An exploration of the factors involved in planning care pathways for children with dental caries

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The candidate confirms that the work submitted is her own and that appropriate credit has been given where reference has been made to the work of others.

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Abstract

Background

Paediatric dental consultations involve discussions with parents of three routes of care pathways for treating children with dental caries. Those are local anaesthetics, inhalation sedation in conjugation with local anaesthetics, and general anaesthetics. Care pathways describe a patient journey through the healthcare system. Paediatric dentists and general dental practitioners may propose different care pathways when treating the same child with dental caries. To understand the reasons for the variation, this research study was conducted to explore the factors that may influence the dentists' decisions. **Aim:** The aim was to explore the dynamics of dental consultation and clinical interactions to understand factors that can influence paediatric dentists' decisions on their planning care pathways for children with dental caries.

Methods

Two studies were carried out in this research, which included two approaches.

The first study (quantitative): A retrospectively refined cohort study was carried out reviewing 172 clinical records over three months (September-November 2015). The data was collected from a database system into data collection sheets. Statistical Package for the Social Sciences SPSS version 23 was used for data analysis. Descriptive analysis, multinomial logistic regression, and binary logistic regression were applied. The second study (qualitative): The paediatric dental consultations were recorded and semi-structured qualitative interviews were conducted with families of children aged 5-9 years and consultants. The researcher interviewed the consultant paediatric dentists and the participating families regarding the planned care pathways separately. Thematic analysis was carried out.

Results

In the first quantitative study, 60% of the children referred to the Leeds Dental Institute aged between 4 and 7 years (mean = 6.5, ± 2.8SD); 61% came from the most deprived neighbourhoods. No gender differences were found. Half of the sample had full agreement on planning GA care pathways by the referring dentists and the consultants. In the second qualitative study, four themes described the process of the decision-making when planning a care pathway for dental caries management: timeframe to complete dental treatment, urgency, impact of previous dental experience, and clinical communication.

Conclusion:

Planning care pathways for children with dental caries is multifaceted. A set of key factors have a strong influence on consultant paediatric dentists' and general dental practitioners' decision-making.

Poster and oral Presentation

A poster was presented for the University of Leeds School of Dentistry Research Day in July 2018:

"A Study of Factors Involved in Planning Care Pathways for Children with Dental Caries. Research Protocol"

An oral presentation was given for the University of Leeds School of Dentistry Research Day in July 2019:

"A Study of Factors Involved in Planning Care Pathways for Children with Dental Caries. A quantitative study"

A presentation was cancelled and an abstract published in the European Archives of Paediatric Dentistry for the EAPD 15th virtual congress in July 2020. This was held online due to the Covid-19 pandemic:

"A Study of Factors Involved in Planning Care Pathways for Children with Dental Caries. A qualitative study"

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List of Abbreviations

GA	**General anaesthesia**
GDP	**General Dental Practitioner**
HCP	**Health care provider**
LDI	**Leeds Dental Institute**
NHS	**National Health Services**
OHA	**Oral health assessment**
PCC	**Patient-centred communication**
PDC	**Paediatric Dental Consultant**
SES	**Socioeconomic status**
SDM	**Shared decision-making**
UK	**United kingdom**
PIS	**Participant Information Sheet**
PI	**The principal investigator**
DPA	**Data Protection Agreement**
TA	**Thematic analysis**

Introduction

Physician-patient communication is of paramount importance in determining the outcome of a health-care service for adult patients and has been the subject of a substantial body of medical literature (Hartmann et al., 2018, Klitzman, 2018, Langhorne et al., 2017, Kaplan et al., 1989). Effective clinical communication should improve the health outcome for adult patients. A good communication in healthcare for adult patients can enhance diagnostic accuracy, promote patient-centered treatment decisions, and lower the risk of malpractice claims (Howick et al., 2018, Street Jr et al., 2009). The key functions of patient-centered communication include information exchange to manage uncertainty, better self-care skills, promote clinician-patient relationships, and decision-making (Street Jr et al., 2009). Patient satisfaction and adherence are indicators of effectiveness of physician-patient communication (Howick et al., 2018, Street Jr et al., 2009, Kaplan et al., 1989). Clinical communication is important across all of healthcare as well as in dental care (NICE, 2015). Dentists alongside other medical staff are responsible for making clinical decisions and proposing the appropriate dental/health care to their adult patients including those who are medically compromised, physically disabled, and/ or mentally impaired patients. Improving the clinical decision-making skills among professionals are fundamental (Ettinger, 1984) because the higher needs patient may require advanced care in primary dental care (Harris et al., 2011). There is a variation in the decision-makings between dentists, it is believed that the quality of dental care is affected by this variation while its consequences remain undetermined (Bader and Shugars, 1995).

In Paediatric Dentistry, dental caries is the most common dental disease among children worldwide (Estai et al., 2020, Abbass et al., 2019, Alhabdan et al., 2018, Janakiram et al., 2018, Tafere et al., 2018, Kato et al., 2017, Benjamin, 2010). Studies have reported variations in clinical dental decisions and uncertainty of the health outcome (Rønneberg et al., 2017, Brunton, 2015, Dobloug et al., 2014). The variation in dentists' clinical decisions vary widely even when planning dental treatment to the same patient. General dental practitioners (GDPs) refer children with dental caries to a specialised paediatric dentistry centres for a second opinion or to provide dental treatment under a specific care pathway that requires access to specialist services such as inhalation sedation (IHS) or general anaesthesia (GA) (GDC, 2019, Allen, 2018, Affleck et al., 2017). There are observations of difficulties in accessing dental care services to treat dental caries due to geographic and socioeconomic barriers (Estai et al., 2020).

The triad interaction between dentist, parent, and child is a characteristic feature of clinical communication in Paediatric Dentistry. This also could occur when an adult patient is unable to decide on his/her own healthcare because of impaired intellectual ability. The primary challenge in paediatric dentistry is to gain patient trust and build a good dentist-patient relation and that can lead to improve the child oral health (Duggal et al., 2012). Different strategies have proven to be effective in young patients in managing fear and anxiety they may have during dental treatment (Caltabiano et al., 2018, Carter et al., 2014). The child developmental stage is considered as the main influence when planning dental care. The dental treatment plan depends on the child's need

and the level of cooperation. Dental anxiety and fear considered as factors that influence the planning of care pathways (Jabbour et al., 2018b). The dental team stands “at attention” to manage child behaviour to deliver dental treatment safely at clinics. The complexity of dental treatment, which involves many steps, can be completed in a safe environment when the appropriate pathway is chosen. Decision-makings of dental care pathways is made at the first contact between child with the accompanying parent and the Paediatric Dental Consultant (PDC). The care pathways for the child dental care involve treating caries with or without local anaesthesia (LA), or under general anaesthesia (GA). Sometimes, the care pathway can be local anaesthesia with relative analgesia (RA) such as inhalation sedation (IHS). Moreover, selective cases might receive a ‘biological approach’ to manage dental caries, which involves isolating the carious lesions from the biofilm by using sealants, the Hall Technique, and indirect pulp capping (BaniHani et al., 2018, Innes et al., 2007). Follow-up visits may be arranged for monitoring, and others could be discharged to the referring dentists. It was found that some children who were referred for a GA care pathway were deemed sufficiently cooperative for dental treatment under LA (Shepherd and Ali, 2015, Hosey et al., 2006). In some cases, the parents asked for a GA care pathway because of their opinion of their child’s cooperation or their families wider social situation and ability to attend multiple appointments, if a LA care pathway was chosen (Tyrer, 1999). There is limited information on the dynamics of consultations in paediatric dentistry and how the choice of different care pathways is selected. Additionally, there is limited information on what factors influence dentist and parent to evaluate the child cooperation. Social history could influence parents to request a GA care pathway. In the United Kingdom (UK), “looked after

children" may have irregular dental attendance, poor oral care, dental neglect, oral disease, and/or higher needs for dental treatment (Williams et al., 2014, Sarri et al., 2012, Scott and Hill, 2006). GDPs and paediatric dentists take the social context into account when considering the legitimacy in referring or planning GA care pathways for dental treatment for children (Allen, 2018, MacCormac and Kinirons, 1998, Landes and Bradnock, 1996). Concerns have been raised about clinical decisions for dental treatment that it should be made in the best interest of a child and her/his rights and to offer children the highest standard of care (Rønneberg et al., 2017). There are many factors that can have implications on health care resources including cost, increasing exposure to GA risk, and increased waiting list time (NCGC et al., 2010). Subsequently that may lead to delay in dental treatment for those patients who have a high demand for a GA dental care pathway.

This research aimed to explore the dynamics of clinical consultations and the interactions between paediatric dental consultant-parent-child to understand the factors that may influence the decision-making process for care pathways to manage dental caries. Factors may vary from different perspectives, some of these factors have been reported in the literature. However, limited information has been documented about the process of decision-making in paediatric dental consultations for dental caries management. The structure of this research study is outlined in six chapters as described below:

Chapter one: Literature review and research strategy

Chapter two: Methodology of the quantitative and qualitative studies and the rationale of the research approach and study design

Chapter three: Results of the quantitative study

Chapter 1
Literature review

This review highlights the scope of this research, it aimed to investigate the dynamics of the consultation visit to provide a better understanding of what could influence paediatric dentists' decisions when planning care pathways for children. Starting with the known prevalence, aetiology, prevention, and treatment of dental caries, the dental condition to be studied. Then, a brief review on the history of care pathways, definitions, and applications in medicine and dentistry to be discussed. Implications of dental care pathways on health-care resources will be talk about briefly. A thorough review on the variation among dentists in the decision-makings and some of the contributing factors will be highlighted in the literature review. Furthermore, the role of qualitative research in dentistry to understand the behaviours of dentists and patients in clinical consultations is also will be included in the review.

1.1 Dental caries

In the present research study, dental caries was chosen as it is the most prevalent oral disease affecting children in the UK. It is the most common chronic disease in the oral cavity affecting children worldwide (Estai et al., 2020, Abbass et al., 2019, Alhabdan et al., 2018, Janakiram et al., 2018, Tafere et al., 2018, Kato et al., 2017, Benjamin, 2010). Countless studies have been conducted on many aspects of dental caries including its mechanism, aetiology, and prevention. In 2015, The Royal College of Surgeons of England

(RCSE) found that tooth decay is the most common single reason for 5-9 year-olds being admitted to hospital in the UK (NICE, 2015). Dental pain and dental treatment appointments are also reasons for children to miss school (NICE, 2015).

There is great benefit of understanding the aetiology of dental caries and the contributing factors. It aids to limit its progression, save tooth structure, and reduce the possibility of developing infection and inflammation. The aetiology of dental caries is multifactorial; however there are three components considered critical to develop a carious lesion: tooth enamel, acidogenic bacteria and ingestion of fermentable carbohydrates. These along with reduced salivary flow and low pH (below 5.5) lasting for a period of time initiates demineralisation of dental enamel (Featherstone, 2004). At the population level, the occurrence of dental caries is also associated with low-socioeconomic status (Levine and Stillman-Lowe, 2019, NICE, 2015, Dong et al., 2011, NCGC et al., 2010, Bedos et al., 2003). Fortunately, dental caries is a preventable infectious disease in nature (Broomhead et al., 2020, Levine and Stillman-Lowe, 2019, NICE, 2015). It is preventable or at least its progression can be limited when a full range of universal effective preventive measures are applied (Ismail et al., 2013, NCGC et al., 2010, Bedos et al., 2003).

The National Health Service in the UK provides cost-free dental care services for children up to 17 years-of-age, steered by evidence-based, and regularly updated clinical guidelines (Allen, 2018). Each child has to be registered in a general dental practice for regular check-up visits and prevention. The recommendation from The National Clinical Guideline Centre states that child

cooperation must be assessed as to whether the child is able to receive conventional care in the dental chair or requires referral to a specialist or a PDC for advanced dental treatment in a hospital-setting (NCGC et al., 2010).

The General Dental Council (GDC) advises GDPs to refer patients who require additional services that are beyond their ‘competence’ to other generalist or specialist dentists (Allen, 2018, GDC, 2019). Some inappropriate referrals from GDPs have been reported in England, Scotland, and Wales (Allen, 2018, Aspinall and Blinkhorn, 2007, Thomas et al., 2004, Podesta and Watt, 1996). There have been issues of patient selection and treatment planning reported among a range of perceived faults in GDPs’ referrals.

1.1.1 Care Pathway

In the UK, the pathway of care for dental treatment is mostly decided at the first appointment for a child patient with a PDC. Care pathways for treating dental caries vary according to the circumstances of each case. It is a complicated procedure to decide on a care pathway that should be tailored for every case, this decision should be made while considering the potential risks and benefits. In 2002, the NHS Dentistry mentioned the potential use of care pathways to commission primary dental care for the first time in the document *Options for Change* (Harris and Bridgman, 2010, Renson, 2002). It was aimed to control cost and achieve improvements in quality of care (DE BLESER, 2006.). However, factors involved in choosing dental care pathways are still unclear especially when they are related to children with dental caries. “Variations in dentists’ provision of services have been documented, but information about any contributing factors is limited” (Pourat and Marcus, 2011).

Care pathways bring structure in healthcare services and transparency between patients and practitioners and lead to high quality clinical outcomes (Brunton, 2015). There are some pilot pathways for urgent and routine care that have been tested (Brunton, 2015). The contracted pilots and pathways have been introduced to manage patient referral from primary practitioners to enhanced practitioners, specialists or consultant care. When a care pathway is implemented successfully, it can ensure that treatment is provided and clinicians have followed requisite clinical stages and it is more likely that the expected/intended outcome will be positive (Brunton, 2015).

1.1.1.1 History of care pathway

The concept of a care pathway was initially designed as a method of quality management in industry in the 1950's particularly in engineering (Gray, 2005, Hally and Pitts, 2005). It was created to follow some agreed steps that lead to predictable outcomes. However, when the result is not satisfactory, it is intended to go back, trace the source of this deviation, and improve it by omitting the unnecessary procedures. It was adapted to healthcare in the USA in 1983 (Rooney, 2014, Vanhaecht et al., 2010) and later in the UK in the 1990's (Harris and Bridgman, 2010, Hally and Pitts, 2005, Renson, 2002). The reason for applying this approach to healthcare is assumed to be due to an increasing number of negligence claims by patients when they are upset with the outcomes (Rooney, 2014). Better public knowledge has increased expectations and led to less acceptance of poor quality outcomes (Rooney, 2014). In the UK, care pathways have been used as a commissioning tool. It was observed that there is a wide variation in providing healthcare and that

clinicians do not always draw on the findings from Randomised Clinical Trials (RCTs) to explain their decision-making, when the evidence is available (Harris and Bridgman, 2010, Stirrat, 2004). The care pathway was applied first in nursing services and then to both primary and secondary healthcare services. The modernised agenda of the UK National Health Service (NHS) is to deliver health care that is responsive to individual needs (Smith and Firth, 2011), actively emphasise involving patients with long-term conditions in the management of their conditions, value their expertise, and work cooperatively with patients (DH, 2007, DH, 2005, DH, 2001). The intended benefit of this is to empower patients to take control of their health-needs, improve the understanding between medical staff and patients, and patients influencing the healthcare agenda. The three common chronic illnesses that have been managed by care pathways in the UK are diabetes, stroke, and chronic obstructive pulmonary disease-COPD. Care pathways are intended to ensure that all patients receive a standard package of care for a given diagnosis (Brunton, 2015, Harris and Bridgman, 2010). Therefore, an electronic tool of care pathways has been built on approximately 400 evidence-based case studies (Brennan et al., 2011, Harris and Bridgman, 2010). It was established as a new form of a decision-making process. The available tool is known as “Map of Medicine". Only management of a dental abscess is included in this tool with no evidence so far of management of other dental conditions.

1.1.1.2 Definitions of care pathway

Various definitions have been given to describe care pathways. One definition is: “A documented sequence of effective clinical interventions, placed in an appropriate time frame, written and agreed by a multidisciplinary team. It helps a patient with a specific condition or diagnosis to move progressively through a clinical experience to the desired outcome’’. This definition was written by Dame Margaret Seward, a former Chief Dental Officer for England/Department of Health, 2002 (Hally and Pitts, 2005).

A care pathway has also been described as "a methodology for the mutual decision making and organisation of care for a well-defined group of patients during a well-defined period" (Rooney, 2014, Harris and Bridgman, 2010), and also defined as "a mechanism that ensures that patients receive the right treatment, in the right place, at the right time and provided by the right individual" (Brunton, 2015). In other words, the use of a care pathway is to describe a patient journey through the healthcare system (Harris and Bridgman, 2010). Another example was given by some clinicians who summarised the use of a care pathway as ‘cookbook medicine’ (Pearson et al., 1995). Clinicians who argue that care pathways constitute ‘cookbook medicine’ do so because they are critical of the concept and argue that care pathways risk eroding clinical judgement and autonomy aiming to respect quality and patient safety (Mannion and Exworthy, 2017).

1.1.1.3 Related definitions

There are two overlapping terminologies; care protocol and clinical guideline. The two terminologies are aimed to achieve patient satisfaction and to improve the quality of care (Patchett et al., 2006). The care protocol is a form of action plan that translates national clinical guidelines into an embodied action plan for practitioners. It grafts evidence onto practice and the care process. It was also defined as a rule relating to a procedure, which dictates actions that must be adhered to (Harris and Bridgman, 2010). Clinical guidelines are essential guiding or directing works that allow professionals to use their professional judgment in certain cases. A care pathway aims to ensure that clinicians follow all clinical stages of standardised evidence-based practice, and to promote health system efficiency and patient safety (Jabbour et al., 2018a, Brunton, 2015, Kurtin and Stucky, 2009, Rowe et al., 2007, Grol, 2001). It also has the potential to reduce healthcare costs and to improve patient outcomes (Jabbour et al., 2018a).

1.1.1.4 Application of a care pathway for oral health assessment

A care pathway project for oral health assessment (OHA) in primary dental care was completed at the end of May 2005 for NHS England, a different oral health assessment pathway is also developed within NHS Scotland since 2005 known as the Childsmile programme (Macpherson et al., 2010, Hally and Pitts, 2005) . In the oral health assessment care pathway project for NHS England, the first step was to establish a broad-based team representing patients, special needs patients, primary care dental professionals both in general practice and in salaried services, dental specialists, academics and

the Department of Health (England), known as a clinical advisory group. The second step was to review the best clinical practice and the evidence-based practice. Then, the formation of the algorithm of the process of care was made and the care pathway was recorded in paper-based proformas (Jabbour et al., 2018a, Hally and Pitts, 2005). Figure1.1 shows the general process of documenting a care pathway. The four main elements in a patient journey on a care pathway according to Harris and Bridgman (2010) are 1) a timeline, 2) intervention, 3) an outcome, and 4) a variance record. The two primary purposes of the care pathway according to Harris and Bridgman are firstly to improve quality of health care by standardising clinical processes and secondly to monitor activity and health outcomes (Harris and Bridgman, 2010).

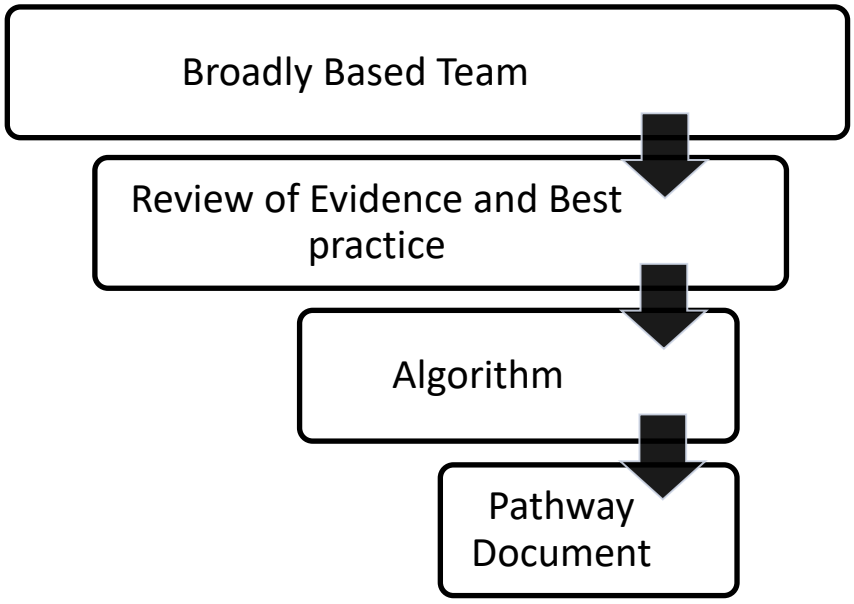

Figure 1.1 Documenting care pathway process

*Source (Hally and Pitts, 2005)

In the National Institute for Health and Care Excellence (NICE) guidelines, it is advised to use a person-centred approach in assessing patient needs and planning a preventive care plan (NICE, 2015). It is acceptable for clinicians to use their professional judgment in exceptional circumstances and to not follow clinical guidelines when there is a reasonable motive and consideration of the patient's benefit as a priority. However, it is recommended to invest in treatments when the health outcome is likely to be as intended (Brunton, 2015). Instead of focusing on treatment, a patient might benefit from controlling the primary disease and reducing the risk of further consequences. Likewise, for dental caries, it would be rational not to refer adult patients to secondary or tertiary care providers for advanced endodontic or prosthetic treatment when the patient is classified as a high caries risk, although that might be impractical for urgent care cases that require a quick intervention such infected, symptomatic impacted third molars. These urgent cases will require immediate referral to secondary/tertiary care providers with no delay with preventive dental care to be arranged at a later date when the urgent problem is resolved (Hally and Pitts, 2005).

1.1.1.5 Application of care pathways on managing dental caries for children

There is limited studies on care pathways in primary dental care (Robinson et al., 2019, Hally and Pitts, 2005), although a care pathway on oral health assessment was introduced in dentistry a while ago to enhance prevention, better oral health, and patient satisfaction considering patient social and dental history and clinical condition. There is a belief that better oral health and patient satisfaction increase the predisposition of patients to visit the

dentist (Robinson et al., 2019). Preventive care to improve oral health is the key element to reduce the prevalence of dental caries. It has been reported that the prevalence of dental caries in British children is 31% in five-year-olds and 46% in eight-year-olds (Children's Dental Health Survey, 2013). It is associated with low-socioeconomic status (NICE, 2015). Fortunately, dental caries is preventable or at least reduced when a full range of effective preventive measures is applied (Ismail et al., 2013, NCGC et al., 2010). Dental caries is a multi-factorial disease that results from a change in the bacterial ecology in the biofilm layer adhering to tooth surfaces. Some bacteria will increase the biofilm acidity by the fermentation of monosaccharides, disaccharides, and fermentable carbohydrate. This increase of acidity will lead to creating new kinds of bacteria that can live in an acidic environment, elevate the acidity levels, and also initiate dental caries (Ismail et al., 2013).

In the first dental visit for a child, a full assessment of dental behaviours and caries risk will guide the dentist to the intervention that should be tailored according to the patient's need. Obtaining patient demographic data, the main complaint, medical, dental, and social histories, are routinely carried out. Furthermore, behavioural status, dietary screening, use of bottled water and the fluoride history will help the dentist to predict the possibility of a patient developing dental caries (Ismail et al., 2013). The three most important evidence-based signs of high caries risk according to the Scottish Dental Clinical Effectiveness Programme SDCEP (2018) are previous caries experience, living in a deprivation area, and a healthcare worker's opinion.

An epidemiological investigation in eight European Union (EU countries) found that the most frequent management path for caries in children in the UK is extraction, as it is broadly available (Bolin et al., 1996). It was referred to

dental extraction of primary teeth as a cultural perception that does not recognise the significance of restoring baby teeth as demonstrated by the low Care Index in the UK (Allen, 2018, Threlfall et al., 2007, Hosey et al., 2006, Macpherson et al., 2005, Clewett and Treasure, 2004, Clayton and Mackie, 2003, Pitts et al., 1999, Bolin et al., 1996, Landes and Bradnock, 1996, Podesta and Watt, 1996, Pitts and Davies, 1992).

Harrison and Nutting (2000) found that the chief reason for a repeated GA care pathway in a 5-year period from 1992 to 1997 was because caries was not managed properly in the first dental GA. The mean age of children requiring second GA was five years and four months (Kakaounaki et al., 2011, Harrison and Nutting, 2000). The General Dental Council in its document “Maintaining Standards” (1997.) requires justification for referring dental patients to GA. Fulfilling two or more of the following five initial criteria is sufficient to justify a GA care pathway (Clayton and Mackie, 2003).

- The child less than four years old
- The child is intellectually impaired and has a lack of effective communication
- The presence of allergic reaction to local anaesthesia
- The need of urgent extractions with the existence of acute soft tissue swelling excluding the use of local anaesthesia
- Several teeth causing pain in more than two quadrants or when bilateral inferior dental block is needed

Some studies have highlighted factors which might influence dentists to refer patients for GA, such as a young child (mean age - six years and eight months), lack of cooperation, acute infection, multiple extractions needed, unsuccessful past restorative treatment or failure of extraction, medical conditions or orthodontic extractions (Tahmassebi et al., 2014, Clayton and Mackie, 2003, MacCormac and Kinirons, 1998).

1.1.1.6 The implication of dental care pathways on health-care resources

Socioeconomic status SES is a well-known factor influence the provision of healthcare services. Patient financial condition has been underlined in several studies as a major factor determining dental treatment plans. In some countries, healthcare insurance may overcome this problem for people who can afford it or when the workplace is providing health insurance to their employees. Healthcare is unequally provided in many countries and the variation in treatment outcomes is inevitable (Broomhead et al., 2020, Harris et al., 2017, Bedos et al., 2003, Grembowski et al., 1988). In the UK, the National Health Service is not for profit and may resolve patient financial factors by governmental funds providing an equal delivery of healthcare services. However, inequity of access to dental care has been noticed among patients treated in dental practices (Maunder et al., 2006).

The UK Public Health Advisory Committee (PHAC) conducted a valuation study to inform economic modelling due to a lack of evidence on health state utility values related to oral health. In the valuation studies and economic models, oral health outcomes were measured using decayed, missing and

filled teeth (DMFT) indices, decayed, missing and filled surfaces (DMFS) indices, gingival conditions, and dental pain (NICE, 2015). In the UK, a higher rate of complete tooth loss was reported in lower SES groups (Harris et al., 2017, Bernabé and Sheiham, 2014). It was found that people in higher professional occupational groups had 10-11% more natural teeth than people who were unemployed for a prolonged period (Harris et al., 2017). Over the past two decades, a decline of total tooth loss by 80% has been reported in the highest SES groups, and by 48% in the lowest SES groups (Harris et al., 2017, Bernabé and Sheiham, 2014).

A study was carried out in the north east of England to determine the equity of access to dental care from GDPs for children aged 0-17 years (Maunder et al., 2006). They used 2001 census data to calculate the child registration rate for wards in the Durham and Tees Valley Strategic Health Authority area and the Index of Multiple Deprivation was used to score the level of deprivation. It was found that the number of children registered with a dental practice was negatively associated with the increase of deprivation. The probability of child registration was reduced by 5% of the overall rate for every 10-point increase in the deprivation score. The availability and distribution of NHS specialist dentistry services is significantly associated with geographic variation within England, Scotland, and Northern Ireland with fewer practices in areas of high deprivation (Allen, 2018, Barnes et al., 2011, Boyle, 2011, Cook et al., 2002, Nuttall et al., 2002, Scuffham and Steed, 2002, Linden, 1998).

Several studies have documented a strong association between regular preventive dental visits and good oral health related quality of life (Harris et al., 2017, Broadbent et al., 2016, Listl et al., 2014, Thomson et al., 2010, Richards and Ameen, 2002, Mc Grath and Bedi, 2001). This association was also found after adjusting for socioeconomic status (SES) (Harris et al., 2017, Sanders et al., 2006, Petersen et al., 2004, Mc Grath and Bedi, 2001, Unell et al., 1999). The association is strongest at any age when their regular dental visits are maintained (Harris et al., 2017, Thomson et al., 2010). There was no significant association found between 6-month and 24-month intervals in dental check-ups for adults (Clarkson et al., 2020). There was no strong link found between SES and maintaining regular dental visits; however seeking care may not be the priority for people when it compared with other demands. It was identified that micro-level, meso-level and macro-level factors influence individuals' behaviours in the care-seeking process (Harris et al., 2017). In other words, individual/psychological background, social process/community structure, and population-wide structures/policies together are important to maintain regular dental visits. Therefore, by excluding patient financial condition as a confounding variable, there is a great opportunity to study those other influencing factors.

In the UK, care pathways have been applied in healthcare services to control costs, focus on the care outcomes, and to reduce variation in the care delivered by clinicians. At this time they have been implemented less in dentistry (Harris et al., 2011, Campbell et al., 1998). Recent studies have been conducted on the application of care pathways in dentistry by Fox (2019), treatment experiences of the care pathway for people with cleft lip and/or palate by Abualfaraj (2016), a study on pathways of dental anxiety and fear

by Carter et al (2014), and the care pathways of children who present with avulsed permanent tooth by Counihan (2013).

Dentists promote patient oral health to reduce the severity and complications of dental caries. The number and severity of affected carious teeth is a factor influencing dental extractions under a GA care pathway. Failure to improve patient oral health following a GA dental care will result in new carious teeth which will contribute to the increase of repeat GA for dental care. It has been suggested that inadequate treatment planning also contributes to the increase of repeated episodes of GA (Allen, 2018, Aspinall and Blinkhorn, 2007, Clewett and Treasure, 2004, Tochel et al., 2004, Landes and Bradnock, 1996, Landes and Clayton-Smith, 1996). Building on that, it has been reported that Community Dentists alter GDPs' treatment plans to make them more radical, in order to avoid repeated GAs for children (Allen, 2018, Aspinall and Blinkhorn, 2007, Landes and Bradnock, 1996). Repeated GAs for dental care is a burden on the funding by healthcare. In the UK, a recent National Health Service Digital Statistics report showed that tooth extraction is the number one hospital procedure for 5-9 year-old children. Hospital admissions for dental extractions were estimated to cost more than £30 million in one year with approximately 40,000 extractions in England (Broomhead et al., 2020). It was documented more than 20 years ago at Guy's Dental Hospital in London that 75% of single tooth extraction cases in children under GA required a second GA and the mean interval between the first and second GA was one year and 9 months (Harrison and Nutting, 2000). This may explain the reason for some dentists being more radical to remove all affected teeth when treating a child under a GA care pathway along with improving oral health and regular follow-up visits of preventive interventions.

There is a claim that due to poor clinician judgment, long GA waiting lists are filled with cases that do not necessarily require to be treated under GA (Allen, 2018, Shepherd and Ali, 2015). This may lead to a delay in dental treatment for those who are in urgent need. It was suggested that inadequate remuneration in the 2006 GDS contract promoted referral of many children to reduce workload in dental practice and avoid long treatment periods in order to obtain standard fees. Remuneration was perceived to be inadequate for GDPs in England (Allen, 2018, Davies and Macfarlane, 2010, Field et al., 2009, Marshall, 2006, Coulthard et al., 2000).

An audit in the Oldham Community Dental Service (OCDS) investigated the outcomes of referred children for dental treatment under GA in 2011-2012 (Shepherd and Ali, 2015). It was recorded that out of eighty-five patients referred for GA, 30 (35%) accepted treatment under LA, 21 (25%) had LA in conjunction with inhalation sedation, and only 21 (25%) actually required treatment under GA. The National Institute for Health and Clinical Excellence (NICE) investigated the high cost of GA on the NHS. They found that treating a child with sedation in a primary care-based sedation service cost £273.01 while it was £719.90 for dental GA (NICE 2010). Evidently, carrying out a dental procedure in a primary care setting is less expensive than in a hospital setting partly based on the numbers of staff involved and the cost of the facilities. A moderately high success rate greater than 59% was reported for multiple dental extractions under an inhalation sedation pathway (Sury et al., 2010). The study concluded that inhalation sedation (Nitrous oxide) is a cost-saving procedure compared with GA when careful patient selection is carried out because the cost of the drug is considered less significant than the cost of the staff involved (Sury et al., 2010). Therefore, it was suggested that

increasing the availability of sedation in primary care might reduce waiting lists in hospitals as well as decrease the cost on the NHS (NICE 2010). In a study of healthcare systems, it was found that the English system was the most costly in delivery of dental care compared with nine other European Union (EU) member states (Eaton et al., 2019, Tan et al., 2008). This was explained as a reason of variation in healthcare workers' decisions that was influenced by a number of factors and it has been suggested that applying care pathways may reduce healthcare costs, improve health outcomes, and decrease the mental effort for clinicians to allow them to focus on complex cases (Jabbour et al., 2018a).

1.1.2 Variation in dentists' clinical decision making

''Too little is known and too much assumed'' is the ending sentence of a review article on variation in dentists' clinical decisions written by (Bader and Shugars, 1995). This sentence referred to what we know about questions such as is there variation in dentists' clinical decision-makings? Why does variation occur? What might reduce the differences? Some of these questions are still being investigated. In a recently published systematic review by Broomhead (2020), it was reported that there is variation in dentists' clinical decisions shown in a great number of studies . A study which was carried out in 2013 in Norway, explored the differences between dentists in how they would treat two case scenarios of children with dental caries (Rønneberg et al., 2017). The two scenarios were for five-year-old children with severe dental caries in the primary dentition. One case was symptomatic and the other was asymptomatic. Participants were asked to write the best approach to manage the two scenarios. The majority of participating GDPs chose

behaviour management techniques (BMT) and sedation for the next visit. Those who had their qualifications outside the Nordic region tended towards using restraint to treat the child. Those with more than ten years of experience preferred to wait and not to intervene if the child was not in pain. On the other hand, paediatric dentists preferred to refer for sedation or GA care pathways. They justified their approach as in paediatric dentistry it is common to use conscious sedation to manage mild to moderately anxious patients, while GA is recommended for dental phobic or special needs patients and for advanced dental procedures. In another study conducted in California, variation in clinical decisions in relation to the clinician gender was reported. It was found that female general dental practitioners showed a more preventive orientation and a preference to refer adult patients to specialists for prosthodontics, endodontic and surgical procedures (Pourat and Marcus, 2011). These findings were reported on the variation in clinical decisions in relation to the dentist factor.

Another study from Norway in 2011 was conducted to investigate variations among dentists in regard to diagnosing dental caries (Dobloug et al., 2014). It was found that the variation among dentists in diagnosing dental caries was low. The extent of variation was dependent on diagnostic uncertainty (Grembowski et al., 1988, Elderton, 1985, Bailit et al., 1983, Wennberg et al., 1982, Kress, 1980). This is may be explained in clinical examination of early carious lesions including enamel lesions, as they are difficult to detect unlike dentine carious lesions which are more visible clinically and radiographically. This uncertainty in diagnosing dental caries was inversely related to the years of experience of the dentists.

In Denmark in 2011, a study investigated inter-examiner variability in orthodontic treatment decisions for Danish children with borderline orthodontic treatment need. One hundred and one Danish orthodontic specialists were recruited into the study. They were asked to provide their demographic data, place of education, place of work and years of experience. Later, they were allocated to one of three equally sized groups. Fifty-six Danish children in the fifth grade from three municipalities who had been screened and assessed by six orthodontists affiliated by the municipality formed the study group. From initial screening, the six orthodontists agreed on 65 children as borderline cases for orthodontic treatment. The 65 children were invited to participate in the study and 57 agreed to participate. One child did not attend the exanimation, so eventually 56 were recruited. Every child was examined clinically by one of the three groups of orthodontic specialists and then was assessed as a case presentation by the other two groups of orthodontic specialists. The results of the study showed considerable inter-examiner variation in the assessment of orthodontic treatment need for children in the borderline group. This variation between orthodontists in their assessment of the children's treatment need happened whether assessments were based on a clinical examination or a case presentation (Bælum et al., 2012). This study's finding highlighted the dentist factor that influenced the variation in clinical decisions, a considerable inter-examiner variation was reported.

In 1997, the Eastman Dental Institute for Oral Health Care Science of University College of London provided a course for GDPs entitled 'Diagnosis and planning for success with fixed bridgework'. Fifty-five dentists who attended this course were given standard information about a simulated patient in the form of clinical history, radiographs, and study casts. They were

asked to design a bridge for the case that previously had a failed bridge and to submit their design preceding the course. The result was 65% of the participants showed a wide variation in identifying important features relevant to the final treatment plan (Ibbetson et al., 1999). This study found a considerable variation in clinical decisions, it was related to the dentist factor.

A not so current but an important review article by Bader and Shugars (1995) discussed dentists' variation in making clinical decisions and identified decision making variations in three levels: 1-Variation at the practice level, 2-Variation at the patient level, 3- Variation at the tooth level. Cost of treatment, type of payment, patient socioeconomic status, and geographical location were always taken in consideration. It was observed that differences in treatment rely solely on dentists and their interactions with patients according to their concerns. Therefore, analysing variation at practice level and patient level can be greatly affected by financial considerations, whereas studying variation at the tooth level is a straightforward method to compare between dentists' clinical decisions. Cohen's Kappa is a useful tool to assess level of inter-examiner agreement. Studies showed Kappa Coefficients among General Dentists vary between fair to almost full agreement on the decisions of treatment at the tooth level. However, most studies have reported that there is a moderate agreement between dentists in making clinical decisions.

In 1984, a study of 346 Washington State's dentists found a substantial variation across dentists in their treatment planning for any given patient, even after differences in dental findings, other dental information, patient attitudes, and financial conditions have been taken into account (Bader and Shugars, 1995, Conrad et al., 1984).

1.1.2.1 Contributing factors to variation in dentists' clinical decision making

This review highlighted the contributing factors to the variation in dentists' decisions based on the previous studies. Additionally, I attempted to understand the dynamics of the paediatric dental consultation and to identify the factors involved in planning care pathways for children with dental caries. There is wide diversity in patients who are referred to specialists for management of dental caries. Children vary in their demographic characteristics, medical/dental histories, and socioeconomic status. Children's personalities and behaviour also vary among those who are in the same age range, diversity also exists among dentists. In fact, diversity of characteristics among dentists is thought to be the main reason behind the variation in clinical decisions although other factors might be involved (Roter and Hall, 2006). Dentists vary demographically, socially, in their place of education and years of experience and qualifications. There have been factors reported that are significantly related to variation in dentists' clinical decisions. In order to determine methods that might be used to reduce these differences, it is crucial to first identify the main factors (Pourat and Marcus, 2011). It has been found that variations in self-reported provision of services by general dentists in the private sector might be related to dentist characteristics, practice structure or patient characteristics.

Dentist characteristics in regard to gender, ethnicity and place of education have been recorded in a study (Roter and Hall, 2006), and differences related to gender and place of education were also reported in another study (Pourat and Marcus, 2011). Ethnicity factor showed a different pattern of variation that

was not adequately explained (Pourat and Marcus, 2011). It has been suggested that practice structure, employment, and numbers of dental hygienists employed in a practice play a role in allowing general dentists to provide other services (Pourat and Marcus, 2011). Nevertheless, patient characteristics provide another source of variation that may affect the treatment decisions (Grembowski et al., 1988, Kress, 1980, Sadowsky, 1979, Starfield, 1973, Fuchs, 1968). A few studies have reported that patients in lower socioeconomic groups show poorer oral hygiene, and have difficulty accessing dental healthcare services (Bedos et al., 2003). In reports from North America, the reason behind dental health inequalities was related to patients with non-white racial backgrounds because of the cultural and language barriers (Dong et al., 2011, Pourat and Marcus, 2011). Another study from Canada reported patients in lower socio-economic groups from white racial backgrounds also reported to have dental services inequality (Bedos et al., 2003). The common factor in these studies was the low socioeconomic status regardless of the ethnicity. It was reported that people in lower socioeconomic groups are affected by poor oral health and inequality of access to healthcare services in many countries regardless of the racial/ethnic background (Harris et al., 2017, Maunder et al., 2006). A recent rapid review of variation in the use of dental GA in children in the UK highlights a number of factors in patient characteristics that play a major role in the use of dental GA in children (Broomhead et al., 2020). Based on reviewing 171 articles, it was found that child age, gender, health conditions, learning disability, ethnicity, and culture, socioeconomic and deprivation status, and geographic location are contributing factors to the choice of dental extractions with a GA care pathway. Although the result of this review article showed that

higher numbers of female children had GA dental care, there have been no differences in gender distribution in other reviews (Raja et al., 2016, Hosey et al., 2006).

In 1999, Ibbetson et.al stated that variation in planning dental treatment is influenced by a number of factors. Those factors include patient wishes, the medical and/or dental condition, and cost of treatment. Other attributes are the dentist place of education, clinical experience, and participation in continuing education. Theoretically, according to Bader and Shugars (1995) the process of clinical decision-making in dentistry goes through three phases. First is the diagnosis phase where investigations and diagnostic tools are used to detect a disease or a condition. In the second phase, the dentist needs to decide whether this condition requires intervention or observation. The third phase is when the dentist decides on a treatment plan from various alternatives. Variation between dentists could occur in any of these three phases. Previous studies covered the variations in the first, second and third phases (Broomhead et al., 2020, Rønneberg et al., 2017, Dobloug et al., 2014, Bælum et al., 2012, Pourat and Marcus, 2011, Ibbetson et al., 1999, Ettinger, 1984). Differences in the use of diagnostic tools and the accuracy of each tool are acceptable in the first phase (Bader and Shugars, 1997). A decision to intervene or observe for a condition in its early stage is controversial; however, application of preventive measures and observation of self-limiting conditions with good prognosis are recommended. There is a wide variation between dentists in deciding a treatment plan for managing dental conditions (Grembowski et al., 1988). It was suggested that the ways dentists interact with patients may be a major source of differences and that area has not been explored. The authors stated that it is important to determine the effectiveness

of exploring the effect of dentist-patient interaction on healthcare. Healthcare services could be improved if research studies identify the psychological impact of the dentist-patient interaction on the health care outcome (Grembowski et al., 1988). The research could explain the variation and how it might be possible to reduce the differences in dentists' clinical decision-makings.

In paediatric dental consultation clinics, investigating the dental problem and making a diagnosis are carried out at the first visit through taking patient history, clinical examination, behavioural and caries risk assessment. The second phase is when the consultant has decided to intervene and a variety of options are discussed with the parents and child. Sometimes a second visit might be arranged for further investigations or for further discussion to decide on a care pathway. Behaviour assessment is based on children's behaviour during the first visit. It will include previous dental experience and/or parental judgement. Child dental behaviour is a key element to decide a care pathway. A behaviour problem in a child patient is not necessarily related to dental fear, because dental fear can be scored on the dental subscale in the Children's Fear Survey within cooperative and uncooperative groups (Yamada et al., 2002). It was found in one study that children in the uncooperative group had different personality issues (shyness, impulsivity, and negative emotionality) in addition to dental fear (Arnrup et al., 2002). A systematic review by (Jamali et al., 2018) found a significant correlation between child cooperation and the duration of dental procedures in young children aged 2-3.5 years. Only four studies have investigated the effect of the length of dental procedures on child behaviour during and after dental treatment (Davidovich et al., 2014,

Aminabadi et al., 2009, Getz and Weinstein, 1981, Lenchner, 1966). In two studies, behaviour assessment was carried out using the sound, eye and motor (SEM) scale, two self-developed questionnaires and the Houpt scale for general behaviour (Lenchner, 1966, Getz and Weinstein, 1981). Shorter duration of dental procedures was suggested to enhance positive child dental behaviour since longer appointments would be a sign for a problem in children's minds which may increase anxiety and lead to negative dental behaviour. Two studies have defined short duration of dental treatment to be less than thirty minutes (Davidovich et al., 2014, Lenchner, 1966). Managing child behaviour is achievable via pharmacological or psychological behavioural management techniques. It is recommended to start with the least invasive techniques moving progressively to the most invasive (SDCEP, 2018). However, paediatric dentists need to carefully make a decision for a suitable behavioural management technique for a child patient weighing the risks and benefits.

