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Review of factors that influence non-elective hospital admission(s)

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REVIEW OF FACTORS THAT INFLUENCE NON-ELECTIVE HOSPITAL ADMISSION(S)

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A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT OF SHEFFIELD HALLAM UNIVERSITY FOR THE DEGREE OF MASTERS OF PHILOSOPHY

SEPTEMBER, 2019

Content

I certify that this thesis has been adequately read, in my opinion, it is fully adequate in scope and quality as the degree of Masters of Philosophy

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ACKNOWLEDGEMENT

My special appreciation goes to my advisors: Dr. Frances Slacks and Deborah Harrop who has been tremendously helpful since the commencement of this thesis up till its completion. The methodological guidance that I received from Deborah was valuable and the knowledge acquired was useful in my write-up. Dr Frances Slacks' support on the introduction and conclusion part of my thesis is treasured; a thought of which gave direction to my work and helped me complied my findings to delivered a reasonable conclusion in my thesis.

More specifically, I would like to thank my supervisor, Prof. Shona Kelly, without whom this research would not have been achieved. Her patience, tenacity, taught ideologies, comments, recommendations and optimally her guidance during the entire time, made a huge impact on my thesis and was worth it at the end.

I specially, like to show my gratitude to the Cultural Communication and Computing Research Institute (C3RI) for making essential resources and facilities available during my study period. Appreciation also goes to the RefWorks expert in Sheffield Hallam University, who gave guidance towards effective application of RefWorks on screened literature.

A special gratitude to my families and friends; embodiments of who has been my pillar and reasons for completing this thesis. Words cannot express how grateful I am to my siblings who stood by me in the difficult times. I can never forget the words of my late parents; whose souls will continue to rest in perfect peace. Their prayers, at the time they were alive has sustained me this far. Appreciations goes to my friends within the faculty, whose determination to excel was an encouragement for my success. I cannot thank you enough for your physical, emotional and intellectual support.

Finally, I thank the almighty God, my good Father, for letting me through all the difficulties I have experienced. You are the one who let me finish my degree and I will keep on trusting You for my future.

ABSTRACT

BACKGROUND: There has been unexpected influx of patients into hospitals, especially in United Kingdom. The reasons for non-elective hospital admission in hospital (NeHA) remain poorly understood. The unprecedented rise in NeHA places severe financial and manpower strain on hospitals, due to the continuous targets to meet statutory patients' expectations and admissions demand

OBJECTIVE: This research study examines the sociodemographic risk factors that account for non-elective hospital admission among patients who experienced non-elective hospital admission(s).

METHOD: A review of literature was carried out to identify relevant studies published between 2010 and 2017 using a range of search engine including CINAHL, Medline, Scopus and Cochrane Library. Inclusion criteria were; published in the English language, cohort studies, with population sample aged mostly 18 years and above, not a specific health condition and focused on influencing factors for NeHA(s).

FINDINGS: From a total of 6,889 reviewed papers, 15 studies on risk factors to NeHA(s) met the inclusion criteria. Data extraction sheets captured information on the population setting, study design, characteristics, quality assessment, methodology, findings and risk factors included in the analysis. Less studies addressed non-clinical risk factors. Seven studies relied on retrospective administrative data which explored unplanned hospital admission. From the overall studies, only 1 study in Belgium reported a discriminative ability (c statistic: 0.73). Another UK study yielded a R-squared value of 0.74, while the remaining studies presented result using odds ratio at a 95% confidence interval (ranging from 0.001 to 8.600). Six studies explored similar models within the same population, from which various non-clinical risk factors, including deprivation, age, sex, ethnicity, financial support, income, living situation and social factors, were reported as risk factors for unplanned hospital admission(s). Thirteen out of the fifteen included studies incorporated variables for groups of conditions, which capture physical illness, cognitive heart failure and mental health conditions. Two studies did not report variables relating to patient's health condition rather they presented demographic characteristics. Age was found to be a significant influencing risk factor to non-elective admissions in 8 out of the 15 studies that were included and was the most dominant significant risk factors among the sociodemographic risk factors that were examined. Sex was also reported to be significant in 4 studies, while ethnicity was reported to be significant in only 3 studies which and were conducted in the UK among a reasonable population sizes ranging from 867 to 1,177,304.

