.11.22	NT12	23	f	29	Black -African	BSc	5	10 months	6	f

Table 4.2 Study Participants Workstream 2 (Interviews)

Ward	Date of interview	Identifier	Overall participant #	Gender	Age	Ethnicity	Qualification	NHS grade	Years registered with NMC	Years of experience in medication admin	Full or part time
1	13.01.23	iNS1	1	f	29	Indian	BSc	5	2 years 5 months	6	f
1	10.02.23	iNS2	2	f	29	British	BSc (Hons)	6	7	7	f
1	21.02.23	iNS4	3	f	29	White-British	BSc (Hons)	5	2	2	f
1	06.02.23	iNS5	4	m	45	White	PGCert	7	22	22	f
1	13.02.23	iNS6	5	f	27	White-British	BSc (Hons)	5	2	2	f
1	03.03.23	iNS7	6	f	22	White-British	Foundation degree	4	6 days	2 [as student] 0	f
2	12.12.22	iNT1	7	f	62	White-British	Diploma in nursing	5	16	16	f
2	13.12.22	iNT2	8	f	40	White - other	MSc	6	14	16	f
2	05.01.23	iNT3	9	f	29	Black - African	Tertiary [BSc]	5	10 months	6	f
2	21.01.23	iNT4	10	f	46	White-British	Postgrad diploma	8	18	18	f
2	25.01.23	iNT5	11	m	30	Asian - Filipino	BSc	6	3	18	f
2	06.03.23	iNT6	12	f	47	White-British	BSc (Hons)	6	1	1	f
2	05.02.23	iNT7	13	f	40	White-British	BSc (Hons)	6	15	15	p (15
2	15.01.23	iNT8	14	m	49	African -Zulu	Diploma in Nursing	5	1	20	f

Findings from the demographic data collection form (appendix D) are described next. A total of twenty-five participants took part in the ethnographic study. There were twenty-three participants in the observation workstream, and fourteen participants in the interview workstream. Twelve of the observation participants consented to take part in the interviews.

Twenty participants (75%) identified as female and five (25%) as male. Mean age was thirty-seven, ranging from twenty-two years to sixty one years. The amount of time since NMC registration ranged from six days to twenty-two years.

The most frequently declared ethnicity was White-British (eleven participants), with two participants stating they were white-other, one Filipino, one Filipino British, two Asian-Filipino, two participants stated their ethnicity was Asian, and five were of African ethnicity, with one participant declining to state their ethnicity. These details are presented in figure 4.1.

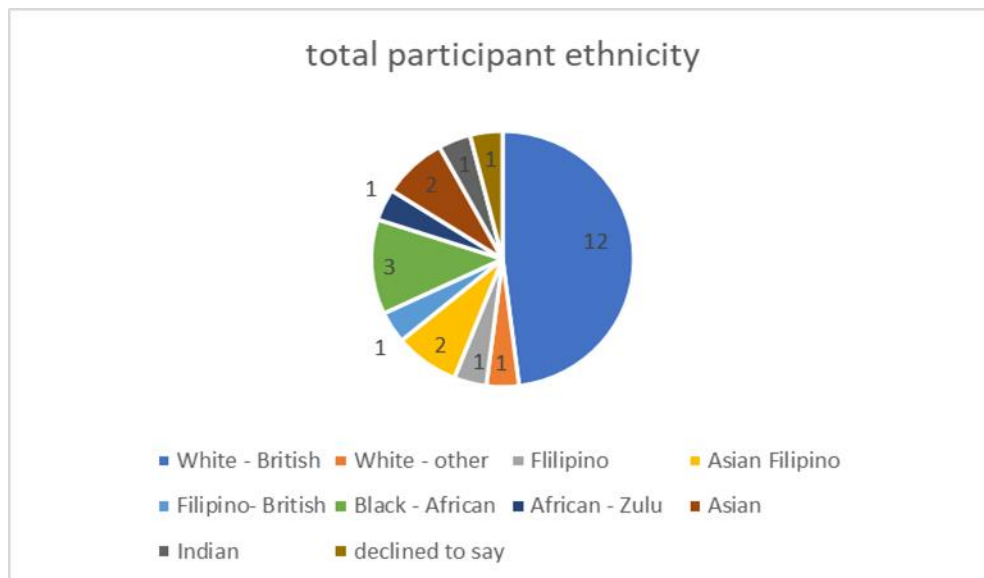


Figure 4.1 Participant Ethnicity

4.4.2 Description of data collection occurrences

Observation and interview workstream details are reported separately. A potential limitation of this study around data saturation was balanced using the concept of information power (Malterud et al., 2015) discussed in section 3.3.3.2 of chapter 3, and theoretical sufficiency. The latter showing ethnographic analysis is ongoing and cannot be saturated due to the constant changes in work, and field notes not being a complete or final record (Emerson et al., 2011).

4.4.2.1 Observation workstream 1

In total, twenty-two RNs and one NA participated in the observation workstream. Participants came from the array of ward-based agenda for change bandings across bands 4-7. Four drug rounds were observed for each scheduled drug round, at 8am, 12 mid-day, 6pm and 10pm (see table 4.3).

Table 4.3 Observation Drug Round Participants, NHS band, and Drug Round Time

Ward 1 Observation						
drug round time	participant	band	participant	band	participant	band
8am	NS1	4	NS6	6	NS11	5
12 mid-day	NS2	6	NS4	5	NS12	5
6pm	NS3	5	NS7	5	NS5	5
10pm	NS9	5	NS10	5	NS8	withdrew
Ward 2 Observation						
8am	NT1	6	NT6	5	NT8	6
12 mid-day	NT9	6	NT5	5	NT12	5
6pm	NT10	5	NT2	5	NT7	6
10pm	NT11	5	NT4	5	NT3	6

4.4.2.2 Interview workstream 2

During the interview workstream fourteen participants were interviewed, four chose to be interviewed online, and ten in-person (see table 4.2). The participant choice of online or in-person may have been influenced by ward managers' permission for interviews to take place during work hours, a change to protocol described in chapter 3 part 3.3.1. The richness and breadth of the data did not appear to be influenced by the format by which the data was collected (in-person or online), likely due to the robust semi-structured interview guide (appendix G), ensuring all questions were asked and explored with the participants.

Six participants took part in interviews on ward 1, one participant was a band 4 nursing associate, three were band 5, one band 6, and one band 7. Four interviews took place in person, with two online. The mean interview time was 50 minutes 48 seconds, with time range lasting between 38 minutes 29 seconds and 66 minutes 37 seconds.

Eight participants took part in interviews on ward 2. Three were band 5 and five band 6. Two interviews took place online, and six online. Mean interview time being 54 minutes 21 seconds, with time range lasting between 31 minutes 51 seconds and 69 minutes.

Table 4.4 Interview Participants, Mode of Interview, and NHS Band

Ward 1 Semi-structured interviews		
participant	online or in-person	band
iNS1	in-person	5
iNS2	in-person	6
iNS4	online	5
iNS5	online	7
iNS6	in-person	5
iNS7	in-person	4
Ward 2 Semi-structured interviews		
iNT1	online	5
iNT2	in-person	6
iNT3	in-person	5
iNT4	in-person	6
iNT5	in-person	6
iNT6	in-person	6
iNT7	in-person	6
iNT8	online	5

4.4.3 Training in medication administration and human factors

Two additional questions were added to the demographic data sheet (appendix D) asking participants “Have you had any training in medication administration? If yes, please describe”, and “Have you had any training in human factors or patient safety? If yes, please describe”.

A variety of responses centred on pre-registration and post-registration education, continuing practice development training, and additional training for preceptees or nurses trained outside the UK. Specific training responses also depended on when registration took place, with requirements changing over time. Each ward had six

participants whose years' experience of medication administration exceeded their registration with the NMC. This was because they were trained outside the UK.

4.4.3.1 Medication administration training

Medicines management pre-registration training was identified as a module as part of the NA programme, or as part of the degree level nursing degree in whichever country the participants did their training.

Participants stated an array on ongoing post registration training, including on-ward pump training, IV courses and NG training, controlled drug training, ad hoc training by pharmacists, and the Trust medicines awareness course. More recently, nurses who did their degrees overseas and newly qualified nurses were required to do an Observed Structured Clinical Examination (OSCE) in medication administration to demonstrate competency in a standardised scenario, a compulsory part of induction which also included a Trust medicines awareness course. Participants were also required to be supervised on drug rounds and other medication administration until signed off as competent by a senior nurse, and to pass a drugs calculation test. For post-registration preceptees and nurses trained outside the UK a medicines awareness course is a formal part of integration, confidence and knowledge transition for quality care (NMC, 2023).

A band 5 nurse with one year's experience stated that this course included in their preceptorship contained:

"IV, oral, topical route administration, with NG and PEG [percutaneous endoscopic gastrostomy] training." (Demographic data sheet, NT6)

Continuing practice training in medication administration was an ongoing annual online requirement for all RN's and NA's at the Trust, but only one participant mentioning this yearly online medication course of the demographic data sheet.

4.4.3.2 Human factors or patient safety training

The question on human factors or patient safety training at the end of the demographic data sheet was used to gather information on participant experiences of taught components on patient safety. The rationale was to establish participant's baseline understanding of patient safety during data collection, especially the ad hoc interview and semi-structured interviews.

Seven participants answered that they had not received human factors or patient safety training, and one declined to answer this question. Only three participants stated they had experienced this training post-registration, from 'numerous Trust courses' (NS4) to human factors training on the preceptorship course (NS5), and an online video as part

of Trust induction (NT2). Other participants responded to this question with examples including mandatory training, medicines awareness, infection control, health and safety, safeguarding, and DOLS training, which are not considered to be aspects of human factors training. However, some may be considered part of patient safety training, for example medicines awareness.

Understanding participant experiences of both human factors and patient safety training could contribute new knowledge about how individual safe practice is influenced by their education in these critical areas.

4.5 Discussion

In the context of this PhD study, ethnographic findings in this chapter identified contextual factors at three systems levels, at individual (participant or patient), ward, and organisation levels to develop understanding related to PhD objectives 3 and 4 by revealing local and wider contextual factors that impact everyday practice during medication administration.

Key local contextual factors impacting WAD were interpreted as latent conditions for safety-relevant events embedded within the organisation (Reason, 2000a) with examples that focussed on the different ward settings, space, noise, patient flow and acuity. An unexpected contextual factor concerned participant training on human factors and patient safety which was variable and sometimes participants lacked understanding of what constituted this training. However, both these training elements have been recognised as essential for all healthcare workers and are part of the e-learning for healthcare programmes (elfh). As of 2024 all NHS providers are required to adopt the elfh learning packages, but neither human factors or patient safety are mandatory modules. This would be a recommendation for future practices at this study's trust. Training is also considered a latent condition (Lawton, Carruthers, et al., 2012) and an 'active failure' by Reason, because active failures result from individuals directly interacting with the system (Reason, 2008).

The SEIPS 2.0 model (Holden, Carayon, et al., 2013), a conceptual model showing how work systems, adaptation and resilience affect processes and outcomes; is a widely used socio-technical framework used by the NHS as part of the Patient Safety Incident Response Framework (PSIRF) (NHS England, n.d-a) and broader safety strategies.

In this current study systems levels have been adjusted from the SEIPS 2.0 model which describes micro-level system as the ward, meso-level system as the organisation, and macro-level system as the external environment and broader healthcare system. The rationale for this was that this PhD study's aim focused on

individual nurse resilient practices to create and maintain safety, so rather than starting at the hospital ward level as the micro-level system, this researcher re-interpreted the individual as the micro-level system to more appropriately explore the nurse's role in patient and systems safety. This decision to adjust the systems levels is part of this analytic story arc of this thesis and reflects the focus of Anderson's study of resilience at similar systems levels (Anderson et al., 2020). Adjusting systems levels is also sanctioned by SEIPS 101 authors (Holden & Carayon, 2021).

Findings equate with contemporary primary and secondary studies of resilience in healthcare (Page et al., 2023; Vos et al., 2020; Wiig et al., 2020) where adaptations are seen as compensatory adaptive responses to external pressures and organisational dysfunction. However, few examine individual nurse practices as well as systems levels, and those that do (Øyri & Wiig, 2022; Vos et al., 2020) did not use the ethnographic method or methodology.

Ethnographic data gathered from a wider exploration of contextual factors in this chapter has identified some relevant implications for practice, outline in table 4.5 below. Later in chapter 8, these support future synthesis of overall practice implications.

Table 4.5 Implications for Practice

	Implications for practice: Contextualising ethnographic findings, chapter 4
●	Local contextual factors such as ward space challenges, a cramped and untidy environment, insufficient space to store equipment, poor lighting on night shifts, and a distracting dynamic environment (noise), proves challenging from a human factors & infection control perspective
●	Handovers held in the main ward concourse could impact confidentiality
●	Evidence of the increasingly complex and frequently changing environment under which participants practice
●	Evidence of participants not undertaking patient safety safety/human factors training
●	Large drug trolleys with keys are difficult to navigate round cramped ward and patient bays, with potential for patient safety-related events
●	Lack of access to central functions (out of hours & weekend access to doctors, critical care outreach team, pharmacist, pharmacy) put pressure on participants, with potential impacts on patient safety and organisational resilience
●	Evidence of staffing levels impacting nurses' personal resilience

4.6 Conclusion

In exploring local and wider contextual factors and the demographic profiles of the study participants, a range of significant latent factors have been identified, from ward

and trust characteristics to the internal dynamic and static environments, and the impact of the external environment on study participants. Highlighting the broad array contextual factors that impact on this study participants' WAD emphasises latent conditions at organisational level revealed as challenges to nurses to develop practices to preserve safety in medication administration.

Insight from this chapter provides meaningful context for the following two findings chapters (5 & 6) which are the focus for further analytical exploration of ethnographic findings on the creation and maintenance of resilience and safety. Applying a deeper, interpretive analysis to the following two chapters, the impact of context on individuals, the ward, and the organisation is further investigated. Chapter 5 explores variations in practice relating to work as done and work as planned, while chapter 6 examines adaptive practice in medication administration.

Chapter 5

Findings: variations within and from normative models of nursing medication administration practice

5.1 Introduction

This chapter is the second of three findings chapters (chapters 4, 5 and 6). In chapter 4 ethnographic discovery of local and wider contextual factors were explored within the clinical setting and identified as latent conditions impacting safety. At this point in the analytic story arc, further enquiry to develop understanding of variations was deemed necessary. This led to four questions (labelled a to d) being asked to supplement this PhD study objectives:

- a What are the variations nurses make during medication
- b What drives/triggers these variations?
- c How can these variations be classified? (typology)
- d How can variations be compared to the normative model?

These what? and how? intermediary questions sit within the study aim and have been mapped to this and the PhD objectives in table 1.2.

To address the intermediary questions, this chapter is divided into five sections. Starting with an essential description of the four normative models informing nursing medication administration practice, section 5.2 continues with a description of analytical steps provided to achieve conceptual clarity. Reflexive commentary supplements this section, offering transparency to issues and decisions made in analysing the data.

The analytic story arc progresses to section 5.3, where participant reflections on normative models and variation are explored within five inductive themes.

In section 5.4 observed variations during process stages of medication administration are deductively analysed, applying a hierarchical task analysis (HTA). Ethnographic data are abductively examined, and perceptions of institutional ruling (Smith, 2006) and professional accountability are explored using normative models and existing theory.

Section 5.5 offers some examples of unsolicited changes to practice where participants offered suggestions about what could be done differently to strengthen WAD and WAP for medication safety. A discussion (section 5.6) and conclusion (section 5.7) close this chapter.

As described in the methods chapter 3, to preserve fidelity with the context of this ethnographic study, the nurses who have consented to participate in this PhD study are referred to as 'participants'. This enables distinct identification from nurses in the generic

sense. To make it clear to the reader, during the writing of field notes during participant observation, this researcher used the term 'my nurse' as a way of distinguishing the participant from the rest of the nursing team on the ward. This term may be seen in the data extracts and preserves the fidelity of ethnography to report what is observed.

5.2 Introduction to normative models, analysis and clarity

Four normative models shaping nurse medication administration practice were selected, with rationale provided below (5.2.1). At the time the data was collected the trust medicines policy had been updated to version 10, and the next review date was identified for October 2024. Other documents were the latest published editions.

5.2.1 Normative models shaping nursing medication administration

To gain a broad perspective on how nursing medication administration is informed by policy and guidelines, four normative model documents (figure 5.1) were selected to represent WAP guidance for medication administration practice.

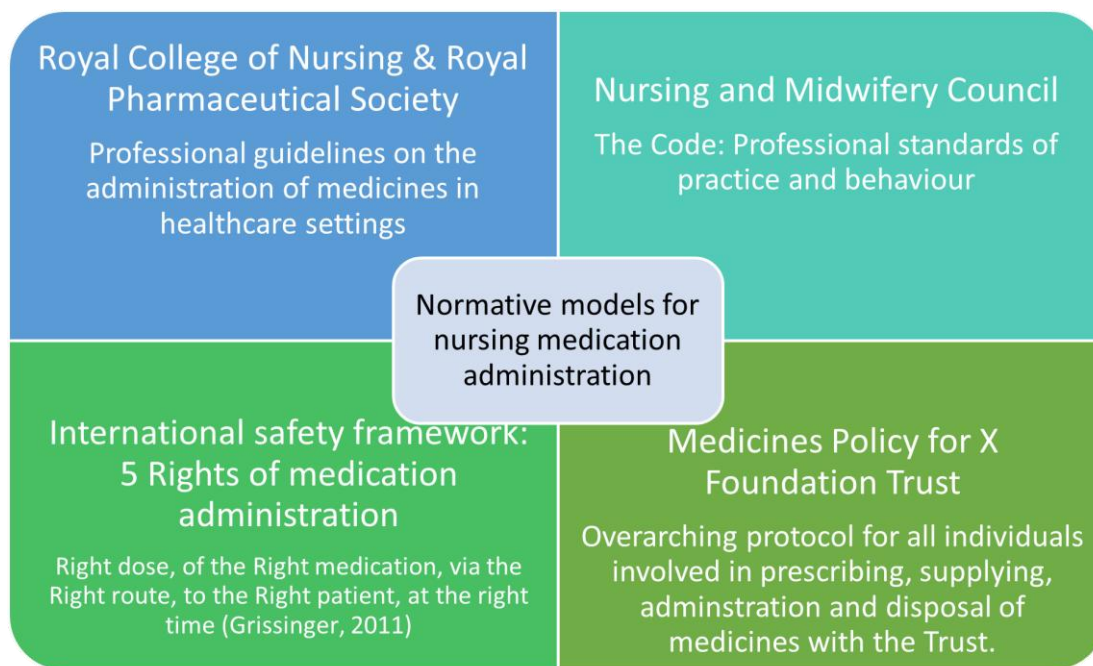


Figure 5.1 Normative Models Ruling Nursing Medication Administration Practice

Rationale for why these models were selected focussed on the different views these models could provide. The internationally applied 5 Rs focusses on safety during five vital stages of medication administration (Grissinger, 2010). Alongside these 5 R's, nurses must have knowledge of the patient's condition, history, and the prescribed medications forming part of

professional accountability for the safe use of medicines following registration in the Code's expectations for patient care (NMC, 2018). Nurses are expected to follow the Code as well as the more detailed and specific national guidelines (Royal Pharmaceutical Society & Royal College of Nursing, 2019) which inform local trust medicines policy guidelines for medication administration.

Criticism applied to the 5R's regarding the lack of acknowledgement of human and systems factors (Martyn et al., 2019) is seen as valid by this researcher, but the same could also be applied to all normative models. Expectations for policy frameworks could never include enough nuance to enable guidance for every aspect of medication administration. The reason the 5Rs is regularly updated to include more rights is largely due to addition of extra vital steps, for example checking allergy status, or the right to refuse. Even with these additional process steps, limitations in this PhD study's methods for selecting appropriate documents and frameworks for ethnographic analysis focus on the fact that medication administration WAD is much more complex and nuanced than the linear process outlined in the four WAP normative models in this study.

Describing what variations occur from or within the normative models are an important part of exploring how nurses create and maintain safety. Recent studies have used similar normative models as this study to identify variations/deviations in medication administration (Blignaut et al., 2017; Lyons et al., 2018). However, a limitation in the observation method for data collection is that vital practices such those in the 5Rs are not always fully observable (Martyn et al., 2019).

Lyons et al. (2018) classified variations (termed 'discrepancies' in their research) as either procedural or documentation variations (Lyons et al., 2018). This classification has been used when describing variation typologies and summarised later in section 5.3.5. While Blignaut et al's observational study of errors and related deviations from safe practice used the term 'deviations' in the context of deviations from safe practice as procedural errors and documentation (Blignaut et al., 2017). In in this chapter, how the term deviations are contextualised and operationalised as variations in this PhD study is rationalised in section 5.2.3.

5.2.2 Reflexive commentary: reflections on this researcher's position – struggling with showing the 'what? and how?'

'I found it very hard to take a step back from the data and look at it in a different way from the inductive approach. At the point where I was re-naming and sorting my themes for the triggers and types of resilient adaptations and feeling that this was my main work towards the PhD aim in terms of maintenance and creation of resilience, I was challenged to look at the data differently.'

This reflexive decision prompted a methodological adjustment to data analysis with the introduction of a more top down deductive approach to certain aspects of data analysis.

It took quite a while to find a deductive approach that felt right and helped to describe what my data was telling me. I got horribly bound up in 'this is not true to my data'. The main issue was around application of a prior typology. I was used to working through codes and themes that spoke to the data I had collected and not place an existing framework on top. However, I came off my philosophical high horse when I remembered (finally) that work as planned is a representation of policy and guidelines – work as planned!. This took me back to my early days of PhD protocol writing when I was exploring the work of Smith (2006) in how the organisation dictates or 'rules' through power. Although I had not wanted to use an institutional ethnographic approach, I was very curious about this in the early days, and making my way back to this sparked my interest in variations from policy as exemplars of the meeting between work as planned and WAD. As a consequence we decided that a first round of analysis describing the 'what' of variations was an important (and missing at this point) step in supporting the research aim.' (Reflective diary September 2023)

5.2.3 Gaining conceptual clarity for definitions

The addition of intermediary questions for this findings chapter may limit the methodological approach or question the veracity of the PhD study objectives. However, the questions resulted from iterative examination of the data and the need to clarify the definition, context and drivers for variation in this very conceptual area. Being able to establish a clear conceptual definition of variations and adaptations was key to analysing the ethnographic data, and address the intermediary questions, particularly questions a and c (see table 1.2).

The relatedness between the two terms (variations and adaptations) is unclear in the literature despite attempts to rectify this (Lyng et al., 2021). A dictionary definition states that variation is “a different or distinct form or version of something” (Languages). Adaptation is defined as “the action or process of adapting or being adapted” (Languages). Of significance here is the intention during adaptation. However, they are not completely separate entities. For reporting this study, greater clarity was assured by showing the nuanced relationship between key conceptual terms in safety terminology (Blignaut et al., 2017; Higham & Vincent, 2021; Lawton, Carruthers, et al., 2012; Lyons et al., 2018; Reason, 1997; Vos et al., 2020) to enable the data analysis arc to be clearly demonstrated over the next two findings chapters. Variations are described and explored in this chapter, with the next chapter focussing on adaptations.

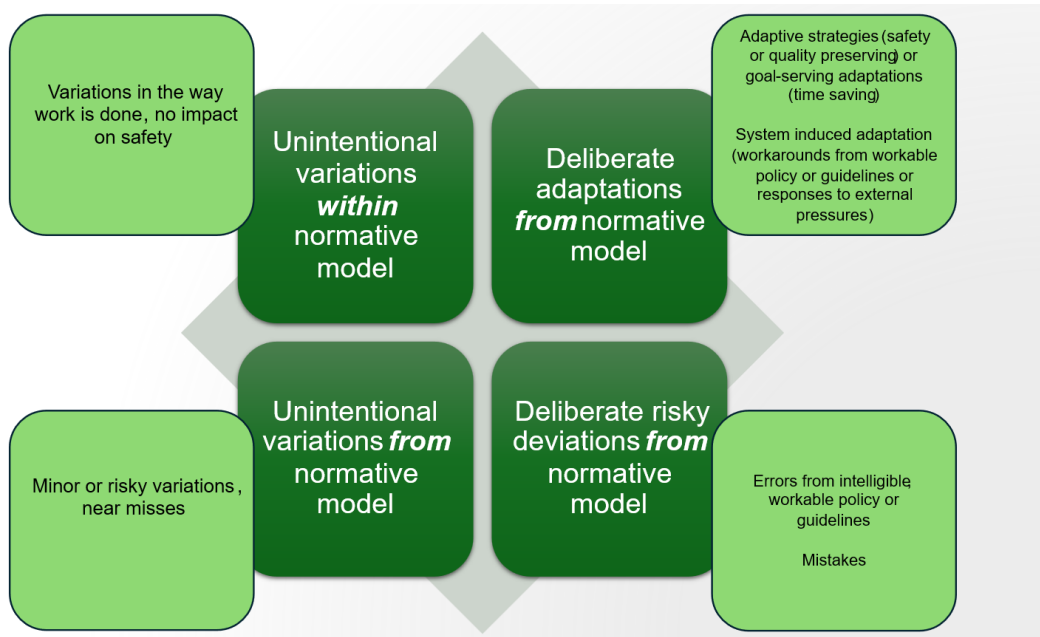


Figure 5.2 Model of Key Concepts and Relatedness Between Error and Safety Terminology in Variation or Adaptation Type

For the purpose of this chapter, the normative model for standardised, guideline-driven nursing medication administration practice represents work as planned within policy and guidelines rather than simply what nurses normally do.

Often synonymous with variations in the safety literature, ‘deviations’, are defined in a 2017 nursing focus group study as:

“any practice that deviates from protocols or regulations intended to uphold patient safety during medication administration.” (Blignaut et al., 2017).

However, there is still a need to distinguish between variations that are clear deviations *from* a model for practice, and more minor variations *within* the model for practice. Variations from the normative model have been described as discrepancies (Lyons et al., 2018; Reason, 1997). In their work examining intravenous medication administration Lyons et al. have defined types of deviation by describing the observed example, considering not all deviations as errors, with minor or intentional deviations categorised as discrepancies (Lyons et al., 2018).

In this PhD study it is important for this researcher to be clearer about boundaries and grey areas. Variations that depart from the normative model are classified as three types: unintentional variations from the normative model that are not intended or meant to cause harm, deliberate adaptations from the normative model, or deliberate risky deviations from the normative model as presented in figure 5.2.

This provides interpretive clarity in this PhD study ensuring nomenclature is consistently applied and enabling an accurate portrayal of the range of variations observed in the context of this current study. Inference and participant perspectives from such a small sample can only contribute to theory building and further consideration is needed, perhaps by continuing to explore the grey area between intentional and unintentional variations.

5.2.4 Analytic steps

Iteration (part of RTA) and responding flexibly to the data contribute to good analysis (Braun & Clarke, 2022). Analytic steps developed the analytical methods to find answers for this chapter's four intermediary questions (table 1.2), resulting in an abductive approach (part inductive, part deductive) described earlier in chapter 3.

Use of the semi-structured interview guide developed by this researcher (appendix G) provided an analytic framework for exploring participant reflections on normative models and variations in practice in section 5.3.

An existing analytic framework in the form of a HTA (Lane et al., 2006) was deductively applied to map administration process steps and document variations using an Excel spreadsheet.

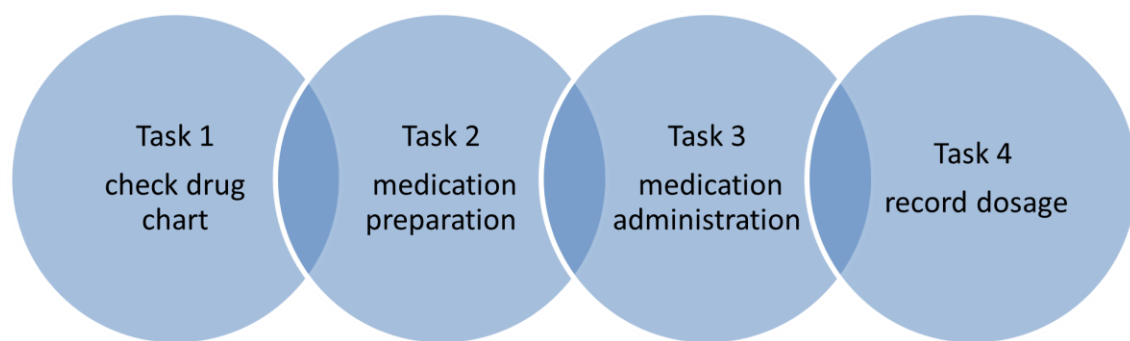


Figure 5.3 Four Hierarchical Process Steps of Medication Administration

As part of exploring the intermediary analytic questions (table 1.2) the entire coded data set from observations and interviews was themed by applying the YCFF framework of factors contributing to safety incidents in hospital settings (Lawton, McEachan, et al., 2012). The outcome of this iterative analysis which was a distinct set of data mapped to the YCFF framework (figure 5.4 below) which was partially successful in contributing to making sense

of the data, later discussed in section 5.4. In figure 5.4 the 19 domains in the applied practice YCFF framework are identified in the yellow post-it notes, with the coded elements from the entire data set (orange lines represent the interview codes, pink lines represent the observations codes). The domains are listed below:

- Active failures
- Safety culture
- Communication systems
- Scheduling and bed management
- Equipment and supplies
- Staff workload
- Design of equipment and supplies
- Supervision and leadership
- Individual factors
- Support from central functions
- Lines of responsibility
- Task characteristics
- Management of staff and staffing levels
- Team factors
- Patient factors
- Training and education
- Physical environment
- External policy context
- Policy and procedures

The following findings present an exploration of what types of variation are found in the ethnographic data and where they occur in the HTA stages, so developing an understanding of variations from the normative model of WAP. The analytic story arc progresses with iterative interpretation of the data.

'During exploring the 'what' I realised I still had issues with frameworks. I themed all the observation and interview data codes to the YCFF themes and was then concerned because I had told my participants and myself for so long that this research was not about human failures or error, it was about safety. But safety-II goes further than safety-I by not just correcting human failures, but extending the view, to look at the whole healthcare system and how this impacts safety. It took a while to understand and be at ease with this and see the relevance of the YCFF framework for exploring the intermediary questions.

After lots of discussion and experimentation with how to show the 'what', I settled on an initial analytical descriptive discussion of what are the variations in practice from

four normative practice ‘ruling’ frameworks: policy, 5R’s, NMC Code and RPS/RCN nationwide guidance, structured within a hierarchical task analysis. Now I was happy, in coming back to what nurses were supposed to do and how they varied from the normative rules, I could answer the intermediary research questions for this chapter and the overall PhD aims.” (Reflective diary 23.01.24 & 29.08.24)

Using an iterative process alongside different deductive lenses helped me test, refine, and challenge emerging interpretations, ensuring that the themes reflected the complexity of the data rather than a single theoretical viewpoint. Through this process, I became aware of how my professional identity and analytic preferences risked narrowing the analysis, prompting me to intentionally engage with contrasting deductive lenses to broaden and challenge my own assumptions.

To present this chapter’s findings, participant perspectives on normative models are interpreted (section 5.3), following which variations in HTA process stages are described and discussed (section 5.4), addressing this PhD study objectives 2 and 3.

5.3 Participant reflections on normative models for practice and the reasons for variations

In this section, researcher commentary and data extracts (captured largely from semi-structured interviews but also from ad hoc interviews during observations) are themed according to the five high level themes this researcher developed for their semi-structured interview guide (appendix G). The deductive application of an existing framework (figure 5.5) developed by this researcher was weaker because the framework was untested. However, the framework was an effective guide for data collection during interviews, and it’s application here was theory testing and was successful in theming relevant participant data.

1. Background & context

2. Approaches: describing current systems & processes

3. Sources of variation & challenges

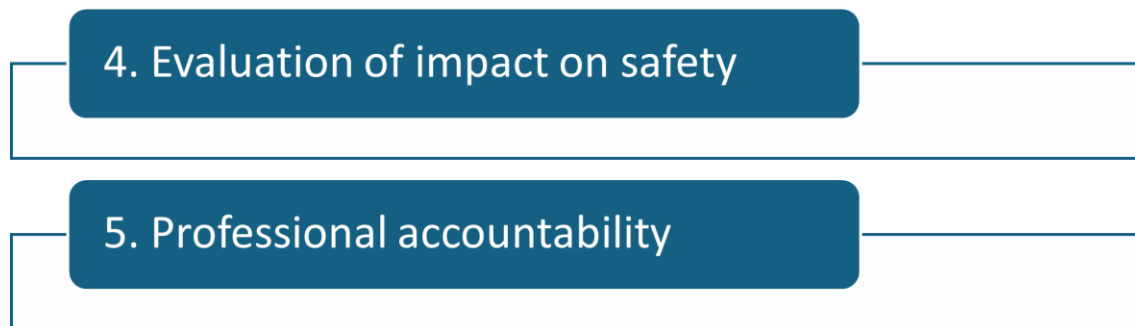


Figure 5.5 Coding Framework Applied to Participant Reflections of Normative Models in Medication Administration Variations

5.3.1 Theme 1: Background and context

In interviews exploring variations in WAD a spotlight is shone on the differences between safety I and safety II in clinical practice; for the latter, the influence of latent conditions and environment are recognised as essential safety factors (Higham & Vincent, 2021; Lawton, Carruthers, et al., 2012; Reason, 1997).

In response to a more probing question about any difficulties in medication administration, a participant provided insight on the necessary focus to get the drug round completed which led to a mechanical approach to task completion.

"It's only when you start thinking about medication, you think, my God [laughs]. I mean, it's important, it's an important part of our role, isn't it? It is, yeah. I think you get into a routine and you just follow the routine without even thinking what, you know, you're so focussed on that patient and getting that medication down, you know, I think you do things automatically. Sometimes it's good to do something like this [interview], to think about why you do it and what you're doing, remind yourself." (iNT1 interview)

This reflects how the rote nature of the 5R's and the focus on tasks in policy and guidelines indicates the safety-I nature of WAP, restricting variations responding to context or individual in-the-moment decision making. Key to creating safety in medication administration (Iflaifel et al., 2020), adaptive strategies play an essential part in functional resilience. Adaptive strategies are explored in chapter 6 as resilient mechanisms to create and maintain safety.