Table 1.1 The key references that inspired the author to identify the research gap

Rønneberg et al., 2017	A pre-coded questionnaire included two case scenarios to reflect common dental conditions related to severe caries	(n = 391) GDPs working in Norway	This study concluded from an ethical point of view that all children have a right to optimal prevention and care of dental caries, which is according to the Rights of the Child. Clinical guidelines based on such ethical principles should be implemented in paediatric dentistry. The variety of treatment decisions indicates differences in opinion and uncertainty among GDPs regarding the treatment of children with primary dentition caries. This variation was investigated in relation to dentist factor such as Gender, Region of Education, and Years of practice. -A pilot study was performed before the main study.	The collected responses in this study of the two case scenarios do not necessarily reflect dentists' actual clinical activity. There were differences of severity showed in the bitewings and clinical photographs of the teeth with caries, which may have confused some dentists. Based on other studies, it is known that also in a group of specialists in Paediatric Dentistry there will be variation in the views; however, a majority-based answer was used to judge and validate the preferences made by the GDPs.	Norway
Shepherd and Ali, 2015	An audit	(n = 85) child patients referred for GA	This audit investigated the outcomes of patients referred in specifically for treatment under GA in 2011–2012 to assess the new patient referral consultation outcomes. It also identified and quantified the treatment outcomes provided by the Oldham Community Dental Services (OCDS) in 2013 for those not specifically referred for treatment under GA. All paediatric new patient appointments within a three-month period were included in the review. The final treatment outcome was recorded, following the patients through for a year after the initial appointment. It showed that often the outcome of a new patient assessment clinic is different from the referral request.	Only the final treatment outcome was recorded for the included 85 patients after following the patients through for a year after the initial appointment. There were five treatment outcome categories, which were: Discharged, Monitored, LA only, HIS, and GA. There was no attempts of testing the associations between factors that Increase likelihood of GA care pathway and factors that Influence a dental GA decision to treat children with the treatment outcome.	Oldham Community Dental Service/UK

Key references	Bader and Shugars 1995	Tates and Meeuwesen, 2001
Study design	A review article	A (re)view of the literature
Study sample	Medline searches from 1986 to 1995 of English-language articles.	Twelve articles published between 1968 and 1998
Study strengths	This review article highlighted how our understanding of variation may be incorporated into a conceptual model of dentists' treatment decision making, and underlines the need for more examination of the consequences of variation in dentists' clinical decisions. Variation among dentists in the clinical decisions are examined at three levels: the dental practice (or dentist), the patient, and the individual tooth. If differences in dentists' decisions are associated with clear differences in outcomes of importance to the patient, then dentistry must begin to determine why the variation in dentists' decisions occurs and what methods might be used to reduce differences. It is highly recommended to determine the consequences and the underlying causes of the variation that has already been shown to exist in dentistry.	This review concluded that doctor– parent–child communication is a subject that has been insufficiently studied; most of the reviewed studies ignored the consequences of the child's presence in medical communication as well as the need for triadic analyses. Because the interactional dynamics of a triad differ fundamentally from those of a dyad, it was recommended to use quantitative and qualitative approaches for triadic analyses in future studies.
Study weaknesses	The number of the included studies was not mentioned in the review. It is evident that the studies reviewed here have used several measures for assessing variation among dentists. This heterogeneity reflects the early stage of investigations into this phenomenon. The lack of models from medicine also may be a contributing factor as well as the information is based on such limited studies.	All 12 studies claimed to analyse the triad interaction between doctor, parent and child; however, only three studies (Aronsson & Rundstro¨ m, 1988; Meeuwesen & Kaptein, 1996; Meeuwesen et al., 1998) explicitly focused on the communication between all three participants (doctor–parent, doctor–child and child- parent). The remaining 9 studies restricted their analysis to the doctor–parent and doctor–child dyad interactions.
Country of the study	University of North Carolina/ US	The Netherlands

1.1.2.2 Contributing factors in the variation of dental caries management

Caries risk assessment is performed at the first consultation visit. Caries risk should be evaluated regularly by dentists at every recall visit together with providing prevention. The SDCEP Guideline notes the three main indicators of caries risk for a child: previous caries experience, living in deprived neighbourhood and health workers' opinion. Recall visits should be planned based on caries risk assessment for each child with the oral health care need ranging from 3-12 month intervals. Periodically, it is important to re-evaluate oral hygiene (tooth brushing and fluoride toothpaste use), record plaque scores, evaluate diet and snack habits and provide advice accordingly. Topical fluoride application and fissure sealants significantly contribute to improving caries prevention (Munday, 2008). Essentially, prevention visits should also be arranged for patients who are planned to go on a GA care pathway (Aljafari, 2016). The SDCEP has also provided a guidance for referrals for children with dental caries (Figure1.2). However, it has been documented that in many cases it would seem that children who are referred to a GA care pathway are cooperative enough to be treated with local anaesthesia (Shepherd and Ali, 2015).

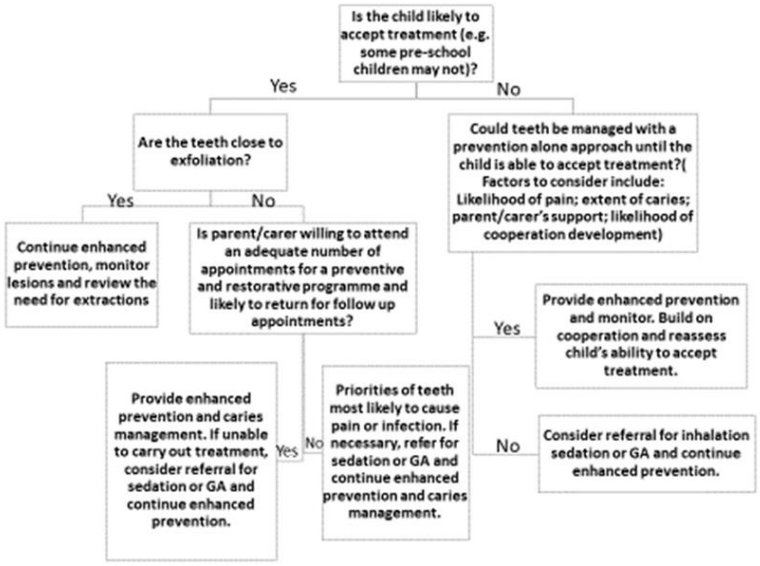

Figure 1.2 A flow diagram illustrates decisions to be made when referral is considered

*****Source: Scottish Dental Clinical Effectiveness Programme (SDCEP, May 2018)

1.2 Doctor-parent-child communication

As young children do not have the capacity to make a decision related to their own healthcare, a legal guardian should accompany them. Parents, social services, and foster parents may be involved in making decisions related to a child health care. A review of the literature on doctor-parent-child communication included 12 articles published between 1968 and 1998 (Tates and Meeuwesen, 2001). The articles involved the verbal and/or nonverbal interactions between doctor-parent-child in a medical setting when the child is the patient. The recording methods in the reviewed studies were either audio or video recordings. Three out of the twelve studies (Meeuwesen and Kaptein, 1996, Bensing, 1991, Aronsson and Rundström, 1988) investigated the triad interaction involving the child rather than the dyads when only the parent and

doctor were involved. The most recent study used a visual text analysis (Leximancer^{TM}) of video-recorded conversations in a paediatric dental clinic in Hong Kong in addition to recording the caregivers' feedback in a questionnaire on the quality of clinician consultation skills. The limitation of this visual text analysis approach was its failure to record non-verbal triad interactions. It counts numbers of related words and their percentage in the total number of words, similar statements and their percentage in the total number of statements, and percentages of time spent on the related utterances on a recorded video (Wong et al., 2017). The primary interest of this study was the dentist-parent interaction and its effect on parent satisfaction and adherence and if they precisely followed the treatment regimen. They disregarded the child's interaction and satisfaction, which could also influence the adherence to dental treatment. Nine studies found the gender of parents who attend dental appointments were mainly mothers. Some study observations were that doctors direct questions towards parents when collecting medical information and provide information, diagnosis, or decision-making contributions to the parent, which is known as instrumental doctor behaviour. On the other hand, some studies showed that doctors showed more joking interaction towards the child (Ong et al., 1995), and less child involvement in decision-making (Young et al., 2011). Some studies showed that doctors exclude older children and even adolescents from clinical communication. Two studies found that controlling parents represented 52% of the cases who excluded their child from the discussion by interfering when the doctor attempted to communicate with the child (Damm et al., 2015, Aronsson and Rundström, 1988). Some parents may use adult proxy to interfere in the discussion and disregard the child's view (Gardner and Randall, 2012). The

mean age of children in most of these studies ranged between 5 and 10 years years-of-age. Conversational contribution by the child patient was positively correlated with the increase of age was observed in few studies (Garth et al., 2009, van Dulmen, 1998, Pantell et al., 1982, Roter and Hall, 2006). Another factor of the child involvement in clinical decision-making was the number of visits mainly first visits versus repeat visits. Most of the studies in the review article by Tates (2001) described the dynamics of the consultation as doctor-control. However, parents who were not given the opportunity to express their concerns about their child were less satisfied and adhered less to advice than parents who received answers to their questions an and information from doctors (Korsch and Negrete, 1972, Korsch et al., 1968).

Patient-centred communication (PCC) has been defined as reaching a shared understanding of patient problems and the treatments that are concordant with patient values (King and Hoppe, 2013, Epstein and Street Jr, 2007). This concept was introduced in medicine in 1970 by (Balint et al., 1970) and later, it was elaborated on, developed and refined by others (Stevens, 1974, McCracken et al., 1983, Stewart et al., 2013). Due to what has been shown in the medical literature, it is believed that implementation of PCC can increase patient satisfaction and adherence in dentistry (Kulich et al., 2003, DiMatteo et al., 1993, Street, 1989). Expressing humanistic attributes by showing empathy and understanding of patients' concerns is the top priority of patient-centred communication (PCC) in dentistry and is considered a characteristic of the ideal professional dentist (Kulich et al., 2003, Kulich et al., 1998, Smith and Hoppe, 1991). Many reports have recommended doctors to try to understand the whole person and some have defined it as 'a holistic perception' and understanding of patients (Kulich et al., 2003, Brown et al.,

1986). It requires an integrated approach to understand the full picture of a patient's life to include psychosocial, social, spiritual, physical, and economical dimensions (Kulich et al., 2003, Tresolini, 1994).

In the study by Nowak et al. (2018), dentists who were working in the NHS complained about the limited time they had to practice PCC with only 10-15 minutes with each patient. Another reported barrier to PCC in dentistry is dental anxiety; some anxious patients may have difficulty discussing their problem with dentists. Moreover, the influence of social stereotyping of dentists and their relationship with pain is common. Some patients believe that dentists are money-oriented professionals who do not care about patient health. This may affect their adherence to treatment plans and dental advice (Nowak et al., 2018). Furthermore, many dentists in the Nowak study believed that SES and educational background affect patient cooperation and communication skills. However, the participating dentists in this study rated their way of communication in consultation as positive but it still could be improved. They alleged that they tried to establish a good rapport in their communication and to ensure patient comprehension of the treatment plan. They believed this mutual communication enhances the importance of shared responsibility and patients' involvement in the decision-making process.

Shared decision-making (SDM) is an evidence-based approach that has shown improvement in patient health outcomes (Boland et al., 2019, Land et al., 2017). However, a systematic review by Boland et al. (2019) found that the implementation of SDM in paediatric healthcare is limited because of several factors from different perspectives. Healthcare providers (HCPs) found that there was insufficient time for SDM due to heavy workloads.

Children’s developmental nature in the biological, cognitive, and psychosocial aspects might be a factor that affects their capability to participate in health decisions. For parents, SDM is important to build trust and respect between HCPs and the family (Boland et al., 2019). On the other hand, some parents reported lack of options or sufficient knowledge and affordability of other alternatives that could be barriers for SDM. HCPs, parents and children in the Boland study (2019) showed acceptance of child-involvement in less risky health decisions. Furthermore, some children were reported to feel intimidated to participate in health decision due to the power imbalance. A review by Asa'ad (2019) described informed consent as a part of applying shared decision making (SDM) in dentistry. Informed consent embodies an agreement on the treatment plan aimed for patient satisfaction and adherence to advice which may lead to positive health outcomes.

1.2.1 Implication of involving patients in decisions on patient adherence

In the light of current changes in health care delivery systems, the doctor-patient relationship has been found to have a great influence on patient health outcomes (Timmermans and Tietbohl, 2018, Roter and Hall, 2006). The effectiveness of doctor-patient communication is directly related to patient satisfaction and adherence (Timmermans and Tietbohl, 2018, Roter and Hall, 2006, Kaplan et al., 1989). It has been found that poor patient adherence is associated with miscommunication or misunderstanding between patient and doctor (Britten et al., 2000). Consequently, patient failure to adhere to medical advice may affect the public health, which can lead to a great financial burden on the health care system (Timmermans and Tietbohl, 2018, Vermeire et al.,

2001, Morris and Schulz, 1992). In order to understand patient health behaviours from the patient perspective, it is important to acknowledge patient decision-making and not only to expect a patient to follow the doctor's instructions (Timmermans and Tietbohl, 2018, Calnan, 1984, Stimson, 1974). Therefore, studies on patient health behaviours have moved from being clinician-centric to patient–centric because patient behaviour is the main motive for patients to follow medical advice when they would like to do so (Timmermans and Tietbohl, 2018, Calnan, 1984). Modern technology aides people to search for information and get answers in a very short time and this can affect patients' perspectives and sometimes may raise their concerns about the condition they have (Timmermans and Tietbohl, 2018). It is recommended to listen to patients' stories and understand their concerns and why they sought to see a doctor in the first place (Roter and Hall, 2006, Zola, 1973). Some studies in social science have highlighted the variations of doctor-patient interactions based on the severity of patients' conditions and type of treatment (Heritage and Maynard, 2006, Szasz and Hollender, 1956). An important early study in this field found that shared decision-making in parallel with specific physician patient-centred behaviour showed a high rate of patient adherence to treatment and improved patient satisfaction with the consultation (Stewart, 1984). It was found that behaviours such as the physician requesting a patient's opinion explicitly when starting a discussion had more impact on the outcome. Furthermore, physician non-verbal responses to patient concerns have a profound impact on the care outcome (Roter and Hall, 2006). Smiles and head nods of agreement from the doctor while listening to the patient's story could be a motive to add more details in the history (Nowak et al., 2018). In the doctor-patient relationship, doctors are

the expert in diagnosis and treatment while patients are the expert in their history, symptoms, experience, and values. Clinical communication is the main element of medical care (Roter and Hall, 2006). There are several publications related to medical doctor-patient communication, but only a limited number of studies have been conducted on dentist-patient communication (Nowak et al., 2018).

Oral health care is a dual responsibility of the patient and dentist and depends on patient daily practice of oral hygiene and adhering to their dentist's advice as well as the provision of dental care by the dentist (Nowak et al., 2018). If a child patient and parents failed to adhere to their dentist's advice on daily practice of oral hygiene, an increase in dental caries may result, as well as incomplete dental care and/or the need of repeated GA will continue to rise in children. According to the Association of Paediatric Anaesthesia of Great Britain and Ireland (APA) guidelines, for dental extraction under general anaesthesia, it is mandatory to discuss with parents or legal guardians all the options and whether the treatment should or could be performed under local anaesthesia, local anaesthesia in conjugation with conscious sedation or under GA. The discussion should also include associated risks and benefits of each technique and allowing sufficient time for the parents/ legal guardians to consider each route (Adewale, 2011).

A study aimed to explore the preferred and perceived roles to adult patients in dental treatment decision-making was carried out (Chapple et al., 2003). This study was a cross sectional survey where they used (Control Preference Scale – CPS) among patients in hospitals and private dental practices to measure the patients' preferred roles in treatment decisions (De Las Cuevas

and Peñate, 2016). The CPS was given to patients who were asked to choose from the more to the least applicable statement on cards that reflected their preferences on taking a role in the decision making process of the treatment plan. The findings of this study suggested that dental patients have concerns about decision-making during consultations and that dentists may not be considering their concerns. The content analysis of the verbatim data found the following themes regarding patient rationale for their role preference: knowledge of subject, trust, consumerist stances, time constraints, and factors that would alter the individual's role preference.

The study by Wong (2017), found that the core of a successful conversation between a paediatric dentist, child patient and caregiver is by showing empathy and by directing the discussion to become more patient-centred while using positive reinforcement. This key element resulted in significant outcomes such as improving oral health care, parents following the dentist's advice, and reduction in children's dental anxiety. The same concept of showing empathy has also been reported to be effective with dental anxiety in adults (Roter and Hall, 2006, Kulich et al., 2003, Kulich et al., 1998, Smith and Hoppe, 1991). A claim that more experienced dentists are more capable, and have the skills to show empathy, may not be accurate as it varies among individuals. It has been reported in several studies that the first contact between dentist and patient is very important to reduce dental anxiety (Kulich et al., 2003, Berggren, 1984).

It has been recommended to study the role of parents in medical interactions, whether it is representative, mediator or activator (Tates and Meeuwesen, 2001). Nevertheless, there are lack of studies that have discussed parental

influence on doctors' treatment decision-making. Reviewing the literature revealed limited research studies investigated the doctor-parent-child communication triad. A question arises whether the two interactions of doctor-parent and parent-child would affect the doctor's decision on planning a care pathway for a child with dental caries. Examining this hypothesis could be clarified through research using qualitative methodology. A wide-range of information could be obtained using qualitative research interviews, capturing the three-way interactions as shown in Figure1.3

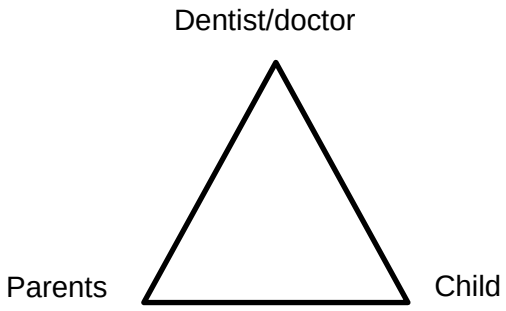

Figure 1.3 A diagram of doctor-parents-child interaction

1.3 Qualitative research in health care

In dentistry, research has been predominantly quantitative in nature with a drive more towards evidence-based dentistry (Stewart et al., 2008). The most common research approaches in dentistry are randomised controlled trials RCTs, questionnaire-based surveys, and cross-sectional studies (Stewart et al., 2008, Blinkhorn et al., 1989, Watt, 1989). In the past, few dental studies were conducted using qualitative approaches. In the mid-1980's, Nettleton commenced a series of studies using a qualitative approach to record observations of dental visits in a surgery in South London (Nettleton, 1992).

Nowadays, qualitative research has an important place within dental studies. It is used for exploring areas that are inadequately understood and this aids in generating hypotheses and defining problems (Stewart et al., 2008). This review included qualitative studies of behaviours in clinical visits, such as doctor-patient relationships, patient-centred communications, and clinical consultations. Other qualitative studies explored clinical decision-making, referrals, and dental care pathways for well-defined groups of patients.

Qualitative research is a methodology that contributes to an understanding of social structures, cultures and behaviours (Ritchie et al., 2013). It helps to identify people's thoughts, attitudes, preferences, feelings and perceptions (Stewart et al., 2008). It is also used to understand, describe and explain social phenomena by analysing communications and interactions based on observation of recoded materials (Brinkmann and Kvale, 2018). Using qualitative research in healthcare may help clinicians to understand behaviour and social phenomena around the patient (Masood et al., 2010). It explores the complexities in well-being and health to enable clinicians to deeply understand the patient experience (Smith and Firth, 2011). Unlike quantitative research, it does not deal with numbers and enumerated data; it analyses participants' behaviours in their own language and in the natural settings (Masood et al., 2010).

There are different methods of data collection in qualitative research depending on which method is more appropriate to address the research question (Mason, 2017, Stewart et al., 2008). The most common methods used in healthcare settings are research interviews and focus groups (Stewart et al., 2008). A qualitative interview is a professional conversation that has a

purpose and involves a specific method and technique; it is neither an open daily conversation nor a closed questionnaire (Brinkmann and Kvale, 2018). The semi-structured qualitative interview is more often used in healthcare studies than the other approaches such as observation, diaries and documents (Stewart et al., 2008).

1.4 Summary

Differences in diagnosing dental caries have been widely discussed in the literature. However, less attention has been devoted to differences in making decisions of the routes of dental care. Another premise that has not been explored is the difference in dentists' interactions with patients as this might be a major source of variation. Variation could equally occur in proposing treatment for a new or for a returning patient (Bader and Shugars, 1995). Previous studies have recommended to use the two approaches of quantitative and qualitative research in studying doctor-parent-child communication (Tates and Meeuwesen, 2001). In summary, this literature review has looked at care pathways in dentistry and the variation in dentists' clinical decision-making. It has included studies of dental care pathways for a well-defined group of patients. In addition, it has highlighted the importance of the contributing demographic factors of patients such as age and socio-economic background on dentists' decisions. There is evidence of the impact of doctor-patient communication on health outcomes. Patient satisfaction and adherence to medical advice are indicators of effective interaction with physicians. The dentist-parent-child interactions that have been studied have shown an association with dental outcomes. In paediatric dental consultations, many children with dental caries are referred for management under sedation or GA care pathways. Some observations of failed outcomes such as incomplete care pathways and repeat GA care pathways are a burden to the healthcare system.

1.5 Research Strategy

This exploratory research was conducted to understand the dynamics of paediatric dental consultations. It was also studying the impact of clinical communication on planning the care pathways for dental caries management. It was also open to explore other potential factors appearing in the clinical consultations. Two different types of data collection and analysis were used retrospectively and prospectively. This research study intended to identify the high risk patients to dental caries those who are referred for advanced treatment to the Leeds dental institute LDI. Reasons for referral and child involvement in the decision-making were investigated. Dentist-parent-child communication in consultation clinics was recorded to understand what factors influenced dentists to make their clinical decisions. The literature review included evidence of variation in dentists' clinical decision-making. This variation can occur at any stage of the dental care that included the assessment stage, diagnosis, and the treatment planning. Further studies are need to explore and examine variation among dentists and identify how different factors influenced dentists in their clinical decision making processes.

1.5.1 Research questions

This study aimed to answer the following questions:

- What is the process of decision-making in paediatric dental consultations?
- What are the factors that influence the paediatric dentist's decision when planning a care pathway for a child patient with dental caries?

1.5.2 Aims and objectives

The aim of this study was to explore the dynamics of the dental consultation and the interactions between the consultant paediatric dentist, parent, and child and how this might affect planning a care pathway for dental caries management.

Objectives:

•To identify the characteristics of paediatric patients referred to Leeds Dental Institute for dental caries management

•To examine the degree of agreement between the reasons for the referral and the suggested pathway from dental practitioners and the care pathway recommended by the consultant in paediatric dentistry following the consultation visit.

- To examine parental influence on the consultant paediatric dentists' decisions while planning care pathways for children with dental caries.

•To explore other factors affecting the consultant paediatric dentists' decisions while planning care pathways for child patients with dental caries.

- To understand what could influence child and parent acceptability of a proposed care pathway for dental treatment.
- To evaluate the degree of child involvement in planning a care pathway for dental treatment.

Chapter 2
Methodology

This chapter describes the methodology of this research study, it was developed with quantitative methodology applied to the first part of the research in the form of an observational analysis of a retrospective cohort. The second part was designed as a qualitative interviews using Thematic analysis as shown in Figure 2.1

2.1 Research design

Quantitative and qualitative strands of the research were designed to be carried out sequentially. The research methodology was designed to first apply a quantitative method approach and then to help explain its results in more depth by using a qualitative method approach. The quantitative study was used to explore the variations in planning the care pathways between GDPs and PDCs for children with dental caries and to explore the factors leading to this variation besides to the patient demographic factors. The results of the quantitative study were used to show the most likely age-group of children referred to the LDI for dental caries management. The following qualitative study involved children from the same age-group to be interviewed.

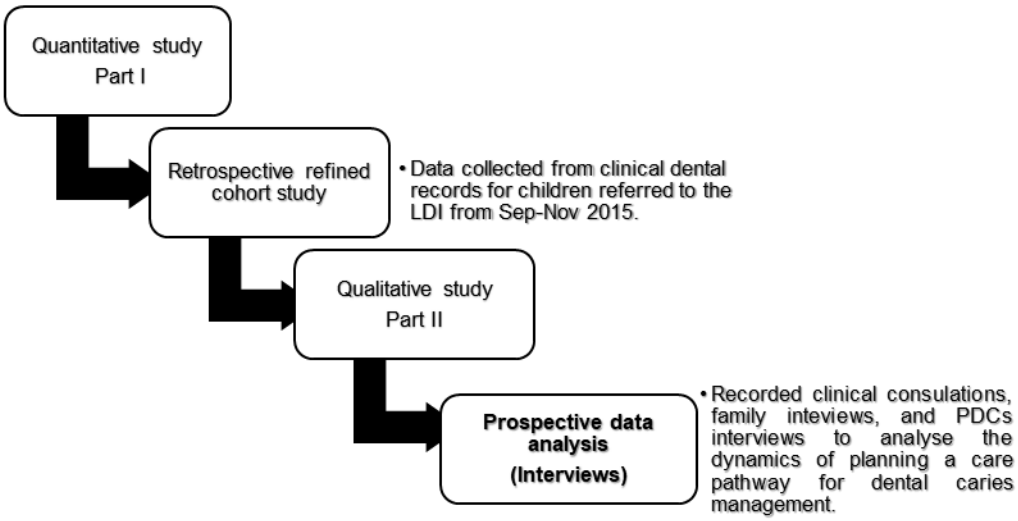

Figure 2.1 A diagram of the study design consists of two different methodologies: first is quantitative and second is qualitative

The appropriate care pathway had to be tailored to each patient as there is no one single optimal plan that suits all patients (NCGC et al., 2010). The process of planning a care pathway requires a thorough clinical assessment and use of evidence-based clinical guidelines. Different types of data were collected from clinical dental records and from recorded clinical consultations. The quantitative strand of this research collected data that identified children who are more likely to have GDPs referrals to specialists and consultants in Paediatric Dentistry for dental caries management. In addition, it recorded the variation in planning the care pathways between what the referring dentists wrote in their referral letters and what the paediatric dental consultant (PDC) decided and what the health outcomes were for each individual case. The qualitative strand recorded data during Paediatric Dental consultations and the interviews with the consultants and patients and their parents. The key features of research design in the qualitative study are the flexible nature that is concerned with what, why, and how and the focus on the process rather

than the number. The common flexible characteristics of qualitative research were described by (Ritchie et al., 2013) in the following points:

- A reflexive approach: Some researchers reporting their personal experiences of the field is acknowledged.
- Aims and objectives are providing an in-depth and interpreted understanding of the social world of research participants. It is learning about their perspectives, histories, experiences, and the sense they make of their social and material circumstances.
- Non-standardised methods are used for data generation, they are adaptable for each case to allow exploration of emergent issues that are sensitive to the social context of the study.
- Collected data are complex, detailed, and rich and may vary between studies.
- Data analysis respects the complexity and uniqueness of each case as well as recurrent, cross-cutting themes.
- At the analysis and interpretive stage, it is open to emergent categories and theories.
- The detailed descriptions of the phenomena being researched are grounded in the participants perspectives.

This study attempted to understand the clinical interaction during the consultations to explore the contributing factors involved in planning a care pathway for children with dental caries.

2.2 Ethical approval

The University of Leeds sponsorship approval letter was obtained to conduct this research (Appendix A). An application on the Integrated Research Application System (IRAS) was required for the quantitative and qualitative studies. This approval was obtained to access patients' data on the NHS database system and for interviewing the NHS PDCs and child patients who were referred to the Leeds Dental Institute (LDI) for dental caries treatment accompanied with their parents. The project had the IRAS no. 223539 was granted the ethical approval from the Health Research Authority (HRA) and Research Ethics Committee (REC) on the 8th of May 2018 (Ref No.: 18/SW/0080) (Appendix A). The capacity and capability authorisation to commence this study was obtained from the Research and Innovation Department R&I in the Leeds Teaching Hospitals NHS Trust.

2.3 The first study (quantitative)

A retrospective refined cohort study with referred children to the LDI over three months for management of dental caries was carried out. The data was refined for dental caries referrals only. The intended observation was to record the factors involved in the variation of the care pathways as recorded by the referring dentists and the consultants to manage dental caries for children. The comparison was made between the decisions made by referring GDPs and Specialists in Paediatric Dentistry in primary and secondary dental care and the decisions made by the PDCs in a tertiary dental care. The decisions were then compared with the patient outcomes. Initially, there were three

potential outcomes for care pathways for treating children with dental caries: 1) Local anaesthetics care pathway (LA) 2) Inhalation sedation in conjugation with local anaesthetics (IHS) care pathway 3) General anaesthetics (GA) care pathway.

2.3.1 Objectives of the quantitative study

- To explore characteristics of child patients referred to LDI for dental caries management
- To examine the agreement between the reason for referral by GDPs (the management the dentists suggested) and the care pathway planned by the PDCs at an initial consultation visit.

2.3.2 Null hypothesis

There is no difference in the decisions planned by referring dentists and PDCs in planning the care pathways for dental caries management to the referred children. There is also no difference in the care pathways planned by referring dentists and PDCs with the outcome of dental caries management.

2.3.3 Research hypothesis

There is a significant difference in the decisions planned by referring dentists and the care pathways planned by the PDCs for dental caries management to the referred children. There is also a difference in the care pathways planned by referring dentists and PDCs with the outcome of dental caries management.

2.3.4 Selection criteria

A. Inclusion criteria

- A new referral from a primary/secondary dental care to Leeds Dental Institute booked to see a consultant in paediatric dentistry for dental caries management.

B. Exclusion criteria

- A referred child patient with dental trauma or dental anomalies
- A child patient booked for a follow-up appointment
- A child patient referred by non-dental practitioners

2.3.5 Sampling strategy

A hybrid sampling strategy of convenience and heterogonous purposive technique was applied in the quantitative study. The referred children to the LDI for dental caries management were the population to be studied; the sample of this population were those children who were referred from September to November 2015 to the LDI for dental caries management. Clinical dental records for the referred children with dental caries over a three-month period were reviewed and all the cases were follow-up for three years until October 2018. The follow-up period was by re-reviewing all the clinical dental records after three years from referral to record completion of dental treatment. The sampling was focused only on referrals of children with dental caries.

2.3.6 Contributing factors were identified from the literature

A review of the literature allowed identification of the factors thought to be relevant to the present study of factors involved in planning the care pathways for children with dental caries. Documentation in the patients' clinical dental records is a mandatory requirement for each dental visit. In paediatric dental consultations, it involves documenting patients' demographic data, history, dental behaviour assessment, caries risk assessment, diagnosis and a short-term/long-term treatment plan. The index of multiple deprivation (IMD) is a tool to assess the socioeconomic status SES, which can be scored by using patients' postcodes. This was developed by the Office of National Statistics in the Ministry of Housing, Communities & Local Government in the UK. The factors in Table 2.1 were reported in previous studies thought to influence the decision and contribute in the variation in the decision-making between the referring dentists and the PDCs in planning the dental treatment for children with dental caries.

Table 2.1 Factors involved in the decision-making when planning dental treatment for dental caries based on past studies

*Presence of symptoms includes dental pain, abscess, and infection/inflammation

Factors	Sub-factors
Demographic factors	Age Gender Ethnicity
Social factors	Socioeconomic status Involvement of social worker Cultural/language barrier
Medical factors	Presence of chronic disease Healthy child Learning disability
Dental factors	Regular dental attendance and prevention Oral Hygiene practice Dietary habits History of previous dental treatment
Behavioural factors	Child dental behaviour assessment (Frankl scale) Parental involvement
Treatment need factors	Caries risk assessment Number of primary/permanent teeth required treatment Dentition phase (primary, mixed, and permanent) Presence of symptoms*

1.3.7 First study method

This study looked at the descriptors of children referred to the LDI to explore the influence on the decision-makings in referrals and following initial consultation visits with PDCs when planning a care pathway for dental caries management. Furthermore, the study recorded the outcome of care pathways that the patient received over a three-year follow-up period. Data analysis was performed to correlate between the outcome with the PDC planned care pathways, and between the outcome with the proposed care pathways in the original referral letters.

Data were collected from clinical dental records that had a full documentation of demographic information: age, gender, ethnicity, and postcodes; recorded information from referral letters including the source of the referral and the reasons for referral; medical, social, and dental history. The examination form was also included that the PDCs used to assess the dental treatment need in order to decide on a care pathway. The number of teeth affected with dental caries and the dentition phase whether it is a primary, mixed, or permanent dentition.

1.3.7.1 Training and practice

The principal investigator PI undertook training courses in using SPSS software. Discussions and consultations on data analysis was undertaken with Dr Jing Kang and Dr Jianhua Wu, Biostatisticians within the School of Dentistry at the University of Leeds. It was agreed to apply the Multinomial Logistic Regression analysis MNL to test factors that influence the decision-making. This statistical test allow adding multi independent variables IDVs (factors) to predict a dependent variable DV (dental care pathways).

1.3.7.2 A pilot study

A pre-piloted data collection sheet was designed following several long discussions with the PDCs at the LDI and the Biostatistician that later were approved by the Research Ethics Committee and the Health Research Authority. As a result of piloting the data collection sheet, three changes were added. The first change was recommended by the Biostatistician to use the IMD scoring system to record the SES for referred children. The second change was a modification on the child age question, it was agreed to record the age of the child at the time of referral as a PDC recommended. The third change was a question added about the number of carious primary and permanent teeth, it was considered an important factor when planning the care pathways as advised by a PDC.

The initial data collection sheet was used to record data from 85 dental records selected based on the selection criteria. There were some identified missing questions and categories on the data collection sheet. This had led to apply some modifications on the data collection sheet (version 8) on 9/10/2018. The modification on data collection sheets was approved on 12/10/2018. A covering letter, the original data collection sheet, the modified sheet, and approval of amendments in Appendix B. Modifications on the data collection sheet were applied to reduce overlapping, repetition and providing a wider range of choices to support data transformation into the soft copy form in the SPSS software for later data analysis.

1.3.7.3 The sample identification

A total of 297 digital dental records of child patients seen on the Children's Consultation Clinics in the LDI during the period between September to November 2015 were examined. Of these, 172 records were included in the study based on the previously mentioned inclusion and exclusion criteria. Data was retrieved from SALUD; a database system of patient dental records in the LDI. The SALUD technical support team provided two lists of hospital numbers for patients who were seen between September 2015 and November 2015. The first list was for patients seen on consultation clinics supervised by three different PDCs. There were 170 hospital numbers available for referred children for dental caries management during the three-month period. Eighty-five of the 170 referrals matched with the inclusion criteria for this study. Dental files (a hard copy file) that were missing or had incomplete dental records were excluded. The SALUD technical support team have searched

for more referred children with dental caries seen on consultation clinics under supervision of a Locum PDC used to work at the LDI during the same period of this study. They managed to provide a further list of 127 patient hospital numbers. Those paediatric dental consultation clinics involved trainees that were supervised by PDCs. The reason of data being provided in two separate sheets was because of the difficulty in finding the right code for the former Locum PDC who had worked at the LDI three years before conducting the study. Eighty-seven out of the 127 referrals matched with the study selection criteria. The total sample size was 172 digital records as shown in Figure 2.2. The criteria for excluding 125 dental records are illustrated in Table 2.2

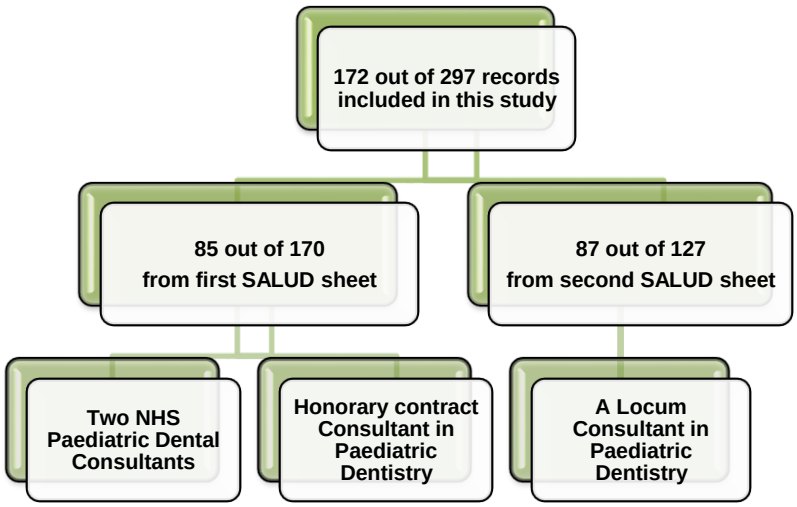

Figure 2.2 A diagram of the sample of dental records included in the study

Table 2.2 Included and excluded dental records from the SALUD sheets
*TSL: Tooth surface loss

No. of dental records from SALUD team	**Dental records matched inclusion criteria**	**Excluded dental records**						**Total**
		Review visits	No carious lesions (Dental anomaly/ TSL/ discoloration) referrals	Trauma /Oral lesions referrals	Orthodontic/ Periodontics referrals	Missing documents	Non-dental staff referrals	
1st sheet	85	16	38 *27 Anomaly, 11 TSL	5 *Trauma	29 *27 Ortho, 2 Perio	3	1	170
2nd sheet	87	2	20 *15 Anomaly, 5 Not carious	6 *1Trauma, 5 Oral-lesions	10 *9 Ortho, 1 Perio	0	2	127
Total	172	18	58	11	39	3	3	297

Dental records were excluded if they matched one exclusion criterion; however, 14 dental records matched two criteria for exclusion. Reasons for exclusion included review visits for orthodontic treatment, dental anomaly, orthodontic consultation visit, missing documents, consultation for cleft lip and palate, dental trauma, and temporomandibular joint disorder (TMD). All of the aforementioned excluded cases were from the first SALUD sheet that represented the consultation clinics of two NHS PDCs and one PDC with honorary contract. Eighty-five dental records were excluded from the first sheet and 40 records were excluded from the second sheet those were provided by SALUD technical support team.

1.3.7.4 Data collection

The data collection sheet incorporated 18 questions with multiple answers. After piloting the sheet, in question 4, more IMD scores were added (from 6 to10) according to the scoring system of the Office of National Statistics ONS, which consists of 10 scores, 1 represents the most deprived postcode and 10 describes the least deprived postcodes. In addition, there was one group (unmatched) was added to describe a solo postcode that was not found on the IMD scoring system. In question 6, there was no recording of no relevant social history; thus, the choices of answers for this this question were either relevant social history mentioned or not mentioned. In question 7, two choices of answers were added for the medical history to identify the child health status when there was a medical condition. If there was a medical condition, a different value was given for each condition to aid the statistical analysis. In question 10, more choices of answers were added to the reasons for referral to include parental involvement, not specified reason, and other reasons to be specified. In questions 13 and 14, there was an overlap found in the choices of answers, 10 affected teeth with dental caries was repeated in two groups (5-10) and (10-20) in the primary and permanent dentitions. The following choice of answer was changed accordingly to (11-20). In question 16, information was added about the assessment of child dental behaviour performed by trainees - speciality trainee or postgraduate student supervised by a PDC. In question 17, two more choices of answers were added for dental caries management recommendations; biological approach (application of Hall technique crown) and discharge when no treatment was needed. Lastly, in question 18, three choices of answers were added to the outcome of delivered dental care; biological approach (Hall technique crown), discharge when no dental treatment was needed, and incomplete/not started

treatment because of failure to attend multiple appointments. All data were extracted from SALUD database in NHS computers into a hard copy of data collection sheet and saved in a locked cabinet in a secured-access office.

The final data collected included demographic information such as age, gender, and ethnicity. The IMD was determined by using postcodes to score the SES of the children. Further data were extracted from referral letters including the source of referrals, medical, dental, and social history. Furthermore, the use of medication, history of any allergies, reason for referral and radiographic attachments in addition to behavioural assessment and the recommended care pathways by the referring dentists. Further data was collected from the new patient examination sheet used during the consultation including number of carious primary and/or permanent teeth, behavioural assessment and the planned care pathway that was approved by the supervising PDC. All dental records were tracked for up to three years to record the outcome of care pathways. The data were transferred into a soft copy form in the SPSS 23 software on a password-protected University computer for statistical analysis.

1.3.7.5 Data Management

Data in patients' dental records were sometimes ambiguous and some records had missing or imprecise details. Standardisation of the collected data was discussed by the research team and an agreement was reached to ensure all data were recorded using a consistent and agreed standard. The child age was recorded on the day of referral, in order to overcome the gap between referrals and consultation appointments. Initially, the behaviour rating scale used in this study was introduced by Frankl et .al (1962) who classified child dental behaviour into four groups: definitely negative, negative, defiantly positive, and positive (Kamel et al., 2017,

Riba et al., 2017, Asokan et al., 2014, Frankl, 1962). It was found in some referral letters and examination sheets that the child dental behaviour was described as cooperative only for examinations or ‘child is pre-cooperative’. Some of the referring dentists expressed their thoughts on the patient dental record and wrote ‘Do not think the child will cope’. A child’s ability to cooperate in dental appointments depends on the stage of development and can be divided into three categories: cooperative, pre-cooperative, and uncooperative (Gupta et al., 2014). It was agreed by the research team to consider all the descriptions of child behaviour with insufficient cooperation for treatment in the dental chair as pre-cooperative.

The assessment of child dental-behaviour was classified into three categories: pre-cooperative, cooperative and uncooperative. The Frankl behaviour rating scale was only used by the PDCs on consultation clinics. Therefore, the three categories based on the child stage of development was used in this data analysis to standardise the assessment made by the referring dentists and the PDCs. When a child was assessed as “cooperative for examination only” that was considered as pre-cooperative. A cooperative child was able to accept dental examination and cope with dental treatment with or without behaviour management techniques. Children assessed as anxious, dental phobic, needle phobic, or who failed to respond to dental-behaviour management techniques were categorised as uncooperative.

There were cases of children who stopped attending their dental appointments before the completion of the planned dental treatment. The hospital rule is those patients should be discharged to their family dentist and to be removed from the dental hospital waiting list. Other reviewed cases failed to attend any of the dental appointments, so they had not started the dental treatment. Those cases were also discharged and removed from the waiting list. Patients who had not started dental

treatment or had not completed the planned treatment plan were placed in the category: not completed/ started dental treatment. Cases who attended dental appointments and were discharged when no more treatment was needed, were placed in the Discharge group.

An issue was raised for children with two or more medical conditions. Statistically, every condition was given a value for statistical analysis. To avoid this issue, it was agreed by the team to select the condition most likely to affect the overall health and dental treatment e.g. cardiovascular disorder or bleeding problem. When a child's medical history showed two chronic illnesses that could both affect the overall health and dental treatment then a new category was created for those cases and named others.

For the assessment of intra-rater reliability, the 172 dental records were re-reviewed and retrieved three times from the file of scanned documents that were regularly updated on SALUD database. Extracted data from new patient information sheets included the number of carious primary/permanent teeth on consultation clinics. It also showed the most frequently presented group of child dental-behaviour assessment (pre-cooperative, cooperative and uncooperative) in referrals and on consultation clinics. Correspondingly, data analysis revealed the most planned care pathway for dental caries management by the PDCs and the outcome for every case of the referred children.

1.3.7.6 Data Analysis

A refined retrospective cohort study was carried out to explore associations and relationships between decisions made on consultation clinics and referrals with the outcomes. All documents were traced to the final care pathway delivered to each of the 172 cases. This tracking started from the decision made on referrals, through consultation clinics to the outcome of care pathways to provide dental treatment at the LDI over a three-year period from September-November 2015 until October 2018. Descriptive analysis was applied on demographic data to identify the characteristics of children referred to the LDI for dental caries management. Regression analysis was used for data analysis to examine the effect of every factor on the decisions made on referrals, at consultations, and the outcome of care pathways. Multinomial logistic regression was applied to investigate the factors which had a significant influence on the referring dentists and PDCs when planning a care pathway for children with dental caries. Patient factors reported in the literature review in Chapter one that might have an influence on clinical decisions were examined and analysed in the referrals, consultations, and the outcomes. Based on observations of the study sample, there were three care pathways for children with dental caries. Dental treatment for children could be managed under GA, LA, and under Inhalation Sedation (IHS) with LA. The three care pathways were commonly suggested in referrals, in consultation treatment plans and in the treatment outcomes. Other less common findings observed in the consultation treatment plan and outcome were biological approach of managing dental caries such as Hall technique crowns or non-invasive dental treatment such as discing of proximal tooth surfaces with dental caries without using LA. The observations reflect the levels of complexity to perform dental procedures for a child, the level of

cooperation, and the actual dental treatment needed based on the patient's physical, developmental and mental health.

