Admission patterns of paediatric patients aged 0-4 years diagnosed with respiratory conditions between Emergency Department (ED) and acute paediatrics and its relationship to zero-day admissions

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Abstract

The number of children presenting to National Health Service (NHS) Emergency Departments (ED) in England is increasing, with a reported 28% increase in presentations in children aged less than 15 years between 1999 and 2010 (Gill *et al.* 2013). Alongside increased presentation rates, emergency hospital admissions have also increased, with Keeble and Kossarova (2017) reporting a 12% rise between 2005 and 2016, and in particular lasting less than 24-hours, known as zero-day admissions (Gill *et al.* 2013). Children aged 0-4 years are determined as the most frequently presenting age group at ED (Sands *et al*. 2011) and a respiratory diagnosis as the second most prevalent condition for this age group (Sands *et al.* 2011). However, evidence examining why this high conversion rate from presentation to admission exists is scarce. The ability of maintaining such emergency provision is under continuous scrutiny and review.

Using a mixed-methodology approach, this work explored common characteristics of the 0-4 year's patient group who were admitted from ED to acute paediatrics with a respiratory diagnosis. Experiences and knowledge of unplanned admissions from health care professionals working in acute paediatrics were obtained via semi-structured interviews. These findings aided the development of themes which were subsequently converted into quantifiable variables. These variables alongside variables identified through systematic literature review were used to interrogate data of N = 211 children aged 0-4 years old admitted to hospital via the emergency department between March 2017-March 2018 with a respiratory diagnosis. The data was obtained under freedom of information requests, from two district general hospitals in the East Midlands.

The minimally used Bayesian method of information analysis (Noyes *et al.* 2019) was employed to facilitate the synthesis of qualitative and quantitative evidence. This achieved an in depth triangulation of findings and concepts (Dixon-Woods *et al.* 2005).

Overall this work concludes that whilst data analysis in silo did not provide statistical significance of the variables in relation to zero-day admissions, its evaluation in conjunction with the interview transcripts led to a deeper understanding of characteristics contributing to zero-day admissions. This further led to identification of future research of more refined characteristics which will aid in the reduction of short-stay emergency admissions to hospital.

Acknowledgments

Firstly, thank you to my Director of studies – Dr Noel Harris, who has been with me in this project since its conception – Dr Harris has remained a sound board and a voice of advice and reason, also thank you to Dr Jacob Sangara who stepped in to support me in the last stages of this study.

Since starting my Professional Doctorate I have experienced life changing events, all of which have helped make me more determined to succeed. The constants during these experiences have been my parents, Brigitte and Stephen, whose never ending love, belief and encouragement have been, at times, my soul source of strength, and also my two daughters, Darcy and Claudia, who have always told me 'Mummy you can do it' – I've done it for you girls. I have been blessed in gaining two additions to my family, my future husband, Simon and my daughter, Maisie, who have accepted and encouraged my passion to learn and improve practice.

The completion of this thesis sees a life time dream achieved – not only in the writing of this paper, but in achieving a professional goal of pushing the boundaries, seeing an area of development and actually trying to make a difference to patients' health experience and the way we, as healthcare professionals, practice.

For M'Dad – who always says I am head-strong x

Contents

1. Introduction

The pressures on emergency care provision across England are reported as continually increasing, with numbers of patient presenting to Emergency Departments (ED) at a record high, of those accessing emergency care children and young people (CYP) aged fifteen and under are identified as the most frequent users and two and half times more likely to present at ED than those aged 80 years and older (Criddle and Howe 2017). A range of reasons including population increase and public opinion of reduced primary care provision (Quality Watch 2019) are attributed to increased presentations to ED and in particular the presentation of CYP (Keeble and Kossarova 2017). Despite these reasons being offered Mason *et al.* (2017) argues that the causation for the rise in ED attendances and further hospital admissions, including those of CYP, remains unclear and is multifactorial. Rudge *et al.* (2013) cite further potential causes as environmental and socioeconomic factors, with Keeble and Kossarova (2017) suggesting that human decision making in terms of time chosen to access services as contributing to increased presentations of CYP at ED. However, Gill *et al.* (2013) places responsibility for increased attendances with changes to health policy and political changes, such as the four-hour transit time currently seen in ED departments in England. In line with the higher presentation rates, hospital admissions have also increased, particularly in admissions lasting less than 24-hours, known as zero-day admissions (Gill *et al.* 2013). In 2015, referrals direct from ED to in-patient paediatric services accounted for 62% of all emergency admissions for CYP (Keeble and Kossarova 2017). This increase in emergency admissions would suggest that the 'Five Year Forward Plan' aimed at reducing children's hospital admissions has not moved forwards (NHS England *et al.* 2014).

Studies have attempted to explore and understand reasons for the changes in ED presentations and subsequent admissions, and in turn adapt practice to meet these altering needs (Ismail *et al.* 2013, Mason *et al.* 2017). However, the paucity of research on ED presentations and hospital admissions in relation to children's health restricts the application of findings to the paediatric health arena (Criddle and Howe 2017). The lack of investigation in to this subject is questionable,

especially in light of the identified growth of presentations and admissions for CYP (Criddle and Howe 2017). Despite a wide range of literature reviewing the issue of ED attendances, few appear to consider any associated increase rise in short-stay admissions stemming from the presentations (Keeble and Kossarova 2017). The impact of short-stay admissions and in particular zero-day paediatric admissions have been documented as not only carrying an emotional burden for parents and children, but also placing an unnecessary financial burden on the National Health Service (NHS) (Criddle and Howe 2017). However, failure to appropriately admit a sick child for fear of generating increased costs and placing strain on an already stretched NHS could potentially result in unsafe and inappropriate health care management (Gill *et al.* 2013).

Controlling the flow of emergency admissions is an indicator of a well-balanced and working healthcare system (Blunt 2013), this indicator extends to the care of children, however is particularly difficult to manage when considering the complexity of how a child physiologically responds to illness (Sachedina and Donaldson, 2010). In an attempt to assist in managing this flow and potential development of urgent care pathways, Sands *et al.* (2011) reviewed notes of all 0-15 year olds presenting to a large ED in Nottingham during 2007-2008 (N= 39,394). From the study the top six presentations were identified, with 'breathing' problems being listed as the most prevalent, accounting for 20.1% of all presentations. This finding is supported by NHS Gloucestershire Clinical Commissioning Group (2014) which identified the 'big six', these being the top six conditions children presented to urgent care with, with number one being identified as respiratory conditions. Exploring ED presentations further Sands *et al.* (2011) also identified the prevalence of age brackets presenting to the ED, 0-4 year olds were identified as the most frequently presenting age group of medical attendees, accounting for 69.8% of attendances (N= 8655), respiratory conditions are noted as a medical admission category. Despite several interventions aimed at reducing the number of emergency admissions (regardless of patient group), the problem remains a significant issue, costing the NHS on average £1.4 billion a year (Blunt 2013). Considering the growing paediatric emergency admission numbers, it would be valuable to explore these interventions specifically within the paediatric arena (Husk *et al.* 2018).

Exploration of common characteristics seen in admissions would aim to assist in understanding potential factors which could help to reduce unplanned admissions that result in zero-day admissions (Husk *et al.* 2018). A stronger understanding of admission pathways would enable the planning and reviewing of services, and subsequent commissioning in both emergency care and acute paediatrics (Sands *et al.* 2011).

Despite exploration of literature in to underlying causation for increased paediatric hospital admissions from ED (Sands *et al.* 2011, Husk *et al.* 2018), none to date appear to have offered significant theory for this connection. Identification of this issue led to the development of this work research question with supporting hypothesis and aim.

1.1 Research Question

Does a relationship exist between the referral pathways of patients aged 0-4 years diagnosed with a respiratory condition between ED and acute paediatrics and those who experience a subsequent zero-day admission?

Secondary research questions

- *1- Can a relationship be identified between the characteristics of patients referred to acute paediatrics and the number of patients experiencing a zero-day admission for 0-4 year olds with a respiratory diagnosis?*
- *2- Does a correlation exist between the referral pattern from ED to acute paediatrics and admission outcomes for 0-4 year olds with a primary respiratory diagnosis?*

1.2 Research Aim

Use qualitative exploration to influence the development of quantitative variables to support the exploration of referral activity for zero-day admissions of 0-4 years old patients from ED to acute paediatrics diagnosed with 'respiratory' condition. The results of which will aim to inform future practice and develop pathways to benefit patient care and safety.

1.3 Hypothesis

A relationship exists between zero-day admissions of children aged 0-4 years with a primary diagnosis of respiratory condition and the referral pathway evident between ED and acute paediatrics.

1.4 Null hypothesis

No relationship exists between zero-day admissions of children aged 0-4 years with a primary diagnosis of respiratory condition and the referral pathway present between ED and acute paediatrics.

Having identified the research topic a wider consideration of the development of the issue was required; the following chapter provides a more comprehensive review of what is commonly known surrounding the topic.

2. Background

The number of children presenting to National Health Service (NHS) Emergency Departments (ED) in England is increasing, with a reported 28% increase in presentations in children aged less than 15 years between 1999 and 2010 (Gill *et al.* 2013). Alongside increased presentation rates, emergency hospital admissions have also increased, with Keeble and Kossarova (2017) reporting a 12% rise between 2005 and 2016. Despite this increase in the use of emergency services, evidence does not support this being due an increase in critical illnesses, with statistics demonstrating a 19.2% reduction of in hospital mortality between 2005 and 2016, with deaths reducing from 1/1274 to 1/1925 (Keeble and Kossarova 2017). This further raises question regarding the causation for increased presentation and admission.

Whilst the rise in ED attendance for young people aged over 15 years' does so in line with the growth in population for that age group (Keeble and Kossarova 2017) the same is not seen with attendances among the 0-4-year olds (Keeble and Kossarova 2017) where presentation rates are increasing ahead of the population growth. The ED presentation rates for the 0-4 years' age group is recorded at almost 2 million across England between 2015/16, an increase of almost 200,000 attendances on the 2014/15 statistics (see table 2) (NHS Digital 2017). Gill *et al.* (2013) also highlights this growth, identifying a 25% increase in ED presentations in this age bracket between the years of 1999-2009. The rate in ED attendance and emergency admissions in this age bracket is increasing over and above documented population growth, drawing further interest to the causation and management of this phenomenon (Keeble and Kossarova 2017).

Table 2 Presentation numbers for 0-4 year olds to ED in 2015/16

Age In years	Number of ED attendances 2014-15	% of total ED attendances	Number of ED attendances 2015-16	% of total ED attendances
0-1	483,187	2.5%	538,848	2.6%
1-4	1,390,945	7.1%	1,515,244	7.4%

Factors accounting for ED attendance can be attributed to a multitude of reasons, such as social deprivation, co-morbidities and perception of primary healthcare provision (Scantlebury *et al.* 2015). And whilst healthcare initiatives such as NHS111 and extended paramedic responsibilities have been introduced attempting to address these factors (NHS England *et al.* 2014) there is currently no nationally available data about the quality of primary care provision for children which may help prevent ED presentations and subsequent admissions (Keeble and Kossarova

2017). Having considered the changes seen in ED attendances a parity of knowledge was sought regarding primary care services. In 1995 the 0-5-year-old population accounted for 270,542 General Practitioner (G.P) consultations; by 2005 this number had risen to 1,254,853 consultations for the same age bracket (NHS digital 2009). Hobbs *et al.* (2016) conducted a seven-year retrospective study exploring the change in primary care clinical workload in England. As evidenced in statistics from NHS digital (2009), Hobbs *et al.* (2016) study also established a continuous increase in primary care use, with most consultations being provided for 0-4-year-old age group. Reviewing these statistics reflects an increasing use of both primary and secondary care settings by the young age group (NHS digital 2009, Hobbs *et al.* 2016). The requirement for provision of suitable and effective primary care is echoed in the NHS five-year plan document (NHS England *et al.* 2014), which highlights the availability of community pharmacists and G.P's working evening and weekends to provide service, this is in addition to the 379 urgent care settings that were initiated in 2014. However, this effort is contradicted by the 2004 Healthcare reform, which enabled G.Ps to opt out of providing out-of-hours primary care (The House of Commons Health Committee 2004); which, in turn, could be associated with changes in ED attendances and emergency admissions for children. During this period of service change, changes were also been seen in acute hospital admissions, with admissions via the GP demonstrating a 16% reduction between years 1998-2008 (Department of Health 2008) (DoH 2008). However, despite this reduction, Gill *et al.* (2013) identified a 28% increase in acute admission rates for paediatric patients between years 1999-2010, and of the increased admissions 30% were identified as being for acute infections which would have historically been managed in the primary care setting. Of the increased admissions, Gill *et al.* (2013) noted a 48% increase in zero-day admissions relating to asthma, diabetes and epilepsy, which is supported by the identification of the 'Big Six' as previously discussed (NHS Gloucestershire Clinical Commissioning Group 2014).

The financial implications of this changing platform should not be overlooked, however gathering exact intelligence on Clinical Commissioning Group (CCG) financial tariff for zero-day admissions is challenging due to a lack of published data (Andrews 2011). According to Andrews (2011), the financial tariff attached to these emergency admissions, is around £1000, this would include the patient's presentation to ED and hospital stay. Currently, NHS Improvement (2018) places the cost closer to £2000, to include a non-elective inpatient stay without excess days, staff and ED attendance. Whilst the seven-year time lapse may provide some rationale for the increase in costing, it does reinforce the high costs associated with zero-day admissions, and the demonstrated upward trajectory of increased emergency admissions continues.

The NHS provides an outcome framework (NHS-OF) which aims to monitor health outcomes for adults and children in England (NHS digital 2019). Of these outcomes only nine pertain to the care

of children, and of these only two relate to the emergency care provision for children. NHS-OF 3.2 refers to the emergency hospital admissions for children with lower respiratory tract infections, which have increased from 303.6 per 100,000 populations in 2006/07 to 422.7 in 2015/16 (NHS Digital, 2017c). Between the years 2006-2016 the diagnosis of respiratory problems increased by almost three-quarters, to 24,848 emergency admissions (Keeble and Kossarova 2017) further highlighting the growing intensity and concern surrounding this situation within the emergency care arena. Whilst potential considerations for increased ED presentation have been previously discussed, the same considerations cannot be applied to the prevalence of respiratory diagnosis (Andrews, 2011). What is not clear from the literature is, the respiratory conditions presenting to ED and subsequently being admitted, which transpired in to a zero-day admission and therefore the financial burden this increasing classification group is currently placing upon the NHS.

ED's across the country are categorised in to three types, each type provides a different level of care provision, this is explained in table 2.1. The type of ED heavily influences the type of admissions that hospital can take, or onward referrals to other hospitals, (Parliament House of Commons 2014), interestingly type 1 ED's account for two-thirds of all ED attendances and most hospital admissions (Parliament House of Commons 2015).

Table 2.1 Emergency Department categories

Type	Care Provision
Type 1	Emergency departments are a consultant led 24 hour service with full resuscitation facilities and designated accommodation for the reception of accident and emergency patients.
Type 2	Consultant led mono specialty accident and emergency service (e.g. ophthalmology, dental) with designated accommodation for the reception of patients
Type 3	Other type of A&E/minor injury provision with designated accommodation for the reception of ED patients. The department may be doctor led or nurse-led and treats at least minor injuries and illnesses and can be openly accessed. An entirely appointment based (for example a G.P or out-patient clinic) is excluded.

The region of interest in this work is the East Midlands, this region is supported by four district general hospitals, all offering similar health services and care provision. The in-patient capacity of each hospital ranges between 360 – 700 beds; each hospital has a type 1 ED provision and acute paediatrics department, making the admission pathways comparable. The patient demographic served by these Trust were explored for comparison. Data taken from the Northamptonshire Analysis (2014) showcased in table 2.2 highlights the 0-4years population in Northamptonshire in comparison to England between the years 2011-2015. The growth of the population in Northampton typically replicates that of England (Keeble and Kossarova 2017) and has remained static. When balanced against the documented increase in ED attendances and admissions to

acute paediatrics this gives further rise to questions surrounding the increased presentation rates of these patients. The 0-4 year population of Northamptonshire statistics sit only marginally above the national average where 0-4-year olds account for 6.3% of the total population. From that number 55% of these children lived in areas considered to be primarily served by NGH (NCC 2015).

Table 2.2 Change in 0-4 year olds population in Northamptonshire

Year	Overall 0-4years Northamptonshire population	% of overall Northamptonshire population	Overall % average of 0-4 years population – England
2011	46012	6.7%	6.3%
2015	47174	6.5%	6.3%

All areas reviewed demonstrated the 0-4-year-old population as accounting for, on average, 6% of the area's overall population (NCC 2016, Bedfordshire Clinical Commissioning Group 2017), with the exception of Milton Keynes, where data demonstrated a marginally higher than average population percentage at 8% (Milton Keynes Council 2019).

The NHS Outcomes Framework (12/13) indicates the reduction of emergency unplanned admissions of children as being a health improvement objective (DoH 2011); with an overall exploration of potential new ways of working and thinking surrounding the management of acutely unwell children being high on the agenda. However, with the predicted ED presentation rates and subsequent admission rates of children aged 0-4 years old set to continue increasing (Office for National Statistics 2011), the need to investigate the topic area regarding potential causes and relationships in hospital admissions is identified. The investigation and analysis of this background literature led to the development of the study's aims, to explore recognised trends and themes of ED admission patterns which may identify an association with increased emergency respiratory zero-day admissions.

Having identified the research topic, a solid understanding of existing literature and knowledge on the matter was required, a subsequent systematic literature review follows detailing the development of the review, its findings and the contribution this brings to the current knowledge base.

3. Literature search

3.1 Method

Having identified the aim of the study a systematic review of current literature, its limitations, quality and potential impact to practice took place, in part to potentially answer the research question, but also via appraisal and synthesis, to provide direction to the value and planning of the proposed research (Piper 2013). Support from the HEI academic librarian was utilised to ensure a robust and systematic approach. Four databases were selected for searching, these were COCHRANE, Ovid- Maternity & Infant care database, Medline and CINAHL, considerations for the use of these databases are detailed below in table 3.

Table 3 Considerations for use regarding databases

Database	Considerations
CINAHL	Considered an authoritative database of nursing, allied health professionals and research related literature which is peer reviewed (Wright2015). Index is provided for 2,928 journals from the field of nursing and allied health. Over 1,000,000 records are held dating back to 1981. (EBSCO 2019)
OVID, Maternity & Infant care database	Access to over 550 English language journals, considered an essential base for academics exploring the health medicine of infants (Sheffield Hallam University 2019)
Medline	Provides authoritative information on topics such as nursing, dentistry, the health-care system and medicine. The system utilises tree-hierarchy and searches from over 5,400 current journals.
COCHRANE	Non-commercial allowing input from over 130 countries, articles are reviewed and aimed specifically at improving health care and processes, summarises high quality evidence for decision makers (Baker *et al.* 2014).

Searches took place on three dates 11/02/2019, 13/02/2019 and 15/02/2019. Successful exploration of a topic area requires well-planned consideration of terminology and needs extreme specificity and preciseness (Aslam and Emmanuel 2010); this was supported by drawing upon the established research question to guide the search language and subsequent literature recovery. Utilising PICO (population, intervention, control, and outcomes) framing was considered, however this was found to be prescriptive and better suited to a purely quantitative methodology (Bettany-Saltikov 2012). As much of the literature reviewed at this stage was quantitative a need for considering differing methodologies was identified in order to achieve a

richer literature return. An alternative tool PEO (Population and the problem, exposure and outcome) was considered effective for mixed-methodology approach and a robust tool which would withstand challenge, examination, and analysis. PEO aims to determine an association between a specific population group, an exposure and the outcome (Munn *et al.* 2018), the PEO approach supported the research questions aim to explore the admission experience following an ED presentation. Commonly PEO will assist in exploring disease, symptom or health condition (Moola *et al.* 2015); however it is also accepted that capturing cultural and individual experiences are best placed within a qualitative framework, reinforcing the decision to apply PEO to this work. The output of the PEO is demonstrated in table 3.1 below (Aslam and Emmanuel 2010, Bettany-Saltikov 2012, Nobel and Smith 2014).