Not without controversy, the 5 R's still represent a normative safety framework for education, however, they are seen as having little impact on preservation of medication safety, provided by policies and guidelines (Grissinger, 2010). With a sole focus on the individual, without recognition of the environment and team factors, policy is seen to be a mechanism to achieve the safety outcomes of the 5 R's, with professional regulations dictating accountability and the importance of following policy. Grissinger argues for the necessity to allow individuals to 'design their own systems' for achieving the 5 Rights (Grissinger, 2010), which is consistent with nationwide guidelines for being accountable but also using

knowledge and professional judgement (Royal Pharmaceutical Society & Royal College of Nursing, 2019). However, insight from participants with their shared perspectives on flexibility and use of their professional expertise (see also section 5.2.4) does not detract from their use of the 5 R's, as one participant explained:

"I mean the five rights which is getting more and more like six rights, seven rights, eight rights [both laugh], actually it's helpful, like we make sure that those name, number, hospital number, and the NHS number and everything, like matches to the patients' chart... like you'll be looking, oh I've got the right chart, I've got the right patient, and checking on the ID band." (iNS1 interview)

5.3.2 Theme 2: Approaches: Describing current systems and processes

Interview participants were asked to describe what they normally do when administering medication, their understanding and use of policies and guidelines, and whether they feel administration guidelines reflect what happens in everyday practice.

Interviewer *'Okay. And can I just take you back to the national guidelines? So do you think there are any national guidelines for medication administration that support the local guidelines?'*

'Uh, I haven't looked much into that to be honest to comment on that, yeah.' (iNT8 interview)

Interviewer *'Do you think that the guidelines, the practice guidelines and protocols help safety?'*

"Yes, yes, if followed, yes." (iNT1 interview)

These data extracts demonstrate perspectives on policy ruling (Smith, 2006) showing participants are not always au fait with national guidelines on medication administration; and for some, guidelines were acknowledged to support safety if followed. While these insights are not reflective of observed evidence of variations from normative models, they do reflect participant perspectives on adherence to policy. This suggests a more laissez-faire approach than a sense of being 'ruled', viewed from an IE perspective (Smith, 2006). This shows how this study's participants approach their practice and how this, and their thinking, influences safety.

In exploring policy reflecting practice, understanding is sought to interpret drivers for variations from WAP in the context of WAD:

Interviewer: *"....so I guess really what I'm asking is do you feel that the administration protocols reflect what happens in everyday practice?"*

Participant: "I suppose yes and no, that will be the answer, you know, I would say 50/50 because you know, because there are so many variations we have to do and I suppose the policy cannot cover it all or maybe, maybe it can, maybe it will be bigger over the years, you know, but yeah. Yeah, so I think, you know, I think it could be done a little bit more in-depth, to be honest, build up to the, you know, on the people experiences and some studies such as yours really, so yes, it could be improved, yeah." (iNT2 interview)

Professional and regulatory standards, and policies and guidelines, work together to ensure patient safety in medicines administration. Drawing on IE perspectives again, policies exist within the context of institutionally bound ‘rules’ and the social and institutional determinants of work as planned (Mackinnon, 2011; Smith, 2006). Here, policies and guidelines, the ‘texts’ that structure the practice of medication administration, are the embodiment and representation of institutional power relations (Smith, 2006). These are interpreted in this study as reference points to frame and organise the social/clinical world of the nurse, providing rationale for how policy can influence practice variations but also acknowledging the limits to what can be covered.

5.3.3 Theme 3: Sources of variation and challenges

Participants describe professional autonomy and the role of clinical expertise as a source of variation when deviating from the normative model, for example:

“I think they [policies and procedures] make everything seem very black and white and there’s not, sort of, a lot of wig... well, I say there’s not a lot of wiggle room but it’s, they basically, in all the policies you see, they put it down to your professional judgement, professional guidance, so you use that quite a lot. Obviously in our line of work, you have to use your professional judgement. So as long as you can justify any, and give any rationale for a decision you’re making then you’re kind of within policy guidelines.....

.....If it doesn’t work for you, you know, we’re allowed to be autonomous, really, and say things aren’t working or this doesn’t seem to work well. That’s the benefit of it, isn’t it, really, that you try and you think, “OK, it doesn’t work, we’ll try something else. So I think most nurses are quite flexible and quite open to change. If we weren’t open to change, it would be really hard to.....

I think they are [flexible], like, as individual nurses but then I think, as a trust, they’re not, they’re very black and white and they’re like, “no, this is what we want across the board,” do you know what I mean? So I don’t think they’re flexible with, yeah, with that across the trust but I think as nurses, individually we are [flexible].” (iNS4 interview)

This insight demonstrates how the importance of using autonomy and professional judgement is internalised to allow individual variations within guidelines when they do not appear to fit WAD, aligning with Grissinger’s stance on the necessity for individuals to create their own mechanisms for achieving safety (Grissinger, 2010).

5.3.4 Theme 4: Impact on safety

Interview insights from participants show that policies are ambiguous, lack detail and do not reflect WAD. The local trust medicines policy determines that professional responsibility outlined in the nationwide guidelines (Royal Pharmaceutical Society & Royal College of Nursing, 2019) does not negate the responsibility to comply with local trust policy (trust medicines policy p.33). However, local policy guidelines are broad and often lack specific

detail for medication administration, providing one rationale accounting for deliberate adaptations from policy, that the policy itself is unworkable. This is an obvious driver influencing interpretation on operationalising guidelines.

An associated perception of safety appears to underpin practice. During interviews, participants considered policies to be important for guidance and safety:

“...and this is kind of indication to put it all together for me, the whole policy, you know, it just guides you through it.” (iNT2 interview)

Another participant expressed:

“they're [guidelines and policies] there to keep the patient safe, keep us safe as a guide, as to, you know, what we should be doing, how we should be doing..... I don't look at the policies often, though, so my decision making on a day-to-day basis is, is just [pause], not me looking at that policy every day, you kind of like, you just know what you're, what you should be doing, how you should be doing it”...

Interviewer: *“So do you look at things, not just policies, but other guidelines, if you...?”*

....“So the guidelines that I might look at a bit more regularly is a guideline for a particular drug or an IV, so those, yeah, I would be looking at them more regularly.” (iNT4 interview)

Perceptions of policies and self-perception of professional expertise also drive variations.

The following data extracts reflect how policy ruling has less influence in this domain, where adherence to guidelines, regardless of how often participants consult them, could be interpreted as examples of behavioural expertise.

Interviewer *“Do you think you refer to those, any kind of guidelines very often, or not very often when you're doing your medication, your daily routine practice?”*

“To be honest I wish I do, but because I am quite assured with my practice, then I tend not to refer to the guidelines anymore, but saying that I think I should be you know, once in a while checking, checking in with the guidelines against my practice, just to make sure I'm in line with the practice. But yeah, I have to be honest I don't, I don't religiously read guidelines, surrounding medication administration.” (iNT5 interview)

However, expertise could be compromised by ignorance of guideline details with potential safety implications:

Interviewer [seeking clarity] *“..whether you feel that the standard practice in the protocols and guidelines is actually adequate, and reflects what happens in everyday practice?”.*

“Er [pause], saying that I don't really [laughs] have the guidelines in my head, or at my disposal at the moment, so I don't... I couldn't say it's not enough or no, there might be guidelines surrounding my inadequacy, or my own, the things that I don't know, but because I don't know them then I couldn't use them, so I think one thing I learned now is I should be well versed with policies and guidelines nationally.” (iNT5 interview)

Participants again reiterated the mismatch between WAP and WAD, where policies were not seen as acknowledging their current situational context and have unrealistic expectations:

“...you might find that the policies are saying “this is what you are supposed to do, whenever you are doing the drug round we expect this and that, this and that” but the reality on the ground, these are the issues that actually what it says, you must make sure that you put all your attention through the drug round to avoid any drug error and omissions but these are the disturbances that are coming, these are the pressures that are coming, so what do we say about that?” (iNT8 interview)

This participant's position infers that rather than adherence to the letter of unrealistic guidelines, variations within WAP are influenced by factors over which people have little or no control or are not aware of, such as disturbances and time pressures. This echoes findings on exploring patient safety and risk management (Higham & Vincent, 2021); and questions the applicability of Reason's error typologies in practice (Higham & Vincent, 2021; Reason, 2008). Utilising a safety II perspective in this PhD study has meant the terms discrepancies and deviations from WAP are interpreted as either deliberate safety persevering or goal-serving adaptations to create safety, or deliberate risky deviations with the potential safety-relevant impact of mistakes or errors. These key concepts are further explored in chapter 6.

5.3.5 Theme 5: Professional accountability

Checking policy can act as a check for participants to ensure they do not deviate from required standards. In this case, a newly qualified nursing associate referred to professional guidelines (NMC, 2018) to ensure they did not vary their practice beyond the constraints of their professional scope:

“The code and like the nursing associate standards for me are quite important because there's differences in my role to a registered nurse, so obviously at the minute, I know in some other trusts they're bringing it in but IV medications I know that that's a no for my role, that's stated in our NMC standards and obviously in the code it says that, you know, to only do what your role requires or like you're competent at doing, so it's ensuring that I stick to doing that. And obviously me, I can't give medications under PGD [patient group direction] so I need to make sure that, you know, and obviously it's stated in the standards in the code that there's things that I can and can't do and it protects me as well as it protects patients.” (iNS7 interview)

The code as a normative model sets clear professional standards, straying from which can have serious consequences for safe practice and professional registration.

“I think it [the Code] underpins a lot of our medication administration, we're practising effectively and safely, we're maintaining knowledge, we're involving patients in decisions around their medications or teaching and educating them about what they're taking. I think a lot of medication administration is underpinned by our NMC Code and value.” (iNT6 interview)

“So, I think it [NMC Code] is a large part of the influences and kind of, well even stronger than influences actually, it kind of polices the whole of our PIN number so, and our discretion, our nurse discretion over giving medication to people, so yeah absolutely.” (iNT1 interview)

The ‘permission’ to utilise judgement and make decisions (iNT1) is part of professional accountability. In this example, the participant felt the Code exerted a significant influence, policing medication administration yet also encouraging discretion in practice, where variations are an acceptable necessity for person-focused care and effective safe practice.

Participant reflections on normative models explored in section 5.3, have contributed to understanding of intermediary analytic questions c and d (see table 1.2).

5.4 Observed variations: process stages, types, purpose and functional outcomes or safety implications

In this next part of the analytic story arc HTA highest level process steps introduced in figure 5.3 have been developed to recognise lower task levels (figure 5.6 below). The deductive application of a selection of the HTA process steps to the study data allowed a focussed exploration of the types of variations, the process steps in which they were observed, the rationale or purpose behind these, and any identified or inferred outcomes or safety consequences, broadening the analytic story arc.

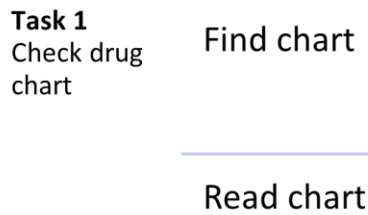
This exploration and interpretation of this data arises addressed the intermediary questions a, b, c and d, contributing to meeting study’s PhD objectives (table 1.2).

Task 1 Check drug chart	Find chart
	Read chart
Task 2 Prepare medication	Get medication from trolley or ward stock
	Prepare to give
Task 3 Administer medication	Lock trolley
	Patient identity check
	Observe patient taking medication
Task 4 Record dosage	Sign drug chart

Figure 5.6 The Four Hierarchical Task Process Steps with Selected Sub-Tasks

5.4.1 Variations in checking the drug chart

This first task has two key process sub-stages ‘find chart’ and ‘read chart’.



5.4.1.1 Finding the patient drug chart

Finding the drug chart was observed to be done in a number of ways by individual participants, and variations within their own drug rounds and between participants were identified. In the majority of observations, participants would collate the drug charts in preparation for their own next drug round, or for their colleague's drug round at the end of a shift (NS10, NS11, NS12 observation field notes). This practice varied, some participants would gather the drug charts on top of the locked trolley as they prepared for their drug round (NS1 observation field notes); or the day shift a participant were observed to collate the drug charts and put them on the drug trolley's side table in preparation for the night shift nurse. This caused some chagrin as the night nurse looked in and on the patient's notes trolley to gather their charts before realising they were already sitting on the drug trolley in the treatment room (NS9 Observation field notes).

On ward 2, the drug charts were situated in a plastic folder hanging from the end of the patient's beds (if in a bay) or outside (if in a side room) (NT1 observation field notes). This made the process of finding the drug charts a lot more efficient, but not without variation. An example was an instance where the drug chart was not in the expected folder, and the participants found it on the front desk. Another nurse had been using it to liaise with the out of hours GP service (NT4 Observation field notes).

Often, other members of the multiprofessional team were using the drug chart when it was needed for the drug rounds. On observing a participant getting ready for their drug round (NS4 observation field notes), the pharmacist had the drug chart, saw the nurse was looking for it and brought it over. The doctor on seeing this, interrupted to ask for the drug chart, so the nurse negotiated for the doctor to take it now and give it to her when finished with.

The function of these variations is likely to save time, minimise issues when sharing access to drug charts and avoid the need to self-interrupt once the drug round has started; this inference is supported by interview data:

“so I generally keep all the drug charts, try to keep them in the same place so they’re easy for me to find and the doctors will know where they are as well..... I’ll keep them in the treatment room with my drug trolley because we know that’s locked. So then the doctors generally, yeah, will just come and take them or the pharmacist will come and take them and they kind of know where they are.” (Interview iNS4)

“...in the back of your mind I’m also thinking, well Safer [meeting] is at 9 o’clock. I’ve also got people queuing up at 9 o’clock to come and take the [drug] charts as well and I don’t want you to do that either, so I think there’s other bits where you just think, oh hang on sec, give me a chance, so yeah.” (Interview iNS5)

5.4.1.2 Reading the drug chart

Multiple variations were observed in participants reading the drug chart, the purpose of which is to scrutinise the prescribed medication details. Every participant had their own ways, but all participants rested the chart in front of them to read, whether this was on the trolley chart stand (in the more traditional drug trolley style on ward 1) or flat on the trolley top in ward 2. Some participants were very structured when reading the chart:

‘she arranged them all in bed order (bed 19 to 24, then side room 25), and pre-read each drug chart front to back, ‘putting her finger between the pages she wants to come back to where the drugs are that she will need to give tonight.’ (NS10 observation field notes)

Like most others (NS6, NS7, NS9, NT1-12, observation field notes), another participant only read the chart once:

‘she only reads through the chart once, separately, when she is preparing to administer meds to each of her patients.’ (NS5 observation field notes)

This represents policy deviation to ‘read the prescription carefully’ before administration, and as part of the policy preparation stage to ‘prepare the medicine and check with the prescription’. Square brackets indicate where this researcher has applied the 5R’s framework to the trust policy (trust medicines policy pp. 33-34).

- the name of the patient [5R’s right patient]
- then name and form of medicine [5R’s right drug]
- the route of administration [5R’s right route]
- the calculation (if any) [5R’s right dose]
- the measured dose [5R’s right dose]
- the date and time of dosage [5R’s right time]
- the time of the last dose [5R’s right time]

A risky unintentional process variation in reading the chart, a near-miss rather than a medication administration error (for non-administration of a prescribed drug), occurred when a participant incorrectly read the drug chart. Finding there were no medications due, he

walked away and was called back by the patient and reminded about their injection, which was then given:

'My nurse went back, he had missed the dose of Dalteparin (anticoagulant). He said spontaneously "This is what happens when you get chatting with patients". He administered the Dalteparin to the patient.' (NT2 observation field notes)

The chart was read, this fulfils the 5 R's safety framework, but only checked once, so was a deviation of trust policy but not a breach of the nationwide guidelines as these only require checking that the prescription meets legal requirements including name, form or route, strength and dose of the medication to be administered (Royal Pharmaceutical Society & Royal College of Nursing, 2019).

However, without the quick reminder from the patient, this could have breached the NMC code to 'preserve safety' (NMC, 2018). Although the drug chart was not read accurately, (this suggests a process based mistake) the patient's intervention enabled continuance to the administration stage and achievement of the top-level hierarchical task goal to deliver drugs to the patient. Additionally, the participant attributed this near miss to chatting with their patient and admits to being distracted by this interruption. This implies that their attention was interrupted during the cognitive process of reading the chart, indicating the participant's rationale for why the risky variation occurred. There was no obvious intention in this variation, aside from to safely give the patient their due medication. This near miss illustrates how in a complex work environment with multiple distractions, the intended safety benefits of standardised normative operational procedures can be defeated by local circumstances.

5.4.2 Variations in preparing medication

Task 2	
Prepare medication	Get medication from trolley or ward stock

Prepare to give

Acquiring the 'right medication' is the first step of preparation and is the first step of the 5 Rights, a specified process in national guidelines (Royal Pharmaceutical Society & Royal College of Nursing, 2019) and trust policy, and part of the NMC Code part 4 'preservation of safety' to:

“administer medicines within the limits of.....our guidance and other relevant policies, guidance and regulations.” (NMC, 2018)

Lack of drug trolley stock was a consistent problem when participants were getting the right medication for their patients. Deliberate adaptative strategies for managing unavailability of medication are discussed in chapter 6; here examples of variations related to policy are explored.

When a participant was preparing a syringe driver with a colleague there was only one vial of midazolam in the CD stock cupboard. This had been ordered and the pharmacy technician agreed to take the order down to pharmacy to ensure stock for later, but this did not address the immediate problem. They decided to borrow some from the next ward, a procedural variation in the process steps, which did not include this option (Observation fieldnotes NS2). A document and procedural variation within the normative model across wards in the same trust was also observed when acquiring the medication:

‘While borrowing the midazolam from next-door, my nurse (NS2) had taken the CD book to sign in the additional medication and found that this drug was not registered in that ward’s CD book. They asked the pharmacist later why this was so and were told it was about the way this ward met the variable CD requirements.’ (NS2 observation field notes)

The functional outcome of these variations was to ensure the patient received the right medication at the right prescribed time. The significance of this for patient safety is paramount, and the drive to remedy failures in supply and demand is part of the 5 Rights safety framework for timely administration of medications.

Having acquired the medication, checking it is the ‘right drug’ ensured the exact medication prescribed is what is being prepared and administered. Part of this check is to check expiry date. This was the hardest task to note in the field without interrupting the participant for clarification or validation, although participants were observed to always read the medicines labels where the expiry date is written.

Not checking the medication expiry date are process variations, deviations from WAP in local (trust Medicines policy p.34) and national guidelines (Royal Pharmaceutical Society & Royal College of Nursing, 2019). Resulting from three contributory factors, ‘communication’, ‘equipment and supplies’ and lack of clarity about ‘lines of responsibility’ (Lawton, McEachan, et al., 2012), in practice the pharmacy team only check expiry dates in the ward storage cupboards but not the trolleys and only do so on weekdays.

Participant NS5 was noted to not check the expiry dates in observation field notes. For another 5 participants omission of this essential task was confirmed during ad hoc interviews. Reasons for not checking expiry dates were twofold. Either the participants ‘knew’ the tablets and container were not expired as they had consistently nursed the same

patients over drug rounds or shifts, or because (as above) they thought the pharmacy team checked expiry dates. Participant NT3 explained he did sometimes check the expiry date:

“but this is the third night. I know the tablets so if I wasn’t too sure I would read the expiry date.” (NT3 observation ad hoc interview)

Another participant only checks the expiry dates on the trolley medication once:

“I mean, the only thing is, is once I’ve checked the medication date, I don’t, I check the medication is the right medication, but I don’t always check the date on that same round again because I’m taking it out of the same box erm...” (iNT1 interview)

When asked if the practice of not checking expiry dates was a policy variation the reply from another participant was:

“you can adapt and vary the policy in a neutral way, rather than the policy, because the policy is robotic.” (NT3 observation ad hoc interview)

Another participant stated checking the expiry was a waste of time:

“it’s difficult at first to check it [expiry date], and you think ‘oh it’s a waste of time’ but eventually I may learn to master it.” (NS7 observation ad hoc interview)

This participant explained the pharmacy team’s responsibilities for checking:

“we check them [expiry dates] because when we take it from the cupboard the pharmacist will check them, so they know everything is in date”

This was confirmed by asking:

Researcher: *“So you don’t check the drugs in the trolley?”*

“We do sometimes, but the pharmacist checks the cupboard twice a week [but not the drug trolleys].” (NS11 observation ad hoc interview)

Another participant was selective about checking the expiry date:

“the pharmacist checks the tablets in the trolley every day, so I’m pretty sure they’re in date. For IVs though I always check the expiry date.” (NS9 observation ad hoc interview)

Prioritising checking expiry date was routine practice for high risk medications and consistently observed to follow the trust CD policy. For medications deemed less high risk participant’s beliefs about pharmacy expiry checks underpins their rationale for minor variations from guidelines.

In an observed example, participant NT8 found a procedural error when the expiry date for acyclovir [an antiviral] in the drug trolley was expired by over four and a half months (NT8 observation field notes). This incident was escalated as per study and trust protocols (with prompting from the ward manager) and is an example of where variations can exceed the boundaries beyond the normative models of safe practice, with the potential to impact on safety.

5.4.3 Variations in administering medication

Task 3 Administer medication	Lock trolley
	Patient identity check
	Observe patient taking medication

The most frequent variations in the ‘administer medications’ tasks were around locking the drug trolley or cupboard prior to walking to the patient, the patient identity check, and observing the patient taking their medication.

5.4.3.1 Locking the drug trolley

The HTA did not specify locking the trolley, only unlocking it as a process task. However, because this important safety step is not in any of the four selected normative models it is important to share this study finding as a safety-relevant event.

Variations around locking the trolley have been described because this significant safety feature justifies attention and possible inclusion into any future development of a HTA on this subject. Expert opinion on the safe use of drug trolleys cautions that unsafe storage of medicines in drug trolleys could breach the Code, and employers’ policies and procedures (Griffiths, 2016). Failure to lock the trolley impacts safety by increasing the risk of confused patients taking medication, theft, and tampering (Hodges et al., 2015).

Some participants (NS10, NS11) on ward 1 locked the trolley, but hid the key in a small side draw, interpreted here as an unintentional variation from best practice with unpredictable variable safety outcomes. Potential observed and stated drivers are:

“a lot of people do this [put keys in trolley side drawer], especially now with wandering patients, it’s not safe to keep the trolley not locked.....there is a risk of the patient opening the cupboard.” (NS10 observation ad hoc interview)

“some people leave the trolley unlocked. In case we have confused patients I put the keys in the drawer. Because in case I lose the keys.” (NS11 observation ad hoc interview)

Other participants were observed closing the drug trolley lid but not locking it (Observation NS11, NS7, NS5, NS6). This variation only applied to ward 1 which had a lock and key, and not ward 2 where the trolleys were merely closed, and unlocked with a 4 digit keypad code.

When asked during the ad hoc interview why participants did not lock the trolley, a participant stated:

“I tried to get into a good habit, we have so many confused patients. They did a CQC [Care Quality Commission] visit a year ago and this was something they picked up on. I tried to incorporate this, I forget the odd time, but generally I’m pretty good.”
(NS5 observation ad hoc interview)

Another explained:

“it’s about time, it’s only seconds, but it’s about being distracted again and time to lock and unlock.” (NS6 observation ad hoc interview)

These participants were often sensitive to the safety issues, and the intention and following practice strayed beyond the ‘good habit’ of trolley locking. They appear to have normalised their practice in response to triggers of time, distraction and forgetfulness. While these practices were not normalised throughout the ward team, they are examples of variations in practice becoming the new norm; seen as an erosion of safety culture and evidence of departure from acceptable stands (Wright, 2023).

5.4.3.2 Checking patient identity

Patients are a key part of safe medication administration and including them in the process is encouraged for their safety, knowledge and independence (trust medicines policy p. 34). Active patient involvement in identity checks prior to medication administration is a crucial safety component (Wiig et al., 2020)

The process requirement of the HTA is simply to ‘check the patient ID wrist band’ (Lane et al., 2006). Variations occurred at several process points during regular or high risk medication administration.

For high risk medications including CDs, the policy required a double checker for the whole administration process (trust CD medicines policy). During two occasions process step variations for the final identity check stage were observed when only one participant took a CD to a patient, after checking the drug’s name, dose, route and time with an RN colleague, as per policy (NS3 and NS11 observations). This procedural minor variation while fulfilling the requirement of the 5R’s, (although ‘right patient’ is the risk here, the right patient received their medication on both occasions), did not meet the Code’s requirement to preserve safety or to administer medicines within the limits of relevant policies, guidance and regulations (NMC, 2018). Potential safety consequences from this procedural near misses, from clear and specific policy guidelines, could have a major impact on patient safety if the CD was given to the wrong patient, and could then be categorised as errors or risky variations because of their greater potential for harm.

Clearly identifying staff busyness as a driver for this variation, participant NS11 provided context to a practice based on trust which appears to have been normalised over time:

“On this ward we trust each other to give it [controlled drug] to the patient.....in reality what we do when its busy and we can’t get another staff to check [the patient identity], we just do it ourselves.” (Observation & ad hoc interview NS11)

Interpretation could infer that lack of ‘consistent risk alertness’ (Wright, 2023), may contribute to a consideration of how risk is perceived in this and other examples, where priorities for safety are not considered, so variation extends the limits of good practice through normalized processes. These types of variations could become discrepancies or errors, named as active failures (Lawton, Carruthers, et al., 2012) with a clear potential for impacting patient safety.

The trust policy signposted further details that should be followed for medication administration which could be found in the local drug round competency document. This indicated that these detailed lower level process steps are relevant for guidance yet were not added to the policy as an appendix or indicated where they could be found. This questions the quality of the policy, another contributory factor for patient safety incidents and an example of an organisation latent failure (Lawton, McEachan, et al., 2012).

The timing of when to check patient identity was not clear in the policy, showing lack of insight into the clinical processes for WAD during the process of preparation and administration. Tasks for this step are stated twice, once before administration when reading the prescription:

“the patient..... must be identified by reference to his/her nameband and by asking his/her name.” (trust medicines policy p. 33)

And after the preparation stage (checking prescription and medication) where the policy states:

‘check that the name and hospital number on the patient’s identity bracelet are the same as on the prescription sheet.’ (trust medicines policy p. 34)

An observed common normalised variation was to merge these checks and only check the nameband once, after the medication had been prepared and taken to the patient’s bedside. Usually, the participant would say hello and introduce themselves to the patient, (often verbally checking the patients name) on their first drug round of the day.

“...I obviously do my ID checks with the patient, admittedly I don’t do that on every round because if I already know, if I’ve been nursing the patient from you know 8 o’clock I know at 12 o’clock that’s still the same person but I will do an ID check at least one of the rounds and hope, yeah I’m pretty sure that they haven’t, they’re not in disguise!” (iNS6 interview)

Procedural variations occurred in other observed instances by participants completely omitting to check the nameband hospital number to the drug chart (NS11, NS5, NT3, NS12,

NT6 observations); when patients were not asked their names when woken up (NS10, NS6 Observation fieldnotes); and when neither the full name nor the hospital number were checked (NS6, NS9, NT6, NT9 observations).

“in the morning, for the first meds, I’ll always do the ID, date of birth and hospital number and check it against correlates with what they [patient] tell you and the drug chart; from then on I know its them, they haven’t changed!” (NS5 observation & ad hoc interview)

In these examples, it is clear how participants orientate their practice around patient recognition, and additionally being mindful of patient’s perception of being asked to confirm their names and date of births so frequently:

“Yeah, they probably look at us and say, for goodness sake, you know, you were with me all day yesterday, you know, and half the time the patient can tell us their hospital number. Yeah, they’re like der, der, der, der, der, and I was like, yeah.” (iNT4 interview)

The normalisation of these variations mostly stays either within the boundaries of the normative model guidelines or are interpreted here as minor or risky variations from the normative model. Theoretically defined as violations (Amalberti et al., 2006) the variations explored here show different levels of migration to boundaries within a normalisation of deviance model where the degrees of migration from the normative model are influenced by external pressures (such as time and generally busyness in this study), and a belief system that patients have negative feelings about being asked to confirm their identity, and that variations from normal practice are for the good of the patients (Banja, 2010).

The new normal is only disrupted by an undesirable safety outcome (Sedlar et al., 2023; Vaughan, 1996). The fact that participants in this study had perhaps not disclosed or experienced safety issues in this step of the HTA could mean that they were not driven to stay within the boundaries of the ‘ruling’ policies, ensuring their WAD extended beyond the borders of WAP and became routine and tolerated.

5.4.3.3 Observing patient taking medication

The responsibility of nurses to witness patients taking their oral medication is an important safety task to mitigate risk that medication had not been taken, to assess and document refusal, and to assess effectiveness and any allergic response to the medication (Royal Pharmaceutical Society & Royal College of Nursing, 2019). By recording the dose with a signature, the nurse acknowledges accountability for completion of these responsibilities. This will be further explored in section 5.4.4 as observing the patient take their medication is an intrinsic part of recording the dosage.

5.4.4 Variations in recoding the dosage

Task 4
record
dosage

sign drug
chart

Instances of variation occur when drugs are signed for before the patient has taken their medication. National guidelines and local policy state:

“the person authorised to administer must initial or sign...the prescription sheet at the time of administration [sic]” (trust medicines policy p. 36).

Witnessing the patient taking the medication is the nurses' responsibility, which they can delegate but must confirm, as per the Code principle to practice effectively (NMC, 2018). The significance of witnessing patients taking their medication is understood in terms of making sure the right patient gets their medication:

“we’ve got wandery patients or, you know, visitors who come in, anybody could come in and take them and you know, you’ve signed to say you’ve given it to that patient and somebody else has had it.” (iNT7 interview)

Some participants were observed signing for each medication as they read through the chart, rather than after the patient has taken the medication (NS3, NS 10, NS 11, NS 5, NS6, NT8 Observations). This procedural variation represents how WAD variations simply represent the participants' routine process. However, signing 'at the time of administration' is an area where policy falls short on specific clarity. It is difficult to ascertain whether this practice is so routinised it becomes unintentional, or whether it is intentional in terms of having a purpose, to save time or to keep track of where the participant is in reading the drug chart. Attempts have been made to explore signing the drug chart prior to administering medications as an adaptive practice in chapter 6 so further exploration of this develops understanding using an alternative lens.

Occasionally, participants unintentionally omitted to record administration of medications to their patient. In all observed instances the participants found that medicines given on earlier drug rounds had not been signed for and ward nurses or participants had either forgotten to sign for the medication administration or not given it for any reason, without using the series of non-administration codes and free text to document why it was not given. Examples for doses not recorded were observed as follows.

Participant NS12's patient was prescribed medicine at 8am which was not signed for and not given (patient stated they did not receive it). NS9's patient's medicine was not signed for, and participant NT2 did not sign for their own 8am drug round patient's medication and picked this up on the 12-2pm drug round. NT3 found that for two of their patients the 6pm drugs had not been signed on their drug chart from the previous day. These examples show unintentional minor variations or near misses from WAP. These 'failures' of memory are interpreted as lapses (Higham & Vincent, 2021; Reason, 1997).

5.4.5 A typology of variations

As a result of this exploratory work a context specific typology of variations observed in clinical practice, with any inferred, observed or stated drivers and outcomes has been developed, shown below in table 5.1. The table addresses intermediary objectives a, b, c and d and the first three PhD study objectives.

Table 5.1 Typology of Variations in Medication Administration

HTA task stage of normative model	Variation example	Inferred, observed or stated drivers/purpose of variation	Functional outcome/safety implications	Variation type (based on figure 5.1) & identified as document or procedural
1 Check chart > find chart	Gather all drug charts prior to drug round	Save time, avoid need to self-interrupt	Lean, efficient and timely medication round	Procedural variation <i>within</i> normative model
	Negotiation with Doctor/pharmacist	Prioritise need of drug chart, ensure shared access to drug chart document	Shared negotiation for timely prioritisation of access to drug chart	Procedural variation <i>within</i> normative model
1 Check chart > read chart	Reading the drug chart once but not checking the prescription	Distracted by communication with patient	Near miss	Minor procedural variation <i>from</i> normative model
2 Acquire medication > get medication from stock	Borrowing CD from another ward which did not follow same requirements for audit trail by writing in CD book	Non availability of ward stock	Interruption of drug round, time, possible recording of CD details	Procedural & documentation variations <i>within & from</i> normative model
2 Acquire medication > prepare medication > check expiry date	Not checking expiry date	Prior knowledge of expiry date through previous checking	Avoid repetition, save time	Procedural variation <i>from</i> normative model
	Not checking expiry date	Assumption of ward pharmacist checking ward and trolley stock, time wasting activity	Avoid repetition of check from pharmacy colleagues, save time	Risky deviation from normative model
3 Administer drug to	Hiding key in drug trolley drawer	Safety – preventing patients from	Variable: either positive safety	Minor procedural variation from

patient > lock drug trolley		accessing medication	implication to hide key Or: Negative safety implication to leave key accessible to patients	normative model Or: Procedural variation near miss or risky procedural variation
HTA task stage of normative model	Variation example	Inferred, observed or stated drivers/purpose of variation	Functional outcome/safety implications	Variation type (based on figure 5.1) & identified as document or procedural
	Closing but not locking drug trolley	Safety – preventing patients from accessing medication	Functional outcome to save time but with potential for safety-relevant event	Procedural variation near miss or risky procedural variation
3 Administer drug to patient > check patient identity	Omitting second nurse patient identity check for controlled drug	Unable to access second checker due to nursing colleagues being busy	Functional outcome to save time but with potential negative safety implications	Unintentional variation <i>from</i> normative model
	Only checking the drug chart once	Combining two process tasks for efficiency, normalised deviance	Functional outcome to save time, shortfall in understanding WAP	Procedural variation <i>within</i> normative model
	Omitting part of the patient identity check	To save time	To reduce patient burden of frequent identity checks, migration to boundaries of unsafe variation leading to potential error	Procedural variation <i>from</i> normative model
3 Administer drug to patient > observe patient	Signing the drug chart at wrong process step - when reading the	To save time	Potential minor harm to patient if signature does not record witnessing	Document variation <i>from</i> normative model

taking medication	chart prior to administration		patient taking medication	
4 Record dosage > sign drug chart	Omitting to sign drug chart	Lapse	Failure of memory	Document variation from normative potential risk

The typology of variations summarises the HTA task step, examples of the characteristics of WAD variations, their functional outcomes and potential impact/safety implications and variation type. A limitation of this typology is that in addressing the contradictory conceptual clarity and complexity around practice variations which have not been theory-tested using a safety II lens, interpretation could be seen as idealistic and impractical.