There were three models generated for the three categorical variables (the referring dentists' plans, the PDCs' plans, and the outcome of care pathway). Those were the Dependent variables (DVs). The three main observations in those Dependent variables were GA, IHS, LA care pathways. Other observations included the biological approach, non-invasive dental procedures, and no specified care pathway in referrals. On the dental consultation plan, the PDC might decide to discharge the child patient because the tooth of concern was exfoliating and no further treatment was required. Discharge was also considered as one of the outcomes. The independent variables were age, gender, ethnicity, SES, medical history, number of carious primary teeth and behaviour assessed by the PDCs.

The independent variables for all the three dependent variables DVs in the three Multinomial logistic regression models were similar except for the behaviour assessment, which was carried out by the referring dentists in the first model. The number of affected permanent teeth was not considered as an IDV because of a very low number of subjects in the groups. Binary logistic regression analysis was applied to highlight the relationships of the referral plans and consultation plans with the observations of the patient outcome.

1.3.7.7 Data confidentiality and anonymity

Confidentiality and anonymity of all participants in this research study was protected. The researcher designed a coding system in which all participants were given a particular code number in order to anonymise their identity and names in any reports, publications, and conference presentations. Dental records of the study sample were given a unique number; this coding system allowed patients' records to be identifiable only to the research team. The coding system consisted of one letter and three digits of the patients' hospital number e.g. A676. An alphabetical letter was given to every page of the SALUD sheets besides the last three digits of patient's hospital number. Extracted data sheets were kept in a locked filing cabinet at the Leeds Dental Institute. Electronic records were saved on a university password-protected computer.

2.4 The rationale of the research approach and study design

Previous studies have covered the influence of dentist factors in making clinical decisions. In this research study, I wanted to explore the influence of patient factor on the paediatric dentists' decisions when planning care pathways for dental caries management. Bader and Shugars (1995) had explored the variation in dentists' clinical decisions. While (Rønneberg et al., 2017) explored the dentist factors in the variation of dental caries treatments. Shepherd and Ali (2015) claimed that only 25% of GA referrals are actually required dental treatment under GA care pathways. Finally, The types of doctor-patient-child clinical communication was analysed thoroughly in a review article that recommended to use quantitative and qualitative approaches in future studies in this field (Tates and Meeuwesen, 2001). All the previous four studies were of a great importance in finding the gap of this research.

Data analysed retrospectively in the first study showed a variation of clinical decisions to plan care pathways for children with dental caries. It was noted that a few cases failed to attend the first treatment session or did not attend the following appointment to complete the planned dental treatment. The second study was designed to explore the dynamics of the paediatric dental consultation and the types of clinical interaction between families and the PDCs. Furthermore, it explored the factors of patient involvement as identified from the literature review and their potential effect on clinical decisions and on starting and completing dental treatment. This was not assessed in the first study, the second (qualitative) study was conducted prospectively to understand the factors that might influence the decisions in planning care pathways for children with dental caries. The qualitative study was designed to interview parents, children, and PDCs to investigate clinical interactions within consultation clinics.

2.5 The second study (qualitative)

For deeper understanding of the whole picture of what factors might have influenced the decisions in planning the care pathways, the second study was designed as a prospective qualitative study. Data was collected using semi-structured interviews. Research participants included NHS PDCs, children with dental caries referred to the LDI and, their parents/guardians. Analysis of the dynamics of a paediatric dental consultation when planning a care pathway for a referred child with dental caries involved recording this experience with PDCs and the participants and recording their behaviours. Observing the PDCs' behaviours and their communication approach in patient assessment was one component of the analysis. Recording parents and children behaviour, and their interactions on the consultations aided to create categories that strengthened both the precision and plausibility of the analysis. Semi-structured interviews was designed to cover a wide-range of potential factors that may influence the decision-making for dental caries care pathways.

2.5.1 Objectives of the qualitative study

- To explore the dynamics of Paediatric Dental consultations and the patterns of clinical interaction.
- To understand the factors that affect PDCs' decisions on planning the care pathways for children with dental caries.
- To understand the potential influence on child and parent acceptability of a proposed care pathway for dental caries management.
- To investigate the child-involvement in planning a care pathway for dental caries management.

2.5.2 Selection criteria

A. Inclusion criteria

- A child patient referred to the LDI by a primary/secondary care dental practitioner
- A child patient referred for dental caries management
- A referred child patient in the age-group (4-7), the first study results.
- A referred child patient of either gender
- A referred child patient with any of the medical stages according to the American Society of Anaesthesiologists classification: ASA I, II, III and IV

B. Exclusion criteria

- A child patient referred to the LDI by non-dental practitioners
- A child patient referred for dental trauma
- A child patient referred for dental anomalies
- Any referral not related to dental caries

2.5.3 Sampling strategy

A heterogonous purposive sampling was applied in the second study (qualitative) to include a variety of decision-makings in planning care pathways for participants that represented the population of children with dental caries. Clinical dental records of the referred patients were refined by age. The age-group selected was based on the results from the first study, with this age cohort representing the most frequent age groups of children to be referred for dental caries. This age-group was also the most recorded on the waiting list for consultation clinics. Research recruitment of participants aimed to include both genders, different ethnicities, all the groups of

SES, and a wide range of social, medical and dental history. Initially, it was planned to recruit 20-24 child patients into the research study with a possibility to increase that number of participants until data saturation was reached. Every participating PDC of the four PDCs will record the clinical consultations of 5-6 child patients in each session. In reality, three PDCs managed to record 13 consultations from the recruited participants, two cases were excluded because of an unmatched selection criteria. Thematic saturation was planned to stop recruiting further participants when the researcher reached the point in which no more codes or themes that being developed in the data are added with the new participants.

2.5.4 Methodology

The second study was designed with a qualitative approach using semi-structured interviews. Three audio recordings included the paediatric dental consultations and two interviews. The PI had recorded two separate interviews, the first interview following the consultation with the participating family and the second was with the participating PDC. Thematic analysis was applied to the qualitative data and the key steps included data familiarisation, coding (indexing), creating themes, and reviewing. The applied coding strategy was a description-focused coding that depended on the research question to find the factors involved in planning a care pathway for children with dental caries. A theme-case approach was used for this data analysis. Themes were described as claims and codes were the evidence of these claims which was supported by studies in the literature review.

2.5.4.1 Philosophy

Key philosophical issues in studying the social world are raising several questions related to ontology and epistemology. Ontology are questions related to what is the nature of the social world and what is there to know about? While epistemology are questions related to how to learn about the social world and what is the basis of our knowledge? The ontological and epistemological assumptions of this research are described in the following points following the approach and methods described in (Ritchie et al., 2013):

I. ***Realism:*** is that we see an external reality as something that exists independently of our beliefs and understanding but is only accessible through the interpretation and perceptions of individuals. External reality is multifaceted and the aim of research to capture that reality in all its depth and complexity. The ontological position in the research falls within two schools. Critical realism (Bhaskar, 2013, Robson, 2011) that see an external reality exists but the only way to be known is through the socially constructed meanings and the human minds. Subtle realism (Blaikie, 2007, Hammmersley, 1992) that see reality consists of different levels: the empirical domain, the actual domain, and the real domain. In the same order, those are what we experienced through our senses, what exists whether or not it is observed, and what is the underlying mechanism and process.

II. ***Interpretivism and the role of theory:*** Our practices emphasise on the importance of understanding participants' perspectives in the circumstances of their lives. In the research, the approach of data analysis was an inductive/deductive balanced approach that was more of a research question-focused approach. The analytical output of this study was explanatory: explaining the process of decision making on paediatric dental consultation clinics and the contributing factors. There is a strong requirement of interpretation to be supported by the data, I aim to include the explicit descriptions of full range of participants' perspectives and experiences based on their accounts. Then, moving to wider theories of researchers' interpretations that relate to the data provided by study participants.

III. ***Pragmatism:*** Choosing the appropriate methods to address my research question was of a great importance when I designed the research study more than aligning to an epistemological position. Combining different data sources was the priority to understand all aspects of paediatric dental consolations.

IV. ***Reflexivity:*** I aim to achieve 'empathic neutrality' to avoid bias and to be neutral in collection, interpretation, and reporting the data. Three of the four members in the research team are paediatric dentists this allow the team to be reflexive on the research process. In all researches, there is no completely 'neutral' or 'objective' knowledge.

V. ***Rigour:*** I believe that a well-designed and well-conducted research will generate a well-founded and trustworthy evidence.

VI. ***Inferential status:*** I believe that qualitative research can be generalised in relation to the diversity and nature of the phenomena not in terms of their prevalence. My aim is to produce meaningful qualitative evidence that has a wider application in paediatric dentistry beyond the sample involved in the research.

2.5.4.2 Interview techniques - training and practice

The PI undertook three courses on qualitative research at the National Centre for Social Research (NatCen). These courses included introduction of qualitative research, in-depth interviewing skills with practice sessions, and data analysis of qualitative data. A workshop on NHS ethics approval was also taken. Four parts of N-vivo courses provided by the University of Leeds were completed. Courses on Endnote, Critical appraisal, and Word for thesis I & II also provided by the University were taken.

2.5.4.3 A pilot study

A pilot study was performed with three children and their mothers prior to starting the main research study. Nine audio recordings of six interviews and three consultations were recorded. Observations were collected and amendments to the topic guides and PISs for the main research study were applied. As a result of the pilot study, the children version of the PIS included the researcher animated picture.

In the first draft of the PIS for children there were pictures of a boy and a girl, two of the three children in the pilot study had asked if they will see those people in real. Logistic arrangements was also noted to pre-book interview rooms in a different floor of the LDI building away from clinical sittings and to add some entertainment including colours, colouring books, and refreshments. For the PDCs interviews, it was agreed to record the interview at the end of the session up to 48 hours if necessary to avoid recall bias. A question on the OH practice and regular dental check-ups were added to the topic guides for consultants and families as recommended by PDCs.

2.5.4.4 Identifying and approaching suitable participants

There were four NHS PDCs at the LDI invited to take part in the study. One version of the PIS was designed for the PDCs (Appendix C), which was given four weeks prior to the research recruitment of patient participants. This time was planned to allow the PDCs to read and consent and for other logistic arrangements within the Children's Dental Department at the LDI.

Research recruitment of children and parents was carried out by selecting potential participants from the consultation waiting list. Those patients were assigned to the consultation clinics of the four participating PDCs. The selection criteria were based on the aforementioned inclusion and exclusion. A total number of 33 research invitation letters were sent to the selected potential participants with the two versions of PIS (Appendix C). One mother responded through email to apologise for not being able to participate. There were 18 male and 15 female potential participants recorded on a code link sheet (appendix D). This sheet had a special code given to each child and to the assigned PDCs where he or she was booked to their clinics. Demographic information like name, age, and gender were recorded

in this sheet. This code link sheet was only accessed by the PI and saved in a locked cabinet. Invitation letters along with the confirmation letter for the appointment at the LDI were sent to the addresses by first-class mail. All invite envelopes included two versions of the PIS (Appendix C), which were sent four weeks prior to the consultation appointments. There were two versions of PIS, one has been designed for adults and the other version with animated pictures was designed for children in the (5-9) age-group. The age-group was decided based on data from the literature review for the application of ethical approval, which took place before the first study was implemented. Studies have shown that the most likely age-group referred for GA dental care pathway is 5-9 years of age (Raja et al., 2016, Shepherd and Ali, 2015, Hosey et al., 2006). All potential participants were asked to confirm their approval to participate at the front desk. If parents asked for more information about the study, an email was provided on the adult version of the PIS for parent/guardian or they could approach the PI at the waiting area on the day of dental consultation appointment.

2.5.4.5 Consent procedures

Four weeks after distributing the PIS, the four PDCs consented to participate in the research study (Consents on appendix D). On the day of consultation appointments, the receptionists at the front desk confirmed with potential participants if the PIS had been received and whether they were interested to participate in the study. If the family showed their interest, they were directed to the PI in the waiting area. The PI introduced herself to the parent/guardian, offered further explanations, and answered the queries. When the parent/guardian agreed to take part in the study, the child also had to show their willingness. Afterwards, the parent/guardian was consented and the child was assented to participate in the

research study (Appendix D). Those participants had been informed that they would be interviewed and this interview as well as the consultation with the PDC would be digitally audio-recorded. Parents and guardians who did not wish to participate in the study were thanked and assured that their decision would not affect their child's dental care at the LDI.

2.5.4.6 The sample size

Out of the 33 potential participants, 13 families accepted to participate, 17 declined and three had to cancel their appointments. In three sessions, potential participants who were assigned to one participating PDC had declined to participate in the study. The 13 participants of child patients consisted of eight males and five females. Out of the 13 participants, 11 cases had all the three recordings completed while 2 cases were dropped out at the stage of family interview. The two dropout cases were referred for dental caries and anomalies but no evidence of carious lesions was found on dental examinations. One of the two dropout cases had completed three audio recordings, while the other case had completed only two audio recordings, the consultation and the PDC interview but failed to record the family interview. A total of 38 audio-recordings for the 13 participating children were recorded. Thirty-three digital audio-recordings for the 11 participating families were included in this research study, those were 11 paediatric dental consultations, 11 family interviews, and 11 PDCs interviews.

2.5.4.7 Data collection

Data collection sheet (Appendix E) was filled by the PI including personal details of the participants of child patients including ethnicity, medical history, and postcode. Data collection was carried out from March to August 2019. All participating PDCs were asked to record their consultations on a digital audio-recorder. The 11 recruited participants of children accompanied by their parents/guardians were assigned to three of the four participating PDCs. The PI had interviewed the participating family for 20-30 minutes in a separate interview room, away from clinical sittings. The interviews with the PDCs were carried out separately to discuss the clinical consultation of each case that were booked in one of the morning/afternoon sessions.

A. The family interviews

The PI interviewed participating families on the same day of the dental consultation appointments or they were offered to arrange a day on a later date as convenient. The PI had to arrange a phone call interview after the dental treatment was completed for one case of a child patient who lived outside Leeds with a foster carer. The foster carer could not stay longer or arrange another day for a face-to-face interview as she was taking care of other foster children.

Travel expenses were reimbursed for the extra time the participants had to spend for the interviews. The interview room was deigned to be child friendly provided colouring books and colours for entertainment, offering biscuits and water as refreshments. At the end of every interview, participants were given a shopping voucher as a gesture of appreciation for their time in taking part in

the research study. The topic guides for parents and children's interviews were approved by the HRA and REC version 9, 01/05/2018 (Appendix F). The questions asked in the parent interviews included confirmation of their relationship with the child, their understanding of the reason for their referral to the LDI and attending consultation clinic, what they thought of the planned care pathway for their child and whether they were happy to proceed on this particular care pathway and why. More questions were about the child oral hygiene and the dental experience of the parent and child. In addition, they were asked to describe feelings and interactions during the consultation clinics. They were asked to add any comments or suggestions to improve the quality of the process of planning the care pathway for their child's dental care. Similar questions in a simple wording were asked of the child patient. As a result from the first study findings (quantitative), the selection criteria of the second study (qualitative) was children aged 5-7 years-old those are the most likely to be referred for dental caries management. However, for more child contribution in the family interviews, it was agreed by the research team to increase the age range which was already approved by the ethical committee, a 9 years-old child was later interviewed with her family. In case of any participant wishing to place a complaint, the PI provided the Patient Advice and Liaison Service leaflet (P.A.L.S), which has a contact number and detailed information on the process of placing a complaint.

B. The PDCs interviews

The PI had interviewed the participating PDCs while recording the interview on a digital audio-recorder. Every PDC was interviewed to summarise the consultations in one session on the same day if that was applicable. The PI offered to arrange another day but not later than 48 hours after the session to avoid recall bias in the interviews. In the PDC interview, questions were asked about the reasons for referral, a summary of the child's dental health, the planned care pathways, and a justification for planning a particular care pathway for each child patient. Furthermore, the PDC was asked to describe the dynamics of every consultation appointment with the participating family. The topic guide for the PDCs were approved by the HRA and REC version 9, 01/05/2018 (Appendix F). The first PDC was interviewed after the consultations of seven participants, the second was after two participants, and the third PDC was after three participants.

C. Paediatric dental consultations

The consultation sessions were audio recorded by the PDC or sometimes the assigned dental nurse. Normally, those sessions are divided into two parts. In the first part, the PDC confirms the identity of the patient and the accompanying guardian, takes the history, examines the patient, completes dental charting, and sends the patient for x-rays. Dental radiographs used to investigate other lesions or to define the severity and extent of dental caries. It aides to diagnose the carious lesions on proximal tooth surfaces that are not easy to be detected clinically. In the second part of the consultation sessions, based on the interpretation of dental radiographs, the PDC will make a clinical

decision of dental treatment. Then, a discussion of the routes of dental caries care pathways with the parents and children will take place. At the end of the session, the dental team will have to consent parents and assent children on the agreed care pathway.

The workload on NHS clinics, the limited time to spend with every patient, and the use of behavioural management techniques for examination proved to be challenging for the dental team to record the two parts of the consultation sessions. Out of the 11 consultation sessions, six cases had a completed audio recordings with the two parts of the consultation session recorded. Of the five cases that had only one part recorded, four cases had recorded the first part and one case had only the second part recorded.

2.5.4.8 Transcriptions

A professional company was hired to transcribe the 33 audio-recorded interviews and consultations; this company has an approved Data Processing Agreement with The University of Leeds. A Data Protection Agreement (DPA) was signed and approved by the research team (Appendix G). The agreement was consistent with the Data Protection Act 1998, together with successor legalisation incorporating the General Data Protection Regulation (GDPR). Thirty-three audio recordings of interviews and consultations were emailed using a University approved, encrypted data transfer service provided by the company. They transliterated all the audio-recordings. The verbatim transcripts were sent back to the PI in Word® documents. The PI had reviewed all the 33 transcripts to correct the misheard medical/dental terminologies.

2.5.4.9 Data analysis

Familiarisation of the triangulated data of three groups of transcripts; Family interviews, PDC interviews, and clinical consultations was carried out. Initial thematic framework was drawn in a table to represent every group of the three data sources. Then, labels were added to each case of a child patient including the outcomes and the waiting time since referrals. Each transcript was coded line by line using individual-based sorting strategy. The coding steps included 1. Decide on the code strategy 2. Labelling research question 3. Create and define labels 4. Search for relevant information in the data 5. Assign labels to the relevant information. Labels were applied to the data followed the non-cross-sectional data organisation strategy, looking at particular cases in the sample, each case may require a specific set of categories. This approach was used to gain a sense of the distinctiveness of particular segments of the material for a better understanding of the process of planning care pathways in paediatric dental consultation clinics. Data was summarised to be related to a specific theme in each transcript and then moving to another theme.

The final stage was to find the relation of those themes with the patients' lives and that was achieved by identifying concepts and other aspects from the established literature review. Data then was summarised and displayed using construction of framework matrix. The Framework method summaries the qualitative data in a table of rows and columns and allow for both cross-case as well as sorting data by theme. Cases were sorted by row with some attributes such as (age, IMD, gender, and ethnicity) while themes to which the data have been coded occupy the columns of the matrix. In each intersecting cell, the information from each data source was summarized and related to the intersecting case and theme. Data extracts were

reviewed to see if there was any missing theme from the framework. After materials were summarized, the matrix was reviewed, the empty intersecting cells considered to mean that the theme was not relevant to the case or the information was missing.

An idea was emerged from data extracts and framework matrices of what is happening in a matter of clinical communication between parent, child and dentist to reach to a final decision of a care pathway. Codes were reviewed to detect elements and to be sorted according to underlying dimensions to aid in constructing themes. Typologies then identified a set of sub types of a general theme within the data. Data was explored to identify in what way of a particular configuration these themes were connected and linked to each other. Following the steps of data descriptive, subthemes were accounted for patterns. Explicit accounts based on reasons given by participants in the study and implicit accounts were when the author inferring an underlying logic based on participants intentions or situational factors inspired by other studies or theories.

2.5.4.1.0 Data confidentiality and anonymity

The participating PDCs were provided with an encrypted digital recorder to record the consultation sessions, the PI collected it immediately after each session. The PI had interviewed the parents/guardians and children. Then, the PI had interviewed the PDC at the end of the session. The two separate interviews were recorded on an encrypted digital recorder. Later, all audio-recordings were transferred to the University of Leeds computers on a secure server and deleted immediately from the digital devices. The digital audio recordings of the consultations and interviews were pseudonymised, incorporating codes substituting participants' names. The codes were stored on a server of the University of Leeds and only the PI and main supervisor have access to it. These

codes will be deleted once the analysis and PhD thesis have been written. The code link sheet was kept in a separate file from the transcripts. The code link sheet and transcripts were stored on a server of the University of Leeds that only the PI and the main supervisor can access. Any paper copies of pseudonymised transcripts as well as consent forms were stored in a locked filing cabinet and will be destroyed once the PhD thesis has been written. All recorded data that was obtained from the two audio-recorded interviews and consultations was also stored in a locked filing cabinet. The original audio recordings are kept safe until the completion and reporting of the research study and all publications are completed.

2.6 Summary

This chapter described the two studies in this research that was designed with two different methodologies. The first methodology, a retrospective quantitative study was planned to explore any demographic linkage to referrals of children to manage dental caries. Moreover, to show the association between dentists' decisions and the outcome of care pathways. Furthermore, to evaluate the concordance between the referral letters for children with dental caries management and the consultation plans of care pathways.

The second research methodology was a prospective qualitative study that aimed to explore the interactions and behaviours of the PDCs, child patients, and parents. Exploring the dynamics of the consultation clinics and the association with the decision-making when planning the care pathways. Data analysis of the three groups of data sources were intended to explore the child-involvement and the parental influence on the PDCs' decisions.

Chapter 3
Quantitative results

This chapter presents the results of the quantitative study which was designed to find the characteristics of child patients referred to the LDI for dental caries management. It was also aimed to investigate the variation between GDPs and PDCs when planning care pathways for children with dental caries and the potential factors that influenced their decisions.

3.1 Descriptive analysis

Nearly 300 digital dental records of child patients seen on the children's dental consultation clinics at LDI during the period from September to November 2015 were collected and 172 records were included in the study based on the selection criteria. The sample was followed-up for three years until October 2018. Data were analysed to identify the most common age-group, gender, ethnicity and social-economic status among the children referred for dental caries management. Further analysis was performed to investigate factors that influenced a General Dental Practitioner (GDP) or Specialist in Paediatric Dentistry to refer a child patient to a Paediatric Dental Consultant (PDC) for dental caries management. Likewise, factors that had influenced a PDC's decision to plan one particular care pathway for dental caries management for a referred child patient were investigated. Factors were identified from the literature review in Chapter-one and were planned to be tested statistically on the data of this study.

3.1.1 Demographic data

Data analysis of a hundred and seventy-two dental records was completed. Descriptive analysis showed that the 4-7 year age-group was the most common group among the children referred to the LDI for caries management, almost 60% as shown in Table 3.2. Precisely, children aged 5 and 6 years-of-age represented one third of the sample 31.4% as shown in Table 3.1. There was no significant difference found in relation to patient gender; 53.5% (n=90) of the referred children were males and 46.5% (n=82) were females. The Index of Multiple Deprivation (IMD) of the UK Office for National Statistics (ONS) was used to classify the socioeconomic status (SES) for the referred child patients using postcodes, IMD1 represented the lowest SES and IMD10 was for the highest group. Sixty percent of the sample was classified from the low socioeconomic status (SES) as follows: 35.5% (n=61) IMD1, 11.6% (n=20) IMD2, and 14% (n=24) IMD3 as shown in Figure 3.1. Approximately, half of the referred children 53.5% (n=92) were from the white-British ethnic group; 12.8% (n=22) were from the south-Asian group (Pakistani, Indian), 21 % (n=37) were not specified. Other ethnicity groups were reported as Black (African, Caribbean) in 4.7% (n=8), white-not British (mainly Polish and Lithuanian) in 4.7% (n=8), and mixed-race in 2.9% (n=5).

Table 3.1 Frequency and percentage of age-groups of the referred children to the LDI with dental caries during a three-month period in September-November 2015 (n=172)

Age	Frequency	Percent
1	1	0.6%
2	5	2.9%
3	13	7.6%
4	23	13.4%
5	27	15.7%
6	27	15.7%
7	25	14.5%
8	17	9.9%
9	13	7.6%
10	3	1.7%
11	7	4.1%
12	2	1.2%
13	3	1.7%
14	3	1.7%
15	3	1.7%
Total	172	100%

Table 3.2 The most frequently reported age-group of the referred children to the LDI with dental caries

Age-group	Frequency	Percent
1-3 years of-age	19	11.0%
4-7 years-of -age	102	59.3%
8+ years-of-age	51	29.7%
Total	172	100%

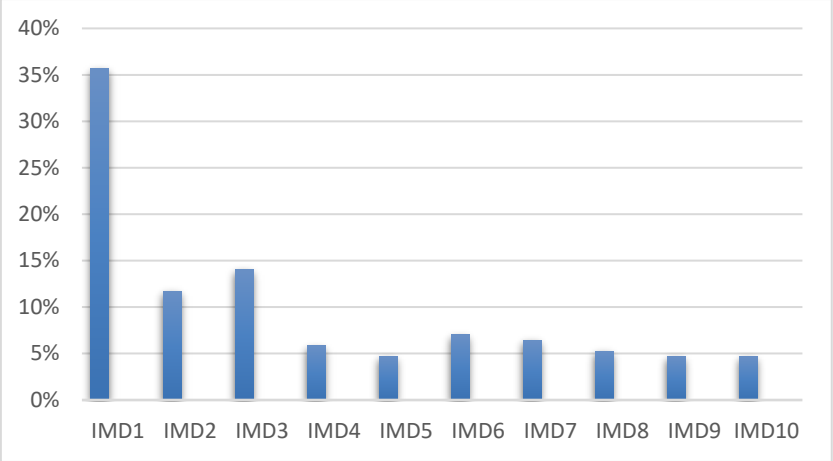

Figure 3.1 The socio-economic status of the referred children to the LDI for dental caries management

*Source: The Index of Multiple Deprivation (IMD) of the UK Office for National Statistics (ONS) using postcodes.

3.1.2 Extracted data from dental caries referrals and medical history assessment sheets

Extracted data from referral letters was analysed to reveal the most common reason for referrals and justifications for care pathways recommended for each case of the children with dental caries. GDPs were the source of most of the referral letters 82.0%, while Specialists in Paediatric Dentistry had referred 15.1% of the sample. Other dental professionals such as speciality trainees, consultant trainees, and Oral and Maxillofacial Surgery (OMFS) consultants had referred 2.9% of the sample. There was no social history recorded in most of the referrals (93.6%). Reasons for referral in the dental records showed 61% were because of the lack of child cooperation, 16.3% were not specified, 9.3% were for the complexity of the dental procedures, and 7.0% were because of relevant medical conditions as shown in Figure 3.2. Parent preference was recorded as a reason for referral in 2.9% of the referral letters and 3.5% were for assorted reasons, such as re-referring after a discharge after not attending more than

two dental appointments at the LDI. Approximately, 89.0% of the referrals had no attached dental radiographs, while 11.0% had included radiographs to support a proposed dental plan.

About 70% (n= 120) of the referred children were healthy and had no medical problems recorded on referral letters and/or on the medical history assessment sheet. Descriptive analysis of the remaining 30% (n=52) those with a medical history showed that 11.6% had asthma, 1.7% had cardiovascular conditions, and 2.9% had bleeding disorders. Fourteen percent of the referred children had different conditions, such as Eczema, DiGeorge syndrome, and learning disabilities (Attention Deficit and Hyperactivity Disorders (ADHD) or Autistic Spectrum Disorder). One child had a renal disorder representing 0.6% of the sample. No allergies were reported in 87.2% of the cases of referred children to LDI for dental caries management. This missing information could be mistakenly overlooked by parents or most probably those patients had no history of allergic reactions. However, history of allergic reaction was reported in 12.8% of the referred cases. No regularly taken medication was reported in 76.2% of the cases while 19.2% were reported to have medication taken regularly. The remaining 4.6% of the medical assessment sheets, parents answered yes on the question of the child patient is taking regular medication but they could not recall the names.

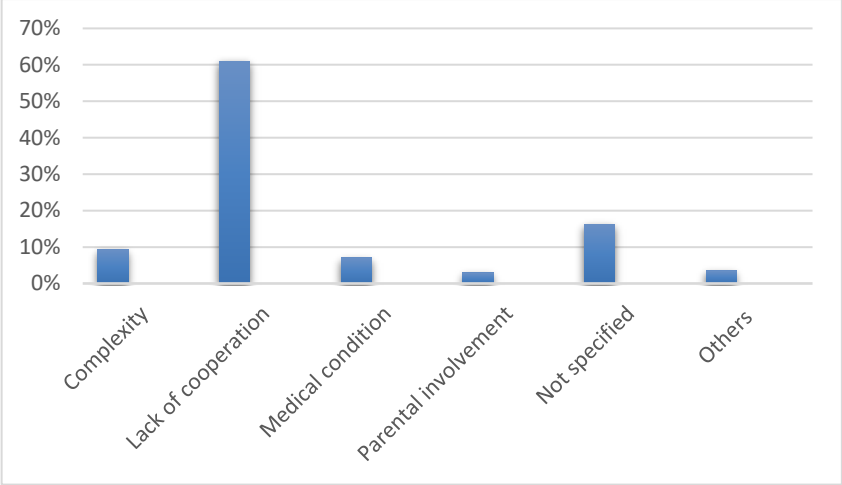

Figure 3.2 The reasons for referrals for the children referred to the LDI from Sep-Nov 2015

3.1.3 Clinical assessment on consultation clinics

Nearly half of the referred patients had dental caries in 5-10 primary teeth as shown in Table 3.3. The number of affected permanent teeth was excluded from statistical analysis due to insufficient number of subjects in the subgroups as shown in Table 3.4 because the majority of the referred children had no or less than five carious permanent teeth because of their young age.

Table 3.3 Number of carious primary teeth among the referred children to the LDI

Number of carious primary teeth	Frequency	Percent
<5	67	39.0
5-10	85	49.4
11-20	20	11.6
Total	172	100.0

Table 3.4 The majority of the referred children to the LDI had less than 5 permanent teeth affected with dental caries

Number of carious permanent teeth	Frequency	Percent
<5	166	96.5
5-10	5	2.9
10-20	1	0.6
>20	0	0
Total	172	100.0

On referrals, the referring dentists had assessed half of the sample as uncooperative/anxious/phobic as shown in Table 3.5. In contrast, the PDCs assessed nearly half of the referred children on consultation clinics as cooperative as shown in Table 3.5.

Table 3.5 Dental-behaviour assessment for the referred children to the LDI for dental caries management

Behaviour assessment by referring dentists	n	%	Behaviour assessment by PDCs	n	%
Pre-cooperative	20	11.6	**Pre-cooperative**	39	22.7
Cooperative	2	1.2	**Cooperative**	79	45.9
Uncooperative/anxious/phobic	85	49.4	**Uncooperative/anxious/phobic**	31	18.0
Not-specified	65	37.8	**Not-specified**	23	13.4
Total	172	100	**Total**	172	100

3.1.4 Planned care pathways for the referred children with dental caries

Planned care pathways for dental caries management was based on various factors. When a referred child attended a dental consultation clinic at the LDI accompanied by parents/guardians, a PDC had to decide on a care pathway at the end of that visit. Informed consents are routinely signed by parents/guardians and a child often assents to the planned care pathway for dental caries treatment. If a child failed to cope, a review appointment was arranged for re-assessment of child dental-behaviour and for planning another care pathway to complete dental treatment. Thus, a study of those factors that had influenced the decision-making of planning care pathways for dental caries treatment was necessary.

A sample of (n=172) children referred to LDI for dental caries management from Sep-Nov 2015 was collected. Every case was traced for three years and the outcome was recorded at the end of the follow-up period. Data analysis explored the associations between the decision-making in planning care pathways for a child patients with dental caries upon referral and on clinical consultation and the involved factors. Table 3.6

showed 42.0% of dental referrals were planned for a GA care pathway and 40.0% had no specified pathway; whereas, PDCs had planned GA care pathways for 67.4 % of the sample and 22.7% were planned for a LA care pathway as shown in Table 3.6.

The outcomes of care pathways for dental caries management for the referred children to LDI had three observations: GA care pathway, other care pathways, and not started/completed dental treatment. There were 15.1% (n=26) of the referred children who had not started or completed dental treatment at the end of the three-year follow-up period. In this group, 6.4% (n=11) had no dental care pathway started and 8.7% (n=15) had not completed the planned care pathway for dental caries management. On the other hand, the majority of referred children to LDI 63.4% (n=109) had completed the dental treatment in a GA care pathway as shown in Table 3.6. One of the observed outcome was (Others) as shown in Table 3.6; this was labelled for the cases that had been treated with non-invasive dental procedures without using local anaesthetics and included disking carious proximal surfaces of primary Incisors.

Table 3.6 Planned care pathways for dental caries management to the cases of referred children to the LDI and the outcome

Care pathways planned by referring dentists	n	%	Care pathways planned by PDCs	n	%	Outcome	n	%
GA	72	41.9	**GA**	116	67.4	**GA**	109	63.4
IHS	18	10.5	**IHS**	11	6.4	**IHS**	12	7.0
LA	13	7.6	**LA**	39	22.7	**LA**	17	9.9
Not Specified	69	40.1				**Not started/ completed**	26	15.1
			Biological approach (Hall crown)	3	1.7	**Biological approach (Hall crown)**	3	1.7
			Discharge	1	0.6	**Discharge**	2	1.2
			Others	2	1.2	**Others**	3	1.7
Total	172	100	**Total**	172	100	**Total**	172	100

3.2 Dental care pathways planned by referring dentists and PDCs and the outcomes

SPSS cross tabulation was applied to examine the agreement in planning care pathways for dental caries management between referring dentists and PDCs with the outcomes. Furthermore, gender distribution in dental referrals, consultation plans, and the outcome of care pathways for dental caries management were examined.

3.2.1 The planned dental care pathways by the referring dentists and the outcomes

Out of 72 of the children who were referred to LDI for a GA care pathway, 56 had their dental treatment completed in a GA care pathway; 78% of the referrals for GA matched the outcome as shown in Table 3.7. Of 18 of the referrals for inhalation sedation, three cases had the dental treatment completed in the IHS care pathway; 17% of IHS referrals matched with the outcome. Of 13 of the referrals for an LA care pathway, three had the dental treatment completed in an LA care pathway; 23% of LA referrals matched with the outcome. Of the 69 no specified care pathway referrals, 13 had not started or completed dental treatment. About half of referrals with no specified care pathway 56.5% (n=39) had their dental treatment completed in a GA care pathway. Three of the no specified care pathway referrals had dental treatment completed using the biological approach, and one case was discharged because no dental treatment was required. Referrals for treatment under GA were less likely to have the outcome of not started or completed dental treatment than other referrals. However, referrals for dental care under LA pathway were more likely (30.8%) to have the dental treatment not started or completed after the three-year follow-up period. A small percentage (7%) of the referred children for GA failed to complete the dental treatment

compared to the referrals for other care pathways who had a higher percentage to not complete dental treatments at the end of the three-year follow-up period, 22.2% of IHS and 30.8% (one third) of LA referrals. Most of the referred children for the IHS and LA pathways completed dental treatment eventually under a GA care pathway, 55.6% and 30.8% respectively.

Table 3.7 The outcome of the care pathways for the dental referrals

Dental caries referrals	**The outcome of care pathways**						
	GA	IHS	LA	Not started/ completed	Biological (Hall crown)	Discharge	Others
GA (n = 72)	77.8% (n=56)	5.6% (n=4)	8.3% (n=6)	6.9% (n=5)	--	1.4% (n=1)	--
IHS (n = 18)	55.6% (n=10)	16.7% (n=3)	--	22.2% (n=4)	--	--	5.6% (n=1)
LA (n = 13)	30.8% (n=4)	15.4% (n=2)	23.1% (n=3)	30.8% (n=4)	--	--	--
Not specified (n = 69)	56.5% (n=39)	4.3% (n=3)	11.6% (n=8)	18.8% (n=13)	4.3% (n=3)	1.4% (n=1)	2.9% (n=2)
Total	(n=109)	(n=12)	(n=17)	(n= 26)	(n=3)	(n=2)	(n=3)

3.2.2 The planned dental care pathways by the PDCs and the outcomes

For 116 of the cases planned for GA care pathway by the PDCs, 101 completed the dental treatment with a GA care pathway; 87.1% of the PDCs' plans for GA matched with the outcome. Eleven of the cases were planned for an inhalation sedation care pathway by the PDCs and five cases completed the dental treatment with inhalation sedation; 45.5 % of the PDCs' plans for IHS matched with the outcome. Thirty-nine of the cases were planned for a LA care pathway by the PDCs, and 13 had the dental treatment completed in a LA care pathway; 33.3% of the PDCs' plans for LA matched with the outcome.

Observations of the tracked patient dental records showed that the PDCs had positively predicted the outcome of LA and IHS care pathways in 33.3% and 45.5% of the cases respectively, while the referring dentists had lower predictions of the outcome for LA and IHS care pathways with 23.1% and 16.7% respectively. Similarly, GA care pathways planned by the PDCs were less likely to have the outcome of not started or completed dental treatment than other consultation plans. LA care pathways planned by the PDCs were more likely (38.5%) to fail to complete the dental treatment after the three-year follow-up period. However, GA care pathways planned by the PDCs were more likely to complete the dental treatment successfully at the end of the three-year follow-up period compared with the other plans of care pathways evidenced by the small percentage (6%) of children planed for a GA care pathway who failed to complete the dental treatment Table 3.8.

Table 3.8 The outcome of the care pathways for the PDC's plans

PDCs plans	**The care pathways outcome**						
	GA	IHS	LA	Not started/ completed	Biological	Discharge	Others
GA (n=116)	87.1% (n= 101)	1.7% (n=2)	3.4% (n=4)	6.0% (n=7)	--	0.9% (n=1)	0.9% (n=1)
IHS (n=11)	27.3% (n=3)	45.5% (n=5)	--	27.3% (n=3)	--	--	--
LA (n= 39)	10.3% (n=4)	12.8% (n=5)	33.3% (n=13)	38.5% (n=15)	2.6% (n=1)	--	2.6% (n=1)
Others (n=6)	16.7% (n=1)	--	--	16.7% (n=1)	33.3% (n=2)	16.7% (n=1)	16.7% (n=1)
Total	(n= 109)	(n=12)	(n=17)	(n= 26)	(n=3)	(n=2)	(n=3)

3.2.3 The agreement on a GA care pathway between the referring dentists and the PDCs with the outcomes

A hundred and nine (63.4%) of the total sample of 172 referred children to the LDI had the outcome of a GA care pathway. The cases that had the outcome of a combined care pathway included with GA were also included in the outcome of GA care pathways. There were four cases who had the outcome of a combined LA/GA care pathways and two cases who had a combined GA/biological approach care pathway. The PDCs had planned 101 of the 109 cases who had the outcome of a GA care pathway, and the agreement between the PDCs' plans and the outcome was 92.7%. The referring dentists had planned 56 of the 109 cases who had the outcome of a GA care pathway, and the agreement between the referring dentists' plans and the outcome was 51.4%. The cases that had agreement between the referring dentists and the PDCs to plan for a GA care pathway with the outcome of a GA care pathway was recorded in almost half 49.5% (n=54) of the cases with a GA outcome as shown in Figure 3.3.

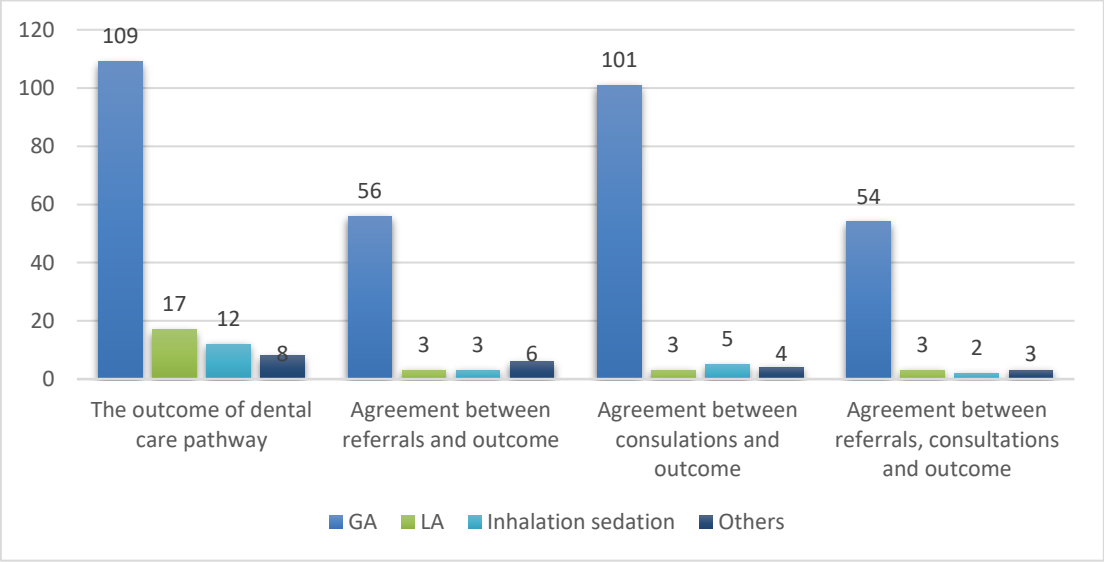

Figure 3.3 The agreement in planning GA care pathways and the GA outcome for dental caries management

3.2.4 Retracing the outcome of not started or completed dental treatment

A hundred and forty-six cases (85%) of the sample (n=172) of children referred to the LDI completed the dental treatment within the three-year follow-up, while 26 cases (15%) failed to start or complete dental treatment by the end of the follow-up period. The cases in the outcome of not started or completed dental treatment were recorded as either failed to attend the first dental appointment or stopped attending appointments prior the completion of dental treatment. Those cases were retraced to the planned care pathways in the referrals and consultations. It is important to identify the start points associated with the failure in starting or completing dental treatment for the referred children for dental caries management. It was also planned in the second study to explore factors that were involved in leading to this outcome. Half 50% (n=13) of the 26 cases in the outcome of not started or completed dental treatment had been referred with no specified plan. However, the PDCs had planned an LA care pathway for 15 patients (57.7%) of the cases in the outcome of not started or completed dental treatment as shown in Table 3.10. The characteristics of referred children in the outcome of not started or completed dental treatment is reported in Table 3.9.

Table 3.9 The characteristics of referred children in the outcome of not started or completed dental treatment (n=26)

Variables	Frequency	Percent
4-7 years of-age	18	70%
Males	17	65%
White-British	8	30%
South-Asian	6	23%
No relevant medical history	22	84.6%
5-10 carious primary teeth	14	53.8%

Table 3.10 The outline of retraced cases in the outcome of not started or completed dental treatment (n=26)

Planned care pathway for <u>not started</u> cases	**Plans upon referrals**	**Paediatric dental consultants' plans**	**Planned care pathway for <u>not completed</u> cases**	**Plans upon referrals**	**Paediatric dental consultants' plans**
GA	3	3	GA	2	2
IHS	0	2	IHS	4	1
LA	2	4	LA	2	11
Others	0	2	Others	0	1
Not specified	6	0	Not specified	7	0
Total	11	11	Total	15	15

3.2.5 Gender distribution in dental referrals, consultation plans, and in the outcome of dental care pathways

There was no significant difference found in gender distribution of male and female patients referred to the LDI for caries management; 53.5% (n=90) were males and 46.5% (n=82) were females. In the outcome of GA care pathway for dental caries management, there were 47.7% male patients and 52.3% females as shown in Table 3.11. In the outcome of the LA care pathway, gender distribution recorded was 47.1% males and 52.9% females. On the other hand, 75% males had the outcome of an IHS care pathway for dental caries management, higher than females (25%). A higher percentage of male than female patients was reported in the outcome of not started or completed dental treatment.