CONCLUSION: The findings suggest that, recent studies on non-elective hospital admission(s) were designed for clinical comparative purposes and very few studies reflected the implication of non-clinical sociodemographic risk factors as presented in this review. The outcome of this review presented age, sex and ethnicity as the sociodemographic risk factors influencing NeHA, a discovery that emerged from the three levels classificatory system, which was uniquely produced in this review. Thus, health organisations should therefore, render necessary intervention towards older ethnic minority men, that are rated high unplanned hospital utilizers, so that the exceptional increase in NeHA could be significantly reduced.

Key Words: Admission, Readmission Hospital, Non-elective, Factors, Literature review

GLOSSARY OF TERMS

*:	-More Studies Present the Significant Risk Factors
A&E:	Accident and Emergency
AC:	Acute care
ACES:	Faculty of Arts, Computing, Engineering and Sciences
AD:	Administrative Data
ADL:	Activities of Daily Living
AM:	Admission Measure
AUD:	Alcohol Use Disorder
CASP:	Critical Appraisal Skills Programme
CBF:	Community Based Factors
CC:	Community Care
CCS:	Clinical Classification Software
CIRS:	Cumulative Illness Rating Scale
CM:	Comorbidities;
COPD:	Chronic Obstructive Pulmonary Disease
CSS:	Community Supportive Services
CSS:	Cross-Sectional Studies
CT:	Can't Tell
DOS:	Director of Studies
EA:	Emergency Admission
ED:	Emergency Department;
EHA:	Emergency Hospital Admission
FF:	Fixed Factors
GP:	General Practice
HBF:	Hospital Based Factors
IADL:	Instrumental Activities of Daily Living;
IMD:	Index of Multiple Deprivation
MH (MESH):	Medical Subject Headings
n:	Number of Responses
N3:	Near Operator

NC:	Not Clear
NeHA :	Non-elective Hospital Admission
NeRa :	Non-elective Readmissions
NR:	Not Reported (Null Value)
NSS:	Not Statistically Significant;
OR &AND:	Boolean Operators (Connectors)
PS:	Prospective Studies
QA:	Quality Assurance
Quintile 2:	Category of Deprivation
RS:	Retrospective Studies
SDF:	Sociodemographic Factor
SES:	Socioeconomic Factors
SF:	Significant Figure (Shows measurement precision)
LOS:	Length of Stay
SHU:	Sheffield Hallam University
Shurec1 and Shurec2:	Ethics Application Forms
SN:	Serial Numbers
SDF:	(Sociodemographic Factors) Features Other than Patients' Treatment or Medical Condition (Including; Age, Sex and Ethnicity)
SRL:	Systematic Review of Literature
SS, NSS:	Some Group were Significant, while Some were not Significant
SS:	Statistically Significant
UFF:	Unfixed Factors
UHA:	Unplanned Hospital Admission
UK:	United Kingdom
URA:	Unplanned Readmission
US:	United State

CHAPTER ONE

Introduction

1.1 OVERVIEW

Non-clinical risk factors, specifically sociodemographic factors for non-elective hospital admission (NeHA), have not been adequately studied in the past. There had been no review of their influence on non-elective hospital admission. This chapter, discusses the basis and purpose of this review, including the study background, the current state of knowledge on non-elective admission, research motivation, contribution to practice, the impact of non-elective admission to the society, research aim and objectives as well as the chapter synopsis.

1.2 BACKGROUND OF STUDY

Non-elective hospital admission (NeHA) is an emergency or unplanned hospital admission at short notice, often presented at the emergency department, supported by (Dumke, 2004; Iannuzzi et al., 2014). This admission type, often occurs when a patient is admitted without previous booking. It is generally understood to include at least one overnight stay and is due to patients' clinical requirement or unavailability of an alternative healthcare service, supported by (Iannuzzi, et al., 2014). Recently, the number of NeHA(s) has doubled in many developed countries, such as; United Kingdom, Belgium, Spain, Canada and Australia, according to (Walshe et al., 2015). In this review, the underlying factors responsible for such admissions, are classed as risk factors for unplanned admission. Relevant risk factor is any characteristic or attribute of an individual that increases the likelihood of experiencing NeHA, including age, sex and ethnicity, as defined by (WHO, 2018).