Table 3.1 Output from PEO framing tool to support terminology choice

Population and their problem	Children, Kids, Youth, Child, United Kingdom, UK, England Respiratory, short of breath, breathing problems,
Exposure	Capacity, Intervention, Patient load, Emergency Department/room, ED, A&E, Accident and Emergency, Capacity, Interventions
Outcome	Factors, Causes, Reasons, Influences, Detriments, Zero-day admission, Short-stay, Admissions, Admit, Admitted, Reduce, Length of stay, Hospitalisation

Output from the applied PEO was utilised as search terms in the identified databases (see table 3), the use of boolean operators 'AND' and 'OR' assisted in combing the topic areas together to maximise the search findings. The term ‘AND’ is acknowledged as refining findings whilst ‘OR’ will provide effective expansion to include all inputted terms (The National Institute for Health and Care Excellence 2017). Table 3.1.1 demonstrates the inclusion criteria and underpinning rationale to be applied to retrieved articles to ensure robust and reliable literature is selected (Parahoo 1997).

Table 3.1.1 Inclusion criteria to be applied to potential articles for inclusion in systematic literature review

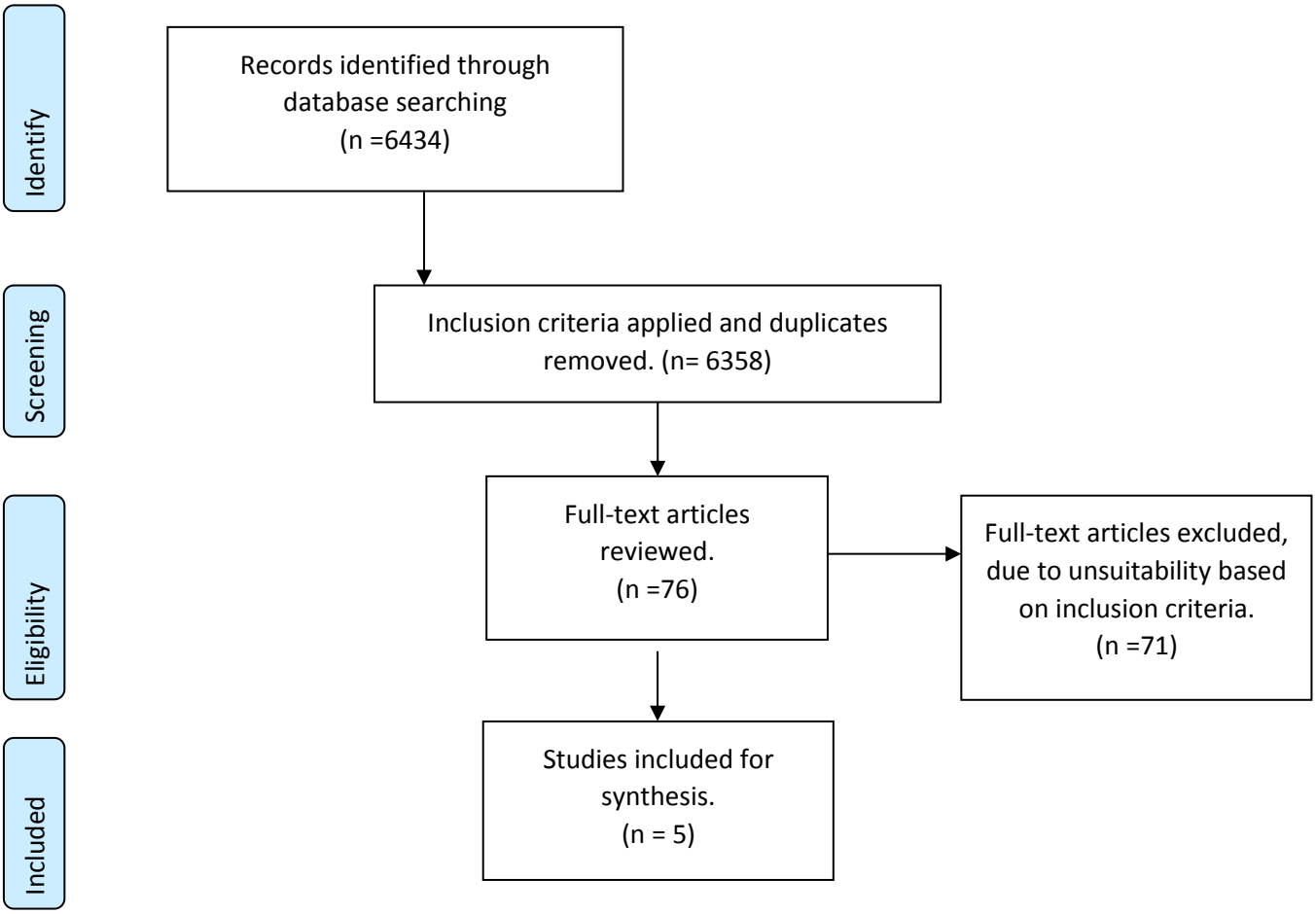
INCLUSION	RATIONAL
Able to identify paediatric patient groups	Matches study aims
Countries with comparable health care service levels	Comparable health and health service demography
Research published between 2005-2015	Utilising contemporary literature and reflective of 10-year period from when project proposal was originally submitted for HEI permissions.
Primary articles	Primary sources not filtered through interpretation
Peer reviewed	Ensures work has been subjected to scholarly scrutiny
Focus on acute and unplanned hospital admissions/ED attendance	To focus on emergency admissions only and avoid inclusion of repeat and planned care admissions.
Acute respiratory	Optimise case inclusion, matches coding identified within NHS Digital

coded diagnosis	(2017c) relating to increased admission of respiratory infections
Academic journals	Aims for a logical structure supported with evidence
Admissions resulting in < two days	Include studies that may cross over two days but deemed short-stay
Paediatric admission/observation unit studies/ward	To ensure all potential areas of acute admission were included omitting intensive care units and high dependency units.
Insurance or state funded care	To be fully inclusive of state funded, health insurance funded and self-funded care.

3.2 Article Recruitment and Review

Following the application of the PEO criterion to the chosen data bases and a final total of five papers were recruited. To maintain accuracy and transparency in the literature article recruitment process a refining flowchart is employed in figure 3.a to demonstrate the practical refinement (Liberati *et al.* 2009). Initial consideration and filtering of articles was conducted online through title review to ensure inclusion of key words. All remaining articles were printed or requested from the Higher Education Institute interlibrary loan system, these were then read and matched against the inclusion criteria (as identified in table 3.1.1), from which the final five articles were identified for inclusion.

Figure 3.a Refinement process of research articles meeting the inclusion criteria



To provide a systematic and robust exploration of the selected articles quality, the 'Critical Appraisal Skills Programme' (CASP) was utilised as an underpinning critiquing tool (Public Health Resource Unit 2006). Despite a growing use of mixed-methodology a lack of suitable critical assessment frameworks (CAF) exists (Hayvaert *et al.* 2013). Therefore, when considering the CAF factors such as ease of use and quality of interrogation were essential to consider. CASP was reviewed and considered a quality tool offering a structured approach to the assessment of the rigour of studies being reviewed (Smith and Noble 2015). Declaring itself as an expert in field (CASP 2018), the tools do demonstrate characteristics considered superior in terms of consistency. CASP frameworks facilitate the appraisal of published articles from a range of methodologies (Royal College of Nursing 2018) and thus maintained consistency in the origin of the tool, by avoiding the use of multiple frameworks.

Although the literature covered a wide variety of concepts, this review will focus on three major themes which emerged repeatedly throughout the literature reviewed. These themes are: age of child presenting, time of presentation and season of presentation. Although the literature presents these themes in a variety of contexts, this paper will primarily focus on their application ED presentations and subsequent admissions. The following sub-chapters detail the interrogation, discussion and findings of the critique. A summary of the appraised literature included in table 3.2.

Table 3.2 Critique summary of final articles for inclusion in literature review

Title, Author and date	Country	Objective	Sample	Data	Methodology	Conclusion/Results
Bekmezian, M, Chung, P, Cabana, M, Masellie, J, Hilton, J and Hersh, A (2011) - Factors Associated With Prolonged Emergency Department Length of Stay for Admitted Children *Pediatric Emergency Care*	USA	Estimate prevalence of and identify contributory factors associated with prolonged ED length of stay for admitted children	2634 total sample size (0-18 years) 51% of total sample <5 years	Data recorded from 2001-2006 using the National Hospital Ambulatory Medical Care Survey. An administrative data base which records use and provision of emergency care.	Retrospective study.	Prolonged length of stay associated was with ethnicity, season and time of presentation to ED. <5 years old children made up large % of ED attendees.
Levett, I, Berry, K and Wacogne, I (2006) - Review of a paediatric emergency department observation unit	England	To review the function of the paediatric emergency department observation unit	4446 children admitted to the observation unit over a 10 month period, May 2004- Feb 2004	Data was retrospectively collected and the following information recorded date and time of admission and discharge, diagnosis category, admitting speciality and outcome (discharged/admitted)	Retrospective case review	Gross seasonal variation identified, with highest admission rate in winter. Two main categories for admission – respiratory and gastro. Highest % were discharged, majority stayed <8 hours.
Mansbach, J, Clark, S, Barcega, B, Haddad, H and Carmago, C (2009) - Factors Associated With Longer Emergency Department Length	USA	To examine factors impacting upon extended length of stay in ED and characteristics associated with ED attendance	Sample group contained 1416 children with an identified extended ED length of stay.	Data obtained via prospective cohort study during 2004-2006 winter seasons. Multi centre of 30 centres. Site examiners were present at site for	Prospective cohort study.	<age group impacted on extended ED length of stay. Time of presentation impacted on ED length of stay. An increase number of health interventions resulted in extended ED length of stay. Breast feeding infants experienced a longer ED stay.

of Stay for Children with Bronchiolitis: A prospective Multicentre Study *Pediatrics*				between 18-24 hours to coincide with high presentation bronchiolitis patients, examiners also reviewed data for inclusion.		
Rose, P and Gardner, S (2008) - Reducing overnight hospital admissions: an audit and literature review	England	To establish possibility of reducing children's overnight hospital admission by identifying characteristics of the children and patterns of medical attention	45 case notes retrospectively reviewed over 3-month period October-December (inclusive). Children aged <15 years.	Case studies obtained using a pro-forma with Clinical Audit Office. Criteria was set that the child had to be admitted under the care of the acute paediatrician and stayed only one night in hospital.	Retrospective case review	The time of day the child was admitted directly impacts upon their length of stay in the admission unit. All 45 cases could be attributed under 4 main diagnosis with N=8 attributed to 'other'. Higher admissions in younger age groups. Those admitted with 'respiratory' had a lower mean average age.
Saxena, S, Bottle, A, Gilbert, R and Sharland, M (2009) - Increasing Short-Stay Unplanned Hospital Admissions among Children in England; Time Trends '97-'06	England	To identify characteristics of isolated short stay admissions to hospital in children <10 years old between 1997-2006	Total sample of 3,682,493 children < 4 years, over 9-year study period 1997-2006.	Data obtained from Hospital Episode Statistics Database, which records all admissions to NHS hospitals in England	Population based trends study	Increase in emergency admissions, with increase in short stay admissions. Short stay admissions increased in the <4 years age bracket. *short stay was deemed < 2 days but not explicitly timed at 48 hours. Therefore, those experiencing <24 hours admissions are included within this sample group

3.3 Literature theme: Age of child

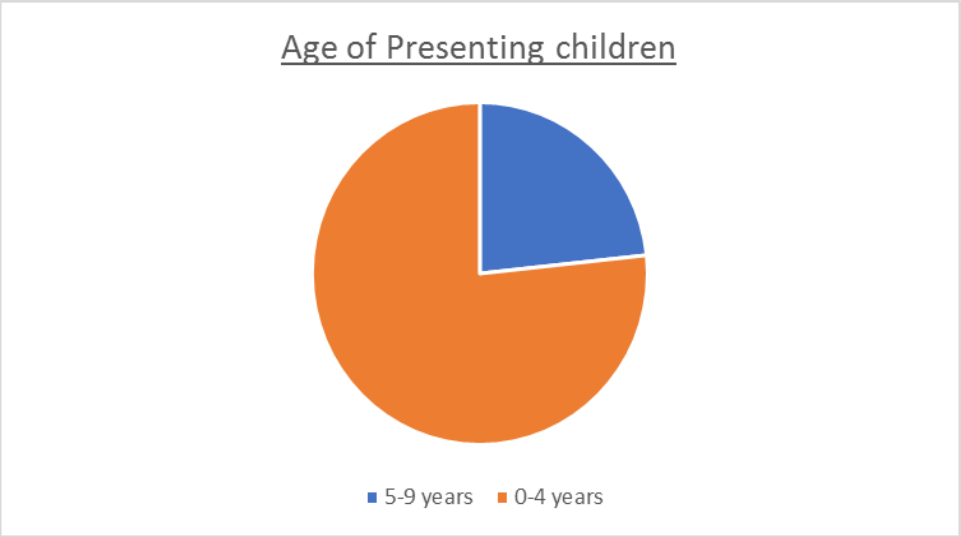
Age of attendee was identified as a significant theme variable impacting on both the ED length of stay in an ED (ED-LOS) and the emergency admission of a patient (Rose and Gardner 2008, Saxena *et al.* 2009, Mansbach *et al.* 2009 and Bekmezian *et al.* 2011). All four of these studies relied upon the collection of retrospective data available either via NHS Trust admission processes or through an American nationally available data-base. It could be argued that strength of this method collection would be the broad population group targeted strengthening potential generalisation of results. However, both Bekmezian *et al.* (2011) and Saxena *et al.* (2009) acknowledged the difficulty of accuracy whilst using nationally available data (National Hospital Ambulatory Medical Care Survey and Health Episodes Statistics, NHAMCS and Hospital Episode Statistics, HES). Due to third party data entry both authors acknowledged the potential for missed data, inputting mistakes and coding errors. Nether the less, whilst the authors remained confident of the studies it does generate some hesitation regarding the generalising of results previously considered strength of the papers. The papers were of an equal distribution of American and British studies, thus providing research from differently funded health services. Whilst the American papers (Mansbach *et al.* 2009 and Bekmezian *et al.* 2011) did not stipulate if the participants were of state or self-funding status the recognition of this potential influence to the study acts as a strength in generalising the outcomes for participants. The median ED-LOS for Mansbach *et al.* (2009) study was identified at 3.3 hours; therefore anything beyond this was considered an extended ED-LOS. Similarly, Bekmezian *et al. (*2011) study acknowledged the mean ED-LOS as 3.7 hours, whilst these timings are comparable, Bekmezian *et al.* (2011) considered a stay of over 8 hours as being extended ED-LOS, Mansbach *et al.* (2009) did not provide a definition of what was considered an extended ED-LOS. Despite this, both papers identified a comparable median ED-LOS and as such this is suggestive that the time required to see, treat and manage the child's ED attendance health requirement was of equivalent efficiency.

Findings from both American and British papers indicated that the younger the child's age of children, and in particular those aged <2 years, the higher the likelihood of the child experiencing an extended ED-LOS and subsequent unplanned short-stay admissions (Rose and Gardner 2008, Saxena *et al.* 2009, Mansbach *et al.* 2009 and Bekmezian *et al.* 2011). Mansbach *et al.* (2009) prospective study of 30 ED departments yielded a significantly suitable population group of 1459 <2 years old infants, however, data on ED-LOS was only available for 97% of this number (N=1416 total). Mansbach *et al.* (2009) identified several contributory factors which contributed to an extended ED-LOS. These factors consisted of the time of day the child presented, and the volume of patients seen at the hospital, Mansbach *et al.* (2009) reported that as the child's age increased

their ED-LOS decreased regardless of the presence of these factors. These findings are replicated in Bekmezian *et al.* (2011), who utilised the national data base NHAMCS to collect data from a six-year time frame (2001-2006)information on hospital admitted children (<18 years) admitted to hospital who had experienced a prolonged ED-LOS (>8 hours) as part of their admission pathway. The study yielded a sample of 2643 cases over a 6-year period, (2001-2006), and ED-LOS data was obtained for 77% of the sample (N=2035), thus providing a bigger sample size than Mansbach *et al.* (2009) and enabling a wider generalisation of findings. Bekmezian *et al.* (2011) study identified that of the cases sampled, 51% was occupied by children aged 0-5 years accounted for 51% of the sample, in comparison to the remaining 49% being represented by 6-18-year olds. This observation reaffirms the higher prevalence of younger age groups presenting to ED's, an observation shared by Mansbach *et al.* (2009). Whilst not explored further within the study it is significant to note the vast difference in admission between the age brackets, through the statistics the study demonstrates children aged <5 years as being 50% more likely to be admitted compared to their older peers chance of admission if aged >5 years. This finding correlates with Mansbach *et al.* (2009), who reported younger age children as being more likely to experience of admission to hospital via ED.

Limitations of both the studies are recognised as these being USA based, raising uncertainty surrounding admission policies and alternative healthcare provision. However, reassuringly a British based study by Saxena *et al.* (2009) highlights similar such findings in England. Saxena *et al.* (2009) study utilised HES and collated data from over a nine-year time frame, 1996-2007, resulting in a sample group of N= 4,800,504. The raw data collection from this study is presented in the below pie-chart (Figure 3.b), and reinforces the high ED attendance rates of 0-4 year olds to ED, as seen in the previous studies (Rose and Gardner 2008, Mansbach *et al.* 2009 and Bekmezian *et al.* 2011).

Figure 3.b Children presenting to England Emergency departments between 1996-2007, broken down in to two age brackets 0-4 years and 5-9 years (N= 4,800,504).



Prior to formal analysis these figures demonstrate in interesting findings to the writer, with regard to the number of unplanned admissions for children aged older age brackets. In particular, admissions for the age group 5-9 years of age, which demonstrates a significantly lower admission percentage than of those aged 0-4 years old. This strengthens findings by Mansbach *et al.* (2009) and Bekmezian *et al. (*2011) whose studies also identified admissions as more frequent for children aged <2 years of age.

Saxena *et al.* (2009) further refined the data in to 'short stay' admissions; short-stay was defined as a length of stay lasting less than two days without a recorded readmission to hospital within the subsequent 28 days. The study demonstrated an overall increase of 41% in short stay admissions over the ten-year study period, with a corresponding reduction of 12% in admissions lasting longer than two days. The study notes a marked increase in the <1 year's bracket; in 1997 short stay admissions for males <1 year age bracket accounted 64.6% of total emergency admissions, by 2006 this had risen 60.5%, these numbers are representative of female patients of the same age bracket and both genders in the 1-4 years bracket. In further support to these studies is findings from 2008 Rose and Gardner (2008), who conducted a case study review of a paediatric assessment unit (AU) the study identified that of a sample group of reviewed 45, collected cases over a three-month period, of these 15 (33.3%) of the admissions were occupied by children aged 3-9 years. However, the remaining 72.7% of admissions fell within the 0 months – 2 years age bracket. The findings from these two studies add further evidence that the younger patient group is more likely to experience an emergency admission compared with their older peers.