Table 3.11 Gender distribution in the outcome of care pathways for dental caries management

Gender distribution	**The outcome of care pathways for dental caries management**					
	GA	IHS	LA	Not started/completed	Others	Total
Males	47.7% n=52	75% n=9	47.1% n=8	65.4% n= 17	75% n=6	53.5% n=92
Females	52.3% n=57	25% n=3	52.9% n=9	34.6% n=9	25% n=2	46.5% n=80
Total	63.3% n=109	7% n=12	10% n=17	15.1% n=26	4.6% n=8	100% n=172

Patient gender did not appear to have any influence on the referring dentists when planning to refer children for GA, LA, or IHS care pathways for dental caries management. However, male patients were more likely to be referred with no specific planned care pathway than female patients as shown in Table 3.12

Table 3.12 Gender distribution in referrals for dental caries management

Gender distribution	**Care pathways for dental caries management planned by referring dentists**				
	GA	IHS	LA	Not specified	Total
Males	47.2% (n=34)	55.6% (n=10)	46.2% (n=6)	60.9% (n=42)	53.5% (n=92)
Females	52.8% (n=38)	44.4% (n=8)	53.8% (n=7)	39.1% (n=27)	46.5% (n=80)
Total	41.8% (n=72)	10.5% (n=18)	7.6% (n=13)	40.1% (n=69)	100% (n=172)

Likewise, patient gender appeared to have no influence on the PDCs when planning a GA care pathway for dental caries management. However, the PDCs were more likely to plan care pathways including LA, IHS, biological treatment, or non-invasive dental procedures without using local anaesthetics for male patients than female patients as shown in Table 3.13.

Table 3.13 Gender distribution in the PDCs' plans of care pathways for dental caries management

Gender distribution	Care pathways for dental caries management planned by the PDCs				
	GA	IHS	LA	Others	Total
Males	47.4% (n=55)	72.7% (n=8)	61.5% (n=24)	83.3% (n=5)	53.5% (n=92)
Females	526% (n=61)	27.3% (n=3)	38.5% (n=15)	16.7% (n=1)	46.5% (n=80)
Total	67.4% (n=116)	6.4% (n=11)	22.7% (n=39)	3.5% (n=6)	100% (n=172)

3.3 Regression Analysis

3.3.1 Multinomial Logistic Regression

Multinomial logistic regression analysis was used to examine the association between nominal and/or continuous independent variables (IDVs) and the interactions of independent variables to predict a dependent variable (DV) of multiple nominal outcomes. IDVs in this study were the potential factors identified from the literature review chapter that had influenced planning care pathways for dental caries management. These included age, gender, ethnicity, socioeconomic status, medical history, number of carious primary teeth, and the assessment of dental behaviour of the referred children to the LDI. The number of carious permanent teeth was excluded from the regression analysis as an IDV because of insufficient numbers of subjects in the subgroups. Three multinomial logistic regression models were created to predict three DVs. The DVs intended to be predicted in this study were the care pathways for dental caries management planned by the referring dentists, the PDCs at the LDI, and the outcomes. Table 3.14 shows the variables in the three logistic models.

Table 3.14 A summary table of variables in MNL regression analysis

Variables	Categories	n	(%)	Mean (SD)
Age-group	1-3 years-of-age 4-7 years-of -age 8-15 years-of-age	19 102 51	11% 59.3% 29.7%	6.5 ± 2.8
Gender	Males Females	92 80	53.5% 46.5%	N/A
Ethnicity	White-British South-Asian Others (black, mixed-race, white not British) Not Specified	92 22 21 (8,5,8) 37	53.5% 12.8% 12.2% 21.5%	N/A
IMD	IMD 1-3 IMD 4-7 IMD 8-10	105 41 25 *One missing data	61% 23.8% 14.5% *0.7% missing data	N/A
Medical History	No relevant medical history Medically compromised	119 53	69.2% 30.8%	N/A
Number of affected primary teeth	≤5 5-10 11-20	67 85 20	39% 49.4% 11.6%	N/A

Behaviour assessment on referrals	Pre-cooperative Cooperative Uncooperative/anxious/phobic Not-Specified	20 2 85 65	11.6% 1.2% 49.4% 37.8%	N/A
Behaviour assessment in consultation	Pre-cooperative Cooperative Uncooperative/anxious/phobic Not-Specified	39 79 31 23	22.7% 45.9% 18% 13.4%	N/A
Decisions by referring dentists	GA Others Not specified	72 31 69	41.9% 18% 40.1%	N/A
Decisions by PDCs	GA LA Others	116 39 17	67.4% 22.7% 9.9%	N/A
Outcome	GA Others Not started/completed	109 37 26	63.4% 15.1% 21.5%	N/A

A. Factors that had appeared to influence the referring dentists in planning care pathways for dental caries management

In the first model, GA referral was the reference group to analyse factors that had influenced the referring dentists decisions in planning LA, IHS, or no specified plans of a care pathway for dental caries management (Appendix H). Seven IDVs were examined for any association to predict the care pathways planned by the referring dentists. Those IDVs were patient age, gender, ethnicity, SES, medical history, number of carious primary teeth, and the child dental-behaviour assessed by the referring dentists.

It was found that LA and IHS referrals were more likely to be planned for older children than for those in younger age-groups *P*-value 0.04, 95% CI= 1.01-1.49. Another association found was that the LA and IHS referrals were more likely to be planned for patients with no assessment of dental-behaviour on their referrals than patients who were assessed as uncooperative or anxious *P*-value 0.03, 95% CI= 1.15-8.69. Children from higher socio-economic status were more likely to be planned by the referring dentists for LA and IHS care pathways for dental caries management than children with low SES *P*-value 0.01, 95% CI= 1.52-28.26. No recorded assessment of child dental-behaviour was more likely to be found on the referrals with no planned care pathways for dental caries management *P*-value 0.02, 95% CI= 1.22-6.64. Children from middle and high socioeconomic groups were more likely to be referred with no planned care pathway than those from low socioeconomic group *P*-value 0.007, 95% CI= 1.421-9.517 *P*-value 0.006, 95% CI= 1.645-20.993 respectively (Table 3.15).

Table 3.15 Results of the MNL regression analysis of factors influence the referring dentists plans of care pathways for dental caries management with p-value <0.05 and the reference category is the GA referrals*Reference groups for IDVs were 4-7 age-group, Males, White-British, IMD 1-3, 5-10 carious primary teeth, and uncooperative behaviour assessment on referrals

Factors	Categories	OR	(95% CI)	P-value	Association with decisions made by the referring dentists
Age	8-15 years-of-age	1.23	1.01-1.49	0.04	More likely for LA & IHS care pathways referrals
IMD	IMD 4-7 IMD 8-10	3.68 5.88	1.42-9.52 1.65-20.99	0.01 0.01	More likely for referrals with no specified care pathway
	IMD 8-10	6.54	1.52-28.26	0.01	More likely for LA & IHS care pathways referrals
Behaviour assessment on referrals	Not-Specified	2.84	1.22-6.64	0.02	More likely for referrals with no specified care pathway
	Not-Specified	3.16	1.15-8.69	0.03	More likely for LA & IHS care pathways referrals

B. Factors that had appeared to influence the PDCs in planning care pathways for dental caries management

In the second model, the group of cases that were planned for a GA care pathway on the consultation clinics at the LDI was the reference to analyse factors that had appeared to influence the PDCs to plan a LA care pathway and other care pathways for dental caries management, such as inhalation sedation, non-invasive dental treatment without local anaesthetics, and the biological approach (Appendix I). Seven IDVS were examined for an association to predict the care pathways planned by the PDCs. Those IDVs were patient age, gender, ethnicity, socioeconomic status, medical history, number of carious primary teeth, and the child dental-behaviour assessed by PDCs.

It was seen that PDCs were less likely to plan a LA care pathway for children with less cooperation or who had no recorded assessment of dental-behaviour than those in the cooperative group *P*-value 0.02, 0.00 and 0.02 in 95% with Confidence Interval= 0.10-0.82*,* 0.01-0.37, 0.03-0.77 respectively. Children with less than five affected primary teeth were more likely to be planned by the PDCs for an IHS care pathway, biological approach, or non-invasive dental treatment without LA than those with more than five and less than 10 affected primary teeth *P*-value 0.03, 95% CI= 1.19-17.67 (Table 3.16).

Table 3.16 Result of the MNL regression analysis of factors influence the PDCs' plans of care pathways for dental caries management with P-value <0.05 and the reference category is the GA care pathways planned by the PDCs

*Reference groups for IDVs were (5-10) carious primary teeth, and cooperative behaviour assessment made by PDCs

Factors	Categories	OR	(95% CI)	P-value	Association with decisions made by PDCs
Number of affected primary teeth	≤5 carious primary teeth	4.59	1.19-17.67	0.03	More likely to be planned for other care pathways like IHS, biological approach, and non-invasive dental treatment by the PDCs
Behaviour assessment in paediatric dental consultation	Pre-cooperative Uncooperative/anxious/phobic Not-Specified	0.28 0.05 0.16	0.10-0.82 0.01-0.37 0.03-0.77	0.02 0.00 0.02	Less likely for LA care pathway planned by the PDCs

C. Factors that had influenced the outcome of care pathways for dental caries management

In the third model, the outcome of a GA care pathway was the reference group to analyse factors that had influenced the outcome of LA and IHS care pathways and the outcome of not started/completed care pathways for dental caries management (Appendix J). Seven IDVs were examined for an association to predict the outcome of care pathways for dental caries management. Those were patient age, gender, ethnicity, socioeconomic status, medical history, number of carious primary teeth, and the child dental-behaviour assessed by the PDCs and the referring dentists.

It was found that the children from the older age-groups were more likely to not start or complete a care pathway for dental caries management than those in younger groups *P*-value 0.04, 95% CI= 1.25-1.01. Females were less likely to not start or complete a care pathway for dental caries management than males *P*-value 0.03 in 95% with confidence interval=0.11-0.88. Medically compromised children were less likely to not start or complete a care pathway for dental caries management than healthy children with no relevant medical history *P*-value 0.03 in 95% CI =0.06-0.89. Children of South-Asian ethnicity and other minority ethnicities were more likely to not start or complete a care pathway for dental caries management than children from the White-British group *P*-value 0.03, 95% CI= 1.19-17.70, *P*-value 0.01, 95% CI= 1.57-22.5 respectively. Children with less than five affected primary teeth were more likely to complete the planned care pathways for dental caries management than those with more than five and less than 10 carious primary teeth *P*-value 0.03, 95% CI= 1.10-7.47 (Table 3.17).

Table 3.17 Results of the MNL regression analysis of factors influence the outcome with p-value <0.05 and the reference category is the GA outcome

*Reference groups for IDVs were 4-7 age-group, Males, White-British, No relevant medical history, and (5-10) carious primary teeth

Factors	Categories	OR	(95% CI)	P-value	Association with the outcome of care pathways
Age	8-15 years-of-age	1.25	1.01-1.55	0.04	More likely to not start or complete a care pathway
Gender	Females	0.31	0.11-0.88	0.03	Less likely to not start or complete a care pathway
Ethnicity	South-Asian Other ethnicity groups (black, mixed-race, white not British)	4.58 5.93	1.19-17.70 1.57-22.5	0.03 0.01	More likely to not start or complete a care pathway
Medical History	Medically compromised	0.24	0.06-0.89	0.03	Less likely to not start or complete a care pathway

Number of affected primary teeth	≤5 carious primary teeth	2.87	1.10-7.47	0.03	More likely to complete dental treatment in other care pathways than GA

3.3.2 Binary logistic regression

Binary logistic regression analysis was performed to examine the relationship between the dental referrals and the paediatric dental consultations to look at predictors of the outcomes of dental care pathways for dental caries management (the predicted variable). The three defined outcomes of care pathways for dental caries management were GA care pathway, not started or completed care pathways, and other care pathways such as LA, IHS, biological approach, non-invasive dental procedure without local anaesthesia, or discharge due to no required treatment. Three binary logistic regression models were created; each model was examined to determine how it predicted one of the three outcomes of care pathways for dental caries management. The dependent/predicted variable was dichotomous, which made the binary logistic regression analysis the statistical test of choice to be applied. The Hosmer and Lemeshow test was applied to the three logistic models to confirm that binary logistic regression test was fitting data reasonably.

A. The relationship between the PDC plans, the referring dentist plans, and the outcome of GA care pathway

The first model examined the relationship of the PDC plans and the referring dentists' plans with the outcome of GA care pathway. This model was found to be statistically significant, $\chi 2$ (4) = 98.265, $p < .0005$ (Appendix K). The *P*-value in the Hosmer and Lemeshow test was 0.906 greater than 0.05 indicating that the binary logistic regression was reasonably a good fit for the data and the model was significant. The first binary logistic regression model explained 59.5% (Nagelkerke R2) of the variance in the outcome of GA care pathway for dental caries management and correctly classified 86.6% of the cases. Sensitivity was 92.7%, specificity was 76.2%; positive predictive value was 87% and negative predictive value was 85.7%.

Two predictors were statistically significant: the PDCs' plans and the referring dentists' plans. The odds of having a GA outcome for the referred children who were planned for other care pathways by the referring dentists was a high chance by OR= 4.4, *P-value* 0.017, and 95% CI= 1.3-14.66

The odds of having a GA outcome for the referred children who were planned for a LA care pathway by the PDCs was a high chance by OR=63.5, *P-value* 0.000, and 95% CI= 18.84-214.18. The odds of having a GA outcome for the referred children who were planned for other care pathways by the PDCs was a high chance by OR=23, *P-value* 0.000, and 95% CI= 5.99-88.43.

B. The relationship between the PDC plans, the referring dentist plans, and the outcome of not started or completed dental treatment

The second model examined the relationship between the PDC plans and the referring dentists' plans with the outcome of not started or completed care pathways. This model was statistically significant, $\chi 2$ (4) = 26.504, $p < .0005$ (Appendix L). The *P*-value in the Hosmer and Lemeshow test was 0.638 greater than 0.05 indicating that the binary logistic regression was reasonably a good fit for the data and the model was significant. The model explained 25% (Nagelkerke R2) of the variance in the outcome of not started or completed care pathways and correctly classified 85.5% of the cases. Sensitivity was 19.2%, specificity was 97.3%, positive predictive value was 55.6% and negative predictive value was 87.1%.

The PDC plan was the only statistically significant predictor (p-value 0.000). There was a significant difference between the PDC plan and the outcome of not started or completed care pathways, so the null hypothesis was rejected.

The odds of having the outcome of not started/ completed care pathway for the referred children who were planned for a LA care pathway by the PDCs was a lower chance by OR=0.12, *P-value* 0.000, and 95% CI= 0.04-0.32

C. The relationship between the PD' plans, the referring dentist plans, and other outcomes of LA, IHS care pathways, biological approach, non-invasive procedure, or discharge

The third model examined the relationship between the PDC plans and the referring dentist plans with the other outcomes of care pathways including LA and IHS care pathways, biological approach to dental treatment, or discharge due to no required treatment. This model was statistically significant, $\chi 2\ (4) = 44.172$, $p < .0005$ (Appendix M). The *P*-value in the Hosmer and Lemeshow test was 0.493 greater than 0.05 indicating that the binary logistic regression was reasonably a good fit for the data and the model was significant. The model explained 35% (Nagelkerke R2) of the variance in the outcome of care pathways other than GA and correctly classified 82.6% of the cases. Sensitivity was 43.2%, specificity was 93.3%, positive predictive value was 64% and negative predictive value was 85.7%.

The PDC plan was the only statistically significant predictor (p-value 0.000). There was a significant difference between the PDCs' plans and the outcome of care pathways other than GA, so the null hypothesis was rejected.

The odds of having the outcome of dental care pathways other than GA including LA, IHS, biological approach (Hall technique crown), or to be discharged due to no required treatment for the children who were planned for an LA care pathway by the PDCs was a lower chance by OR=0.07, *P-value* 0.000, and 95% CI= 0.03-0.18. The odds of having the outcome of dental care pathways other than GA for the referred children who were planned for other care pathways by the PDCs was a less chance by OR=0.06, *P-value* 0.000, and 95% CI= 0.02-0.21

3.4 Summary

Most caries management referrals were for children aged 5-7 years who lived in the most deprived areas. No differences were found in caries referrals based on gender or ethnicity. Seventy-two referrals for GA from dentists were recorded but 109 patients had a GA care pathway outcome for dental caries management. The agreement between referrals for GA and a GA outcome was 51.4%. A noticeably higher agreement (92.7%) between a GA outcome and a PDC plan for a GA care pathway was found. It was also found that almost half of the sample (49.5%) had a full agreement on a GA care pathway in referrals, consultation plans, and the outcome.

The influence of child age, socioeconomic status, number of carious primary teeth, and child dental-behaviour on the GA referral letters was statistically significant. The number of carious primary teeth, and the child dental behaviour were the two factors that statistically significantly influenced the PDCs to plan the GA care pathways. The outcome of GA care pathways for dental caries management was statistically influenced by the child age, gender, ethnicity, medical history, and the number of carious primary teeth. The child dental-behaviour had no influence on the outcome of GA care pathway statistically. Binary logistic regression analysis showed that there was a higher chance to have dental care under a GA care pathway for the referred children who were planned for other care pathways by the referring dentists. There was a higher chance to have a GA outcome for the referred children who were planned for LA and other care pathways by the PDCs. There was less chance to have the outcome of not started/ completed care pathway for the referred children who were planned for a LA care pathway by the PDCs. There was a less chance to have the

outcome of dental care pathways other than a GA for the referred children who were planned for a LA care pathway by the PDCs.

For the quantitative results, data analysis was completed using data collected from patient dental records. Statistical analysis revealed four factors that were involved in planning the care pathways for dental caries management: Patient's age, socio-economic status, child dental-behaviour, and number of carious teeth. However, the type of clinical communication and interaction between the PDCs and the child patients and their parents/guardians that had influenced the decision-making was still unknown. Any data that recorded clinical communication in the paediatric dental consultations was not documented in this part of the research study. A question was raised with regard to the reason for 15% of the referred patients not starting or completing the dental treatment by the end of the three-year follow-up. Therefore the qualitative interviews in this research were designed to explore the dynamics of the consultation clinics and to understand the type of communication between parents, children, and the PDCs to try to answer some of those questions.

Chapter 4
Qualitative results

For a more detailed understanding of factors that influence the decisions when planning care pathways, the second qualitative study was designed. Semi-structured interviews were conducted with the child's family and the PDCs to explore the dynamics of clinical communication in paediatric dental consultations and the relationships to the decision-making if it exists. Clinical consultations and two separate interviews with the PDCs and the parents after the consultations were all recorded. This data was transcribed and analysed to capture a wide-range of potential factors that might influence the decision-making of PDCs. Triangulation of data sources was applied to understand the dynamics of clinical consultations from different perspectives. The qualitative results revealed factors that were involved in planning care pathways for dental caries management for the children referred to the LDI. Some of these factors were explicit in the interviews conducted with the child's parents and the PDCs; others were implicit in the paediatric dental consultations through the interactions and types of communication observed between the PDCs and the child's parents. Some similarities and differences between the cases were highlighted. Anonymised quotes have been used from the relevant data sources to illustrate the findings. Four themes were found that describe the process of decision-making in paediatric dental consultations. Those themes were not identified in a hierarchy order, there was no dominant theme found in the process of the decision-making but they found complementing each other. However, a strong influence of the triad clinical communication was found in gathering patient information of past dental experience, assessing timeframe to complete dental treatment, and evaluating the urgency of

dental care. Every theme was then divided into subthemes that represent the variation in the cases supported with observations of patterns as well as anonymous quotations.

4.1 Thematic framework analysis of the process of decision-making in planning care pathways for children with dental caries

The framework approach of thematic analysis (Smith and Firth, 2011) was used to analyse 33 transcripts of 11 cases of children referred to the LDI to plan care pathways for dental caries management. Child age which was included in the qualitative interviews was guided by the findings from the first study. It was found that the most likely age-group to be referred for dental caries management was the 4-7 year-old group. The four-year-old children were excluded from the qualitative interviews because they were less frequently reported than the 5 -7 year-olds. Given their developmental stage, younger age children are less likely to contribute in interviews. A nine- year-old child was added in a late-stage of the interviews to add more contribution from the child patient side. Three groups of qualitative data were collected from the three recorded interviews with each child's parents, the PDCs and the clinical consultations. They were transcribed and analysed in parallel. The description of qualitative data analysis was presented through categorisation to explore 'formal' relations based on differences and/or similarities between cases.

Table 4.1 shows the demographics of the 11 children who participated in the qualitative interviews. In contrast, the demographics of the three participating PDCs was not recorded or shared in reports as disclosure of any information would identify participants which was beyond the scope of the study. The study was aimed to investigate the dynamics of paediatric dental consultations and clinical communication between PDCs, parents, and children and the associations of the types of

communication with planning care pathways for dental caries management. Seven of the cases referred to the LDI for dental caries management were planned for dental treatment with a GA care pathway; those were Case Nos 1, 2, 4,6,7,8, and 11. Two of the seven cases planned for dental treatment with GA care pathway were females and five were males; all were aged from 6-7 years-old.

Table 4.1 Demographics of the participants of children referred to the LDI in the qualitative interviews

*NRMH: No relevant medical history

Case #	Gender	Age	Ethnicity	Interviewed parent	IMD	Medical/ social status	Outcome
Case# 1	M	7	White-British	Father	1	NRMH	GA
Case# 2	M	7	South Asian-British	Mother	5	NRMH	GA
Case# 3	M	5	White-not British	Mother	1	NRMH	LA/GA
Case# 4	F	6	White-British	Foster carer	8	NRMH-Social worker involved	GA
Case# 5	M	5	White-British	Mother	2	NRMH	LA

Case# 6	M	7	White-British	Mother	1	NRMH	GA
Case# 7	F	7	White-British	Both parents	2	Allergic to a combined vaccines	GA
Case# 8	M	6	White-British	Mother	8	Allergic to Penicillin	GA
Case# 9	F	9	White-British	Mother	2	Special need and Learning disability	Discharge
Case# 10	F	5	White-British	Both parents	1	NRMH	LA
Case# 11	M	6	Mixed race Black-Caribbean/ White-British	Mother	7	NRMH	GA

4.1.1 Key themes/factors and sub themes

Generally, children referred to the LDI to plan care pathways for dental caries management are placed on a waiting list after the dental referrals are sent and then they receive a confirmation letter for a consultation appointment with a PDC. Ongoing progression of dental caries in these cases can be related to increased waiting list times in addition to the absence of preventive measures such as practice of good oral hygiene, and healthy food choices. In the early stages of dental caries, incipient enamel lesions might be managed by preventive treatment unlike deep dentinal lesions and dental abscesses/infections which require restorative or surgical intervention. Therefore, the urgency of dental care and the timeframes to complete dental treatment are regularly discussed with the children's parents. The waiting times between receiving the referrals and the paediatric dental consultations is shown in Table 4.2.

Table 4.2 Waiting time after referrals and consultations for the child participants to complete dental treatment

*ODU: One-day-unit for GA dental extractions at the LDI

*CWT: Clarendon-wing-theatre for comprehensive dental treatment under GA at the children's hospital

Cases number	Waiting time after GDP referrals	Waiting time after PD consultations	Care pathway outcomes
Case #1	10 months	3 months	GA (ODU)
Case #2	10 months	A month	GA (ODU)
Case #3	5 months	A week	LA/GA (ODU)
Case #4	10 months	2 months	GA (CWT)
Case #5	10 months	2 months	LA
Case #6	10 months	A month	GA (ODU)
Case #7	6 months	2 weeks	GA (ODU)
Case #8	10 months	2 months	GA (CWT)
Case #9	10 months	N/A	Discharge
Case #10	10 months	2 months	LA
Case #11	10 months	3 months	GA (ODU)

In Table 4.2, It shows that there are two routes for a GA care pathway in the LDI. The shorter route is the One Day Unit List (ODU) generally for exodontia cases and simple dental procedures usually completed within three months. The other GA care pathway is through the Clarendon Wing Theatres (CWT) at the children's hospital for comprehensive dental treatment and /or surgical procedures where the children or procedures require hospital admission. Parents are usually informed of the prolonged waiting times for the GA care pathway for comprehensive dental treatment. This

depends on the numbers and complexity of patients on the waiting list and at the time of the present study could last for six months or more. Appointments for preventive dental care with staff dental therapists and dentists are routinely arranged for patients prior to being put on the pathway or while on the GA care pathway.

Eight of the 11 cases in this study were planned for a GA care pathway for dental caries management. On average, children waited 1.7 months (6.8 weeks) for a (ODU) GA care pathway to complete dental treatment, which was not considerably different than the waiting time for a (CW) GA care pathway and a LA care pathway that is 2 months (8 weeks). The process of the decision-making to plan care pathways for children with dental caries is multi-factorial. The PDCs carry out this process for every child patient, weighing the risks and benefits of different care pathways as explained in the quotation below of the PDC in Case#6. Then, they discuss the options for dental care pathways with the child's parents and explain their thoughts on the most appropriate route to manage dental caries for the child and after agreement both sign the consent form.

"As a clinician what you're always thinking about is the hierarchy, local anaesthetic, inhalation sedation, general anaesthetic and for this child being 7 all of those options should have been open to them really you know, and you're thinking about it as a hierarchy in terms of patient safety because obviously general anaesthetic carries risks that the others don't, and I do always explain that to parents and that is part of the decision making process. I think at the end of the day you've got to realise that even though you know, local anaesthetic or, local anaesthetic and inhalation sedation are the safest routes, they're not always appropriate for every child" ***PDC, Case#6***

The PDC shared the eagerness to explore the process of decision-making while discussing Case#6 with the researcher in the interview.

"It is a complex decision making process and I have to say in some ways I think it's really interesting that you're going to try and sort of tease this out and come out with a you know, a pathway, if we do this we do that, if we do this with that, because we do often think about that in ourselves" ***PDC in the interview, Case#6***

In the quotation below, the PDC describes the different factors that contribute to decisions about dental caries management.

" It is such a complex decision making process, there's so many factors that you're considering to come to this decision at the end, it's not one size fits all, there's all the social circumstances to think about, there's the child, the anxiety of the child, their medical history, what does the parent want, what's the past dental experience, what, are they experiencing pain or infection, how urgent it is, all of these things have to be factored in to come to this decision at the end of the day and at the end of the day the parent is consenting to that and so we have to come up with a plan that they want to consent to, so it's a very complex process." ***PDC, Case#6***

Data coding from the recorded clinical consultations and interviews with families and PDCs was completed (Appendix N), and then categorised into themes and revised. A pattern in the process of decision-making for dental caries management was identified, shown in Figure 4.1. Clinical communication appears to direct the process of decision-making, starting from the discussion with parents regarding the timeframe to complete dental treatment, the assessment of the urgency of dental care, and the evaluation of the child dental-behaviour. Themes, sub themes based on similarities and differences between the cases, and codes are shown in Table 4.3.

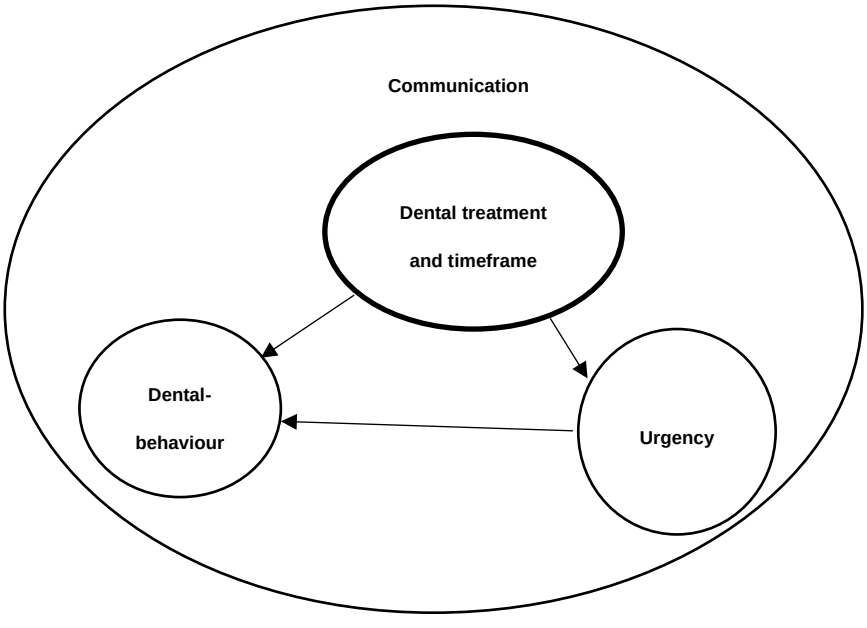

Figure 4.1 The pattern of the process of decision-making of care pathways for dental caries management

Table 4.3 Themes and subthemes of the process of decision-making when planning the care pathways for dental caries management

Main themes	Sub-themes	Codes
1) Assessing dental treatment and the timeframe to be completed	a) Progression of dental caries b) Number of dental visits	• History of severe dental pain • Dental abscess and infections • Multiple extractions was required • Poor OH required preventive treatment • Presence of dental anomaly • Not urgent dental treatment • Long waiting time since referral • Accessibility to dental hospital • Social circumstances
2) Evaluating the urgency of dental care	a) Medical complications b) Completion of dental treatment	• History of multiple courses of antibiotics • Chronic medical conditions • Learning difficulty • Required rapid dental intervention
3) The impact of past dental experience on the child current dental-behaviour	a) Child past dental experience. b) Parent past dental experience. c) Child dental-behaviour assessment	• Child with no experience of LA • Child had complications with dental treatment • Parent with negative dental experience • Child with limited cooperation • Child with sufficient cooperation
4) The type of dentist-parent-child communication	a) Dentist-parent b) Dentist-child c) Parent-child	• Professional advice (answered or declined) • Prolonged discussion • Parent knowledge about dental caries management • Parent satisfaction • Child-involvement in decision-making • Child cognitive development

Table 4.4 The themes and example quotes

Themes	Example quotes
1) Assessing dental treatment and the timeframe to be completed	*"That's going to be the only difficulty because I went from being in Dewsbury to being homeless for 6 months and then moving up to where I am now."* ***Child's mother, Case#9***
2) Evaluating the urgency of dental care	*"I think once the concept of urgency come in, you're automatically thinking general anaesthetic because you know, it's definitely going to happen, if you go down any of the roads you know that okay, you could say this treatment should be done in 4 or 5 visits but if there's any hiccup along the way, they miss an appointment or if they're not just having a good day on that day or whatever, that's when you're going to it on the pathway you know, and so general anaesthetic is the most predicable way of getting the treatment completed as soon as possible."* ***PDC, Case#6*** *"recurrent episodes of pain and infection, 6 times antibiotics you're not really going to delay that child's care, and also as well I suppose you're thinking about chronic infection around these teeth, buccal sinus on one of the teeth, is there potential then the local anaesthetic wouldn't work you know, and you just don't want to delay, I would not want to delay this child's treatment."* "*It's quite urgent, I think it's quite urgent to get these teeth out as soon as possible"* ***PDC, Case#6***
3) The impact of past dental experience on the child current dental-behaviour	*"The dentist tried to take the tooth out, October 2018, right, and he's been in discomfort ever since with these teeth, and mum described how he gets lots of discomfort, he gets loads of food packing in there, he's complaining of pain from it on and off, so although there was no frank infection clinically, radiographically there was evidence of infection, so my diagnosis is a chronic periapical peri-radicular periodontitis on those teeth and we need to get rid of those Es for him, so I think, and mum was absolutely certain that a general anaesthesia was the only way, I mean I said to her I said, I think I said, it's hard for me to remember but you'll hear it on the tape, I think I said something like I'm sensing that you feel that it would need to be a general anaesthetic and mum said absolutely definitely, he's not going to have those teeth out any other way."* ***PDC, Case#11***

	"Well somebody's tried sedation and they couldn't get him in the room, so it has been tried and when I discussed these options again with mum I didn't discuss sedation again today, I just explained that he could have a general anaesthetic or we could try treatment with him awake and mum said no, we've tried all, there's no, he definitely, definitely needs to be asleep to have these teeth out, that was the message I got from mum as that he really does need to be asleep, you're not going to get the teeth out any other way." ***PDC, Case#11***
4) The type of dentist-parent-child communication	*"Essentially you've got to decide how much discomfort your son's been in okay, that's number 1, how much you think he can cope with having done in the chair, okay, and how long you are willing to wait."* ***PDC in clinical consultation, Case#2*** ***Child's mother in clinical consultation, Case#2:*** *To be honest, he's not complained since he's had the temporary, well fillings put in, he's not complained of any pain and I've been back since, he's got his next appointment in May, so What do you recommend, what do you think is the best option?* ***PDC, Case#2:*** *Well, unfortunately I can't do that.* ***Child's mother, Case#2:*** *You're not allowed?* ***PDC, Case#2:*** *I'm not, no, I can give you your options and then you tell me which one you would think is more feasible for your son, okay?* ***Child's mother, Case#2:*** *I think putting him to sleep is probably the best…* ***PDC, Case#2:*** *I would agree with that to be honest* ***PDC in clinical consultation, Case#2:*** *So I'm going to consent for removal of 1, 2, 3, 4, 5…* ***Child patient:*** *Will they only do one removal?* ***Child's mother:*** *Yeah, it's only one removal.* ***Child patient:*** *One removal.* ***Child's mother:*** *You know the ones that are broken and have holes in, just, yeah, get rid of those.* ***Child patient:*** *The ones!* *"I'm sad because I just don't want to do it."* ***The child, Case#2***

4.1.1.1 Assessing dental treatment and the timeframe to be completed

Clinical assessment is a crucial part of paediatric dental consultations. The type of dental treatment and the period of time required to complete the treatment were seen to influence the PDCs and the child's parents in making the decisions of a care pathway for dental caries management.

A. Progression of dental caries in a referred child patient

Four groups of child patients were observed in the PDCs' clinical assessments of the needed treatment to manage dental caries. The first group was children requiring multiple extractions for un-restorable teeth and those were in Case Nos 1, 2, 6, 7, and 8 that planned for a GA care pathway. The second group was children needed a comprehensive dental care of preventive treatment, restorations, and extractions. Child patient in Case# 3 was planned for a combined LA/GA care pathway, Case#4 planned for a GA care pathway, and Case# 5 and 10 were planned for LA care pathways. The third group was a child patient with carious teeth for extraction presented with dental anomaly that requires preventive treatment in Case#11 that was planned for a GA care pathway. The fourth group was a patient with no dental treatment needed other than preventions in Case#9 who was discharged from the dental hospital.

B. Number of visits to deliver dental care

The timeframe to complete dental treatment was discussed during clinical consultations with parents in relation to the number of visits needed. Accessibility to the dental hospital was assessed prior to planning LA or IHS care pathways to evaluate the convenience of travelling to the dental hospital for the child's family to attend dental visits. In some cases, social circumstances had an impact on accessing the dental hospital where the child patient had different home addresses which occurs sometimes with a looked-after child and a family who was temporarily homeless. The accessibility to the dental hospital was a factor influencing the planning of the most convenient care pathway for the family as they have to travel a long way to attend several dental visits which could be a barrier to completing dental treatment for a child patient.

For example, the paediatric dental consultation of Case#9, the child's mother described to the PDC the situation of being temporarily homeless and that had caused irregular dental visits for her child's dental care. They had to see different dentists and therefore the child had incomplete dental records. In this case, a discharge was the decision for this child patient because preventive treatment was possible to be completed by a nearby family dentist and to save the child's family the long journey to the dental hospital.

"That's going to be the only difficulty because I went from being in Dewsbury to being homeless for 6 months and then moving up to where I am now." ***Child's mother, Case#9***

4.1.1.2 Evaluating the urgency of dental care

The urgency of dental care was a significant theme frequently observed in the family interviews, the PDC interviews, and on the clinical consultations. It was noticed that the preferable care pathway for the cases that required urgent intervention was the pathway with the shortest waiting list and was less dependent on child dental-behaviour. That mostly resulted in a GA care pathway. The certainty to have dental treatment completed in a GA care pathway was described to be more predictable. In Case#6, the PDC explained the theme of the urgency care:

"I think once the concept of urgency come in, you're automatically thinking general anaesthetic because you know, it's definitely going to happen, if you go down any of the roads you know that okay, you could say this treatment should be done in 4 or 5 visits but if there's any hiccup along the way, they miss an appointment or if they're not just having a good day on that day or whatever, that's when you're going to it on the pathway you know, and so general anaesthetic is the most predicable way of getting the treatment completed as soon as possible." ***PDC, Case#6***

Even though, the child patient in Case#6 might have tolerated the dental treatment under an alternative care pathway, because the treatment was urgent, the PDC was concerned that multiple visits could increase the risk of delays. Therefore, a GA care pathway was opted for.

A. Medical complications

Assessing the child's wellbeing and planning the most convenient care pathway for dental caries management is intended to lower the risk of medical complications. One group was observed in relation to children's general health and the risk of medical complications, those were the children with history of multiple courses of antibiotics. The PDCs planned to manage dental infections to avoid the risk of medical complications such as spread of infection to facial spaces. Furthermore, this decision was intended to reduce the overuse of antibiotics to avoid antibiotic resistance in the future. Medical complications is taken into account when planning LA or IHS care pathways, a special dental care in a hospital setting is required.

In Case#6, the child patient had had 5-6 courses of antibiotics for recurrent dental infections. The PDC discussed the GA care pathway for dental caries management with the child's mother to avoid more antibiotics and she agreed.

"recurrent episodes of pain and infection, 6 times antibiotics you're not really going to delay that child's care, and also as well I suppose you're thinking about chronic infection around these teeth, buccal sinus on one of the teeth, is there potential then the local anaesthetic wouldn't work you know, and you just don't want to delay, I would not want to delay this child's treatment." "*It's quite urgent, I think it's quite urgent to get these teeth out as soon as possible"* ***PDC, Case#6***

B. Completion of dental treatment

A pattern were identified in Case#4, who were planned for a GA care pathway urgently as a quicker route to complete the dental treatment. Rapid intervention with no delay and certainty to have the treatment completed to manage dental caries were observed. In Case#4, a looked-after child had recently been adopted and was moving to her adoptive family in a different area within few months. The foster carer and the PDC recognised that the child was less likely to access the dental hospital in the upcoming months and thus required the dental treatment to be completed rapidly. Although the child patient was potentially cooperative, a GA care pathway was opted for dental caries management because of the child's social circumstances.

*"I think potentially she would cope with treatment with local anaesthetic but the burden of care is quite high. She needs a lot of treatment. And also as well we, we have to do acclimatisation and all of that kind of thing. And I think really for her because of the urgency, I mean she's had, she's had, she has an abscess, and she has got chronic infection in this tooth. And because of her social circumstances, you know, we, we can't really delay her treatment. I don't want her to, I didn't want her to start a course of treatment and not to be successful and then to go down another pathway. I think with general anaesthetic it is guaranteed the treatment will be completed. And I think they needed that guarantee in view of her social circumstances. "**PDC, Case#4***

4.1.1.3 The impact of past dental experience on child current dental behaviour

Four groups of child patients were identified in data analysis; a group who had limited experience of dental treatment (no experience of dental LA), others had history of negative dental-behaviour, one patient had a positive experience with LA, and lastly there were children who had had complications with dental treatment. The group with a history of dental complications was observed in three cases (Case#9, 10, and 11). Parents with a negative past dental history were observed in three cases (Cases#1,

8, and 10). In these cases, the observed impact on the child's current dental behaviour that is believed to be in relation to the parents' reported negative dental experiences is shown in Figure 4.2. Children with no experience of dental LA and the parents had negative dental experience showed three different dental-behaviours: negative behaviour, limited cooperation, and sufficient cooperation. The child with past dental complications and the parents had negative dental experience showed sufficient cooperation. While, the child with past dental complications without parental negative dental experience showed two different dental behaviours: negative and limited cooperation.

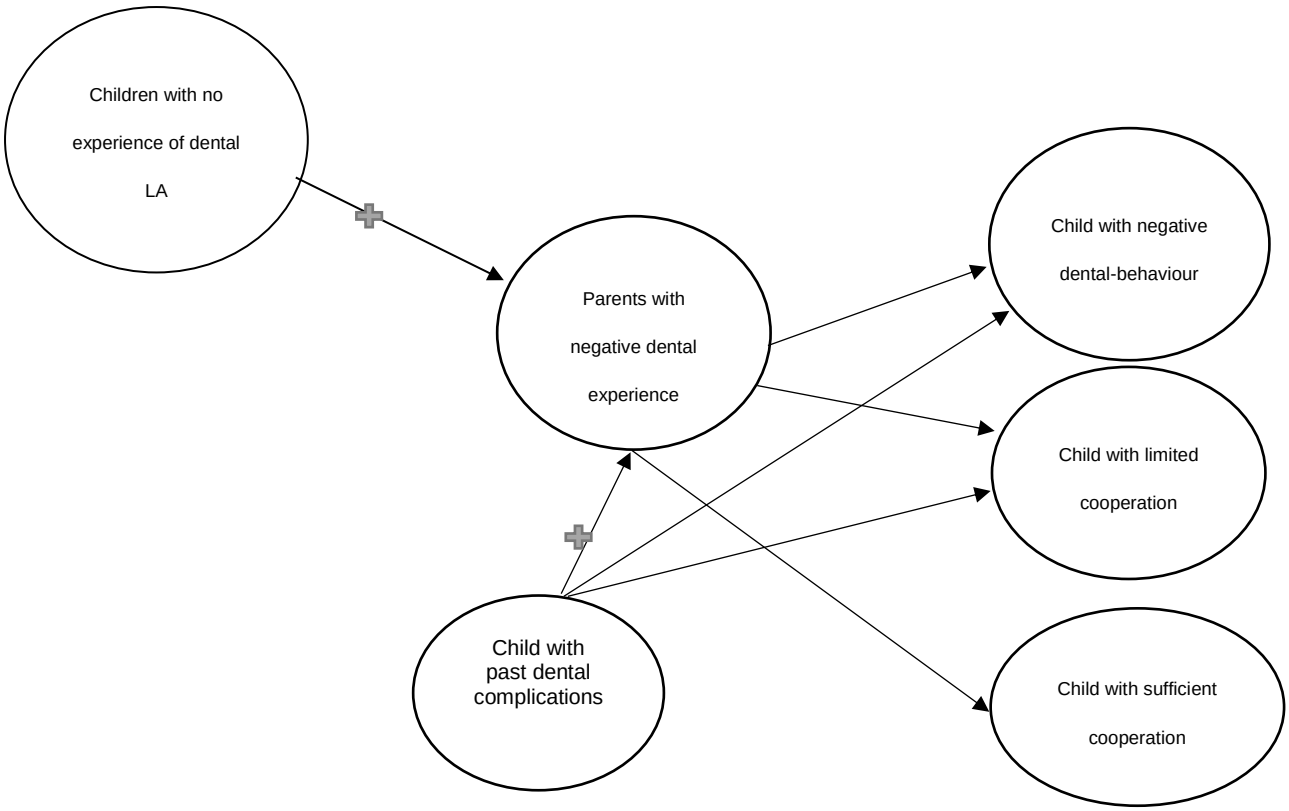

Figure 4.2 The impact of past dental experience of child and parent on the child current dental behaviour of the research participants

A. Child past dental experience.

The decision-making for a child patient with no experience of local anaesthetics was challenging for the PDCs when planning LA or IHS care pathways for dental treatment. The PDCs would try to predict how a child would respond in a LA care pathway based on previous responses, if they had no previous experience, this would make the decision-making more difficult. The child patients who had temporary fillings without using of local anaesthetics were reported in Case# 2, 3, 4, 5, and 8. Eventually, most of these cases were planned for a GA care pathway because of the influence of other factors and no influence was observed of the child dental-behaviour on the decision-making due to their limited dental experience. The child patient in Case#5 was planned for a LA care pathway because there was a potential that the child would accept dental treatment under an LA care pathway as stated in the PDC interview.

"I think it's always difficult to predict and I always say that to parents, how children will manage in the dental chair. But what we know is anyway, that our, you know, our waiting list for general anaesthetic are five months, six months plus. So I think it's always worth, if parents are willing, to try. I think it's always worth giving the child the opportunity to see whether they manage the treatment in the chair with some local anaesthetic or with some inhalation sedation. Because obviously the risk is lower and I think the potential then for the child later on to accept dental treatment in the chair is there" ***PDC, Case#5***

"If he wasn't able to cope with local anaesthetic, the other options of sedation and general anaesthetic are still open to them." ***PDC, Case#5***

In the interview with the foster carer in Case#4, she reported that the child had shown a positive dental behaviour while having dental examination and temporary fillings.

"She's absolutely fine when we go to the dentist for a check-up or an examination, that's absolutely fine, but you wouldn't have been able to remove teeth with her awake [laughs]." ***Foster carer, Case#4***

“She suffered with pain which the dentist originally filled her teeth, she had to have fillings until we were put on the waiting list to have these teeth removed.” ***Foster carer, Case#4***

In the family interviews, parents in Case#1and 7 reported that the children had history of negative dental behaviour towards dentists and towards dental x-rays respectively. Those cases were planned for a GA care pathway to avoid further distress and anxiety.