However, this typology does lay some groundwork for future exploration in this area, and participants in this PhD study did make contributions to offering areas where safety-events could be minimised. In the next section, collected data on participant's reflections of how patient safety could be enhanced in their practice setting are described.

5.5 Participant reflections on strengthening medication safety

During data collection participants occasionally deliberated on how things could be changed in or around medication administration by themselves, others or the organisation. An outcome of these reflections were some solutions. As part of RTA the reflections were coded as 'improvement ideas'. During data analysis these important participant voices were heard and expressed in table 5.2.

The operational level at which the participations solutions were aimed are identified by this researcher as at the level of the individual (micro level), the team (meso level) and organisation (macro level). Safety contributory factors from the YCFF (Lawton, McEachan, et al., 2012) were used to support identification of domains where safety could be strengthened. As previously discussed, the application of the YCFF to this study findings have focussed on creating safety, so any safety issues are reported as opportunities for learning.

Participant contributions were summarised in table 5.2 below, alongside the trigger for their suggestions, which was inferred unless directly stated in the participants' reflection. Whether the participant's suggestion related to WAD, WAP or both, was also identified in table 5.2 alongside any potential outcome (suggested, reported, or inferred by this researcher) with the potential to impact safety or systems resilience.

The data was also mapped to the five high level interview themes (appendix G) summarised in figure 5

Table 5.2 Participant Reflections and Suggestions for Strengthening Medication Safety

Participant suggestions operating at system levels	Safety contributory factors (YCFF)	Source	Participant suggestions to do things differently	Data extract	Trigger/pressure	Interview high level theme	WAD or WAP	Suggested or inferred potential outcomes
micro & meso	Management of staff & staffing levels; Staff workload	iNS2	Have a shift coordinator allocated to shift, as well as nurse for each bay	"If we could purely focus on just giving drugs then it would be fine but there's so much else going on. Especially with my role because I'm always coordinating as well as running a bay and giving medications, which ideally we shouldn't be, we should be having a coordinator and a nurse for each bay, it's just all the distractions so, you know, calls from the bed managers about discharges, people coming to you just for advice and everything else, and then we have a lot of confused patients... .who are	distractions and interruptions, time	Theme 3 'Sources of variation & challenges'	WAD	focussed, uninterrupted drug round, safety, safety in 5R's 'right patient'

Participant suggestions operating at system levels	Safety contributory factors (YCFF)	Source	Participant suggestions to do things differently	Data extract	Trigger/pressure	Interview high level theme	WAD or WAP	Suggested or inferred potential outcomes
				always wandering around and interrupting you, not that they mean to but yeah. So yeah, it's just hard to stay focused really, yeah..... just trying to finish that one [patient's medication] safely...preventing drug errors....giving it to the patient so it's the right patient"				
micro & meso & macro	Communication systems; safety culture; Policy & procedures	iNS4	Utilise the ward council for agreement of evidence based changes in practice	"we've got like the ward council, you know, if there's any changes we want to make, we have to have evidence to prove, you know, that it's a worthwhile change. So, you know, any sort of evidence to do with practice is always good."	unworkable policies or procedures	Theme 2 'Approaches: describing current systems & processes' & Theme 3 'Sources of	WAP & WAD	Agreed local, safe variations to practice based on empirical evidence

Participant suggestions operating at system levels	Safety contributory factors (YCFF)	Source	Participant suggestions to do things differently	Data extract	Trigger/pressure	Interview high level theme	WAD or WAP	Suggested or inferred potential outcomes
						variation & challenges'		
meso & macro	Communication systems; Policy & procedures; Physical environment	iNS5	Update and revise [medication] infographic posters on the ward to avoid 'poster blindness'	"Yeah, so there's a bit of poster blindness as well, so that's the other bit, we need to revise that a bit, so yeah."	Messy work environment, inaccessible and unworkable guidelines	Theme 2 'Approaches: describing current systems & processes'	WAD	Quick access to a flowchart summarising process steps for high risk medication. Need for updating and circulating

Participant suggestions operating at system levels	Safety contributory factors (YCFF)	Source	Participant suggestions to do things differently	Data extract	Trigger/pressure	Interview high level theme	WAD or WAP	Suggested or inferred potential outcomes
								key messages
meso	External policy content; Physical environment, Communication systems; Safety culture; Policy & procedures	iNT4	Have access to a desktop computer with a large screen in the treatment room where medication is prepared	".....even the drugs that I know like Amoxicillin and Flucloxacillin, every time I given that I always have to go on Medusa [online IV administration guide] and remember how to give it, because we don't give IVs all the time here, so.... Researcher: Do you go to Medusa on the internet or on the...? "On the internet. Yeah, on a computer because I, I don't think the iPods	Hard to access to external guidelines	Theme 2 'Approaches: describing current systems & processes'	WAD	Safety - making checking medication regimes easier

Participant suggestions operating at system levels	Safety contributory factors (YCFF)	Source	Participant suggestions to do things differently	Data extract	Trigger/pressure	Interview high level theme	WAD or WAP	Suggested or inferred potential outcomes
				have got it [Medusa] on, and then you've got the iPads, but half the time they don't work, so I always, yeah, use a computer for that. Researcher: 'So, but there isn't a computer in the treatment room?' "No, there isn't and that would help so much, next door's got a computer."				

Participant suggestions operating at system levels	Safety contributory factors (YCFF)	Source	Participant suggestions to do things differently	Data extract	Trigger/pressure	Interview high level theme	WAD or WAP	Suggested or inferred potential outcomes
micro & meso & macro	Communication systems; Policy & procedures	iNT4	Moving oral anticoagulant prescription to the 'regular oral medication' front pages of the drug chart	Researcher: I suppose in a way that oral anticoagulant is kind of hidden...."it is a problem, it is right at the back and they [nurses] don't always go [look] right to the back, but I have said to a doctor recently that if he could, on the regular medications [on the drug chart], if he can indicate that there is, so they just write 'Apixaban in the back page' and then that will alert [us] to go right to the back. The only solution that I can think of is scrapping those back pages and having those regular medications on the regular, you know, having them actually prescribed there, because they're not going to get	Time to read through whole drug chart and check the medication prescribed at the back of the drug chart	Theme 3 'Sources of variation & challenges'	WAP	Safety - to prevent or reduce missed doses

Participant suggestions operating at system levels	Safety contributory factors (YCFF)	Source	Participant suggestions to do things differently	Data extract	Trigger/pressure	Interview high level theme	WAD or WAP	Suggested or inferred potential outcomes
				missed, you know. I know that, for whatever reason, the [hospital] drug chart, you know, it's like a booklet, and they want everything all separated like that. I don't know what their reason is, I don't know if that's a safety thing or what, but they get missed, and they do get missed.				
micro & meso & macro	External policy content; Communication systems; Policy & procedures	iNT5	Have a clear idea of what makes an 'on time' medication, and what constitutes 'late administration',	"nurse giving a medication for let's say ten patient, would be impossible for us to give this tablet at the same time for everyone, at this very moment.....Yeah, I'm thinking about nights when you've got not just six or seven patients, you've actually got... You've got ten	Lack of clarity for nurses about the accepted parameters for timely medication administration	Theme 3 'Sources of variation & challenges'	WAP	Safety - to ensure timely medication for effective treatment.

Participant suggestions operating at system levels	Safety contributory factors (YCFF)	Source	Participant suggestions to do things differently	Data extract	Trigger/pressure	Interview high level theme	WAD or WAP	Suggested or inferred potential outcomes
			ie 'medication window'	patients, yeah."				
macro	Policy & procedures; Safety culture; Task characteristics	iNT6	Write into policy and guidelines to protect nurses on drug round from interruptions.	"....when I've read through the policy recently and going back to this thing when we're saying about interruptions and stuff. It's a shame that that's not written into a policy or a guideline to say, you know that people shouldn't be interrupted, or things shouldn't be done. Maybe that would give us more of a protection almost, and the fact	Unworkable policy	Theme 2 'Approaches: describing current systems & processes'	WAP	Safety - reduce interruptions and distractions, reduce error

Participant suggestions operating at system levels	Safety contributory factors (YCFF)	Source	Participant suggestions to do things differently	Data extract	Trigger/pressure	Interview high level theme	WAD or WAP	Suggested or inferred potential outcomes
				that then things couldn't get in the way or interfere with what we're doing possibly."				
micro & meso	Management of staff & staffing levels; Staff workload	iNT8	Have a floating nurse to support nurses allocated to each bay	"I'm aware of the challenges, the staff shortage that are there, but I'm thinking of a floating nurse.... Her job is to look at these things that are coming up, disturbing the meds. Someone is being discharged, she runs to that site and make sure that all the discharge comments are in place.....you have to close the trolley..... That sitting down [to	distractions and interruptions	Theme 3 'Sources of variation & challenges'	WAD	reduce medication errors and omissions, support priority of drug round, safe

Participant suggestions operating at system levels	Safety contributory factors (YCFF)	Source	Participant suggestions to do things differently	Data extract	Trigger/pressure	Interview high level theme	WAD or WAP	Suggested or inferred potential outcomes
				complete form] takes the steam away from you"				
meso	Communication systems; safety culture; Policy & procedures	iNT8	Short meetings to troubleshoot medication related issues	"back home what they would do is we have a session where we all sit down for about 30 minutes, we pick a specific topic that we see as an issue prevalent maybe in that week and then we say "okay, Friday we're having a meeting, we're going to be talking about this", just 30 minutes....let's say it's omissions, drug omissions, short presentation and then reflection and then we talk.... there's something that has happened... What are the emerging issues?	Lack of time to support discussions about safety issues or events, immature safety culture	Theme 4 'Evaluation of impact on safety'	WAD	Safer medication related practice, develop a more mature safety culture

Participant suggestions operating at system levels	Safety contributory factors (YCFF)	Source	Participant suggestions to do things differently	Data extract	Trigger/pressure	Interview high level theme	WAD or WAP	Suggested or inferred potential outcomes
				Right guys, let's talk about what is happening 1, 2, 3? What's the best way to come out together [to] work on. But as I'm saying is what I see, there is so much time, there is no time"				

Participant voices have significance for future opportunities to strengthen WAP and WAD to enhance organisational resilience at different systems levels. Some participant suggestions are integrated into chapter 8 as recommendations for practice.

A discussion follows, informing a context specific topology of variations (section 5.6) before a conclusion closes this chapter.

5.6 Discussion

The realities of WAD and participant's own explained perspectives of their usual practice and viewpoints on policy and procedures was captured and explored to answer this chapter's intermediary analytic questions (table 1.2). These focussed on what drives variations in practice (intermediary analytic question a), what variations were (intermediary analytic question b), how they could be classified (intermediary analytic question c), and how variations related to normative policy and practice guidelines (WAP and WAD) (intermediary analytic question d).

The deductive application of a HTA and safety research evidence enabled an extensive interpretative of variations in nursing practice. There is a precedent for utilising HTA process models when examining medication administration. A study in high risk intravenous medication successfully used HTA to understand variability in WAD (Ifaifel et al., 2020), and an earlier study (Lane et al., 2006), explored the complexities of WAD practices and medication errors. Lane et al's drug administration HTA was compatible with classifying variations across a range of administration routes, stages and drug routes (Lane et al., 2006). By shortening Lane et al's model to the first or second level of task hierarchy, a useful framework was applied for understanding where variations occurred within the overall task of medication administration.

Several methodological limitations in this chapter have been highlighted focussing on conceptual interpretation and method. The rationale for the selection of the policy, guidelines and the 5R's framework for document analysis was that they each addressed safe practice as a base line for reliability, a necessary aspect of safety. As discussed, the fact that all aspects of the 5 R's are not always fully observable (Martyn et al., 2019) has also meant that some lower level process tasks from Lane et al's HTA (Lane et al., 2006) were not explored. However, breaking down the task processes was only relevant to this study in so far as developing understanding of variations, and the ethnographic approach served well to explore the intermediary analytic questions, and this PhD study's aim and objectives.

An unexpected finding from the interview data from this PhD study was that most participants could not describe who authored or published medication administration policies or guidelines. Although this information was not commonly known, to know the

authors of policies or guidelines authors is not necessarily relevant as long as the participants knew of existing policies or guidelines, whether they knew the content, and whether they used them to find the information they needed. There is an opportunity for further research in this area.

Participants often had trouble naming nationwide guidelines for medication practice such as standards from RPS and RCN (Royal Pharmaceutical Society & Royal College of Nursing, 2019). Although this did not appear to have any impact on safety in terms of observed or articulated functional outcomes from variations, this finding is perhaps unsurprising considering the local trust policy was so closely aligned with national guidance.

While guidelines were often seen as important to participants, an outcome from the data analysis was that they only used guidelines occasionally for the purpose of supporting their problem solving or decision making when unsure. Where their knowledge appeared assured, participants did not feel the need to frequently consult guidelines. On occasion, for example when checking verbal prescribing protocol or preparing an IV medication that was not commonly used, access to appropriate guidelines was observed or described.

Unintentional variations within the normative models of WAD were expressed in this current PhD study as everyday practices and behaviours that exist either *within* the boundaries of normative guidelines or policy or vary *from* the normative model (see figure 5.2). For the purpose of this study, and incorporating the classification of 'documentation' or 'procedural' (Lyons et al., 2018) to describe variations, this study incorporated the consideration that some variations from policy (WAP) can be risky and therefore patient safety relevant. This extends understanding in this very focussed micro-level arena of the individual, to the ward team, where normalisation of deviance beyond the individual impacts on team practices, occasionally migrating to, or beyond the boundaries of safety. Some wider contextual factors were found to drive variations in behaviour.

It is the very routineness of WAD on the drug round, usually performed on the day shift three times by the same nurse and followed in a standard and highly structured manner that provides the background for practice variations with no intention to cause harm.

Highlighting variations in practice as part of the gap between WAP and WAD is seen as important for establishing high reliability in organisations, as there is a small difference in just what people do differently (variations) and policy adaptations or deviations which could introduce risk (Ashour et al., 2021). Figure 5.2 made an attempt to integrate key concepts and identified relatedness between error and safety terminology in variations

and adaptations. However, future development of this model (figure 5.1) might address areas that are less robustly supported by current safety literature.

In this chapter deliberate adaptations are introduced into the model of key concepts and relatedness (figure 5.1), this progresses the analytic story arc. Adaptations are mechanisms of resilience operating wider than variations in, or from normative models, and are strategies responding to local triggers or wider pressures.

Some variations in observed or discussed participant data show a level of inconsistency in reliability which could affect quality and safety over time. Application of the YCFF contributory factor themes (Lawton, McEachan, et al., 2012) to analyse this PhD study data particularly resonated with some of the nineteen contributory factors. Examples of these were active failures, physical environment, policy and procedures, communication, management of staff and staffing levels, and safety culture. Despite the YCFF being developed to understand factors contributing to failures in care, it's application as a safety framework has been partially effective in understanding factors contributing to safe and risky variations in medication administration practice.

Standardisation in processes and care delivery are key features of reliability in healthcare (Lachman et al., 2022). Identified variations in his study question reliability in nurse medication administration practice because under different conditions nurses do vary their practice. As high reliability relies on consistency under different conditions (Lachman et al., 2022), the riskier variations, where deviations from WAP is normalised and practice variations migrate beyond the boundaries of safe practice (Amalberti et al., 2006; Rasmussen, 1997) can impact on safety. These highlight the role of the individual nurse in safe medicines management and wider organisational safety.

Human variation as variation in knowledge and attitudes could impact adherence to safety principles (Vaismoradi et al., 2020). Within the four HTA task process stages of medication administration in this PhD study, participant attitude appears to confirm a theoretical perspective that aligns with a culture where patient safety is not fully established, or is impaired (Everson et al., 2020) so compromising safety principles.

The shared thinking in this study's data appears to mirror 'groupthink' (DiPierro et al., 2022) making risky variations from standards acceptable. Pressures are at the route of such variations (DiPierro et al., 2022). Similar to Ashour et al's 'work conditions' and 'competing priorities', these pressures can lead to prioritisation of production over safety (Ashour et al., 2021; Everson et al., 2020). In these circumstances normalisation of deviance over time can lead to risky variations where deviations become acceptable. Despite lack of studies and conceptual dissent about groupthink in healthcare (DiPierro et al., 2022) it has been found to result from decision making amongst teams, resulting

in conforming to the majority opinion. This study shows how groupthink can influence decision making around adherence to WAP, and variations in WAD.

Education in healthcare is seen as a tool to reduce the impact of the phenomenon of groupthink (DiPierro et al., 2022), and is also a tool for understanding clinical risk, human factors and the impact of these on implementing guidelines (Ricciardi & Cascini, 2021). Data on human factors and patient safety training was collected in chapter 4 using the participant demographic data sheet (appendix D). The free text responses from participants showed nearly half of this study's participants had not had any human factors or patient safety training. Given the significance of patient safety training for all healthcare professionals it appears that even within this small nursing sample some extrapolation of lack of training and its impact on safety might be cautiously drawn. Lack of training is considered by this researcher as having implications for practice although more evidence of this from the study site is needed if this conclusion is to be supported by data.

This and other implications and recommendations for practice from this chapter are summarised below and later synthesised in chapter 8.

Table 5.3 Implications for Practice

	Implications for practice: Findings: variations from the normative model chapter 5
•	In recognition of the dynamic nature of medication administration, more emphasis on variation and adaptability rather than compliance to normative models of WAP should be encouraged
•	External pressures influencing normalisation of deviance is an opportunity for future exploration on wards
•	Nurse perceptions of patient needs or wants should be confirmed by asking the patient
•	Nurses' experiences of safety-relevant issues could be shared to agree and encourage local boundaries for medication administration variations in WAD
•	Employers could consider developing an accessible learning platform for training on human factors and patient safety

Variations have been explored as differences in practice procedures in the process of medication administration and related to normative models of policy and guidelines.

This was seen as an important start for further analysis and exploration of this PhD study aim to explore the creation and maintenance of resilience and safety.

From analysing the data exploring variations as distinctive elements of medication administration practice was not easy. Lack of clarity, and conceptual application of safety and error models has been found to contribute to this difficulty (Higham & Vincent, 2021), particularly the notion of intention. Here, there needs to be recognition that behaviour is influenced by factors that participants cannot always control or are not aware of, making intent unclear. However, despite the challenges and limitations, this analysis finds that variations in medication administration are intimately linked to studies of human factors and error, and a conceptual framework showing relatedness between error and safety terminology has been used to show this in figure 5.2.

As a result of this exploratory work a context specific typology of variations observed in medication administration practice, with any inferred, observed or stated drivers and outcomes has been developed (table 5.1). This could be used to develop understanding and opportunities for further research.

5.7 Conclusion

In this chapter conceptual and analytic clarity and transparent reflections on researcher positionality present findings on variations in medication administration practice using an array of normative models, research, and existing frameworks. Participant's reflections on WAD and the applicability and usability of normative models have been explored using mostly interview data. Data extracts of variations within and from normative policy and guidelines have been explored across the four hierarchical tasks of medication administration. A context specific framework of relatedness between variations, adaptations and safety and error terminology was developed to interpret changes to practice (figure 5.2).

The abductive approach combining deductively applied existing healthcare models to data analysis with inductive generative exploration of findings enabled variations relating to normative (WAP) task process steps, national and local policy and the conceptual framework of the 5 Rights. A rich description and classification of key variations observed from recurring commonalities within the data set was achieved in the typology (table 5.1).

The data has been used to explore the tensions and relationships between WAP and WAD finding document and process variations. Description and interpretation of the evidence ensured the intermediary study objectives were answered using descriptive analysis of participant reflections on variations between WAD and WAP, intention, and outcomes and how they can be classified by establishing the typology (table 5.1).

Four significant outcomes have arisen from this iterative abductive approach to data analysis:

- 1) It enabled a robust synthesis of an array of normative models to view the data, highlighting the strengths of an abductive approach
- 2) It linked the language of variation in medication administration from a safety II perspective to existing error and safety literature, ensuring a clear and common language in findings from this study, and for future work in this area
- 3) It contributed to the development of a typology of variations
- 4) It allowed participant voices to be heard, and their reflections and proposals for quality improvements supporting safety to be aired

Insights gained enabled a thorough descriptive exploration of variations within and from the normative model from several important stances across all aspects of the data set.

The articulation of policies and WAD has been appraised, preparing the way for a further inductive analytical stage of data analysis of safety and resilient adaptive strategies by exploring triggers, pressures and outcomes of intentional resilient strategies in chapter 6.

Chapter 6

Findings: Triggers, pressures, and adaptive strategies

6.1 Introduction

After exploring the impact of contextual features in the findings from chapter 4 and examining variations from the normative model (WAP) in chapter 5, the analytic story arc in chapter 6 turns the focus to exploring intentional adaptations. This addresses PhD study objectives three and four (table 1.2) by exploring the scenarios under which WAP deviates from WAD, and nurses perceptions of risk, resilience, and factors that drive variations.

Conceptual clarity is assured in section 6.2 of this chapter, followed by a summary of analytic steps for this chapter as this research moves from an abductive approach to an iterative inductive approach using reflexive thematic analysis (RTA). Findings are analysed by examining the triggers for resilient adaptive strategies, the nature of these changes in practice, and their observed or inferred effectiveness in influencing safety.

Detecting, mitigating, and preventing adverse events is key to patient safety (Hanskamp-Sebregts et al., 2016), yet preventing adverse events is not the only means to achieve reliability and safety. Creating resilient adaptive strategies is a dynamic process that aligns with the safety-II approach and focusses on safety creation rather than accident prevention.

6.2 Conceptual clarity

Detecting, mitigating, and preventing adverse events is key to patient safety (Hanskamp-Sebregts et al., 2016), yet preventing adverse events is not the only means to achieve reliability and safety. Creating resilient adaptive strategies is a dynamic process that aligns with the safety-II approach and focusses on safety creation rather than accident prevention.

Adaptations are deliberate individual strategies responding to challenge or change (Lyng et al., 2021), and reflect WAD to maintain quality care (Wiig et al., 2020).

Adaptive resilient strategies have the intention to support patient safety in response to real world complexity by compensating for limitations in processes or the environmental context that act as pressures and triggers to adapt.

In this chapter the conceptual focus of 'normative' is broadened as the analytic story arc progresses from the planned model of work (WAP) in chapter 5, to exploring how the individual responds to triggers and pressures impacting their plan of work (WAD).

In this PhD study triggers apply to local (individual or ward level) factors that demand a compensatory response – the adaptation; so, there is an association between the trigger and the adaptation. Wider environment or contextual organisational factors that influence the nurse's work are conceptualised as 'pressures' which also have a relationship with resilient adaptive strategies.

6.3 Analytic steps

An inductive approach ensured clear analytical development of themes. Within the themes, an identical process of data exploration was followed, exploring and identifying the triggers, the consequential adaptative strategies, and any outcomes. This linear process is highlighted in figure 6.1 below.



Figure 6.1 Linking Triggers and Adaptive Strategies to Safety Outcomes

Selecting data extracts from the extensive collected data that best represented the study findings resulted in a potential study limitation. The selected interview data more often summarised and concisely told the participant's story of how each theme contributed to the identified PhD study objectives in this chapter's focus on adaptation (table 1.2). Although this was not intentional and was simply a product of examining all the coded data in each theme to find the optimum extract that best represented observed and described practice, this researcher felt that this might be a result of the need to validate observed practice triangulating with explorative interview data.

6.4 Theme findings

The final theme headings and their characteristics are summarised in table 6.1. The findings are analysed throughout this chapter as the analytic story arc continues, showing the trigger, the adaptive strategy and outcomes (table 6.3). Findings are analysed using current relevant literature and empirical research to support interpretation of the data extracts, using either illustrative or analytic narratives (Braun & Clarke, 2022) where appropriate.

Table 6.1 Theme Summary

Theme	Characteristics
1. I am a problem solver	The strategies and techniques used to problem solve in response to triggers
2. The person inside the patient • Patient preference • Patient need	Strategic understanding of patient needs or preferences used to adapt practice to ensure safety, learning, concordance and patient preference. Individual expressions of resilient practice
3. Finding what I need • Unavailability of medication • Missing or lack of equipment	The use of adaptive strategies for managing the availability of medication and equipment with goal to maximise system functioning
4. Pre-emptive actions	Preparatory and anticipatory proactive adaptations in response to changes responding to change.
5. Ready, steady.....	Using avoidance strategies as process changes for triggers: being disturbed, interrupted and distracted.
6. Go Go Go! From preparation to administration • Time constraints • Multi-tasking in the time warp	The main factors that influence adaptation on the drug round, and the responses and outcomes from these triggers
7. Disturbances in the status quo • Self-checking • Multi-tasking in the time warp	Key triggers and creative adaptations compensating for disturbances in the ward environment

8. Teamwork makes the dreamwork • Collaboration • Communication	Adaptive communication strategies to convey information. Working together collaboratively to optimise safety, save time or reduce risk, responding to pressures or triggers.

6.4.1 I am a problem solver

Observing the variety of participant's adaptive strategies in response to a multitude of triggers and involving individual problem solving and decision making were found to be key influencers to the outcome of the creation of safety during medication administration. (see figure 6.1 above for the process diagram).

While ward nurses do have a degree of autonomy, this is found to be restricted to ward level, and to be an occasional practice as opposed to being an integral part of their role (Oshodi et al., 2019). Autonomy is seen as part of advanced practice, and for this current study participants this does not apply. Autonomy for any nurse does however lie within the boundaries of the Code (NMC, 2018).

This nursing associate (NA), in a semi-structured interview described the pressures, planning and process strategies to prioritise medication administration with the outcomes of supporting reliability of a timely drug round, prioritising patient need and the necessity to support wider organisational resilience:

“and obviously throughout the day then or even when we’re doing the medication round there’s lots of pressure on with regards to making beds available and moving patients to like discharge lounges, so you’re having to work around your medication round as well as sorting out patient discharges and as well as supporting patients that are really poorly and yeah, trying to manage, juggling basically. But I always try, especially like get the morning medication round done, focus on my jobs and then set away time to do the medication rounds, yeah, because it’s really important that patients get their tablets on time and antibiotics. And yeah, then once the medication round’s done, then do the rest of the jobs”. (Interview iNS7)

The pressure of patient flow and bed management was widely observed and expressed in the data and acted as either a pressure or a trigger (depending on circumstances) for adaptive strategies. An example of this was when observing this same participant who pro-actively self-protected by keeping out of the way so she could maintain her focus on the drug round and avoid potential distractions:

“I think obviously because there is a lot more pressure on the need for beds and we’re very like short-staffed, I think I definitely when doing medication round keep myself like to the side so there’s no distraction from everyone else and especially when there’s lots of bed moves.” (Interview iNS7)

The development of skills to support decision making and problem solving are exemplified by another participant:

Interviewer: "How do you respond to those kinds of pressures that enable you to vary your practice?"

I think I'm getting better at trying to rationalise my mind, how urgent the distraction or the need is. I think when I first qualified, I would automatically jump and, where do I need to go? Almost in the flight mode, as you know the flight and fight mode, and rushed over. I think I'm becoming a little bit more confident in my ability to process things and understand. I tend to take a step back now and think, do I need to do this now or can it be something that can be done in 10 minutes or 15 minutes or 20 minutes time? But I think that's coming with experience and knowledge." (Interview iNT6)

The planning and strategizing in these three examples show how experience and decision making support effective medication administration, which, tried and tested by the participants over time have become embedded in their individual practices. In this study context, these participant's data extracts presented proactive, anticipated, long-lasting and regular adaptive strategies through mental decision making to support safe medication administration and wider organisational functioning.

6.4.2 There's a person inside this patient

Two analytical subthemes of patient preference and patient explore how participants worked with patients to ensure safe, effective administration.

6.4.2.1 Patient preference

Non-adherence to prescribed medication regimens is a global issue, partially resolved by engaging with patient preference (Laba et al., 2015). A forerunner to person-centred care patient preference is an NMC code requirement to understand and respond to patient needs, preferences and values (NMC, 2018). Engaging with patient wishes promotes empowerment, improves independence, and concordance which is an important part of effective treatment (Bucknall et al., 2019; Laba et al., 2015).

The following data extracts exemplified this, showing how patient preference regarding the timing of their medication was considered by study participants. During observation, a participant:

"gave the patient the option to take their midday supplement at 12 or 2pm and the patient preferred to take it later after lunch." (Observation fieldnotes NT5)

Another example in different observation showed how the participant adapted their drug round process:

"she [participant] explains that she's going to start with the man in bed 18 because he likes his medications early." (Observation fieldnotes NT1)

In a short-lasting, intermittently applied adaptation, participant NT1 deliberately changed the usual drug round process of starting with their first allocated patient and ending with their last, common among all participants observed. The usual process steps of a drug round would start with the patient occupying the first bed number the nurse is allocated; a normal strategy to meet normative guidelines for completing medication administration within a defined time period, while also handling time-pressures (Alteren et al., 2021). Despite little empirical evidence exploring why nurses start with the same patient, anecdotally this is inferred as emerging from the need to make sure there is a correct time gap between medications that require a variety of dosing regimens with necessary spaces between medication, such as every four, six, eight or twelve hourly.

For the observed practice of participant NT1, the priority was to satisfy patient preference and concordance, so using former knowledge she broke her usual regimen for this patient only, as a mechanism to preserve quality care. The outcome of this proactive strategy is that the patient took their medication at the time they were used to, following their usual self-medication regimen, while reducing the risk of the patient declining their medication. In another example, this participant engaged with their patients on the drug round prior to preparing their medication, notably pain relief:

Researcher: 'she [my nurse] checks for pain, asking "are you in pain?." The patient says no. Then she checks the drug chart. "Do you want your paracetamol?" She puts an R [for refusal – a non-administration code] in the box [where she would normally sign that the patient had taken their medication].' (NT6 Observation fieldnotes)

This data extract exemplifies the standard approach, an indicator of reliability in the process of a patient-focused approach and safe documentation. Although this is also a resilient strategy, interpreted in this study as a 'monitoring' resilience potential underpinning effective WAD (Hollnagel, 2017), and used by the participant to detect any patient problem or need for analgesia.

6.4.2.2 Patient need

The same participant as above (NT6) adapted her practice with a different patient to make it easier for them, facilitating safe swallowing and patient education:

'She helps the patient with her orange juice. She has a large tablet in her medicine pot. She says "shall we drop this in your porridge? It's the biggest one". The patient says yes. My nurse administers this medication to the patient's mouth, then helps with several more spoons of porridge. Each time asking has it gone? Then my nurse then gives the rest of the tablets this way. All the tablets are given with the porridge. The nurse placed the tablets in the mouth. Then my nurse gives the spoon of porridge. My nurse then asks, "do you want to try it?" Having given a patient their porridge for the previous drugs, this is the last one. The patient says "go on". [She puts the tablet on the spoon].

The patient tries this [to take the tablet from the spoon] with the spoon in her hand. But the patient has a tremor and mobility issues with her arm/hand and cannot manage to take the spoon to her mouth. So my nurse continues to feed her porridge." Last tablet"? asks the patient. "One more. It's your calcium tablet, You have to chew this one". (NT6 fieldnotes observation)

During the ad hoc interview, the participant provided rationale for her observed actions, having explained that giving medication tablets with porridge makes it easier to swallow, and why she continued to give the patient their porridge after the last drug was given.

"she would not have finished if I had not been there to feed her, she would not have eaten properly and had her full breakfast". I ask why she asked the patient if she wanted to take the last tablet herself and she replies "this is part of rehabilitation for the patient, to be able to start to take her medications by herself". (NT6 ad hoc interview)

The outcomes of the strategies the participant employed in the above patient interaction demonstrates the complexity of medication administration beyond simply handing out drugs, exemplifying person-focussed holistic care and enabling rehabilitation towards independence. These anticipated, regular, long-lasting adaptations support safe medication use for the patient and contribute to safety for this patient with their poor swallow.

Another example from interview data, where compensating for individual patient need promoted safety was when adapting the medication itself to optimise medication effectiveness:

"I think the other bit for me though is just, you're just very aware when people, like... so some of the antibiotics that we prescribe, so Calamox [Co-amoxiclav] is a great example, it's a massive tablet and you're trying to give it to some poor frail 80 year old and so I think one of the things that I'm really aware of when you're doing medicines is actually just recognising when you might need to change the preparation, you know, so it's fine the doctors writing up the antibiotic or whatever it is but, you know, it's like I gave someone a calcium tablet the other day and she just looked at it, this poor lady looked at it and went seriously, you want me to do what with it! And I was like, well just chew it but it was massive. So she broke it in half and I was like oh, that's a really good idea, now I know you do that, I'll break in half when I give it to you tomorrow. I think for me it's just being aware of stuff like that and just thinking actually, you're really struggling with that antibiotic, shall we make it a liquid, you know, and that tends to be the sort of things that I look for. Yeah, and I think, because that's the bit I think sometimes we, you know, it's really easy to think, oh they've got a chest infection, I just need to write up x and y or they've got cellulitis, they just need this antibiotic but actually sometimes it's the recognising actually that patient hasn't got a particularly good swallow and I think as nurses we're probably the best people to pick that up and the doctors just won't, with the greatest will in the world, it's not that they're being neglectful, they're just on a process aren't they of just, well they need an antibiotic and I think it comes down to us to say actually, hold on doc, that's not going to happen, we need to make it syrup or whatever..." (Interview IN5)

Nurse interactions with prescribers can serve to advocate for patients and optimise compliance. Participants regularly evoked 'preparing for going home' during their medication administration, using strategies focusing on a goal for preparing the patient by improving their knowledge about her medicines.