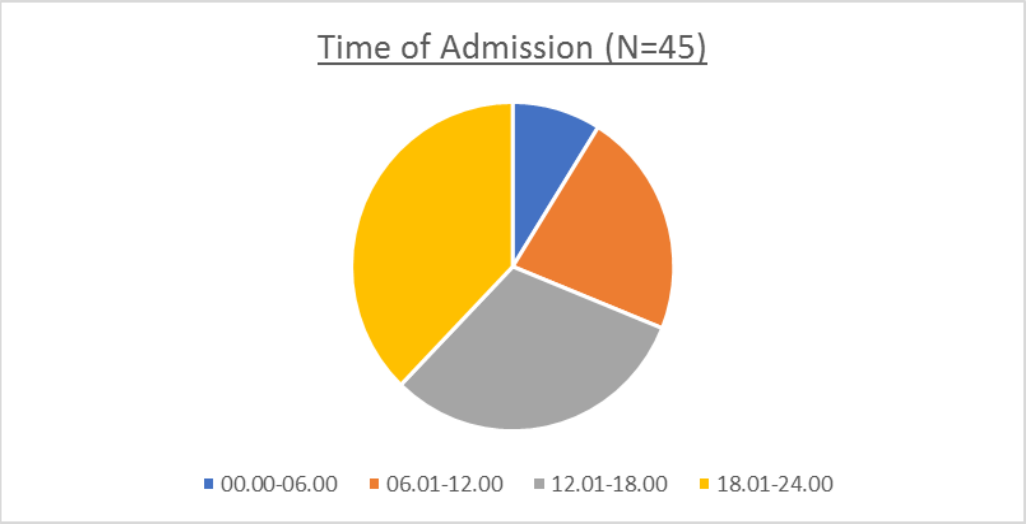
Limitations within both Bekmezian *et al.* (2011) and Saxena *et al.* (2009) studies are recognised and acknowledged, largely due to the reliance of accurate data coding. Both authors identify the potential for error when utilising data collected and inputted historically by third parties, in particular the accuracy of inputting of times relating to patient admission and discharge. Having explored the literature these concerns can effectively be challenged and mitigated against by the similarity of findings between the two studies. Saxena *et al.* (2009), Mansbach *et al.* (2009) and Bekmezian *et al.* (2011) studies were considered as longitudinal, varying from between 2 and 9 years for data collection. These timeframes could potentially allow for political aims and targets, such as those identified in Rose and Gardner's (2008) study, to change and subsequently alter the way in which patients are admitted to hospital for example. Reassuringly, none of the papers refer to this within their work therefore providing assurance that any changes that may have occurred within healthcare delivery during the period of the study did not impact on the presented results. Notwithstanding these limitations there are significant implications and similarities drawn from each of the papers in relation to patient age and ED-LOS and admission, all of which indicate that the younger the age of the child the more likely they are to experience

an extended ED-LOS (Mansbach *et al.* 2009 and Bekmezian *et al.* 2011) and also the more likely they are to be admitted to hospital (Rose and Gardner 2008, Saxena *et al.* 2009). Whilst these studies contribute to the existing body of knowledge there remains gaps in explanation as to the underlying reasons and causes for younger children to be more likely to experience extended ED-LOS and have higher possibilities of short-stay hospital admissions. Investing in research to bridge this gap may assist in the development of pathways to reduce ED-LOS by identifying characteristics associated with extended stays and highlight the number of short-stay admissions that may have been avoidable through reducing ED-LOS.

3.4 Literature Theme: Patient presentation time

Studies by Levett *et al.* (2006), Rose and Gardner (2008), Mansbach *et al.* (2009) and Bekmezian *et al.* (2011) all identified the time of day the patient presented to ED or AU as contributing to either ED-LOS or admission to an AU., Rose and Gardner (2008) collected data from case notes of children attending the assessment unit within their employing Trust between October and December of the same year, this represented the first three months of the unit opening. Inclusion criteria was identified as children aged between 0-15 years of age, be under the care of a paediatrician and stayed for only one night in hospital (Rose and Gardner 2008). A total of 265 children met these criteria and of these a sample of 60 case notes was requested, however only 45 were available for review. Rose and Gardner (2008) rationalise the request of 60 case notes as this figure was deemed manageable by the researchers, however the writers failed to offer any explanation for the final sample number. Rose and Gardner (2008) did not acknowledge this as a limitation of the study; however a lack of robust methodology gives rise to caution when considering the results. The study divided the 24-hours of a day in to four categories for analysis. Distribution of the figures demonstrated an almost identical percentage of children were admitted between 12pm and 6pm, and then 6pm-midnight (shown in Figure 3.c).

Figure 3.c Distribution of time of day children attend Emergency Department as detailed in Rose and Gardners (2008) study (N=45)



Of the sample, only 24% required hospital follow up post discharge, however data was not provided regarding what these follow ups were required for. However, as the data pertains to short-stay admissions only, interpretation that the follow up would be for a relatively minor medical requirement would not be unfair. Findings demonstrated by Rose and Gardner (2008) (see Figure 3.c) are mirrored by findings within Levett *et al.* (2006) study. Levett *et al.* (2006) study reviewed case notes over a 12-month period for children admitted from ED to ED observation unit (N=4446). From this review the peak time of arrivals were reported as 12.00hrs and 24.00hrs, with 71% of admissions taking place within this period. Following the review, it was seen that 65% of discharges also took place within this timeframe and overall 76% of patients were discharged home, usually within 8 hours of admission (Levett *et al.* 2006). These findings differ from those offered by Rose and Gardner's (2008), who state that if a child were admitted >12.01 hours then their admission would last overnight. Causation for this is not clear, however Levett *et al.* (2006) study is based in a unit attached to a main ED whilst Rose and Gardner (2008) explore a unit detached to the admitting ED, it is possible that the physical locality of the units plays some part in the discharge habits, however there is not enough evidence to generalise this wider than speculation.

Mansbach *et al. (*2009) offers similar findings to Rose and Gardner (2008) and Levett *et al.* (2006), demonstrating that of the sample group (N=1416) 85% presented between 08.00hrs and 23.59hrs. However, Mansbach *et al.* (2009) analysis demonstrated children presenting between 00.00hrs and 07.59hrs were subject to a longer ED-LOS that at other times. This finding is not seen within Rose and Gardner (2008) nor Levett *et al.* (2006) study, reason for this is attributed to the latter two studies focusing on the post admission journey to an observation or admission unit. Drawing the three articles together begins to formulate a picture surrounding the patient

journey, and identifies the deficit of considering the articles in silo. Levett *et al.* (2006) further identifies a drop in senior medical presence in the attached ED over-night and identifies this as a potential contributory factor for a child's admission to an observation unit, a consideration also supported by findings previously presented by Mansbach *et al* (2009), comparatively Rose and Gardner (2008) study identified that the majority of admissions were completed by junior doctors. Highlighting these similarities gives rise to the possibility of the experience of medical personnel having influence over potential admissions. Although not discussed within Mansbach *et al. (*2009) research it is worth considering the potential for similar factors influencing extended ED-LOS observed within the work. Levett *et al.* (2006) pays consideration to political influences on healthcare outcomes discussing the four-hour transit time, indicating that an ED-LOS of four hours was not considered a clinical reason to admit the child for observation and therefore was not thought to contribute to findings. The median ED-LOS for Mansbach *et al.* (2009) study was identified at 3.3 hours; therefore anything beyond this was considered an extended ED-LOS. Similarly, Bekmezian *et al. (*2011) study acknowledged the mean ED-LOS as 3.7 hours, whilst these timings are comparable; Bekmezian *et al.* (2011) considered a stay of over 8 hours as being extended ED-LOS. Both studies are American based and therefore not demonstrative of the current four-hour ED transit time requirement as identified in Levett *et al.* (2006) British based study, thus providing consensus in relation to what is considered an extended ED-LOS. Despite the lack of a target transit time (Levett *et al.* 2006) both American studies do highlight time frames similar to that of the British four-hour transit time, providing further reassurance regarding the applicability of these studies within this review and generalising of findings.

Discrepancies were seen between the British and American based studies were seen in relation to the time of patient presentation. Whilst Mansbach *et al.* (2009) and Bekmezian *et al.* (2011) American studies identified high presentation rates between 00.00hrs and 08.00hrs, British studies by Levett *et al.* (2006) and Rose and Gardner (2008) flagged this peak time as >12.00hrs. Both British studies are based within an observation unit environment in England and not an ED, Levett *et al.* (2006) study admissions were directed only from ED, whilst Rose and Gardner's (2008) study focuses on an AU with children referred from either ED or primary care. Levett *et al.* (2006) stipulates that the observation unit was not used to enable the achievement of the four-hour transit target, but patients could be referred under the care of an ED practitioner and the majority of those referred to the OU left <8 hours, potentially indicating an extended period of investigation was required as opposed to a formal admission. This variance could further indicate an increased potential for patients to be referred to the AU from ED due to the need to make a clinical decision as their ED-LOS approached 4 hours This consideration can be supported by Rose and Gardner's (2008) study, where referrals could come from either GP or ED practitioner and in which all children referred >12.01pm remained overnight. This extended length of stay could be

attributed to the clinical need of the child or the physical locality of the unit as previously discussed in this wok. Despite the literature recognising the influence of the four-hour transit time, higher admission numbers and length of stay none have brought these concepts together to consider potential links and contributors to admission.

Exploration of the literature has provided evidence of time of day influencing not only the presentation of children to ED, the ED-LOS but also subsequent short-stay admissions. Whilst doctor provision is touched upon as a contributory factor, no other solid considerations are offered. The previous theme of a child's age impacting on their ED-LOS is not drawn together in relation to the time of day they might present. To do so would help identify characteristics which could potentially identify those children more likely of experiencing an extended ED-LOS and potential short stay admission. This reinforces the existing gap in knowledge surrounding presentation characteristics, thus limiting health-service development and identification of superior care-pathways.

3.5 Literature theme: Season of presentation

The influence of seasons on attendances was identified studies by Levett *et al.* (2006) and Bekmezian *et al.* (2011), these papers being UK and USA based respectively. The differing countries of origin of these studies ensured a variation of demographic and environmental differences was observed. Both studies discussed the influence of seasons on the number of patients attending ED and hospitals and as such categorised winter and summer seasons by months, as identified in table 3.4 below

Table 3.5 Classification of seasons identified by months of the year, as seen in Levett et al. (2006) and Bekmezian et al. (2011) study

Paper	Summer	Winter
Levett *et al.* (2006)	June	December
Bekmezian *et al.* (2011)	April-December	January-March

Data from Levett *et al.* (2006) study (N=4446) detailed a 12-month data collection between 2003-2004, however on inspection the work only represented 10 months' worth of figures (May 2003-February 2004). Nevertheless, the study still identified a marked variation with 505 children admitted in the month of December compared to 246 in June. Levett *et al.* (2006) identified the two-main diagnosis for admission as being respiratory problems and dehydration; the study did not explore any association between the month and predominance of one condition or another. However, Bekmezian *et al.* (2011) study, identified the winter season as being peak activity for respiratory illness, as one of the main diagnosis in Levett *et al.* (2006) study also, an association between winter presentation and a respiratory diagnosis could start to be made. Of Bekmezian *et*

al. (2011) sample, (n=2643), 29% presented within the winter months (3 months), furthermore ED attendance during the winter months was associated with prolonged ED-LOS also, replicating the increased presentation of patients seen in Levett *et al.* (2006) study. Additionally, Bekmezian *et al.* (2011) identified that children presenting in winter were 1.8 times more likely to experience a prolonged ED-LOS. Whilst Bekmezian *et al.* (2011) does not explore this, the increased activity relating to respiratory conditions could be considered a contributing factor due to potential increased clinical need of the patient. The findings of the literature bring together an understanding of the factors influencing ED-LOS and then separately short-stay admissions. What the literature fails to do is draw together if the factors seen in ED-LOS are subsequently reflected in short-stay admissions. To do so would enable the early identification of patient characteristics that are more likely to experience extended ED-LOS, or whose ED attendance would potentially result in a zero-day admission.

Through effective critique and exploration, the literature has effectively exposed what is currently known regarding admission patterns of children with a respiratory coded diagnosis and ED-LOS. Further understanding was gained surrounding short-stay admissions and gaps in existing knowledge identified. A significant limitation of the studies was the lack of British based research in the topic; whilst Levett *et al.* (2006) and Rose and Gardner (2008) offered contribution to the British knowledge, these were small in scale at one site (Rose and Gardner 2008) and neither specifically targeted any preceding ED attendance. Levett *et al.* (2006) acknowledged the unique political influence of the four-transit time currently seen in ED departments across the country. However, Levett *et al.* (2006) failed to consider the potential impact the transit time could have on the ED-LOS of children and the subsequent need to refer to an observation unit due to reaching the maximum time allowed in ED, Rose and Gardner (2008) did not consider this in their study at all. According to NHS England (2017) 1,942,000 attended ED's during April 2017, an increase of 4.0% on April 2016. Furthermore, attendances over the previous twelve months to this were higher than levels in the preceding twelve-month period (2016) (NHS England 2017). During this continual growth of ED attendances, the four-hour transit time target has remained in place, considering numbers of presentation it would fair to reason the number of patients physically in ED would fluctuate throughout the day and as such attainment of the four-hour transit time could fluctuate also. However, data relating to ED capacity was not included in any of the studies reviewed and as such did not feature as a theme when reviewing reasons for prolong ED-LOS. Exploring this identified gap in knowledge would provide sustenance to understanding if the four-hour transit time featured as a contributory factor to extended ED-LOS or short-stay admissions and would be worthy of investigation.

Similarly, a younger age of patient was associated with higher presentation rates and increased ED-LOS (Rose and Gardner 2008, Saxena *et al.* 2009, Mansbach *et al.* 2009 and Bekmezian *et al.*

2011) alongside an increased level of presentations during winter season (Levett *et al.* 2006 and Bekmezian *et al.* 2011). Despite the studies recognising these variations they failed to explore the impact of season on ED presentations and ED-LOS in relation to age. Unfortunately Rose and Gardner's (2008) work did not reduce the data in to seasonal variants, it would of interest to note if admissions to a longer stay unit also varied with season as per ED based studies. Consideration to age and season of presentation would offer practical indication for practice areas regarding staffing and expected case-load pressures, in addition to this an understanding of referrals for admission would subsequently support the patient journey on admission and staff planning. The purely quantitative approach of all these studies, limits the potential of understanding if work place factors impact upon ED-LOS and subsequent short-stay admissions. The absence of stake-holder driven variants when analysing the data removes the potential for exploring health-care professionals' thoughts regarding influences on ED-LOS and admission rates, limiting any wider understanding of the topic.

3.6 Conclusion

Overall the findings of the literature review have supported those presented in the background of this work, with similarities of findings seen both nationally and internationally. The literature has been drawn together and synthesised relating to the current body of knowledge, whilst recognising the limitations of the studies and indeed the number of relevant studies available. This exploration of the current body of knowledge has opened up avenues to be investigated not currently provided by studies available. In order to interrogate these avenues effectively careful attention was paid to the generating of the research paradigm and methodology. Having effectively identified the restrictions currently evident within the knowledge body, this study intended to provide a more unique approach to studying the topic to reveal new findings. The consideration and subsequent construction of the study design and underpinning paradigm is detailed in the following chapters

4. Study Design

Having identified the research aim and explored literature surrounding the aims, the work then moved to defining the study design which would enable effective interrogation of the topic. Through systematic critique an absence of human input and consideration within the research design and outcome was uncovered. The lack of human influence led to the design of a mixed methodology to establish a more diverse and robust understanding of the research topic. The supporting paradigm is discussed at length in the following chapter; however direction regarding data collection and analysis processes are presented in table 4.1, with clarification of detail established in each relevant chapter

Table 4.1 – Overview of research project data collection and analysis

Approach (in conducting order)	Collection	Analysis	Aim
Research Design	**Blend of concurrent triangulation and design**		
Qualitative	Semi-structured interviews based on the research aim of two key stakeholders. Audio recorded and then transcribed verbatim by researcher.	Electronic interpretation tool used to support generating common themes identified by interviewees, convert these themes in to a quantifiably measurable variant.	To identify unseen reality known within work force, from this to identify potential existence of theme for later analysis
Quantitative	Collect data based on themes identified in previous literature review, pertaining to children aged 0-4 years of age, admitted from ED to acute paediatrics which result in a zero-day admission. These children will have a primary diagnosis coded as 'respiratory'	Utilising statistical software analyse the variants identified from data collection and generated from interviews maintaining zero-day admission as the dependent variable	To establish positive or negative correlation between identified variants and zero-day admissions. These variants have been generated through a variety of platforms.
Mixed-methodology	Bring together the data analysis findings and the interview outcomes.	Integrate the data analysis findings in to findings from the semi structured interviews. Then	To integrate findings from the data analysis and interviews, looking for commonalities and challenges

		collectively appraise these against findings from the literature.	between the findings. These combined findings will then be reviewed against those drawn from the literature.

5. Methodology

As evidenced in the previous chapter, studies to date have concentrated on the analysis of empirical data, which has failed to return a solid understanding for admission activity currently being witnessed within the NHS. It is therefore the intention of this study to draw upon a range of resources to develop and broaden current knowledge and application of research. Utilising a positivist paradigm to interrogate would initially seem an equitable approach, with the aim being to draw upon empirical data to develop understanding of causation of happenings (Parahoo 1997) and potentially explain and predict human actions (Cohen *et al.* 2018). The application of the positivist paradigm enables researchers to do so free and independent of the observer or views (Aliyu *et al.* 2014). However, despite dominating research in health and social sciences for many years (Cohen *et al.* 2018) the pure utilisation of the positivist paradigm gives the potential for researchers to become blinkered in to a cause and effect approach to research (Cohen *et al.* 2018). More than simply a rebuttal of positivist approach, a non-positivist paradigm approach offers recognition of the positivist data collection methods but struggles with the application of the treatment terms (Alessandrini 2012). Seeking multiple explanations for a single phenomenon, the non-positivist paradigm actively pursues the human presence and influence in the approach to research (Aliyu *et al.* 2014). In this instance the consideration and application of the thoughts of healthcare professionals (HCP) involved in the admission process would replicate said human element (Aliyu *et al.* 2014). Placing the research aim within either methodology does not lead to a reliable framework upon which to structure research. An expectation by researchers to find a paradigm more suiting to proposed research is an approach historically supported by Kuhn (1970), who supports the searching for paradigms to effectively underpin new science research.

Solely using a quantitative approach was considered limiting to the study, potentially reducing a complex phenomenon to a range of variables, which would not offer comprehensive understanding of the structure (Bryman, 1989), and indeed would echo the limitations uncovered in previous studies. Similarly, the influential work of (Collier 1994) suggests that the sole use of qualitative research in this study would be akin to portraying a subjective opinion as an objective truth. To do this would place HCPs view-points open to being disproved, in light of evidence provided in the back ground chapter of this work this would result in a limitation of true potential findings. Thus, the inclusion of a qualitative approach was employed; focussing on individuals located within the context of the phenomena would result in a richer description and understanding of the structure (Braun and Clarke 2013). The use of mixed methodologies has grown over recent years as the complexity of health care and its investigation has grown also

(Shorten and Smith 2017). Employing both qualitative and quantitative research methods enables researchers to explore and uncover the diverse and intricate layers of multifaceted research areas (Agerfalk 2013). Howe (1988) criticises the use of mixed methodology, suggesting that that incommensurability of the two research approaches would pose challenge to the paradigm supporting the study; however, the use of both qualitative and quantitative approaches was driven by a desire to explore both the social and subjective world whilst not engaging in a forced conceptual framework (Minger 2001).

When considering the paradigm supporting this work it is essential to recognise that science is not simply the analysing of repeated conjunctions (Minger 2006). The study aims to include the actions that help generate the observable events, in this instance the causation for referral of children from ED to the acute paediatric admissions (Archer, Bhaskar *et al.* 1998). The intention of this study was to utilise data relating to characteristic of referrals involving the identified population group and whilst these recordable events could be quantitatively explored, there would remain human experiences that still exist but are not empirically observed (Minger 2006). In order to reveal and access this independent reality the study intended to tap in to the real experience of staff working within the field of emergency care and acute paediatrics, thus drawing out the potentially unseen reality which could be contributing to overall the phenomena (Archer *et al.* 2016). In accepting the existence of an objective reality but challenging the application of a purely positivist paradigm the philosophical framework of critical realism accepts that much of that reality exists independently of the awareness of its construction (Archer *et al.* 2016).