The third group included a child with positive experience with local anaesthetics for dental treatment in Case#6. In the family interview, the child’s mother described her child’s positive behaviour towards dentists.

“I think he’s all right, he’s never had any problems going to the dentist, he’s never cried, sometimes he’s had fillings without local anaesthetic, so he’s quite good that way. He’s always been okay, I’ve never had any problems when he’s gone to the dentist. I think he quite enjoys it.” ***Child’s mother, Case#6***

There were three children with a history of complications with dental treatment. Two cases had a history of failed attempts of tooth extractions by GDPs in Case#10 and 11. The child patient in Case#9 had a history of severe allergic reaction to local anaesthetics in the past dental treatment with a GDP, it was also observed that the patient had a learning difficulty.

In the family interview, the child’s mother in Case#9 reported a history of severe allergic reaction to local anaesthetics. This nine-year-old girl with learning difficulties was admitted to hospital because of a severe reaction to local anaesthetics in a past dental visit with a GDP. On the clinical consultation, the PDC requested further investigation and allergy testing for the child patient. The PDC also planned to contact the GDP for further details about the incident to document it in the child’s medical record to avoid a recurrence in the future. Ultimately, the child patient in Case#9 was

discharged to a Community Dental Service for prevention because the primary teeth were exfoliating and no urgent treatment was required.

"She had an injection where she came out, nearly passed out, I had to get her into an ambulance to Dewsbury and then basically her whole mouth came out here in a blister and it all popped. She couldn't eat for nearly 5 weeks, it was bad. It just bled and bled, and bled and it just bust, and it came like her mouth wide out here, it was massive and then all like blister all over here, it was really not nice. They told us it was an infection and they gave her antibiotics and then she came home, I had to feed her through a straw, on this side, do you know, like so she could suck up on this side and just give her soups, blended everything. 5 weeks. Yeah, until it all calmed down, because no matter how calmed down on the inside, it was sore on the outside as well, so it was just, what we've went through I wouldn't put her through that again."

Child's mother, Case#9

"The actual referral reason was the dentist had sent me over to tell them that basically needed all her back teeth out when, truthfully, she doesn't need anything out. So the dentist woman in there thought that was quite suspicious and she said that all it is, is that basically the two teeth are going to fall out anyway and that, obviously I said to her that in the last place she had allergic reaction to the injections but I can't remember which injection it was, if it was the injection or the cream. But to put an end of all of that she said she'll be looking into that for me." ***Child's mother, Case#9***

Each child in the group of children with history of dental complications was planned for a different care pathway for dental caries management. In the family interview of Case#10, the child's parents were very confident that the child would accept dental treatment in an LA care pathway. In the PDC interview, the assessment of the child behaviour was that she was likely to accept an LA care pathway. The PDC and the child's parents agreed on the LA care pathway.

"I'm pretty sure, she is quite a confident child, she's not scared of nothing, so she'll be alright." ***Child's mother in family interview, Case#10***

On the contrary, the child's mother in Case#11 was confident that the child was unlikely to accept dental treatment while awake because of the history of a traumatic dental experience when she had held the child hands during a procedure of a failed dental extraction by a GDP and the child was distressed. Then, the child had two failed attempts with inhalation sedation by a specialist in Paediatric Dentistry. The PDC and the child's parent agreed on a GA care pathway.

"The dentist tried to take the tooth out, October 2018, right, and he's been in discomfort ever since with these teeth, and mum described how he gets lots of discomfort, he gets loads of food packing in there, he's complaining of pain from it on and off, so although there was no frank infection clinically, radiographically there was evidence of infection, so my diagnosis is a chronic periapical peri-radicular periodontitis on those teeth and we need to get rid of those Es for him, so I think, and mum was absolutely certain that a general anaesthesia was the only way, I mean I said to her I said, I think I said, it's hard for me to remember but you'll hear it on the tape, I think I said something like I'm sensing that you feel that it would need to be a general anaesthetic and mum said absolutely definitely, he's not going to have those teeth out any other way." ***PDC, Case#11***

"Well somebody's tried sedation and they couldn't get him in the room, so it has been tried and when I discussed these options again with mum I didn't discuss sedation again today, I just explained that he could have a general anaesthetic or we could try treatment with him awake and mum said no, we've tried all, there's no, he definitely, definitely needs to be asleep to have these teeth out, that was the message I got from mum as that he really does need to be asleep, you're not going to get the teeth out any other way." ***PDC, Case#11***

Nevertheless, the child in Case#9 was discharged to a Community Dental Service for preventive treatment as no dental treatment was necessary to be planned in the dental hospital.

"They'll fall out themselves she says. Which are the ones that are as loose as nearly falling out and the other one is going to be falling out. She says it could be just a little bit more hygiene, you know, for the teeth, she's going to refer me to hygiene clinic for her teeth, see how far that goes and she's going to look into the next dentist to see why they've referred over because it might not just be the case that they might've referred her over here saying that she needs all her back teeth out but obviously she can't have anaesthetic. Where they were wrong in obviously saying that she didn't need all her teeth out so it, it's like one story to another story" ***Child's mother, Case#9***

B. Parent past dental experience.

The impact of parent negative dental experience on the child current dental behaviour was observed. In the family interview of Case#1, the child's father reported that the mother feared dentists and as a result the child had developed negative dental behaviour.

Child's father in family interview, Case#1: *"It's his mother that makes it worse but she's petrified of dentists, absolutely petrified. She shakes just waiting to go in the room, do you know what I mean."*
The child, Case#1: *"No, because that's why one of us has to hold her hand."*
Child's father, Case#1: *"Yeah. I have to hold her hand don't I?"*

Child's father, Case#1*: "To tell you the truth, he's actually quite well with 'em, do you know, I'm quite shocked with him to tell you the truth because normally he's either... It can go one way or another with him, he'll either be proper nasty or not do anything you ask him..."*
The child, Case#1: *"I destroy things."*

In the family interview of Cases#8, the child had not shown negative dental behaviour towards dentists with temporary fillings, though the child's mother had had an unpleasant experience. However, the child was assessed as reasonably cooperative for dental treatment as reported in the interview by the PDC.

"I don't particularly like going to the dentist! So I used to come to the dental hospital, so I used to come here when I was little and I had a broken, I broke a tooth when I was quite young, so yeah, I don't have the best experiences." ***Child's mother, Case#8***

"Because we've only been at the local dentist. He's not too bad. He sits still most of the time but they've only been quite short. But yeah, he prefers not to go like most children but he's not very scared of it or anything like that. He doesn't get upset worrying about it or anything like that." ***Child's mother, Case#8***

"He was challenging but reasonably cooperative. I got a mirror in his mouth and I got x-rays, so for me that's good, yeah." ***PDC, Case#8***

The child's mother in Case#10 had a traumatic dental experience back in her home country when she was young but she believed that her daughter was a confident child and would accept a LA care pathway for dental caries management because from her perspective, Paediatric Dentists are more friendly in the UK than in her home country. Although the five-year-old female patient had had a failed attempt of tooth extraction with a GDP, she was likely to accept a LA care pathway as predicted by the PDC and the child's parents.

"My personal experience, it happened back at my home in (an east European country) and it was traumatising, I'm still scared of going to the dentist, but here I noticed when I bring my children or when I go to dentist everything is entirely different so I wouldn't have ever no complaints about it." ***Child's mother, Case#10***

C. The child current dental-behaviour assessment

A child with sufficient cooperation for dental treatment who managed well during clinical consultation had an influence on the decision-making to plan a LA care pathway for dental caries management. On the contrary, the PDCs in some cases suggested an IHS care pathway for a child with questionable cooperation.

In most of the cases, the child patients were assessed by the PDCs as having limited cooperation for dental treatment in a LA care pathway or as being hyperactive or less likely to cope with a LA/IHS care pathway. Those children were mostly planned for a

GA care pathway. Exceptionally, the child's mother in Case#3 insisted on having a LA care pathway to save more teeth that would have been planned for extractions in a GA care pathway. This plan was decided despite the fact that the PDC had assessed the child as having a limited cooperation.

"He wasn't that forthcoming, and he was a little bit reluctant, so I think we'll be asking a lot of him, but I'm willing to give it a go." ***PDC, Case#3***

4.1.1.4 The type of dentist-parent-child communication

Three groups were observed in the clinical consultations between the PDCs, child patients and their parents. The first group observed when the PDCs were communicating with parents. The second group observed when the PDCs were communicating with the child patients. The third group observed when parents communicated with their children (Figure 4.3).

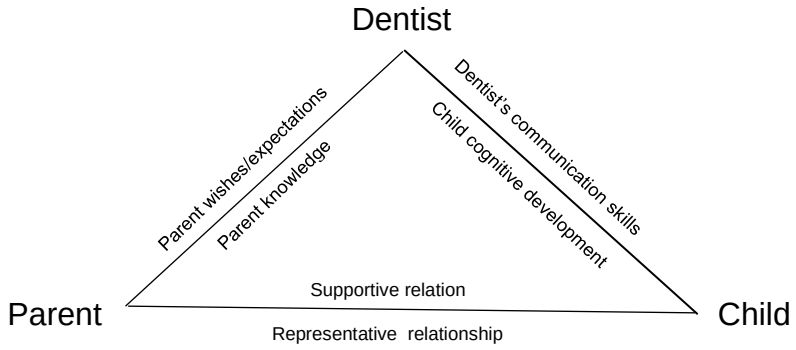

Figure 4.3 The factors influence the triad clinical communication between dentist-parent-child

A. The type of Dentist-parent clinical communication.

Two groups were observed in the clinical communication between the PDCs and the child's parents. The first group was when the planned dental care pathway for a child patient aligned with the parents' wishes and expectations. The second group was when the planned dental care pathway was not aligned with the child's parent wishes and expectations and the PDC had to compromise the treatment plan.

I. The planned dental care pathway aligned with parents' wishes and expectations

A pattern was observed in this group of clinical communication between the parents and the PDCs. In the case of the newly adopted child and the cases of children with history of dental complications, a pattern of trust/confidence was observed.

In the clinical consultation of Case#2, the child patient had history of dental trauma. The mother of a seven year-old boy requested professional advice from the PDC on the best pathway but that was declined. However, the PDC had offered the three options of care pathways for dental caries management and had guided the child's mother on how to make her decision. At the end, the parent was confident with her decision because it was aligned with her wishes and expectations.

"Essentially you've got to decide how much discomfort your son's been in okay, that's number 1, how much you think he can cope with having done in the chair, okay, and how long you are willing to wait." ***PDC in clinical consultation, Case#2***

Child's mother in clinical consultation, Case#2: *To be honest, he's not complained since he's had the temporary, well fillings put in, he's not complained of any pain and I've been back since, he's got his next appointment in May, so What do you recommend, what do you think is the best option?*

PDC, Case#2: *Well, unfortunately I can't do that.*

Child's mother, Case#2: *You're not allowed?*

PDC, Case#2: *I'm not, no, I can give you your options and then you tell me which one you would think is more feasible for your son, okay?*

Child's mother, Case#2: *I think putting him to sleep is probably the best…*

PDC, Case#2: *I would agree with that to be honest*

The child's mother was certain that her child was unlikely to stay on dental chair in a LA care pathway to manage dental caries. For that reason, a GA care pathway for dental caries management was opted for and approved by the PDC who was confident that it was an appropriate plan.

In the interview with the foster carer in Case#4, she said she trusted the PDC's decision in planning a GA care pathway to complete the dental treatment before the child moved to live with the new adoptive family in another region.

"it was very sort of informal so you could, you were fully aware of things were explained really well, you know, you, I felt that I could ask questions, but at the end of the day you go with what a dentist is telling you is the best treatment for your child, that dentist is trained, so you've got to take their advice on board and do what they suggest in my opinion." ***Foster carer, Case#4***

The PDC in Case#4 had discussed with the foster carer the alternatives and the most appropriate care pathway that comply with the child's social circumstances.

"We do know that these children are quite disadvantaged because they do, looked after children do tend to move around quite a lot from one foster family to another and they go and see a dentist and then they're waiting for treatment. And then when the time the treatment comes up they've actually moved again. So I am aware of that and I think that that was both, for the carer and myself that was central in making the decision to have this child's treatment under general anaesthetic." ***PDC, Case#4***

"I think initially we did plan to sort of attempt some treatment with local anaesthetic or local anaesthetic and a bit of, and sedation but it was, when we came to that final decision the, the foster carer intervened at that point and did say that it was urgent that the treatment was completed as soon as possible. And I think that influenced the decision then by the carer to go for general anaesthetic. I think we spent a lot of time, yeah." ***PDC, Case#4***

In Case#9, the child's mother had a physical disability, learning difficulty, and a support worker was involved to help the family read their letters. The PDC offered to contact the GDP to investigate the incidence of allergic reaction to local anaesthetics instead of the child's mother because of her disability. The child's mother trusted the decision that the PDC planned and agreed to discharge her child from the dental hospital to a community dental service.

"Lovely because like really good with me with my learning rehabilitations and stuff. Very understanding as well." ***Child's mother, Case#9***

In the interview with the child's mother of Case#11, the mother reported that her child had history of a very traumatic dental experience when she held his hands while the GDP attempted to extract his tooth. The child's mother in Case#11was very satisfied with the clinical communication and trusted the PDC and wished if they could see this PDC regularly. The decision of planning a GA care pathway was made in alignment with the parent wishes and expectations.

"Absolutely brilliant, I couldn't ask for anything else, spoke to my child at his level, was so patient, and was brilliant, fantastic. I wish could be my regular dentist, I think would get this fear sorted out straight away" ***Child's mother, Case#11***

II. Compromise treatment planning to meet parents' wishes and expectations

A pattern was observed in this group: a child's parent lack of knowledge of dental caries management during clinical communication, the PDC had to come to a compromise about treatment planning to meet the expectation of a child's parent. When the parents did not understand the justification of a plan, the PDC sometimes had to compromise the plan of a care pathway for dental treatment.

The child's parent in Case#3 refused the PDC's recommendation to extract 14 primary teeth in a GA care pathway. She asked to save more of the child's primary teeth in a LA care pathway, she did not understand the justification for the plan. The PDC agreed to attempt the LA care pathway; however the PDC believed that the child cooperation was not adequate. The child's mother believed that her son was likely to accept a LA care pathway for dental treatment if she forced him. In the family interview, the child's mother expressed her thoughts of the PDC's decision that made her confused about the child's ability to eat after 14 primary teeth were extracted. The mother concerns was not shared with the PDC and hence the lack of knowledge had influenced the decision-making.

"I am confused why like here in England they did take out tooth, if any way they know be [laughs], because you know, I think that like at the moment if we take out 14 tooth this will be not comfortable for him like to eat and everything. Anyway they will done, they will other treatment, we now try to save, they will say that they need to take all 14, then they will discuss, half now, and half later, because of how he will eat" ***Mother, Case#3***

In the PDC interview of Case#3, the PDC reported that the evidence of extensive dental caries on radiographs was insufficient to convince the child's mother to extract the 14 teeth.

"I think she was, mum was very surprised that there were so many teeth that needed filling, even though the evidence was on the x-ray, I think she was quite surprised by that and I think her head because it's so many teeth she thought all of them could be saved, so I don't think mum understands the extent even though it was shown to her on the x-ray, the extent of damage and decay that's in her own child's mouth." ***PDC, Case#3***

In the PDC interview of Case#8, the PDC proposed a GA comprehensive care and a GA for only extractions. The child's parent opted for the GA for only extractions because she wanted the dental treatment to be done without knowing the risks and benefits of each option.

"The child was reasonably compliant, reasonably. The parent was a lot, mum was a lot more, she fully understood what her own child was like and what he could cope with, and I think that's why she opted for general anaesthesia but she didn't want the comp care. She just wanted it over and done with for him." ***PDC, Case#8***

In the family interview for Case#8, the child's mother suggested a leaflet that could be sent to the child's parents prior to the consultation appointment explaining all the options of care pathways for dental extraction. She added that the lack of knowledge was a barrier for her in making a decision and wished she had more information. She believed that the leaflet might improve the type of communication in the paediatric dental consultations.

"I like to read up about things so I think maybe some information ahead of potential treatment options. I think I'd been, it had been suggested to me that it was likely that it would be general anaesthetic and stuff but I wasn't sure about the other options that may have been. So maybe just a leaflet with the letter about potential options for treatment could involve this, either if he visits here or tooth extraction with, and these are the ways that it can be done and various children's ages. And I think maybe I could have had a bit of thinking ahead about what kind of, if I was presented with a tooth extraction, if one of the things, I might have thought already in advance then about what way that might be done that might be suitable for him. Not made a decision or anything like that but just general information because I know you can't give anything about it's likely you're going to get told this but it might be something "if your child is told they need to have a tooth taken out, this is how it might be" ***Mother, Case#8***

In the family interview of Case#11, the child's parent was uncertain about adhering to the PDC's prevention plan because she was not fully aware of the procedure for applying fissure sealant on a tooth presented with dental anomaly (Molar Incisor Hypo-mineralisation MIH).

The child's parent in family interview, Case#11: *Yeah, I'm fine with that, and they've told me that if there's any wobbly, which these at the minute, his front tooth, they'll take that as well, which I understand."* "*So, because he got that condition (MIH) he's going to have to have the back ones plastic on the new molars, so I'm going to come back for that, I'm not really looking forward to that either because he's really petrified now but he's getting better, aren't you?*

The child patient: *Yeah.*

The researcher: *Was the procedure explained to you?*

The child's parent: *No, just to come and it's get plastic on the back teeth, just a normal clinic like downstairs.*

B. The type of dentist-child clinical communication

In the paediatric dental consultations, observations of child-dentist communication were identified in greetings, introducing the dental team (PDC and dental nurse), and explaining the dental examination using the tell-show-do technique. In one case, the PDC explained the three options of the care pathways to the child patient. The PDCs did not involve the children in the decision-making and only discussed the pathway options with the child's parents/carer.

"*The child wasn't really involved in agreeing the plan, no****." PDC, Case#4***

However, the child's cognitive development was observed in three groups to identify the child ability to understand and communicate with the PDCs. Children aged seven years old, children younger than seven, and the third group was the child patient with a special need.

I. Children aged seven-years-old.

In the paediatric dental consultations, two patterns of child interaction were identified in seven- year-olds: a child who was able to express his concerns about the planned dental care pathway and a child who was not interested in being involved in the decision-making. In the qualitative interviews, there were four seven-year-olds: Cases# 1, 2, 6, and 7 those children listened to the talk between the PDCs and their parents and they were able to understand the discussion. Recorded paediatric dental consultations showed that some children were not pleased about the GA care pathway. However, neither the PDCs nor the child's parents appeared to consider the child's concerns in the decision-making.

In the family interview of Case#1, the child was concerned about the number of teeth planned for extraction and also expressed that he was not interested in being involved in the decision-making.

"Kind of worried. Because like everyone started talking about if I have like 50 teeth taken out or 10 teeth taken out." ***Child patient in the family interview, Case#1***

"*Well! I won't be bothered but I don't think I'm really bothered to think about it"* ***Child patient, Case#1***

In the paediatric dental consultation for Case#2, the child did not agree with the decision of GA care that his mother made and was agreed by the PDC. It was observed that the child expressed his wishes to the PDC and to his mother but they

did not appear to be considered in the decision-making. The same pattern was observed with the child in Case#6.

“I’m sad because I just don’t want to do it.” ***The child, Case#2***

“I want to be awake when you do it.” ***Child patient, Case#6***

II. Children younger than seven-years-of-age.

The identified pattern in children aged five years was that they were not attentive to the discussion and the decision-making. However, six year-olds were aware of the discussion but had no concerns or wishes to share with their parents or the PDCs. There were three cases aged six years: Case # 4, 8, and 11, and three cases aged five years: Cases#3, 5, and 10.

In Case#4, the child patient listened to the discussion between the PDC and the foster carer. When the decision was made, she asked if she is going to have the GA care pathway and she was answered by the PDC but there were no further comments or wishes added.

“*Am I going to sleep?”* ***Child patient on clinical consultation, Case#4***

“Yeah…” ***PDC on clinical consultation answered, Case#4***

In the paediatric dental consultation of Case#11, the PDC explained the procedure of dental examination using the tell-show-do TSD technique to the child patient. In the family interview of Case#11, the child patient was aware of the planned GA care pathway but had no further comments or wishes added.

“Make me go to sleep.” ***Child patient in the family interview, Case#11***

III. A special-needs child

Although the child in Case#9 was nine- years-old, she had learning difficulties. The child did not appear to be aware of or involved in the decision-making in planning care pathways for dental treatment.

C. The type of child-parent relation

Two patterns of child-parent interaction were observed in the paediatric dental consultations.

I. Supportive parent

In some cases, parents were supportive and they encouraged their children to talk and respond to the PDCs or they added more details to the child's talk as it seemed important in the discussion and decision-making. In Case#1, the child's father explained to his child in simple words what the PDC had said.

PDC in clinical consultation, Case#1: *So it'll be removal of up to 8 baby teeth, okay?*
Child's father: *Do you hear that?*
Child patient*: Huh?*
Child's father: *8 teeth has to go.*
Child patient*: 8!*

The child's mother in Case#2 discussed the dental treatment plan with her child when he asked questions.

PDC in clinical consultation, Case#2: *So I'm going to consent for removal of 1, 2, 3, 4, 5…*
Child patient: *Will they only do one removal?*
Child's mother: *Yeah, it's only one removal.*
Child patient: *One removal.*
Child's mother: *You know the ones that are broken and have holes in, just, yeah, get rid of those.*
Child patient: *The ones!*

II. Representative parent

Two patterns were observed in this group of parents speak on the child's behalf in two of the cases Case#3 and 9. There was no child-parent communication observed in Case#3, while in Case#9 a brief talk was noticed.

In Case#3, the child patient was very quiet and there was no encouragement from the child's mother to engage him in the discussion or in the decision-making.

"The child was, he was okay, he sat in the chair, there wasn't much dialogue between mum and child, it was very much sit there and he sat and he opened his mouth but they didn't, like most parents would have a little bit of banter with their child, whilst I'm typing or doing something, there wasn't really much of that. So that it was very much he's a child, I'm the mum that was it." ***PDC, Case#3***

In Case#9, the child's mother had to answer the questions that were asked by the PDC to her child. There was a brief talk observed between the mother and the child with special need. The child's mother had not offered the child to be involved in the discussion or in the decision-making.

4.2 The pattern of planning each outcome of the care pathways for dental caries management

Linkage was explored between the process of planning the care pathways for dental caries management and the outcome to identify in what particular way the themes are linked to the outcome. There are three observations of the outcome of care pathways for dental caries management at the LDI: a GA care pathway, a LA care pathway, and other care pathways. They were linked to the factors involved in the decision-making. This finding aids to understand what factors influence the dentists' decisions while planning each care pathway for dental caries management for child patients at the LDI.

4.2.1 The process of decision-making in planning each outcome of care pathways for dental caries management.

Although a GA care pathway was the main outcome planned for most of the referred cases, the pattern of decision-making in planning other care pathways was identified. However, a different order of the process of making a decision was observed among the PDCs in the paediatric dental consultation clinics. Figure 4.4 summaries the pattern of decision-making in planning a GA and other care pathways.

A. GA care pathway for dental caries management.

In the paediatric dental consultations, patterns were observed in the decision-making when planning a GA care pathway for the referred child patients. The group of child patients requiring multiple extractions influenced the decision-making of the PDCs and the child's parents in planning a GA care pathway. Difficulty to access the dental hospital and related social circumstances were also considered. The child patients with a high risk of medical complications those in relation to high exposure to antibiotics had influenced the decision-making in planning a GA care pathway. Similarly, the cases that required rapid intervention and certainty to complete the dental treatment with no delay showed an influence in the decision-making. As well, the child with insufficient cooperation had also influenced the decision-making to plan a GA care pathway.

B. Other care pathways for dental caries management.

Two cases were observed to be planned for other care pathways for dental caries management. In Case#3, a combined LA/GA care pathway was planned for the five years-old boy. The PDC had to compromise treatment planning for the child in Case#3 to be aligned with the parent wishes and expectations. In Case#9, a nine-year-old girl with a history of a severe allergic reaction to local anaesthetics was planned to be discharged from the dental hospital to a Community Dental Service for regular prevention. The PDC had considered in the decision-making for the child in Cas#9 that dental treatment was not required because of the impending exfoliation of the carious teeth. In addition the social background of the child patient in Case#9 reflected the difficulty of accessing the dental hospital regularly.

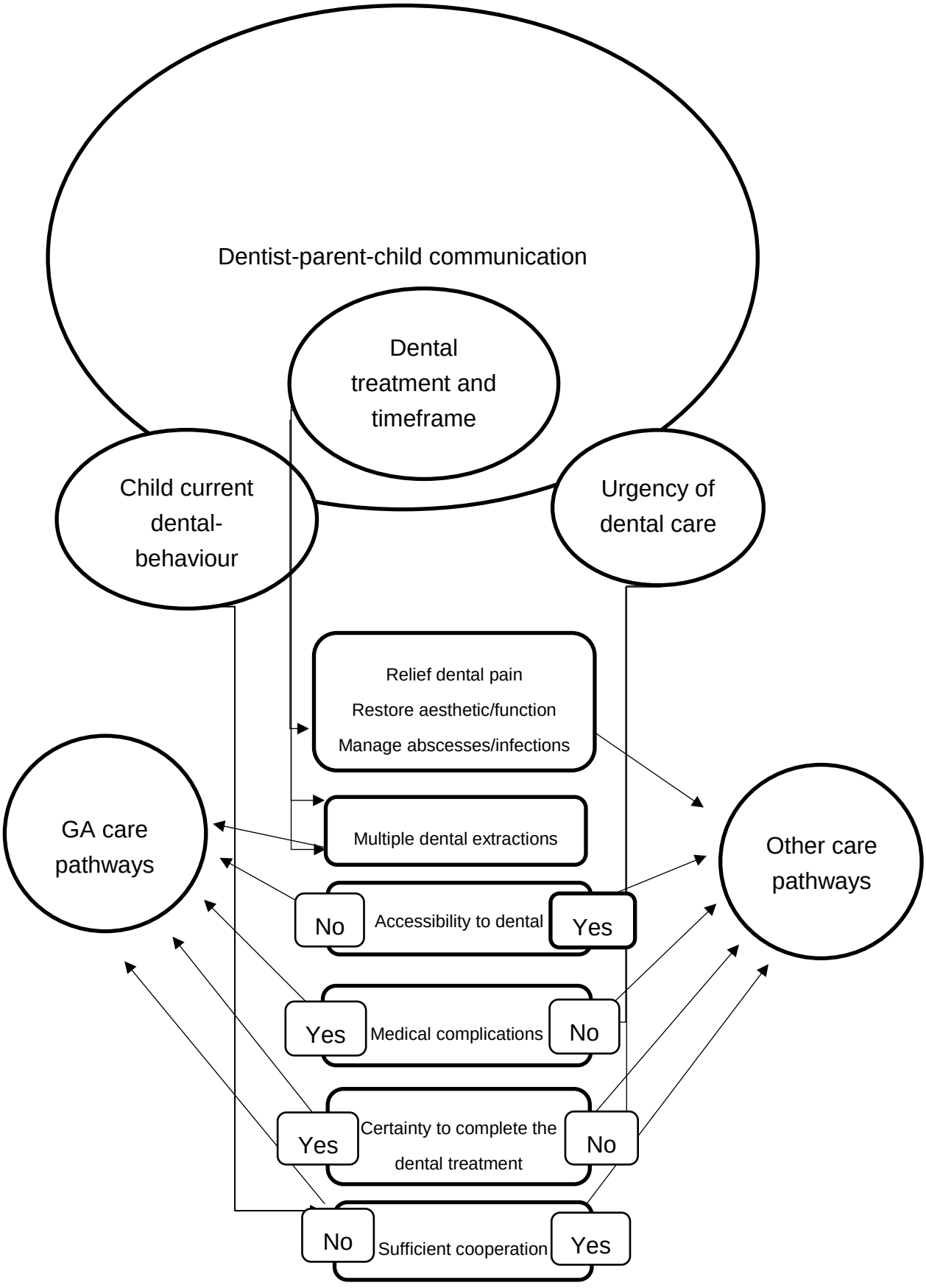

Figure 4.4 The pattern of decision-making when planning a GA care pathway and other care pathways for dental caries management

C. LA care pathways for dental caries management.

LA care pathways were planned for two child patients in Case# 5 and 10. In Case#10, the five-year-old girl was planned for a LA care pathway to start dental treatment immediately to avoid more episodes of dental infection and to stop more courses of antibiotics. The identified pattern that had influenced the decision-making was that the child had sufficient cooperation for dental treatment under a LA care pathway. A male patient in Case#5 and a female patient in Case#10 were observed in the two cases suggesting a limited influence of the child's gender on the decision-making for LA care pathways. The child patients in the two cases aged five years old. Accessibility to the dental hospital had influenced the decision-making for the LA care pathway because of the need of multiple dental visits as shown in Figure 4.5.

A pattern of shared decision-making (SDM) was observed in the two cases planned for LA care pathways. The observed shared decision-making showed a collaboration between the child patients, parents, and the PDCs when planning LA care pathways for dental caries management. The children's parents in the two cases were strongly affirmative of their child's cooperation and positive dental-behaviour. As well, the child patients showed a positive dental-behaviour in the consultation clinics.

"He'll be happy about it, he's happy about everything." ***Child's mother in family interview, Case#5***

"I'm pretty sure, she is quite a confident child, she's not scared of nothing, so she'll be alright." ***Child's mother in family interview, Case#10***

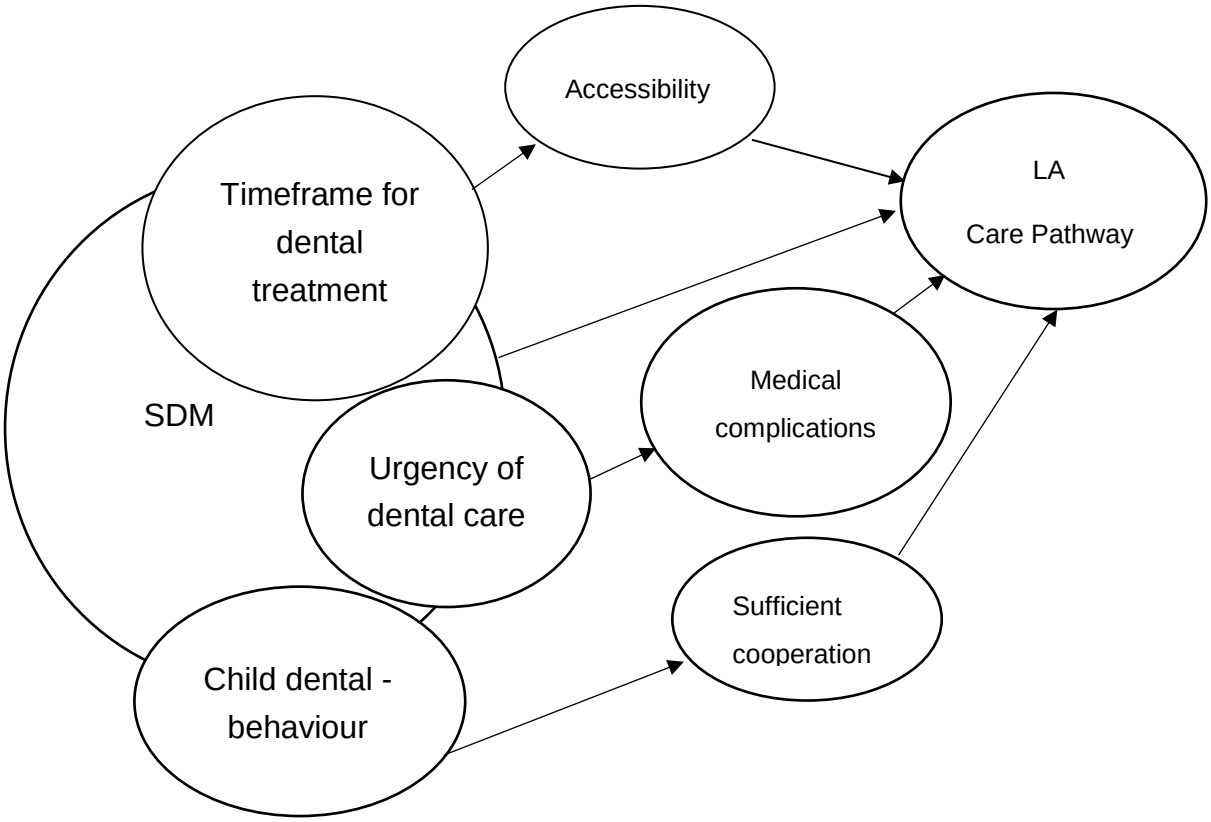

Figure 4.5 The pattern of decision-making when planning a LA care pathway for dental caries management

4.3 Summary

In this chapter, the results of the qualitative study revealed the process of decision-making in planning the care pathways for dental caries management that was presented in four themes

1. Assessing dental treatment and the timeframe to be completed
2. Evaluating the urgency of dental care
3. The impact of past dental experience on the child current dental-behaviour
4. The type of dentist-parent-child communication.

The key factors that were involved in the decision-making for planning the care pathways for dental caries management were:

a. Dental treatment planning
b. Accessibility to the dental hospital
c. Social circumstances
d. Completion of dental treatment
e. Medical complications due to multiple exposure to antibiotics
f. Child dental-behaviour assessment:
g. Child with history of dental complications
h. Mothers with past negative dental experience.
i. Parents' wishes and expectations
j. Parent knowledge

The decision-making for a GA care pathway was observed to be influenced by five factors: need for multiple dental extractions, difficulty to access the dental hospital, certainty of completion of dental treatment, limited cooperation, and high risk of medical complications. Child patients with questionable cooperation due to lack of experience of local anaesthetic who required multiple extractions were more likely to influence the PDCs to opt for a GA care pathway. SDM was observed in planning LA care pathways and the one discharged case was also a result of a SDM. Accessibility to the dental hospital had influenced the decision-making for LA care pathway because of the convenience of multiple dental visits to the parents. A child patient with sufficient cooperation was more likely to influence the PDCs to decide on a LA care pathway. In the qualitative interviews of this research study, no child-involvement in the decision-making was observed.

Chapter 5
Discussion

In this chapter, I will discuss the quantitative findings from study one and that qualitative findings from study two and consider how these findings relate to previous studies in the field. What contributing factors in the decision-making that influenced dentists in planning the care pathways were found in this research study have already been discussed in other studies and factors that have not been mentioned previously. In this research study, I have tested the impact of patient factor on the process of decision-making; future studies may consider testing the dentist factor. In the qualitative study, the dynamics of consultation clinics were explored to understand the factors involved in the decision-making that could lead to incomplete dental treatment for a child patient referred for dental caries management. What are those reasons that influenced parents and children to not complete the dental treatment after the decision of the care pathways was made in consultation clinics. In the following sections, I will discuss the strengths and weaknesses of this research approach by evaluating the sampling strategy, data management, data analysis, quality of research methods, and findings of the quantitative and qualitative studies.

5.1 Research study design

This exploratory research study was designed to answer the question of what factors would influence the paediatric dentist's decision when planning a care pathway for a child patient with dental caries. Two methods of a quantitative and qualitative approach was carried out to answer the research question. This research was designed as an explanatory research (Ritchie et al., 2013). The quantitative part intended to define the characteristics of referred child patients to the LDI, to examine any variation in dentists' decisions, and explain the associated factors with the decision-making. This study approach succeeded to identify the characteristics of the referred child patients for dental caries management. It displayed the variation in the decision-making between the referring dentists and the PDCs and the involved factors. However, it failed to explain the factors involved in the process of the decision-making. The qualitative part was intended to explain the dynamics of paediatric dental consultations and explain the process of decision-making to answer why planning care pathways varies among dentists. This approach was effective to explain the process of decision-making when planning the care pathways and described the clinical communication in paediatric dental consultation clinics. It explained the associated factors with the GA decision but have not fully explained the association with other care pathways.

5.2 Discussion of the first study (quantitative)

The quantitative findings revealed the characteristics of children referred to the LDI and the factors that influenced GDPs and PDCs when planning the care pathways for dental caries management. The agreement between GDPDs and PDCs on half of the sample was also described. The outcome of dental care pathways at the LDI showed cases with complete and incomplete dental treatment. The GA care pathway was the main outcome for children who completed the dental treatment.

5.2.1 Sampling strategy

A hybrid sampling strategy of convenience and purposive technique was applied in the first quantitative study to retrieve patients' dental records for the referred children to the LDI that are easily accessible to the researcher; those records were selected based on the experiences of planning the care pathways for dental caries management (Sedgwick, 2013). This type of sampling is a nonprobability sampling technique which is mostly used in a very large population when randomisation is not applicable. This type of sampling has some limitations because of the bias in choosing the sample and it is not good representation of the population. However, it is useful for the researcher who does not aim for generalisation and has limited time, resources, and workforce. The main assumption associated with this type of sampling is the heterogonous members of the target population. The population to be studied were the children referred to the LDI to manage dental caries; the sample of this population were those children who were referred from September to November 2015. The time between September-November is the longest continuous period of the year when the

flow of patients is not interrupted by holidays or breaks. Out of 297 digital dental records of child patients attending the paediatric dental consultations in the LDI during the period September to November 2015, 172 records were selected for this study based on the criteria that were mentioned in Chapter 2. No power calculation of the sample size was applied because of the nature of this exploratory research study. The study purpose was focused on tracking the pathway of each child patient through the healthcare system to complete the dental treatment. The sample size of the first study (quantitative) is typical to LDI which aligns with a previous research that investigated the number of children who required a repeat dental GA for dental caries management in Leeds, the study sample was 484 within a year in 1997 (Kakaounaki et al., 2011). The outcome of dental GA in this research was 109 in three months Sep-Nov 2015, it represents 436 GA cases within one year.

5.2.2 Data collection and management (methods)

A refined retrospective cohort was designed for the first quantitative study. It is an observational design where data is taken from a database of records of all hospital admissions, visits, and discharge (Sedgwick, 2014). In this research, clinical dental records for the referred children with dental caries were collected from SALUD, the database system at the LDI. The data of the referred children to the LDI included those who were referred over a three-month period from Sep-Nov 2015, then all the cases were traced for a three-year follow-up period until October 2018. The data was refined for dental caries referrals only. The advantages of this study method are minimising selection bias and recall bias. The disadvantage is the possibility of a bias in the observational associations in relation to incomplete records if the reason of missing information was related to a contributing factor such as biological sex. Although, there

was only three missing records in data collection in this study. A small number of missing records would result in a less chance of selection bias.

Previous studies have shown that the socioeconomic status SES is a contributing factor for children to have dental caries (Levine and Stillman-Lowe, 2019, SDCEP, 2018, NICE, 2015, Dong et al., 2011, Bedos et al., 2003). The collected data from patients' dental records was sufficient to identify the SES of the referred children to the LDI for dental caries management.

5.2.3 Data analysis

Retrospectively, tracing the pathway of 172 cases of referred children to complete the dental treatment at the LDI was reported and analysed. The first point of a pathway started when the decision was made on referral, throughout consultation and treatment visits, until completed dental treatments were carried out under the care pathways at the LDI. Descriptive statistical analysis was applied on demographic data to identify the characteristics of children referred to the LDI for dental caries management. The Index of Multiple Deprivation IMD to measure the SES factor using postcodes was a categorical variable rather than continuous because the data was not equally distributed. There was a few groups of high IMD with no recorded data and most of the sample were from the IMD 1, 2, and 3, mainly IMD 1. Similarly with the age factor, data was not equally distributed as most of the sample belongs to the 4-8 age-group. The number of carious permanent teeth was excluded from the statistical analysis because almost all the sample belongs to one category of a group of child patients presented with less than five carious permanent teeth. The observation of the

agreement between the referring dentists and the PDCs in planning care pathways for half of the sample was reported using cross tabulation statistical analysis.

Because the data was not equally distributed, regression analysis was the best choice. Regression analysis was used to examine the effect of every factor on the decisions made in regard to planning the care pathways for dental caries management by the referring dentists and the PDCs and the outcome. Multinomial logistic regression was undertaken to report any causal relationships existing between the different variables those that can influence the decision-making of the referring dentists and the PDCs when planning a care pathway for children with dental caries. The patient contributing factors that identified from the literature were displayed in Table 2.1 page 51 of Chapter 2. Those factors were tested and analysed in the regression analyses models in Chapter 3 page 102-114 and further discussion will be mentioned in the evaluation of findings page 174-178 in this Chapter. The association between those factors with the dental treatment have not been tested with the clinical decisions of care pathways in previous studies according to our current knowledge. Binary logistic regression analysis was applied to highlight the relationships of the referral plans and consultation plans with the observations of the outcome of dental care pathways. It involved testing how well the observed data fits the proposed model, followed by the analysis of direct and indirect effects.

5.2.4 Quality of quantitative research

The aim of the current study was to use rigorous research methods to enhance quality research. This is achievable through measurement of two elements, validity and reliability (Heale and Twycross, 2015). Assessing the validity and reliability of the research can help in the decision whether or not to apply the findings in the area of clinical practice.

I. **Validity:** is defined as how accurate a concept is measured.
   - Content validity: to ensure that the used instrument have covered all aspects related to the process of planning care pathways for dental caries management.
   - Construct validity: to assess the research tool measured the intended construct. A convergence evidence of construct validity achieved if the instrument measures a concept is similar to other instruments.
   - Criterion validity: how a research instrument is related to other instruments that can measure the same variable. We can conduct correlations to determine the extent to which the different instruments measure the same variable. A predictive validity means the instrument should predict to have high correlations with future criterions.

II. **Reliability:** is defined as the consistency of a measure to have the same results if used in the same circumstances on repeated occasions. Strong correlations indicate high reliability, while weak correlations indicate the instrument may not be reliable. Equivalence is assessed through inter-rater reliability. This test includes a process for qualitatively determining the level of agreement between two or more observers.

In this research, data extraction tool was used effectively and efficiently to gather and read the pathway of a referred child patient for dental caries management and also highlighted the variation in dentists' decisions of the care pathway planned for the same child patient. Standardisation of the collected data was discussed by the research team and an agreement was reached to ensure the data were recorded using an agreed standard for inter-rater reliability. The data was collected from SALUD database into a hard copy form and then transferred into a soft copy form on SPSS sheet. Using electronic primary dental records is a valid tool in research (Wanyonyi et al., 2019). I believe this is the first study first to explore the factors involved in planning the pathways of dental caries management for individual child patients.

5.2.5 Evaluation of the findings

Demographics (age, gender, ethnicity, and SES) of the child patient referred for dental caries management to the LDI was revealed. A different set of factors was influencing the GDPs and the PDCs when planning the GA care pathways for the children referred to the LDI for dental caries management.

A. The characteristics of child patients referred to the LDI for dental caries management

In the past, patient characteristics were considered a source of variation that might affect clinicians to make treatment decisions (Grembowski et al., 1988, Kress, 1980, Sadowsky, 1979, Starfield, 1973, Fuchs, 1968). Based on reviewing 171 articles, it was found that child age, gender, health conditions, learning disability, ethnicity, culture, socioeconomic/deprivation status, and geographic location were contributing factors to the choice of dental extractions under a GA care pathway (Broomhead et

al., 2020). The most recent survey finding was one-in-four of 5 year-olds (23%) children in the UK have had dental caries (Ravaghi et al., 2020). The results of the present study showed that the 4-7 year-old group was the most frequent age-group referred to the LDI for caries management especially those aged 5 and 6 years old who represented 31.4% one third of the sample. The result of a recent rapid review article showed that a higher number of female children received dental GA than males (Broomhead et al., 2020), although no difference was reported in gender distribution in other reviews (Raja et al., 2016, Hosey et al., 2006). In this small scale study, there was no significant difference found in gender distribution of male and female patients referred to LDI for caries management; 53.5% (n=90) were males and 46.5% (n=82) were females. In regard to the GA outcome, the male patients were 47.7% and the females were 52.3%. In the LA care pathway, gender distribution was reported as 47.1% males and 52.9% females. However, there was a higher percentage of male children 75% reported in the IHS outcome than females 25%.