There are also, non-elective readmissions (NeRa), which are subset of NeHA(s). They occur when a patient is admitted, discharged and readmitted within a period of thirty days of discharge of an index admission, for the same condition or health problem, supported by (Blunt et al., 2014). The term admission(s) and readmission(s) are used interchangeably in this review, given their interlink to unexpected hospital utilization. Both types of hospital admission(s) may be a direct admission by a General Practitioner (GP) or occur via the Emergency Department (ED), supported by (Robusto et al., 2016). Sociodemographic involves a combination of social and demographic characteristics which are generally used for analysis in health science. (Bankart et al., 2011), defined, patients' sociodemographic factors as features, including; age, sex and ethnicity. Other patients' social factors include

socio-economic status, which consist of information relating to education and income. This review focus on patients' sociodemographic characteristics, which are attributes other than patients' medical condition or treatment and are classified as either fixed or unfixed factors. These factors explain variation on NeHA rate between organisational practices, according to (Bankart et al., 2011).

In Belgium, 65 years and over aged patients, occupy two-thirds of the general hospital beds. This accounts for 50% of the recent growth in NeHA(s); which might result from the increased rate of NeHA, reported by (Deschodt et al., 2015; Braet et al., 2010). Older patients with mental health conditions were reported to be more likely to make unplanned returned visits into hospital, according to (Kirby et al., 2012). This bolsters the argument that older patients exert some influence on NeHA. Older patients have higher propensity to experience falls when compared with the younger patients. This may be as a result of the link between older aged patient and functional decline, supported by (Salvi et al., 2007; Panya et el., 2013). The underlying assumption is that the elderly patients are affected by the inadequacy in the primary healthcare system, given the inaccessibility to healthcare services that occur in some countries. Nonetheless, researchers emphasise that most emergency admissions are avoidable but may not be established among the aged population given their required healthcare needs (McDonagh, et al., 2000; Lyon et al., 2007).

However, there were differences in the ethnicity of patients older than 45 years among the Turkish, Moroccan, Surinamese and Antillean populace, according to (De Bruijne et al., 2013). The study shows that certain adult ethnic group experienced NeHA(s) than others. Older Turkish populace are more likely to experience NeHA than others in the same population, according to (De Bruijne et al., 2013). In the States, realistic piece of evidence revealed the existence of ethnic inequalities in the quality of care received for the treatment of cancer and myocardial infraction (Vaccarino et al., 2005; Agyemang et al., 2010). These inequalities exacerbate NeHA rate among some ethnic groups; given their healthcare need and may result to the high NeHA, rate among such ethnic group. In Europe, black populace experiences a worse case of hypertension, when compared to other population, according to (Agyemang et al., 2015; Modesti 2015). This leads to their need for getting appropriate treatment in hospital in order to reduce their rate of hospital presentations.

Studies presented sex, to be connected to emergency admission and male sex was mostly reported to be an influencing risk factor for NeHA in the work (Bankart et al., 2011; Payne et al., 2013; Long et al., 2016). All these studies were also conducted in the UK and her population is more dominated with female sex. In Scotland, male sex was reported to be associated with NeHA, which might be as a result of the propensity of men to multiple prescriptions, according to (Appleton, Abel and Payne 2014). However, another study who investigated three different sites reported female sex to be associated with NeHA; an implication of which revealed lack of hospital facility as a limiting factor for those patients, reported by (Ismail et al 2017). These shortages, might be peculiar to the female gynaecology ED; where medical treatments are focused on female gender. The aftermath of increased NeHA(s) is that hospitals are pressured to improve capacity, regardless of the influx of patient via ED, supported by (Bottle et al., 2006).

In addition, emergency readmission has brought impeding financial burdens on health organisations given its swiftly growing occurrence in many hospitals, including England, confirming to (Blunt et al., 2010; Robinson, 2010; Blunt et al., 2014). Also, a study undertaken in Australia, reported an additional hospital cost of 3858.3 US Dollars for each emergency readmission within 30 days, reported by (Gili-Miner et al., 2014). Similar cost implications were reported in Belgium Emergency Department (ED) visits, which proved to be a predictor for hospital readmission (Braet et al., 2015). The National Health Service (NHS) and other health systems in some countries are currently facing similar challenges (Bottle et al., 2006). Thus, a thorough review of relevant literature on risk factors to emergency hospitalisation(s) would be of benefit to the stakeholders, given the need to reduce the growing unexpected utilization of healthcare services, which significantly increases health budget and unanticipated hospital admission(s) (Carvel and Woodward, 2006). The underlying assumption here is that avoidance of unplanned hospitalisation is much more difficult among aged population given their complex nature of healthcare demand.