5.1 Critical realism

Through Bhaskar's work the philosophical framework, critical realism, (CR) was developed (Fletcher 2017). Recognising the complimentary importance of empirical social science and philosophy, Bhaskar also maintained that no social theory could be exclusively descriptive and requires a combined evaluative approach (Fletcher 2017), of which there were three-schema. These schemas were identified as the real, the actual and the empirical (Jessop 2005). Reviewing the real through casual mechanisms, the actual through various real tendencies and the empirical, where observations or measurements of the events can be analysed (Jessop 2005). This supports the ontological basis of CR which considers that whilst events can be measured via an empirical approach, these events are mediated through human interpretation (Minger 2006), and that this interpretation of reality is shaped by social aspects including language, culture and political interests (Collier 1994). Despite this, criticism has been directed at the paradigm regarding researchers' lack of clarification regarding ontological and epistemological perspectives (Fletcher 2016). This could be due to the requirement to draw upon high-level philosophical

theories whilst simultaneously reporting on empirical data (Fletcher 2016), thus leading to researchers being unable to fully articulate the epistemology and ontological basis of the work and how these have contributed and supported construction of the study. However, Parr (2013) does discuss the ontological basis being three pronged, seeing the world as the real reality, the empirical reality and the actual reality. Parr (2013) furthers this view stating that the world is developed by depth of events and outcomes and cannot be explained by experience alone. This stratified ontological basis holds significant epistemological implications, as Easton (2010) provides an insightful description stating that only the 'tip of the ice-berg may' be seen it does not mean that the remaining three-quarters is unconnected to the tip we see. Easton (2010) description supports the intention of this study in using critical realism, as CR epistemology accepts that an empirical and observable reality exists but also that the reality may be understood in a totally different way by the observers (Easton 2010).

Thus, the application of CR to this work would enable the closer understanding and reality of the phenomena rather than the just the empirical description (Archer, Bhaskar, Collier, Lawson and Norrie 1998). It is recognised and accepted that although a combination of both qualitative and quantitative will assist in this broad exploration, one research approach may take dominance in the work (Shorten and Smith 2017). However, the embedding of findings from both arms of the research is crucial to justify and promote its use. Furthermore, CR promotes the Quantitative-Qualitative approach of this study in recognising both paradigms as essential to meeting the reality, thus recognising that whilst the quantitative element may hold more prominence in the study, it does not demonstrate a dominance of importance (Schoonenboom and Burke Johnson 2017). Venkatesh and Brown (2013) provide a non-exhaustive list of advantages to utilising mixed methods within in a study, such as those seen in this work involving the combination of paradigms to contribute to the depth and breadth of the study. Therefore, embarking on a mixed methodology study facilitates making known explicitly the knowledge which is known implicitly (Collier 1994).

When considering the mixed methodology design this study identified characteristics of both concurrent triangulation and concurrent nested design (Hughes 2016). In recognising the need to explore implicitly understood knowledge by way of human input, in this case health-care professionals, concurrent triangulation enables the use of both quantitative and qualitative data to contribute towards the defining of variables for investigation (Gonzalez Castro *et al.* 2010). However, as previously explored, critical realism accepts the prominence of one design method, but refutes the dominance of one over the other (Schoonenboom and Burke Johnson 2017). Therefore, the application of concurrent nested design is required to supports this, enabling both quantitative and qualitative data to be collected at the same time, but permits one methodology to carry more weight than another (Creswell 2009). Shortfalls commonly seen in mixed-

methodology studies is noted as the capturing of qualitative knowledge being seen as a preliminary stage of a study, which is subsequently used to refine quantitative procedures or instruments (Bryman 2007); the core study is then perceived as a quantitative data capture with analysis (Gonzalez Castro *et al.* 2010). Whilst it is accepted that few studies manage to fully unify the application of both methodologies, this study intends to utilise the qualitative and quantitative findings concurrently in both data analysis and then through the triangulation of findings to gain a stronger and more robust perspective of the understudied phenomena (Hughes 2016). The unified mixed methodology design seen in this work aids in removing the limitation of the sequential approach commonly observed when attempting mixed-methodology studies (Gonzalez Castro *et al.* 2010).

The application of a mixed methodology paradigm raises debate regarding the inclusion of a hypothesis, research question or in fact both (Creswell 2009). Indeed, as this work has already identified, there is not a dominance of one methodology over another, and as such a combination of the two in the formulation of a research question and hypothesis is required to strengthen the study aim (Creswell 2009). To achieve an effective mixed methodology Creswell (2009) suggests developing both quantitative hypothesis and qualitative research question, each to be delivered with the corresponding element of the study. Whilst this approach would ensure effective addressing of each paradigm it could potentially fuel the limitations suggested earlier, in that the mixed-methodology of the study could be restricted to being seen in stages (Gonzalez Castro *et al.* 2010). To reduce the potential of a sequential approach, Creswell (2009) further suggests also presenting a hybrid research question, drawing together both strands of the study in to a presentable form, emphasising the importance of both paradigms but overall demonstrates their combined strength (Creswell 2009). To ignore the strength of each paradigm's contribution to the mixed-methodology was felt to fail to appreciate the nested design approach. Therefore, the approach laid out by Creswell (2009) was adopted ensuring the provision of research aims and considerations of all strands of the methodology, accumulating in the embedding of these strands in to the overall aim.

The CR thought process is embracing of a multi-dimensional and multi-layered vision on life (Minger 2006, Zarzecki 2015), which empowers researchers to admit their knowledge position as fallible (Archer et al. 2016). The nature of this recognition assists in mitigating against, or bracketing, unacknowledged preconceptions by requiring all three dimensions to be pulled into focus to generate knowledge (Zarzecki 2015). Whilst Heidegger (1962) would argue that humans are unable to bracket pre-conceptions, the continual consideration and transparency of the approach enables a deeper level of reflection of all elements of the study, from data collection, user involvement and analysis (Tufford and Newman 2010). Maintaining a cognitive awareness in the development of the study so as to achieve transparent findings has enabled the reflection of

potential pre-suppositions which would potentially have challenged the study (Tufford and Newman 2010). Utilising a mixed-methodology in order to reach the three identified schemas relevant to CR has, in turn, promoted a transparent approach through which to investigative works and findings. Appreciating Heidegger (1962) argument of humans being unable to bracket pre-conceptions, the use of mixed methodology to interrogate and explore the three schemas seen in CR (Minger 2006) went towards the reducing the potential of pre-judgements influencing the study by drawing upon the findings from those working in the healthcare arena. Exploring and interrogating the issue using a multi-layered approach, such as CR, aims to enhance the understanding of the phenomena and to highlight contributing factors which could be further addressed to either initiate practice change or implement supportive action in order to better patient experience and application of NHS resources. This approach echoes the guiding principles outlined by the National Institute for Health Research (2019) (NIHR 2019), aimed at adding value in the research framework. The guiding principles cover three main components which have been woven in to this work, the identification of a topic with relevance and need for exploration, which is conducted through high quality research which recognises and minimises potential for bias (NIHR 2019). The uniqueness of this topic is supported by studies to date having concentrated on the analysis of empirical data, which has failed to return a solid understanding for admission activity currently being witnessed within the NHS.

5.2 Data Analysis

Development of the mixed-methodology approach to the research design required in-depth consideration of the data analysis style (Noyes *et al.* 2019). Selection of the correct analysis framework can be difficult due to the complexity of the topic and the variety of information collected, indeed the usefulness of utilising a mixed-methodology approach may not be supported until the data and knowledge is brought together (Petitcrew *et al.* 2019). Noyes *et al.* (2019) explored this topic, selecting three case-studies which utilised both qualitative and quantitative data and the methods of interrogation explored, the findings of which were drawn upon to influence the analysis pathway of this study. Through Noyes *et al.* (2019) findings, the minimally used Bayesian theory to achieve synthesis of qualitative and quantitative evidence, was deemed as offering the most effective interrogation method suitable for this study (Voils *et al.* 2009). Published posthumously in 1763, the Bayesian theory was developed by Thomas Bayes, and originally coined to assist in the calculation of inverse probability based on the events of known probability (Andrews and Baguley 2012). Through the years of revisit and development the Bayesian theory reached the understanding that to calculate forwards, previous experiences should be incorporated, including human experiences (Andrews and Baguley 2012). Therefore, the theory is recognised as an effective method for synthesizing qualitative and quantitative research findings, enabling qualitative evidence to contribute to data analysis by identifying

variables to be included (Dixon-Woods *et al.* 2005). Bayesian theory prioritises the importance of qualitative research acknowledging that it is often used to identify variables of interest which can then contribute to and be used when conducting a quantitative element of a study (Dixon-Woods *et al.* 2005). Fusing findings from both quantitative and qualitative strands is seen to more properly reflect the diversity of evidence, particularly to show where quantitative data relevant to people's concerns might be absent (Noyes *et al.* 2019). This approach is in keeping with the principles displayed within critical realism, where the need to examine and understand realities on a multi-level basis is the goal to achieve true understanding of those realities (Collier 1994). Originally developed as a mathematical calculation (Andrews and Baguley 2012), and considered conceptually straightforward to use (Dixon-Woods *et al.* 2005), techniques for achieving Bayesian analysis remain under development, with many methodological issues yet to be resolved (Dixon-Woods *et al.* 2005). This includes the development and impact of different methods of qualitative synthesis. As such this provides the opportunity for this work to continue to develop and mould the application of Bayesian theory within the synthesis of the mixed-methodology findings and analysis of concepts.

As this work progressed each strand of the mixed-methodology was explored and detail of its construction provided, however it is important to note that the design of this study was placed through the rigorous scrutiny of the Integrated Research Application System (IRAS). IRAS reviewed all intentions and considerations of the study and in particular the ethical consideration of quantitative data collection and ethical considerations of qualitative exploration. Quantitative data surrounding referral and admission characteristics relating to the research aim was to be analysed looking for any relationship between these and zero-day admissions. Working knowledge from HCPs in emergency care and acute paediatrics was to be accessed to develop, support and challenge potential variables for analysis, whilst also providing an expansive qualitative knowledge base upon which to compare, validate and potentially dispute findings. When accessing professionals working knowledge the privacy and security of these individual's personal contribution was paramount, and extensive measures were planned to ensure all data recoded was anonymised, coded and kept within secure encrypted data storage.

5.3 Ethical considerations and approval

Full ethical and legal implications of managing data was considered and addressed and ethical committee approval was sought from the University of Northampton ethics committee and the NHS Health Research Authority (see appendix A) to ensure that all issues of anonymity and potential breeches were considered. The project was reviewed and agreed by the hospital research boards and committee who supported involvement of their staff in the qualitative

development of this work. Further detail of the journey which influenced this study is included within the relevant chapters.

6. Development of variants through qualitative approach

Background

To establish human reality in the work and a deeper knowledge of the phenomena (Minger 2006, Herborth 2012) semi-structured interviews with health-care professionals were employed (Parker 2003), the intention being to establish parity with findings from the literature or indeed to raise new areas of exploration. The use of semi-structured interviews provided a focus of topic for the participant whilst enabling a detailed exploration of the topics social influence (Gill, Stewart, Treasure and Chadwick 2008), (Braun and Clarke 2013). The exploratory nature of semi-structured interviews allowed the probing of participant's knowledge base to contribute to the research aim (Stuckey 2013). Utilising professionals' contributions to influence the research direction aimed to enhance and supplement the themes identified within the literature analysis; these themes would then be used as variants to explore within the data. This added further strength to the research design and reducing potential bias that may be introduced by the researcher (Stuckey 2013). A previously validated semi-structured interview by Kyle *et al.* (2013) was used with minimal adaption by way of question removal to make it suitable for gathering information from the stakeholders. The original interview structure was developed to support Kyle *et al.* (2013) study regarding avoiding inappropriate admissions between primary care and community children's nurse services, themes through the work were pertinent to this study and as such the tool deemed suitable. Clinical research can be conducted where no validated instrument exists however to improve robustness for this approach, the researcher would need to justify the importance the tool held in to the study (Schou *et al.* 2011). Kyle *et al.* (2013) tool had already passed through Higher Education Institute ethical approval and ethical approval from the NHS committee local to the original study (Kyle *et al.* 2013), thus supporting and reaffirming the validity and reliability of the tool (Tsang *et al.* 2017). The health research ethics board that reviewed this study also supported the use of a previously validated tool, deeming it as meeting the requirements of the proposed study. Whilst it was recognised that semi-structured interviews could be lengthy it was reassuring that the method offered the collection of potentially complex and sensitive details. It was hoped this would offer an enhanced contribution to the study (National Institute for Health Research 2009) (NIHR 2009), and whilst more expensive and labour intensive, personal interviews were considered a superior way of achieving the level of high quality knowledge desired (NIHR 2009). Details of the interview questions are

seen in the transcribed interviews in appendix A. Exploration of qualitative findings enabled the development of variants not identified through the literature review. The amalgamation of these variants ensured the true use of mixed methodology and also the mixed methodology exploration of the available evidence. The reliance on variants generated through the literature search alone would place complete dependence on the researchers' interpretations and investigation of the literature, thus undermining the philosophy of critical realism and removing the appreciation of human reality.

Method

Engagement in the study was established with the lead paediatric consultant and an ED consultant of a large district hospital within the identified research environment. Both individuals lead on acute paediatric admissions within their clinical areas. In addition to this a Nursing Midwifery Council registered nurse on the child sub-section from paediatrics and ED, both of whom were on the same NHS pay-band 7 (NHS employers 2019) as each other were approached for inclusion. A variety of literature supported that many participants would be unnecessary (Boddy 2016); therefore the intended interview number of four was considered sufficient for the gathering of rich knowledge (Malterud, Siersma and Guassora 2016). Whilst not frequently used in qualitative social science research, the sample method of quota sampling was considered and applied to this study (NIHR 2009). Recognising that the sample was the same as the desired research population (Acharya *et al.* 2013), quota sampling enabled the recruitment of participants who had pre-identified and demonstrated the required professional characteristics required to achieve an enriched knowledge base for the study (Acharya *et al.* 2013).

Despite initially positive verbal engagement from ED staff members this did not transpire in to participation. Active communication and engagement were sought by the Trust research department to enable local permissions for the study. However, this did not prompt response, the Trust research department would therefore only give local permission for the paediatric team to be approached and engaged in the study. It was unclear why the ED team did not pursue the study as keen interest had previously been shown, but in keeping with principles discussed by Garton and Copland (2010) no further contact was made with ED or attempts made to gain their cooperation. Consent was obtained for participation from the paediatric unit via the local Trust processes. Contact was made with identified participants via email with an IRAS approved participant information sheet (PIS) (see appendix A). Following a positive response via email from the participants, a paper copy of the PIS and consent forms were hand delivered to the participants where the opportunity to answer any questions was provided. Interestingly no

additional questions were raised at this time. Dates for the interviews were set with the individuals in line with their availability. Interviews were audio recorded as detailed in the study design chapter and the signed individual consent forms were obtained at the same time, examples of the consent forms are located in Appendix D.

Positive Engagement with stakeholders aimed to help broaden the knowledge base from a social perspective (Concannon *et al.* 2014), assisting to develop and support variates to explore; further supporting the underlying CR approach of the research (Sox and Greenfield 2009). Employing both stakeholder driven variants and those identified from an underpinning literature base allowed for a cross-checking of consistency in the variants identified (Concannon *et al.* 2014). An hour of time was allocated per interview, but participants were made aware that this was an outline and not a set requirement (Braun and Clarke 2013), interviews where audio recorded and transcribed verbatim. The sequence and delivery of the interview questions were predetermined and it was ensured that the same questions were asked of each participant (Cohen *et al.* 2018), this approach helped in maintaining the reliability of the interview (Silverman 1993). Whilst Parahoo (1997) recognised that not all words mean the same to everyone, Oppenheim (1992) champions that changing the words in turn changes the content of the question. Paraphrasing when requested was facilitated, however the meaning of the questions was maintained (Parahoo 1997), in turn this reinforced the participants understanding and of the interview content (Parahoo 1997). Great care was taking during the verbatim transcribing process of the interviews, remaining acutely aware that the transcription would be two-steps removed from the original interaction (Braun and Clarke 2013). Moving the spoken language in to written language with meticulous detail ensured a thorough orthographic transcribe, this included the application of all language both word and non-semantic sounds (Cohen *et al.* 2018). Doing so safeguarded the quality of the transcribe process and in turn reduced the chance of cleaning the data and therefore editing how the participants have expressed themselves (Braun and Clarke 2013). This approach also aided to increase reliability of the work by reducing the influence the researcher may have had due to previous knowledge base (Davidson 2009). Transcribes were then sent on to the participants for review, this resulted in one interviewee retracting one sentence from their interview as it was felt too personal to share. The retraction of data is recognised as a risk when asking for interviewee review (Hagens *et al.* 2009), however ensuring the accuracy and mutual trust of the participant-transcribers voice and relationship were considered more desirable for validity, reliability and credibility (Lapadat 2000).

As common with much of qualitative research, NVivo software was used to support transcription analogy and to develop themes from the data (Thomas & Harden, 2008) (Jones and Diment 2010). Various analysis software options were considered, however NVivo offered a more insightful method of information management as it requires the manual transcribing of the

interview notes (Jones and Dimnet 2010) Whilst time consuming, this process provides the opportunity for the researcher to engage more meaningfully with the development of themes and analysis of the data (Jones and Dimnet 2010). During the interviews the researcher maintained attention and focus on the participant, this could mean vital information and interesting themes were overlooked, however completing the transcription process enabled the researcher to re-immerse themselves in to the knowledge (Jones and Dimnet 2010). Due to the nature of the researcher developing the emerging themes from the interviews, the potential for bias in interpretation process was acknowledged, to address this peer supervision was used to check and establish reliability and validity (Cretchley, Rooney and Gallois 2010). The use of 'critics' to consider the quality of qualitative research supports the differentiation between research that is found interesting and research that is of good quality (Braun and Clarke 2013). Utilising critics enables some assurance of ecological validity (Braun and Clarke 2013), ensuring the consideration of the data in conjunction with the 'real world'. This would ensure the on-going evaluation of whether the interview findings are representative of other clinical settings and supports judgement regarding the original interview tool, its implementation and interpretation of findings (Leung 2015). As discussed, the participant review of their own transcripts would also act as a reliability and accuracy checker in the development of themes (Cretchley, Rooney and Gallois 2010).

Maintaining an experiential approach allowed for a fuller and deeper understanding of the phenomenon as seen by the clinicians in the field (Braun and Clarke 2013). Taking time to appreciate the complexities as identified within the interviews ensured the interviewees remained the priority in uncovering a richer perspective of the topic which could in turn contribute to the research investigation (Braun and Clarke 2013).

6.1 Development of variants through semi-structured interviews

Analysis

Following verbatim transcription of the interviews, NVivo was utilised to gather commonalities between the two professionals, identifying common themes and trends not previously identified through the literature review and analysis, thus enriching the exploration of the phenomena (Reicher 2000). Utilising a complete coding approach, where 1 referred to the Doctors response and 2 referred to the Lead Paediatric Nurse (LPN) allowed for the capturing of features that could hold potential relevance to the research question. In total nineteen nodes were populated with content from both interviews as demonstrated in table 6.1.1.