In several previous studies, an association has been reported between the occurrence of dental caries and low-socioeconomic status (Levine and Stillman-Lowe, 2019, NICE, 2015, Dong et al., 2011, NCGC et al., 2010, Bedos et al., 2003). It was reported in a few studies that people in lower socioeconomic groups were affected by poor oral health and suffer healthcare inequality in many countries regardless of the racial/ethnic background (Harris et al., 2017, Maunder et al., 2006, Bedos et al., 2003). This research study shows similar findings, that 60% of the referred children to the LDI for dental caries management were from a low socioeconomic status (SES): 35.5% (n=61) IMD1, 11.6% (n=20) IMD2, and 14% (n=24) IMD3. Approximately, half of the referred children to the LDI for dental caries management in this study were from the white-British ethnic group 53.5% (n=92), 12.8% (n=22) were from the South Asian

group (Pakistani, Indian) and 21 % (n=37) was not specified. Other minorities were reported including black (African, Caribbean) by 4.7% (n=8), mixed race 2.9% (n=5), and white-not British (mainly Polish and Lithuanian) 4.7% (n=8).

About 70% of the referred children to the LDI had no relevant medical history recorded on referral letters and/or on the medical history assessment sheet. The majority of the referred children were fit and healthy because referrals from non-dental practitioners were excluded in the sampling. Referrals from medical practitioners such as cardiologists, oncologists, and nephrologists were not included in the study sample. Unlike dental referrals, medical referrals are lacking of important information for data analysis in regard to the decision-making in planning dental caries care pathways for the referred children.

Almost half of the referred patients had dental caries in 5-10 primary teeth. A different aspect that was not explored about the affected teeth besides the quantity was their location in the same quadrant versus if they presented in different quadrants. The location of affected teeth in the oral cavity might influence the decision when planning the care pathways for dental caries management that could be tested in future studies.

The dental behaviour assessment carried out on consultation clinics by the PDCs revealed almost half of the referred children were cooperative. The dental-behaviour assessment carried out by the GDPs and recorded on the referrals showed half of the referred children were uncooperative/anxious/phobic. Parental preference was recorded as the reason in 2.9% of referrals and 3.5% was for assorted reasons, such as re-referring after a discharge for not attending multiple appointments. I found that GDPs did not specify dental care pathways in 40% of the referrals. In those referrals with no planned care pathways, GDPs had requested from the PDCs to plan a care pathway as appropriate and 42.0% of the referrals were for the GA care pathways.

The reasons for referral in patients' dental records showed that 61.0% of the referrals were because of the lack of child cooperation, 16.3% were not specified, 9.3% were because of the complexity of the required dental treatment, and 7.0% were because of relevant chronic medical conditions. Approximately, 89.0% of the referrals were without dental radiographs, while 11.0% had attached radiographs. Ideally, attachment of dental radiographs is meant to support the dental diagnosis made by the referring dentists to ask for a second opinion or for an advanced treatment. In this study, half of the cases were referred because of the lack of collaboration, radiographs would not be an easy task to be asked from those young children. A recent Greek study found an association between gagging reflex and negative dental behaviour in taking dental radiographs (Κατσούδα, 2021).

B. The outcome of care pathways for the children referred to the LDI for dental caries management

The General Dental Council (GDC) advises GDPs to refer patients who require additional services that are beyond their 'competence' to other generalist or specialist dentists (Allen, 2018, GDC, 2019). Yet, some inappropriate referrals from GDPs have been reported in England, Scotland, and Wales (Allen, 2018, Aspinall and Blinkhorn, 2007, Thomas et al., 2004, Podesta and Watt, 1996). There have been issues of patient selection and treatment planning reported among a range of perceived faults in GDPs' referrals. In this research study, GDPs were the source of 82.0% of the referral letters, while specialists in Paediatric Dentistry referred 15.1% of the sample and other dental professionals such as speciality trainees and consultancy trainees in Paediatric Dentistry or consultants in Oral and Maxillofacial Surgery OMFS had

referred 2.9%. Perhaps because specialists and speciality/consultancy trainees are more capable of managing uncooperative children, they are willing to try different behavioural management techniques before making a decision for a referral. It seemed like the NHS system for referrals was encouraging GDPs to not start dental treatment for children which is time consuming while they can earn the same by referring those patients to secondary/tertiary dental care (Allen, 2018). Child cooperation must be assessed as to whether the child is able to receive conventional care in the dental chair or a referral to a specialist or a consultant for special arrangements is required (NCGC et al., 2010).

The outcome of care pathways for the children referred to the LDI for dental caries management in the research study is divided into completed and incomplete dental treatments.

I. Completed dental treatment in a GA dental care pathway

A hundred and forty-six cases (85%) (n=172) of the children referred to LDI completed the dental treatment within the three year follow-up. It was found that the majority of those 109 cases (63.4%) had completed the dental treatment in a GA care pathway. In this study, the GA care pathway was the dominant outcome for the referred children with dental caries. Similar to our finding, a recent study mentioned that dental treatment in a GA care pathway is common for some young high caries-risk patients (Knapp et al., 2022). Dental treatment in a GA care pathway can increase the oral health-related quality-of-life for young patients which has been explained because of the great impact of pre-treatment discomfort and distress. I observed that children who were referred for any care pathways other than GA were more likely to have the GA outcome. Another observation was for children who were planned by the PDCs for any

care pathway other than GA were more likely to have a GA outcome. The present study found that GA care pathways are more predictable to complete the dental treatment for child patients than LA care pathways irrespective of the long GA wait lists. The reason why only a few cases had their dental caries managed using the biological approach (Hall Technique Crown) or other non-invasive dental procedures might be related to the prolonged waiting list time which increased the progression of dental caries in the absence of preventive dental care. Children referred to the LDI were observed to have increased severity and extent of dental caries which require more invasive techniques such as multiple dental extractions.

II. Children with incomplete dental treatment

Twenty-six cases (15%) had failed to complete treatment to manage dental caries at the end of the follow-up period. It was found that the older age-group was more likely to not complete treatment plans for dental caries management than those in younger age-groups. This could be explained by more than one reason: the older children are more likely to have primary teeth exfoliating with replacement by permanent teeth and therefore attending appointments would not be a priority for parents if the discomfort was gone. This could be explained because families found multiple appointments difficult for LA and IHS care pathways. Another explanation is that changing address would result in non-delivery of appointment letters and the child may require registration in a different dental hospital in the new region. Male patients represent 65% of the children not started/ completed care pathways. Parent and child acceptability for the planned care pathways could be the reason for completing or not

completing the dental treatment. In fact, parents are responsible for attending dental visits with their children.

The PDCs were more likely to plan care pathways including LA, IHS, biological treatment, or non-invasive dental procedures without using local anaesthetics for male patients than female patients. Several studies have reported that females are more likely to have dental anxiety. I found that female patients were more likely to complete the treatment plan for dental caries management than males. It reflects the fact that GA outcome is the most likely to complete dental treatment compared to other care pathways and it is related to the proportion of male patients with incomplete dental treatment or complete dental caries management under IHS and other care pathways more than females. It was concluded in a review article (Broomhead et al., 2020) that the GA care pathway was most likely to be planned for females. This could be explained as having a GA care pathway planned may result in less anxiety for a child patient and their parents and allow them to become more motivated to complete the dental treatment by attending all the required appointments.

Medically compromised children were less likely to not start or complete a care pathway for dental caries management than those children with no relevant medical history. Children with no relevant medical condition were 5-8 times more likely to not start or complete a care pathway than those with a lifelong medical condition. This seemed to be due to parents of a child with a health problem being more committed to complete the dental treatment with the planned care pathway recommended by the PDCs because of the concerns about their children's general health and wellbeing. It has been reported by Ibbetson et al. (1999) that the variation in planning dental treatment was influenced by the patient's medical and/or dental condition.

The referring dentists had referred 50% (n=13) with no planned care pathway of the 26 incomplete cases of dental treatment. The PDCs had planned a LA care pathway on consultation clinics for 57.7% (n=15) of the 26 incomplete cases of dental treatment.

i. Not started care pathways

In this subgroup of children with incomplete dental treatment, 6.4% (n=11 cases) had not started dental treatment at the end of the three-year follow-up period. Four cases in this subgroup were planned for a LA care pathway by the PDCs.

ii. Not completed care pathways

In the second subgroup, there were 8.7% (n=15 cases) of referred children those had not completed the dental treatment at the end of the three-year follow-up period. Eleven cases were planned for a LA care pathway by the PDCs**.**

This could be explained because the LDI is an educational institute and some dental treatment is carried out by dental students/trainees who are supervised by experienced dental professionals. Incomplete dental treatment suggests that child patients at the LDI do not always complete their dental care efficiently due to several reasons that may involve changing clinical classes or graduations of dental students and this could contribute to patients being lost in the booking system. The two groups of not-started treatment and not-completed treatment were merged into one group because each category had insufficient numbers of subjects for individual statistical analysis.

A Binary logistic regression model showed that there was less chance to have the outcome of not started/ completed care pathway for the referred children who were planned for a LA care pathway by the PDCs. However, fifteen cases of the children planned by the PDCs for LA were reported in the not completed care pathway group. This means that most child patients who were planned for a LA care pathway by PDCs actually started dental treatment in the same pathway but did not complete it for some reason. Some potential reasons are loss of child cooperation or parents live a long way from the dental hospital or the treating dental student changed clinical sessions and the patient was lost in the booking system. An Australian study measured patient anxiety in student dental clinics pre and post treatment. A reduction of dental anxiety was recorded on the Modified Dental Anxiety Scale MDAS for less complex procedures (Caltabiano et al., 2018). Although the reduction in patient anxiety reflected good clinical practice and interpersonal skills of dental students, they suggested that clinical supervisor-student ratios need to be more equivalent to reduce the time length of appointments. Studies have shown that long appointments increase anxiety in young patients (Caltabiano et al., 2018, Davidovich et al., 2014, Aminabadi et al., 2009, Getz and Weinstein, 1981, Lenchner, 1966). Moreover, anxious patients perceive a higher level of pain in invasive procedures such as dental extractions (Maggirias and Locker, 2002). Implications with treating anxious patients can include failing to attend appointments, more appointment cancellations, impaired oral health outcome, and heightened perceptions of pain (Armfield, 2011, Armfield, 2010, Holtzman et al., 1997).

C. Factors influencing the decisions of planning care pathways for dental caries management

Managing child behaviour is achievable via pharmacological or psychological behavioural management techniques. It is recommended to start with the least invasive techniques moving progressively to the most invasive (SDCEP, 2018). However, the process of decision-making should consider weighing the risks and benefits when planning the care pathways for a child patient with dental caries. In paediatric dentistry it is common to use conscious sedation to manage mild to moderately anxious patients, while GA is recommended for dental phobic or special needs patients and for advanced dental procedures (Rønneberg et al., 2017). Our findings show that the PDCs had planned GA care pathway for 67.4 % of the study sample and LA care pathway for 22.7% of the children. This was contrary to the findings of an audit that was carried out in the Oldham Community Dental Service (OCDS) that investigated the outcomes of 85 patients referred for a GA care pathway in 2011-2012 (Shepherd and Ali, 2015). It reported that 35% (n=30) accepted a LA care pathway, 25% (n=21) had a combined care pathway of LA in conjunction with inhalation sedation, and only 25% (n=21) actually required treatment under a GA care pathway. In this research study, I found that 78% (n=56) of the referred cases to LDI for GA care pathway (n=72) had the treatment completed with GA care pathway and of the 116 cases planned for a GA care pathway by the PDCs, 87.1% (n=101) had completed the dental treatment with the GA care pathway as planned.

Although many children deemed cooperative, the majority still had a GA care pathway outcome. This finding reflects that cooperation is not the only factor that influence the decision-making when planning care pathways to children for dental caries management. That's why regression analyses were carried out and the results showed

other involved factors in the decision-making when planning dental care pathways. The factors that influenced the decision-making of GDPDs and PDCs were investigated and explained in the following sections. The agreement between the referrals and the consultation plans for GA care pathway with the GA outcome was reported in almost half 49.5% (n=54) of the sample. An old study had supported this finding by reporting that there is a moderate agreement between dentists in making clinical decisions (Bader and Shugars, 1995).

I. Factors influenced the referring dentists' decisions:

Gender, ethnicity and medical history of referred child patients were found to have no association with the referring dentists' decisions on dental care pathways. There was no evidence of medical history influencing referring dentists' decisions. That might be due to the medically compromised patients who were routinely referred by treating physicians were excluded from the study sample. Dental referrals by medical staff were excluded because of the deficiency of essential information included in data collection sheet related to this study such as dental diagnosis, behaviour assessment, and the planned care pathways for dental caries treatment which is the main scope of the study. However, there were significant associations between patient age, child dental behaviour, and IMD with the referring dentists' decision of dental care pathways for child patients. Similarly, the factors that have been reported in previous studies that might influence dentists to refer patients for GA, include a young child (mean age - six years and eight months), lack of cooperation, acute infection, multiple extractions needed, unsuccessful past restorative treatment or failure of extraction, medical conditions or orthodontic extractions (Tahmassebi et al., 2014, Clayton and Mackie, 2003, MacCormac and Kinirons, 1998). Authors of a recent study believed that

healthcare workers' decisions were influenced by a number of factors and it has been suggested that applying care pathways may reduce healthcare costs, improve health outcomes, and decrease the mental effort for clinicians to allow them to concentrate more on complex cases (Jabbour et al., 2018a). Moreover, waiting list can be adjusted when considering those factors that influence the decision-makings. It might be helpful to prioritize the younger age patients who are in urgent need of dental treatment.

It was found that LA and IHS referrals were more likely to be planned for the older children than for those in younger age-groups. This finding could be explained by the emotional development of the child patient enabling them to control dental fear through improvement in the communication skills with dentists when they grow older (Caltabiano et al., 2018).

Another association was found that the LA and IHS referrals were more likely to be planned for the patients who had no assessment of dental-behaviour on their referrals than the patients who were assessed as uncooperative or anxious. Those patients who were assessed with less cooperation were more likely to be planned for a GA care pathway by the GDPs. Failure to assess the child dental-behaviour would be a sign that dental treatment was not attempted prior to referral. Another reason might be the child was coping with examinations but the referring dentists were not sure if the child would cope the dental treatment. Therefore, the child may or may not require sedation with LA pathway for dental caries management.

The children from higher SES groups were more likely to be planned by the GDPs for LA and IHS care pathways for dental caries management than the children from the lower groups. Children from the middle and high SES groups were more likely to be referred with no planned care pathway than those from the lower groups. It has been found in several studies that a GA care pathway was more to be likely associated with

low SES patients who lived in the most deprived areas and had poor OH and inequality of accessing dental care (Allen, 2018, Harris et al., 2017, Barnes et al., 2011, Boyle, 2011, Maunder et al., 2006, Bedos et al., 2003, Cook et al., 2002, Nuttall et al., 2002, Scuffham and Steed, 2002, Linden, 1998). This reflects the complexity of child dental care for those children in the low SES groups who are more likely require the GA care pathways for dental extractions.

II. Factors influenced the PDCs' decisions:

No evidence was found that patient age, ethnicity, medical history and level of SES had an association on the PDCs' decisions when planning the dental caries care pathways. Most of the referred children to the LDI for dental caries management in this study were from the same age-group and SES. Although, there was a diversity of ethnic groups, the majority were from the white-British group. No differences were found in the PDCs' decisions in relation to patient ethnicity when planning the care pathways for dental caries management. There was no evidence of medical history influencing the PDCs' decisions, the reason for excluding medical referrals by non-dental practitioners was explained in the section of the characteristics of child patients referred to the LDI for dental caries management page 168 in this Chapter. However, there were significant associations between gender, child dental-behaviour, and number of carious teeth influencing the PDCs' decisions when planning dental care pathways.

Male patients were more likely to be planned by the PDCs for other dental care pathways (not including GA) as compared with females. In past studies, it was found that female patients were more anxious having dental treatment than males (Akshaya et al., 2020, Caltabiano et al., 2018, Saatchi et al., 2015). Therefore, female patients

were less likely to be planned for other dental care pathway than GA such as LA, IHS care pathways that require a higher level of cooperation.

There is evidence that correlates the level of child cooperation with the treatment planning for dental caries (Jabbour et al., 2018a, SDCEP, 2018). The assessment of dental behaviour for a referred child with dental caries had a significant influence on the PDCs' decisions to plan a LA care pathway for dental treatment compared with other care pathways. The cooperative group was more likely to be planned for a LA care pathway than the uncooperative group.

I found that children with less or equal to five affected primary teeth were more likely to be planned by the PDCs for an IHS care pathway, a biological approach, or non-invasive dental treatment without LA than those with 5 to 10 affected primary teeth. That was mostly associated with the duration of dental treatment and the child cooperation. Lower duration of dental procedures has been reported to cause less anxiety to patients which can be managed by the IHS care pathways s (Jamali et al., 2018, Davidovich et al., 2014, Aminabadi et al., 2009, Getz and Weinstein, 1981, Lenchner, 1966).

5.3 Discussion of the second study (qualitative)

The qualitative findings of the process of decision-making involving factors influencing the planning care pathways are discussed. Themes were created in a particular configuration related to the process of decision-making, which are highlighted in the evaluation of the process of decision-making. The factors involved in planning the care pathways for children with dental caries were linked to the outcome. The GA care pathway was the main outcome for children who were referred to the LDI for dental caries treatment.

5.3.1 Sampling strategy

A heterogonous purposive sampling was applied in the second qualitative study. This approach aimed to select groups of participants, where homogeneity in age-group was fairly maintained while variation in the target phenomena was sought to show variation in the experience of planning care pathways for dental caries management in children to study the contributing factors. However, each group was heterogonous to create comparable subgroups. It is important in the sampling to consider the willingness of participants to participate and share their experience and opinions in expressive and reflective manner (Sedgwick, 2013). Participants were selected by age-group based on the main characteristics of the children referred to LDI found from the first quantitative study. They represented the group of children more likely to be referred for dental caries and those who are the most recorded on the consultation clinic waiting lists. It also included only those who were willing to participate. The research groups are reasonably homogenous as the children share the same age range and dental condition (dental caries). Therefore, a small data sample includes all the internal

diversity that is needed. Sampling in qualitative research is concerned with the richness of information rather than the quantity (O'Reilly and Parker, 2013). Unlike the quantitative sampling strategy, the qualitative findings are not concerned about incidence and prevalence being representative of the population. The purpose of the qualitative findings is to understand the depth of planning care pathways for children with dental caries. Eleven children were included; each child represented a case of planning a care pathway in managing dental caries, which was discussed in three groups of data sources. The three groups were, recorded clinical consultations, the PDCs' interviews, and the family interviews. The eleven cases were analysed to study the depth of the process of planning care pathways to manage dental caries, which was mostly GA care pathways. In-depth interviews of 11 cases were carried out; each case was analysed from three groups of transcripts. The first two cases were interviewed and reviewed with the research team. Similarly, a qualitative study interviewed 11 participants to explore parents' experience of their child dental GA; however, the sample size was decided before the data saturation was determined (Amin et al., 2006). For more child contribution in the family interviews, a child patient aged 9 years was interviewed. In the clinical consultation of the 9 years old child patient, the contribution was not as expected because the child had severe learning difficulties.

The notion of data saturation in qualitative data is contested. The bigger sample isn't necessarily better, the more important than predetermined sample size is the clear conceptualisation of what themes represent and how significant they are in the way we interpret them. (Braun and Clarke, 2015, Mason, 2010). The judgment on the adequacy of sample size depends on the quality of the collected information and its interpretation, the research method, the strategy of purposeful sampling, and

evaluation of the intended research outcomes (Sandelowski, 1995). The objects of purposeful sampling are people experiences not people per se. Data saturation was defined as when researcher reaches the point of data collection from several participants and no substantial codes or themes that are being developed from new participants are added (Creswell, 2014, O'Reilly and Parker, 2013). In the present research, data saturation was reached at the point of data collection when the process of decision-making was initially labelled in the first eight interviews and four clinical consultations for four cases. A similar pattern was then repeated in the new cases. There are different minimum sample sizes for different purposeful sampling strategies, it is recommended to use 3-10 participants for a phenomenology, one or two for a narrative study, 4-5 cases for a case study research, a single group sharing the same culture for ethnography, and 20-30 participants for grounded theory (Creswell, 2014, Sandelowski, 1995).

5.3.2 Data collection

In this study, four participating PDCs were asked to have clinical consultations with participating families recorded on a digital audio-recorder. The participating PDCs were NHS staff, trained in the UK but at different times and they were following the same clinical guidelines. The demographic information for those PDCs was not be reported since they are only four of 8 PDCs working at the LDI and any reporting of this information would most likely breach their confidentiality by making them recognisable. A Norwegian paper (Rønneberg et al., 2017) which included 391 participating GDPs and 29 paediatric dental specialists were asked to answer two forms of questionnaire. The philosophy of the Scandinavian study was to study the variation between dentists when planning dental treatment for two case scenarios of

child patients with dental caries, one case was symptomatic and the second one asymptomatic with pre-coded response options.

In the present study, I managed to have most of the clinical consultations recorded by the dental team (PDC and dental nurse). Although, the time was limited to examine each child patient and request dental x-rays. After reporting dental radiographs, a diagnosis is made and dental treatment is planned. In addition to a discussion of the options of care pathways with parents to allow consent, all paper work is completed at the end of most of the consultation clinics. It was not an easy task for the dental team to carry out examination, radiographs request, consents, and to record the clinical consultations because of the limited time they have with each patient. The dental team had to record two parts of the clinical consultation for each participant. The first part included the examination and dental charting, while the second part was recorded after having dental radiographs and this was the main part where the decision of which dental care pathway was made. However, the dental team did manage to record the two parts of clinical consultations for six cases on the day of the appointment. When the participating child patient was sent for dental x-rays, the PDC examined another child patient who was not necessarily participating in the study which made the procedure more difficult to track which child is a participant to record the second part of the consultation. Four cases had only the first part of the clinical consultation recorded, and one case had only the second part recorded. It would be more useful to assign more members to the research team for data collection. One member could be assigned to record the clinical consultations, another member to facilitate logistic arrangements and a further one to carry out the interviews with families and PDCs.

Data was collected from three sources (observing the consultation, interviewing the Consultant and interviewing the family) presenting dichotomous responses of PDCs and parents in relation to planning care pathways. This relies on both parties agreement on a care pathway for dental treatment for a child patient. Three data sources managed to capture the process from the PDCs' perspectives, parents' perspectives, and the interaction between the two parties during clinical consultations. The two perspectives are equally important to be captured and analysed in order to understand in what pattern the process of decision-making has happened in clinical consultations. Building on that, the factors involved in the process were extracted to make a full picture of the event. Triangulation of data sources aims to avoid biases by gathering information from more than one perspectives in addition to observing ordinary conversations to increase internal validity and reliability and to enhance the rigour of a research study. (Morgan, 2019, Heale and Forbes, 2013, Thurmond, 2001). Interviews may gather data with limited information because it depends on what participants are willing to share with a stranger (the researcher), incorporating an event such as talk to a physician (in this study clinical consultation) can add range and depth (Baker SE, 2012). In qualitative research, triangulation is combining two or more data sources: investigators, methodologies, theoretical perspectives (Denzin, 1970, Kimchi et al., 1991), and analyses (Kimchi et al., 1991) within the same study. Multiple methods of data collection have used with a long history. According to (Lincoln and Guba, 1985) p.283 "Triangulation of data is crucially important in naturalistic studies. No single item of information (unless coming from an elite and unimpeachable source) should ever be given serious consideration unless it can be triangulated". The advantage of using data triangulation is the nature and amount of generated data for

interpretation (Banik, 1993). Multiple data sources triangulation was used to obtain a more comprehensive view of family needs in critical care (Burr, 1998). There are three types of data sources triangulation based on the time data were collected, the place and settings of data collection, and the person to collect the data from (Thurmond, 2001, Fielding and Fielding, 1986, Mitchell, 1986, Denzin, 1970). The disadvantage of data-sources triangulation is the difficulty in coding dichotomous responses regarding judgment, in some instances the judgment did not fit with a labelled behavioural code. Another problem is how to code a category for a particular ideal type, when the ideal type was not one identified or did not exist (Buchanan, 1992). In this study, data coding was fitted with identifying the ideal types of routine clinical procedures and communications.

5.3.3 Data management

In the data analysis of this qualitative study, N-vivo software version 12 was initially planned for data management. Later, data analysis was completed on Microsoft Word® because of the global disruption caused by the Covid-19 pandemic in 2020, when working from home was obligatory and the original software could not be accessed. Data analysis was completed using a university encrypted laptop with the remote support of the University IT team. The data was anonymised for being analysed on the university encrypted laptop.

Organising qualitative data was carried out through a number of steps. Data familiarisation was by reading the three groups of transcripts in two ways. First, the author was getting familiar with the way of communication in each group of data source within: clinical consultations, PDCs interviews, and family interviews. Second, each case was read separately to identify distinctive features. Then, data was organised

case by case and an initial thematic framework was constructed. Indexing and coding, creating codes line by line, reviewing data extracts, and data summary and display were carried out. The applied code categorisation strategy was an individual-based sorting strategy. The coding steps included: 1. Decide on the code strategy 2. Label the research question 3. Create and define labels 4. Search for relevant information in the data 5. Assign labels to the relevant information.

5.3.4 Abstraction and interpretation (Data analysis)

There are different approaches to analyse data in qualitative studies. Thematic analysis (TA) is one approach that is used to identify themes (patterns of meaning) across datasets (Braun and Clarke, 2019). The identified themes in this study represented the process of decision-making in planning care pathways for children with dental caries. Thematic analysis was defined as an interpretive process, in which data was searched systematically to identify patterns to provide an informative description of the phenomena (Smith and Firth, 2011). However, it has been criticised for lacking depth in the studied phenomena and lacking transparency in development of themes. Using a framework approach in thematic analysis can lead to questioning the rigour of the findings (Attride-Stirling, 2001). The framework approach of thematic analysis was helpful to understand complex phenomena and can be applied to expand or test an existing theory through a range of theoretical and epistemological approaches (Braun and Clarke, 2006). The analysis process consisted of data familiarisation, data coding, theme creating, and revision. It aided generating meaningful themes without making a theory as in the grounded theory approach (Tesch, 2013). It facilitated both case and theme approach in data analysis (Smith and Firth, 2011).

Qualitative analysis is the process of describing data through linking codes into categories and constructing themes, typologies and forming sub themes, and to identify linkage to link the categories. The final stage is explaining qualitative data by accounting patterns to find the relation of those themes with the patients' lives and that was achieved by identifying concepts and other aspects from an established literature review. The approach of data analysis was an inductive/deductive balanced approach that was more of a research question-focused approach. The analytical output of this study was explanatory: explaining the process of decision-making in paediatric dental consultation clinics and the contributing factors.

In qualitative research, each study does not necessarily follow the same steps of data analysis; it all depends on the research questions and the aim of the study. It is possible to look back on what is emerging and to reflect on how much sense this is making in terms of representing the original material. In the first instance, child-involvement was identified in the indexing step of data analysis. Then, secondary analysis using the existing data was decided on to explore themes and patterns in relation to child-involvement and was reported in a separate chapter. The triangulated data sources were analysed to evaluate the child-involvement in the decision-making process of dental care pathways. Three themes were constructed and patterns were identified in two themes. Further discussions with the research team identified the child-involvement as an aspect of clinical communication which was then added to the theme of dentist-parent-child communication that is involved in the process decision-making when planning the care pathways for dental caries management. Further refinement was carried out to integrate the two analysis to enhance a more detailed understanding of the triad interaction between parent-child-dentist.

5.3.5 Quality of qualitative research

The way to evaluate the quality of qualitative research is so diverse (Denzin et al., 2005). Generalisation of qualitative research findings is controversial; whether a study's findings can have a relevance to a context beyond the sample and context of the study itself supporting a wider inference (Ritchie et al., 2013). This is mainly because views on generalisation are highly influenced by the epistemological and ontological orientations of the contributors (Altheide and Johnson, 2011, Seale, 1999). Lincoln and Guba (Lincoln and Guba, 1985) talk about naturalistic generalisation a concept introduced by Stake (Stake, 1978) to offer a more intuitive form of generalisation based on the researchers' knowledge, experience and feelings. Inferential generalisation asks whether the study findings can be generalised or inferred to other settings or contexts beyond the sampled one. "It is recommended that qualitative health researchers learn to judge a variety of approaches in different but appropriate ways" (Sparkes, 2001). There are no commonly agreed conditions or process to say qualitative research findings can be generalised. According to Ritchie et al (Ritchie et al., 2013), qualitative research findings need a careful explication to be generalised. In this research study, data was gathered from recorded clinical consultations, two different perspectives of patients' family and PDCs were considered in viewing the fuller picture. The researcher and research team are familiar to the paediatric consultation field that helped in connecting the codes in a realistic way to what really happened in clinical consultations. Therefore, I believe that the findings of the current study can be generalised as well as modified if inferred to other paediatric dental consultation clinics beyond the sampled one.

One of the ultimate goals in research design is to have strong internal and external validity and reliability. Validity and reliability within qualitative research in relation to generalisation are discussed in the following sections.

A. Reliability

Unlike quantitative research findings, there is no single reality to be captured and replicated in qualitative research findings (Hughes and Sharrock, 1997, Marshall and Rossman, 1999). However, the view of Seale (Seale, 1999) is that by showing more of the audience of research studies the procedures that have led to a specific set of conclusions is considered good practice in relation to reliability and replication. The sturdiness of a finding needs to be reassured beyond the study sample, to link questions about reliability to those surrounding generalisation. A first requirement to apply reliability criteria in qualitative research is to have a clear understanding of what is expected to be consistent and replicable features of the raw qualitative data. What would be expected to repeat is the collective nature of the phenomena that have been generated by the study's participants besides the meaning that they have attached to them. Therefore, the reliability of qualitative findings depends on the likely recurrence of key features of the raw data and the integrity with which they have been classified (Ritchie et al., 2013).

B. Validity

The key strength of qualitative research is the conception of validity, its ability to describe a phenomenon in ways to reflect the language and meanings assigned by participants. There is a strong link between the validity of qualitative data and generalisation. It is the need to have at least a confidence that the findings have a well-founded depth and internal validity. There is no point in trying to draw a wider inference if there is no confidence of the concepts and the relationships between concepts in the findings if they are not fully grounded in the data. External validity is used interchangeably with generalisability in many research studies; it asks whether findings can be transferred to other groups in other settings or within the wider population. External validity can conclude the occurrence of representational generalisation (transferability of findings to the wider population) and inferential generalisation (transferability of findings to other groups in other settings).

C. Validation

According to Ritchie et al (Ritchie et al., 2013), validation is the extent to which the validity of evidence has been verified. Different approaches have been suggested to validate qualitative research: triangulation and member or respondent validation. Triangulation is the use of more than one approach to improve clarity and or precision of a finding in researching a question (Heale and Forbes, 2013, Ritchie et al., 2013). Member or respondent validation involves taking the findings back to the research participants to confirm transferability of the findings to the same participants to check that the subject was covered completely from all aspects (Ritchie et al., 2013). The argument raised was related to the inconvenience of taking the findings back to the research participants and it is also known that there is no completely reliable access

to reality (Robson, 2011, Hammmersley, 1992). Therefore, research validity must be judged based on the adequacy of the evidence offered in support of the event being described. In the present research, data-sources triangulation was used to present two different perspectives of planning care pathways in addition to the recordings of paediatric dental consultation clinics to avoid biases. The members of the research team were involved in the discussions related to the process of data coding and themes creating. These discussions led to re-evaluating the themes and their relationship with codes repeatedly and modifications were made as appropriate.

Another approach to assess the rigour of qualitative research is by using a four dimensions framework: Trustworthiness, Auditability, Credibility, and Transferability TACT (Daniel, 2019). This framework was established to utilise in peer-review and as a pedagogical method for teaching qualitative research. Rigour in qualitative research provides consistency and transparency in the research process and implications of the outcomes. However, the use of TACT framework is likely to be contested by qualitative researchers because it is closely appeals to the measurability of scientific methods, which is against the epistemic interpretative nature of the qualitative research.

5.3.6 Evaluation of the findings

There is wide variation between dentists in deciding on treatment plans for managing dental conditions (Grembowski et al., 1988). Variation in treatment outcomes is inevitable (Broomhead et al., 2020, Harris et al., 2017, Bedos et al., 2003, Grembowski et al., 1988). A finding from the quantitative study of this research that there is a 50% chance of agreement between GDPs and PDCs when planning care pathways for dental caries management. Unlike the Norwegian study that aimed to explore variation between GDPs and specialists in paediatric dentistry when planning dental treatment to similar case scenarios (Rønneberg et al., 2017). This research study aimed to explore the process of decision-making and what are the factors involved in the variation of planning the care pathways to manage dental caries. It was suggested that the ways dentists interact with patients may be a major source of differences and that area has not been fully explored (Roter and Hall, 2006, Brown et al., 1995, Brown et al., 1986). Healthcare services could be improved if research studies identify the psychological impact of the dentist-patient interaction on the health care outcome (Grembowski et al., 1988). It has been found that poor patient adherence is associated with miscommunication or misunderstanding between patient and doctor (Britten et al., 2000). The author of this research identified the importance of exploring the effect of dentist-parent-child interaction on the dental care. The primary interest of the present research was exploring the dentist-parent-child clinical communications in paediatric dental consultations and its influence on the decision-making when planning the care pathways to manage dental caries.

5.3.6.1 Evaluation of the process of the decision-making in planning care pathways for children with dental caries

The decision to treat caries in children with Early Childhood Caries (ECC) is based on three elements: caries risk assessment of a child patient (Corrêa-Faria et al., 2020, Tinanoff and Douglass, 2002), the willingness of the child's caregivers to change behaviour to improve oral health (Innes and Manton, 2017, Slayton, 2015), and the professional experience of the treating dentist (Rønneberg et al., 2017). In the current research, the process of decision-making when planning care pathways for the referred children with dental caries was described in four themes. It was found that the process of the decision-making is multifaceted and there is no hierarchy of the factors that influence dental care pathways decisions. The influence of each factor had a wide range of variation when applied on each case of the child patients with dental caries.

Theme 1: Assessing dental treatment and the timeframe to be completed

In this research, the process of decision-making started when the PDC was observed to discuss the treatment planning with the parents. Dental treatment is planned based on several aspects such as progression of dental caries, child behaviour (Rønneberg et al., 2017), and cost of patient/reimbursement system for dentists (Slayton, 2015). In the current research, the timeframe to complete dental treatment is assessed by the number of dental visits, the availability of dental appointments in the booking system at the LDI, and the type of clinical sessions (Staff, Postgraduate, Undergraduate, and Therapist). The number of dental visits is dictated by the number of affected teeth with dental caries, the type and duration of dental treatment, and the accessibility to the dental hospital. The type of dental treatment ranges from active surveillance of

incipient lesions to simple procedures such as application of fissure sealant on occlusal surfaces or resin infiltration on proximal surfaces to more advanced procedures as restorative treatment and extraction (Corrêa-Faria et al., 2020). Tooth extraction may be recommended in cases of pulpal involvement and is influenced by child cooperation, medical condition, presence of infection, extent of carious lesions, and orthodontic need. The accessibility to the dental hospital could be involved in the decision-making when parents choose a GA care pathway over a LA care pathway because of the need of multiple dental visits. According to the National Institute for Health and Care Excellence (NICE, 2015), dental pain and dental treatment appointments are the reasons behind many children missing school. A systematic review and meta-analysis (Ruff et al., 2019) claimed that dental caries and tooth pain might have adverse impacts on academic achievements and school absenteeism, though casual conclusions were not supported because of inconsistent definitions of exposure and outcome and a predominance of cross-sectional design. There are two other themes that have to be evaluated by the PDCs while deciding the route of care pathways for a child patient with dental caries. Those themes are the urgency of dental care and the impact of past dental experience on child current dental behaviour each of which is evaluated in parallel.

Theme 2: Evaluating the urgency of dental care

Definitely, the urgency of dental care in this study did not include the emergency cases such as dental trauma and patients who require immediate intervention and management, which is beyond the scope of this study. Dental trauma is more common in different age-groups, 0-3 years old (34.42%) and in 7-12 years old (18.12) (Sakai et al., 2005). Here, the urgency is related to health issues when dentists are trying to

avoid or to decrease the risk of medical complications by carrying out rapid intervention and completion of dental treatment in a short period. The misuse or overuse of antibiotics is inducing a global problem of antimicrobial resistance AMR, with 10% of the prescriptions being from dentists (Buonavoglia et al., 2021). Recent studies encourage practicing personalised medicine in dentistry, a tailored dental treatment based on patient's need to decrease antimicrobial resistance and its life-threatening consequences.

In the present research, rapid intervention and completion of dental treatment with no delay was also observed in the PDC management of the case of the looked-after child. It considered the social circumstances of the child patient and the negative consequences that could occur in relation to a delayed dental treatment. The other case was of a child with special needs who had a history of severe allergic reaction to local anaesthetics and needed urgent attention, this child did not require any dental treatment. However, correspondence with the referring GDP was planned to manage the case and to avoid medical complications in the future.

The key questions that the PDC needs to ask when choosing the care pathway for a child patient in particular include: does the child patient require an urgent completion of dental treatment and is there potential for the child to cope dental treatment under a LA care pathway. Alternatively, is the child patient not in urgent need of completing dental treatment but it is less likely to accept treatment in the dental chair. By answering these two questions, an idea of what care pathways are suitable for a particular child patient will be clearer.

Theme 3: The impact of past dental experience on child current dental behaviour

In this research study, there was no observation of a direct impact of a child's negative dental experience or the parent negative dental experience on the child's current dental behaviour. Limited research attention has been paid on how to predict child dental-behaviour based on the parental and individual determinants of dental caries.

In contrast to other study findings, it has been found that the mother's anxiety was a major factor in shaping a negative dental behaviour and anxiety in a child patient (Buldur, 2020). Surprisingly, for the child patient in Case#10 who had a history of failed dental extraction and the mother had had a traumatic experience with dentists, the child dental behaviour showed sufficient cooperation to cope with dental treatment under a LA care pathway.

Almost all the parents accepted the GA care pathway knowing the related risks of morbidity. This must be related to the fact that the cases in the study were referred and the discussion about the care pathways to manage dental caries was already initiated by the referring dentists (GDPs or specialists). In some cases, parents requested the GA care pathway in particular because they believed that there was no other way to have the dental treatment completed for the child. Similar findings were observed in a study by Amin (2006). Parents were observed to be more concerned about the number of tooth extractions as in Case#1, the post-operative eating problems as in Case#2 and Case#3 who asked to save more of the primary teeth if

possible. A new study has found a negative impact on Oral Health Related Quality of Life for children with increased number of extractions under GA for dental caries treatment**.** Parents and children should be fully informed about the potential risks of choosing to extract multiple primary teeth where there is the possibility of restoring them. A study of path analysis examined factors related to quality of life following GA care pathway found that children who received a combination dental care reported poorer Oral Health Related Quality of Life compared to those with GA extraction only at follow-up (Knapp et al., 2022). This might be explained by dentists that GA treatment planning tends to be more radical than in other care pathways. It was found that the more teeth planned for extraction rather than for restoration has a great impact on the Oral Health Related Quality of Life. The explanation in the same study suggested that those patients planned for comprehensive dental care mostly have Autism spectrum disorder and/or Attention deficit hyperactivity disorder that require hospital admission and pre-med, which can make GA more distressing.

The assessment of child dental-behaviour in a dental visit may not be very accurate. Other studies argue that changes in child dental-behaviour varies in the 1st and the 2nd dental appointments (consultation vs. treatment visits). It has been suggested the nature of consultation clinics (Tates and Meeuwesen, 2001) is ‘doctor-control’ where most of the questions are asked by the consultant rather than the patients and there is limited interaction with the child to assess the dental behaviour accurately. When planning the care pathways to manage dental caries in children, consideration of the duration of the dental procedures should be taken. There is a significant correlation found between child cooperation and the duration of dental procedures in young children aged 2-3.5 years (Jamali et al., 2018). Shorter duration of dental procedures was suggested to enhance positive child dental behaviour since longer appointments

would be a sign of a problem in children's minds which may increase anxiety and lead to negative dental behaviour (Lenchner, 1966, Getz and Weinstein, 1981). Two studies have defined short duration of dental treatment to be less than thirty minutes (Davidovich et al., 2014, Lenchner, 1966).

Theme 4: The type of dentist-parent-child communication

In the present study, all the information of urgency and child dental-behaviour were gathered through dentist-parent-child clinical communication. The triad of communication was observed in clinical consultations as in dentist-parent, dentist-child, and parent-child.

The observation of the dentist-parent clinical communication when discussing the care pathways to manage dental caries in the child patient is linked with parent wishes/expectations and knowledge. The parental influence on decision-making when proposing a care pathway should be considered to enhance the acceptability for dental treatment. Parent knowledge varies and is influenced by individual experience. Some parents had experienced different dental systems outside the UK (e.g. European) as in Case# 3 and 10. They also might have a negative past dental experience that impacts on their decisions. In the current research, confidence/trust in clinical communication was observed when the PDC plan met parent wishes and addressed their concerns by discussing risks and benefits thoroughly. Several studies found that expressing humanistic attributes by showing empathy and understanding of patients' concerns is the top priority of patient-centred communication (PCC) in dentistry and is considered a characteristic of the ideal professional dentist (Kulich et al., 2003, Kulich et al., 1998, Smith and Hoppe, 1991).

The observation of the dentist-child clinical communication in this research is that it is associated with understanding the child's cognitive development and dentist communication skills. Children aged seven-years-of-age were able to express their concerns about the planned dental care pathway but sometimes they were not interested in being involved in the decision-making. Six year-old children were aware of the discussion but had no concerns or wishes to share with their parents or the PDCs. Children aged five years were observed to be not attentive to the discussion and the decision-making. A child with special-needs or learning difficulties was observed to not be aware or involved in the decision-making. Observations of child-dentist communication in the paediatric dental consultations were identified in greetings, introducing the dental team (PDC and dental nurse), and explaining the procedure of dental examination using the tell-show-do TSD technique as in Case#11. In Case#2, the PDC explained the three options of the care pathways to the child patient. The PDCs did not involve the other children in the decision-making and only discussed the pathway options with the child's parents/carer. Traditional paediatric consultations observed that doctors direct questions to parents to collect health-related information, which is known as instrumental doctor behaviour and also occurs when doctors give a medical advice or ask for contribution in decision-making directed to parents. On the other hand, some studies showed that doctors showed more pleasantries interaction towards children (Sanz, 2003, Ong et al., 1995), and less child involvement in decision-making (Young et al., 2011, Sanz, 2003). Three studies in a systematic review investigated the triad interaction involving the child rather than the dyads when only the parent and doctor were involved (Meeuwesen and Kaptein, 1996, Bensing, 1991, Aronsson and Rundström, 1988). The mean ages of children in most of the studies ranged between 5 and 10 years years-of-age. Conversational

contribution by the child patient was positively correlated with the increase of age in few studies (Garth et al., 2009, Roter and Hall, 2006, van Dulmen, 1998, Pantell et al., 1982). It was found that the child-involvement in clinical decision-making is positively correlated with the number of visits, mainly first visits versus repeat visits. Some studies reported that doctors exclude older children and even adolescents from clinical communication (Tates and Meeuwesen, 2001). This was explained (McKinnon, 2014) that practitioners think they know best and that failure of patient acknowledging this part could be harmful to them. Shier (2001) argued that child-involvement is only possible when professionals are committed to child-cantered values and their willingness to listen and engage with children. The reality of what children are capable to deciding and our assumption on how we expect them to behave needs to be untangle, says McKinnon (2014). Children are capable of understanding the rationale of the process of disease treatment; their concerns are more likely to surround the pain, discomfort, and stigma among their peers furnished by treatment more than by the long term side effects. It is useful to use imaginative models, sketches and conversation pitched to active involvement in care planning with children younger than seven years of age (Gabe et al., 2004). In the same way at different points in life we need help in making decisions; it is the patient's right to make a right decision and also it is their right to make what we believe is a wrong decision and accept the consequences (McKinnon, 2014). In the research study, it was found that children planned for a LA care pathway in Case#5 and 10 were observed to be aware and glad with the decision while some children who planned for GA in Case#2 and 6 were not pleased.