Adaptive strategies compensating for patient's need resulting from conditions such as dementia are critical for person-centred care and effective administration. In this example of 'bedside cabaret', a participant described how she tailored her care:

"You do tailor the way you work depending on the patients who you're treating, I've had to do all sorts of weird and wonderful things at 2 o'clock in the morning to get confused patients to take their antibiotics, like singing and dancing with sick bowls on my head and stuff like that but they took them and they got better and you know so, yeah I think you do adapt but, and that is directly because of the patients but also because of your surroundings as well and, yeah I suppose it's a combination"

Researcher "The vision of you dancing around with a vomit bowl [laughs].

"Yeah, and a stick, I call it 'bedside cabaret'; and I do think you, I do think I've had to, you do tailor the way you work depending on the patients who you're treating." (Interview iNS6)

The strategy of using distraction techniques of humour, and song and dance, was triggered by one patient's confusion; but was a frequently applied strategy by this individual participant for some patients. In this example, the participant anticipated the need for bedside cabaret as a reactive, intermittent distraction technique, short-lasting to ensure both goal serving (time), and safety preserving outcomes. In the participant's own words, the outcome was:

"they took them [antibiotics], and they got better." (Interview iNS6)

6.4.3 Finding what I need

This theme is explored by firstly identifying the issue of not being able to find drug charts before the drug round because they were being used by doctors or pharmacists, introducing the issue of access to essential items. This is followed by an examination of two common triggers to adaptive practices compensating for non-availability of essential items: ward medication stock, and equipment necessary for medication administration. The semi-structured interviews were particularly successful in creating understanding of participant perspectives on unavailability of these items during the high level themes of 'background and context' and 'sources of variation and challenges' (appendix G).

Many participants raised issues during observation and semi-structured interviews around availability of medication stock (in drug trolleys and local pharmacy stores); and equipment supporting medication administration, for example intravenous pumps. Part

of 'central functions' (Lawton, McEachan, et al., 2012), availability and accessibility of medication was an issue that participants found frustrating. A variety of short- and long-lasting strategies were applied in response to these triggers.

Before even starting the drug round, participants faced issues around finding drug charts due to doctors and pharmacists on the ward competing with them for access to these. For example a participant reported:

"It's the pharmacist that's the biggest culprit, that will just arrive on the ward and then walk off with like 4 or 5 drug charts and doesn't tell anybody that she's taken them. Or doctors that are writing up drugs to take away [medications for patients to take home on discharge] and things, they're the two main culprits that tend to walk off. It's something that I'm finding increasingly frustrating, and we've got a ward meeting tomorrow, so I'm going to be mentioning it tomorrow, just seeing how we can address it because it's time consuming and unsafe because you're having to leave what you're doing and wander around a ward looking for something"

Interviewer "Yeah, does the wandering drug charts from the pharmacists and the doctors, is it particularly raised to any particular drug round?"

"It tends to be the lunchtime one when the pharmacist tends to come. So, I don't really understand why they, we have set times for medication rounds don't we, and it's frustrating when she appears on the ward at the start of a drug round and just takes the drug charts and doesn't tell you that she's taking the drug charts. There's no system in place." (Interview iNT6)

This participant's frustration was triggered by not being able to find the drug charts, a common 'system functioning pressure' (Page et al., 2023), but she has no adaptive strategy for a longer solution to this common issue, other than pleading with professional colleagues for access to the chart. She did however decide to raise this as an issue as, apart from the frustration, she considers this to be a timing and safety issue which is not working for her. The outcome and any changes made as a result of this anticipatory strategy were not followed up with this participant. However, the participant's intention to raise the issue did suggest an existing culture of listening and empowerment, contributing to an established safety culture the lack of which has been found to contribute to errors or active failures (Lawton, McEachan, et al., 2012).

6.4.3.1 Unavailability of medication

Medications not being easily available was a common issue which was identified in the semi-structured interviews when participants were asked the following question:

Researcher: "Can you tell me if there's anything about medication administration that you find difficult or challenging?"

Participant: "The most difficult is when we haven't got the drug and it hasn't been ordered and erm..., yeah, I do find that quite challenging, yeah."

Researcher: "Because, I suppose, particularly for your hospital, which is a community hospital with no pharmacy, so there's an added layer of stuff that you have to do."

Participant: "Yeah, you've got to order it, it's got to be faxed, you wait for it and it doesn't always come that day, so, if it, you know, if you don't give a drug, whatever it may be, if it's prescribed and you don't give it, so it's an error, it's a drug error. So when you haven't got the medication and there's nothing you can do about it, you've then got to try and source it from next door, they haven't got it, then you're on the phone to pharmacy, can you get it over here quick enough? They've got their deadlines when you can get the order form through, then you're waiting for it and it doesn't come. Yeah, it's a nightmare." (Interview iNT4)

When observing or discussing absence of ward or drug trolley stock during interviews, participants identified adaptive strategies to remedy this trigger. Being faced with a patient and unable to find their specific medications in the trolley this participant explained:

"I literally just got the first drug, stopped and thought, well, if I haven't got this [in the drug trolley] chances are I probably haven't got others, so at that point I went through the trolley, saw what I hadn't got, went to the cupboard just to get it en masse and then start again." (Interview iNS5)

This proactive strategy triggered by not being able to find the first of several medications this patient was prescribed, saved time on the drug round by bundling the task, a mechanism that contributed to timely medication for this patient, and to all their following allocated patients. This goal-serving time-saving outcome resulted from an unanticipated reactive adaptation.

In the many observed situations stock was not just missing from the drug trolley but also un-available from the ward stock cupboards. One participant adapted the continuous flow of her drug round to order medications in the ward stock or non-stock order books as she completed the drug round for each patient, rather than leaving this activity to the end:

"Not having the stock at the pharmacy, you know not having the stock on the ward and having to stop and go and order it, it's rare for me to remember because I've probably got a list as long as my arm to do after my drug round so I try and order the medication while I'm still on that patient so if that particular medication isn't in stock I will go, get the rest of the medication, go to the treatment room, order that medication, then go back to the patient with the drug still in my hand. Little things like that are really annoying." (Interview iNS6)

Her rationale behind this process is to avoid the risk of her not remembering to order the required medications at the end of the drug round which could impact on the patient's treatment; this speaks of their individual self-awareness and problem-solving practice. These adaptations are dynamic trade-offs (Sujan et al., 2015a) between efficiency for timely medication administration for all patients on the drug round, and workload task balancing, where the participant acknowledged the limits of their memory in the context of the many tasks on her 'to do' list.

6.4.3.2 Missing or lack of equipment

While participants could anticipate issues and responded by utilising proactive strategies, they often needed to react to triggers in-the-moment. In this example, a participant had collected a blood transfusion for a patient, and was preparing to double-check the blood with the nurse looking after the patient who had got the wrong pump set up:

“...you can’t use a Baxter pump to give blood because we only use Alaris because the giving set has a filter so we generally use Alaris pumps. And then all of the other pumps that, for Alaris weren’t available on the ward, there was none in medical devices, the blood had been taken out the fridge and it was approaching like, you know you’ve got half an hour to pick the blood up and get the transfusion going so it was a bit of a palaver, I had to take another patient’s pump, use, take their fluids down then restart their fluids with a different pump after I’d got the blood, you know used, got the blood transfusion up and used the pump for that. So, sometimes it can be difficult to, things like that can obviously hinder time and you know certain medications have to be given at certain times and the blood would’ve obviously expired if we didn’t so yeah, you can have difficulty with the availability.” (Interview iNS6)

Described as an ‘on-the-day adaptation’ (Page et al., 2023), or an ‘unanticipated adaption’ (Holden, Rivera-Rodriguez, et al., 2013) this participant’s reactive and short-lasting, intermittent, strategy prioritised the blood transfusion to ensure it was started within safe time limits, in response to lack of availability of the right pump for safe blood transfusion. This resulted in a safety and goal serving outcome, ensuring the full transfusion amount was given, and the blood was not wasted for being out of its use-by time.

Issues with equipment and supplies are a contributory factor to hospital patient safety incidents (Lawton, McEachan, et al., 2012), and these examples show how short and longer-lasting adaptive strategies effectively compensate for equipment and stock problems so preserving safety.

6.4.4 Pre-emptive actions

Pre-emptive actions were found to be preparatory, proactive adaptations responding to anticipated pressures or triggers. For example, one participant prepared themselves for any likely disruptions to their drug round by declarative and clear language while ensuring roles and necessary actions were clear for their team:

“These are my three HCAs that I’m going to work with, now to protect myself from disruptions in the drug round then we discuss, “so guys now I’m doing my drug round, I’ll be doing also observations, so don’t worry about the observations, I want you to concentrate on attending to the immediate patient needs, as you give the tea please also note Room 7 needs to be fed, needs one-on-one, also when they ask for bedpans I’ll be calling you guys [to get] bedpans during my meds round. So at times that is part of the preparation for the drug round so that you know that there is minimum disturbance, but though

at times it's not easy because when it's really a goal, things change." (Interview iNT8)

This example shows an instance where delegation and gaining clarity in work and roles supported efficiency in both time and resources, an example of an effective proactive, long-lasting and regular anticipatory strategy. This secures both a safety and quality preserving outcome meeting the demand of a safe, timely drug round.

Proactive anticipatory strategies also included examples where medication was prescribed outside of the usual drug round times. A participant was observed setting an alarm on the ward mobile phones:

Researcher: *"She sets an alarm on the iPhone to 6.45"*

Participant: *"They are due at 7"* (NS3 Observation field notes)

Researcher: *"Why set the alarm?"*

Participant: *"I'll tell myself with every intention [of remembering] but I may forget at 7 so I set an alarm on my phone."* (NS3 Observation ad-hoc interview)

When the alarm went off, the participant reflected:

"the alarm went off and I wandered why I'd set the alarm, then I remembered. If I hadn't set the alarm I know I wouldn't have remembered." (NS3 Observation ad-hoc interview)

Another participant was observed to also anticipate the need to timely medication administration and was proactive in adapting to the trigger of prescribed medication outside of the drug round times by setting their alarm (NS4). It was observed that the mechanism was the same – to set the mobile phone alarm 15 minutes before the medication due time. The timing and type of medication varied (Parkinson's drug at 7pm for NS3, and intravenous antibiotic at 4pm for NS4), and by giving themselves some time to prepare the medication and disengage from their current activity meant that the specific and critical timing for these medications was met. The goal of meeting the time demands of these types of medications were met, and there was also a safety outcome to ensure effective medication treatment. For these participants these adaptive strategies were regular and long-lasting, in that they extended beyond just one shift:

Researcher: *"She said she always uses her alarm to remind her. She's so busy and she can't keep everything in her head.."*

Participant: *"....the medication is quite complicated and it has a strict process to prepare and administer, so I wanted to give myself time to be able to do that, so I gave him the drug at the right time. Its important for this drug because its and antibiotic ad it's a once a day dose."* (NS4 Observation ad-hoc interview)

The use of alarms was also observed for reminding participant NS4 to check blood glucose for a patient on an intravenous sliding scale of insulin (patient in bed 17), another time critical action which required titration of IV insulin and glucose. During ad hoc interview this participant was asked about the consequences of missing the alarm, and replied:

"I might forget to give the medication." (NS4 Observation ad-hoc interview)

Another safety-preserving, short-lasting adaptive strategy was made by this participant when responding to the result of the patient in the next bed's (bed 18) blood glucose check which was within normal limits. However, critical thinking caused her to alter the timing of giving the patient their lunchtime dose of sub-cutaneous insulin until she had seen how much lunch he had eaten, her rationale was expressed as she was thinking out loud:

"If he doesn't eat and I give him 6 units [of insulin] it might drop his blood glucose too low" (NS4 Observation)

Pre-emptive adaptive strategies are anticipatory in nature, performed by nurses using their experience and expertise. Anticipating is the first of four 'resilience potentials', identified by Hollnagel (Hollnagel, 2018b); and anticipatory responses are described by Anderson et al as well practiced and well recognised professional behaviours (Anderson et al., 2020).

Usually related to compensating for developing changes and sudden issues in work conditions, the strategies above suggest a more nuanced view of anticipation. When considered as embedded practice, regular in nature for the situations identified in the above data extracts, these pre-emptive, proactive strategies show how, at the level of the individual, anticipatory can also mean thinking ahead to address future needs.

For example in this next data extract, this participant (iNT7) described their pre-emptive strategy from learning how to manage a drug round during Covid-19. Changes to the everyday use of personal protective equipment (PPE) triggered alterations to practice during medication administration, necessitating changes in preparation and administration of medication. During interview questioning examining sources of variation and challenges (high level theme 3, appendix G), the researcher asked the following question:

"....so how did Covid and I suppose you mentioned PPE, how did that change the way you gave medications normally?"

The response from the interviewee (interview iNT7) explained:

"So you would prepare it all outside and take it in. I mean, now if I'm outside I'm looking at the patient kind of through the open door or at the end of their bed but they were behind a closed door, so you had to prepare everything and then kind of think oh, are they going to want their painkillers, are they going to want their laxatives, so put everything in kind of different pots and try and remember or you can write in the... We have waxed paper pots so you could write in the bottom what was in that pot, so painkillers, antihypertensives, whatever, before you went in, so you knew what was in the pot that you were giving them and you could say, well this is x, y and z"

Researcher: "So just tell me again the rationale for putting it in separate pots?"

“So because you couldn’t see the patient, if you’re stood at the end of the bed you could say, oh do you want any laxatives? No. Well I won’t get them out but because they’re the other side of a door and you’ve got to get dressed up, if you get them out in separate pots then if they didn’t want them once you’d taken them in, you had them so you didn’t have to come back out and then go back in again, so you were taking it all in and then what they didn’t want you would dispose of appropriately and not have to give them but know what they were before went in”

Researcher: “So what risk were you trying to minimise by doing that, or risks?”

“So contamination, obviously with the PPE keep coming in and out, so minimising your face to-face contact with the patient and yeah, time really, if you had it all there and not getting de-gowned and whatever and then dressed again to go back in again”

Researcher “Has that carried over, any of those practices carried over as something you do now at all or do you not do that?”

“No, not really” (Interview iNT7)

These pre-emptive actions on separating out the medications into separate pots, and labelling the pots where necessary, were specific adaptive strategies compensating for the necessary change in how medications were administered on the drug round during the pandemic, and the need for strict adherence to PPE to reduce the risk of cross-infection. Changes in the ‘how’ of how the process was done (Sanford et al., 2022b) described in the interview above, were long-lasting proactive adaptive strategies, responding to Covid-19, serving to mitigate current and future risk. These safety-preserving strategies were incorporated into regular practice to ensure a smoother, more efficient process outcome, and minimise a variety of risks. Risks included contamination of the drug trolley (from taking it into the patient’s side room), cross-contamination from patient to patient, safe identification of medications, and addressing patient need for certain ‘as needed’ medications such as laxatives or pain relief.

Once the threat of cross-infection was reduced, the external pressure, and local (individual patient, or ward level) triggers for PPE and adjustments to medication administration practice were observed to be used intermittently, on an as-needed basis. The nature of Covid-19 and other viral pandemics during data collection were incidents that arose quickly, and this researcher’s field observation was that responses at individual and ward level aligned with Hollnagel’s third resilience potential ‘responding’, ensuring ward functioning and performance was maintained (Hollnagel, 2018b). This researcher was immediately aware of ward-level changes in pandemic status and number of patients with Covid-19 when entering the wards, by looking at the nurses’ uniforms. Raspberry coloured scrubs signified bay or ward closure, the operational provision of scrubs being a system induced adaptation, a trust wide response to the external and internal pressures of the pandemic.

The unpredictable nature of organisational pressures and ward based, or individual triggers mean adaptations in behaviour and practice were necessary resilient responses to deliver quality and safe care (Anderson et al., 2020; Sujan et al., 2015a)

One participant expressed adaptations linked to change as the following:

“Just because, well, working in a hospital is, you know, is a constant change, every day is different, every patient is different, yeah, every situation is different so you’re just constantly going with change. So you can never say for definite, “oh, I’m going to do this at this time,” because you don’t know what’s going to happen.” (Interview iNS4)

This participant’s perception exemplifies how anticipatory strategies are not always effective, and advanced troubleshooting may not be successful because situational context changes over time.

For example, participant (NT2) had been unable to give their patient their medication at the 8am or lunchtime drug rounds due to being unable to aspirate stomach acid to check the correct placement of the NG tube. Non administration being a necessary safety procedure to ensure the tube was in the stomach and not the lung, (thereby preventing the risk of aspiration). After repositioning the patient:

“[I’m] hoping that the change of position will help” (Observation NT2)

and proactively checking for any aspirate (to assess pH) several times over the shift, by 16.45 they were finally able to assess the aspirate acidity to indicate correct tube placement.

“if I check it now then we could give some fluids and meds. He may pull it out so I’m going to prepare that by giving the Carbocysteine liquid now.” (Observation NT2)

The ad hoc interview confirmed that the participant wanted to capitalise on the moment as the patient had repeatedly pulled their NG tube out. By preparing the appropriate medicines and administering them an hour early for some 6pm medications, and late for the morning and lunchtime medications (8am and 12-2pm), the outcome was perceived by this researcher as an ‘as safe as was possible’ administration, despite the delay. The practices of patient position change and staggering several tests for stomach acid over the day, were reactive mechanisms to enhance tube placement (change of position) and checking pH, to ensure the patient was able to receive medication safely. Here, procedural compliance was adapted to produce an acceptable safety-preserving outcome.

The mechanisms of adaptive strategies outlined in this section varied, but the goal of each was to support safe, effective medication administration while compensating for patient wishes or needs, local triggers or external pressures.

6.4.5 Ready, steady.....

The early preparation stage of medication administration was a time when participants sought to protect themselves from being disturbed. To avoid distraction or interruptions, an array of strategies were shared during one interview.

“if I think that I’m way too disturbed, if I’m in the corridor giving the medication I would take myself into the treatment room, give the medicines from there, because I obviously have like a lot of stress, so I try to be away from all the noise and disturbance, so that I can have a track of what I’m doing, and so I’ll take the drug charts altogether in the treatment room, get the medicines out, it is a little bit of hard work walking up and down but that doesn’t matter because I’m making sure that everyone is getting their medicines on time, so like I’ll be, if I go to one with the drug chart, then I finish the drug chart using it, like administer it, I leave it on the trolley [doctors notes trolley], I won’t take it back into the treatment room, so that I can make sure that what I’m doing, like I have a track of what I’m doing.....that’s done, so I don’t have to bother about that one, so like that I’ll keep track”

Researcher: “so you’ve for a system going?”

“Yeah.....”

Researcher: “Do you tend to use that only when you’ve got more patients, or nights, or do you tend to sometimes do that when you’re doing a daytime drug round?”

“I usually don’t do that during the normal daytime, I get the drug trolley out, and go...or more patients, and if it is so confusing, like what I do”. (Interview iNS1)

This participant described their intermittent self-protective actions and additionally provided some contextual factors (noise or when on night duty where there is one less RN on duty, so nurses are allocation a team of 8-10 patients) that drove them to seek alternative practices to the day shift. These were preparing medication in the quiet treatment room and placing the completed drug chart post-administration on the doctor’s notes trolley. This served to keep track of which patient had had their medications, and avoiding confusion (Interview iNS1).

The adaptation strategies in this data extract align with Sanford et al’s findings showing that adaptations performed by hospital workers are most often performed as process changes (Sanford et al., 2022b)

6.4.6 ...Go Go Go! From preparation to administration

When observing participants actually starting their drug rounds or administering medication outside of the usual drug round times, there was a palpable sense of purpose and focus. Specific factors that triggered adaptive strategies were being short of staff (section 4.3.4) and lack of time (section 6.4.6.1).

6.4.6.1 Time constraints

'Time' as an underlying sub-text and was almost as common as 'more staff' when talking to participant about their challenges in medication administration. While understanding these triggers, particularly in the context of data collection during the Covid-19 and flu pandemics and strikes, these difficulties drove compensatory strategies.

Perceptions of lack of time and efficiency have influenced practice is many of the themes in this chapter. Time constraints were not always simply the pressures on participants to complete their tasks, often medication itself was time-consuming to prepare or administer, if the patient's condition required more time given safely administer medication. On interviewing a participant (iNT8) about these he identified several triggers for when patients may need more nursing time when administering medications due to the complexity of patient needs:

"So because of the pressure of time.... patients who are actually dysphagic [difficulty with swallowing]....because they are stroke patients, and secondly these are old people...now the time that they take, what you take for each patient may be 10 minutes, that's 40 minutes [for four of the allocated patients]. You can't hurry it....the patient can be very upset when you are rushing "don't rush me because I'm very slow in swallowing". So what do you do now with realities before you? But there's that time that you keep looking at the clock and saying "the time is going"...you can't really...and remember you don't leave the patient with the medication, they must swallow in your presence, you have to stand there and you are looking at the time. The time is not waiting for you, so those are the challenges we are facing" (Interview iNT8)

These timing pressures also co-existed with other triggers such as age, frailty, difficulty with swallowing, polypharmacy and dementia, with the result that:

"Definitely your medication round becomes too long." (Interview iNT8)

In these situations there are few options to save time, although it was observed that delegation of supporting the patient to take their medication to a healthcare assistant (HCA) (Observation NS11) was an effective strategy to save time. Another observed instance of delegation was rationalised by this participant:

"because [otherwise] I would have been in there for two hours" (Observation ad hoc interview NT7).

While delegation was an effective strategy with the outcome of freeing the participants to continue with their drug rounds, 'time' also meant the pressure of timely medication administration. Participants had strategies to deal with timeliness in differing circumstances; being on time, especially for time-sensitive and high risk medications such as for Parkinson's disease or IV (intravenous) antibiotics, or at busy times such as medication due around the handover period. Examples of adaptations under both these circumstances are noted in observation field notes:

'The night staff gave his IV antibiotics and a couple of his medications before handover at 7.30am... and he is also on a 4pm dose of amphotericin [antifungal]...she [participant] sets her alarm on her phone for this to remind her; as we are talking, she sets the alarm for 3.45pm and spontaneously says "so she can prepare" [the medication]' (Observation fieldnotes NS4).

This example highlights how multiple adaptive strategies from the individual or the team, for example administering medication slightly earlier than the prescribed time, collaborative teamworking, and setting alarms, are proactive anticipated strategies compensating for organisational pinch points and medication need outside the usual drug round. The participant's individual proactive strategy to address their propensity to forget:

"I can't keep everything in my head, the medication is quite complicated, and it has as a strict process to prepare and administer, so I wanted to give myself time to be able to do that, so I gave him the drug at the right time" (Observation ad-hoc interview NS4)

This also ensured they had time to prepare a more complicated medication. Being proactive is a resilience strategy, identified here as a response to contextual triggers. Giving themselves time to prepare the medication lengthened the process of preparation, setting an alarm was the mechanism for ensuring safe and timely administration outside the usual drug round time, and the addition of acknowledging the part human factors play in this participant's own practice ensured a safe outcome when responding to contextual complexity.

6.4.6.2 Multi-tasking in the time warp

As with other themes, time influences adaptive practice. In this theme participants react to time pressure by cutting corners to effectively reduce the time of their task, or by increasing the amount of activity in any given time as outlined during the interview below (iNT3). Outcomes from either of these strategies have potential to be positive or negative.

During the interview questions exploring the higher level theme of sources of variation and challenges, this participant was asked the question:

Researcher: "is there anything you do to make your drug round a bit quicker or you change it slightly so that you can accommodate those situations where you're challenged to do things in a different way?"

"Yeah. One thing that I do, especially with the NGs [nasogastric tubes] it takes a lot of time when you want to wait for it to dissolve, yeah, so one thing I do is I get my drugs ready, crush them, put them in the little bowls, add a bit of water to it, just push my [NG preparation] trolley to opposite side of the ward and then leave it there and then go ahead with the next patient. By the time I'm done with about five patients then come back to my first one, it would have been dissolved instead of just standing there then waiting. So that is how I get my work done quicker".

Researcher “So what’s driving that action, that decision to do that?”

“Because we are time bound and then I need to finish it and then get to the next patient. So instead of just standing there and then waiting for it, I’ll just push it far away because if the patient is someone that can walk about, so they don’t get access to the drugs.” (Interview iNT3)

This multi-tasking action served to squeeze work into a time slot that the participant perceived to be wasted time if it were not filled in by activity; another example of where demand exceeds capacity in a system (Sanford et al., 2022b).

The outcome was that while waiting for the medicines to dissolve, (so enabling them to be syringed into the naso-gastric tube (NGT), they could continue with the drug round to ensure timely administration to other patients and then return to this patient later. However, there was a potential risk to patient safety by leaving the dissolving medications close to the patient (and other patients in the bay) so if was possible for anyone to take them. The participant perceived they were mitigating this by moving the trolley on which the drugs were dissolving out of reach of the patient they were prescribed for.

Clarity was sought with this participant, exploring the outcome of their strategy:

Researcher: “So, what’s the reason why you’re putting it far away from them? Just so it’s out of their reach?”

“Yes”

Researcher: “And what would be the issue if they could reach it do you think?”

“If they could reach it they could take it because if a patient is confused they might just take it and then drink it, so it’s best if you take it far, far away.”

Researcher: “So, what’s far, far away?”

“Far, far away to the end, to the last bit of the room [Laughs]”

As the probing questions continue, a follow up question on risk and the impact on patient safety follows, and the participant then identified how delegation has done, or could reduce risk and not just time:

Researcher: “So what’s the ultimate risk?”

“I’m trying to reduce the risk of them having access to the tablet or whatever that I’m waiting for it to dissolve, or if I’m working with somebody, I let them stay behind, so if I’m working with a student nurse or anybody, overseas nurse, I’ll just let them stay behind and they’ll look over it. But most of them [patients] they can’t walk so we stick it far away from them”. (Interview iNT3)

During this interview, the outcomes of the participant’s intentional adaptive strategies were triggered by time and complexity around medication administration via NGT, and both proactive and reactive, short-term intermittent adaptive resilient strategies. Delegation in this interview example is another strategy for creating resilience, responding to pressures or triggers, discussed in themes 6.4.4, 6.4.6 and 6.4.7.

As with signing the drug chart prior to administration, pre-preparation of medication is a process with no or unclear guidelines in local and national policies. In both examples, guidelines do not say what *not* to do. Signing the drug chart is part of local and national guidelines with instructions to sign the drug chart at the time of administration; pre-preparation is not part of either guideline.

Anecdotally, this researcher was told that pre-preparation of multiple IVs at the same time was picked up on a recent audit as a safety concern. This particularly relates to IV antibiotics, some of which take up to 20 minutes to dissolve when the diluent is added. Intravenous preparation generally involved more preparatory stages as they require more process components (Westbrook et al., 2011). Pre-preparation adaptations varied. They occurred when a participant pre-prepared an IV antibiotic and left it on the sideboard before leaving the treatment room with the drug trolley on the 10pm drug round (NS10). There was already another IV drug prepared, on a tray and with the drug chart beneath it on the sideboard. At the time the participant verbalised:

“I just want to get the Tazocin going” (NS10 observation)

At the end of the drug round when questioned about this she stated:

“There wasn’t really any trigger for doing this I just knew that at some point I would have thought to set it up as it takes some time to dissolve. It just makes the drug round faster if I’ve made it up already.” (NS10 observation ad hoc interview)

Another participant was also observed doing the same thing on the midday drug round, when asked about the risk of pre-preparing antibiotics she stated:

“I usually put a label on it, or on the container and write the bed number. Here nurses know what this prepared drug is and they only touch what they have prepared. I didn’t really want to wait for the powder to dissolve.” (NS12 observation ad hoc interview)

Other pre-preparation practices were when participants prepared multiple patient’s IV medicines at the same time, (participant NS2) or prepared two consecutive doses for the same patient e.g. 12pm for both the 12pm dose and for the 6pm dose (NS5 observation). The complexity of this practice is exemplified in this data extract from researcher’s fieldnotes:

‘The nurse is in the treatment room with the three drug charts for the patients in her bay who required IV medications. She sets out the three drug charts on the countertop. There are four drug charts in total, two patients have one chart each and one patient has two drug charts. She opens the cupboard and selects the medication to be given and places that on top of the drug charts. She tells me “Before I start mixing them I’m just going to ring X back, he’s chasing beds”. There is another patient’s drug chart with IV medications on top, it has an orange post-it on the front, and my nurse pushes this drug chart with the medication on it further to the left hand side so it is out of the way.’ (Observation field notes for NS2)

Pre-preparation is a time-saving intermittent and proactive procedural adaptation triggered by the time needed for preparation. It serves to meet a productivity goal to ensure medication is ready to give to the patient at the prescribed time. However, this is potentially at the expense of safety, causing confusion, and potential mismatches between the pre-prepared medications, doses, and the patient they were being prepared for. Additional safety concerns focus on microbial contamination and reduction in potency (Soni & Mannari, 2025).

6.4.7 Disturbances in the status quo

Identifying disturbance as a trigger for resilient adaptive practice was an outcome of the systematic review (chapter 2). In this current study, participants were conscious of the likelihood of distractions and interruptions during medication administration, and during interviews participants were questioned on anything they found difficult about medication administration:

“being drawn away from the medication round, not being able to just purely concentrate on the medication round” (Interview iNT1).

The next data extract shows one participant’s perspective on how they promoted safety in their practice following disturbances:

“I wouldn’t stop halfway between the medication because if I then got called away and distracted then I’d forget where I got to, I could end up giving two doses of the medication or could completely misread the drug chart, it would, yeah, if I had to get called away I would discard the medication and then start completely again, I wouldn’t leave a pot of medication just sitting around in the trolley because again if another nurse needed to come and grab some medication they could move things and yeah, I would completely start again.” (iNS7 interview)

Not being able to focus on the drug round was a common barrier to safety. Other adaptive strategies were self-checking.

6.4.7.1 Self-checking

Strategies triggered by disturbances often revolved around self-checking:

“Just being really vigilant with checks I suppose, like when you do get to them [patient] if you’ve been distracted just double-checking the meds, double-checking the wristbands and everything and allergies, yeah. Just I always find if I’ve been distracted I think “oh I, you know, double double [sic] check.” (Interview iNS2)

Often, external factors such as pressures beyond the participant’s scope of influence came into play, causing safety concerns when administering medication. This participant identified several common process strategies resulting from the

organisational need to maintain patient throughput and flow from moving, admitting and discharging patients.

“....if we’re so pressured for making beds available and we’re in the middle of drug rounds and new patients are being admitted, there’s always a risk that patients are being moved about so obviously you need to keep checking identity because people, you know, could move by the time you’ve prepared the medications....and obviously if you’re under pressure and you’ve got lots of people like getting at you whilst you’re doing your medication there’s a chance you could potentially read the wrong drug and give the wrong medication or the wrong dose or give it at the wrong time. Yeah, there’s loads of different things that could impact... if you’re being pressured all the time.” (Interview iNS7)

6.4.7.2 Managing safety and risk

Participants identified other disturbances triggering interventions, for instance:

“So if it comes down to, you know, patients trying to climb out of bed or their need help with their eating and drinking or something, then you do have to, you know, generally stop to go and help them..... you kind of can’t really say no to certain things” (Interview iNS4).

In other situations, alternative strategies to engaging with the patient were to delegate:

“....and while you’re doing the drugs patients might ask you for a commode, or a telephone might come, and it is the, like most of the phone calls won’t come by eight o’clock, but then we do have phone calls asking like how the patient was overnight, so most of those times what we do is if I’ve, if we have a ward clerk we just pass the information rather than going to the phone and answering it, so kind of like, yeah, how their day and night was, just hand it over, and the ward clerk will answer it, so that that disturbance can be minimised, and our ward clerk is really helpful, she’ll say that, “Oh the nurse is on the drug round, she can’t answer you right away, but I can give you the information,” so she will come and ask us. Other than that [the] drug round runs smoothly [both laugh]” (Interview iNS1).

A striking feature of participant observation was how teamwork both within a patient allocation team (teams allocated before shift handover by previous nurse in charge), and as a ward team, served to address triggers such as short staffing. This has triggered the identified adaptive practices of cutting corners, explored in section 6.4.6. or strategies to increase the amount of activity in any given time, effectively creating more time, such as leaving medications to dissolve, explored in section 6.4.6.2, or as delegation to a ‘floating’ nurse, below in this section (NS11). The optimum staffing levels would allocate a senior nurse in charge and then 4 RN’s taking a bay of patients each. Field notes outline this ‘floating’ role:

‘The nurse in charge has another RN [registered nurse] going on the early shift, so the nurse in charge this morning can float and the other RN can be doing the CD [controlled drug] checks [with the other teams] and her patient drug round’ (Fieldnote observation NS11).

Often however, having a ‘floater’ was not the case, and in this example below, the shift co-ordinator floater was allocated a bay of patients, but due to other pressing issues which she prioritised, started her mid-day drug round later. The nursing associate had

gathered all the patient's drug charts together and handed them over to the RN, who placed them on the drug trolley but said "I'm going to do a couple of things first". Short staffing for the night shift and a patient discharge were the triggers for this decision:

"If I started the drugs I would have been thinking about staffing that I still need to do and be distracted, I needed to put it aside and get on with my drug round. Also it was tonight's shift which needed to be escalated...and if I had not started to sort the patient with the discharge problem I would have had even more interruptions during the drug round" (Observation and ad hoc interview NS2).

Her experience as a band 6 helped her adapt to the situation:

"I would normally pass things on...the things I can deal with I like to get on with them so I've not got too many things to think about at once during the drug round. It's a lot, it's all a bit of overload..... I delegate where I'm able to, and that helps reduce the mental brain power" (Observation and ad hoc interview NS2).

This unanticipated, short term adaptation had desirable organisational outcomes supporting wider operational resilience, and the 20 minute delay to the drug round which she had planned to start at 12 midday had no effect on the timeliness of medication administration as a whole.

Teamwork is part of organisational culture, and suboptimal teamwork is a contributory factor for patient safety (Lawton, McEachan, et al., 2012). When teams work well together optimisation of the drug round is a positive outcome for patients:

"And obviously our colleagues we're all, especially like our nurses we're all in the same situation doing medication rounds and the staff that I work with on the ward are really good at knowing like you're doing your medication round and they'll be like "oh I'll come and catch you afterwards" or "I'll write this down and leave it here for you later. And I'd say we've got quite a good team with regards to managing medication rounds and ensuring that we, you know, focus on them and we're not keep getting distracted" (Interview iNS7).