Table 6.1.1 Interview coding output

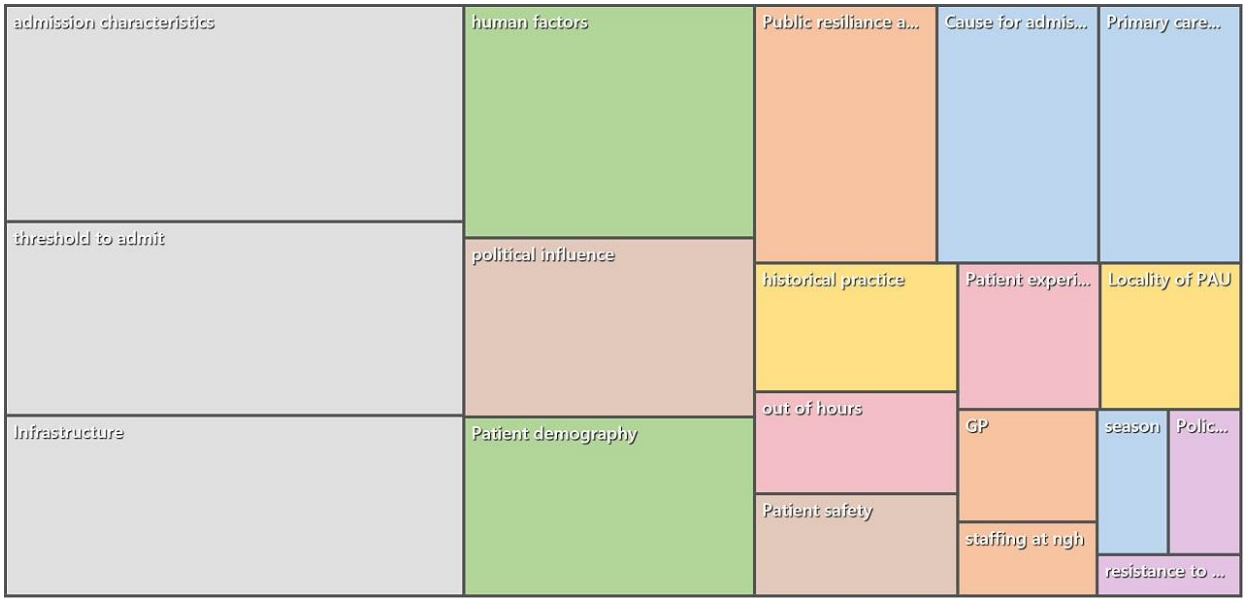
Name	Sources	Number of References made
Admission characteristics	2	19
Cause for admission	2	8
GP	1	3
Historical practice	1	5
Human factors	2	20
Infrastructure	2	16
Locality of PAU	2	4
Out of hours	2	4
Patient demography	1	10
Patient experience	2	4
Patient safety	1	4
Policy of admission	1	2
Political influence	2	10
Primary care accessibility	2	7
Public resilience and education	2	9
Resistance to change	1	1
Season	1	2
Staffing	1	2
Threshold to admit	2	17

Using the NVivo software capabilities a node hierarchy was generated on the transcription information (Figure 6.a), enabling the identification of the three most commonly discussed themes (Jones and Dimnet 2010), these are listed as -

1- admission characteristics
2- threshold to admit
3- Infrastructure

The identification of these main themes acted as the basis for further exploration in terms of interrogating the interviews. Whilst it is acknowledged the literature would contain a plethora of points interesting for exploration, to attempt to review them all would risk dilution of the analysis which could be offered in this study.

Figure 6.a NVivo node hierarchy output



Findings

Table 6.1.2 demonstrates the number of references the HCPs made to each of the top 3 themes. Reviewing the feedback from the interviewees demonstrated a relatively equal percentage of discussion from each participant in relation to two of the most prominent themes (table 6.1.2). Interestingly there was a significant difference in the coverage between the two interviewees when discussing the second most prominent theme, threshold to admit, (demonstrated in table 6.1.2). Exploring these differences facilitated the development of a deeper understanding of the working reality which could be used in conjunction with the observed reality in order to explore the research topic (Easton 2010).

Table 6.1.2 Professionals' references to top three themes

Professional	Theme	References	Interview coverage
Doctor	1	10	7.37%
Lead Paediatric Nurse (LPN)	1	7	7.34%
Doctor	2	12	8.86%
LPN	2	5	4.39%
Doctor	3	10	11.19%
LPN	3	6	10.37%

Within the threshold to admit node Doctor referred to the tolerance of medical professionals in admitting a child to hospital.

'the level of threshold to present is is much lower you know either among the public themselves turning up in A and E or the GP referring' (sic)

'I think the threshold to refer onto us from A and E has gone down a bit the but the population has also increased so that's another reason to see increased numbers' (sic)

However, the same views are not as apparent in LPN coding, in which LPN cited more frequently that the referrals from A&E are considered appropriate, however did concur that the threshold from GP's to admit children may have altered.

'I think the referrals we get are usually appropriate from the ED' (sic)

'I think GP's err on the side of caution when they are referring and I think they get quite worried particularly when they have particularly young children erm and they might be inexperienced and in paediatric' (sic)

Although not identified as a prominent theme LPN interview did hold a high coverage relating to '*public resilience and education',* with 7.25% of the interview coverage discussing a perceived change in the public's ability to manage health due to a reduction of health promotion advice and extended family support previously available. Interestingly Doctors coverage of the same node only produced 1.56% with no discussion of health advice or contributing factors.

'I think the nurses certainly find there is a change in that parenting and general advice in how to manage common illnesses that' (sic)

This observation may be related to the individuals' professional roles, as referrals to acute paediatrics are historically considered and accepted or rejected by a doctor and not the nurse (NHS 2017). As such only 'medically accepted' children are admitted on PAU, this could amount to a reduced number of children seen versus 'potential' admissions deflected by the doctor.

The prominent theme of 'admissions characteristics' featured with equal coverage in both interviews, the content consisting largely about the time of presentation of GP referred children to PAU. Both participants highlighted the chief time for these presentations to occur between 11am until 6pm in the evening

'I would say from about 11 o'clock onwards would be from when they start to get more' (sic)

'six o'clock onwards as it starts to get in to the evening time GPs are less happy I guess to manage the children at home' (sic)

'PAU starts to increase around lunch time and then subsides around school run' (sic)

'around four until nine or ten and I think probably A and E don't see the little blip around lunch time when the GP surgeries finish and all the referrals have been made the emergencies seen by GP's because they come directly to us' (sic)

Discoveries from the interviews interrelated with findings in Rose and Gardner's (2008) study who identified that 37.8% (N=45) of presentations occurred between 18.01 hours and 00.00 hours, and overall 68.9% to present in second half of the day (>12.01hrs). In both cases the area considered was an assessment unit, demonstrating consistency regardless of differing population and health demography's. Levett *et al.* (2006) considered admissions to an OU attached to an ED and reported peak time of admission to be between 12.00 and 24.00hrs. Considering this against the backdrop of the participants' comments and Rose and Gardner's (2008) study suggests that in-hours children are being seen by the appropriate routes of health-professional in primary care. In combination with findings from the literature review the variable of 'time of presentation' is indicated as valuable to explore.

Discussion surrounding the node 'infrastructure' featured dialogue recounting to changes to service provision, both in primary and secondary care, as having perceived impact on the presentation of children aged under four-years old to PAU. Both participants referred to the previously discussed four-hour-transit time and a perceived reduction in primary care health promotion as a cause for not only increased admissions to PAU but also for increased presentation at ED.

'health promotion advice and support to the families that has had an impact as has school nursing in that lack of relation in way of erosion of services in the community shows in the patients that we get through because they've not got that advice going on in the community yeah I think over the years that's certainly had an impact' (sic)

'I will usually challenge them that's not a reason for transferring them you know have they got a clinical plan in place have they been seen etc and I think it is sometimes because they have those clinical targets erm and I understand that but it's got to be a safe transfer whether it's a breech or not'

'I think GP closing means a lack of access or a perceived lack of access after you know half four five o'clock means they presents to A and E which means we see this build up four o clock until half nine ten and then we see it drop right away' (sic)

Having completed and explored the rich knowledge returned from the semi-structure interviews the characteristic of the four-hour transit time was identified as a new variant not identified nor analysed through the previous systematic literature review, thus generating a new passage of investigation. The development of this theme for inclusion stemmed from the deeper understanding revealed by the HCPs involved (Braun and Clarke 2013), enabling the researcher to explore the intricate layers of the topic area (Agerfalk 2013). In line with the applied Bayesian analysis approach, in order to reach a common metric for analysis the qualitative theme identified will be converted to replicate anticipated quantitative data trends derived from the planned systematic literature review (Voils *et al.* 2009). In doing this it would result in the intended fusing of qualitative and quantitative data so as to achieve a stronger analysis of the diversity of evidence (Noyes *et al.* 2019).

6.2 Variables to be explored

Following a thematic analysis of the semi-structured interviews and the amalgamation of these findings with those draw from the literature review, the following independent variables were identified for exploration in relation to the research aim (table 6.2.1).

Table 6.2.1 Variables identified to be explored

Independent Variable – limited to children presenting to ED without GP referral	**Dependent variable**
Age of child	Zero Day Admission
Season of presentation	
Four-hour-transit time at the point of admission to acute paediatrics	
Time of day presenting to ED	

7. Quantitative analysis

Hypothesis
A relationship exists between zero-day admissions of children aged 0-4 years with a primary diagnosis of respiratory condition and the referral pathway evident between ED and acute paediatrics.

Null hypothesis
No relationship exists between zero-day admissions of children aged 0-4 years with a primary diagnosis of respiratory condition and the referral pathway present between ED and acute paediatrics.

Background

The themes identified and explored from the literature review were utilised to define the variables for investigation and are detailed as the independent variables in table 7.1 below (Pallant 2013); it is worth recapping that the variable of 'Four-hour-transit time at the point of admission to acute paediatrics' was developed from the qualitative contribution of this study. The dependent variable is identified as 'zero-day admission' and will be tested as a dichotomous variable, with the value either being a zero-day admission (0) or a non zero-day admission (1). This dependent variable was used to examine potential relationships between the independent variables identified in table 6.2.1. Whilst it is acknowledged that correlation does not indicate causation between one variable and another (Pallant 2013), the indication of a cause and effect relationship between the variables would assist in bridging the gaps in knowledge discussed in the previous chapter and developing new and stronger understanding in the topic.

Table 7.1 Variables identified for analysis

Independent Variable	Dependent
Season	Zero Day admission
Age of child (0-4 years)	Zero Day admission
Time of presentation to ED	Zero Day admission
Four-hour-transit time at the point of admission to acute paediatrics	Zero Day admission

Reliable exploration of the cause and effect of the identified variables required careful consideration of which statistical analysis approaches to utilise (Field 2013). The study intention was to examine the relationship between two variables, conscious that variables do not exist in isolation (Balnaves and Caputi 2001) a bivariate approach was adopted to examine the cause and

effect between two variables (Balnaves and Caputi 2001). After consideration of the potential tests' binomial regression and Chi-square (Stangroom 2015) were selected as most appropriate to test the fit of the observed data (Field 2013). The application of data analysis will be discussed in a later chapter.

Method

To interrogate the variables, data was to be sourced from NHS Trusts, the data required was driven by the research aim and the identified variables, inclusion criteria for data collection is detailed in table 7.2

Table 7.2 – Inclusion criteria for data collection

Data Required
Children aged 0-4 years
ED attendances resulting in admission to acute paediatrics
Respiratory diagnosis
Data collected between March 2017-March 2018

Statistical Package for Social Science (SPSS Version 22) was chosen as the data analytical tool with which to explore data and provide trends and analysis. SPSS provides itself as an efficient data management tool which allows for a significant level of control from the researcher with minimal requirement for data coding knowledge. Statistical Analysis System (SAS) was also reviewed, and whilst comprehensive in terms of its ability to manage large data sets and fast processing capacity, the software was considered unsuitable due to the detailed need for coding and the requirement for different programmes for data mining. SPSS is considered a superior tool in terms of its easy user interface and popular establishment in social science research; furthermore the researcher has previously used the software with positive results providing support for its use.

The data required was identified as routinely held by hospitals (NHS Health and Research Authority 2017) from which the three identified variables could be readily retrieved. The use of a Confidentiality Advisory Group (CAG) application was initially considered to gain access to this data. The completed CAG application was put forward to Integrated Research Application Service (IRAS); however concerns were raised by IRAS regarding patient consent relating to the

researcher accessing the data. Curcin *et al.* (2012) acknowledge the difficulty in accessing and utilising routinely collected NHS data. Curcin *et al.* (2012) further recognised that whilst NHS data collected for clinical or administrative purposes can be used without consent for clinical audit or service evaluation, it cannot not always be accessed and used for research as easily. Following the apprehensions raised by IRAS, discussions took place with an expert in information governance at a local Northamptonshire district general hospital, regarding the use of a Freedom of Information (FOI) application. It was considered that by utilising the FOI approach this would help reduce ethical concerns expressed by IRAS regarding retrospectively gaining access to patient's notes without gaining their explicit permissions. The approach also aimed to provide enhanced anonymity assurance, (Savage and Hyde 2012); provider organisations were responsible for removing all identifiable details at source and prior to disclosure (Savage and Hyde 2012). An alternative data collection would have been the use of Hospital Episode Statistics (HES), which provides recorded NHS data considered suitable for research. However the level of detail and intricacy required for each case study was not met by the more generalised collection methods of Hospital Episode Statistics (Thorne *et al.* 2016), in particular the ability to track the ED admission at individual case level, with any subsequent hospital admission. Wright-Hughes *et al.* (2018) explored the use of HES in comparison to data collected by the researcher directly from an NHS hospital. Wright-Hughes *et al.* (2018) concluded similar findings to Thorne *et al* (2016) in that whilst HES data enabled a larger data set, exploring the data led to ambiguity regarding the classifications of data recorded.

Following these considerations, a FOI application to the chosen hospital Trusts was decided as the most effective and robust tool with regards to data access and potential data protection concerns (Fowler *et al.* 2013). The NHS England Publication Scheme provides details on information which is already readily available in the public domain; however the data required for the study was not obtainable within this scheme, providing further support for an FOI application. FOI requests were made to four NHS Trust Information Governance departments; the data requested is outlined in table 7.3 (Fowler *et al.* 2013).

At this stage it is important to note that as data was obtained via a freedom of information request no active experimental design was undertaken. Regardless of this, full ethical and legal implications of managing data was considered and addressed. Therefore, ethical committee approval was sought from the University of Northampton ethics committee and the NHS Health Research Authority to ensure that all issues of anonymity and potential breeches were considered.

Table 7.3 FOI requested data requested for the time frame of March-March 2017-2018

FOI requested data request
ED overall patient capacity per day on an hourly breakdown
Grade of referring medic from ED to paediatrics
Time of patient arrival to ED
Time patient was seen by ED practitioner
Time patient was referred to paediatrics
Time patient discharged from ED to paediatrics
Last recorded PEWS score of referred child
Length of patient stay in paediatrics
Diagnosis code on discharge from paediatrics
Age of patient

7.1 Population and research sample

The decision to use a FOI application to obtain required data helped guide development of the population sample (Annandale and Lampard 1993). Gaining access to information in this format meant the NHS Trusts were required to gather the specific details set out in the request and therefore only those that met the request criteria were included in the returned information (Savage and Hyde 2014). This resulted in the sample being gathered in to a cluster of potential participants, consequently fitting the probability cluster sample framework (Parahoo 1997), meaning it was subject to a one stage cluster sampling plan at collection site (Balnaves and Caputi 2001). As previously discussed, having received the data it was then refined in to suitable and useable form, resulting in a two-stage cluster sampling plan (Tashakkori and Teddlie 2003). The strength of using cluster sampling is the population already existed and would be automatically gathered through the FOI information return, acting as the stage-one cluster sample. Furthermore, as the sampling framework selected only one certain group from the entire population, the method required less resources and researcher activity (Bergin 2018). The appropriateness of the sampling framework is supported by the characteristics of the required population, currently emergency care in England is accessed via NHS ED provision only (NHS England 2013), and therefore confidence was placed in the capturing of all suitable cases. This resulted in the smaller cluster group offering representation of the entire local patient group and did not discriminate through any ethnicity or social demographic variance. Whilst it is recognised that this approach would not, by definition, allow for a generalisation of a population (Bergin

2018) it does enable the generalisation among the target population, and as discussed above, this would then allow for theoretical generalisation to the wider population (Parahoo 1997).

The calculation of the sample size needed to allow for clinical meaningfulness (Gogtay, 2010), and minimise the risk of falsely rejecting or failing to reject a null-hypothesis (Gogtay 2010). However, it is important to recognise that a large sample does not guarantee accuracy (Bergin 2018). Cohen *et al*. (2018) suggest that as a minimal number of participants, thirty would be considered acceptable when using some form of statistical analysis. From the useable data returned the sample number totalled at N=204, exceeding the acceptable number indicated by Cohen *et al*. (2018)

The FOI request were positively responded to, however not all the requested information could be collated and returned by all Trusts, this is presented in table 7.1.1 below. Curcin *et al.* (2012) discusses the disparity of information collected across NHS Trust sites, citing the challenges of poor data management and collection, alongside a lack of coherent and comparable analytical approaches as a barrier to comprehensive data retrieval (Curcin *et al.* 2012). An identical FOI request was made to all the Trusts involved, and whilst a lack of awareness regarding data available from the institutions may have contributed to the varied response, a consistent and robust approach to the request was maintained.

Table 7.1.1 Overall data return from Trusts following FOI request for the time frame of March-March 2017-2018

Requested	Available
ED overall patient capacity per day on an hourly breakdown	Not available from all Trusts.
Grade of referring medic from ED to paediatrics	Not available
Time of patient arrival to ED	Available
Time patient was seen by ED practitioner	Not available for all Trusts
Time patient was referred to paediatrics	Available
Time patient discharged from ED to paediatrics	Not available from all Trusts
Last recorded PEWS score of referred child	Not available for all Trusts
Length of patient stay in paediatrics	Available
Diagnosis code on discharge from paediatrics	Available

Age of patient on presentation	Available

Whilst all four Trusts upheld the requests, and provided data, having reviewed, verified and cleaned the data (Moran *et al.* 2020), two of the Trusts data was provided in a format which rendered it unusable. From these two Trusts zero-day admission status could not be linked to the relevant case number, meaning that effective and reliable investigation could not take place due to this violation. Following review and cleaning of the remaining two Trusts data provision, the following data sets were deemed suitable for inclusion with **x** indicating useable data provided demonstrated in table 7.1.2

Table 7.1.2 Data returned which meets the requirements for data analysis

Trust	Total number (N)	+/-0-day admission	Time of presentation	Age of child	Month of presentation	ED Length of stay (ED-LOS)
1	77	x	-	x	x	x
2	134	x	x	-	x	x

Analysis

7.2 Quantitative Data Analysis

The outcome of the data analysis was to identify any correlation between one of the four independent variables against the dependent variable. The use of binomial logistic regression met the need to predict the interactions between independent variables to predict the influence on the dichotomous dependent variable (Laerd Statistics 2018). Field (2013) identify seven assumptions of binomial regression, the study design of this work meets four basic assumptions requirements (Stoltzfus 2011). These are noted as i) the data includes a dichotomous variable, ii) there is at least one nominal or continuous independent variable (IDV), iii) there is an independence of observations, and finally iv) the categories of the nominal IDV and dichotomous dependent variable should be mutually exclusive and exhaustive (Stoltzfus 2011). The remaining three assumptions relate to the nature of the data and will be tested through the application of SPSS. The remaining assumptions are identified as 1) demonstrating linear relationships between the IDV and the logit transformation of the dependent variable, ii) data is not to show multicollinearity and iii) there should not be any significant outliers or highly influential points (Laerd Statistics 2018). Of the final three assumptions the requirement to confirm data linearity was omitted as the data to be analysed consisted of categorical independent variables and was therefore exempt (Laerd Statistics 2018). Observation of the data and subsequent analysis failed to identify any concerns regarding significant outliers, thus providing further reassurance of the

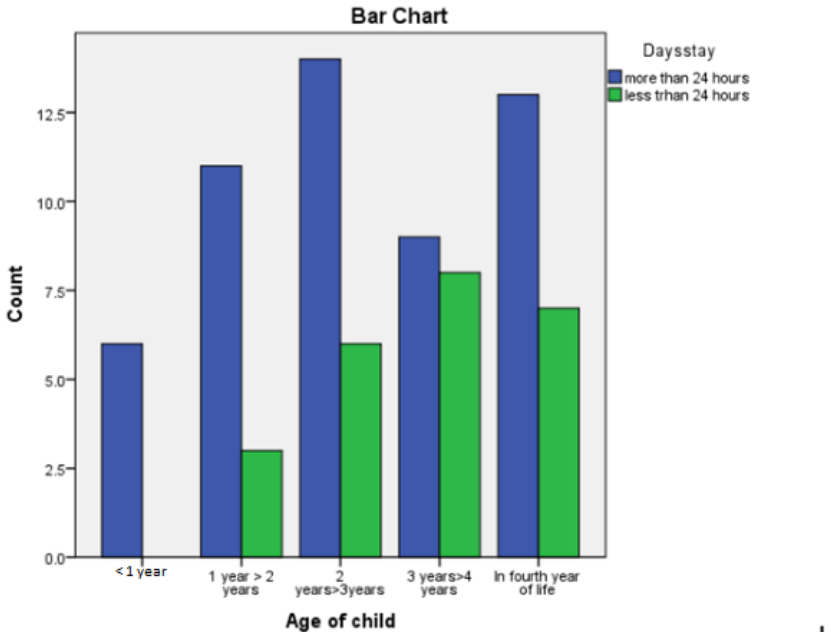
test suitability (Laerd Statistics 2018). The risk of multicollinearity would occur should the IDV's exhibit high correlation with each other (Laerd Statistics 2018). This can be attributed to how the data has been collected, for example two variables may in avertedly measure the same data as each other, such as weight in Kilograms and pounds. However, the intention of this study was to complete binomial regression with each IDV in silo, thus avoiding ambiguity regarding which IDV may have caused an effect to the dependent variable. Field (2013) supports this approach identifying that without distinction between IDV's during analysis, any variance in outcome cannot be confidently attributed to one IDV or another.