The observation of parent-child clinical communication has an impact on the child contribution in the decision-making. In a review article, nine studies found the gender

of parents who attend dental appointments were mainly mothers (Tates and Meeuwesen, 2001). In this study, a female predominance was also observed. In seven of the 11 cases in this research, the accompanied guardians were mothers; there was one female foster carer, one father, and in two cases both parents were present. Some parents were supportive and encouraged children to talk and respond to the PDCs, others added more details to the child's talk as it seemed important in decision-making. Another observed type of child-parent communication was limited or no interaction. Two studies found that controlling parents represented 52% of the cases who excluded their child from the discussion by interfering when the doctor attempted to communicate with the child (Damm et al., 2015, Aronsson and Rundström, 1988). Some parents may use adult proxy to interfere in the discussion and disregard the child's view (Gardner and Randall, 2012). Parents may vary in their willingness to involve their child in decision-making; that was explained as some parents fear that their role in decision-making may be undermined and their own views may be neglected (McKinnon, 2014, Tates and Meeuwesen, 2001). Parents need to be reassured that child anxiety may not always related to the exposure to too much information but it also may result from total exclusion from discussion and decision-making. In this research, some children were observed to interrupt and correct their parent's narrative of their dental experience which reflected the knowledge the children are willing to share. Similar findings were found in preschool children age (McKinnon, 2014). Williams et al. (2011) assumed that young children can and should be involved in clinical discussions but there is a danger that their parents may be withdrawn. In child-involvement, professionals should consider eye level conversation pitched at their level of understanding (McKinnon, 2014).

5.4 Clinical implications

According to the author's current knowledge, planning care pathways for dental caries management in children is a subject that has not been fully covered in previous studies, although, paediatric dentists and general dental practitioners are practicing it frequently. Questions have been asked among dental professionals whether there is a universally agreed method of the way they practice their decision-making. One of the participating PDCs in this research study shared the concerns about this question while discussing one case. The PDC described the decision making as a complex process and added that it is interesting that this research will try to come out with a pattern for the process of decision-making.

This research might help dental professionals to understand in what direction they need to think and what factors to consider when planning dental care pathways for children with dental caries. This gap in practical-knowledge (Miles, 2017, Müller-Bloch and Kranz, 2015) will need further investigation and confirmation of results by repeating the study in different settings and on a wider group of participants. I believe, this could enhance the quality of dental care by decreasing the numbers of cases with incomplete dental treatment, encouraging more adherence to dentist's instructions, and improving patient satisfaction. In Boland et al study (Boland et al., 2019), some NHS paediatric dentists claimed that the short appointment time allowed for each patient is a barrier to applying shared decision-making with parents and children. In the foreseeable future, further studies could be conducted based on our findings to create a new tool that would guide dental professionals when planning dental care pathways for children to be used as a check-list that does not require consuming more time. The factors involved in the decision-making result from these research findings

when planning care pathways for dental caries management, may or may not contribute to a reduction in the variation and an increase in agreement between dental professionals.

5.5 Research Limitations

The two approaches used in this exploratory research study have explored aspects of the dynamics of clinical consultation in paediatric dentistry. They also revealed the process of making a decision when planning the dental care pathways and further exploration may reveal more factors and associations. This study was carried out in an NHS environment, participants were recruited from Leeds dental institute. The NHS does have a big impact on how pathways are chosen because of what options are available. This research findings reflect Leeds and Yorkshire region and the public settings of healthcare system since it was conducted in the NHS settings. However, different discussion is expected when applied to private and insurance settings. A prior approval of dental treatment is a factor to be considered in the discussion of the insurance healthcare system, while financial factor is expected to play a role in the private settings.

GDPs were not involved in the in-depth qualitative interviews. Considering their perspectives in planning a care pathway for a child patient may add explanations to the gap of knowledge such as the situations for not assessing child dental-behaviour or not proposing a care pathway in their referrals. More exploration of the dynamics of clinical consultation should consider the referring dentist factor. Information might be collected from participating GDPs and PDCs such as demographics including age and gender, years of experience, and places of education/qualification.

Eleven cases were included in the study because of reaching data saturation in regard to themes related to the process of decision-making. Increasing the sample size is not necessary will include more cases in different care pathways such as IHS and biological care pathways, it mainly depends on the willingness of families to participate and spend longer time after dental appointments.

There is a claim that use of path analysis is superior to regression analyses (Buldur, 2020). The explanation provided is because regression analysis does not examine the mediating role of a third variable in the relationship between two variables, which do not fully determine the association between variables.

A follow-up of the interviewed cases in this research study was not possible because of the Covid-19 Pandemic and the resultant lock downs and restrictions. In future studies, following-up the interviewed cases would highlight the associated factors that affected the outcome of incomplete dental treatment.

Using qualitative interviews method for data collection with young children has some limitations. Children in the 5-8 age-group had a limited contribution in the family interviews, this could reflect the developmental nature of their cognitive ability on how to express their feelings or it may reflects the stressful environment of dental visit that could limit their engagement. Different methods are recommended to be used with young children for more contribution such as making videos, drawing, and playing. For future research, I would recommend to interview an older age-group for more contribution from the child part in the qualitative interviews in order to deeply understand the triad clinical interaction and its influence on the dental care pathways decisions.

Additional considerations in the logistic arrangements are recommended to reduce the loss of data due to practical difficulties. More research members could contribute in gathering patients' consents and recording consultations. The principal investigator PI will be focused in making interviews with participating families and PDCs without interruptions. The dental team has a limited time between patients to record consultations. Those arrangements could be handled by another research member and that would facilitate the process of data collection and reduce the loss of data. This also could enhance the role of the PI to conduct in-depth interviews using the probing and prompting techniques as appropriate which will positively influence the quality of the collected data.

Chapter 6
Conclusion and Recommendations

6.1 Research Conclusion

I conclude from the quantitative findings that there is a difference in the care pathways planned by the referring dentists (mainly GDPs) and the care pathways planned by the PDCs for the same child patient. There is a 50% chance of agreement between the care pathway planned by the GDPs and the PDCs. Statistical analysis found that the patient factors such as: age, gender, socioeconomic status, dental-behaviour, and number of affected teeth have an influence in planning dental care pathways for children referred to the LDI. The child patients referred to the LDI for dental caries management were mostly in the 4-7 year age-group, were from the low SES groups, and presented with 5-10 carious primary teeth and less than five carious permanent teeth. The most common reason for referral was lack of child cooperation. The GA care pathway was the pathway most planned on referrals and consultations and in the outcome. The fewer the number of affected primary teeth with dental caries is more likely to have the outcome of a care pathway other than GA. Child patients in the high SES group are more likely to be referred for a LA or IHS care pathway. The PDCs are more likely to plan the GA care pathway for females than males. The PDCs are more likely to plan LA for the cooperative patients. It is less likely to have an outcome of a not started/ completed care pathway for the children who were planned for a LA care pathway by the PDCs.

It was found that male patients with less than five carious primary teeth are more likely to have the outcome of an IHS care pathway or non-invasive dental procedures. It was

observed that the outcome of not started or completed dental treatment occurs more with male patients and less likely with female patients.

In concluding from the qualitative findings that explored the dynamics of paediatric dental consultations and the patterns of clinical interactions, more factors were revealed which involved clinical communication between parents and PDCs. Furthermore, the potential influence of clinical communication on the child and parent acceptability of a proposed care pathway for dental caries management. The factors that affect a PDC's decision when planning the care pathways for children with dental caries are occurring through regular dental examination, dental diagnosis and when a treatment plan was decided. Referrals may be disadvantaged by having a long waiting time before that paediatric dental consultation which can directly affect the progression of dental caries in the absence of good oral hygiene, preventive measures, and healthy food habits. Accessibility to the dental hospital was also considered important when assessing the convenience of multiple dental visits. Social circumstances were evaluated to understand the impact on completing dental treatment. A child's medical health and risk of medical complications are considered when requiring urgent dental care. Multiple courses of antibiotics and urgency of care are a priority in the decision-making. Dentist-parent-child communication and the child-involvement in the decision-making might increase the parent and child acceptability of a proposed care pathway for dental caries management.

In conclusion, there is evidence of variation between dentists in planning care pathways for children for dental caries management. The process of decision-making is multifaceted. The patient factor that contributes in the variation among dentists were tested in the two approaches; quantitative and qualitative. The child dental-behaviour had no influence on the outcome of being placed in a GA care pathway in statistical

and qualitative findings**,** although it was shown to be associated in the outcome of LA and IHS care pathways**.** The factor of child dental behaviour was mainly observed to be involved when planning a LA care pathway. There is no evidence of involvement of ethnicity in planning care pathways by the GDPs and the PDCs. I found that parent wishes and knowledge influence the clinical communication when planning a care pathway for a child patient to manage dental caries. However, effective triad clinical communication might influence the child and parent acceptability to complete the planned care pathway for dental treatment.

A. The main factors involved in the decision-making processes

Statistical analysis revealed five factors which influenced the GDPs' and the PDCs' decisions when planning the care pathways for dental caries management: patient age, gender, socio-economic status, dental-behaviour, and numbers of carious teeth. The findings of the qualitative analysis showed involvement of other factors in the process of decision-making. The factors were: dental treatment planning, accessibility to the dental hospital, social circumstances, completion of dental treatment, medical complications in relation to multiple exposure to antibiotics, child dental-behaviour assessment, child with history of dental complications, mothers with negative dental experience, parents' wishes and expectations, and parent knowledge.

The two sets of findings showed seven main categories that were involved in the decision-making when planning the care pathways to manage dental caries as shown in Figure 5.1.

I. Demographic factors: Patient age, gender

II. Dental factors: Number of carious teeth, dental treatment

III. Medical factors: Medical complications, multiple exposure to antibiotics

IV. Environmental factors: Socio-economic status, accessibility to the dental hospital

V. Behavioural factors: Child current dental-behaviour, history of dental complications

VI. Communicational factors: Parent knowledge and wishes, child cognitive development, parenting type, dentist communicational skills

VII. Social factors: Adoption, temporary homelessness

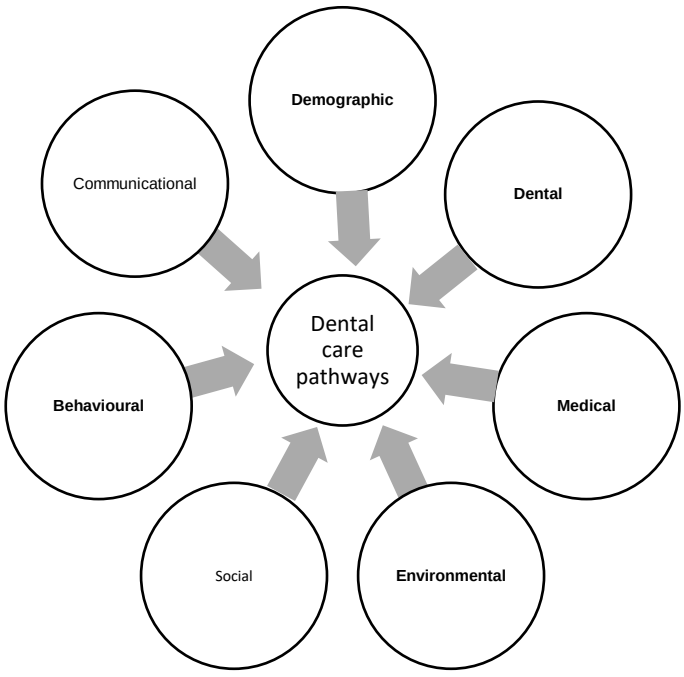

Figure 5.1 A summary of factors involved in planning dental care pathways for children referred to the LDI based on quantitative and qualitative studies

B. Planning dental care pathways for children with dental caries:

I. Planning GA care pathways:

The GA care pathway is a more predictable pathway to complete dental treatment for child patients: it is the best choice when certainty of the completion of dental treatment is significant. Child dental behaviour had no influence on the outcome of GA care pathways. A cooperative child still might be planned for a GA care pathway because of the influence of other contributing factors.

II. Planning LA care pathways:

The child dental-behaviour and clinical communication had a great influence when planning LA care. Clinical communication influenced the decision-making when planning LA care pathways for children. Shared decision-making (SDM) was observed in the cases planned for LA care pathways. Accessibility to the dental hospital influenced the decision-making for the LA care pathway because of the need of multiple dental visits. In those cases, children had showed positive dental-behaviour. Therefore, there is a less chance of having the outcome of not started/ completed care pathway.

III. Planning other care pathways:

There is not enough evidence on planning the IHS or biological care pathways. In the research study, children who were planned for other care pathways other than GA by the PDCs were more likely to have the outcome of GA care pathway. Regression analysis found that the children in the older age-group are more likely to be referred by the GDPs to the IHS care pathway.

6.2 Recommendations for the field of paediatric dentistry

In paediatric dental consultation clinics, I would recommend a questionnaire asking parents about their expectations before attending consultation clinics.

- Information for parents using appropriate media (such as a leaflet, video or interactive digital resource) of the available services of care pathways to manage dental caries in young patients was suggested by one of the parents that would increase their knowledge, to enhance their involvement in the decision-making.
- A follow-up system for patients with incomplete dental treatment using electronic dental records is recommended. Technical support team for the database (e.g. SALUD at LDI) should work closely with clinicians, managers, and researchers to program the system to detect incomplete cases. Then, those patients need to be contacted once or twice a year to ensure that they have been discharged to a nearby family dentist or they can book another consultation appointments.
- Child-involvement was not observed in the decision-making, this might need more attention as it thought to influence the child acceptability to complete dental treatment in a planned care pathway. Fear of the unknown can escalate into an intolerance of uncertainty. Providing simple information thought to decrease the anxiety of dental visits.

6.3 Recommendation for dental science

In a future research study, the referred cases of children with dental caries might be traced from referrals at the GDP's clinic, throughout consultation visits with a PDC, treatment visits, until the completion of dental treatment. In the quantitative study, the dentist factor might add more depth in understanding the variation in planning dental care pathways for similar cases of child patients with dental caries. In statistical analysis, the type of dental treatment may be considered to be added to the data collection sheet in a future repeat of this study. Further studies could investigate the influence of the length of a dental procedure when planning the care pathways for children with dental caries. The position of carious teeth in the oral cavity of a child patient may be considered as factor to be tested in relation to the decision-making when planning the care pathways for dental caries management including if the affected teeth are in the same quadrants or sextants.

To consider the dentist factors in studying the influence on the decision-making process to plan a care pathway for dental caries management. Information to be collected on GDPs and PDCs to include demographics data such as age and gender, years of experience, and places of education/qualification would be useful. Different locations of dental practices and hospitals for the qualitative interviews could include cases planned for an IHS care pathway or a biological care pathway.

Chapter 7
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Appendix

Appendix A

A.1 The University of Leeds sponsorship letter

Role of the Research Sponsor under the UK policy framework for health and social care research (2017 v3.3) and the Medicines for Human Use (Clinical Trials) Regulations 2004

I hereby confirm that the University of Leeds would be prepared to accept the role of research sponsor as currently defined in the UK policy framework for health and social care research version 3.3 and the *Medicines for Human Use (Clinical Trials) Regulations 2004 (SI2004/1031)*, in relation to the study:

'A study of factors involved in planning care pathways' (IRAS 223539).

I have been informed that this study will be led by, Miss Ebtesam Abdullah, a PhD student at the University of Leeds under the supervision of Professor Jinous Tahmassebi and Professor Joanne Greenhalgh of the University of Leeds.

Sponsorship is conditional upon review and approval of the research by appropriate ethics, NHS and regulatory bodies.

To enable the sponsor to meet their responsibilities as listed in section 9.10 of the UK policy framework for health and social care research, Chief Investigators are required to adhere to their responsibilities as outlined in section 9.2 of the Framework, https://www.hra.nhs.uk/planning-and-improving-research/policies-standards-legislation/uk-policy-framework-health-social-care-research/

In line with this requirement Miss Abdullah must ensure that all involved in the research project understand and discharge their responsibilities in accordance with the agreed protocol and any relevant management, ethical and regulatory approvals.

If you have any queries about sponsorship of this project then please address them to Mrs Clare Skinner, at governance-ethics@leeds.ac.uk or 0113 343 4897.

Yours,

Jean Uniacke

On behalf of Clare Skinner, Head of Research Integrity and Governance.

NHS Research Ethics Officer
Faculty of Medicine and Health
Room 9.29, Level 9
Worsley Building, Clarendon way
University of Leeds, LS2 9NL
Tel: 0113 3437587
j.m.uniacke@leeds.ac.uk

NB: *Please note -I work from 9.15 to 2.45pm, Monday to Thursday.*

A.1.1 The HRA and REC approval letters

Ymchwil Iechyd a Gofal Cymru
Health and Care Research Wales

NHS
Health Research Authority

Miss Ebtesam Abdullah
Integrated PhD student in Paediatric Dentistry
University of Leeds
Worsley building, level 6
Clarendon Way, Leeds
LS2 9LU

Email: hra.approval@nhs.net

08 May 2018

Dear Miss Abdullah

HRA and Health and Care Research Wales (HCRW) Approval Letter

Study title:	**A study of factors involved in planning care pathways for children with dental caries. Mixed methods study.**
IRAS project ID:	**223539**
REC reference:	**18/SW/0080**
Sponsor	**University of Leeds**

I am pleased to confirm that **HRA and Health and Care Research Wales (HCRW) Approval** has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

How should I continue to work with participating NHS organisations in England and Wales?
You should now provide a copy of this letter to all participating NHS organisations in England and Wales*, as well as any documentation that has been updated as a result of the assessment.

This is a single site study sponsored by the by a partner academic institution, under joint research governance arrangements. The Joint R&D Office will confirm to you when the study can start following issue of HRA/HCRW Approval.

It is important that you involve both the research management function (e.g. R&D office) supporting each organisation and the local research team (where there is one) in setting up your study. Contact details of the research management function for each organisation can be accessed here.

How should I work with participating NHS/HSC organisations in Northern Ireland and Scotland?
HRA/HCRW Approval does not apply to NHS/HSC organisations within the devolved administrations of Northern Ireland and Scotland.

IRAS project ID	223539

If you indicated in your IRAS form that you do have participating organisations in either of these devolved administrations, the final document set and the study wide governance report (including this letter) has been sent to the coordinating centre of each participating nation. You should work with the relevant national coordinating functions to ensure any nation specific checks are complete, and with each site so that they are able to give management permission for the study to begin.

Please see IRAS Help for information on working with NHS/HSC organisations in Northern Ireland and Scotland.

How should I work with participating non-NHS organisations?
HRA/HCRW Approval does not apply to non-NHS organisations. You should work with your non-NHS organisations to obtain local agreement in accordance with their procedures.

What are my notification responsibilities during the study?

The document "*After Ethical Review – guidance for sponsors and investigators*", issued with your REC favourable opinion, gives detailed guidance on reporting expectations for studies, including:

- Registration of research
- Notifying amendments
- Notifying the end of the study

The HRA website also provides guidance on these topics, and is updated in the light of changes in reporting expectations or procedures.

I am a participating NHS organisation in England or Wales. What should I do once I receive this letter?
You should work with the applicant and sponsor to complete any outstanding arrangements so you are able to confirm capacity and capability in line with the information provided in this letter.

The sponsor contact for this application is as follows:

Name: Ms Clare E Skinner
Tel: 0113 343 4897
Email: governance-ethics@leeds.ac.uk

Who should I contact for further information?
Please do not hesitate to contact me for assistance with this application. My contact details are below.

Your IRAS project ID is **223539**. Please quote this on all correspondence.

Yours sincerely

Juliana Araujo
Assessor
Email: hra.approval@nhs.net

IRAS project ID	223539

Copy to: *Sponsor Representative: : Ms Clare E Skinner, University of Leeds*
Lead NHS R&D Office Representative: Ms Doly Coutinho, Leeds Teaching Hospitals NHS Trust

IRAS project ID	223539

List of Documents

The final document set assessed and approved by HRA/HCRW Approval is listed below.

Document	*Version*	*Date*
Covering letter on headed paper		01 May 2018
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only)		21 September 2017
Interview schedules or topic guides for participants [Consultants]	9	01 May 2018
Interview schedules or topic guides for participants [Parents]	9	01 May 2018
IRAS Application Form [IRAS_Form_28022018]		28 February 2018
Other [Code Link Sheet]	4	21 February 2018
Other [Data Collection Sheet Part1]	6	25 January 2018
Other [Data Collection Sheet part 2]	2	21 February 2018
Participant consent form [Assent form]	5	21 April 2018
Participant consent form [Consultant]	5	21 April 2018
Participant consent form [Parent]	8	21 April 2018
Participant information sheet (PIS) [Children]	9	21 April 2018
Participant information sheet (PIS) [Consultant]	8	21 April 2018
Participant information sheet (PIS) [Parent]	12	21 April 2018
Research protocol or project proposal	7	31 January 2018
Summary CV for Chief Investigator (CI)		
Summary CV for student		
Summary CV for supervisor (student research) [JFT]		
Summary CV for supervisor (student research) [JG]		08 May 2018
18 SW 0080 IRAS 223539 FIFO ltr.pdf		22 March 2018
18 SW 0080 IRAS 223539 prov op ltr.pdf		
223539, 18/SW/0080, SE81 (Approval) Non Commercial Study - Valid for REC Review.eml		09 March 2018

IRAS project ID	223539

Summary of assessment

The following information provides assurance to you, the sponsor and the NHS in England and Wales that the study, as assessed for HRA/HCRW Approval, is compliant with relevant standards. It also provides information and clarification, where appropriate, to participating NHS organisations in England and Wales to assist in assessing, arranging and confirming capacity and capability.

Assessment criteria

Section	Assessment Criteria	Compliant with Standards	Comments
1.1	IRAS application completed correctly	Yes	No comments
2.1	Participant information/consent documents and consent process	Yes	No comments
3.1	Protocol assessment	Yes	No comments
4.1	Allocation of responsibilities and rights are agreed and documented	Yes	An agreement is not expected as Joint Research Office arrangements are in place between the sponsor and the participating NHS organisation.
4.2	Insurance/indemnity arrangements assessed	Yes	No comments
4.3	Financial arrangements assessed	Yes	No funding application was made for the study.
5.1	Compliance with the Data Protection Act and data security issues assessed	Yes	No comments
5.2	CTIMPS – Arrangements for compliance with the Clinical Trials Regulations assessed	Not Applicable	No comments
5.3	Compliance with any applicable laws or regulations	Yes	No comments
6.1	NHS Research Ethics Committee favourable opinion received for applicable studies	Yes	NHS Research Ethics Committee favourable opinion was confirmed by the South West - Exeter Research

IRAS project ID	223539

Section	Assessment Criteria	Compliant with Standards	Comments
			Ethics Committee on 08 May 2018
6.2	CTIMPS – Clinical Trials Authorisation (CTA) letter received	Not Applicable	No comments
6.3	Devices – MHRA notice of no objection received	Not Applicable	No comments
6.4	Other regulatory approvals and authorisations received	Not Applicable	No comments

Participating NHS Organisations in England and Wales

This provides detail on the types of participating NHS organisations in the study and a statement as to whether the activities at all organisations are the same or different.
This is a single site study; there is therefore one site type. The Chief Investigator or sponsor should share relevant study documents with participating NHS organisations in England and Wales in order to put arrangements in place to deliver the study. The documents should be sent to both the local study team, where applicable, and the office providing the research management function at the participating organisation. Where applicable, the local LCRN contact should also be copied into this correspondence. If chief investigators, sponsors or principal investigators are asked to complete site level forms for participating NHS organisations in England and Wales which are not provided in IRAS, the HRA or HCRW websites, the chief investigator, sponsor or principal investigator should notify the HRA immediately at hra.approval@nhs.net or HCRW at Research-permissions@wales.nhs.uk. We will work with these organisations to achieve a consistent approach to information provision.

Principal Investigator Suitability

This confirms whether the sponsor position on whether a PI, LC or neither should be in place is correct for each type of participating NHS organisation in England and Wales, and the minimum expectations for education, training and experience that PIs should meet (where applicable).
A Principal Investigator will be in place at the participating NHS organisation. No assistance is needed to identify a Principal Investigator from the participating organisation. GCP training is not a generic training expectation, in line with the HRA/HCRW/MHRA statement on training expectations.

IRAS project ID	223539

HR Good Practice Resource Pack Expectations

This confirms the HR Good Practice Resource Pack expectations for the study and the pre-engagement checks that should and should not be undertaken
It is unlikely that letters of access or honorary research contracts will be applicable, except where external staff employed by another Trust (or University) are involved (and then it is likely that arrangements are already in place). Where arrangements are not already in place, external staff would be expected to obtain a Letter of Access based on standard DBS checks and occupational health clearance would be appropriate.

Other Information to Aid Study Set-up

This details any other information that may be helpful to sponsors and participating NHS organisations in England and Wales to aid study set-up.
The applicant has indicated that they do not intend to apply for inclusion on the NIHR CRN Portfolio.

NHS
Health Research Authority
South West - Exeter Research Ethics Committee
Whitefriars
Level 3
Block B
Lewins Mead
Bristol
BS1 2NT

Telephone: 0207 104 8028

Please note: This is the favourable opinion of the REC only and does not allow you to start your study at NHS sites in England until you receive HRA Approval

08 May 2018

Miss Ebtesam Abdullah
Integrated PhD student in Paediatric Dentistry
University of Leeds
Worsley building, level 6
Clarendon Way, Leeds
LS2 9LU

Dear Miss Abdullah

Study title:	**A study of factors involved in planning care pathways for children with dental caries. Mixed methods study.**
REC reference:	**18/SW/0080**
IRAS project ID:	**223539**

Thank you for your letter of 01 May 2018, responding to the Proportionate Review Sub-Committee's request for changes to the documentation for the above study.

The revised documentation has been reviewed and approved by the sub-committee.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this favourable opinion letter. The expectation is that this information will be published for all studies that receive an ethical opinion but should you wish to provide a substitute contact point, wish to make a request to defer, or require further information, please contact please contact hra.studyregistration@nhs.net outlining the reasons for your request.

Under very limited circumstances (e.g. for student research which has received an unfavourable opinion), it may be possible to grant an exemption to the publication of the study.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised.

Conditions of the favourable opinion

The REC favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements. Each NHS organisation must confirm through the signing of agreements and/or other documents that it has given permission for the research to proceed (except where explicitly specified otherwise).

Guidance on applying for HRA and HCRW Approval (England and Wales)/ NHS permission for research is available in the Integrated Research Application System, at www.hra.nhs.uk or at http://www.rdforum.nhs.uk.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of management permissions from host organisations.

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database. This should be before the first participant is recruited but no later than 6 weeks after recruitment of the first participant.

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g. when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.

To ensure transparency in research, we strongly recommend that all research is registered but for non-clinical trials this is not currently mandatory.

If a sponsor wishes to request a deferral for study registration within the required timeframe, they should contact hra.studyregistration@nhs.net. The expectation is that all clinical trials will be registered, however, in exceptional circumstances non registration may be permissible with prior agreement from the HRA. Guidance on where to register is provided on the HRA website.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" above).

Approved documents

The documents reviewed and approved by the Committee are:

Document	*Version*	*Date*
Covering letter on headed paper		01 May 2018
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only)		21 September 2017
Interview schedules or topic guides for participants [Consultants]	9	01 May 2018
Interview schedules or topic guides for participants [Parents]	9	01 May 2018
IRAS Application Form [IRAS_Form_28022018]		28 February 2018
IRAS Checklist XML [Checklist_09032018]		09 March 2018
Other [Code Link Sheet]	4	21 February 2018
Other [Data Collection Sheet Part1]	6	25 January 2018
Other [Data Collection Sheet part 2]	2	21 February 2018
Participant consent form [Assent form]	5	21 April 2018
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Participant information sheet (PIS) [Consultant]	8	21 April 2018
Participant information sheet (PIS) [Parent]	12	21 April 2018
Research protocol or project proposal	7	31 January 2018
Summary CV for Chief Investigator (CI)		
Summary CV for student		
Summary CV for supervisor (student research) [JFT]		
Summary CV for supervisor (student research) [JG]		

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document "After ethical review – guidance for researchers" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The HRA website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

Feedback

You are invited to give your view of the service that you have received from the Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website:
http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance

We are pleased to welcome researchers and R & D staff at our RES Committee members' training days – see details at http://www.hra.nhs.uk/hra-training/

18/SW/0080	**Please quote this number on all correspondence**

With the Committee's best wishes for the success of this project.

Yours sincerely

pp. **Mrs Joan Ramsay**
Chair

Email: nrescommittee.southwest-exeter@nhs.net

Enclosures: *"After ethical review – guidance for researchers" [SL-AR2]*

Copy to: *NHS Research Ethics Officer*

Doly Coutinho, Research & Innovation Department

Appendix B

B.1 Data collection pre-amendments sheets of the first study version 7

The Leeds Teaching Hospitals NHS
NHS Trust

23/04/2018

UNIVERSITY OF LEEDS

School of Dentistry Ref. no. 223539 V.7

A Study of Factors Involved in Planning Dental Care
Data Collection Sheet Part1

In this study, the researcher will fill this form using clinical dental records of patients have been referred to the Leeds Dental Institute LDI in three months period September- November 2015 and follow up the final care pathway on completion of the treatment.

Objectives:

- To distinguish patients characteristics' seen in consultant clinics at LDI who have been referred for treatment of dental caries from primary dental care
- To examine the degree of concordance between the reason for a referral from primary dental care and the recommended dental care by a consultant following the first visit.

Patient's number: ☐

1. **Age at referral** ☐

2. **Gender**
   - ○ Male
   - ○ Female

3. **Ethnicity:**
   - ○ White British
   - ○ South Asian (Indian, Pakistani and Bangladeshi)
   - ○ Black (African and Caribbean)
   - ○ Mixed-race (Specify):
   - ○ Other (Specify):
   - ○ Not specified

4. **IMD** (The index of multiple deprivations provided by the office of national statistics ONS in which 1: is the least deprived 5: the most deprived using postcode)
   - ○ 1
   - ○ 2
   - ○ 3
   - ○ 4
   - ○ 5

5. Source of referral?
- ○ Specialists in paediatric dentistry
- ○ General Dental Practitioners
- ○ Others (Specify):

6. Does the patient have any relevant social history (e.g. under care of foster parent)
- ○ Yes (Specify):
- ○ Yes but not specified
- ○ Not mentioned

7. Does the patient have any relevant medical history?
- ○ No
- ○ Yes
- • CVS
- • RD
- • Liver disorders
- • Kidney diseases
- • Bleeding disorder
- • Cancer treatment
- • Radiation therapy
- • Others (Specify):

8. Is the patient taking regular medication?
- ○ Yes
- ○ No

9. Does the patient have any allergies?
- ○ Yes (Specify):
- ○ No

10. The reason for a referral?
- ○ Complexity of dental treatment, e.g. ortho, extraction of FPM
- ○ Cooperation (e.g. age or behaviour)
- ○ Medical history
- ○ Others (Specify):

11. The recommended dental care by the referring dentist:
- ○ General anaesthesia
- ○ Inhalation sedation
- ○ Local anaesthesia
- ○ Not specified

12. If the dentist has taken x-ray when deciding on referral (if not applicable, skip to the next statement), has radiograph been attached?

- Yes
- No

13. The number of primary teeth affected by dental caries:

- <5
- 5-10
- 10-20
- >20

14. The number of permanent teeth affected by dental caries:

- <5
- 5-10
- 10-20
- >20

15. Behaviour assessment by the referring dentist?

- Pre-cooperative
- Cooperative
- Uncooperative/anxious/phobic
- Not specified

16. Behaviour assessment by the consultant?

- Pre-cooperative
- Cooperative
- Uncooperative/anxious
- Not specified

17. The recommended dental care by the consultant

- General anaesthesia
- Inhalation sedation
- Local anaesthesia
- Others (Specify)

18. The final dental care

- General anaesthesia
- Inhalation sedation
- Local anaesthesia
- Others (Specify)

B.2 Letter to REC for minor amendments on Data Collection Sheets of the first study

18/SW/0080

Ebtesam Abdullah
Integrated PhD student in paediatric dentistry
University of Leeds
Worsley building, Level 6
Clarendon Way, Leeds
LS2 9 LU

09 October 2018

To: South West-Exeter Research Ethics committee
Whitefrars
Level 3
Block B
Lewins Mead
Bristol
BS1 2NT
Telephone: 0207104 8028

Dear Committee,

Study title:	**A study of factors involved in planning care pathway for children with dental caries**
REC reference:	**18/SW/0080**
IRAS Project ID:	**223539**

I'm writing to you about minor amendments on my data collection sheet part one after collecting data from 85 patient records that have been analysed retrospectively. The attached document shows a tracked changes on the sheet which I believe it should be approved by the committee chairman.

1. **Question 4: Add 6-10 of IMD according to the Office of National Statistics ONS from 1-10 which 1: is the most deprived, 10: is the least deprived. One unmatched post code were found in the 85 collected patient records.**
2. **Question 6: The answer of this question about existence of relevant social history or not is either yes mentioned or not mentioned. As no record was found stating that there is No relevant social history.**
3. **Question 7: The answer of this question is either no or yes attached to the relevant medical condition as it's easier to be analysed on SPSS programme.**

18/SW/0080

4. **Question 10: Parental involvement has been added as one of the reasons for a referral as it has been found in few records.**

5. **Question13: Primary teeth are 20 in number, therefore, the last option which was more than 20 was deleted. To overcome overlapping of having number 10 in two groups (5-10, 10-20) we changed the last group to 11-20**

6. **Question 14: To overcome overlapping of having number 10 in two groups (5-10, 10-20) we changed the last group to 11-20**

7. **Question 16: The behaviour of the child patient was assessed by trainees under supervision of a paediatric dental consultant.**

8. **Question 17: Add more options of dental management that were recommended by consultants such as: Biological approach (Hall crown) and Discharge (If no treatment was needed).**

9. **Question 18: Add more options of dental care management were found as the final dental care delivered to the referred dental patients such as: Biological approach (Hall crown) and Discharge (If no treatment was needed). Also, not completed/ started dental treatment because patient did not attend.**

Please find the updated data extraction sheet (attached). Appreciate your time and consideration.

Sincerely,
Ebtesam

B.3 Updated data collection sheets after minor amendments of the first study version 8

The Leeds Teaching Hospitals NHS
NHS Trust

09/10/2018

UNIVERSITY OF LEEDS

School of Dentistry **Ref. no. 223539** **V.8**

A Study of Factors Involved in Planning Dental Care
Data Collection Sheet Part1

In this study, the researcher will fill this form using clinical dental records of patients have been referred to the Leeds Dental Institute LDI in three months period September- November 2015 and follow up the final care pathway on completion of the treatment.

Objectives:

- To distinguish patients characteristics' seen in consultant clinics at LDI who have been referred for treatment of dental caries from primary dental care
- To examine the degree of concordance between the reason for a referral from primary dental care and the recommended dental care by a consultant following the first visit.

Patient's number: ☐

1. **Age at referral** ☐

2. **Gender**
   - ○ Male
   - ○ Female

3. **Ethnicity:**
   - ○ White British
   - ○ South Asian (Indian, Pakistani and Bangladeshi)
   - ○ Black (African and Caribbean)
   - ○ Mixed-race (Specify):
   - ○ Other (Specify):
   - ○ Not specified

4. **IMD** (The index of multiple deprivations provided by the office of national statistics ONS in which 1: is the least deprived 5: the most deprived using postcode)

   - ○ **1**
   - ○ **2**
   - ○ **3**
   - ○ **4**
   - ○ **5**
   - ○ **6**
   - ○ **7**
   - ○ **8**
   - ○ **9**
   - ○ **10**
   - ○ **Unmatched**

The Leeds Teaching Hospitals NHS
NHS Trust

09/10/2018

UNIVERSITY OF LEEDS

School of Dentistry **Ref. no. 223539** **V.8**

5. Source of referral?

- ○ Specialists in paediatric dentistry
- ○ General Dental Practitioners
- ○ Others (Specify):

6. Does the patient have any relevant social history (e.g. under care of foster parent)

- ○ Yes (Specify):
- ○ Not mentioned

7. Does the patient have any relevant medical history?

- ○ No
- • Yes, CVS
- • Yes , Respiratory disorders
- • Yes , Liver disorders
- • Yes , Kidney diseases
- • Yes , Bleeding disorder
- • Yes , Cancer treatment (Chemotherapy)
- • Yes , Radiation therapy
- • Others (Specify):

8. Is the patient taking regular medication?

- ○ Yes
- ○ No
- ○ Not specified

9. Does the patient have any allergies?

- ○ Yes (Specify):
- ○ No

10. The reason for a referral?

- ○ Complexity of dental treatment, e.g. ortho, extraction of FPM
- ○ Cooperation (e.g. age or behaviour)
- ○ Medical history
- ○ Parental involvement
- ○ Not specified
- ○ Others (Specify):

11. The recommended dental care by the referring dentist:

- ○ General anaesthesia
- ○ Inhalation sedation
- ○ Local anaesthesia
- ○ Not specified

12. If the dentist has taken x-ray when deciding on referral (if not applicable, skip to the next statement), has radiograph been attached?

- Yes
- No

13. The number of primary teeth affected by dental caries:

- <5
- 5-10
- 11-20

14. The number of permanent teeth affected by dental caries:

- <5
- 5-10
- 11-20
- >20

15. Behaviour assessment by the referring dentist?

- Pre-cooperative
- Cooperative
- Uncooperative/anxious/phobic
- Not specified

16. Behaviour assessment by a trainee under supervision of a consultant?

- Pre-cooperative
- Cooperative
- Uncooperative/anxious
- Not specified

17. The recommended dental care by the consultant

- General anaesthesia
- Inhalation sedation
- Local anaesthesia
- Biological approach (Hall crown)
- Discharge(No treatment needed)
- Others (Specify)

18. The final dental caries management was...

- General anaesthesia
- Inhalation sedation
- Local anaesthesia
- Not completed/started
- Biological approach (Hall crown)
- Discharge (No treatment needed)
- Others (Specify)

B.4 HRA and HCRW approval letter of minor amendments on data collection sheets version 8 of the first study

Dear Miss Abdullah,

IRAS Project ID:	223539
Short Study Title:	A study of Factors involved in planning care pathways. Version 7
Amendment No./Sponsor Ref:	NSA1: Updated data collection sheet
Amendment Date:	09 October 2018
Amendment Type:	Non Substantial Non-CTIMP

I am pleased to confirm **HRA and HCRW Approval** for the above referenced amendment.

You should implement this amendment at NHS organisations in England and Wales, in line with the conditions outlined in your categorisation email.

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: http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/.

Please contact [hra.amendments@nhs.net]hra.amendments@nhs.net for any queries relating to the assessment of this amendment.

Kind regards,

Natalie

Natalie Wilson

Health Research Authority

Ground Floor | Skipton House | 80 London Road | London | SE1 6LH

E.hra.amendments@nhs.net

W. www.hra.nhs.uk

Appendix C

Participant information sheets PIS

C.1 PIS for participating Paediatric Dental Consultants at the LDI

The Leeds Teaching Hospitals NHS
NHS Trust

21/04/2018

UNIVERSITY OF LEEDS

School of Dentistry IRAS Project ID 223539 V. 8

Participant Information Sheet
Paediatric Dental Consultant

We would like to invite you to participate in a research study. Please take your time to read this information sheet and if you have any questions do not hesitate to ask the researcher directly.

Title of study:

'A Study of Factors Involved in Planning Dental Care for Children with Dental Caries'

Purpose of this study:

To understand how parental influence affects the dentist's decision on planning dental care for paediatric patients with dental caries.

Who is doing the study?

Ebtesam Abdullah, a postgraduate dentist, will carry out this research as her PhD research project.

Why have I been selected to participate?

You have received this information sheet because you are one of the Consultants in Paediatric Dentistry at Leeds Dental Institute (LDI). In your consultant clinics, you are seeing patients who have been referred by general dental practitioners/specialists for treatment of dental caries.

What is going to happen if I take part in this research?

You are going to receive this information sheet four weeks in advance of conducting this research. If you agree to take part, the researcher will approach you to sign a consent form. Both you and the researcher are going to recruit potential participants from the patient waiting list allocated to your consultation clinics. Potential participants will be selected based on the predetermined age group in the first part of this study.

Potential participants who are willing to participate will confirm by email to the researcher. On the day of your consultation clinic, participants will be consented to be interviewed by the researcher together with their children for approximately 25 minutes and to record this interview and the consultation. You will be given a digital device by the researcher to record the consultation. The participant family interview will be held in a separate room providing privacy and entertainment (i.e. coloring book), away from the clinical facility. After the interview, they will be free to leave. Then, you will be interviewed for 40 minutes to discuss the consultations of 4-5 children that you have seen in the session with their parents. The interview will be audio-recorded. A total number of 4 participants Paediatric Dental Consultants and 16-20 participants children with their parents/guardians will be interviewed in this study. The researcher will access potential participants' dental notes and collect information including name, gender and date of birth into a code sheet only for identification. After participants sign the consent forms, more information will be extracted from their dental notes into a data-collecting sheet to include ethnicity, medical history and postcode to find possible factors that may or may not contribute to parental influence on dentists' decisions.

What are the risks and benefits of taking part in this study?

Audiotaping your consultation might make you or the children and their parents you are talking to feel a little uncomfortable.

However, this study may help in understanding the differences in treatment planning between paediatric dentists and the potential for parental influence to be a factor. In future, it might help to standardize the dental care for children with dental caries to improve the quality of care and limiting referral for general anesthesia to those who really need it without any parental influence on dentist's decision.

Can I withdraw from the study?
Your participation is entirely voluntary, and you can withdraw up to 30 days after the interview by contacting the researcher. All your interviews would be deleted and excluded from this study.

Who is funding this study?

The University of Leeds and the Leeds Dental Institute is funding this research.

What is going to happen to my information?

The digital audio recording of your consultation and your interview with Ebestam will be stored on a server at the University of Leeds that only Ebestam can access and will be deleted when the analysis and Ebestam's PhD have been completed. The consultation and audio recordings will be pseudonymised by substituting your name with a code. This code will be kept in a separate file from the transcript. Then, The Typing Works Company (which has a confidentiality agreement with University of Leeds as shown in their website www.thetypingworks.com) will transcribe these audio-recordings, and the transcripts will be sent to Ebestam using a University approved, encrypted data transfer service or on an encrypted USB stick. Both codes and transcripts will be stored on a secure server on the University of Leeds computers that only Ebestam can access. Any paper copies of pseudonymised transcripts will be stored in locked filing cabinets at the postgraduate room on Level 6 in Worsley building and then destroyed once Ebestam's PhD has been written.

What if there is a problem?
The contact details for the research team are provided below. If you would like to discuss any problems with the study with an independent body, please contact Clare Skinner at the Faculty of Medicine and Health Research Ethics & Governance
Medicine and Health Faculty Research and Innovation Office
Email: governance-ethics@leeds.ac.uk, phone number: 0113 34 31642

What will happen to the results of the study?
We can share results of this study with you if you would like through email. You will be asked to provide your email in the consent form (optional). The results of the study will be written up for my PhD thesis. We may also publish findings from the study in peer reviewed journal and use quotations. Your name will not be associated with any quotations used.

This study has been revised by South West – Exeter Research Ethics Committee.

Contact details of the research team:

Ebtesam Abdullah Email: dnema@ leeds.ac.uk Department of Paediatric Dentistry Address: LS2 9LU	Dr. Jinous Tahmassebi Email: J.Tahmassebi@leeds.ac.uk Phone: 01133433955 Department of Paediatric Dentistry Address: LS2 9LU	Dr. Joanne Greenhalgh Email: J.Greenhalph@leeds.ac.uk Phone:01133431359 School of Sociology and Social Policy Address: LS2 9JT

Thank you for taking time to read this information sheet

C.2 PIS for participating Parents/Guardians

The Leeds Teaching Hospitals NHS
NHS Trust

UNIVERSITY OF LEEDS

School of Dentistry | 21/04/2018 IRAS Project ID 223539 | V.12

Participant Information Sheet for Parents/Guardians

We would like to invite you to participate in a research study. Please take your time to read this information sheet and if you have any questions do not hesitate to ask the researcher directly.

Title of study:
A Study of Factors Involved in Planning Dental Care for Children With Dental Decay

Purpose of this study:
To understand how parental influence affects the dentist's decision on planning a dental care for a child patient with dental decay.

Who is doing the study?

Ebtesam Abdullah, a postgraduate dentist as her PhD research project, will carry out this research.