However, evidence does suggest that staffing levels do have an impact on the quality of patient care (Tamburello, 2023). When teams are under pressure this has been seen to be a risk for medication safety:

"So yeah, staffing is definitely I'd say a big risk" (iNS7)

Where staff shortages are known, in some cases anticipatory strategies can resolve the issue. For example, when shadowing participant (NT6) on a day shift, the night staff had escalated that the ward were going to be short of HCA's so even though no HCA's could be found, an extra RN was, so they were brought in to cover the morning shift (Observation fieldnotes NT6). When shadowing participant NT7 on a Friday morning, they worked with the nurse in charge to review staffing over the weekend, driven by the fact that there would be no senior nurse on call on Saturday. They found a staffing shortfall and discussed whether to put it out to agency or whether they could "shuffle with [ward next door] and borrow a nurse" (observation fieldnotes NT7) to cover the

shortfall. There are funding restraints and conditions to think about when asking for agency nurses, and they pre-empted the likely request from their manager to consider finding other ways to cover the ward.

Bringing together the triggers, adaptive strategies and characteristics of the strategies from some of the data extracts in this theme are illustrated in table 6.2 below. The presentation of data in this table has been further developed and extended with the addition of a description of the adaptive mechanism and observed, reported or inferred or outcomes across the data set in table 6.4 in section 6.5 of this chapter, showing characteristics of adaptive strategies and findings across the whole data set for this chapter.

xxi Table 6.2 Strategies, and Adaptation Description Related to ‘Disturbances in the status quo’ Theme

Trigger	Adaptive strategy example	Adaptation impact
Interruption (iNS7)	Discard medications for current patient, start again	Short-lasting, reactive
Distraction (iNS2)	self-check/double check reading drug chart, second check of patient’s identity	Short-lasting, reactive
Patient climbing out of bed (iNS4)	Leave drug round, engagement with patient	Short-lasting, reactive
Being in charge - phone calls (iNS1)	Delegation to ward clerk	Short-lasting, reactive or proactive
Being in charge – competing priorities (NS2)	Delay drug round while dealing with priorities	Short-lasting, reactive
Optimum staffing levels (NS11)	Allocate a ‘floater’ nurse	Short-lasting, reactive
Staff shortage (iNT2)	Cut corners by leaving medications with a patient and not observing them take them	Short-lasting, reactive

6.4.8 Teamwork makes the dream work

The final theme explores resilience at the level of the individual and team.

Communication and collaboration are interpreted in this PhD study as links between individual resilient strategies and safe, productive, ward and organisational functioning.

Communication is a core component of resilience, enabling teams to adapt and maintain safety under varying conditions (Hollnagel, 2013). Not simply about information transfer, Hollnagel et al 2015 highlight the merits of communication for sensemaking (Hollnagel et al., 2015). Collaboration helps teams work better through sharing their support, expertise and experience, leading to quality care, and is seen to be more than task sharing within teams to produce reliability and safety when under pressure (Hollnagel, 2013). Collaboration is a dynamic process and also a mechanism for resilience across systems levels to manage complexity (Hollnagel, 2013). In this PhD study the systems levels relate to the individual, ward and organisation.

6.4.8.1 Collaboration

These data extracts present participants' perceptions and perspectives, and observed examples from observations show how collaboration and teamwork during clinical practice can support individual, ward and organisational resilience.

"... teamwork, I think the things that make it easier is having helpful colleagues that help you out" (Interview iNS2)

"Obviously a lot of peer support from those around you, like other nurses that are a lot more experienced than I am, as well as doctors, pharmacists when they come on the ward, I'd ask them if there's any queries." (Interview iNS7)

The perspectives in the above data extracts show how teamwork and peer support (aspects of collaboration) contribute to facilitating everyday clinical work. Examples of behaviours in the data extracts below demonstrate the small actions that support teamwork within the ward team:

"There's a note in the drug trolley from a nurse who has previous previously used it and it says 'have a lovely day'." (Observation NS2)

"She washes her hands and checks in with the healthcare assistant 'are you alright?'" (Observation NS3)

"She gets bed five's charts and then goes through the drug chart. She checks with a different healthcare assistant if she's alright." (Observation NT11)

"My nurse has the red trolley for team one, but this is the trolley for another nurse. He approaches and says 'you've got my trolley'; they laugh and swap trolleys, she says 'I filled it up for you!'" (Observation NT11)

"My nurse was late for work this morning she should have been here at 7:30 and did not get here till 10 due to an undisclosed event. Another one of her colleagues had performed the 8:00 AM drug round for her and it had been completed by the time she came into work." (NS12 Observation fieldnotes)

Collaboration also extended to healthcare professionals who are not part of the ward team, as seen in the following data extracts:

“A member of the discharge team is on the ward and approaches my nurse and asks “are you alright, is there anything I can do for you? My nurse just updates them on the staffing and the three discharges. This person and the doctor both say together that he is being very calm and he's doing very well today, they say it could have been a lot worse and that he looks like a swan on the outside, very calm, perhaps on the inside working very hard batting his feet.” (Observation NS7)

“She returns to the drug chart and says “right, folic acid” when doctor approaches her and says thank you for your help. My nurse says thank you for yours. She also tells another doctor “That’s exactly how I’d do it.” (Observation NS7)

“Night Outreach sister interrupts to check on the poorly patient, says they are OK and offers that my nurse can call her if she needs anything.” (NS9 Observation)

Collaboration was observed to be a short-lasting or long-lasting and regular occurrence, interpreted as evidence of individual, ward and organisational operational resilience. Findings from this study data are consistent with findings from a systematic review identifying four aspects of collaboration (professional, social, physical and task-related) that help bridge communication gaps (Schot et al., 2020).

6.4.8.2 Communication

Aspects of communication in this study were either written or verbal. Written communication was in the sense of written reminders for oneself or others. For instance, the use of post-it notes was observed as communication with others, or with oneself.

In this observed instance the participant used sticky post-it notes to communicate with the doctors on the 9am ward round:

“She picks up a yellow post it note from the top of the drug trolley and writes the date and then “please rewrite insulin thank you.” (Observation NT6)

This was a reactive response to the trigger of the written prescription not being clear, with the aim to enhance safety by ensuring the dose was easily recognisable to avoid misreading and error.

During a semi-structured interview a participant (self-styled as ‘a yellow post-it man’) used post-it notes as a mechanism for both a reactive and a proactive strategy. Both being short-term in that they lasted less than the length of the shift; and both having the intention and potential to preserve safety:

“I’m a bit of a yellow post-it man, so I tend to just literally put a post-it on the front of the drug chart and that includes, so it’s not just the IVs, so if I want stuff rewritten, if I think there’s a medication that needs to be reviewed, if there’s something I can’t read and then also I put my reminders there as well, so that’s what I tend to do.” (iNS5 Interview)

The post-it note acted as a visual prompt to themselves to not forget the IV's which were often scheduled outside of the usual drug round times, a proactive short-term strategy for remembering medication priorities. The use of the post-it notes also acted as a request to the doctor to review a medication on the ward round, and as a reminder to the participant to list essential actions for organising their patient care after the drug round was complete. This was a mechanism for a personal regroup to re-orient themselves post drug round. The regular use of the use of post-it notes as a proactive (anticipatory) short-lasting strategy during and after the drug round to remember medication priorities, with the intention of preserving safety.

Documentation is a key part of communication, linking information sharing to the need to adapt plans or respond to unexpected changes, key requirements of resilience.

"...once I'm done with this patient I don't have to remember the things that I've done with them [after writing notes], because sometimes you wouldn't remember everything, and I had so many things in my mind already that I don't want to overload myself with this information, that I could have unloaded, so that I have more space for my next patient, to for the things that I need to remember. So if I've written it, if I read in my notes, for that particular patient, after doing my drug rounds, ...I check everything.....so I know that okay this patient is alright for a minute, I don't have to think about them, I can focus on my other patient that needs support. Because at the end of the day, because you'll never know what would happen, so if there would be an emergency or it's became busy, for that day, for that particular day then you tend to forget, oh what did I do this morning about that patient. And then or worse case you forget to completely write on those patients. So that wasn't good, because there wasn't any documentation done." (Interview iNT5)

During a semi-structured interview this ward manager's perspective on the importance of teamwork and communication as a means of information sharing and seeking was shared:

"There are times where they [nurses on the ward] will come to me and say, 'oh I've got to go and give a betablocker and their heart rate is this or their blood pressure is this, would you do it?' and obviously then I can draw on my experience and say, yeah, I would, and this is why. But yeah, so I think it's a bit of two-way, I think for me it's about creating that psychological safety and actually, I think it's really important for me as the manager to lead the way and go, guys, I haven't got a clue, how would you give this or what's the last time you did because I think hopefully that sets the tone for people feeling able to ask questions and not be afraid of that." (iNS5 Interview)

This attitude is interpreted as an example of collective collaboration and teamworking, as well as an established long-term safety culture on the ward.

The impact of good communication with patients around medication administration is important to patient understanding of their medication regimen and why their medicines are important. Yet this also has a part of information seeking to assess patient progress with their medication treatment and to consider the effectiveness of the medications treatment. The drug round acts as an information gathering mechanism:

“Definitely making things easier by talking to your patients, like knowing, you know, you can find out a lot from talking to the patient, especially with medication.” (Interview iNS7)

“So that they do get the medication and, not only that, while they're taking the medication you can check that they're, do their observations and, just to check what they're like, really. You can see, you can tell a difference between patients, if you've been nursing them each shift, if there's a difference in the swallow, if they're more confused or anything like that, you normally can tell when you're giving that medication round and you're actually looking at your patient, see the colour of them and erm..., yeah, just signs and symptoms of any changes in the way they are.” (Interview iNT1)

Assessing the patient on the drug round, looking for whether their condition triggers an adaptation in medication administration, such as the need to change the tablet form to a liquid form, or decide not to give the medication at all for a patient with difficulty in swallowing, are fundamental aspects of safety-preserving nursing care. This is an example where risk assessment itself can be seen as a proactive anticipatory practice, a mechanism of resilience, where assessment and monitoring, and any adaptation such as changing the medication to a form that is easier to swallow, are ‘responses to triggers and the need to manage risk’ (Sujan, 2019).

Communication and collaboration are resilient mechanism to preserve safety in medication administration. Here they are interpreted as links between individual short- or long-term reactive and proactive strategies and safe, productive, ward and organisational functioning. These findings are consistent with systematic review findings showing how professional, social, physical and task-related aspects of collaboration serve to bridge communication gaps (Schot et al., 2020).

6.5 Findings across the data set

Threats to safety are triggers for resilient adaptive practices, the impact of these practices are analysed within the eight themes (6.4.1 to 6.4.8). Key findings are now drawn together across the data set to address the PhD study aim and objectives (table 1.2).

The table below (table 6.3) provides an overview to summarise resilience in medication administration. Data was organised by theme, identification of the pressure or trigger, the resilient adaptive strategy and a description of the mechanism, and finally the observed, reported, or inferred safety-relevant outcomes. This offers a broad overview of how resilience in nursing medication administration is created and maintained, leading into the following discussion section (6.6).

Outcomes defined as “States or conditions resulting from the work process” (Holden, Carayon, et al., 2013) were found to be characteristics of risk reduction to preserve safety or characteristics of addressing pressures or triggers. A process of iteration

characterised outcomes representing the area the outcome had the most impact (see table 6.3 below). In this study, outcomes were found to be:

- Deliberate safety preserving outcome
- Deliberate quality serving outcome
- Deliberate goal-serving outcome related to timeliness
- Deliberate system induced adaptation, both goal (time) and safety-preserving

Table 6.3 Overview of Resilience in Nursing Medication Administration Practice

Theme # /participant	Trigger or pressure	Resilient adaptive strategy example	Adaptation mechanism and description (grouped together)	Safety outcome observed, participant reported, or inferred
1. I am a problem solver (iNS7, iNT6)	Workload pressures	Prioritise the drug round	Planning ahead (proactive) often used (regular) strategies from anticipating pressures (anticipatory), which have been embedded in the individuals' practice over time (long-lasting).	Deliberate safety preserving outcome
2. The person inside the patient (NT1)	Patient preference	Alter the order of the drug round for allocated patients	This regular (anticipatory) strategy used across multiple drug rounds (regular, long-lasting) for one patient to support this patient's preference (proactive), by changing the patient order of the drug round.	Deliberate quality serving outcome
3. Finding what I need (iNS6)	Unavailability of medication	Bundling tasks to find multiple medications	The participant reacted (proactively) to combine tasks for finding multiple medications not available in the drug trolley, in a (short- lasting, intermittent) response to an (un-anticipated) situation.	Deliberate goal- serving outcome related to timeliness
4. Pre-emptive actions (iNT7)	PPE on a drug round as a	Placing each prescribed	By wearing required PPE and preparing medication outside the side room (proactive, anticipatory) during medication preparation	Deliberate system induced

	response to Covid-19	medication in separate medicine pots	and administration (long-lasting, intermittent), and putting each medication in a separate paper container, medication could be easily identified for patient and nurse, so any medication not required could be easily removed (reactive).	adaptation, both goal (time) and safety-preserving
5. Ready, steady.....(iNS1)	Noise, disturbances, time pressure	Performing the drug round from the treatment room	Regular anticipated (short-lasting) decisions made immediately before drug round preparation, reacting to ward and drug round timing conditions (noise, day or night duty) about whether to locate the drug trolley in the treatment room or take it outside into patient bays or corridor.	Deliberate system induced adaptation, both goal (time) and safety-preserving
6. Go Go Go! (iNT3)	Time constraints	Leaving prepared medication to dissolve and continuing with drug round	An anticipated regular, short-lasting practice of proactive separation of the preparation and administration tasks. The strategy is reactive to drug round time pressure and the time it takes to dissolve medication.	Deliberate system induced adaptation, goal (time)
7. Responding to disturbances in the status quo (iNS2)	Disturbances	Double-checking two of the 5R's.	Despite prior checks, a series of (intermittent) reactive, in-the-moment (short-lasting) extra checks, that the right medications for the right patient have been selected in response to disturbances.	Deliberate safety preserving outcome and Deliberate

				system induced adaptation
8. Communication & collaboration (iNS5)	Communication gaps	Written communication using post-it notes	The regular use of the use of post-it notes as a proactive (anticipatory) or reactive (unanticipatory) short-lasting strategies during and after the drug round to note future requests or reviews for doctors, and reminders for self of future medication priorities.	Deliberate safety preserving outcome

6.6 Discussion

In this illustrative treatment of the data, engaging with existing literature and conceptual frameworks has made sense of the data in each theme. Interpretation of data in RTA is about making meaning and not simply reporting it (Braun & Clarke, 2022). Learning from the systematic review in chapter 2 (Kellett et al., 2024) influenced theming and interpretation of empirical findings in this current chapter.

Study limitations for this chapter relate to methodological approaches and data analysis so it was thought appropriate by this researcher to discuss these at the start of the chapter in the sections on conceptual clarity (6.2) and analytic steps (6.3). A limitation in method in this chapter in particular was in the selection of data extracts that best represented the themed findings. Final defining of the theme labels was performed in stage 5 of the RTA approach, following two previous stages of initial theme construction, and theme review (Braun & Clarke, 2022). Defining and naming themes clarified the analytic story arc, but selected interview data more often summarised and concisely told the story of how each theme contributed to the identified study objectives in this chapter's focus on adaptation. Although this was not intentional it was simply a product of examining all the coded data in each theme to find the optimum extract that best represented observed and described practice. Transparency is key to positionality in data analysis, and on reflection this researcher felt that the selection of participant's data could have resulted from the need to validate observed practice by triangulating it with explorative interview data which could not always happen during short ad hoc interviews. However, observed practice has been fully integrated in this chapter using data from fieldnotes and linking participants to themes and subthemes.

Adaptation drives resilience (Aghaei et al., 2025). This researcher has made meaning from resilient strategies within an analytic story arc that explores triggers, pressures and associated adaptive strategies with connected outcomes, contributing to the PhD study aim (table 1.2).

Adaptations in this chapter have been found to be driven by a variety of triggers and pressures at individual, team and organisation level. In this study systems levels from the SEIPS 2.0 model (Holden, Carayon, et al., 2013) have been challenged and conceptually organised differently where systems exist at individual, ward and organisation levels which successfully reflects this PhD study focus and context. Communication and collaboration as mechanisms of resilience (section 6.4.8) were found to be a key link between these three systems levels, actively linking safe nursing medication administration to ward and organisational resilience by crossing

communication gaps (Schot et al., 2020). Teamwork is part of the organisational culture, suboptimal teamwork is a contributory factor for patient safety (Lawton, McEachan, et al., 2012), and when teams work well together optimisation of medication administration is a positive outcome for patients.

Deliberate adaptations from the normative model in this study are found to be driven by context. Firstly, they are often simply interpretations of WAP guidelines which do not describe expected practice at the granular level of WAD; or secondly, adaptations show how nurses meet their WAP requirements when there are no precise actions or requirements identified. Thirdly, other factors driving adaptation are triggered by nurses seeking to address an array of issues such as balancing risks, interruptions, time pressure, workload or organisational pressures such as bed occupancy exceeding demand. These systems issues are triggers or pressures for nurse resilient adaptive strategies, with the intention to create or maintain safety before, during or after medication administration. This confirms existing understanding that resilience is a two-way process where individuals also influence the rest of the work system through controlling and adapting their everyday practice (Carayon, Wetterneck, et al., 2014).

The SEIPS 2.0 model characterises adaptative strategies as short- or long-lasting, anticipated or unanticipated, and regular or intermittent (Holden, Carayon, et al., 2013). Findings from this study suggest regular adaptations are embedded in the system, anticipating expected challenges. Intermittent organisational strategies reflect acute pressures at system level, and at individual or team level are interpreted as lasting only the length of one shift. Intermittent strategies were found to echo work from Sanford et al., where demand exceeds capacity at any system level (Sanford et al., 2022a).

This PhD researcher has introduced an additional element when characterising adaptive strategies as either reactive or proactive which are not classifications distinguished in SEIPS 2.0 (Holden, Carayon, et al., 2013). These are however used to describe outcomes from other relevant studies, including two systematic reviews where reactive or proactive strategies are identified as key dimensions of resilience in healthcare (Agostini et al., 2023; Ignatowicz et al., 2023). Findings in this chapter confirm the use of this classifications in studies where proactive strategies aim to prevent harm before it occurs by identifying or mitigating safety risks, and reactive strategies are resilient responses. Adaptive responses to triggers are found in this chapter to be usually short-lasting, so if the trigger re-occurred the adaptative strategy would need to be repeated, or a new mechanism applied, depending on the individual and local conditions. This is supported by recent studies showing adaptive strategies are frequently temporary and reactive (Biddle et al., 2020; Copeland et al., 2023; Page et al., 2023).

Adaptive strategies in this current study occasionally had capacity or potential to increase risk and challenge reliability and safety. These are defined as active failures in seminal safety literature (Lawton, McEachan, et al., 2012; Reason, 2008). However, in this study intention was not perceived or inferred to cause harm, rather to respond to latent failures. For this reason, 'active failures' are interpreted here as risky practices deviating from normative models of policies and guidelines, the participant's normal practice, or systems induced adaptive strategies rather than 'deviant practices'.

The SEIPS 2.0 model (Holden, Carayon, et al., 2013) shows how the work system and the external environment drive adaptive processes which can have different outcomes at each system level. Berg and Asse found empirical evidence suggesting descriptions of good organisational outcomes from resilience at department (ward) level is not always accurate and does not always result in organisational resilience, although the adaptations work locally (Berg & Aase, 2019). This has potential for exploration in future research.

In this PhD study, triggers and adaptations were intrinsically connected and linked to outcomes resulting from adaptive strategies. Outcomes are the end result of adaptive strategies explored throughout the eight themes in this chapter. Suggesting or identifying outcomes is less common in the empirical safety literature, perhaps due to the difficulty in assessing outcomes. This difficulty is acknowledged by this researcher with the result that outcomes are presented as either observed, reported (in ad hoc interview or semi structured interview), or inferred.

Outcomes for the array of adaptive strategies explored throughout the eight chapter themes were interpreted using Holden et al's definition, "*states or conditions resulting from the work process*" (Holden, Carayon, et al., 2013) (see Glossary chapter 1 table 1.1). This definition was contextually appropriate for both the systematic review in chapter 2 and this chapter's findings summarised in table 6.3, where the array of outcomes are interpreted as safety preserving or quality serving (Wiig et al., 2020), goal-serving (Holden, Rivera-Rodriguez, et al., 2013), or contributing to wider organisation safety (Wiig et al., 2020).

Outcomes were not always immediately obvious due to the limited timescale of data collection methods. The observation periods were limited to five hours, and the length of the semi-structured interviews lasted up to one hour. So observed, stated or inferred outcomes in this PhD study are conceptualised as when the trigger or pressure has been addressed, usually resulting in a reduction of risk contributing to safety or organisational resilience.

Findings and discussion on this chapter continue the analytic story arc which is taken up in the following synthesis chapter 7. Implications for practice are outlined in table 6.4 below. Limitations and implications for practice across the findings chapters are synthesised in chapters 7 and 8. This chapter's conclusion now follows.

Table 6.4 Implications for Practice

	Implications for practice: Findings: adaptive strategies chapter 6.
●	Evidence of opportunities taken to create safety in medication administration can be used to discuss and develop ward and organisational safety culture
●	The association between creating safety and accident prevention can be shared and safety practices can be targeted to strengthen individual (staff and patient), and ward level resilience
●	The evidence provided offers an opportunity to re-frame, understand or alter practices at organisation, ward or individual level to support system resilience

6.7 Conclusion

Findings from this chapter continue the analytic story arc and contribute to meeting the PhD study aims and objectives (Table 1.2) by exploring adaptations in WAD, the scenarios under which this occurs and the consequence of such strategies (objective 3); and exploring drivers for adaptive practice and participant perceptions of risk and resilience (objective 4) through observation and interview.

Latent analysis involving understanding the context and data interpretation, showed the conceptualisation of resilience as individual or team adaptive strategies, responding to complexity, change and risk throughout the eight themes.

Findings identified a process of intended adaptive intermittent or regular, reactive or proactive, short-or long-term strategies comparable with SEIPS 2.0 model (Holden, Carayon, et al., 2013). The addition of describing adaptive practices as either anticipated or unanticipated adds another element to understanding complexity when interpreting resilient adaptive practice to support safety in medication administration.

Participants sought to address an array of local triggers or pressures from local or wider contextual factors which influenced an array of individual and team adaptive strategies. The outcomes from these strategies are mostly found to result in patient safety or to support wider organisational system resilience.

In the following chapter, findings from chapters 4, 5 and 6 are synthesised using contemporary reliability and resilience conceptual frameworks and theory to explore variations and adaptations as error recovery safety nets to create and maintain safety in nursing medication administration.

Chapter 7

Discussion: research findings in the context of previous work, and study strengths & limitations

7.1 Introduction

The aim of this PhD study was to explore how resilience is created and maintained in nursing medication administration practice in the hospital inpatient setting. In this synthesis of findings chapter, the analytic story arc progresses from data analysis in the previous four findings chapters (2,4,5,6), each chapter identifying and focussing on one or more of the four study objectives.

In this chapter a broad lens is used, interpreting and synthesising findings to meet the overall PhD study aim and the four objectives (table 1.2).

Findings from this study provide cues to embed interpretation and synthesis within existing patient safety knowledge and the theoretical constructs of resilience. The outcome of this is to contribute to existing safety science and resilience theory.

In section 7.2 conceptualisation and the analysis of safety and resilience are evaluated. Section 7.3 synthesises systems functioning at macro, meso and micro levels, and section 7.4 integrates and summarises study data providing a visual roadmap of resilience in medication administration. A discussion on the strengths and limitations of this research in section 7.5 complete this chapter.

The provision of a context specific resilience model to conclude the overall analytic story arc in figure 7.1 below, meets the requirement of the study aim by explaining how resilience is created and maintained in medication administration. The addition of a second model (7.2), designed as a framework of necessary factors for building resilience in medication administration practice summarises this study's findings from across the data sets. Both models share innovative additions to the development of safety theory and understanding and support future recommendations for practice in the field of medication administration.

Analysis in this chapter is inferential and conceptual from findings drawn from all data sets and referenced from evidence in this thesis.

7.2 Conceptualisation and synthesis of safety and resilience

7.2.1 Framing safety

Variations, and adaptations as part of resilient outcomes are significant components of the findings chapters, and the impact of the wider context was found to be key to trigger driving these practices.

The systematic review (chapter 2) was essential for describing context specific findings relating to the individual, the ward or the organisation. These systems levels were altered from the SEIPS 2.0 model (Holden, Carayon, et al., 2013) which provided a socio-technical framework which researchers were encouraged to adjust to their study or organisation's needs (Holden & Carayon, 2021).

Later analysis of this study's empirical data in chapter 6 found a distinction between triggers (Kellett et al., 2024) and pressures (Page et al., 2023) that influenced medication administration practice with the objectives to preserve patient safety or support organisational resilience.

The impact of resilient responses to pressures and triggers were identified as part of iterative development of this researcher's understanding. In chapter 6 (table 6.2) the length of how long adaptive strategies lasted were highlighted in theme 6.4.7 ('disturbances in the status quo'), showing adaptive strategies were largely reactive and short-lasting.

During an examination of findings across the data set in chapter 6, impact was extended to include actual or potential outcomes. Further refinement by this researcher during analysis identified four types of outcomes represented by the area the outcome had the most impact (table 6.3), all of which were characteristics of risk reduction to preserve safety, or characteristics of addressing pressures or triggers.

This connection built on approach to outcomes has developed Holden et al's definition (Holden, Carayon, et al., 2013) by adding discrete outcomes for specific use in medication administration in future research.

Due to the complexity and context-specific nature of variations and adaptations there was a need to be clear how these concepts were framed within resilience. Ensuring concept analysis and defining key terms were necessary areas for this explorative interpretive study the result of which has potential to make meaningful contributions to future research and developing organisation safety culture.

Providing an explanation for variations in medication administration met Reason et al's need for distinguishing between error terms (Reason et al., 1990). However, a potential weakness in this study was not fully adhering to existing error terminology based on

Reason's foundational work. In analysing data in this study, the full concept of safety II (Hollnagel, 2018a) influenced the language used by being more neutral. Further exploration of this novel approach by this researcher could support any future development in this area.

Within a reliability focussed safety I approach, there are relatively clear boundaries between theoretical error typologies based on Reason's work (Reason, 2008). However, once context, pressures and triggers, responses, impact and outcomes were analysed, the application of error and safety nomenclature used to explore the resilience practices of WAD appeared to mis-align with contemporary views on adaptation, resulting in an attempt to push existing concepts further by developing an alternative view of key concepts and their relatedness, shared in chapter 5 (figure 5.1).

As the safety I approach has been found to focus on unreliable human practice with a blame culture for deviations in practice (Lyons et al., 2018), the current language around patient safety could be seen as pejorative and outdated, especially as adaptive practice is now seen as a significant player in system safety from a safety II perspective (Bartman et al., 2021).

Therefore, renaming and viewing deviations or violations that do not contribute to harm or a safety concern, and instead referring to these as variations or adaptations in the context of medication administration, appeared timely.

When safety is not achieved, the blame is often on the human players (Lyons et al., 2018) where terminology is interpreted by this researcher as becoming pejorative once individuals are the focus, and context is less considered. Not acknowledging contextual features has been more recently acknowledged as significant to safety, where latent conditions are identified as 'accidents waiting to happen' and failures in patient care process (Higham & Vincent, 2021; Lawton, Carruthers, et al., 2012).

Within this study of nursing medication administration, latent conditions have become evident through their impact on individual and team practices that could contribute to error or safety (chapters 4, 5 and 6). Understanding this is therefore a necessary part of building a robust safety culture. A safety culture with outcomes supporting patient safety is impacted by variables within systems levels (Abdelaliem & Alsenany, 2022; Hollnagel, 2013; Lee, 2019). This reflects the development of the concept of safety culture from the seminal works of Leape and Berwick (Leape & Berwick, 2005) and Vincent et al. (Vincent et al., 2000), referencing shared attitudes and assumptions as integral to an individual's perceptions and consequent actions which reflect the safety culture and underly the outcomes of organisational safety (Parker, 2009).

7.2.2 Where are we with safety culture?

Although data segments in chapter 6 suggest an effective safety culture sitting at 'proactive' and 'generative' levels of the organisational safety culture when mapped against the Manchester Patient Safety Framework (MaPSaF) (Parker, 2009), it cannot be used to appraise this study trust's current position in developing a truly generative safety culture to manage risk. This is because using the MaPSaF is an organisation focussed workshop activity for teams to assess safety culture and identify potential improvements, is not part of this study's scope. However, recommendations from this study (chapter 8) would suggest this framework is a useful tool for both understanding and exploring further development towards a mature safety culture within organisations.

Best practice, enforced through standardisation of processes introduced in policies and guidelines (Parker, 2009), is synonymous with Smith's institutional ruling, where best practice is defined as expected practice (Smith, 2006). This PhD study's four normative models largely prescribed practice, a necessity for safety guidelines that manage risk, and for the NMC to provide clarity for nurses and reassurance to the public. However, the chosen normative models do not factor context as a trigger or pressure for changes in practice behaviours which is a limitation of the normative models which rule practice. Yet a finding of this study was that nurses did not express feeling forced or ruled to use guidelines, they merely saw them as a necessary part of safe practice, even though sometimes their participants practice contradicted this through decision making adaptations largely reflecting external pressures (chapters 5 and 6).

Adhering to medication administration guidelines and protocols (WAP), aims to keep medication administration safe. This safety I approach to mitigating errors serves to reduce or stop things going wrong by reducing variability so the individual becomes less hazardous to a safe system (Hollnagel et al., 2015). While everyday WAD usually exists within the boundaries of WAP, interpretation of this study's findings suggest that variations reflect nurses' unintentional practices (chapter 5) as they simply interact with the work environment and are not intended or meant to cause harm.

Acknowledging the difference between intentional and unintentional practice was the cornerstone to development of the key concepts and relatedness model by this researcher (chapter 5 figure 5.1). The conceptual terminology for adaptations (discussed in chapter 6) were separated from variations due to the intention of adapting practice and were labelled as deliberate adaptations from the normative model, while intentional deliberate risky deviations formed the fourth description for changes from the normative model in practice. In chapter 6, the utilisation of the term normative was broadened to encompass the participant's normal practice as well as WAP guidelines and policy.

7.2.3 Work as Planned (WAP) versus Work as Done (WAD)

Studies examining variations in practice suggest either that nurses are a source of resilience when varying practice during medication administration (Lyons et al., 2018), or a source of medication error when deviations occur (Blignaut et al., 2017). Whereas this study, by acknowledging the impact of both, sees a largely positive impact on safety from varying or adaptive practices, highlighting practice that works well to preserve safety (Bartman et al., 2021; Iflaifel et al., 2020; Wiig et al., 2020).

When exploring observed variations in this current PhD study (chapter 5), relationships between guidelines and how participants varied their practice within and outside the boundaries of normative models were correlated; and some inferences were drawn. These helped to develop understanding of the disconnect between WAP and WAD, analysed in the discussion section of chapter 5. Inferences were also drawn when further exploration of adaptive strategies revealed insights into associations showing examples of outcomes of resilient practice (chapter 6).

The disconnect between the normative models and everyday work is said to result from three factors: work conditions not allowing for the set procedures to be carried out, competing priorities, and human variation (Ashour et al., 2021). Findings from this PhD study correlate with Ashour et al's three factors, supporting existing study findings where set procedures were found to be limited in places by unclear or non-specific guidelines (chapter 5 findings), competing priorities (chapter 6 findings), and human variation (findings from both chapter 5 and 6).

From systematic review findings (Kellett et al., 2024) (chapter 2) the term *workaround* was interpreted as an adaptive strategy, a way to work with tensions either arising from unworkable policies and guidelines (chapter 5) or adaptive strategies resulting from working in a complex, changing system (chapter 6) so 'workaround' became a redundant term.

Unintentional variations offer no threat to safety, but when intentional they become either adaptations or risky variations. The latter are seen as 'deviations' or 'violations' in the safety literature and there is potential for these to carry considerable risks and safety burdens (Lawton, McEachan, et al., 2012; Reason, 2008). How and why this transition from safe variations to unsafe or risky practices is interpreted in this PhD study uses two theoretical explanations: normalisation of deviance and migration to boundaries.

7.2.4 The grey area of normalised deviance

Normalisation of deviance is seen as opposing high reliability in safety (Wright et al., 2021) where over time, safe standards of practice are reduced over time and become

the new normal if no safety relevant events arise. Yet variations and adaptations also stand out as positive attributes to build safety (Amalberti et al., 2006) (Iflaifel et al., 2020).

To explore these, two conceptual models (Amalberti et al., 2006; Rasmussen, 1997) have been used for exploring how variations or adaptations during WAD migrate to the boundaries of safety. There are three phases in the process of this migration (Amalberti et al., 2006).

The first phase, 'initial safe space of action' (defined by professional standards) is exemplified in this study by following trust medicines policy when reliably administering medication (chapter 5 participant iNS1), similar to Lawton et al's description as 'safety behaviour' in the YCFF (Lawton, McEachan, et al., 2012).

The second phase, 'borderline tolerated conditions of use' (where individual variation acknowledges risk acceptance) is exemplified when the drug trolley is locked but the keys are stored in an accessible unlocked drawer of the drug trolley (chapter 5 participants NS10 and NS11). This second phase was seen in this study's context as a grey area, where intentional variations and adaptations could overlap. In another example from chapter 5 (participants NS11, NS7, NS5, NS6) the potential risk of a patient or other person taking medication from an unlocked trolley is accepted, the practice migrates to the boundaries and the most productive path is followed, normalising behaviour for both the individual and the team.

The impact of 'time' is fundamental to the third normalisation of deviance phase, named group desensitisation of risk. An example from this study is the risky variations observed by two nurses not following trust policy for a two-nurse check of patient identity when administering controlled drugs (high risk) medications (participants NS3 and NS11, explored in both chapter 5 and 6). The desensitisation to risk which occurs as part of acceptance [of not performing this two-nurse check] over time, and lack of negative consequences from error, drives 'violations' and 'recklessness' (Amalberti et al., 2006); interpreted in this PhD study as deliberate risky deviations from the normative model in chapter 5 (figure 5.1).