Chi-independence testing was also chosen to explore any potential association between two variables and assisting in finding evidence against the null hypothesis (Balnaves and Caputi 2001), supported by the production n of a p-value <0.05 or indeed >0.05. Due to the range of data provided, areas of investigation were varied with disparities evident between the two Trusts. However, data was deemed sufficient enough to investigate the independent variables already identified. It is important to note that data sets were kept separate to each providing Trust, whilst combining numbers may have assisted in completing analysis it would lend potential to a type-1 error being made.

7.3 Age and +/-0-day

Completion of chi-square test of independence between days stay (+/-0-day) and the age of the child admitted (*N=77)* did not reach statistical significance, P=0.241. Binomial regression was performed to establish the relationship of age on the likelihood of participants being admitted for less than 24 hours or over. Whilst logistic regression model did not deliver a statistically significant value, $\chi^2(1) = 3.424$, $p > .05$, significance was reported at P= 0.06. Whilst not optimal, this p-value does demonstrate a strong trend towards significance; additionally a simple bar-chart (demonstrated in Figure 2) was suggestive of a relationship between age and +/-0-day is seen.

Figure 7.a Bar chart showing age brackets in relation to number of zero-day and non zero-day admissions



7.4 Season and +/-0 day

To support the analysis and encourage more useable data, the months of the year were collapsed in to four smaller categories of 'season' as demonstrated in table 7.4.1 below.

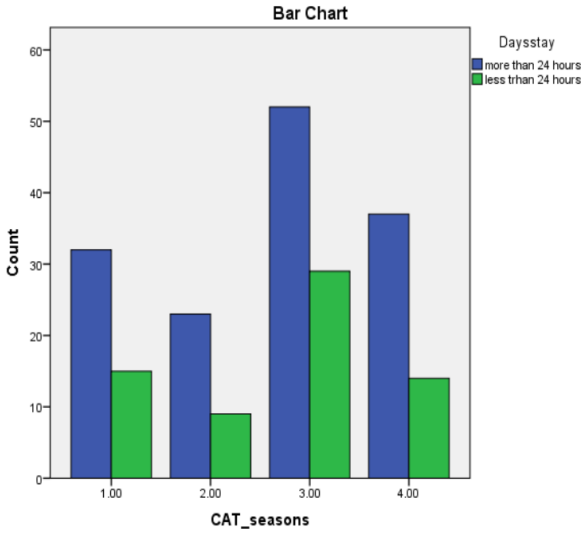
Table 7.4.1 Months allocated to season category

Months	Category
March-May	Spring 1
June-August	Summer 2
September-November	Autumn 3
December-February	Winter 4

A chi-test of independence between month of presentation and +/-0-day admission (N=211) failed to reach statistically significance of P= 0.787. Further exploration utilising binary regression demonstrated no statistical significance, however an overall increase in the number of admissions from October through to February was seen.

Exploration of these seasonal-categories failed to demonstrate statistical significance with a Chi-independence test demonstrating P= 0.743. However, figure 7.b depict a bar-graph demonstrating an overall increase in presentations during the autumn and winter seasons with an associated increase of zero-day admissions evident within the autumn season months, despite this further binomial regression of the variable failed to return statistical significance for any of the categories.

Figure 7.b Bar chart demonstrating patient presentation by season and subsequent zero-day and non-zero day admissions of these presentations.



7.5 Presentation time and +/-0-day

To support and enhance data analysis, the 24 hours of the day were collapsed in to four categories of six-hour windows as detailed in table 7.5.1.

Table 7.5.1 Table demonstrating 24 hour day (presented as 24 hour clock) in to 4 categories

Hours	Category
00.00->6.00	1
6.01->12.00	2
12.01->18.00	3
18.01->00.00	4

A chi-square test for association was conducted between time of presentation and 0 +/- day admission (N=134). All expected cell frequencies were greater than five. There was no statistical significance associated between the two variables, $\chi^2(3) = 5.507$, $p = .138$. Interestingly an association within time category 1 was identified, demonstrating that 50% of admissions in this time zone resulted in zero-day stay. Category 4 demonstrated the highest number of presentations to ED, with 36% of presentations occurring in this time period.

Binomial regression was also performed on the IDV of time of presentation, resulting in the logistic regression model demonstrating statistical significance, $\chi^2(1) = 5.359$, $p < .025$. The model explained 5.5% (Nagelkerke R^2) of the variance in admission time and correctly classified 67.9% of cases. Sensitivity was 91.2%, specificity was 18.6%. For each unit reduction in the independent variable, time of presentation, the odds of having a 0-day admission increases by a factor of 1.52.

7.6 Four-hour transit time and +/-0-day

To support data analysis and aim to provide more meaningful data results the ED length of stay (ED-LOS) was collapsed in to three categories as seen in table 7.6.1.

Table 7.6.1 Emergency Department length of stay displayed in three categories

ED-LOS (*N=134*)	Category
0-3 hours	1
3-4 hours	2
4 hours +	3

A chi-test of independence between month of presentation and +/-0-day admission (N=134) failed to achieve statistically significance, P=0.866, all cells met expected count of more than 5. Cross-tabulation provided visual representation of the % split between +/-0-day admissions in relation to the ED-LOS. From this it is evident that, on average, regardless of ED-LOS approximately 1/3 of presentations, which were admitted, resulted in a <0-day admission (Table 7.6.2). Binomial regression also failed to return statistical significance for the categories, P=>0.05.

Table 7.6.2 Table demonstrating the % of zero-day and non zero-day admissions in relation to ED-LOS

	Days Stay >24 hours	Days Stay <24 hours	Total
ED-LOS 0	40 65.6%	21 34.4%	61 100%
1	33 70.2%	14 29.8%	47 100%
2	18 69.2%	8 30.8%	26 100%
Total	91 67.9%	43 32.1%	134 100%

Conclusion

Recognition of the potential for type-2 error cannot be overlooked (Field 2013), the test lacks the statistical power to detect sufficient evidence for the alternative hypothesis. Due to the relatively limited sample size this could lead the work to create a false error in failing to reject the null hypothesis and skewing results (Field 2013). Within results reported there are examples of P-values nearing optimal significance (P=<0.05) (Dorey 2010), and therefore raises the recognition that even with a very small sample size, a large effect would not lead to a desired small p-value (Silby 2016).

Having completed statistical analysis the findings required taking forward and fusing with qualitative findings previously established within the study; this analysis and interpretation of the findings against what is already known on the topic. These discussions will aim to develop the current knowledge base.

8. Conclusion, Discussion and future recommendations

Introduction

Despite the increasing popularity in using mixed methodology design, criticism of the approach exists in that the design fails to consider the two elements of the study in unison, and to do so only results in knowledge equivalent to two independent studies (O'Cathain 2010). To achieve effective application of the mixed-methodology design this study concentrated on drawing equally from the two information sets, resulting in effective and robust triangulation of the research aim (Mertens and Hesser-Biber 2012). Moffatt *et al.* (2006) recognises the rarity of a study reporting on the combination of methodologies concurrently, but in doing so the exploration of such differences may be as enlightening as their points of similarity (Bryman 1995). This work has brought together the two methodologies for interrogation concurrently, resulting in the identification of similarities in results and also facilitated differences in findings, adding to a richer understanding of the research topic (O'Cathain 2010).

Summary of findings

Findings from the initial literature review in chapter 3 identified younger age brackets as being a significant influencer on the emergency admission of, and length of admission of the patient (Rose and Gardner 2008, Saxena *et al.* 2009, Mansbach *et al.* 2009 and Bekmezian *et al.* 2011). This finding was further supported through the semi-structured interview with the paediatric consultant, verbatim comments from the transcript stated,

'the proportions have always been greater in the younger children age group'

'obviously it's gone up in the pre-school mainly age groups' (sic)

However, the lead-paediatric nurse (LPN) did not uphold this common view point, instead identifying,

'depending where you are in the year so in winter you would see more babies I wouldn't have said that the numbers have changed that I've seen'

Interrogating the interview transcript further it is relevant to note that the LPN would frequently refer to the 'babies' when talking about bronchiolitis but not specifically relating to zero-day admissions,

'when you hit the bronchiolitis season then you tend to see more erm small babies that come in obviously with the chest problems'

When merging these comments along with this study's statistical analysis, agreement can be found between both the professionals' view-points. Whilst statistical analysis did not reach significance $p<0.06$, it does demonstrate a strong lean towards significance ($P<0.05$) which is reinforced by the qualitative comments. Of further interest is the evidence previously demonstrated Figure 7.a, which supports the LPN and Doctors views of an increase of presentation in pre-school aged children, and further demonstrates a near matching of admission times in the 3-4 years old age bracket.

This ostensibly shows that of those children admitted 100% aged < 1year remained for >24 hours, whilst in pre-school age groups (2-4 years) between 30-47% of all admissions resulted in <24-hours stay. The triangulation of the two datasets demonstrates commonality and leads this study to consider the trend between the child's age and admission length as more than a casual tendency. Whilst the sample size is limited, this study's findings echo those also identified by Rose and Gardner (2008), whose work identified that the <3 years age bracket were most likely to be admitted. Variance in practitioner view point could be attributed to the common admission process seen in district general hospitals, whereby potential admissions are discussed and considered by the senior doctor and admission agreed for those deemed needed (Health Education England 2019). Whereas the LPN may be basing its viewpoint on the experience of caring for already admitted children, while their medical colleagues hold an arguably stronger social knowledge on the pre-event to admission (Collier 1994).

Variances in admission numbers were seen in conjunction with seasonal changes, with the majority of patients presenting in autumn and winter (total N= 211, autumn = September-November, and winter presentation= December-February N= 132), this was consistent with the findings in studies from Levett *et al.* (2006) and Bekmezian *et al.* (2011). All of whom identified increased admission rates during winter months. These themes from the literature were matched by those drawn from the interviews, with direct discussion made by both participants to 'winter' and 'bronchiolitis' and increased patient presentation and admissions.

'in the year so in winter you would see more babies'

'worried this child's got bronchiolitis can you see them many of those children are probably well enough to be managed at home' (sic)

'I'm sure this child's got bronchiolitis the respiratory rate is above 60 and they're not feeding and they're erm increased work of breathing erm you know which would be a justification most likely to admit the child' (sic)

Through robust triangulation and analysis of the findings (O'Cathain 2010) the relationship of increased patient presentation during autumn and winter seasons was demonstrated. When engaging in a critical realism investigation, it is essential to acknowledge that most of social science research creates data that is reported rather than directly observed (Easton 2010). Therefore, whilst accepting that results did not reach statistical significance, the overall combination of findings does support the visible behaviours of the phenomena (Easton 2010). Furthermore, whilst accepting the relatively small sample size used to explore this variable could cause consideration for the potential of a type-2 error being introduced, the results are deserving of future exploration to understand the phenomena and increase its capability for generalisation in to the wider healthcare arena (Sayer 1992).

As previously discussed, statistical significance was demonstrated ($P<0.025$) between the time of day a child presents to ED resulting in a zero-day admission. Furthermore, analysis demonstrated that of those who presented between 00.00-06.00hrs 50% of admissions resulted in zero-day admissions. These statistical findings are in keeping with those seen in the literature review (Rose and Gardner 2008, Mansbach 2009). Bekmezian *et al.* (2011) similarly identified the presentation time of 00.00-08.00hrs as a predictor for extended ED-LOS, whilst it is not clear of these cases how many went on to become admissions, the data suggests this time-frame carries significance in the presentation and management of children in ED. Interestingly Levett *et al. (*2006) study concluded the peak admission activity time to be between 12.00hrs and 00.00 hours. In contrast this study identified the time period 18.00-00.00 hours as peak admission time, therefore whilst Levett *et al. (*2006) offers challenges to the findings of this study, it is arguable that the time window Levett *et al. (*2006) provides is vast and therefore not in keeping with the finer review of this study. Furthermore, Levett *et al. (*2006) study is concerned with admissions to a POU direct from ED and fails to report the ED-LOS prior to admission. The qualitative interview outcomes challenge Levett *et al.* (2006) study, instead agreeing with findings seen within the statistical analysis of the study.

'you'll see it start to peak again probably about five o'clock half past four fiveish when the surgeries are opening again so you'll see it peak again and then I guess you would probably see six o'clock onwards as it starts to get in to the evening time' (sic)

The mixed-methodology approach to this topic has returned, in this instance, similar finding from all points of investigation (Mertens and Hess-Biber 2012), resulting in more than simply a

suggestive relationship between the data points (Mertens and Hess-Biber 2012). This identification would benefit from further investigation to deeper explore any commonalities for children presenting at this time of day, which may enable a better understanding of events and contributing factors occurring during this period. The investigation of potential contributing characteristics would result in a stronger understanding and subsequent improved management of patient journeys, as indicated by the increased presentations, percentage of recorded zero-day admissions supported by professionals' insight and experience.

The final theme of exploration was identified as the ED four-hour transit time and featured in both professionals' interviews,

'I think sometimes its breeching I think a lot of them'

'we get phone calls is because they are about to breech'

'phone call saying can you take this patient because they are breeching and that's often' (sic)

'I think it is sometimes because they have those clinical targets'

*'there's more and more demand we work harder and harder to meet it before people see well if you go to A and E in ** you know the waiting times have come right down and then more people from ** and erm the watershed areas will come to **' (sic)*

The four-hour clinical target was acknowledged in work by Levett *et al.* (2006), but not explored as a potential contributing factor to ED-LOS or extended admissions. The independent variable of ED-LOS did not reach statistical significance in relation to zero-day admissions, suggesting that it did not hold influence over the outcome of admission. Placing this within the applied methodology, Westhrop *et al*. (2011) offered the perspective of 'interdependency', suggesting that how the real world is interpreted influences an individual's actions, and in turn can influence the reality. Westhrop *et al.* (2011) theory suggests that the LPN and doctors view of reality are shaped by their awareness of the four-hour transit time, however the empirical data does not support this reality. Further research into why this perception of the reality exists among the workforce may be beneficial in dispelling organisationally held opinions or indeed recognising organisational behaviours that cannot be captured through empirical data alone (Bergin 2018).

Discussion of findings

The triangulation of mixed-methodology (Kimchi *et al.* 1991) enabled not only the consideration of empirical data but provided a depth of meaning to the considered phenomena (Parahoo 1997). This work enabled the combination of theory generation and hypothesis testing, enabling elucidate of a complex phenomenon (Jogulu and Pansiri 2011). When all variables were considered

collectively, statistical analysis did not demonstrate evidence powerful enough to confirm the relationship between referral pathways and zero-day admissions, and as such based on quantitative evidence alone this work would fail to reject the null hypothesis. When interrogated individually statistical significance was found within the independent variables relating to the time of the day the child presented to ED ($P<0.025$). The construction of the hypothesis limits this independent variables from influencing the rejecting of the null hypothesis, however, the over-arching mixed-methodology paradigm and use of critical realism within this study has facilitated the in-depth exploration of the phenomena (Collier 1994), preventing a potentially forced conclusion (Balnaves and Caputi 2001).

Drawing together the seen and unseen realities (Archer *et al.* 2016), discussed in the research paradigm chapter of this work, brings the opportunity to fully engage the Bayesian method of information analysis (Noyes *et al.* 2019). The findings through this work support the theory of a link between admission characteristics and zero-day admissions for children aged 0-4 years old with a respiratory coded diagnosis. The unique approach to interrogating the phenomena with mixed-methodology paradigm and critical realism (Archer *et al.* 2016) has brought the implicitly known in to the explicit arena (Collier 1994). Thoughts and opinions of professionals working in the arena, obtained via interview, were robustly supported with literature findings (Rose and Gardner 2008 Levett *et al.* 2006), and in part, with the quantitative findings of this study. Dispute was generated in the study in relation to the professional's strong opinion that the ED-LOS four-hour transit time held influence over admissions, however the statistical evidence did not offer support to this variable. Causation for this could be due to the manner in which the data was returned from NHS Trusts, the data for the patients ED-LOS was returned in whole hour time frames; this reduced the ability to refine the ED-LOS any further. Thus meaning that should a referral from ED to paediatrics have occurred within the last fifteen minutes of the hour then this work would be unable to identify this. Further quantitative interrogation of the IDV may provide support of the existing qualitative findings; however, to achieve this successful collapsing of the data would be reliant upon all the data holding the same level of detail (Field 2013). The achievement of this is hampered by the issues demonstrated in this study, whereby the accessing and obtaining of data in a format that is comparable across multiple sites has proven challenging, an impression endorsed by Fontana *et al.* (2020). None the less it is important to note that the absence of quantitative findings in support of this concept does not render it untrue, more that it requires further interrogation to either confirm the opinion of those working within the field, or to consider and explore rationality to why this thought process exists among front-line clinical staff. Continuing confidence in the critical realism methodology (Collier 1994), a matter cannot be considered definite if not considered from all potential positions of reality.

Findings from the systematic literature review supported similar knowledge gained through qualitative investigation; however, statistical analysis did not fully support this. Whilst this limits the generalising of findings, the outcomes do still offer significant contribution to enriching the existing knowledge base. The identification and exploration of variants has assisted in defining characteristics seen in the zero-day admission pathway which were realised in the working environment and through data collection. The locality of this study was based in the East Midlands; to further understand the trueness of the characteristics it would be gainful to replicate the study design in a variety of locations within England. This would help establish the reality of the characteristics as a true behaviour in the population or as an occurrence only pertinent to the East Midlands region, which would in itself would be worthy of further exploration as to why this regional differences were apparent. Further contributions by this study to research include the use of FOI as a data collection tool enabled this study to gain access to data that would previously have been prohibited, this pioneering approach provided evidence of an alternative route for researchers outside of the heath-care service to embark on when trying to explore internal NHS pathways. However, as this unique study has demonstrated, the use of FOI is only as strong as the quality of the Trust data collection tools. Fontana *et al.* (2020) make clear that the current position regarding NHS data is that the NHS is heavily reliant upon external agencies, such as academia, to make best use of the valuable data the organisation collects. However, short of the NHS selling units of data for financial gain, which in current climate would be unacceptable with the public (Fontana *et al.* 2020), the NHS would benefit from developing a solid and robust framework for the collection, maintenance and sharing of information (Fontana *et al.* 2020). As this study evidences, until Fontana *et al.* (2020) information sharing vision is realised, then the likelihood will remain for researchers, who are unable to gain full access to data, to have to continue interrogation of imbalanced data sets with meticulous navigation skills. Further to the uncommon use of FOI to gain data, the use and application of little used Bayesian theory (Voils *et al.* 2009) has enabled this study to contribute to the development of associated methodological issues, many of which remain yet to be resolved (Dixon-Woods *et al.* 2005). The limitations of combining qualitative and quantitative findings with equal influence seen in previous studies (Gonzalez Castro *et al.* 2010) has been readdressed by this study, demonstrating a rarely seen true approach to mixed-methodology. Further contributing to the Bayesian theory of enabling the calculating forward of potential events by drawing the theory together with the paradigm of critical realism, which accepts the prominence of one design method, but refutes the dominance of one over the other in the development and testing of theories (Schoonenboom and Burke Johnson 2017).