Why have I been asked to participate?
You have received this information sheet because your dentist has referred your child to the Leeds Dental Institute for dental treatment of their decayed teeth.

What is going to happen if I take part in this research?

You are receiving this information sheet along with an appointment confirmation letter. On the same day of your visit, the reception staff will make you aware of where Ebtesam is seated in the waiting area of the Children Dental Clinics. If you would like to take part in the study, you can let Ebtesam know, either directly by speaking to Ebtesam, or by emailing her on dnema@leeds.ac.uk, or through speaking to the receptionist or the paediatric dental consultant.

If you will agree and would like to take part, Ebtesam will ask you if you agree to participate in this study and ask you to sign a consent form. During your appointment with the paediatric dental consultant, the conversation between you, your child and the consultant will be audio-recorded. Ebtesam will then interview you and your child for about 25 minutes to explore your views about the decision made about treatment during your appointment with the Paediatric Dental Consultant. This will be audio recorded as well. The Paediatric Dental Consultant will be interviewed separately about the consultation. A £10 voucher will be given for your time. A total number of four Paediatric Dental Consultants and 16-20 child participants with their parents/guardians will be interviewed in this study. The researcher will access potential child participant's dental notes and collect information including name, gender and date of birth into a code sheet only for identification. After signing the consent, more information will be extracted from participant child dental notes into a data-collecting sheet to include ethnicity, medical history and postcode to find possible factors that may contribute to parental influence on dentists' decisions.

What are the risks and benefits of taking part of this study?

Some people find that talking to an interviewer about their conversation with a consultant is helpful to understand the plan. However, other people may find it upsetting to talk about their child's tooth decay and treatment. If your child is with you during the interview, they will be able to hear what you say during the interview that may make either yourself or your child feel uncomfortable. It may lead to your child asking you questions about their treatment. The clinical visit will be longer than normal and we will give you the option to come back for the interview. Travel expense would be provided. Parking cost will be reimbursed.
Sharing your experience could be beneficial for dentists to understand how parents are being involved in the process of decision-making to provide dental care for their children. You are free not to answer any question if you do not wish to and this will not affect the dental care your child receives at Leeds Dental Hospital.

Can I withdraw from the study at any time?

Yes, your decision to take part is entirely voluntary, and if you and your child withdraw, it will not affect the standard of dental care your child will receive. If you wish to withdraw you can contact the researcher within 30 days after the interview and all yours and your child's data will be deleted.

What if I don't speak English?

Should you ask for an interpreter during your consultation appointment, we will arrange to provide interpreting during the interview as well.

Who is funding this study?

The University of Leeds and Leeds Dental Institute is funding this research.

What is going to happen to my child's information?

Your child's information (name, date of birth, ethnicity, post code and medical history) will be collected from his/her dental records and transferred into a code sheet. The consultation and audio recordings will be coded by substituting your child's name with a special code. This code will be kept in a separate file from the transcript and stored in a locked cabinet at the University of Leeds.

The code sheet along with the digital audio recordings of your consultation and your interview with Ebtesam will be stored on a secure server on the University of Leeds computers. These are specific computers that only Ebtesam can access and all collected information will be deleted when the analysis and Ebtesam's PhD have been completed. All information provided by you and your child during the interview will not be shared with the Paediatric Dental Consultant. However, there are certain instances, which could limit this confidentiality, such as if evidence of unsafe practice was discovered in the audio recordings. This would be discussed with you and a disclosure of the related information would be needed.

What if there is a problem?

If you have any concerns about your child's dental care please discuss this with your child's dental team. If you have any concern about any aspect of this study please discuss this with the researchers (details given below) in the first instance. If you remain unhappy and you wish to complain formally you can do this through the NHS complaints procedure. Details can be obtained from the Leeds Dental Institute. Alternatively you can contact your local Patient Advice and Liaison Service (P.A.L.S) on 0113 2066261.

How to get results of this study?

We may share results of this study with you if you want through email. You will be asked to provide your email in the consent form (optional).

This study has been revised by "South West – Exeter Research Ethics Committee"

Contact details of the research team:

Ebtesam Abdullah Email: dnema@ leeds.ac.uk Department of Paediatric Dentistry Address: LS2 9LU	Dr. Jinous Tahmassebi Email: J.Tahmassebi@leeds.ac.uk Phone: 01133433955 Department of Paediatric Dentistry Address: LS2 9LU	Dr. Joanne Greenhalgh Email: J.Greenhalph@leeds.ac.uk Phone: 01133431359 School of Sociology and Social Policy Address: LS2 9JT

Thank you for taking time to read this information sheet

C.3 PIS for participating children

The Leeds Teaching Hospitals NHS
NHS Trust
21/04/2018
UNIVERSITY OF LEEDS
School of Dentistry IRAS Project ID 223539 V.9

Information Sheet For Children (5-9)

1-Hi
My name is Ebtesam.
I am inviting you to take part in my project about how we look after your teeth.

2-Why you?
We want to talk to you because your dentist has sent you here to get your poorly teeth fixed.

3-What is going to happen?
A dentist will explain what is going to be done to you, and we will record this talk.
After that, I will have a chat with your mum or dad and you.
I will also record it.

4-Is this going to upset you?
You might feel a bit sad talking about your poorly teeth, or hearing your mum or dad talk about them. If you don't like any question, you don't need to answer it.

5- What if you want to stop?
You can stop whenever you want. It won't change how your dentist looks after you.

6-If you have any questions you can ask me or ask your parents to contact me; they have my contact details on their sheet.

Our team thanks you for reading this

Appendix D

Consents and assent

D.1 Consents form for participating Paediatric Dental Consultants at the LDI

The Leeds Teaching Hospitals NHS
NHS Trust

21/04/2018

UNIVERSITY OF LEEDS

School of Dentistry IRAS Project ID 223539 V.5

Participant code:

Participant Consent Form for Consultant

Ebtesam Abdullah is conducting this research as her PhD project, under the supervision of Dr J.Tahmassebi and Dr J.Greenhalgh

Title of Research:

A Study of Factors Involved in Planning Dental Care for Children with Dental Caries

Please initial box

- I confirm that I have read and understood the information sheet for the study mentioned above and have had the opportunity to ask questions. ☐
- I understand that my participation is voluntary and I am free to withdraw at any time, without giving any reason. ☐
- I understand that individuals from regulatory authorities or from the NHS Trust may look at relevant sections of research data collected during the study, where it is relevant to my taking part in this research. ☐
- I understand that the researcher will audio-record my conversations with patients and their parents/guardians. ☐
- I understand that the researcher will interview me after the consultations and audio-record the interview for research purposes. ☐
- I understand that in case of data publication of this research, my details will remain anonymous. ☐
- I agree to the use of anonymous quotes from my interview for writing up this study report. ☐
- I consent (agree) to take part in this study. ☐
- I agree to the research team having the following details for the purpose contacting me regarding the results of this study. ☐

Participant's name: **Date:**
Signature:

Email (optional):

Name of Person taking consent: **Date:**
Signature:

When completed: 1 for participant; 1 for researcher site file.

D.2 Consents form for participating Parents/Guardians

The Leeds Teaching Hospitals NHS
NHS Trust

21/04/2018

UNIVERSITY OF LEEDS

School of Dentistry IRAS Project ID 223539 V.8

Participant code: [ ]

Participant Consent Form for Parents/Guardians

Ebtesam Abdullah is conducting this research as her PhD project, under supervision of Dr J.Tahmassebi and Dr J.Greenhalgh

Title of Research:

A Study of Factors Involved in Planning Dental Care for Children with Dental Decay

Please initial box

- I confirm that I have read and understood the information sheet for the study mentioned above and have had the opportunity to ask questions. [ ]
- I understand that my participation is voluntary and I am free to withdraw my child at any time, without giving any reason, and this withdrawal would not affect my child's treatment at Leeds Dental Institute. [ ]
- I understand that relevant sections of my child's dental notes and data collected during the study, may be looked at by individuals from regulatory authorities or from the NHS Trust, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my child's records. [ ]
- I understand that all my child's information will be kept confidential. [ ]
- I understand the risks and benefits of taking part in this study, both for my child and for me. [ ]
- I understand that the researcher will audio-record my conversation with a consultant. [ ]
- I understand that researcher will interview my child and me after consultation and audio-record the interview for research purposes. [ ]
- I understand that in case of data publication of this research, my child's details will remain anonymous. [ ]
- I agree to the use of anonymous quotes from our interview (my child and myself) for writing up the study report. [ ]
- I consent (agree) to take part in this study. [ ]
- I agree to the research team having the following details for the purpose contacting me to share the result of this study. [ ]

Participant's guardian:
Relation to the patient: **Date:**
Signature:
Email (optional):
Participant's name:
Name of Person taking consent: **Date:**
Signature:

When completed: 1 for participant; 1 for researcher site file.

D.3 Assent form for participating children

The Leeds Teaching Hospitals NHS
NHS Trust

21/04/2018

UNIVERSITY OF LEEDS

School of Dentistry IRAS Project ID 223539 V.5

Participant code: [ ]

Child Assent

Dr Ebtesam Abdullah, Dr Jinous Tahmassebi and Dr Joanne Greenhalgh are a research team of this project.

Project Name:

How can we make a good plan to fix teeth with holes for children?

Please initial box

- I have read (or had read to me) and understand the information sheet for this study and have had time to ask questions. ☐
- I understand that I can take part if I want and it's alright if I don't and I can stop at any time, without this affecting my treatment. ☐
- I understand that all my information will be kept private and safe. ☐
- I understand that even if I don't take part in this study, I can receive my dental treatment. ☐
- I understand that Ebtesam will audio-record my talk with a dentist. ☐
- I understand that Ebtesam will interview me with my parents/guardian and audio-record this interview to use it in this project. ☐
- I agree to take part in this study. ☐

Participant's name: **Date:**
Signature:
Name of the researcher: **Date:**
Signature:

When completed: 1 for participant; 1 for researcher site file.

Appendix E

Code link sheet and data collection sheet of the second study

E.1 Code link sheet of the second study

The Leeds Teaching Hospitals NHS
NHS Trust
V.4 21/02/2018

UNIVERSITY OF LEEDS
IRAS Project ID 223539

Code Link Sheet

Code no.	Consultant	Potential participant's name	Age D.O.B	Gender
1-				
2-				
3-				
4-				
5-				
6-				
7-				
8-				
9-				
10-				
11-				
12-				
13-				
14-				

E.2 Data collection sheet of the second study

The Leeds Teaching Hospitals NHS
NHS Trust

IRAS Project ID 223539

UNIVERSITY OF LEEDS

V.2 21/02/2018

Data Collection Sheet part 2

Participant's' code	Ethnicity	Postcode	Medical history
1-			
2-			
3-			
4-			
5-			
6-			
7-			
8-			
9-			
10-			

Appendix F

Topic guides

F.1 Topic guide for participating Paediatric Dental Consultants at the LDI

The Leeds Teaching Hospitals NHS
NHS Trust

01/05/2018

UNIVERSITY OF LEEDS

School of Dentistry IRAS Project ID 223539 V.9

Topic Guide for Paediatric Dental Consultants

❖ **Introduction:**

- This is a PhD research project, the researcher is Ebtesam Abdullah; a postgraduate dentist in children dentistry department.
- We are conducting this interview to discuss parental influence on your decision-making in the consultation clinic (A qualitative study).
- This interview will last for about 20-40 minutes.
- If you decide to take part you will already have been asked to sign a consent form.
- Your participation is entirely voluntary; you can withdraw within 30 days without giving any reason and your data will be discarded and excluded from the study.
- The researcher will provide you with an encrypted digital device for audio-recording your conversation with the parent and child. Then, the researcher will interview you in a side room. This interview will also be audio-recorded.
- Later, the researcher will collect the recorder, upload it to the M-drive on the secure university computer network and delete all the interviews from the recorder within 24 hours.
- The data will be analysed and the findings written up as part of my PhD thesis. I will use anonymous quotes from your interviews in that thesis.
- We confirm that all data will remain confidential; no name will be revealed in the transcription and will be kept safe in locked cabinet and a password-protected university computer. All audio recordings are going to be deleted when we finish this study.
- Do you have any questions?

The Leeds Teaching Hospitals NHS
NHS Trust

01/05/2018

UNIVERSITY OF LEEDS

School of Dentistry IRAS Project ID 223539 V.9

Case- based consultation

(A summary of 4-5 consultations)

- **The child participant code no.** ☐

- **Decision taken at the first consultation**
  - What is the reason for the child attendance?
    - What is the child present complaint?
    - What is the reason for the child referral?
    - How many carious primary teeth and/or permanent teeth that need treatment?
  - What is the planned dental care for this child? Why?
    - Planned dental care includes (Local Anaesthesia/Relative Anaesthesia/General Anaesthesia)
    - How much do you think the parents and the child were involved in making the decision?

- **Child dental health**
  - How would you describe the child previous dental experience?
  - How often does the child visit a dentist?

- **Interactions during consultation**
  - How would you describe the interaction with the child parents/guardians?
    - How long did the consultation last excluding examination and taking x-ray time?
    - What questions did the parents or the child ask?
    - How would you describe the child attitude/behaviour?
    - Did the parents/guardians request a specific dental treatment?
    - What might change the planned dental care for this child?
    - How would you describe the parents/guardians and the child satisfaction?

- Thank you for participation in this interview.
- All data are highly confidential.
- If you want to be informed with the results of this study, please provide us with your email.

F.2 Topic guide for participating Parents/Guardians and children

The Leeds Teaching Hospitals NHS
NHS Trust
01/05/2018
UNIVERSITY OF LEEDS
School of Dentistry IRAS Project ID 223539 V. 9

Topic Guide for Parents/Guardians and Children

❖ **Introduction:**

- This is a PhD research project, the researcher is Ebtesam Abdullah; a postgraduate dentist in children dentistry department.
- We are conducting this interview to discuss your participation in deciding the dental care for your children during consultation appointment.
- This interview will last approximately 15-25 minutes.
- Should you ask for interpreter at your consultation appointment, we can arrange to provide you with an interpreter during the interview.
- We can arrange another appointment for the interview if you could not stay after your consultation.
- If you want to participate, you will be asked to sign a consent form.
- Your participation is entirely voluntary; you can withdraw within 30 days without giving any a reason and your decision to with draw will not affect the care or treatment given to your child. Your child data would be discarded and excluded from the study.
- We are recording this interview to help us better remember what you say instead of writing notes. Also, we will use anonymous quotes from your and your child interview.
- We confirm that all your child personal information will be kept confidential and your child data will be coded and kept safe in locked cabinet and on password-protected university computer. All audio recordings are going to be deleted when we finish this study.
- Do you have any further questions?

Parents/guardians interview

- **Child personal information**
  - Tell me about your relation to the child (biological parents/ adopted child/ foster parent)?
  - How big is your family? Or how many siblings your child has?

- **Decision taken on first consultation**
  - Tell me what has brought you here?
    - What was the main reason of your visit?
    - Why did your dentist refer your child to the Leeds dental hospital?
    - Can you tell us how many teeth your child has that need treatment? Are they baby or adult teeth?
  - Can you tell us what do you know about the planned dental care for your child and why?
    - Was the plan to treat your child while he/she is awake with local anaesthetics or with gas/air (sedation) and local anaesthetics or to put him/her asleep (under general anaesthesia)?
    - Have you agreed to this plan?

- How do you feel about the agreed plan and the discussion you had with the consultant in children dentistry?
  - How similar does that plan to what you expected from this visit?
  - What do you understand about this plan? Why did you agree on this plan?

- **Child dental health**
  - How has your child previous dental experience been? Would you describe it? (Good/bad)
    - How was your experience with dentists?
  - How do you describe your child dental hygiene/care?
    - How often do you get your child to visit a dentist?

- **Interaction with consultants and suggestions to improve consultation**
  - How would you describe your interaction with the paediatric dental consultant regarding your child treatment?
  - Have you got answers to all your concerns?
  - What are additional things could help you on making your decision?
    - Do you think using illustrations like videos or leaflets would help you to understand?
    - Do you think spending more time would improve your consultation visit?

Child interview

- **First, I'm going to talk to you about what the dentist has told you**
  - Can you tell me why you are here today?
  - Can you tell me why did your dentist send you here?
  - What does the dentist was saying to you and your parents/guardians?
    - What did you understand about how are they going to fix your teeth?
    - Are you going to be awake and the dentist will numb your tooth or you are going to have happy gas and numbing your tooth or you are going to be sleep to have all your teeth fixed?

- **Your Feelings**
  - What did you feel after talking to the dentist?
  - What else did you want to say to the dentist?
  - What do you think of dentists?
  - Do you like to come here to see a dentist again?

- Thank you for your participation in this interview.
- We are giving you a £10 voucher for the time.
- Your information is highly confidential.
- If you want to be informed with the results, please provide us with your email.

Appendix G

Data Protection Agreement

G.1 A signed DPA with the Typing work company for transcriptions

IRAS ID: 223539
REC Reference: 18/SW/0080

DATA PROCESSING AGREEMENT

THE UNIVERSITY OF LEEDS

and

[The Typing Work Company]

Name of study: A study of factors involved in planning care pathways for children with dental caries.Version 8

Chief Investigator: Ebtesam Abdullah
Supervisor: Jinous Tahmassebi

AGREEMENT DATED 03/02/2019

BETWEEN:

(1) **THE UNIVERSITY OF LEEDS** of Leeds LS2 9JT ("Leeds"); and

(2) [The Typing Works Ltd], having its registered office at [Korklin & Co, 54-58 High Street, Edgware HA5 7EJ] (the "Processor").

BACKGROUND

(A) This Agreement is to ensure there is in place proper arrangements relating to personal data passed from Leeds to the Processor.

(B) This Agreement is compliant with the requirements of Article 28 of the General Data Protection Regulation.

(C) The parties wish to record their commitments under this Agreement.

IT IS AGREED AS FOLLOWS:

1. DEFINITIONS AND INTERPRETATION

In this Agreement:

"Data Protection Laws" means the Data Protection Act 1998, together with successor legislation incorporating GDPR;

"Data" means personal data passed under this Agreement, being in particular [*audio-recordings*];

"GDPR" means the General Data Protection Regulation;

"Services" means [*Transcription of audio-recordings*].

2. DATA PROCESSING

Leeds is the data controller for the Data and the Processor is the data processor for the Data. The Data Processor agrees to process the Data only in accordance with Data Protection Laws and in particular on the following conditions:

a. the Processor shall only process the Data (i) on the written instructions from Leeds (ii) only process the Data for completing the Services and (iii) only process the Data in the UK with no transfer of the Data outside of the UK (Article 28, para 3(a) GDPR);

b. ensure that all employees and other representatives accessing the Data are (i) aware of the terms of this Agreement and (ii) have received comprehensive training on Data Protection Laws and related good practice, and (iii) are bound by a commitment of confidentiality (Article 28, para 3(b) GDPR);

c. Leeds and the Processor have agreed to implement appropriate technical and organisational measures to ensure a level of security appropriate to the risk, complying with Article 32 of GDPR, details of those measures are set out under Part A of the Annex to this Agreement (Article 28, para 3(c) GDPR);

d. This Agreement is subject to English law and the exclusive jurisdiction of the English Courts.

For and on behalf of The University of Leeds

For and on behalf of [The Typing Works Ltd]

Adele Herson [Director].....

d. the Processor shall not involve any third party in the processing of the Data without the consent of Leeds. Such consent may be withheld without reason. If consent is given a further processing agreement will be required (Article 28, para 3(d) GDPR);

e. taking into account the nature of the processing, assist Leeds by appropriate technical and organisational measures, in so far as this is possible, for the fulfilment of Leeds' obligation to respond to requests from individuals exercising their rights laid down in Chapter III of GDPR – rights to erasure, rectification, access, restriction, portability, object and right not to be subject to automated decision making etc (Article 28, para 3(e) GDPR);

f. assist Leeds in ensuring compliance with the obligations pursuant to Articles 32 to 36 of GDPR – security, notification of data breaches, communication of data breaches to individuals, data protection impact assessments and when necessary consultation with the ICO etc, taking into account the nature of processing and the information available to the Processor (Article 28, para 3(f) GDPR);

g. at Leeds' choice safely delete or return the Data at any time. [It has been agreed that the Processor will in any event securely delete the Data at the end of the Services]. Where the Processor is to delete the Data, deletion shall include destruction of all existing copies unless otherwise a legal requirement to retain the Data. Where there is a legal requirement the Processor will prior to entering into this Agreement confirm such an obligation in writing to Leeds. Upon request by Leeds the Processor shall provide certification of destruction of all Data (Article 28, para 3(g) GDPR);

h. make immediately available to Leeds all information necessary to demonstrate compliance with the obligations laid down under this Agreement and allow for and contribute to any audits, inspections or other verification exercises required by Leeds from time to time (Article 28, para 3(h) GDPR);

i. arrangements relating to the secure transfer of the Data from Leeds to the Processor and the safe keeping of the Data by the Processor are detailed under Part A of the Annex.

j. maintain the integrity of the Data, without alteration, ensuring that the Data can be separated from any other information created; and

k. immediately contact Leeds if there is any personal data breach or incident where the Data may have been compromised.

3. Termination

Leeds may immediately terminate this Agreement on written notice to the Processor. The Processor may not terminate this Agreement without the written consent of Leeds.

4. General

a. This Agreement may only be varied with the written consent of both parties.

b. For the purposes of this Agreement the representatives of each party are detailed under Part B of the Annex.

c. This Agreement represents the entire understanding of the parties relating to necessary legal protections arising out of their data controller/processor relationship under Data Protection Laws.

ANNEX

Part A

Compliance with Article 32, para 1 of GDPR

1. Consideration of anonymisation, pseudonymisation and encryption.

   Is the above possible? If not, please explain why. If possible please insert details.

2. The ability to ensure the ongoing confidentiality, integrity, availability and resilience of processing systems and related services.

   Please explain how the above will be delivered.

3. The ability to restore the availability and access to personal data in a timely manner in the event of a physical or technical incident.

   Please confirm the above is possible and description of process in place to deliver the above.

4. A process for regularly testing, assessing and evaluating the effectiveness of the technical and organisational measures for ensuring the security of the processing.

   Please confirm the above process is in place and broadly what that process is.

Compliance with Article 32, para 2 of GDPR

5. In assessing the appropriate level of security account shall be taken in particular of the risks that are presented by processing, in particular from accidental or unlawful destruction, loss, alteration, unauthorised disclosure of or access to data transmitted, stored or otherwise processed.

   Please describe secure transfer process from Leeds to the Processor and levels of security to be applied by the Processor when the Data is in their possession.

Compliance with Article 32, para 3 of GDPR

6. Adherence to an approved code of conduct referred to in Article 40 (GDPR) or an approved certification mechanism as referred to in Article 42 (GDPR) may be used as an element by which to demonstrate compliance with the requirements set out in para 1 of GDPR – see above.

   Please describe any relevant code of practice relied upon.

Compliance with Article 32, para 4 of GDPR

7. The Processor to ensure that anyone acting on their behalf does not process any of the Data unless following instructions from Leeds unless they are required to do so under English law.

Appendix H

H.1 The first MNL regression model

Parameter Estimates

RD_3[a]		B	Std. Error	Wald	df	Sig.	Exp (B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Others	Intercept	-2.593	.860	9.096	1	.003			
	Age	.203	.100	4.152	1	.042	1.225	1.008	1.489
	[MaleRef=2.00]	-.408	.498	.670	1	.413	.665	.250	1.766
	[MaleRef=3.00]	0[b]	.	.	0	.	.	.	.
	[NoPrimCariousRef=1.00]	.239	.575	.172	1	.679	1.269	.411	3.921
	[NoPrimCariousRef=3.00]	1.230	.807	2.326	1	.127	3.423	.704	16.635
	[NoPrimCariousRef=4.00]	0[b]	.	.	0	.	.	.	.
	[BARDRef=1.00]	-1.563	1.160	1.814	1	.178	.209	.022	2.037
	[BARDRef=2.00]	1.054	1.506	.490	1	.484	2.870	.150	54.948
	[BARDRef=4.00]	1.151	.516	4.976	1	.026	3.161	1.150	8.691
	[BARDRef=5.00]	0[b]	.	.	0	.	.	.	.
	[LowIMDRef=2.00]	.771	.621	1.541	1	.214	2.163	.640	7.310
	[LowIMDRef=3.00]	1.878	.746	6.331	1	.012	6.542	1.515	28.257
	[LowIMDRef=4.00]	0[b]	.	.	0	.	.	.	.

	[HealthyPtRef=2.00]	-.461	.554	.691	1	.406	.631	.213	1.869
	[HealthyPtRef=3.00]	0[b]	.	.	0	.	.	.	.
	[WhiteBritishRef=2.00]	-.570	.767	.551	1	.458	.566	.126	2.546
	[WhiteBritishRef=3.00]	-.689	.889	.601	1	.438	.502	.088	2.868
	[WhiteBritishRef=4.00]	-.239	.646	.137	1	.711	.787	.222	2.793
	[WhiteBritishRef=5.00]	0[b]	.	.	0	.	.	.	.
Not_Specified	Intercept	-1.301	.687	3.579	1	.059			
	Age	.055	.080	.467	1	.494	1.056	.903	1.236
	[MaleRef=2.00]	-.630	.409	2.371	1	.124	.533	.239	1.188
	[MaleRef=3.00]	0[b]	.	.	0	.	.	.	.
	[NoPrimCariousRef=1.00]	.900	.452	3.958	1	.047	2.459	1.013	5.965
	[NoPrimCariousRef=3.00]	.939	.654	2.060	1	.151	2.558	.709	9.221
	[NoPrimCariousRef=4.00]	0[b]	.	.	0	.	.	.	.
	[BARDRef=1.00]	-.615	.671	.840	1	.359	.540	.145	2.015
	[BARDRef=2.00]	-18.263	.000	.	1	.	1.170E-8	1.170E-8	1.170E-8
	[BARDRef=4.00]	1.044	.433	5.806	1	.016	2.840	1.215	6.639
	[BARDRef=5.00]	0[b]	.	.	0	.	.	.	.
	[LowIMDRef=2.00]	1.302	.485	7.209	1	.007	3.678	1.421	9.517
	[LowIMDRef=3.00]	1.771	.650	7.435	1	.006	5.877	1.645	20.993
	[LowIMDRef=4.00]	0[b]	.	.	0	.	.	.	.
	[HealthyPtRef=2.00]	-.397	.444	.797	1	.372	.673	.281	1.607
	[HealthyPtRef=3.00]	0[b]	.	.	0	.	.	.	.
	[WhiteBritishRef=2.00]	-.617	.628	.966	1	.326	.539	.157	1.847
	[WhiteBritishRef=3.00]	.589	.600	.966	1	.326	1.803	.557	5.839
	[WhiteBritishRef=4.00]	.361	.510	.501	1	.479	1.435	.528	3.901

	[WhiteBritishRef=5.00]	0[b]		.		.	0		.		.	.

a. The reference category is: GA.

b. This parameter is set to zero because it is redundant.

Appendix I

I.1 The second MNL regression model

Parameter Estimates

CD_3Sepa[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
LA	Intercept	-.714	.674	1.123	1	.289			
	Age	.080	.089	.815	1	.367	1.083	.911	1.289
	[MaleRef=2.00]	-.707	.439	2.589	1	.108	.493	.209	1.167
	[MaleRef=3.00]	0[b]	.	.	0	.	.	.	.
	[NoPrimCariousRef=1.00]	.465	.475	.959	1	.327	1.592	.628	4.036
	[NoPrimCariousRef=3.00]	-.229	.754	.092	1	.762	.796	.181	3.490
	[NoPrimCariousRef=4.00]	0[b]	.	.	0	.	.	.	.
	[LowIMDRef=2.00]	-.077	.547	.020	1	.888	.926	.317	2.706
	[LowIMDRef=3.00]	.484	.608	.635	1	.426	1.623	.493	5.344
	[LowIMDRef=4.00]	0[b]	.	.	0	.	.	.	.
	[HealthyPtRef=2.00]	-.565	.508	1.239	1	.266	.568	.210	1.537
	[HealthyPtRef=3.00]	0[b]	.	.	0	.	.	.	.
	[WhiteBritishRef=2.00]	-.228	.674	.114	1	.736	.796	.212	2.987
	[WhiteBritishRef=3.00]	1.061	.634	2.800	1	.094	2.889	.834	10.011
	[WhiteBritishRef=4.00]	-.023	.567	.002	1	.968	.978	.322	2.971

	[WhiteBritishRef=5.00]	0[b]	.	.	0	.	.	.	.
	[BACRef=1.00]	-1.259	.543	5.377	1	.020	.284	.098	.823
	[BACRef=3.00]	-3.110	1.075	8.362	1	.004	.045	.005	.367
	[BACRef=4.00]	-1.838	.805	5.212	1	.022	.159	.033	.771
	[BACRef=5.00]	0[b]	.	.	0	.	.	.	.
Others	Intercept	-2.131	.915	5.422	1	.020			
	Age	-.005	.102	.002	1	.961	.995	.815	1.215
	[MaleRef=2.00]	-1.226	.656	3.488	1	.062	.293	.081	1.062
	[MaleRef=3.00]	0[b]	.	.	0	.	.	.	.
	[NoPrimCariousRef=1.00]	1.524	.688	4.916	1	.027	4.593	1.194	17.672
	[NoPrimCariousRef=3.00]	.440	1.236	.127	1	.722	1.553	.138	17.501
	[NoPrimCariousRef=4.00]	0[b]	.	.	0	.	.	.	.
	[LowIMDRef=2.00]	-.098	.669	.021	1	.883	.907	.244	3.364
	[LowIMDRef=3.00]	.503	.834	.364	1	.546	1.654	.323	8.474
	[LowIMDRef=4.00]	0[b]	.	.	0	.	.	.	.
	[HealthyPtRef=2.00]	.456	.612	.555	1	.456	1.577	.475	5.236
	[HealthyPtRef=3.00]	0[b]	.	.	0	.	.	.	.
	[WhiteBritishRef=2.00]	-.409	.868	.222	1	.638	.665	.121	3.641
	[WhiteBritishRef=3.00]	-19.530	.000	.	1	.	3.298E-9	3.298E-9	3.298E-9
	[WhiteBritishRef=4.00]	.006	.692	.000	1	.993	1.006	.259	3.903
	[WhiteBritishRef=5.00]	0[b]	.	.	0	.	.	.	.
	[BACRef=1.00]	-.601	.803	.559	1	.454	.549	.114	2.646
	[BACRef=3.00]	-.321	.772	.173	1	.678	.726	.160	3.296
	[BACRef=4.00]	-.089	.825	.012	1	.914	.915	.181	4.612
	[BACRef=5.00]	0[b]	.	.	0	.	.	.	.

a. The reference category is: GA.

b. This parameter is set to zero because it is redundant.

Appendix J

J.1 The third MNL regression model

Parameter Estimates

FinalDentalCare_3Sepa[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Not completed/started	Intercept	-2.302	.878	6.876	1	.009			
	Age	.224	.109	4.234	1	.040	1.251	1.011	1.547
	[MaleRef=2.00]	-1.160	.525	4.879	1	.027	.313	.112	.877
	[MaleRef=3.00]	0[b]	.	.	0	.	.	.	.
	[NoPrimCariousRef=1.00]	-.223	.588	.144	1	.705	.800	.253	2.533
	[NoPrimCariousRef=3.00]	-.645	.914	.498	1	.480	.525	.088	3.146
	[NoPrimCariousRef=4.00]	0[b]	.	.	0	.	.	.	.
	[LowIMDRef=2.00]	-.635	.668	.904	1	.342	.530	.143	1.962
	[LowIMDRef=3.00]	.196	.768	.065	1	.799	1.216	.270	5.474
	[LowIMDRef=4.00]	0[b]	.	.	0	.	.	.	.
	[HealthyPtRef=2.00]	-1.448	.679	4.554	1	.033	.235	.062	.889
	[HealthyPtRef=3.00]	0[b]	.	.	0	.	.	.	.
	[WhiteBritishRef=2.00]	1.522	.690	4.874	1	.027	4.583	1.186	17.702
	[WhiteBritishRef=3.00]	1.780	.680	6.855	1	.009	5.933	1.565	22.496
	[WhiteBritishRef=4.00]	.800	.685	1.365	1	.243	2.226	.581	8.522

	[WhiteBritishRef=5.00]	0[b]	.	.	0	.	.	.	.
	[BACRef=1.00]	-.336	.661	.259	1	.611	.714	.196	2.609
	[BACRef=3.00]	-.679	.707	.922	1	.337	.507	.127	2.028
	[BACRef=4.00]	-.433	.767	.318	1	.573	.649	.144	2.919
	[BACRef=5.00]	0[b]	.	.	0	.	.	.	.
others	Intercept	-.737	.691	1.138	1	.286			
	Age	-.011	.089	.015	1	.901	.989	.832	1.176
	[MaleRef=2.00]	-.869	.460	3.561	1	.059	.419	.170	1.034
	[MaleRef=3.00]	0[b]	.	.	0	.	.	.	.
	[NoPrimCariousRef=1.00]	1.053	.489	4.642	1	.031	2.867	1.100	7.472
	[NoPrimCariousRef=3.00]	.794	.733	1.173	1	.279	2.212	.526	9.310
	[NoPrimCariousRef=4.00]	0[b]	.	.	0	.	.	.	.
	[LowIMDRef=2.00]	-.566	.569	.989	1	.320	.568	.186	1.732
	[LowIMDRef=3.00]	1.032	.592	3.043	1	.081	2.807	.880	8.953
	[LowIMDRef=4.00]	0[b]	.	.	0	.	.	.	.
	[HealthyPtRef=2.00]	.192	.482	.160	1	.690	1.212	.472	3.116
	[HealthyPtRef=3.00]	0[b]	.	.	0	.	.	.	.
	[WhiteBritishRef=2.00]	-.811	.840	.930	1	.335	.445	.086	2.308
	[WhiteBritishRef=3.00]	.750	.727	1.066	1	.302	2.118	.510	8.801
	[WhiteBritishRef=4.00]	.604	.536	1.274	1	.259	1.830	.641	5.228
	[WhiteBritishRef=5.00]	0[b]	.	.	0	.	.	.	.
	[BACRef=1.00]	-1.505	.612	6.056	1	.014	.222	.067	.736
	[BACRef=3.00]	-2.355	.827	8.102	1	.004	.095	.019	.480
	[BACRef=4.00]	-.774	.629	1.515	1	.218	.461	.134	1.582
	[BACRef=5.00]	0[b]	.	.	0	.	.	.	.

a. The reference category is: GA.

b. This parameter is set to zero because it is redundant.

Appendix K

K.1 The first Binary regression model

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	98.265	4	.000
	Block	98.265	4	.000
	Model	98.265	4	.000

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	1.562	5	.906

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	127.724[a]	.435	.595

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted		
			Final_GA		Percentage Correct
			Yes	No	
Step 1	Final_GA	Yes	101	8	92.7
		No	15	48	76.2
	Overall Percentage				86.6

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	RD_3Ref			6.040	2	.049			
	RD_3Ref(1)	1.472	.619	5.660	1	.017	4.359	1.296	14.660
	RD_3Ref(2)	.263	.553	.226	1	.635	1.301	.440	3.845
	CD_3Ref			53.442	2	.000			
	CD_3Ref(1)	4.152	.620	44.835	1	.000	63.536	18.847	214.183
	CD_3Ref(2)	3.136	.687	20.866	1	.000	23.023	5.994	88.433
	Constant	-2.343	.419	31.242	1	.000	.096		

a. Variable(s) entered on step 1: RD_3Ref, CD_3Ref.

Appendix L

L.1 The second Binary regression model

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	26.504	4	.000
	Block	26.504	4	.000
	Model	26.504	4	.000

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	3.404	5	.638

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	119.600[a]	.143	.250

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted		
			Final_NO_RX		Percentage Correct
			Yes	No	
Step 1	Final_NO_RX	Yes	5	21	19.2
		No	4	142	97.3
	Overall Percentage				85.5

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	RD_3Ref			3.644	2	.162			
	RD_3Ref(1)	-1.271	.667	3.638	1	.056	.280	.076	1.036
	RD_3Ref(2)	-.731	.602	1.475	1	.224	.481	.148	1.566
	CD_3Ref			17.103	2	.000			
	CD_3Ref(1)	-2.157	.522	17.098	1	.000	.116	.042	.322
	CD_3Ref(2)	-1.353	.717	3.558	1	.059	.258	.063	1.054
	Constant	3.302	.553	35.686	1	.000	27.159		

a. Variable(s) entered on step 1: RD_3Ref, CD_3Ref.

Appendix M

M.1 The third Binary regression model

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	44.172	4	.000
	Block	44.172	4	.000
	Model	44.172	4	.000

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	3.399	4	.493

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	134.934[a]	.226	.350

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted		
			Final_Others		Percentage Correct
			Yes	No	
Step 1	Final_Others	Yes	16	21	43.2
		No	9	126	93.3
	Overall Percentage				82.6

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	RD_3Ref			.832	2	.660			
	RD_3Ref(1)	-.296	.612	.234	1	.629	.744	.224	2.469
	RD_3Ref(2)	.231	.527	.192	1	.662	1.260	.448	3.539
	CD_3Ref			32.425	2	.000			
	CD_3Ref(1)	-2.686	.503	28.563	1	.000	.068	.025	.183
	CD_3Ref(2)	-2.820	.650	18.837	1	.000	.060	.017	.213
	Constant	2.589	.436	35.240	1	.000	13.320		

a. Variable(s) entered on step 1: RD_3Ref, CD_3Ref.

Appendix N

N.1 Data coding for the factors involved in planning care pathways for children referred to the LDI for dental caries management

Data extract	Codes
- Lived with a foster carer, recently adopted and moving to another family in different area (4) - lived far away of dental hospital and the family were homeless for 6 months and there were support worker involved (9)	**1-Social circumstances**
-History of severe pain (3) -History of dental pain (10) -History of pain and abscess (5)	**2-History of severe dental pain**
-History of infections (10) -History of dental abscess (5) -History of multiple infections (6)	**3-Dental abscess and infections**
-History of 3 courses of AB (10) -History of multiple 5-6 antibiotic courses. (6) -History of 2 courses of AB (7)	**4-History of multiple courses of antibiotics**
-Allergic to block of vaccines and penicillin (7) -History of bad recovery after non-dental GA allergic to Penicillin and had 3 surgeries under GA. (8)	**5-Chronic medical conditions**

-A special need child and mother. Support worker and teaching support were involved (9)	**6-Learning difficulty**
-The PDC planned GA to avoid more antibiotics history of 5-6 courses (6) -GA comprehensive care waiting list was too long to restore 7 and to extract 2 baby teeth (5)	**7- Required rapid dental intervention**
-Good experience with temporary fillings (2) -Good behaviour with temporary fillings (3) -Good behaviour with temporary fillings (4) -Enjoy going to dentists (6)	**8- Child with no experience of LA**
-Negative behaviour towards dentists (1) -History of bad dental experience, allergic reaction to LA (9) -History of failed extraction by general dentist (10) -History of a traumatic dental experience (11)	**9- Child had complications with dental treatment**
-Mother fears of dentists (1) -Mum does not like going to dentist (8) -Mum had a traumatizing dental experience in as a kid (10)	**10- Parent with negative dental experience**
-Multiple extractions 8 baby teeth (1) - Multiple extractions up to 8primary teeth, History of dental trauma (2) -14 carious teeth some for extractions (3) - 6 primary teeth were extracted (4) -Extraction of 6 baby teeth (6) -Four baby teeth to be taken out (7) -Removal of 4 baby teeth (8)	**11- Multiple extractions was required**
-The child' mother said he can't stay still (2) -The PDC thought child would not cope treatment under LA. Quite child sat still on chair (3)	**12- Child with limited cooperation**

-The PDC spent longer time to explain dental procedure to the anxious child (11)	
-The PDC assessed the child as potentially amenable to LA, Child well-behaved during his appointment (5) -The PDC assessed the child as potentially cooperative for LA care pathway. A bit anxious for extractions (6) -Child behaviour assessment is likely to accept LA care pathway by parents and by consultants (10)	**13- Child with sufficient cooperation**
-Parents were unable to control sweet (1) -History of bad oral hygiene and habit before start living with foster carer (4) -Need prevention treatment because of child bad OH (9)	**14- Poor OH required preventive treatment**
-Malformed teeth with MIH (8) -Deformed tooth with MIH (11)	**15- Presence of dental anomaly**
-Parent opted for shorter waiting list (2) - Parent did not prefer Long waiting list for GA comp care list (5) - Mum wants to finish it once because of commitment if many appointments (7) -Two teeth could be saved but mum wanted faster Exodontia only list since they're baby teeth (8)	**16- Not urgent dental treatment**
-Long waiting time since referral (5) -Long waiting time to be seen by a consultant had episode of pain while waiting (7) -Being on waiting list for long time (9) -Waited a long time to see the consultant (11)	**17- Long waiting time since referral**
- Need it as fast as possible as the child is moving to another foster family in different area soon (4) -Lives far away of dental hospital (9) (case 9 were homeless for 6 months)	**18- Accessibility to dental hospital**

-Parent asked for an advice what to decide which been declined (2) -The PDC had provided a professional advice as requested by parents (10)	**19- Professional advice (answered or declined)**
-The child mother was happy with the PDC's decision and agreed on the plan and upset of general dentist for not explaining those teeth might exfoliate without intervention (9) -The PDC spent longer time to explain to the child. (11)	**20- Prolonged discussion**
- Parent worried the child would not be able to eat and speak with no teeth, Wants to save much teeth (3) -Two baby teeth could be saved but mum wants Exodontia only list because they are baby teeth (8), - Mum assessed the child behaviour as negative to LA care pathway (8) -Mum wanted to save more teeth (5) -Parents were aiming to save more teeth (10) - The child's father was aware of his child previous negative dental behaviour, said no way accepting treatment while awake (1) - The child's mother was aware that her child can't stay still during dental treatment. (2) -Foster carer knows the child would not cope with multiple extractions while awake (4) - Mum said her child was anxious to dental x-rays (7) -The child mother thought the child was no way accepting treatment while awake, she said he was very active and can't stay still, history of mum held her child hands when a dentist failed to extract a tooth (11)	**21- Parent knowledge about dental caries management**
They were great, yeah, they were brilliant. Yeah, they were really helpful, yeah, they were really good. Everything were, well, everything was spoke about, yeah, they were really good (5)	**22- Parent satisfaction**

Lovely ... Lovely. Lovely because .. was like really good with me with my learning rehabilitations and stuff. .. was very understanding as well. (9) I liked .., .. was alright, .. was a fun .., .. seemed alright. Well yeah, .. was planning how .. was going to fix the teeth, so….. made it simple, that's how I felt like, .. explained it very simply and like made it understandable, so…anything that I had questions, they got answered already (10) -Absolutely brilliant, I couldn't ask for anything else, .. spoke to my child at his level, .. was so patient, .. was brilliant, fantastic. I wish .. could be my regular dentist, I think 'd get this fear sorted out straight away (11)	
- Father explained to his son the dentist questions. The child answered all questions asked by the PDC. (1) -The child was interfering with his mother answers. Mother was supportive has only interrupted her son once. (2) -Mother only answered questions directed to her. She can make the child do things he doesn't want. (3) -Child was very active and chatty. Foster carer was supportive. (4) -The child answered all questions during consultation. Mother was supportive, encouraging her child to talk. (5) -The child answered most of the questions. Mother was supportive. (6)	**23- Child-involvement in clinical discussion**

-Child was crying and very anxious during consultation. Parents were supportive. (7) -Very quiet child during consultation. Mother was supportive to get the best for the child by giving more details. (8) - Mother was supportive, answering all questions directed to her child who has special needs (9) -The child is very active during consultation. Parents were supportive to get the best for the child by giving more details. (10) -Very anxious child asking many questions if the consultant going to insert anything in his mouth. Mother was supportive to get the best for the child by giving more details. The child established a rapport with the PDC. (11)	
• The child was worried but not bothered to be involved (1) • The child did not want to go to sleep (2) • No verbal response from the child (3) • The child was aware of the planned GA care pathway (4) • Child was not aware of the planned care pathway (5) • The child was aware of the planned GA care pathway, but want to be awake (6) • The child was not worried about dental treatment decision (7) • The child did not want to know about the decision and did not ask (8) • A special need child with learning disability (9) • The child knew she is going to be awake (10) • The child was aware that he will be sleep during dental treatment (11)	**24. Child cognitive development**