1.3 SITUATIONAL ANALYSIS OF NeHA

1.3.1 International

According to Pitts et al., (2012), unexpected admission has been identified as growing problems across the world, which lead to overcrowding in hospitals, supported by (Crooke et al., 2004; Pines, 2011). An average of 67,991 patients attended A&E departments each day in

England, within countries (such as; France, Netherlands and Belgium). They experienced 41% emergency admission increase in 2018, as compared to year 2017. Accident and Emergency (A&E) department offers a 24-hour services, in order to provide required treatment to her patients. Mostly, the increase is common in the minor injury units and the urgent care centres. Over the last five years, attendances at most A&Es have risen by 10.3%, which amounts to over 4,000 additional patients attending the A&E department every day, as mentioned in (NHS Key Statistics, 2019). In 2001, more than a third of patients in United State (US) hospitals were diverted to other healthcare providers, due to the high rate of unplanned admission, which was seen as a threat to the ED as mentioned in (Franaszek et al., 2002). This was as a result of their disjointed and expensive health system. A disjointed health system is when the health data system is not linked, supported by (Cowling et al., 2013). Patients in US compromise their healthcare because of unaffordability of treatment; which poses great impact on hospital admission. A single visit at the emergency unit may cost thousands of US Dollar, which is one of the reasons, people avoid hospital visit in the US. A similar situation occurred in Spain, where higher hospital cost was a justification for hospital avoidance. As a result, hospital avoidance led to complicated health problems and increased death rate in Spain, as mentioned in (Gili-Miner, et al., 2014).

In contrast, (Kirby et al 2012) reported that discharge destination was associated with NeHA in Australia. It might be that the quality of care at the discharge location might be inadequate which might have led to patients' readmissions. In 1992, Boyle et al., reported that ED in Quebec, Canada, frequently experienced overcapacity, resulting in long waiting times, ambulance diversion and both patient and physician dissatisfaction, which were results from NeHA. In the same country, inadequate hospital bed space was an implication from increase unplanned admission, because there were higher hospital admission and the available beds were not enough for admitted patients. So, Quebec government successfully improved the situation by donating a sum of 178 million Dollars, to increase the number of hospital beds that will accommodate the increased number of patients who experienced NeHA, reported by (Boyle et al., 1992). Another study reported that the diversion of ambulance away from ED was a problem in most metropolitan areas. Patients were forced to present at the ED unexpectedly; which posed increased risk of overcrowding in Taiwan hospital. They were trapped at the ED, due to the high number of presentations at the hospital, reported by (Shih et al., 1999).

Nevertheless, a universal healthcare is also delivered in other European countries including; Germany, Belgium and Netherlands, but very few of them carried out investigation on the risk factors for NeHA. A study in Belgium, reported Meals on wheels and less than three months hospitalisation, as a risk factor for NeHA, (Deschodt et al., 2015). Turkish ethnic group was reported to be linked with NeHA in a Netherlands study, according to (De Bruijne et al., 2013). Another Spanish study was conducted in a country where most healthcare is free of charge; reported previous hospitalisation within three months as an influencing risk factor for NeHA. These reports suggest a prevailing rate of NeHA in some European countries.

1.3.2 United Kingdom

The number of patient presentations at the ED is more than 15 million per year in both England and Wales, reported by (Friebel et al.,2018). There has not been any systematic approach to identify the cause of the high influx of patients into NHS hospitals, confirming to (Cooke and Jenner 2002). Reforming of emergency care (Department of Health, 2001) was implemented as government strategy in 2001, by the Secretary of State for Health, which recognised that problems with the ED are often the results of problems elsewhere in the system (Cooke and Jenner 2002). In the late 1980s, the NHS referred to the high influx of patients at the ED as "winter pressure," Kirby et al., (2012); but it was subsequently demonstrated that winter pressure was not due to ED attendance or admissions. Rather an increase in hospital length of stay was the root cause and mostly occur among patients with respiratory and cardiovascular disease, supported by (Allison, 1991; Douglas et al., 1991). It has been reported that predisposing factors that had led to the increasing rate of unplanned hospital admission in the UK are patients' characteristics of deprivation, age, ethnicity, and sex; which are non-clinical factors (Bankart et al., 2011). This and many other related characteristics are the non-clinical risk factors affecting the use of health services in the UK. Therefore, there is a need for the health commissioners to look into patients' social characteristics so that the prevailing rate of unplanned hospital admission could be moderated.