Implications of findings and suggestions for future research

An identified aim of this study was to inform future practice and develop pathways to benefit patient care and safety. Accordingly, the first major contribution of this study is that it has provided identification of indicators associated with increased zero-day admissions. Establishment of the indicators provides a platform for local review of admission habits and activity seen in the district general hospital, which in turn can lend to the review of provision and resources to reduce zero-day admissions. Exploration in to the reallocation of staffing from paediatrics to ED may provide a paediatric specialist at point of presentation, potentially resulting in successful ED discharge, as opposed to the review happening post admission. A second implication from the findings is the increased presentation rates during lower staffing times and subsequent admissions. Whilst this raises potential new ways of working for staff duties it also flags the need to examine why children present more so in the early hours of the morning and are subsequently more likely to be admitted. There are several routes of investigation relating to this thread, such as, the physiological presentation of children at this time of day and the availability of ED staff due to potentially reduced overall capacity. It was not within the remit of this study to consider the medical history of the presenting child, however with the recognised progression and development in neonatal health and complex diseases (Santhakumaran *et al.* 2018) this could be an influencing factor for the rise in respiratory presentations. This would be an area for consideration in relation to the provision of out of hours care specifically for this patient group and its implications on ED presentation.

Further areas identified for future development are driven by the findings aligned with the research aim and also by the limitations encountered in trying to explore the aim. Future investigations are necessary to validate the kinds of conclusions that have been drawn from this study, but prior to this it would be wise to establish stronger quantitative data collection. The FOI approach utilised for this study suffered from the limitation of how the data was returned from the health institutes. As previously discussed a clear lack of continuity in how the data was delivered (Curved Thinking 2019) held significant influence on the sample size and level of investigation this study could conduct. Future research is needed to delimitate the restrictions created when trying to utilise FOI in conduction research. Research consistently demonstrates that the pathway for utilising the public's clinical data are significantly under developed (Curved Thinking 2019). Addressing this and developing a more robust pathway for utilising FOI for data collection or in how data can be more readily accessed for research is very much a key component in any future studies. Bringing together patient information sources to create a unified health record for use in research would provide a good starting point for further research.

Establishing strength in accessing patient data for research would assist in overcoming the limitation of modest sample size seen within in this study.

Having broadly established an association between admission characteristics and zero-day admissions it is a question of future research to investigate this phenomena on a larger scale to enable generalisation. However, in acknowledging that not all elements of the semi-structured interviews were observed in the data, exploration should also be made into the ambiguity seen between professionals view point of the four-hour transit time and the recovered statistics relating to this. Future studies could fruitfully explore this issue further by mirroring the semi-structured interviews with a more refined data set, breaking the time element of ED-LOS in to smaller collapsed units. This study believes that apart from looking for correlation between patient characteristics and zero-day admissions, future research should look for the unseen reality known by health-care professionals and how this influences the efficiency and effectiveness of the patient pathway.

Through this works journey a secondary source of audiences have arisen in regards to dissemination. Primarily the hospital the work was supported by will review details of findings with potential to collaborate on review and amendments to policy based on finding (NIHR 2019). Secondary audiences that would potentially benefit from this work are identified those undertaking or planning to undertake health research. This study has combined and developed a unique methodology use, which has resulted in driving forward their use in mixed methodology. The distinctiveness of this approach could be motivational to a range of researchers, both advanced and novice, engagement of who will be channelled through literature publication, face to face and virtual platforms (NIHR 2019).

9. Conclusion

This study concludes that influence exists between identified variants and a patient's outcome in relation to zero-day admissions for 0-4 year olds with a respiratory diagnosis. This may be considered a promising aspect of reducing inappropriate admissions or admissions which are most likely to result in zero-day stay, providing a potential mechanism for developing a more efficient pathway of managing the patient's presentation to ED. This is an important advancement in the knowledge that ED presentations remain on an upward trajectory, along with admission rates.

Through exploration, the study has demonstrated that despite the similarities between those working in health and statistical data, input from those working in the clinical arena is not routinely used to consider changes in the patient presentations. The unique application of the paradigm and methodology blend seen within this work has contributed to the knowledge and

information base currently understood in this field of research. This approach, along with the exploration of FOI use, should be replicated on a larger scale in order to contribute to the initial corpus of findings seen in this study. The new findings from this study create the basis for reviewing current admissions pathways and provide a platform upon which to initiate change.

In its infancy, this project took heavily influenced quantitative approach, the introduction of a qualitative thread aimed to remove bias and demonstrate a robust approach to developing variants. However, the inclusion of a seemingly small thread of qualitative research not only changed the dynamic of this work but also moved the researcher from a 'quantitative' researcher to one who embraces the importance of mixed methodology, and now considers themselves versed and embedded in the importance of critical realism and Bayesian theory in successful and progressive health research. This research journey has empowered the researcher to appreciate the level to which an individual can interpret their own health, and to recognise the value a person places on their own health. The presence of invisible reality is one that exists in all health interactions, formed by a variety of life experiences and exposures. Understanding the impact this has on an organisational or individual's engagement in health events is essential in influencing and promoting positive health experiences. Facilitating a health experience which is matched and supported by empirical data is the movement towards enabling the best care possible for the individual that achieves their own needs and expectations and is not solely governed by quantitative data or the lived experience of others.

In summary this study has explored an area of practice which has received little, if in fact any, attention previously. The unique methodology has identified findings for further research which would contribute to the refining and progression of children's ED attendances and subsequent admissions. In addition to this recommendations for further investigation relating to data collection have been made, with the intention of reducing barriers to research and encouraging a more progressive way of using data to support healthcare research.

Appendix A - HRA Approval Certificate 1

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16 August 2018

Dear Mrs Wright

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

Study title:	**Admission patterns of paediatric patients' age 0-4 years diagnosed with respiratory conditions between Emergency Department and acute paediatrics and its relationship to zero-day admissions.**
IRAS project ID:	**235131**
Sponsor	**The University of Northampton**

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.

Participating NHS organisations in England and Wales **will not** be required to formally confirm capacity and capability before you may commence research activity at site. As such, you may commence the research at each organisation 35 days following sponsor provision to the site of the local information pack, so long as:

- You have contacted participating NHS organisations (see below for details)
- The NHS organisation has not provided a reason as to why they cannot participate
- The NHS organisation has not requested additional time to confirm.

You may start the research prior to the above deadline if the site positively confirms that the research may proceed.

If not already done so, you should now provide the local information pack for your study to your participating NHS organisations. A current list of R&D contacts is accessible at the NHS RD Forum website and these contacts MUST be used for this purpose. After entering your IRAS ID you will be able to access a password protected document (password: **Summer14**). The password is updated on a monthly basis so please obtain the relevant contact information as soon as possible; please do not hesitate to contact me should you encounter any issues.

Commencing research activities at any NHS organisation before providing them with the full local information pack and allowing them the agreed duration to opt-out, or to request additional time (unless you have received from their R&D department notification that you may commence), is a breach of the terms of HRA and HCRW Approval. Further information is provided in the "*summary of assessment*" section towards the end of this document.

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 and HCRW Approval does not apply to NHS/HSC organisations within the devolved administrations of Northern Ireland and Scotland.

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 and 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 attached document "*After HRA Approval – guidance for sponsors and investigators*" gives detailed guidance on reporting expectations for studies with HRA and HCRW Approval, 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: Helen Poole
Tel: 01604 735 500
Email: helen.poole@northampton.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 **235131**. Please quote this on all correspondence.

Yours sincerely

Gemma Oakes
Assessor

Email: hra.approval@nhs.net

Copy to: *Helen Poole, University of Northampton [Sponsor Contact]*
helen.poole@northampton.ac.uk
Ms Julie Wilson, Northampton General Hospital [Lead NHS R&D Contact]
julie.wilson@ngh.nhs.uk

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List of Documents

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

Document	*Version*	*Date*
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only) [AON UK Ltd Insurance]	1.0	28 July 2017
HRA Schedule of Events	1	04 August 2018
HRA Statement of Activities	1	04 August 2018
Interview schedules or topic guides for participants [Interview plan]	V1.1	25 September 2017
IRAS Application Form [IRAS_Form_13072018]		13 July 2018
IRAS Application Form XML file [IRAS_Form_13072018]		13 July 2018
IRAS Checklist XML [Checklist_13082018]		13 August 2018
Letters of invitation to participant [Invitation]	V2.1	19 July 2018
Participant consent form [Consent]	V2.2	04 August 2018
Participant information sheet (PIS) [Participant information]	V2.1	04 August 2018
Research protocol or project proposal [Protocol]	V2	04 August 2018
Summary CV for Chief Investigator (CI) [CV - Wright]	1.1	01 January 2018
Summary CV for student [CV - Wright]	1.1	01 January 2018
Summary CV for supervisor (student research) [CV - Harris]		
Summary CV for supervisor (student research) [CV - Beeson]		
Validated questionnaire [Questionnaire]		

IRAS project ID	236131

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 and 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	Page 17 of the Protocol incorrectly refers to the interviews being video recorded. The applicant has confirmed interviews will be audio recorded only.
4.1	Allocation of responsibilities and rights are agreed and documented	Yes	The sponsor submitted statement of activities and schedule of events for information. No other form of agreement is required or will be used.
4.2	Insurance/indemnity arrangements assessed	Yes	No comments
4.3	Financial arrangements assessed	Yes	No external funding has been secured to run the study at site.
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

Section	Assessment Criteria	Compliant with Standards	Comments
6.1	NHS Research Ethics Committee favourable opinion received for applicable studies	Not Applicable	No comments
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.
There is one site type involved in the study. All research activities taking place at the participating NHS sites is the same, as detailed in the study protocol and supporting documentation. Please note that the remit of HRA Approval is limited to the NHS involvement in the study. Research activity undertaken at non-NHS sites is therefore not covered and the research team should make appropriate alternative arrangements with relevant management at these organisations to conduct the research there. 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 Local Collaborator is required at the participating NHS site. **Training**: Not applicable. GCP training is not a generic training expectation, in line with the HRA/HCRW/MHRA statement on training expectations.

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
HR access arrangements are not required.

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. • A suitable room for 4 semi-structured interviews will be required.

Appendix B – LPN Interview Transcribe

N.B - ** Denotes ward name or location and is removed to maintain anonymity

V= the date is the eighth of May 2019 and the time is 11.36am

First of all Sister [redacted] thank you very much for agreeing to do this interview just to remind you the topic is 0-4 year olds referred from ED to acute paediatrics with an acute respiratory diagnosis which results in a zero day admission I would like to start off like by asking you just to talk a little bit broadly about your role and responsibilities and your professional background and just to let you know I may make some notes at the same time

LPN= Ok that's fine so erm my role is I'm ward manager for ** ward which is an oncology surgery ward takes a little bit of medicine and also ward manager for paediatric assessment unit

V= and how long have you been in post in paediatrics

LPN= so in paediatrics erm I've well I qualified in 82 moved here to ** in 84 and have worked across all the different units and in the community in paediatrics my role within the community in the community care team was disbanded in 2014 and we were redeployed and that's when I took up the post as ward manager in PAU initially erm and then was asked to take on ** as well

V = ok thankyou can you just explain to me the principle of PAU

LPN = So PAU was set up initially the GP referrals and those patients were being accommodated on ** ward amongst all the inpatients and medical day case activity and that was quite overwhelming for the ward to manage the number of referrals coming through so I wasn't part of the set-up of PAU and moving it initially as that was done before I took it on but I think the thinking was that if we moved it to a purpose built area then and staffed it separately then we'd be able to manage the admissions and the observations and the assessments of those children better and reduce the number of admissions going to the children's wards that's the principle of how we work at the moment to reduce those admissions

V = thank you so the admissions taken to PAU are they purely from GP's

LPN = so the referrals come from predominantly GP's we have then referrals that come down from A and E when they need paediatric advice or period of assessment open access short and long term open access erm and sometimes from midwives for jaundice babies and those that are losing weight

V = Do you take admissions on to PAU over night

LPN = No we are not open overnight so the unit is open between nine o'clock in the morning and ten o'clock at night and then anything that comes in out of hours erm is then directly admitted in to an inpatient bed on ** so they become inpatients

V= ok and would they be moved down from ** to ** later during the day if that was relevant to their condition or would they be admitted direct on to **

LPN= erm it's a mix of those so sometimes they would be admitted on to ** erm sometimes they might be seem initially on ** and then depending on what where the beds are what the workload is some of those patients may be moved to ** as an admission

V= ok erm so in the morning would you be made aware of the patients that had been admitted overnight

LPN= so we would know which patients had come in overnight from our handover yes

V= and you said at night er sorry at night after ten o'clock what is the process of admission for children in terms of if it's at night are the likely to be sent home if they were brought down or would they stay

LPN= so there's a mix some of them erm because they predominantly go to ** to start off with so those children erm some of those do go home so we do have discharges early hours of the morning if they've gone home erm not so much from **I think if they come down here they usually here to stay as inpatients but some of them do get moved from ** but I wouldn't know the numbers necessarily we would have to look in to that

V= no that's fine thank you so currently what are your views around the current role of acute paediatrics the future role of paediatrics and ED and their relationship (LPN=in terms of…) in terms of how they work together in paediatric care

LPN= erm I think the physical environment sometimes makes it difficult because they are so remote from each other but that's with the children's ward that's not just for PAU and I know that applies to other hospitals as well that we've been on study days for paediatric assessment unit we went on one recently and there's a lot of hospitals where the ED department is remote from paediatrics and they have similar issues to us in terms of transferring children and safety issues about those transfers and they get over it similar ways we do by assessing and almost making sure they have rag rating the children before they are transferred down to the paediatric assessment unit erm I think erm sometimes what makes it difficult is erm the communication that happens from ED to paediatrics wards and to the unit about the child's condition as in what their PEWS scores are and erm how they are clinically before they come down and also that sometimes they ask if we can take those children and if we need to delay for some reason it

might be we are full etc. that sometimes that child has just left the department and ends up at our door before we've said hang on a second we're not ready for the children and I think that is something that you know we do try and work on to make sure the transfer is safe that's what worries me because they are coming such a distance we don't mind taking children who are PEWSING high or need oxygen or anything else erm we're not blocking those coming down but we equally need to make sure that we can accommodate them that I've got staff that can accommodate them and have doctors so I think that is a bit of a problem

V= you say that sometimes patients have left before you have been able to sort the resources what are your thoughts on why they've already left is it just a break down in the communication

LPN= I think sometimes its breeching I think a lot of them think that we get phone calls is because they are about to breech

V= so can you just confirm breech

LPN= so a breech is when they have got that four hour target the A and E four hour target and we will get a number of phone call saying can you take this patient because they are breeching and that's often and I will usually challenge them that's not a reason for transferring them you know have they got a clinical plan in place have they been seen etc and I think it is sometimes because they have those clinical targets erm and I understand that but it's got to be a safe transfer whether it's a breech or not

V= do you know how far it is in terms of distance from here to A and E

LPN= erm I haven't measured it

V= How long would it take to walk it

LPN= to walk it I would say erm 5 or 6 minutes maybe I would think which with a sick child is quite a long time yes and when you've got no very little wards between ED along that main corridor so you've got very limited other resources you could just jump in to as in a ward you've only got ** if you had a problem so that what worries me more if you know it's got to be safe for the child you don't want to do that especially with a sick child

V= thank you in your time as a sister working with acute paediatrics have you seen a change in the level of presentation of patients in terms of age time number day of the week any trends that you have noticed

LPN=erm I wouldn't say necessarily the ages or types of children we get have changed I think GP's err on the side of caution when they are referring and I think they get quite worried particularly

when they have particularly young children erm and they might be inexperienced and in paediatrics and I often overhear the consultants having conversations with GP's giving advice in how to manage temperatures and the GP's are really not happy with that and they push and they have on occasion said so you are refusing to take this patient in which case it backs the hospital in to a corner so that you feel obliged to see them at the unit I do think there are a number of conditions or children who do attend the unit who if they had been given advice about how to manage temperatures how to manage fluids if they'd been given steroids or inhalers by the GP and then reviewed they'd perhaps not need to come to the hospital at all but that's about education and confidence of the doctors and I don't know if it's got any more I remember years and years ago we still had that problem and I think that's a confidence in training issue with GP's

V= thank you what about in relation to the age brackets in particular so the 0-4 year olds do you think any correlation in what you see with the patient or changes in that age bracket at all

LPN=what in the numbers over the years **(V=yes)** erm I think we probably see as many it fluctuates depending where you are in the year so in winter you would see more babies I wouldn't have said that the numbers have changed that I've seen

V= you mentioned that in the winter can you just expand a bit more

LPN=so when you hit the bronchiolitis season then you tend to see more erm small babies that come in obviously with the chest problems and sometimes you see the older age group with the chest problems but that varies year to year in how the virus is in the children in terms of the numbers you get sometimes the severity you get and also where they are in that disease process so sometimes GP's will send them in quite early erm and actually they end up giving them open access because you know they are quite early in that ten day process and they are probably going to represent because they are getting worse you can see them later in the week again as their condition changes

V=thank you do you think there's a change in the tolerance in doctors to admit do you think there is a higher or lower tolerance to what they admit

LPN=our doctors so the paediatrician to admit

V=sorry so the doctors who are requesting the admissions to paediatrics so I guess those in ED in particular and GP's

LPN=Erm I don't think necessarily ED you might get one or two that you think why have we been asked but I say they are probably appropriate referrals down from ED when they've been seen when they are asking for advice erm so I don't think that's changed erm I think its more GP's that have a lower level admission than ED

V=OK thank you within your own profession within the nursing profession do you think there is a change in tolerance or attitude towards admitted patients

LPN=I think the nurses certainly find there is a change in that parenting and general advice in how to manage common illnesses that they like I've said before that there doesn't seem to be the ability to manage giving calpol or an understanding that a virus will run its course for 4 or 5 days or erm I mean its basic health promotion type things I think that is evident that that has changed and maybe the support they get from extended family so that being able to manage children's illness at home seems to be a lower threshold and they need to seek advice at GP's or at hospital

V=thank you just bear with me so you spoke about PAU and service provision do you think there's been an impact on current or future service reconfiguration on the number of children we are seeing do you thinks there's any service relation there in terms of you spoke about the four hour transit time from ED so do you think there are any changes in service provision elsewhere that impact on your work

LPN=Erm as in-service provision in primary care or within here I think the breeching time has made a difference not sure that service provision anywhere else has altered anything

V= so not within the community

LPN=I suppose if you're looking at the health-visiting and giving that health promotion advice and support to the families that has had an impact as has school nursing in that lack of relation in way of erosion of services in the community shows in the patients that we get through because they've not got that advice going on in the community yeah I think over the years that's certainly had an impact

V=thank you in terms of increased number of patients coming from ED do you have any professional views on that

LPN=increased numbers (v=yes) erm no I mean I think the referrals we get are usually appropriate from the ED if they need another opinion and I don't know how many ED turn round the same as we do who perhaps with better health promotion would have stopped them going to ED in the first place probably the admissions we get down here for you know observation are probably appropriate there's not anything that necessarily inappropriate but I would say there are a number of years I didn't work on the wards so I've got nothing to really compare it to because I was in the community so I'm probably not able to give that correlation if it changed during that time but I wouldn't say masses down from ED

V=Do you notice a trend in the patients who are referred from ED in terms of their presentation and their reason for presentation

LPN=The reason erm mainly from ED are respiratory we will occasionally get the gastroenteritis but I would say mainly respiratory to PAU that have probably had first line treatment in ED so they are children who have often needed back to back nebulisers if their asthmatics or on oxygen if they are the bronchiolitis chesty babies then they probably had a period of observation and first line treatment there so they will probably need to come to PAU and I would say I would have to look through the data but I would say would invariably would need to stay in

V= How do you feel projecting forward in terms of numbers will the systems resources and infrastructure support that

LPN= For I guess it depends what numbers your coming from at the moment it will support it we don't open at night I'm not sure that's something we would look at with the number of admissions we get out of hours I'm not sure we get enough to warrant opening the unit overnight at the moment I think that's the general feeling but I think the infrastructure we've got in terms of opening times will support the patients we are seeing at the moment

V=thank you do you see any links in times chosen to present at any time of day in particular that shows a peak

LPN=that varies you can never predict it from day to day I suppose predominantly we would see them from 11 o clock on wards erm and peaking in the afternoon but having said that we will have days it would start at nine o'clock in the morning and we will have a number of admissions that would need to be seen by lunch time so you can't really predict a specific time but I would say from about 11 o'clock onwards would be from when they start to get more