In this study, 'groupthink' (DiPierro et al., 2022) also helped provide some rationale for the 'borderline tolerated' and 'group desensitisation of risk' phases of migration to the boundaries (Amalberti 2006) with risky variations. However, in observed examples of migration to the boundaries in this PhD study there was a tension between protocol and productivity, mirrored in findings from a systematic review exploring normalisation of deviance in high-risk industries including healthcare (Sedlar et al., 2023). Observed outcomes of this tension were near misses and an error, interpreted in this PhD study as deliberate risky deviations from the normative model. Suggestions for handling

migrations resulting from outcomes of this study are discussed as recommendations for practice in chapter 8.

Despite the claim that there is room for clinical judgement in healthcare protocols (Amalberti et al., 2006), room for flexibility in this study could not fully confirm this. Flexibility was found to be restricted by the professional standards of the Code (NMC, 2018) and local guidelines which expect nurses to practice within the stated limits of policy with no expectations of flexibility outlined. Facing the realities of WAD built tensions for nurse participants in this study between the ruling of WAP and maintaining drug round and system resilience during WAD. This study's interpretation of policy ruling found that participants had no issues with varying or adapting their practice despite using their skills or clinical judgment only being part of one of the four normative models used (Royal Pharmaceutical Society & Royal College of Nursing, 2019). When utilising adaptive strategies to compensate for an array of wider contextual pressures the intent was to create or preserve safety at patient level, or more widely to contribute to systems resilience, a finding similar to Vos et al's study (Vos et al., 2020).

This researcher suggests that by acknowledging capacity for working within the limits of personal competence, the ruling of institutional texts (Smith, 2006) is reduced, permitting the use of a degree of professional judgement during medication administration.

In other safety literature, skills and clinical judgement are used to address the tensions between protocol and productivity in clinical practice, where adaptive practices respond to environmental and contextual situations. These are labelled dynamic or risky trade-offs (Sanford et al., 2022b; Sujan et al., 2015a).

In acknowledging nurse decision making *and* the broader context in which nurses practice, policy ruling is again perceived by this researcher to become less necessary as some power is shared with the nurse. This personal agency enables control over practice, and resilient actions and reactions to circumstances over which they have little control in the long term contribute to error wisdom. This researcher's developing theory on how nursing skills, nurse agency, and clinical judgement contribute to error wisdom are opportunities for further study and testing.

7.2.5 Resilience, safety and quality care

Applying error and safety typologies to instances of adaptative practice is less clear unless context, intention and outcome are captured (Higham & Vincent, 2021). These features are an integral part of exploration in this thesis, starting where findings from the systematic review (Kellett et al., 2024) suggested resilient adaptive strategies result

from triggers threatening safety and productivity. These findings have been validated in this empirical study, providing new evidence for how nurses' resilient practices create and maintain safety.

As this analytic story arc developed from reliability to resilience and the exploration of adaptive practices and safety, the contextual definition of resilience, an outcome of the systematic review (chapter 2 and glossary) continued to be used. Influenced by the work of the resilience in healthcare (RiH) team (Wiig et al., 2020), the definition applies to nursing medication administration and is intended for use in clinical practice and further research in this area.

Resilient adaptive strategies in medication administration are found in this PhD study to be dynamic, focus on safety creation, and influence quality care. These outcomes are indicators of performance when examined within the realm of the SEIPS 2.0 conceptual model (Holden, Carayon, et al., 2013). For example, in responding quickly to patient admission and discharge needs and management of patient flow during medication administration, organisational functioning is maintained at the risk of late medication for the patient (chapter 6, participant iNS7).

In this current study, resilient response to such triggers are usually short-term, unanticipated adaptive strategies to meet operational needs, which come with a dynamic trade-off between maintaining existing system function and maintaining medication safety at patient level. This illustrates that nurses' strategies at the micro level support operational functioning at the macro organisational level, which is labelled responsive resilience (Vos et al., 2020).

7.2.5.1 Pressures and triggers

When examining adaptive strategies as responses to contextual factors, synthesising findings by this researcher sought to extend existing knowledge and conceptual thinking. Building on the work of Page et al, who's scoping review (Page et al., 2023) identified adaptive strategies as responses to pressures in the health service, but did not suggest any observed or inferred outcomes from the selected review literature. Page's 'pressures' are partially conceptually synonymous with the term 'triggers' used in this PhD study. While both suggest aspects that influence practice, a trigger is seen in this study as an in-the-moment event that requires a short-term reactive response. For example, the response when interrupted while preparing medication by discarding medication already dispensed in the medicine pot and starting over (chapter 6 participant iNS7); or performing a second safety check by re-reading the drug chart (chapter 6 participant iNS2).

In this PhD study, proactive strategies were often interpreted as resulting from pressures from environmental and contextual threats and are usually long-lasting responses. An example of this is when a study participant always did their drug round from the storeroom (chapter 6, participant iNS1). Their perspective was that the noise and a variety of distractions were long term threats to them being able to administer their medications safely, so every drug round was conducted from the storeroom, therefore indicating a long-term, regular proactive strategy.

Page et al's systematic review presents examples of anticipatory strategies and 'on the day' adaptations (named reactive adaptations in this PhD study) (Page et al., 2023) which echoed the complexity of the context in which the real world of work is done; acknowledging that pressures and constraints at each systems level drive and trigger compensatory adaptations as strategies to reduce risk and maintain safety (Page et al., 2023). Confirming and developing Page et al's findings and taxonomy by adding evidence for, or suggestions for observed or inferred safety outcomes, this PhD study effectively closed the feedback loop inherent in the SEIPS 2.0 model (Holden, Carayon, et al., 2013). The SEIPS 2.0 feedback loop is dynamic and cyclical, emphasising continuous learning and improvement in healthcare systems and patient safety (Holden & Carayon, 2021).

Knowledge dissemination (section 7.5) is where this researcher shares how this study's findings contribute to nurse and organisational learning. In chapter 8 implications for practice (section 8.2) and opportunities for future improvements in practice (section 8.3) and further research (section 8.3.4) are discussed.

This PhD study found outcomes of adaptive resilient strategies in addition to identifying specific pressures and triggers around medication administration and linked them to safety through the creation and maintenance of resilience in nursing medication administration.

Examples where data evidenced this linkage to impact or outcome were shown in chapter 6 (table 6.2). and across the entire data set in table 6.3. The significance of integrating outcome into the analysis further aligns this study's findings with how wider contextual factors and work systems affect quality care and patient safety, as represented in SEIPS 2.0 (Holden, Carayon, et al., 2013) and SEIPS 3.0 (Carayon et al., 2020) models. This integration shows how components work together, rather than showing cause and effect, and ultimately offers an explanation for how adaptations at individual level can influence an array of outcomes through feedback loops supporting longer term reliability and resilience in medication administration throughout the organisation.

Establishing that there are multiple triggers for adaptive strategies is a significant finding of this study. Some findings align with some of the contributory factors for safety incidents in the (YCFF) (Lawton, McEachan, et al., 2012) for example 'safety culture', 'patient factors', 'physical environment' and 'support from central functions'.

Wider contextual factors and specific local environmental conditions provided the pressures and triggers for adaptations, shown as anticipated or unanticipated, short or long lasting, and intermittent or regular in the SEIPS 2.0 model (Holden, Carayon, et al., 2013). However, this study focused on individual nursing practice, a potential limitation meaning that other aspects from the full range of SEIPS 2.0 (Holden, Carayon, et al., 2013) and SEIPS 3.0 (Carayon et al., 2020) models were not fully utilised or explored.

This particularly related to technology in the work system because the trust sites were late adopters of electronic patient records and were revising an electronic prescribing and medication administration solution after piloting; and not utilising existing descriptions of the process aspects from the SEIPS 2.0 model.

However, without the deductive application of the model onto this study's data, thematic analysis of this PhD study's ethnographic findings provided distinct examples of medication administration aligning with the SEIPS 2.0 model's process aspects (physical processes, cognitive processes and socio-behavioural processes) (Holden, Carayon, et al., 2013), as well as contributions to nurses' learning.

An example of this was by identifying the internal (dynamic and static) environment and the external environment and context in chapter 4 (part of physical processes); by exploring problem solving and decision making in chapter 6 (part of cognitive processes); and by developing understanding of teamwork, communication and collaboration in chapter 6 (part of socio-behavioural processes).

There is recent precedent for adapting work system levels from the SEIPS models (Carayon et al., 2020; Holden, Carayon, et al., 2013) by indicating work system levels relevant to the focus of research, such as in Øyri and Wiig's (2022) study (Øyri & Wiig, 2022). In this PhD study, work systems levels started with the individual (the nurse or patient) at micro level, the ward was meso level, and the organisation at macro level represented both internal and external facets (for example local and national policies). The environment then existed as both internal (ward and organisational level) and external levels (such as pandemics), in a similar fashion to SEIPS 2.0 (Holden, Carayon, et al., 2013).

This current study has shown how resilience is operationalised in the patient safety realm of medication administration, seen as an international safety priority (Hodkinson

et al., 2020). Showing that nurses in this PhD study were a key component of medication safety through responding to challenges and complexity through compensatory strategies indicated that at all levels the system had capacity for resilience to achieve quality care, corresponding to literature on resilience in healthcare (Macrae & Wiig, 2019; Vos et al., 2020; Wiig et al., 2020).

Seeing adaptation as an essential part of practice, adaptive strategies align with the safety II approach (Braithwaite et al., 2015). In this PhD study, nursing strategies during medication administration mostly contributed to safety. Depersonalising the language around positive human contributions to safety served to balance the degree of blame and acknowledge nurses as (often) the heroes rather than the hazards, to use Reason's terminology (Reason, 2008). At organisation level, healthcare system dysfunction is recognised as a pressure for compensatory adaptations (Page et al., 2023; Reason, 2008), acknowledging organisations are under constant pressure from an array of human and financial triggers, on top of those pressures indicated in this current study.

7.2.5.2 Three systems levels

In a complex healthcare setting, gaining insight by acknowledging three system levels, external (macro) organisational (meso) and individual (micro) (Wiig et al., 2020) clarifies how successful resilient adaptive practices at the individual level are influenced by a greater system, and that these individual practices also support organisational functioning and safety. As discussed above (7.2.5.2) systems levels were amended in this study to closer reflect the focus being at the level of the individual during medication administration and medication related activity.

While recent research on resilience in specific healthcare settings exists, a whole systems approach is not well explored (Ifaifel et al., 2020), with studies outside of healthcare not recognising the significance of the impact that cultural and organisational factors play (Anderson et al., 2020).

Developed to show how healthcare work systems affect patient safety outcomes, exploration and interpretation of study findings have been influenced by two SEIPS models, SEIPS 2.0 (Holden, Carayon, et al., 2013) and 3.0 (Carayon et al., 2020) which identify adaptations as mechanisms for safety outcomes. Although neither the patient journey nor the multiple care settings of SEIPS 3.0 support this study's objectives, SEIPS 3.0 (Carayon et al., 2020) does introduce and integrate the patient journey as a key part of the combined work system and processes. This PhD study findings identify patient flow as a significant pressure for driving proactive strategies to maintain flow throughout the hospital, such as by keeping out of the way during the

drug round when conscious of an increase in patient flow on the ward (chapter 6, iNS7).

Within the context of nursing medication administration, empirical literature on resilience has identified nurses as sources of system-level resilience by adapting to compensate for organisational vulnerabilities (Lyons et al., 2018; Vos et al., 2020).

Chapter 5 (figure 5.2) of this PhD study identified the characteristics of variations as not intentional, operating at micro and meso level, and merely demonstrating WAD as differences in what nurses do at individual or group level where variations within normative models (WAP) were routinised and accepted. Variations from WAP were interpreted as minor or risky variations and near misses.

Exploring harm was never the primary subject of interest in this current study, because focussing on harm as an outcome would miss an important opportunity for exploring understanding when practices that migrate to boundaries could be mitigated, and risks managed. In reviewing the seminal work from Rasmussen (1997) and Amalberti et al., (2006) through a more recent safety II lens explores adaptive practices as necessary actions to cope with complexity, and not as deviant acts from individuals.

Now that systems levels have been fully integrated into this discussion chapter, the analytic story arc develops with further exploration of how systems function to support safety.

7.3 Synthesis of systems functioning at macro, meso and micro levels

Literature supports the concept that system-wide pressures are key forces for individual adaptation and resilience (Lyng et al., 2021; Page et al., 2023). Yet nurses' interactions at different system levels have been less well studied (Parry, 2015; Vos et al., 2020). Operating on all three levels, (individual, ward and organisation) plus the dynamic and static pressures from internal and external environment, this PhD study confirms findings from Oyri and Wigg (Øyri & Wiig, 2022) that all levels are 'collaborative' in systems resilience and safety. This is despite the system levels being conceptually different in this PhD study.

In this study, collaboration and communication across system levels by participants at individual micro level respond to the conditions of the ward (meso level), and the organisation (macro level) (and wider contextual factors external to the organisation). This reflects the pressure for constant adjustments originating at macro level (Sanford et al., 2022a); and confirms findings from Vos et al, (Vos et al., 2020) that collaboration and communication are aspects of systems level resilience.

Aspects of the fixed environment (for example setting, storage and space in chapter 5) were found to impact staff practices, often leading to variations and adaptations. The addition of the constant pressure in the dynamic environment (for example noise, light, tidiness, access to medication, ergonomics of the drug trolleys in chapter 5) provoked resilient strategies to compensate for these environmental factors. Here resilience was utilised to enhance safety at individual, ward or organisational level.

Although Hollnagel' s definition of resilient healthcare focuses on sustaining everyday operations under varying conditions (Hollnagel, 2018a), the intrusion of the Covid-19 and flu pandemics during data collection were opportunities to capture extraordinary external and dynamic environmental pressures and corresponding adaptations at individual level.

The constant need for adaptive strategies was heightened by participants at the time of data collection. For example, wearing PPE and making compensatory adaptations when preparing medication, where medication was stacked in medicine pots to ensure only one episode of 'gowning and gloving' was performed prior to entry to a patient's side room (participant iNT7). This meant the participant (iNT7) could adjust medication according to patient need, such as identifying the medicine pot which contained paracetamol and holding it back when the patient said they had no pain (chapter 6).

The pandemics also contributed enormous pressures on patient flow within, through and across wards and the organisation. Limitations to organisational function, where factors such as slow discharge of patients due to limitations in care and nursing home capacity, supply of PPE, and reduced staffing levels (due to sickness absence) (see triggers for adaptive strategies in chapter 6), were constant external pressures on all systems levels. At ward and individual level these were pressures for changes in practice. Examples of adaptive responses to pressures were when patient allocations to staff were changed so participant NS7 (chapter 6) had to do the 6pm drug round for thirteen patients rather than the usual practice of seven patients; and prioritising patient flow over medication administration by admitting or discharging patients to support system functioning (chapter 6 participant NS2).

In line with findings from Vos et al, (Vos et al., 2020) these instances of dynamic trade-offs (Sujan et al., 2015a) made by nurses supported organisational resilience, demonstrating the importance of context in the creation and maintenance of safety.

However, the need to create a balance between short and long-lasting adaptations to prevent unintended outcomes is acknowledged as important to creating necessary changes at organisational level (Lyng et al., 2021). Here, long-lasting adaptations (such as starting each ward handover with an updated safety brief and including medication related issues (chapter 4 section 4.1.9) could play a role in introducing longer term

safety change (Lyng et al., 2021), an area for future research. The generative outcome from feedback loops of 'continuous learning' in the SEIPS 2.0 model was observed in this PhD study, where the safety brief is perceived by this researcher as a proactive regular response to a system deficiency, in this case in communication.

Adaptations and variations in demanding and changing conditions served to balance risk to patients and safe care. However, they can sometimes reduce the potential, or actual quality of care, when the success of adaptations at all organisational levels is not assured (Lyng et al., 2021). During this current PhD study observational findings witnessed a practice where reporting of an error on the Datix error reporting system (Chapter 5, section 5.3 participant NT8), would not have been done without intervention from the ward manager. The participant gave subsequent reassurance that she would add this to the safety brief to share with the team, but this was not followed through. This could be interpreted as a missed opportunity to inform changes in the work system, influence future processes and outcomes, and enhance ward safety culture.

The importance of training is stressed by safety scientists (Carayon, Wetterneck, et al., 2014; Carayon, Xie, & Kianfar, 2014; Leape et al., 1995). Findings that staff education included variable amounts of training in human factors and patient safety (chapter 4, section 4.3.3) suggest an opportunity to equip all nurses with an understanding of how human factors enhance reliability and patient safety which could impact mistakes or safety-relevant events.

Group-think (DiPierro et al., 2022) and normalised deviance (Amalberti et al., 2006; Rasmussen, 1997) (chapter 5) were also found to influence safety culture in this study, where revisions in practice were made but the clinical judgement necessary to review and revise practice was absent. An immature safety culture cannot support resilience and safety (Lawton, McEachan, et al., 2012) and this impacts WAD practices and understanding of safety, an example of which are variations and adaptations in best practice around checking patient identity (chapters 5 & 6 participants NS3 and NS11).

Normalised deviance, problem solving, critical thinking and adaptations are individual or team resilience strategies to balance patient safety with task efficiency, time, and wider organisational triggers such as patient flow. These are strategies that individual nurses make which could be shared to ensure wider team and organisation wide safety culture to enhance maintenance of safety during medication administration.

Lyng et al, acknowledge that adaptations can affect safety at individual and organisational levels by their positive or negative effects, both of which were found in this study, but they also suggest that the success of an adaptation does not always mean its long-term success (Lyng et al., 2021). This speaks to frequent review and

change being key to the maintenance of safety, which can only really be considered in a positive safety culture.

The critical thinking and problem solving by nurses before, during, and after medication administration was found in this PhD study to be a key function of organisational resilience which reflects recent resilience in healthcare studies (Lyng et al., 2021; Macrae & Wiig, 2019; Wiig et al., 2020). However, collaboration as a fundamental resource for resilience (Wiig et al., 2020) is also a necessary resource at all systems levels. Evidence for this was found in this PhD study and is a focus of the 'communication and collaboration' theme in chapter 6 section 6.4.8.

In synthesising the findings from this PhD study with a broad lens, situational contextual factors of the internal and external environment as well as the wider factor of time acted as dynamic triggers and pressures for study participants to adapt their practice during medication administration. The characteristics of adaptive resilience were anticipated or unanticipated, reactive or proactive, regular or intermittent, or short or long-lasting responses. These were found to have a critical effect on patient safety outcomes during medication administration and broader organisational resilience showing how resilience is created and maintained in nursing medication practice in the inpatient setting.

The following section (7.4) synthesises the study data to visually capture the creation and maintenance of safety during medication administration (figure 7.1) so meeting this PhD study aim.

7.4 Synthesis: towards a model of resilience for patient safety in nursing medication administration practice

Aligning with current established literature and an array of safety models and frameworks, empirical evidence from this study has been explored utilising a safety II approach to meet this PhD study's aim: to explore how resilience is created and maintained in nursing medication administration practice in the hospital inpatient setting.

Nearing the end of the analytic story arc of this thesis, findings from this study showed the creation and maintenance of resilience in the specific nursing context of medication administration, identifying how resilient strategies preserved safety and quality care at different system levels, and presented here as a roadmap of resilience model (figure 7.1). Integrating and adapting key concepts from the SEIPS 2.0 model conceptualised as a work systems flow diagram (Holden, Carayon, et al., 2013) using a simplified version provided for researchers and organisations (Holden & Carayon, 2021), this model integrates the context/trigger/adaptation/outcome relationship and the feedback

loop demonstrating continuous learning. In doing so it fulfils a need to develop understanding of resilience in the socio-technical environment in the context of nursing medication administration, and how this leads to the maintenance of safety-relevant outcomes.

A systems story logic model (Holden & Carayon, 2021) (table 7.1) acts as a commentary for the road map of resilience model (figure 7.1) by defining the context, components, and characteristic of resilience, mapping these to the pathway of patient safety and systems resilience visualised in figure 7.1.

Table 7.1 Systems Story Logic Model

This study showed how resilience is created and maintained in nursing medication administration practice.

- ▶ Adaptive strategies are mechanisms for resilience in dynamic systems
- ▶ Systems operate at the macro level of the organisation, at the meso level of the ward, and at the micro level of the individual
- ▶ Nurses vary their practice and use adaptive strategies when responding to triggers and pressures emerging from three systems levels
- ▶ Characteristics of resilient strategies are short or long-lasting, reactive or proactive, anticipated or unanticipated, intermittent or regular
- ▶ Outcomes resulting from work process are related to the goal of patient safety in medication administration
- ▶ Education, learning, and collaboration are integral expressions of resilience and contribute to patient safety at all system levels
- ▶ Resilient adaptive strategies are dynamic mechanisms influencing nursing practice in a feedback loop focussed on creating and maintaining safety

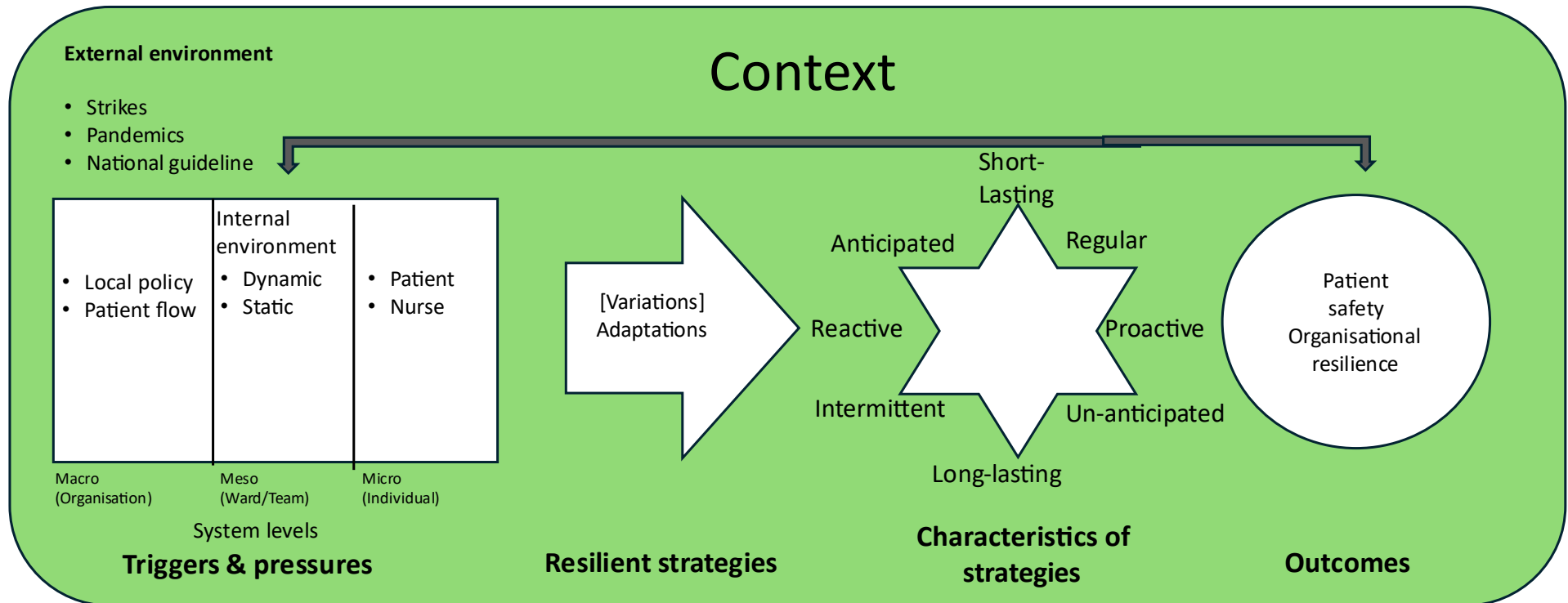


Figure 7.1 How Resilience is Created and Maintained in Nursing Medication Administration: A Roadmap of Resilience

The second figure (7.2) is a framework of necessary factors for building resilience in nursing medication administration. Designed as a framework for nurses to suggest what needs to happen to achieve resilience to support safety in their medication administration practices. This offers an opportunity for nurses and researchers to apply and develop. The framework is conceptualised as a cog and wheel system where the necessary factors for building resilience work together to establish a resilient system



Figure 7.2 Necessary Factors for Building Resilience

In this thesis, exploration and understanding of the creation and maintenance of resilience in the realm of in-patient medication administration has been developed to meet this study's PhD aim and objectives. Through interpretation of collected data from ethnographic observations, interviews and documents, and abstracting innovative typologies, a model (figure 7.1) and a framework (figure 7.2) have been developed. These innovative and significant contributions to safety science have synthesised interpreted study findings to show necessary factors for building resilience, and the processes and influences on the creation and maintenance of safety.

Findings from this study have identified fundamental components of safety in medication administration, which are innovative contributions to shaping future nursing practice and research in this area. These are further explored in implications and recommendations for practice (chapter 8).

In the following sections of this chapter knowledge dissemination is shared (section 7.5) before this study's strengths and limitations are outlined in section 7.6.

7.5 Knowledge dissemination

What is shown from the SEIPS 2.0 conceptual model (Holden, Carayon, et al., 2013) is that a continuous process of learning feeds back in the socio-technical work system. As a consequence, this researcher's interpretation is that continuous learning is fundamental to the creation and maintenance of resilience in medication administration. Therefore, knowledge dissemination is interpreted as having potential for making a significant contribution to influencing WAD and shaping safety outcomes.

In this section, knowledge dissemination has two aspects, knowledge exchange is where there is knowledge sharing by others with this researcher, and knowledge transfer is a one-way process from this researcher to others.

7.5.1 Knowledge exchange

Knowledge exchange came from two areas, unsolicited suggestions from participants, and from seeking experiences from the public.

After the ethnographic approach was deemed the most appropriate method to answer the research aim and objectives for this PhD study, discussion on whether to include patients as patient and public involvement and engagement (PPIE) partners. Reflection on this process and outcome is shared below.

7.5.1.1 Reflexive commentary: reflections on knowledge exchange

“Because my research is about how nurses attempt to create safety during medicine administration, and because this is my first research project as a PhD student, we talked about including patients too, right at the start, and when I was writing the study protocol. After considering the possibility of observing patients and how they contribute to safety in their medication administration while in-patients, we decided that a narrower focus for this study was a better first step into a study with an exploratory objective.

This reflexive consideration and decisions made revealed underlying views about feasibility and the study’s boundaries, methodological choices and what would remain unexamined.

There is also an increasing amount of research involving patients taking their medication in hospital, but the research gap was really in the focus on exploring the nurse’s endeavours to maintain safety during the drug round.” (Reflective journal June 2023).

The thoughtful discussions and decision to focus on nurse resilient practices limited the representation of patient insights, experiences and what kind of knowledge was exchanged in this study. However, findings had significant relevance for patient safety, patient experience, and the impact of contextual and systems pressures and triggers, moving beyond the level of the individual patient and nurse.

Evidence shows that public and patient involvement in research has a positive effect on its quality and end-results (Tomlinson et al., 2019); and positive effects are reported during all stages of study from design to dissemination (Ocloo & Matthews, 2016). This is why public engagement is stressed as a research imperative (Gray et al., 2021). Supporting evidence being drawn from a large-scale clinical trial (Gray et al., 2021) and a literature search (Ocloo & Matthews, 2016), the study from Tomlinson et al, examined how PPIE was included in four doctoral studies and found it to be useful when patients were involved at any stage of the PhD study (Tomlinson et al., 2019).

However, as a team, the decision was made that an ethnographic study focussing on nurses’ practices was an important first study; and later, post-doctorate, there could be an opportunity to broaden the focus and perhaps consider a co-designed study.

Therefore, the present research project was developed with the nurse being the focus of attention with the vital consideration that patients were obviously an integral part of medication administration as the end users of the process. So formal PPIE was not built into this study, although it was an ethical imperative to let patients and their families and visitors know that research was taking place on the ward via a patient facing poster (appendix A).

7.5.1.2 Formal PPIE panel

It was essential to ensure all patients and visitors were aware that the study did not involve patients as research participants, and that they understood the presence and role of the researcher in data collection while they were on the wards.

The advice of a local PPIE panel was sought in the development of the poster. The poster was developed to provide basic information on what the observer was doing, with reassurance that the research was not collecting any data on in-patients or visitors. Suggested changes to be clearer about the wording and font size, and to change the picture in the poster so it more obviously represented the focus of the research were made. An update was approved by the PPIE panel after an important highlighted section stated that if people reading the poster preferred that the staff looking after them were not observed, then to please inform staff, with reassurance that this would not affect their care in any way.

7.5.1.3 Reflexive commentary: reflection on informal discussion with former patients

However, there was a point during data analysis where this researcher would have appreciated a sense check from previous patients.

“Now, as I am analysing the data by inductively coding and theming, the data is telling me for certain key themes, engagement with patients at this stage could really help me understand their views. This isn’t really about the study aims and objectives, I just want to hear patient perspective at this point. I have some themes but really feel an informal sense-check at this point would give me more insight and perspective and avoid an element of my own bias. I feel I need people with personal, lived experience to talk to me about their experiences and how this impacts some of the early themes around patient identity checks, and engagement with, or blocking distractions. Although this research isn’t ‘done’ to or ‘with’ patients, it is really all about keeping patients safe; how do we as nurses adapt our practice to ensure we safely give medication when patients are most vulnerable?” (Reflective journal July 2023)

This reflection showed consequences of earlier decisions about including patients in this study, an important part of my reflexive process. Acknowledging this decision enabled recognition of how my decisions influenced the boundaries of this research and how excluding patient perspectives inevitably shaped what knowledge could be generated.

Two members of the public known to this researcher, who had recent experience as hospital inpatients were invited to talk to this researcher about their experiences of drug rounds as hospital in-patients. This in-person conversation with them both occurred in August 2024. A PowerPoint presentation was developed with some suggestions from the supervisory team and PPIE lead in the school of nursing and midwifery at the University of Plymouth. The study protocol, ethical, and study site approvals were

explained; as well as how PPIE had already been involved in the study through input and approval of the patient facing ward poster.

There were two areas where this discussion was valuable. Firstly, as this researcher's first experience with PPIE, invaluable learning was experienced in setting up and planning the areas of focus; and then delivering and ensuring the patient voice was heard, articulated in their own unique way.

This researcher had not expected the members of the public to feel that they needed to be defensive of the NHS and nurses who cared for them, feedback given related to the very positive service they had received. They both expressed that they would have preferred their medication to be taken at a time that suited them so that it coincided with mealtimes, and also so they could choose to take it later when needed, or not at all. A desire for more autonomy in these instances was inferred here by this researcher.

The second area where the discussion with previous patients added value was regarding the patient identity check. Their experience was that their identity was checked using the nameband as well as verbally, but only on the morning drug round; their feelings about further checks by the same nurse on other drug rounds were expressed as being 'strange' or as 'overkill'. This informal, solicited insight formed an interesting perspective which, although it did not contribute to the current study, did offer some ideas for future research involving patients as the recipients of medication in the in-patient setting.

7.5.1.4 Knowledge exchange: Participant reflections on strengthening medication safety

An unexpected dynamic aspect of the empirical study was the exchange of knowledge from nurse participant suggestions for improvements to reliability in practice, discussed and outlined in chapter 5 table 5.3. Representing important contributions to safety culture, discussed earlier in this chapter, these offerings have influenced this researcher's recommendations for practice, to be found in chapter 8.

7.5.2 Knowledge transfer

Sharing review findings or early results at conferences was important to this researcher, wanting to show this study's future potential impact for clinical practice. The value of knowledge transfer to people who are interested and care about patient safety, and in particular the nursing community, was to develop understanding, identify implications, and recommendations with the potential to impact safety. All nurses have

a stake in patient safety, at an individual, team and organisational level, and as a key part of their professional practice. Therefore, they also have the ability to influence safe outcomes for patients.

7.5.2.1 RCN International Conference: 8 September 2021 (online)

The opportunity to present a 'Visual Presentation with Expert Review' (ViPER) of systematic review findings, with the addition of audience interaction during the following live question and answer session, was the driver for applying to present at this annual, international nursing conference.

Disappointed that the conference was changed to online delivery just prior to the 3-day event, this researcher considered withdrawing because contact was very much reduced, and the potential to network, engage and generally converse with an array of external stakeholders was lessened. However, by providing the session facilitator with three areas for exploration with the ViPER attendees, a discussion with the audience on the following questions was achieved:

- 1) How understandable and relatable do you find the term resilience?
- 2) Do the concepts of 'work as done' (WAD) and 'work as planned' (WAP) make sense to you?
- 3) Do you consider there may be some professional accountability tensions when making adaptations to policies and protocols in your medication administration practices?

The audience were shy, but a sense check on perspectives around these questions was accomplished. The main take home being that although 'resilience' was largely perceived as a personal, psychological attribute, the difference between WAD and WAP was easily understood, and that largely nurses felt little conflict between their practice and professional accountability.

7.5.2.2 The Southwest Clinical School Conference 'Developing a research Skilled Workforce': 29 November 2023 (Plymouth)

A ten minute verbal, in-person presentation of work-in-progress was delivered at this conference. Opportunities for questions were built into the timeframe, and feedback largely focussed on audience members interest and questions on the early findings on adaptive strategies. The audience feedback suggested that they found adaptive practice resonated with their own experiences with medication administration practices and felt these impacted their personal and professional behaviour.

7.5.2.3 Study participants (including local collaborator – associate director of nursing and professional practice)

Study participants were emailed a hyperlink to both above conference recordings once data collection was complete. An invitation to both wards was extended to share study findings, this was later taken up a year after completion of data collection. By then the manager of ward 1 had left, and the interim manager declined the offer. However, this researcher was aware of, and took the opportunity to present their study, at an established bi-monthly, two hour event called 'Our Quality Street' where all staff were invited to share short presentations of research or quality improvement projects in the front lobby of the hospital, not far from ward 1. The date and time were shared with the ward team, and two participants attended. Using a poster, early findings on triggers, types of variation and outcomes during medication administration were presented. Feedback from one participant was on how they enjoyed hearing how findings translated into positive patient outcomes and safety.