V= and where do you think those admissions are coming from which sector

LPN= oh they are usually coming from GP's so you can see from primary care you can see when GP's are opening and you see a spike in the referrals so when GP's are having their surgeries you will see it from about 11 onwards and then a bit of a lull and then you'll see it start to peak again probably about 5 o'clock hast past four fiveish when the surgeries are opening again so you'll see it peak again and then I guess you would probably see six o'clock onwards as it starts to get in to the evening time GPs are less happy I guess to manage the children at home they want that second opinion or maybe looking for an admission so you've not got that potentially sick child in the household overnight so I think there's always been a caution there especially with the young children

V=thinking of patients who have self-presented to ED either walk in or via ambulance do you see any correlation in length of stay they've been in ED and coming down to yourselves in PAU are they rapidly seen in ED with rapid involvement of paediatrics and admission to PAU

LPN= erm I wouldn't say I mean sometimes they've been seen in ED and been in ED for a number of hours and are then end up in PAU and have to start the PAU process and have to wait to see the doctor to see them in PAU so there is a long time with some patients and that can be extremely frustrating and can make them quite cross because they are tired by that time they've had that length of stay in A and E and then have it repeated in PAU sometimes yes they are seen quite quickly in ED and have a plan and come down to us and may equally be seen as quickly particularly if they are respiratory and still quite poorly and would be seen quite quickly by the doctors so I think it is quite clinically led as to how quickly they are seen

V= and just to round up if there's anything that you would feel that's contributing to patients and zero day admissions with a respiratory diagnosis

LPN= erm in order to get them out quickly I think if you can reassure parents and you can give them information and explain the reason why somethings happened and this is normal and this is to be expected and give them their flags then I think you can give parents the confidence to manage at home and I think that's what lots of the work do is and then you can discharge those patients back home quite quickly but you've got to invest that time in patient support

V= thank you is there anything else you would like to add

LPN= No I don't think so

V= thank you very much

Appendix C – Doctors Interview Transcribe

N.B - ** Denotes ward name or location and is removed to maintain anonymity

V – Doctor 26th April at 9.58**Thank you very much Dr [redacted] for agreeing to do the interview just to remind you that the topic is 0-4 year olds referred from ED to acute paediatrics with a respiratory diagnosis that result in zero day admission and I would er just like to start it off by asking you just to talk a little bit broadly about your role and responsibilities and your professional background and just to let you know (Doctor=MM) I will make some notes at the same time**

Doctor= ok erm so I'm a consultant paediatrician I got my membership exam in the early nineties and I have been a consultant in [redacted] since ninety-six er for the last five years or so I've been acute services lead which means that I'm just below the clinical director erm and I'm responsible mainly for overseeing ** and ** ward and have some involvement with PAU and its more administrative my specialist interest is epilepsy but like all my colleagues we see any any and every acute admission whether it be on PAU or on the wards er recently we've had a bit of a change around and there is one consultant who leads on PAU and does most of the erm weeks service the service weeks there but I still do some two a year erm of weeks and then take referrals on to the ward

V= **Right so will you do erm ward rounds in the morning of patients who have been admitted overnight**

Doctor= yes yes erm yep its about one in six one in seven duty weeks on the ward and out of hours children get admitted anyway during the day children will go to PAU and maybe get sent home may be admitted to the ward and then they come in under my care

V**= Right ok thank you so when you say at night children are admitted anyway because PAU isn't open**

J= yeah PAU shuts around well we've got staffing issues at the moment its supposed to finish about ten but sometimes it finishes earlier than that erm because of nurse shortages we've also got some acute problem where it's not going to be open at weekends (V= right) and then they will go direct to the ward and generally we have a policy when unless we are teaming of we keep children in overnight if people are worried enough to refer them or present them to A and E then we tend to keep them until the next morning unless they are completely well (V = right ok) but that would still be a zero day admission

V= **So currently what are your views around the current role of acute paediatrics the future role of paediatrics and ED and their relationship**

Doctor= I think it's a very erm I think it's an individualised into various DGH's what the relationship erm is and becomes erm but I think most people have adopted the the PAU system and as soon as you have a paediatric admission unit there's sort of blurring of the boundaries between A and E and PAU because erm the old days GP's would refer in from or patients would present to A and E we've got a concept now of GP's even though they shouldn't telling kids to go to A and E or telling parents down the phone to go to A and E and those are the patients who would come to PAU anyway so we are getting the same type of patients I think when we've looked at it the kind of patients turning up themselves or being to sent by GPs to A and E are very similar to the ones that go to PAU erm and the only additional thing with A and E in terms of paediatrics is trauma or erm blue light ambulances (V= right) but apart from that the patients are pretty similar (V=ok) erm and so the natural progression of that in my opinion erm and some of my colleagues don't like the idea I think its what it will evolve in to is why not merge or have a much closer working relationship between paediatric A and E and PAU and for example have the doctors rotating and the nurses rotating erm and at triage at A and E trauma goes in to the you know main A and E because we are not experienced in trauma and there are fairly clear guidelines anyway and er everything else goes to this sort of merged A and E PAU erm where there's sort of paediatric and A and E input the problem with our hospital is the physical distance of PAU and the wards [redacted] and PAU erm you know how strict the boundaries need to be between the two I'm not sure I guess we just need to make sure from a paediatric side we generally seeing patients that are being considered likely to be admitted not just anything

V= **have you seen in your time as a consultant have you seen a change in the level of presentation**

Doctor= yeah erm the level of threshold to present is is much lower you know either among the public themselves turning up in A and E or the GP referring erm I just think there's been a lot of high profile cases of children sort of diagnosing illness and dying and everyone is just so fearful now a lot more gets sent in and in olden days for example bronchiolitis season erm GPs would sort of phone or someone would phone and say you know I'm sure this child's got bronchiolitis the respiratory rate is above 60 and they're not feeding and they're erm increased work of

breathing erm you know which would be a justification most likely to admit the child erm whereas now its oh I'm worried this child's got bronchiolitis can you see them many of those children are probably well enough to be managed at home you know depending on their age and what day of the infection they are

V= **right ok erm and what about in relation to the age bracket in particular do you think there is any correlation not correlation sorry have you seen any**

Doctor= you mean in seeing the ages shift down

V= yes

Doctor=I think across the board there are more presentations but we know that erm yeah across the board there are increased referrals all age groups and 70% of paediatric admissions or therefore I guess referrals are infective and most of those are respiratory so we know those have gone up and erm because not many were being referred you know eight nine ten teenage years with those kind of problems unless they were asthmatic erm obviously it's gone up in the pre-school mainly age groups but I think it's gone up across the board but the proportions have always been greater in the younger children age group anyway that you're looking at

V**= OK and you mentioned about tolerance you know the tolerance is lower**

Doctor=MM

V= **From the public (Doctor=mm) do you think that this is also within your profession within medics themselves**

Doctor= MM I think it is in er I think it probably is across from A and E and from GP's in A and E or whatever but I'm not the truth of the matter is that we've not had any increase in you know long standing inpatients beds since I've started here in fact they have gone down so therefore our tolerance must have stayed the same or maybe we have had to become more brutal with an increasing population in terms of the number of admissions so I think our length of stay has gone down and it's below a day anyway our average length of stay you know even for normal admissions which makes it a bit of a difficulty to you to what you would define as a zero day admission and er our referral rates have gone up our local population has gone up so erm we must be being more brutal probably than we were and I can see that myself I used to just get phoned by a registrar and told well I'm not too sure what to do about this patient blah blah blah blah blah you know well we'll just keep them in and see how they are in the morning kind of thing but now you know we're a lot more objective

V=**OK erm and what about any recent you talked about the changes in erm PAU and erm and service provision do you think there's been any impact of past current or future service**

reconfiguration on the number of children that you're seeing coz you feel that you're seeing you mention that you're seeing more children (Doctor=mm) do you feel there's any service relation there

Doctor=what as a consequence of service change (V=yeah yes) erm I think a contributing factor is the GP contract in that erm most of our referrals are coming from GPs who don't know the child and don't know the family I think this is in large practices and of course out of hours so the sort of merging of GP practices means a GP has to make a very quick decision on if the parent is anxious and able to manage or if they knew the family they may well you know could provide adequate support or reassurance to keep them at home but because a patient or parent is seeing a GP they don't know and the GP doesn't know the family blah blah I think a lot more the default is far more often to refer

V= **and what about patients who are emergency admissions so haven't seen a GP and had a referral beforehand so self-presented**

Doctor= what and themselves or by ambulance

V= themselves or by ambulance they requested to come in

Doctor= well yeah I think again there is an issue about accessibility whether it's true or not primary care out of hours erm I think we do get a lot of people saying the GP wouldn't give them an appointment for 48 hours so they've gone to A and E because the child is too unwell but I don't know how true that is and whether that is the GP policy or that is the receptionist or whether they've been able to not been able to get themselves through the system but there is the so called accessibility out of hours and if you call 111 you know I've used it with my kids and you do get seen and you do get phoned but whether people are impatient and present up but again I think if there was better and quicker primary care access either in hours or out of hours I think that would help

V= and do you notice any trends as a consultant seeing patients do you notice any trends or variants or themes in terms of when patients present self-present

Doctor= I think it now seems unacceptable for a child to be unwell and there's got to be a reason and there's got to be a treatment I think but whether that's come from media or whatever it seems a temperature is enough to bring a child to hospital but even if you're comfortable for the cause of the temperature and your comfortable that its viral that they haven't got sepsis but now because everyone's obsessed with sepsis and unwell children being sent home incorrectly from hospital I think any child with a temperature a lot of children with a temperature but who aren't very unwell get sent in

V= and when you say sent in..(Doctor= or well advised to be sent in or self-present)

V= and what about when you do the ward round have you noticed any reason for an increase in presentation as a professional do you feel you've seen any trend with your patient group presenting

Doctor= well I think we seem to see and suppose just about admit erm less sick patients than we used to the threshold used to be much high but as I've said I think we are being reasonable brutal over what actually does get admitted or I think we just see more of the same when its busy and less of the same when its busy which is children not only hot but they are hot have less skin perfusion and look unwell with it and you can't get the temperature down or they've got other symptoms with it

V=and in terms of your increased number of patients coming from ED (J=Mm) do you have any professional views on that

Doctor=No I just think people are just generally more cautious and they probably have to be and that is why there are more but its multifactorial I think the threshold to refer to us from A and E has gone down a bit the but the population has also increased so that's another reason to see increased numbers and the people actually presenting to A and E are anxious has gone up and that's put added pressure on A and E and they can't and I think they justifiably feel they can't send home everyone so..

V= do you think there are any political reasons or factors involved in the increased referrals from ED to paediatrics

Doctor= Not so much political more medicolegal I think everyone's just petrified of sending a child home and they die at home but when I look thankfully there are very few child deaths particularly cot deaths these days erm where children have been seen in A and E and sent home that seems to hardly ever happen now so I think it maybe a false premises I think maybe we are doing it right

V=and how do you feel about projecting forward in terms of numbers systems infrastructure resources

Doctor=well I think that we only need to put 1p more in a year for the NHS to have record funding erm you know and this business that keeps being pronounced by the MP's that the NHS is having record funding so that's ok its well known that there's a gap between what the NHS needs and what the NHS gets and that's getting bigger and bigger and this wedge is getting enormous you know if you draw a graph between rates of funding required that is required and for increasing population increasing technology erm increasing elderly component blah blah blah

erm the its started off like that *(Doctor makes gesture with his hand of increasing level line)* and the two are getting bigger and bigger and bigger and diverging further and further and further and probable is already were it is insurmountable and that will be used as an excuse to privatise erm which is I'm sure the desire politically erm so underfunding is just having knock on effects on absolutely everyone because at the top end you get documents from the department health saying you've got to get this you've got to achieve this standard and this is what's expected and this is blah blah blah yet their doing it with less relatively less and less resources and its becoming unsustainable I think in certain areas there is particularly in mental health I don't know if I've digressed a bit **(V=no its fine**) erm so sorry what was the question again (Doctor laughs)

V= projecting forwards (Doctor= oh yes projecting forwards)

Doctor= erm I just don't feel we can provide generally and I think this applies everywhere such comprehensive service as we used to erm because we can't spread ourselves that wide when we are so thin you know in terms of on the ground with equipment with money with resources with personnel or whatever and the government is very good at whipping up public expectation so that keeps the pressure on us and it becomes unsustainable and if you look and sorry to digress a bit but if you look at outpatients referrals erm you know well children everyone says there is the eighteen week journey and generally the hospital has a policy of trying and see people within four weeks they get to the end of the eighteen week journey completed and erm but we feel that children shouldn't even wait four weeks if we can so we work harder and harder and harder to try and clear those and whenever a GP phones we try and see them quicker and bring them forwards in outpatients but the consequence of that is that you get more and more referrals from ** and other areas that aren't doing that and therefore our waiting list builds up again and Ive tried to make the point to people that we can't just keep working harder and harder and harder because we are just going to get to the point of melt down and that's just the way things are going in terms of timing, in terms of waiting to be seen duration in A and E whatever it is anywhere else more and more there's more and more demand we work harder and harder to meet it before people see well if you go to A and E in**you know the waiting times have come right down and then more people from ** and erm the watershed areas will come to **erm you know and people are getting more burn out and there's lots of political stuff about our pensions and you know people are retiring earlier because its more cost effective than carrying on working

V= and do you feel there is any merit sorry do you see any links between times chosen to present to ED so when you're seeing patients who have come in at any time of the day when they have come down from ED do you notice any peak times

Doctor= Well I think the peak times are very similar to those seen on PAU I suppose PAU starts to increase around lunch time and then subsides around school run and then as it were the shit hits

the fan around four until nine or ten and I think probable A and E don't see the little blip around lunch time when the GP surgeries finish and all the referrals have been made the emergencies seen by GP's because they come directly to us I think A and E and we see this pick up after the school run you know we've had referrals sort of the child is so unwell the parent wants to do the school run and then bring the child up later (Doctor=laughs) erm and I think GP closing means a lack of access or a perceived lack of access after you know half four five o'clock means they presents to A and E which means we see this build up four o clock until ten and then we see it drop right away

V= That build up sorry is in A and E

Doctor= Both places yes so therefore it has the knock on that we are seeing more and more in PAU because A and E are referring them or GP's or out of hours GP's

V=Do talking about patients who have self-present to ED either walk in or via ambulance do you see or do you note any correlation between the length of time they have been in ED and coming to yourselves down to PAU

Doctor= We don't look at that but I guess they are waiting longer and longer being seen in A and E and we are seeing more logic would say that erm they do they are getting better at it and I think they triage patients better and are saying look you know I think this patient is going to have to come in because they are in oxygen or whatever and those ones are coming across quicker to us anyway but I think for the urgent non-urgent would you be able to have a look at them because I'm not sure kind of thing are waiting longer I'm sure of it in the evenings

V= and just to round up if there's anything else you feel is a contribution to zero day admission patients with a respiratory diagnosis

Doctor=I think everyone is just very very tuned in to the rare cases of children dying not necessarily because of respiratory problems although that is the most common cause of infection I think everyone is just far more cautious erm and therefore parents GP's A and E themselves and I think there is a lot more pressure from all angles for that reason really and then we've

got the increasing population locally and expectation is increasing so everything is increasing really

V=Fabulous thanks is there anything you would like to add

Doctor=No I don't think so no

V=OK thank you very much

Appendix D Patient Information Sheet

Participation information leaflet

Thank you for taking the time to read and consider your involvement in this project. This information leaflet should provide you with some understanding of the study aims and intentions. Should you wish to discuss any element further please do not hesitate to get in contact on the attached details**.**

What is the study and what is it about?

'Admission patterns of paediatric patients' age 0-4 years diagnosed with respiratory conditions between Emergency Department (ED) and acute paediatrics and its relationship to zero-day admissions.'

The aim of the study is to explore the referral activity for zero day admissions of 0-4 year's old patients from ED to acute paediatrics diagnosed with 'respiratory' condition utilising a range of underpinned variants.

This will be achieved by =

1 – Identify potential correlations between numbers of presenting paediatric patients to ED and the number of referrals with respiratory diagnosis made to acute paediatrics

2 – Identify potential correlations between the number of patients referred and the number of patients experiencing a zero-day admission for those with a respiratory diagnosis

3 – Identify potential correlations that exist between the referral pattern from ED to acute paediatrics and admission outcomes for 0-4 year olds with a primary respiratory diagnosis?

Why me?

To better understand the above areas it is felt that communication with key stakeholders – such as yourself will enable better appreciation of the present state of real-world practice. Your input

will influence the direction of certain areas of the study to ensure that topics that are key to today's referral practice are effectively explored.

Consent

Taking part is entirely voluntary. If you do decide to take part you will be given this information sheet to keep and be asked to give your written consent. You will receive a copy of the signed consent form. If you decide to take part you are free to withdraw at any time without giving a reason. Any information or responses you may have already given will be destroyed.

What will happen?

Following your agreement, you will be interviewed by the researcher using a semi-structured approach; the aim of the interview is to really gain your view points. The interview will be video or audio recorded. There are no special requirements to taking part or attached to how the information is gathered. Once the interview is completed the researcher will transcribe this is into written format and use the themes identified to inform areas of the study.

The benefits of the study surround the development and progression of practice in paediatric care, your involvement in this would be advantageous to the study.

Who do I contact with a problem?

If you were to have any concerns about any aspect of the way you have been approached or treated during the course of this study, please contact Dr Noel Harris (Supervisor of studies) on noel.harris@northampton.ac.uk

Confidentiality

Your personal information and details will not be made public within the study, any direct quotes used within publications or dissemination of information within the Trust will not indicate the role or name of the participants' to ensure anonymity and confidentiality. The interview data will be kept on encrypted file it will not be accessible by a third party or used outside of the study.

Will I be able to read the results?

The results of the overall study will be available for you to read and details of this will be made available in due course. Should you wish to enquire regarding the status and progression of the

study please contact the researcher or the Supervisor of studies Dr Noel Harris (noel.harris@northampton.ac.uk).

In addition to the thesis this work will contribute to, it is anticipated the study results will also be available via publication in peer-reviewed journal.

The study is being funded by the University of Northampton and completed by Vicky Wright (RN DIP/HE BSc BA MSc NISP) as part of an overall Professional Doctorate award. Vicky's contact details are listed below.

Vicky.wright@northampton.ac.uk

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Park Campus

Boughton Green Road

Northampton

NN2 7AL

Ethical consideration has been gained from The University of Northampton and via the Health Research Authority.

Thank you for considering taking part in this study.

24/7/18

Version 2

IRAS ID 235131 V2.1
19/07/18

Appendix E Example of consent form

Appendix D – Consent form

Project title:

'Admission patterns of paediatric patients' age 0-4 years diagnosed with respiratory conditions between Emergency Department (ED) and acute paediatrics and its relationship to zero-day admissions.'

Principal Investigator: Vicky Wright

IRAS ID 235131

This form should be read in conjunction with the participant information leaflet provided.

Please read the following statements and **sign your initials in the box** to show that you have read and understood them and that you agree with them.

You will be required to complete two identical forms – one for your records and one for data records.

		Please initial box
1.	I confirm that I have read and understand the information sheet dated _____ (version No.____) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
2.	I understand that my involvement is voluntary and that I am free to withdraw at any time, without giving any reason without my medical care or legal rights being affected.	
3.	I understand that the information I disclose will remain confidential and that relevant sections of data collected during the study may be looked at by responsible individuals from the sponsor or authorised by the sponsor, from the regulatory authorities or from the NHS trust, where it is relevant to this research.	
4.	My data will not be identifiable by anyone other than the research team and all reasonable steps will be taken to ensure that my personal information is kept confidential.	

Please tick the box if you would like to receive results of the study ☐

Patient statement:

I agree to take part in the study.

_____ _____ _____

Your name Date Your signature

Researcher's statement

I confirm that I have explained the nature, purposes and possible effects of the research study to the person whose name is printed above. They agreed to take part by signing and dating above.

_____ _____ _____

Name of Person taking consent Date Signature

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