The ward 2 manager invited this researcher to share early results in-person, through a ward meeting. Four participants attended, and this more interactive presentation was an opportunity for the participants to ask questions and understand the results, as well as see how their participation could advance knowledge in the areas of resilience, safety and risk in medication administration.

7.5.2.4 Undergraduate students

Due to shortages of placement providers for student nurses across the South-West, providing students with a 'simulated ward' placement in 2023 was an opportunity for broadening curriculum content. This researcher offered to develop students' understanding of patient safety and has provided 3-hour patient safety seminars to all first and second year nursing students for the last three years. The learning outcomes were to: define patient safety, identify short and long term solutions to patient safety risk in clinical practice, explore the concept of safety II, and discuss patient safety as part of accountability in the NMC Code (NMC, 2018). Some findings from this research were integrated into the seminar to highlight medication administration safety and risk. Engagement and enthusiasm from students to explore and develop their understanding was high and has received positive feedback.

7.5.2.5 Postgraduate students research conference

For four years, twice each year, this researcher has presented their PhD journey to RNs on a post-graduate module 'Advanced Concepts in Research: Methodology and Methods'. Largely delivered by the professorial team, it was important to the module

lead that students had the opportunity to identify with other nurses doing research and see the process in-action, as experienced by first time researchers. Starting with the systematic review before progressing to presenting the empirical research, each conference presentation described the current stage and the rationale for the decisions made during each step of the review or research progress. Feedback was positive:

“I wanted to let you know that several of the students singled you out for praise for your presentation today. They said you put it in a way which made it really engaging and really accessible.” (module lead email 13.07.2021)

“Brilliant 😊 The students loved your session.” (module lead email 02.11.2021)

7.5.2.6 Reflexive commentary: reflections on knowledge dissemination

The benefit to RNs and students from this researcher’s developing expertise, knowledge, and insight was to support learning and understanding of resilience in medication administration and systems safety and contribute to their current and future scholarship. Benefits to this researcher were to add value to the nursing profession through being inquisitive and explorative to gain insight and answers to address the PhD aims of this study.

“I always wanted to make a difference to nursing, and patient safety was always the channel through which I wanted to impact my profession. From dissemination at local and international conferences, presentations and seminars; to publication of my MSc literature review on medication double checking, and systematic review on resilience in medication administration; to sharing the review findings with nursing colleagues and students at the hospital and the two universities I have worked at; I can still see impact by the number of reads and citations from my two publications. Despite the ten year gap between them, both are growing in reads. It has also been lovely to have students ask if articles they have found for their essays are ‘really me’; and have two students quoting my 2024 systematic review when I was marking their work on an evidence informed decision making module. It really feels like I can see my desire for my work to ‘mean something’ start to bloom.” (Reflective journal March 2025)

7.6 Strengths and limitations of this research

Limitations to this research have been acknowledged throughout this thesis.

Acknowledging limitations in research provides context, shows challenges and implications, and potential different approaches, representing a realistic view of the study (Ross & Zaidi, 2019). In this section, strengths and weaknesses are explained and the steps to allay weaknesses are described. Limitations in this research are outlined in four sections, methodology, methods, bias, and findings and transferability.

7.6.1 Methodology

Using a methodology that aligned with the research aim (Vogt, 2008), this ethnographic study explored resilient practice in medication administration with three systematically applied methods of data collection. While often viewed as simply a data collection method, epistemologically ethnography exceeds this limited view, being concerned with seeing, exploring and interpreting reality (Jones & Smith, 2017). Value was added through synthesising findings across the different methods of data collection (Savage, 2006) and exploring wider contextual factors including the internal and external environment. The strengths of this methodological ethnographic approach were that alternative lenses were applied to explore the data from different conceptual and empirical stances, ensuring an extensive, thorough exploration of the data. This approach enabled significant contributions to existing understanding of how safety is framed, safety culture, the gap between WAP and WAD, normalisation of deviance, and the contribution of resilience to safety and quality care at three systems levels, explored above in section 7.2.

The emic approach, the researcher's insider perspective (Mostowlansky & Rota, 2020) aimed to understand practice as it was perceived and understood by the nurses engaging with medication administration, yet it did have limitations, shared in section 7.6.3 below.

The rigour of the research process was informed by reflexive thematic analysis, inspiring exploration, iteration and theoretical engagement (Braun & Clarke, 2022). This researcher's journey included the supervisory team in all aspects of process, issues and development, to ensure rigor, mitigation of researcher bias, and trustworthiness of findings.

7.6.2 Methods

Limitations of this study's methods are explored in turn for data collection and data analysis.

7.6.2.1 Data collection

A limitation of the systematic review's method in capturing relevant research was that even after the creation and application of a focussed operational definition of resilience, and despite the sensitivity and specificity of the search strategy, it was possible that not all relevant, related evidence was captured. Specifically, this might be the case if an alternative interpretation of resilience was used by the authors of the selected empirical studies.

Addressing limitations in this study's data collection methods focussed on credibility and transparency. The participant information sheet (PIS) (appendix B) identified the researcher as a registered nurse and was designed to enable participants to feel safe to be shadowed during observations, and safe to disclose their perspectives and feelings about their practice and their professional role. The level to which participants were willing and ready to share their practices and experiences could have been a potential limitation to data collection. This was mitigated with the approach of prolonged engagement with the ward team during ward visits, providing opportunities to discuss the research and answer questions. These steps ensured familiarity with this researcher over time, prior to the more focussed and potentially exposing (for the participants) semi-structured interviews, which intentionally started after observation data collection had started.

By this researcher openly positioning themselves in the study they were given the privilege of close observation and exploration of participants practices exploring risk, safety, resilience and what drove changes in practice. However, prior intention for recorded participant practices was not always possible to explore during ad hoc interviews in the observed five-hour one-to-one observation period due to participant workload and patient priorities. Although twelve participants took part in both study workstreams 1 (observation) and 2 (semi-structured interviews) and exploration of their prior practices took place, an opportunity for nuanced understanding was missed when all participants could not be interviewed due to limiting the sample size for interviews to fourteen participants.

Transparency concerning the decision to not pursue or enrol replacement participants for the two participants who were unable to participate in their agreed observation or interview (described in chapter 3) highlighted a potential limitation to data saturation. Questionable as a concept in qualitative research (Constantinou et al., 2017), with the view that perspectives from participants can never be saturated as they are shaped by so many factors including education and experience; others have explored sample size in qualitative studies and found saturation can be effectively achieved with smaller numbers (Hennink & Kaiser, 2022).

A strength of this study was that nurses were interested and comfortable enough to agree to participate in any or both workstreams of the study. An advantage of this was referring to observed practice during interviews drew on experiences and aspects of practice, adding depth to the enquiry. Possible limitations were the introduction of bias from familiarity; and the missed opportunity to draw on the experiences of a wider data set which may have impacted breadth of experiences recorded.

7.6.2.2 Data analysis

Accentuating the researcher's role in interpreting data contrasts with traditional thematic analysis where the impact of researcher interpretation is less influential; yet the iterative and recursive nature of reflexivity, and acknowledging positioning and bias, is said to be exactly what leads to more nuanced insights (Ahmed et al., 2025).

Nuanced insights were also gained from the establishment of intermediary questions to explore areas where further understanding was required to address the aim and objectives of this PhD study. The intermediary questions in the systematic review (chapter 2) and the intermediary questions used to explore variations from WAD (Chapter 5) were significant for clarifying existing understanding in nursing medication administration practices and added richness and depth to analysis. Although iteration is not part of research within the positivist paradigm, in qualitative analysis it is an essential function of questioning and interpretation (Ahmed et al., 2025).

Limitations of the systematic review in chapter 2 (Kellett et al., 2024) related to limitations in the amount of available empirical evidence exploring resilience in medication administration, and the post hoc application of resilience terminology to selected studies where adaptive responsive strategies were not identified as resilience by the selected study authors. This showed a lack of interaction between safety science, patient safety and nursing practice, particularly when integrating resilience with nursing medication administration safety. There was also a chance that key literature that might fall under one or more interpretations of the concept of safety and safety II so might have been missed when searching the current literature.

Other insights on limitations pointed to the language and nomenclature of conceptual error and safety terminology which did not seem to have kept up with the emerging safety paradigm of safety II. The focus of blame and the inferred pejorative nature of terminology around violations, deviations, and error contributed to the difficulties in identifying relevant literature yet was an opportunity to directly address safety language. This opportunity was taken in chapters 5 and 6 (see chapter 5, figure 5.2 key concepts and relatedness), and although this is an evolving insight it has yet to be theory tested, providing an opportunity for future research. Limitations to this PhD study could then focus on using an un-tested model to explore this study objectives, although a kinder more safety II relevant language was applied to analysing study data that may resonate with nurses and organisations following safety relevant events. This has significant potential to develop safety culture in the way learning from safety relevant events is shared and integrated.

The attempts to update safety language provided clarity for analytic perspectives and interpretations of current study findings throughout this thesis, clearly signposted as 'analytic steps' in chapters 5 and 6. The analytic steps themselves could be critiqued for not being established as part of the methods in chapter 3. However, the use of an analytic story arc conveyed the complexity of addressing the PhD study aim and the research process by constantly updating the thesis reader on developing analytic steps corresponding to which PhD objective was being explored.

7.6.3 Bias

Reflexivity supported awareness of the researcher's effect on both the process of data collection and the findings of the research. There was a danger that the knowledge, power, and experience of the researcher could excessively affect the data. Being aware of relationality and reciprocity through reflexivity is a mechanism to reduce researcher bias (Vandenberg & Hall, 2011).

The degree and depth of supervision discussions were effective in understanding and reducing bias. However, neutrality was not possible or even necessary in this qualitative ethnographic study, where this researcher's personal perspectives were acknowledged and accepted. Supervision and a reflexive diary ensured ongoing questioning of bias and positionality. These, regularly shared with the supervisory team, ensured constant reminders and discussion around bringing it back to the data, and keeping close to the data (Braun & Clarke, 2022) to reduce the influence of personal bias on data interpretation, analysis and findings.

7.6.4 Findings and transferability

7.6.4.1 Findings

Ethnographic study findings have been said to lack credibility (Adler, 2022).

Mechanisms were used to ensure trustworthiness of the findings by verification, sense checking, keeping themes close to the data and the application of positionality and reflexivity by this researcher.

Verification of participant's own practices took place with ad-hoc interviews during or immediately after observation if possible. Triangulation with participants using sense-checking during semi-structured interviews ensured a more comprehensive understanding and interpretation of the data; strengthening the validity of the findings by reducing any intrinsic bias (Noble & Heale, 2019; Polit & Beck, 2020). Believability of the findings were supported by the proximity of the data to the themes. The use of data extracts to illustrate findings was evidence of credibility (Braun & Clarke, 2022).

Setting the interpreted data within existing relevant research and theory reduced interpretation bias and enhanced trustworthiness.

This researcher's positionality and reflexivity throughout the research process, with regular inclusion of the supervisory team in all aspects of the research process served to mitigate researcher bias and enhance trustworthiness of findings. This was enhanced by embedding analysis within existing theory and research.

7.6.4.2 Transferability

Limitations in this study's methods meant there was a danger that data exhaustion had not occurred. Although data exhaustion was achieved in that data analysis process using RTA coded all the data, the sample size could be questioned, limiting the breadth of data available to be analysed. Adjusting data collection dates and times for study participants due to time limitations, resources, strikes, and pandemics and seasonal illnesses could imply that the sample was not representative. Additionally, focussing only on registered nurses or nursing associates only examined one distinct aspect of healthcare work, focussing on nursing medication administration but neglecting the end user of the process, the patient.

Although this study's findings are not always relevant to populations outside of nursing, transferability of the rich and detailed analysis provided could be applicable to other healthcare professionals who administer medications including doctors and physicians' assistants. The study setting might also be seen as a limitation yet healthcare professionals administering medication in primary settings or home care, such as community nurses, paramedics, nursing associates, and trained carers, may find some outcomes relevant to their practice. These might be in understanding the safety II and systems approaches, and the model and framework for achieving resilience which are novel outcomes of this PhD study. This enhances the usefulness of findings to inform practice, policy or further research.

The broader themes around contextual, and macro, meso and micro level factors influencing variation and adaptability emerge from particularities of the in-patient hospital setting and again, could limit the extent to which findings are applicable to other contexts. Yet the context of a pressured work systems is not limited to the secondary setting or nursing, so there may be applicable findings related to other healthcare contexts and health professionals.

The steps taken to address limitations in the study demonstrate transparency and rigour. Strategies to mitigate biases and data interpretation have been clearly outlined and indicated in the frequent reflective accounts; highlighting areas where researcher

influence on the study has been questioned or mitigated. Within the four broad themes discussing strengths and limitations of this research, the whole PhD study process has been explored addressing validity, reliability, confirmability and believability of this research study.

7.6.4.3 Novelty and confirmation

A table below (table 7.2) summarises where novelty in findings has been highlighted in this thesis, and where other significant contributions were made by confirmation of existing research. Innovations and contributions are examples where new insights were gained in understanding or conceptual development in areas related to the context of nursing medication administration.

Chapter	Section	New knowledge of resilience in nursing medication administration linked to:
2	2.4 & 2.5	Identification of triggers in WAD
		Linked resilience to short-term, real-time adaptive practices during nursing medication administration within the theoretical concept of resilience
4	4.2.1 & 4.2.2	Wider contextual factors resulting from strikes and pandemic explored
5	5.1, 5.2 & 5.3	Exploration of variations in practice through selection of four normative models representing local organisation, and national policy, UK professional guidelines, and an international safety framework
5	5.3.5	Development of a context specific typology of variations including drivers, outcomes and variation type (based on figure 5.1)
6	6.5, fig 6.4	Explicit identification of trigger or pressures, description of adaptive mechanism and observed reported or inferred safety outcomes.
7	7.4, fig 7.2	Development of a framework of necessary factors for building resilience in nursing medication administration
2	2.5.3	Strengthened conceptual and operational clarity of resilience and adaptive practices
4	4.1.& 5.1	Identified contextual factors at three systems levels revealing their impact on medication administration practice. Latent conditions exposed
5	5.13 Figure 5.1	Development of a model of error and safety terminology related to variations and adaptations
5	5.3.3.1 & 5.3.3.2	Evidence of normalised deviance and groupthink in context of variations in medication administration
6	6.4	WAP normative models broadened to include the individual participant's plan of work
6	6.5, fig 6.4	Building on resilience in healthcare and systems safety data, a focussed exploration of resilience at individual level
7	7.4, fig 7.1	Development of socio-technical model, a roadmap of creation and maintenance of resilience in nursing medication administration

Table 7.2 Contributions to Novelty, Theory and Research Development

7.7 Conclusion

The analytic story arc weaving through the thesis chapters has synthesised findings embedded in relevant contemporary literature with the outcome of answering the PhD study's explorative aim. The operationalisation of resilience to create and maintain safety has been exemplified in a model (chapter figure 7.1), built from the foundation of the SEIPS 2.0 model (Holden, Carayon, et al., 2013) to show how nurses create and maintain safety in the inpatient setting. A framework suggests necessary factors for building resilience in medication administration to achieve quality care, a signpost for consideration in future practice or research (figure 7.2).

Knowledge dissemination has been expressed through the lens of this researcher, demonstrating how their need for the research to have meaning to nursing has started to be met through knowledge exchange and transfer. Future plans for this are found in chapter 8.

Strengths and limitations of this study across methodology, methods, researcher bias and findings have been critiqued. This transparency allows readers to see the attempts made to reduce bias and therefore ensuring dependability, credibility and trust in interpretation of this PhD study's findings.

Understanding drawn from this synthesis chapter has implications for future developments in clinical practice and research. While theorising is necessary for defining constructs, developing typologies, and evaluating data in the context of existing studies (Anderson et al., 2020; Davidoff et al., 2015), the impact of understanding and insights has enabled this researcher to identify how and under what circumstances resilience is created and maintained. An additional outcome of this is a number of suggestions for practical interventions for maintenance of resilience and delivery of safer care in medication administration, explored in the next chapter.

Chapter 8 is a further discussion chapter on looking forward, identifying practical implications and recommendations for practice; and, to complete the RTA process, a reflection and evaluation of the write up stage of this thesis is presented.

Chapter 8

Conclusion: Looking forward, implications & recommendations for practice

8.1 Introduction

The aim of this PhD study was to explore how resilience is created and maintained in nursing medication administration practice in the hospital inpatient setting (table 1.2). The analytic story arc of this PhD study ends with this final chapter, as findings generated new insights into the creation and maintenance of resilience in nursing medication administration, identifying nurses as mechanisms for safety through their resilient practices.

Through future dissemination nurses will have an opportunity to learn from contributions this study has made in understanding safety science and resilience. This learning is shared through all the following sections. The implications this study has for nursing practice in medication administration is discussed (section 8.2), and recommendations supporting resilience at different systems levels are explored (section 8.3), offering suggestions and recommendations for practice. The fourth section (8.4) reflects on and evaluates the writing up of this thesis, an essential aspect of reflexive thematic analysis (Braun & Clarke, 2022). This is done by identifying this researcher's role in interpreting data, the iterative exploration of findings, justifying the decisions in the analytic story arc, and positioning themselves within this study (Braun & Clarke, 2022; Byrne, 2022). The penultimate section (8.5) looks further, exploring future dissemination strategies and opportunities for this researcher. Finally, a conclusion in (8.6) draws this thesis to a close, completing the analytic story arc.

8.2 Practical implications for practice

The lens of what works well to maintain safety, rather than focussing on active failures and what went wrong, sits within the safety II perspective which has framed this thesis. This conceptual approach has been applied in previous chapters and is used in this current chapter as an opportunity to discuss implications and recommendations for practice, and future research in an accessible manner that is relevant to nursing colleagues in practice.

8.2.1 Reflexive commentary: reflection on making a difference

Making a difference to nursing has been the key motivator for this PhD study. Positionality was made clear at the very start of this thesis (chapter 1, section

1.2) where this researcher reflected on the impetus for this study (a drug error made as a student nurse). Reflexively, my view on making a difference drew on previous personal experience of drug errors, and professional values to preserve safety. As an academic and a nurse I could have overemphasised educational impact because I value the significance of knowledge, skills and values to patient safety which shape my interpretation of how impact becomes meaningful.

Having developed understanding of the creation and maintenance of resilience in medication administration I questioned myself about how I could share this learning so my PhD study had impact:

'The implications of this study for practice are clear, but translating it into practice is a significant driver, otherwise what was the point of the PhD? As I near the end of my write up, I want to ensure I progress learning in this small but significant area to give something back to my profession.' (Reflective diary September 2024)

Recommendations for practice built on this study's strengths and limitations (chapter 7 section 7.6). Looking for more ways to make a positive contribution to patient safety and nursing this researcher has started to explore further opportunities for knowledge dissemination and self-development as an early career researcher and as a nurse who wants to make a difference. Reflexivity has shown me that future safe effective care in medication administration occurs not simply from my input but from nurses' professional obligation for CPD and education driving a culture of learning and change. Recognising this helps me maintain a balanced view of my contribution.

8.2.2 Implications

Practice implications naturally lead on from evidence synthesis and understanding the study's strengths and limitations, these then offer insight into recommendations for practice and future research.

This feedback from the systematic review peer reviewer:

"I appreciate this review and think it will be a great read for our nursing safety/quality leads"

stimulated the need to make sure a 'great read' was transformed into relevant recommendations to provide insight into any future changes in nursing practice.

The importance of the findings from this study comes from their contribution to the exploration of resilience in nursing practice during medication administration.

Understanding this at the micro level of the individual, and meso level of the team, meant also taking account of the significance of context at all system levels, including

the organisational (macro) level. This knowledge development added value to this researcher's evolving understanding of human factors and resilient practice in medication and patient safety. Knowledge gained also contributed to making connections between resilience and feedback loops, thus generating new insights and offering novel contributions to existing understanding

Although local context is seen as key to making suggestions from existing research (Lyng et al., 2021; WHO, 2021b), recommendations for practice from this study may not be transferable to other settings, even within the same Trust or more nationally, as discussed in chapter 7 (section 7.6.4.2). It has been suggested that resilience is understood in relation to context and collaboration therefore it cannot be operationalised uniformly in different settings (Lyng et al., 2022). This was confirmed in this study where the creation and maintenance of resilience was shaped by dynamic and static contextual factors.

Findings from this study showed that ward patient flow (admissions, discharges and moving patients), immediate patient needs, and interruptions and distractions, all impacted the provision of timely and safe medication. These findings can be transferable because the study and context are clearly described.

Showing how individuals and teams create and maintain resilience during medication administration highlighted the contextual drivers for behaviours, the resilient strategies employed, and any outcomes. This builds on existing knowledge, and proposals are suggested for consideration in future research in section 8.3.4.

The effective and riskier nursing practices around medication administration have identified what works well to facilitate safety and quality, and what could impact safety; all are safety relevant. Sharing these is an important aspect of improvement science (The Health Foundation, 2014). Although the Health Foundation's Framework for Measuring and Monitoring Safety (MMSF) is now over twenty years old, it is still relevant today, influencing conceptualisation and opportunities for improvements in safety when used over time (The Health Foundation, 2014). How safety is maintained over time is also part of creating the setting for safety. This was addressed by creating the context specific aspects of the necessary factors for resilience (figure 7.2), a unique contribution to safety which is part of recommendations for practice discussed below in section 8.3.

From synthesising identified implications for practice from tables in each findings chapter, several key areas have been identified:

- Clarity between variations and adaptations was sought (chapter 5, figure 5.1). This was a starting point for the identification of resilience and how it is created and maintained. This is a positive starting point for learning and development supporting medication administration practice changes; especially in transforming short-lasting, intermittent resilient strategies to long-lasting regular strategies that could have a positive long-term impact on safety.
- Safety-relevant outcomes from nurse's resilient strategies have been explored in relation to patient safety chapter 6 (sections 6.4 and 6.5), again an opportunity for practice learning where all safety-relevant events are opportunities for maintaining safety around medication administration (Iflaifel et al., 2020).
- Including patients and confirmation of their needs and wants at every task level of the medication administration process is an emergent implication for future practice from this PhD study that only tangentially explored the patient's position. There is an opportunity for assumptions about patient's views on essential safety areas such as patient identity checks (chapter 5, section 5.4.3.2) to be explored to contribute to long-term safety in clinical practice.
- Recognition of the complex and changing environment in which nurses practice and how this impacts medication administration is not often acknowledged but does have an impact on safe and quality care. At the level of the individual and local ward-level, nurses and teams could use this as an opportunity to explore areas where risk could be reduced by collaborative learning and shared problem solving (Schot et al., 2020), developing local safety cultures and contributing to a robust organisational safety culture.
- The impact of local contextual factors such as space challenges are found to be significant (chapter 4, section 4.4.2). Operationally, contextual factors have been identified in this study as impacting patient safety and nursing practice during medication administration. These local factors have implications for quality and safe nursing practice which could be addressed through education with a human factors and socio-technical lens. This research suggests that areas relating to the working environment, confidentiality, infection control, training and education, and access to central functions are all organisation-wide issues that should be recognised as latent factors impacting safety.
- While local and national guidelines and policy representing WAP are clearly safety frameworks contributing to reliable and safe practice, there is a natural gap between WAP and WAD (Ashour et al., 2021). This has implications for the degree of variation and the types of resilient adaptive strategies accepted

locally and organisationally. Clarity around nurses' agency in decision making and problem solving during medication administration could help individuals and teams collaborate on safe borders for medication administration practice. This could contribute to enhanced long-lasting safety during medication administration beyond the timeframe of one work shift, with implications for maintaining long-term best practice and safety.

8.3 Translating evidence into improvement: barriers and recommendations for practice

Moving beyond the data is a necessary part of making recommendations (Braun & Clarke, 2022). Findings support specific suggestions that could enhance safety in medication administration, however the barriers to these practical recommendations are significant and must be acknowledged.

There is a historic gap between evidence and getting it into practice (Grimshaw et al., 2012; WHO, 2021b). Results from a systematic review on barriers to research utilisation in nursing (Jabonete & Roxas, 2022), found three main barriers: setting (including organisational characteristics), presentation related factors (how accessible the research is to nurses) and nurse-related factors. In addition, lack of time was perceived to be the most significant barrier. Recommendations outlined below acknowledge these barriers by suggesting realistic actions taking into consideration overall context. It is suggested that reducing the 'knowing-doing gap' by speeding up the transference of evidence to practice (WHO, 2021b) is key for implementing change.

Data driven recommendations have come directly from study participants displayed in chapter 5, recognising the importance of participant's insight and risk sharing across all system levels. Although recommendations are suggestions made from the perspective of this researcher, any future potential actions should accommodate stakeholder engagement and input from all systems levels prior to uptake.

Although individual, ward and organisation systems levels are used to theme recommendations for practice in the next section, many have shown that they operate at one system level and also have potential to impact other systems levels.

8.3.1 Recommendations operating at individual (micro) level

It can be categorically stated that most of the time in healthcare, everyday processes work safely (Braithwaite et al., 2015; Reason et al., 1990). Data driven recommendations support the view that nurses are mechanisms for resilience and

safety (Iflaifel et al., 2020). Critical thinking and decision making are a key function of resilience at all levels (Lyng et al., 2022; Wiig et al., 2020).

A recommendation would be that at the individual level, nurses be encouraged to reflect on their tacit practices that contribute to safety in medication administration, and to view these as resilient strategies supporting quality care.

Including participant suggestions emerging from individual experiences supports Lawton et al's assertion that individuals are key in offering solutions that are more readily acceptable to their peers and thus more likely to be adopted (Lawton et al., 2014). Participant reflections on strengthening medication safety are presented in chapter 5, table 5.2.

This PhD study findings suggest risk and safety are held at the individual level through the rulings of policy and the professional Code (NMC, 2018). The gap between WAP and WAD is an acknowledged issue in safety (Ashour et al., 2021). Being seen as guides to WAD, policy and guidelines are means to assure reliability in practice but are not intended to outline practice under every situation or circumstance. Nursing review of accessibility, scope, and clarity in trust guidelines are recommended, to gather suggestions on where minor adjustments could impact on safe medication related practice.

For example, policies and procedural guidelines were found to be easily accessible to study participants using the online system on desktop computers. Yet one participant (iNT4) reflected that easier access to medication-related information would result from installing a desktop computer with a big screen in the treatment room where medication was prepared. This suggestion would have an impact at the level of the individual, but also at ward and organisation levels by improving accessibility to guidelines, maintaining safety in information seeking, and enhancing important central functions. Another participant-led reflection (iNT2) concerned the scope of guidelines, where quick access to information for the administration of non-prescribed emergency fluids was a suggestion for supporting clinical judgement and clarity for their own 'safety' in terms of accountability.

Safety-relevant concerns from risky practice around patient identity checks and medication expiry dates were themed as potential active failures using a deductively applied framework of contributory factors to error (Lawton, McEachan, et al., 2012).

Suggestions to mitigate error focus first on the individual at micro level, where insights on risk management could impact aspects of normalised deviance and safe boundaries. At ward and organisation level a recommendation would be to review the

current medicines policies to ensure clear, realistic expectations for patient identity checks beyond situations when the patient is not wearing an identity band. For example, consideration of options for checking identity when the patient is known to the nurse administering the medication. Additional education and understanding of professional accountability could form part of macro level recommendations. These should be seen as a priority considering incorrect identification is part of the WHO global action plan; suggestions from WHO focus on improving communication with patients and colleagues (WHO, 2021b) .

A further safety-relevant recommendation operating at individual level but with necessary input from stakeholders (pharmacists and nursing team at ward level) is ensuring medications are not expired. Efficacy of medication is often reduced beyond the expiry date, which has implications for patient safety (chapter 5, section 5.3.2.2, participants NT3, NS7, NS11). A simple process recommendation would be to gain clarity at ward level for which individual does the expiry date checks, and when such checks should take place.

8.3.2 Recommendations operating at ward (meso) level

Sharing how nurses and teams compensate for organisational pressures and local triggers through resilient adaptive strategies is a fundamental aspect of the resilience feedback loop (Chapter 7, table 7.1 and figure 7.1); where learning and collaboration contribute to safe systems. Recommendations to share how adaptive strategies could compensate for ward pressures relating to management of staff and staffing levels, align contributory factors to error from the YCFF framework (Lawton, McEachan, et al., 2012). Sharing, learning, and changes to practice at ward team level could go some way to mitigate the impact of staff shortages. However, it is this researcher's opinion that building a certain amount of redundancy in the system could further support reliability, organisational resilience, and safety over time with the potential for long-lasting safe staffing rather than short-lasting adaptive strategies responding to low staffing levels (chapter 6, section 6.4.6 participant iNT2).

At ward level, short staffing levels and the impact these had on practice were evident in the data. Two participants (iNS2 and iNT8) suggested ways to reduce pressures on nurses during drug rounds or when administering medication outside of the drug round. While being cognisant of the challenges of short staffing, they suggested allocation of a nurse to each bay of patients, and the addition of a floating nurse, or dedicated shift co-ordinator, to mitigate pressures impacting on medication administration.

Conversations and meetings at ward level, and other communication options such as handovers and the safety brief, are all opportunities for sharing and developing existing strategies into long-lasting and more regular adaptative strategies that have the potential to promote desirable outcomes at every systems level. A participant (iNT8), reflected on their past experience of occasional 30 minute staff meetings, where the focus was often around safety. Their suggestion was to focus first on drug omissions, where by working together, some emergent ideas to tackle this issue could be shared and agreed. Another participant (iNS4) identified the ward council as an opportunity to discuss changes and stressed the necessity of providing evidence to prove effectiveness of any changes as 'worthwhile'. This participant reflection could be instrumental to empowering local suggestions for change.

Online annual medication safety updates were ongoing as part of mandatory training on both study wards. However, a recommendation would be for an additional dynamic and focussed opportunity for learning where medication related safety-events could be highlighted in the ward safety brief free-text section and shared with the ward team as part of the safety briefing. Work apps and existing safety briefs could also be used to disseminate updates and generate quick discussions about safety, supporting staff to understand and follow latest safety guidelines and contribute to learning.

There is an opportunity to reduce risk around pre-preparation of IVs and double checking during high risk medication administration. For more unusual or complicated medication regimens, a recommendation for patient specific pharmacy pre-prepared intravenous medicines could save time. This suggestion could impact local conditions and safety, where lack of space and the potential risks to sterility in the drug preparation area on ward 1 was a pressure for adaptation arising from the ward's static internal environment (chapter 4, section 4.2.6).

8.3.3 Recommendation operating at organisation (macro) level

A recommendation to support nurses' agency during medication administration is that at organisational level, resilience through critical thinking and problem-solving is recognised as an important contributor to operational safety and systems resilience (Lyng et al., 2021; Macrae & Wiig, 2019).

Understanding this at macro level is imperative as it is a significant barrier to utilisation of research evidence to reflect current safety approaches (Jabonete & Roxas, 2022), especially in organisation guidelines around what constitutes best practice.

Both study sites used paper drug charts, although utilisation of electronic records and medication administration technologies were in process. Recommendations would be

that any future technologies providing a check, for example a bar code device to check the correct medication and patient's identity against the drug prescription, would align with current thinking concerning the contribution of technologies to safety; with a focus on how the error defence (Reason, 2000a) (that is the technology) could fail, rather than the worker being the failure.

A recommendation evolving from this ergonomically focussed recommendation is for more learning opportunities through training and education in medicines management, human factors and patient safety which would serve to broaden staff understanding of safety and risk management. This is available through the e-learning for health portal and this learning could support the Patient Safety Incident Response Framework (PSIRF) (NHS England, 2022), a systems approach to understand, build and maintain effective systems and processes to respond to patient safety incidents, focusing on learning and improvement.

Recommendations for changes to training opportunities and sharing practice may encourage curiosity and new thinking. This in turn could feedback and impact individual and team practices as mechanisms for safe outcomes. This feedback loop is represented in chapter 7, figure 7.1. Risk is held at all system levels, but it is at organisational level where risk gathering, and coordination occurs in terms of logging safety issues and events. Reviewing safety relevant events and feeding back any learning to individuals and teams in the organisation has potential for sustaining organisational resilience.

Fostering a safety culture based on safety II perspectives is recommended for its ability to avoid a defensive error culture. An additional suggestion would be to recommend that discussions at organisation level include all safety relevant events at all harm levels. NHS England harm grading guidance (used in Patient Safety Incident Response Framework (PSIRF)) (NHS England, 2022) defines harm at five levels, from no harm to fatal harm. Those at lower levels are often seen as not worthy of scrutiny at organisational level, or for organisational learning, and are the remit of ward managers and matrons. This has implications for sharing learning from where near misses or where there has been no harm from medication-related safety events fails to incorporate the feedback loop identified in the new roadmap of resilience model (chapter 7, figure 7.1) arising from this PhD study's findings.

Another recommendation is for a reflective review, seen by authors of the Resilience in Healthcare programme (Lyng et al., 2022) as a key capacity of organisational resilience linked to professional accountability. This could focus on ward and organisation level safety culture. A suggestion would be to use the Manchester Patient Safety Framework

(MaPSaF) (Parker, 2009) or similar, for understanding and exploring organisational safety culture, and understanding strengths and weaknesses and areas for improvement.

In this chapter section source data is linked to recommendations for practice operating within and across the different systems levels of the individual, the ward, and the organisation. Recommendations to appraise and develop the existing safety culture have been made, in order to create a system that is flexible enough to allow resilient practices to mitigate risk and promote safety in nurse medication administration.

8.3.4 Recommendations for future research

Using the PhD study objectives (table 1.2) as an opportunity to look forward helps signpost where further research could question, strengthen or develop existing knowledge or build on the findings from this current study.

Recommendations arising from PhD Objective 1 are identified below.

- There was some concern from this researcher about the language used in current safety research and conceptual literature, where nomenclature was perceived to lag behind the safety II approach. Nomenclature has potential for further exploration and consideration in future research, to ensure alignment with contemporary thinking.
- There is an opportunity to theory test and develop the unique model (figure 5.1) which frames key concepts and relatedness between error and safety terminologies concerning unintentional variations and intentional adaptive strategies. This model could be applied to future research in limited and relevant areas to test the legitimacy of amending the language and proposal of new names for safety practices and safety events, outlining safety II as a safety culture rather than a blame culture. A suggestion might be to consider the term 'safety-relevant events' replacing 'errors', and using the term 'safety-relevant practices' as an overall term encompassing 'adaptations' and 'variations'. The term 'deviations' might also be replaced in certain circumstances.
- The systematic review (chapter 2) highlighted limitations in the evidence base concerning lack of clarity and application to resilience in the nursing literature. This suggests a clear recommendation for development of future research in the field of resilience in nursing practice.

Recommendations arising from PhD Objectives 2, 3 and 4 are identified below.

Validating safety II and adaptation as a resilient mechanism for safety and utilising a systems approach when exploring safety in the context of resilience and

medication administration practice are areas where further nursing research could strengthen and build on findings from this PhD study and add to existing theory with the opportunity to impact future practice in these two areas.

- An opportunity exists to gain further insight in understanding the circumstances under which nurses feel the need to adapt or adjust their medication administration practice, with any associated pressures when adhering (or not) to professional standards and local and national guidelines (PhD objectives 2 and 3). Aligned to this are recommendations to further explore drivers and triggers for adaptative strategies and associated mechanisms, characteristics and any consequential outcomes (PhD objective 3).
- Explorative research on the gap between WAP and WAD (PhD objective 2) and whether there are opportunities to strengthen policies and also provide more 'permission' for nurses to use their clinical expertise and experience is an opportunity for further research.
- Findings from this study suggest decision making sometimes extends beyond guidelines when responding to pressures and contextual factors; for example, pre-preparation of medication (chapter 6, section 6.4.6.2). Recommendations for future research in this area exploring safety outcomes from resilient adaptive strategies has the potential to positively impact on safety during medication administration processes (PhD objectives 2, 3 & 4).
- The study sites in this PhD study did not use electronic prescribing and medication administration (EPMA) technology, nor did they have an integrated patient record system. Review findings from chapter 2 suggest technology has widely focused on ensuring reliability, such as bar coding medication and/or patient's identity bands to meet the safety requirements of the 5Rs. Further research examining how technology is incorporated as a resilient instrument for medication administration, where adaptations compensating for systems pressures are built into the interface of the technology would move forward research in an area largely viewed through a safety lens (PhD objectives 3 & 4).
- Data from this study showed how participants created opportunities to educate patients about their drugs (for example chapter 5, section 5.2.5 and chapter 6, section 6.4.2). In these examples new and existing medication regimens were explained to support patient understanding and preparation for discharge. Study participants supported patients to understand their drugs, the timings and why these are important, and what they have learned in hospital to make it easier to take their drugs at home as part of medication optimisation. Although it is

difficult to extrapolate beyond this study's findings, future nursing research focussing on the importance of patient learning and understanding around medication has potential to significantly impact medication concordance and medicine reconciliation.

8.4 Reflexive commentary: reflection & evaluation of study write up

Reflexivity and simultaneous reflection (a common practice in nursing) have been an essential part of this study. The reflexive diary ended up being a combination of notes from reflections on, and during, data collection and analysis, and expressions of this researcher's reflexive thoughts and positionality throughout. This final reflective work is an evaluation of what was done during this study, examining what was learnt about this researcher and their decisions and actions and outcomes of these during this PhD study's journey (Braun & Clarke, 2022).

At the start of the PhD establishing a focused study aim meant that the study went from 'why do we still make errors?' to 'how do we create and maintain safety?' Influenced by Vogt to make sure to examine the 'how', and exploring appropriate methodologies were necessary parts to developing the methods (Vogt, 2008). The decision to use appropriate academic works to guide and signpost the study journey meant there were existing frameworks to follow in a what often felt like a nebulous world. The works of Vogt and Braun and Clarke added structure and direction to a sometimes confusing journey (Braun & Clarke, 2022; Vogt, 2008).

What was learnt for this researcher was that having a direction was integral to feeling safe, but creating the map was the highlight.

'The decision to fully commit to ethnographic research was relatively easy. After a thorough consideration of several other methodologies and methods it was clear that ethnography would enable insight, perspective and findings to answer the study aim. The overarching study question was firmly embedded in my own clinical practice, and I learnt that ideas development and iteration are vital in qualitative research; and this takes time. A lot of time. Hindsight from gathering the data and analysis suggested the importance for new researchers to fully understand the commitment needed for data collection over time for observation and interview, and time needed for iterative exploration and the process of thematic analysis.'

Ontologically this study viewed nurses as part of a living, moving, complex social structure which they navigated independently, but also within their ward team and their hospital, while responding to continuously changing contextual pressures and triggers.

At times I struggled with being transparent and mindful of my own bias and assumptions. Sharing this with supervisors has helped with understanding both my influence on the process of data collection, and interpretation of the data.' (Reflexive diary June 2024)

Although there is a knowledge gap for understanding resilience in nursing medication administration, the use of an ethnographic approach has meant that by fully exploring the impact of context and environment has enhanced understanding of the complexity of the setting, and the many pressures and triggers nurses contend with during medication administration.

'This meant that during thematic analysis, themes on environmental, internal, and external contexts were identified as pressures under which the responses of variation and resilience practices were made. These developed understanding of the impact of the conditions for resilience; and later, an awareness that the interpretive aspect of the ethnographic approach led me to identify findings beyond what was embedded in the existing literature.' (Reflexive diary May 2025)

In Braun and Clarke's (2022) approach to reflexive thematic analysis, the researcher is not expected to be a neutral observer, they are active in making meaning from data. Reflexivity helped to acknowledge and work with this. In critically examining themselves this researcher often got a bit overwhelmed by the amount of data they had collected.

'The gains to having so much data, far outweigh the negatives of having to transcribe and code it all! It took me a while to realise I had permission to prioritise some data to address the objectives. Interpretation, meaning and focus comes from me, from my position and my interpretation, so as long as I stick close to the data and the study objectives, the analytic story arc that is created from my being so closely integrated in the findings is a positive contribution to what is known, and to what is not yet known.' (Reflexive diary May 2024)

In managing the amount of data, the decision had to be made to focus on some key themes. This decision helped to clarify a way forward.

'It's really hard to let some of the coded and themed data go and not explore it all during analysis. I just have to think about it in terms of 'what story do I want to tell'? but also staying true to the objectives. The themes around the environment I've decided to use as contributory data, so I can draw on coded elements to support the specific features of a significant data extract that I have chosen to progress the analytic narrative.' (Reflexive diary June 2024)

Therefore, an array of generative themes have contributed to existing understanding in resilient healthcare as part of what Braun and Clarke call making the argument (Braun & Clarke, 2022). Themes have influenced suggestions and recommendations for future practice and study.

'The epistemological position, in fully acknowledging the relationship between me the researcher, the research process and the findings, means that my perspective has influenced the findings and synthesis of findings. I have positioned myself as the interpreter of the perceptions, experiences and

practices that the participants have kindly shared. I've taken their knowledge and views as significant and true data, showing how they see and shape their clinical world through varying and adapting practice to maintain safety'. (Reflexive diary, May 2025)

Using an abductive approach has allowed the appropriate use of existing frameworks, for exploring and interpreting data. For example, in chapter 5 the application of YCFF provided valuable data for contributory factors to error and safety (Lawton, McEachan, et al., 2012). A deductive application of this framework was successful in supporting coding-to-theme development at the stage of the interim research questions, examining variations as a step to exploring adaptive strategies. Braun and Clarke suggest avoiding 'positivism creep' by encouraging maintaining a qualitative orientation, supported with reflexivity about researcher assumptions (Braun & Clarke, 2022). However, abductive reasoning is seen as part of the ethnographic philosophy because of its recursive and iterative approach (Green et al., 2012).

'Study strengths and limitations are discussed at the end of chapter 7, however, study highlights extend beyond these. The personal joy of being back in practice, amongst fellow nurses as a non-participant observer, enabled a sense of returning to my vocation and although an outsider, somehow being a small part of nursing. This was reflected in my demeanour, and I feel this positivity and enthusiasm helped with enrolling participants to the study. Now I'm nearing the end of my study, that 'what next'? question has popped up. But first I want to reflect on what I have learnt about myself.

I now know that I am determined and dogged – good qualities for a PhD that started in 2016! I also realise that somewhere along the way I learnt to be a detail person. I've learned that circling the drain of the drama triangle is only OK for a day or two, after that, it's just time to move on. I've learnt that where my knowledge and skills fell short, to explore avenues of learning e.g. why didn't I go on a systematic review course? And well done me for attending a workshop on semi-structured interviews. I've learned a whole lot of depth to research methodologies and methods, enough to feel comfortable with teaching these subjects. I've learned that it's a lonely old business, and having my Leeds PhD buddies and my Plymouth PhD musketeers has been a tremendous support.' (Reflexive diary June 2025).

Finally, personal insight has shown that reflexivity has not just changed the shape of my research but it has shaped my understanding, decisions, changes in thinking, the type of researcher I have become, building confidence and a sense of ownership of my work.

8.5 Looking forward: dissemination strategies & research opportunities

A developmental area for this researcher is to attend and present at conferences beyond South-West and national opportunities.

To share understanding resulting from this research, this researcher is keen to publish at least two articles in relevant journals. Chapter 5 findings would sit with a journal like the Nursing Times or Nursing Standard, and chapter 6 perhaps with the Journal of Advanced Nursing, or Nursing Management. However, opportunities to consult with journal editors for a series of two articles in one journal or publish an article in any patient safety special editions could be explored. A broader audience is also considered by looking at journals with interests in safety science, ergonomics or socio-technical systems and patient safety.

This researcher has explored opportunities for developing their broader research skills. She will continue as a member of the Epilepsy Nurse Association's core committee. The remit is to update the existing buccal midazolam administration guidelines. This is ongoing national work with the responsibility to review and produce updated best practice guidelines for oral midazolam administration in primary care settings. Work with this group started September 2024 and the completion date is December 2025.

This researcher will continue with opportunities for peer review in journals relevant to their expertise. They are registered as a peer reviewer for BMJ Open Quality and BioMed Central (BMC) journals. This researcher will also continue with book review opportunities, they are registered with SAGE publications.

As an early career researcher this researcher has started networking and exploring opportunities for involvement in existing or future research around their key specialist areas of resilience, medication administration and patient safety. Other opportunities are hoped to arise from UKRI policy fellowships, and opportunities for health researchers seeking funding via the NIHR website.

8.6 Thesis conclusion

This PhD study had a clear aim, to explore how resilience is created and maintained in nursing medication administration practice in the hospital inpatient setting. This researcher explored gaps in research and opportunities to build on findings from existing studies and conceptual approaches to extend current understanding by meeting the PhD aim, therefore contributing important insights into resilience and patient safety in clinical practice.

Key findings included systematic review results (chapter 2) in previously unexplored nursing practices showing evidence for the effectiveness of resilience strategies and interpretation of resilience in the work system. Identifying resilience triggers was a

novel review finding which later provided a fresh perspective influencing interpretation of observation, interview and document data.

Using qualitative ethnographic research was an effective method to provide a more detailed understanding of resilience by exploring both individual nurse practice to create and maintain safety, and to situate nursing practice within its wider context making visible the tacit and taken for granted aspects of resilient practice. Positionality enhanced trustworthiness through credibility, transparency, reflexivity and confirmability. This exploratory research required methods that could capture complexity, tacit knowledge, WAD and the dynamic nature of clinical practice, uniquely documenting evidence for the creation and maintenance of resilience in medication administration practice.

The terminology and categorisation of existing patient safety and error models was challenged. This study provided rich data to enable discernment between local triggers and wider contextual pressures influencing resilience strategies for patient safety and organisational functioning.

Local and national policies and guidelines were used to review and document WAP, and the gaps between WAP and WAD were emphasised, extending existing understanding of variations, adaptations and resilience in circumstances where guidelines were insufficient or unclear. Work as it was actually done in real-time practice was observed and explored in interviews, identifying participant's perceptions of risk and resilience, the realities of WAD and organisational ruling in medication administration.

Using the safety II approach added to the small pool of empirical literature on how nurses create and maintain safety, as opposed to what they do wrong where error causation has been the usual focus. This approach added strength by acknowledging the realities of complexity and context and the impact of this on the functioning of socio-technical healthcare work systems. When examining the impact of normalised deviance (Amalberti et al., 2006), interpretation of findings introduced awareness of risky deviations and their impact on errors and safety, areas of key clinical interest.

Conditions for, and consequences of unintentional variations and intentional adaptive strategies were explored; and perceptions of risk and resilience was examined in the context of changes to practice. Findings revealed participant's reality and what was known from their perspectives, providing novel insights into nursing practices and where they varied from plans of work. This added depth and a broader comprehension to changes in behaviours resulting from varying or adapting practice during medication administration. This laid the foundation for understanding any tensions participants

faced when challenged by complexity while working within guidelines that did not always acknowledge problem solving and critical thinking as aspects of WAP.

These perspectives contributed to interpretation of the discourse of resilience in healthcare, explored at three system levels, moving beyond earlier work by providing real world insight into safety outcomes and organisational resilience resulting from individual and team resilient strategies. This resulted in a novel synthesised approach to describing practice behaviours through identification of their characteristics with associated observed, stated or inferred outcomes. The researcher's nascent attempts at typology act as an opportunity for further interpretation in future research.

A model of key concepts and relatedness of error and safety terminology as applied to variations and adaptations (chapter 5 figure 5.1) was a contribution to future research which lacks theory-testing and applicability as of yet. However, this model, a framework to clarify and enhance existing safety and conceptual theory, used a style of language consistent with a safety II approach to patient safety, and acts an exemplar, laying the groundwork for future safety science research.

Complexities in the context of medication administration were found to arise from the local and wider environmental settings in which nurses practice. Findings showed the range of contextual factors from every systems level, and from external factors, such as the pressures of pandemics and strikes. Complexity was also shown to be clinically important, impacted by aspects of the local fixed and dynamic environments such as tidiness, space and functional aspects of the drug trolleys and equipment. Interpreted as latent conditions impacting safety (Higham & Vincent, 2021; Reason, 1997) these wider ethnographic findings enriched understanding of context, showing the significance of these factors for understanding the drivers for variations and adaptations, and their contribution to safety.

Themed data on communication and collaboration (chapter 6, section 6.4.8) provided new insight into adaptive strategies as distinct mechanisms for safety specifically during medication administration. These were identified as expressions of resilience operating at individual and team system levels. Communication and collaboration across teams was also found to support wider organisational resilience in a continuous feedback loop.

Using the SEIPS 2.0 model to interpret data influenced the exploration of systems, processes and outcomes (Holden, Carayon, et al., 2013), and identified the feedback loop as a necessary and significant aspect of systems resilience. Encouraged to use simplified tools based on SEIPS frameworks in studies of systems resilience (Holden & Carayon, 2021), a model of the creation and maintenance of resilience in nursing

medication administration (chapter 7, figure 7.1) synthesised the study findings and addressed the PhD aim. Novelty was established by creating this model as a roadmap of resilience in medication administration. A systems story tool (chapter 7, table 7.1) provided clarity and understanding of the logic model for creation and maintenance of resilience in nursing medication administration practice. This researcher introduced characteristics of resilient strategies as an additional aspect of the roadmap of resilience model (chapter 7, figure 7.1), and introduced 'proactive' and 'reactive' characteristics (Agostini et al., 2023). These innovations more closely represented interpretation of this study's data, offering a clearer perspective when applied to resilience in medication administration.

A framework of necessary factors for building resilience in nursing medication administration (chapter 7, figure 7.2) was another novel PhD study outcome. This was a contribution to ward nurses and managers for use in reviewing resilience in medication administration practice at the micro level of the ward. This framework suggests necessary factors to support the creation and long-term maintenance of resilience and safety in medication administration.

Using an illustrative approach to interpret this study's data, the conceptual framework of resilience was explored in an innovative analytic story arc. Weaved throughout the chapters this distinctive thread clarified abductive interpretive approaches to explore and analyse the data to extend understanding of how nurses sought to address an array of pressures and triggers which significantly challenged safety through a process of problem solving and resilient strategies. The outcomes of which were found to largely support patient safety and wider organisational system resilience.

By fully addressing the PhD aim and objectives, this study offers a clinically meaningful original contribution to how resilience is created and maintained in nursing medication administration practice in the hospital inpatient setting.

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Appendix A

Patient Facing Poster

Research in this clinical area

You may see someone watching our nursing team. This is because we are taking part in some research on how our team safely and reliably administer medications.

If you would prefer that nursing staff are not observed while providing care to you, then please let us know. This will not affect your care in any way.

IRAS ID: 293041. Ethics approval reference: 21/HRA/4518 Date of approval: 21/12/21

If you have any questions please contact the researcher via email
Pollyanna.Kellett@plymouth.ac.uk

If you have any concerns or complaints please contact the researcher: Pollyanna.Kellett@plymouth.ac.uk; the ward manager, or PALS: 01803 655838



https://www.plymouth.ac.uk/uploads/production/media_asset/file/17/17791/medium_1206231_1280x720_.jpg

Appendix B

Nursing Team Participant Information Sheet

An ethnographic study to explore how resilience is created and maintained in nursing medication administration practice in the hospital inpatient setting. (IRAS ID: 293041)

Invitation

Firstly, thank you for taking the time to think about being involved in this research study. Before you decide please take time read the following information to help you decide if you want to take part. The purpose of this research is to explore how you maintain safety during medication administration.

Part 1 of this sheet tells you about the background and purpose of the study.

Part 2 gives more information about the conduct of the study.

Please ask or contact the principal researcher via email if there is anything that is not clear or if you would like more information.

Part 1

Who is conducting the research?

Pollyanna Kellett (PK) is the principal researcher. She is a registered nurse and nursing lecturer. This study is a student PhD project supervised by the University of Leeds. Although we have been given permission to conduct the research within your hospital, the research project is independent of [Name Removed] NHS Foundation Trust.

What is the purpose of the project?

The NHS wants to improve patient safety and quality. Medication safety is a sub-theme of the patient safety agenda, and we want to look at how the nursing team works to maintain safety during medication administration, which is largely a nursing role. In this study we will explore how nurses and nursing associates maintain safety through adapting their practice and behaviours, in response to varying conditions, what we call 'resilience'.

The aim of this PhD study is to explore how resilience is created and maintained in nursing medication administration practice in the hospital inpatient setting. The whole study will last about 12 months. There are two parts, Part 1

is the observation phase, (outlined in this information sheet) lasting about 8 months, followed by Part 2, the semi-structured interview phase, lasting about 4 months.

What will happen if my clinical area agrees to be in the study?

Two inpatient clinical areas will be identified and recruited to the study. Once agreement for the study has been given, the principal researcher will be spending an observation period of 5 hours in your clinical area. During this time, they will be collecting data in three ways:

1) Through directly observing (shadowing) one member of staff administering medications to their allocated group of patients. **What will I be required to do?** It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep (and be asked to sign a consent form) and you can still withdraw at any time, and you do not have to give a reason. We are looking for registered nurses and registered nursing associates who would provide written consent for their medication preparation and administration, to be observed by the researcher only once during the study period. We would like to recruit 12 members of staff in each of the two clinical areas. You will need to decide whether you would like to take part – to be closely watched by the researcher from a distance of 1-2 metres away, while preparing and administering medications to patients. The observation will occur during one working shift, for the duration of one medication administration period, your drug 'round'. This is likely to be between 30 minutes and 1.5 hours. As part of this, after your drug round, you will be asked some questions to clarify what the observer has seen in an 'ad hoc' informal interview lasting no more than 15 minutes. Only handwritten notes from your interview will be taken by the researcher, written in the field notebook and destroyed as soon as they have been transcribed, and stored on the secure University of Leeds OneDrive. We would also like to collect some **demographic information** from you (age, gender, experience and training) on a separate form. You are free to decline to fill out all or part of the demographic form.

Patients: It is important that patients understand why you are being observed. Ward posters will explain the research, but where necessary, if they ask, or if they are in a side room, we think it is better if you tell them and seek their verbal approval.

2) By gathering information on other 'medication related activity' amongst the wider nursing team, for example double checking intravenous medications with the observed participant. **What will I be required to do?** If

you are supporting the observed participant, we will ask for your verbal consent to collect details of this sort of activity either at the start of your shift or at the time of the activity being observed.

3) By collecting other general information during the 5 hour period, such as getting a feel for how busy the ward is, and the practicalities and behaviours that contribute to the administration of medication. **What will I be required to do?** We would like you to carry on with your clinical activities just as you normally do, while the researcher collects this ethnographic data from the ward environment.

What are the possible benefits of taking part?

While there are no immediate benefits for the staff participating in the study, we hope that participation may lead to improvements in patient safety and the body of nursing research about medication administration.

What are the possible disadvantages of taking part?

We will make every effort to make you feel comfortable. The main potential risk is that by being observed you may feel pressurised to change your practice or judged in some way. The principal researcher is a registered nurse who wants to see your normal practice in all circumstances and is not there to judge. They will answer any questions you have. You are under no obligation to participate and can withdraw from the study without providing a reason and with no come-back. The researcher will offer all participants an opportunity to debrief after the observation period.

What do I have to do?

If you have understood the information, have had your questions answered and would like to participate, please contact the researcher Pollyanna Kellett via the email below. If selected for the study you will be asked to complete a consent form and a copy will be given to you to keep.

Part 2

What will happen to my personal information?

The demographic information that we collect from you will be kept strictly confidential and will be stored separately from the research data. We will apply a numerical code to anonymise the research data so you cannot be identified in any reports or publications.

What will happen if I decide to withdraw from the study?

You are free to withdraw from the study at any time without penalty or consequence. If you choose to do so, please notify the research (PK). We would like to retain any data collected from you during the course of the study, but if you would like to withdraw it, you may do so up until the point at which it is analysed (up to 2 weeks after collection).

What will happen to the results of the research?

On completion of the study a dissemination event at your hospital will share the outcomes with you (the participants) and other key stakeholders. We will also share outcomes through journal publications and conference presentations.

It is possible for participants to request results from the investigators and this information would be available after the results have been published. The study protocol, full study report, anonymised participant data and any statistical code for generating the results will be made publicly available as part of the peer-reviewed publication within 12 months of completing data collection.

What type of information will be sought from me?

We will be gathering accurate data on what is happening in practice, how you safely administer medications to your patients, and how you maintain safety in the complex and varying conditions that you work in. This will help us to meet the research aim. If during the process of observing we see something that might have a direct impact on patient safety, breach practice policy or guidelines, we will discuss this privately with you and follow your hospital's reporting policy if necessary. In these circumstances anonymity and confidentiality have limits and it is important that you understand that for any disclosure where harm could be done to yourself or others, there is a professional (NMC) and HRA obligation to report this to all relevant authorities, so confidentiality cannot always be guaranteed. You can find out more about how we use your information by contacting Pollyanna Kellett (Pollyanna.kellett@plymouth.ac.uk). Alternatively you can contact the University of Leeds Data Protection Office (dpo@leeds.ac.uk).

Who is organising/ funding the research?

The research is academically supervised by the University of Leeds and supported and part-funded by the University of Plymouth as part of the researcher's PhD.

The University of Leeds is the sponsor for this study. Information from you will be used in order to undertake this research and the University of Leeds will act as the data controller for this study. This means that they are responsible for looking after your information and using it properly.

Your rights to access, change or move your information are limited, as we need to manage your information in specific ways to ensure the research is reliable and accurate. To safeguard your rights, we will use the minimum personally identifiable information as possible. The research we are doing is independent of the host organisation, [Name Removed] NHS Foundation Trust and no identifiable information or unprocessed raw data collected from the study will be shared directly with the host organisation.

Storage and destruction of data collected

Your data will be looked after in the following way:

All digital recordings will be stored in a secure University of Leeds server. All observation data will be transcribed and fully anonymised after a two week holding period to give you time to withdraw from the study if you choose to. After this period, it will not be possible to withdraw your data as it will not be identifiable. Any direct quotations from interviews included in published outputs will not be attributable to a specific individual. Data from the study will be stored on the secure University of Leeds OneDrive for three years after the collection of data.

Procedures for the handling, processing, storage and destruction of your data will be compliant with the General Data Protection Regulation 2018 and the University of Leeds Ethics Policy.

You may also wish to view the University of Leeds Privacy notices, which can be accessed here: <https://dataprotection.leeds.ac.uk/wp-content/uploads/sites/48/2019/02/Research-Privacy-Notice.pdf>

Questions:

You are welcome to ask questions about the project at any stage, please contact the principal researcher or Chief Investigator (contact details below).

Approval and consent

This study has been reviewed and given favourable opinion by The University of Leeds Research Ethics Committee and from the Health Research Authority

Ethics approval reference: 21/HRA/4518

You will be asked to sign a consent form before we start the observation.

What should I do if I have concerns about this study?

If you have any concerns or complaints about the conduct of this study, please contact the research team in the first instance (see contact details below). If you are not happy with their response you can contact Clare Skinner, Sponsor Representative on governance-ethics@leeds.ac.uk

If you want to complain about how researchers have handled your information, you can contact the University data protection officer using the email address dpo@leeds.ac.uk. If you believe your data is being processed in a way that is not lawful, you can complain to the Information Commissioner's Office (ICO) (www.ico.org.uk or 0303 123 1113).

Contact details

Principal researcher: Pollyanna Kellett Pollyanna.kellett@plymouth.ac.uk

Chief Investigator: Dr Jonathan Benn J.Benn2@leeds.ac.uk

Co-Director of the [Name Removed] Clinical School & PhD supervisor: Dr Susie Pearce: Susie.pearce@plymouth.ac.uk

Thank you for taking the time to read this information sheet. If you decide to participate, you will be given a copy of this information sheet and a signed consent form to keep.

Appendix C

Ethics Approval Letter

From: approvals@hra.nhs.uk <noreply@harp.org.uk>

Sent: 20 December 2021 10:10

To: Jonathan Benn <J.Benn2@leeds.ac.uk>; Pollyanna Kellett <psplrk@leeds.ac.uk>; bryony.deanfranklin@ucl.ac.uk; susie.pearce@plymouth.ac.uk; Jonathan Benn <J.Benn2@leeds.ac.uk>

Cc: Medicine and Health Research Governance <governance-ethics@leeds.ac.uk>

Subject: IRAS 293041. HRA & HCRW Approval issued

Dear Dr Benn

RE: IRAS 293041 Resilience in medication administration, HRA & HCRW Approval issued

Please find attached your HRA and HCRW letter of Approval.

You may now commence your study at those participating NHS organisations in England and Wales that have confirmed their capacity and capability to undertake their role in your study (where applicable). Detail on what form this confirmation should take, including when it may be assumed, is provided in the HRA and HCRW Approval letter.

User Feedback

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website: <https://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/>.

If you have any queries please do not hesitate to contact me.

Kind regards

Anna Bannister

Approvals Specialist

London | 4000

T. 0207 104 8021

E. approvals@hra.nhs.uk

Appendix D

Nursing Team Demographic Data Sheet

An ethnographic study to explore how resilience is created and maintained in nursing medication administration practice in the hospital inpatient setting. This sheet is for study participants who consent to participate in workstream 1 (1:1 observation only) and workstream 2 (semi-structured interview).

The provision of this information is voluntary. You are free to decline to fill out all or part of the demographic sheet without consequence should you not wish to answer any particular question or questions. The data you provide is anonymous. Your name will not be linked with the research materials, and you will not be identified or identifiable in the report or any output that results from the research. The responses you provide will be kept strictly confidential, will be stored separately from the research data, and will be held in a secure location and destroyed as soon as practicably possible.

If you have any questions or concerns, or want to contact the principal researcher, you can do so by email: Pollyanna.kellett@plymouth.ac.uk

What is your gender?	
What is your ethnicity?	
What is your age?	
What is your highest level of academic qualification?	
What is your grade (according to the NHS Agenda for Change pay band structure)	
How many years is it since you registered with the NMC?	
How many years of experience do you have in medication administration?	
Do you work full time or part time?	
Have you had any training in medication administration? If yes, please describe	

Have you had any training in human factors or patient safety? If yes, please describe	

If you want to make a complaint you can contact the principal researcher (Pollyanna Kellett) by email: Pollyanna.kellett@plymouth.ac.uk or the Chief Investigator (Dr Jonathan Benn) by email: J.Benn2@leeds.ac.uk

Appendix E

Consent Form



UNIVERSITY OF LEEDS

School of Psychology, Faculty of Medicine and Health

Consent to take part in: An ethnographic study to explore how resilience is created and maintained in nursing medication administration practice in the hospital inpatient setting

Add your initials next to the statement if you agree

Ethics approval reference: 21/HRA/4518
Date of ethics approval: 20/12/21

I confirm that I have read and understand the information sheet dated 26.09.2021 explaining the above research project and I have had the opportunity to ask questions about the project.	
I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline. I understand that if I wish to withdraw at any point, I will be asked if any collected anonymised data might still be used. I understand that after two weeks following my one-to-one observation or semi-structured interview, withdrawal will no longer be possible because data will have been anonymised and/or amalgamated and cannot be excluded.	
I understand that members of the research team may have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research. I understand that any direct quotations from interviews included in any published outputs will not be attributable to a specific individual. I understand that in the event of a patient safety issue, I will be asked to escalate this within usual reporting guidelines and confidentiality will need to be broken.	
I understand that relevant sections of the data collected during the study may be looked at by individuals from the University of Leeds, or from regulatory authorities where it is relevant to my taking part in this research.	
I agree to take part in the above research project and will inform the principal researcher should my contact details change.	

Name of participant	
Participant's signature	
Date	
Name of principal researcher	Pollyanna Kellett Pollyanna.kellett@pymouth.ac.uk
Signature	
Date*	

*To be signed and dated in the presence of the participant.

Once this has been signed by all parties the participant should receive a copy of the signed and dated participant consent form, the letter/ pre-written script/ information sheet and any other written information provided to the participants. A copy of the signed and dated consent form should be kept with the project's main documents which must be kept in a secure location.

Appendix F

Observational Data Collection Template

Descriptive notes	Reflective notes
1:1 observation	General ethnographic data
	Reflexive account
Informal ad hoc interview questions	Notes
Responses to ad hoc interview	
Other medication-related activity	

Appendix G

Nursing Team Sample Semi-Structured Interview Guide (Workstream 2)

(Please note that due to the semi-structured nature of qualitative research, it is often necessary to adapt the topic guide both within and between interviews in order to explore useful areas of interest within the broad research aims)

An ethnographic study to explore how resilience is created and maintained in nursing medication administration practice in the hospital inpatient setting. (IRAS ID: 293041)

Ethics approval reference: 21/HRA/4518

Before we start: This interview is to explore your understanding and practice of safety and reliability in medication administration in the complex and varying conditions that you work in. I will ask you questions and want to hear your thoughts in your own words. If during the interview I hear something that might have a direct impact on patient safety we will discuss this privately, and if necessary, we will follow your hospital's reporting policy. I am expecting the interview to last about an hour.

- Do you have you any questions?
- Can I confirm that you have received and read the Participant Information Sheet?
- Have you have signed your consent form and are you happy to proceed? We can stop the interview at any time, and you can withdraw from the study if you would like.
- I just need to explain again that I will be gathering your interview data on the voice recorder. I will apply an anonymous code, and I will send it off to be professionally transcribed. Then I will read the transcribed paper recording of what we said in the interview and make sure that you have not accidentally said anyone's name. If necessary, I will delete all data related to people and places, before I start with data analysis. If you want to withdraw from the study after our interview, you are free to do so up to 2 weeks after our interview. After that your data will be incorporated with others and it will be impossible to know which is yours.

Interview questions

Warm up questions:

High level theme 1 BACKGROUND AND CONTEXT

1) Initial(broad) question: Can you tell me: what is your band, what kind of speciality do you work in? what is your professional nursing background? How long have you been a nurse administering medications in the in-patient setting?

2) Follow up: (Probing) questions: Can you tell me if there is anything about medication administration that you find difficult?

High level theme 2 APPROACHES: DESCRIBING CURRENT SYSTEMS & PROCESSES

- 1) Initial(broad) question: Can you talk me through your normal routine practice when administering medication? (their understanding of model of work as planned, for what they are supposed to be doing)
- 2) Follow up: (Probing) questions: Can you tell me about your understanding of policies or guidelines for medication administration? (Who publishes national guidelines for medication administration? Can you tell me who writes any local guidelines or policies or protocols in your hospital?)

High level theme 3 SOURCES OF VARIATION & CHALLENGES

- 1) Initial(broad) question: Have you ever had to do things differently from how you would normally when administering medications? (Probing question: What situations have caused you to change what you do normally?)
- 2) Follow up: (Probing) questions: Can you give me any examples of how you or nurses in your area change or do things differently?

Follow up question: What do you think drives this behaviour?

High level theme 4 EVALUATION OF IMPACT ON SAFETY

- 1) Initial(broad) question: Have you ever thought about the risks or benefits of changing your practice from standard protocols or guidelines?
- 2) Follow up: (Probing) questions: What impact do you think changing practice has on patient safety?

Next question: What factors do you think drive differences in medication administration behaviour?

Next question: How do you think you try to maintain patient safety when administering medications?

Next question: Can you tell me when or how your team or organisation (through briefs or huddles) discuss safety in medication administration and how this should be delivered?

High level Theme 5 PROFESSIONAL ACCOUNTABILITY

Initial(broad) question: What are your thoughts on whether the NMC Code effects med admin practice? How?

Appendix H

Quality Assessment – The Mixed Methods Appraisal Tool (MMAT) version 2018

[illegible]

[illegible]

McAlearney , 2007	Yes	Yes	Yes	Yes	Yes																						100
McLeod, 2015	Yes	Yes	Yes	Yes	Yes											Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	100
Nemeth, 2014	Yes	Yes	Yes	Yes	Yes																						100
Niazkhani, 2013	Yes	Yes	Can't tell	Yes	Yes																						75
Rack, 2012	Yes	Yes	No	Yes	Yes											Yes	Yes	Yes	Can 't tell	No	Yes	Yes	Yes	Yes	Can 't tell	Yes	75
Sitterding, 2014	Yes	Yes	Yes	Yes	Yes																						100
Tucker, 2016						Yes	Yes	Yes	No	Yes																	75
Van Onum, 2018											Yes	Yes	Yes	Yes	Yes												100
Vos, 2020	Yes	Yes	Yes	Yes	Yes																						100

* meets % of the MMAT criteria