It has been reported, that patients sometimes misuse the health facility in certain developed countries (such as; the UK), given that most healthcare services are predominantly free, as reported by (Pirmohamed et al., 2000). The NHS provides healthcare service to majority of

the residents in the UK. Sometimes patients bypass GP's appointment and present themselves at the ED, with the hope of getting required treatment and as such unplanned admission may be unnecessary, supported by (Pirmohamed et al., 2000). Although there are differences in the health organisation in some countries; it may be challenging to generalise changes in the foreign countries system to the UK system, given its unique feature of being a unified national health system rather than the one that slightly varies between regions, as occurred in Canada.

1.4 THE JUSTIFICATION FOR THE RESEARCH

The reasons for increasing NeHA remain poorly understood. An evidence of this is the high rate of NeHA in the UK's hospital; when compared to some hospitals outside the country. The health authorities, including the local councils, are concerned about the amount of money spent on patients' treatment (Veeren and Weiss, 2017; Ismail et al., 2017; Li et al., 2014). Meanwhile, studies focus less on sociodemographic factors, predisposing patients to unplanned admissions(s), given the limited availability of sociological and demographic data to identify its associative factors, as mentioned in the work of (Bankart et al., 2011; Long et al., 2016). The stakeholders demand that the sociodemographic risk factors to unplanned admission(s) be known regardless of these limitations. Appropriate reduction of the high rate of unplanned presentation in hospital, may produce patients' treatments rate, improved quality of care and cut overall healthcare cost

In order to strengthen the validity of this review, it is essential to present a secondary analysis, (such as; a literature review of unequivocal knowledge). Omitting a peer review protocol in a review increases the likelihood of bias within the study, in consonance with (Hemingway and Brereton, 2009). Abstract concepts of clear and understandable knowledge are adequately explored; which also identify contradictions, gaps in existing knowledge and critical evaluation of the literature on risk factors to NeHA(s). In this review, predisposing factors consisting of clinical and non-clinical factors would be examined in order to identify the sociodemographic factors influencing unplanned admission(s), an issue which this review aim to shed some light into.

1.5 CONTRIBUTIONS TO KNOWLEDGE

This review presents a summary perspective on what is already known in the context of

social-demographic predisposing factors for non-elective hospitalisation and rehospitalisation. Not only that, it would enable the hospital management to know the current sociodemographic risk factors that may influence NeHA; but also, that patients might be able to pay attention or take necessary precautions on their health, in order to avoid emergency admissions. Current researchers, would understand which research includes non-clinical sociodemographic risk factors, so that they are able to further focus investigations on the factors that are identified as risk factors to NeHA in this review. Thus, appropriate measures on identified factors would be put in place.

The literature review approach, conducted in a semi-systematic way was adopted in this review. It uses an explicit transparent approach, to identify and critically review relevant literature; by examining the methods and results of each primary study, with an emphasis on background and contextual material supported by (Jesson, Matheson and Lacey, 2011). This approach is accountable, replicable, updatable and can be used to inform healthcare providers, who are trying to curb the high influx of patients into the hospital. To the best of my knowledge, this review appears to be the first study that review the literature relating to the identification of sociodemographic influencing factors for NeHA(s) in a systematic way and as such, develops a classificatory system for risk factors considered to date.

Given the unexpected changes in hospital events, factors such as; management policies, legislation; an up-to-date literature review and a classificatory system for influencing factors to NeHA, will contribute greatly to decision making towards the reduction of NeHA(s). Especially in a country like the UK; where the rates of NeHA is now a burden to the stakeholders. Thus, undertaking a review of this kind allows the focus on evidence-based strategies which depends on a good methodical review of current knowledge and adds to the existing body of knowledge not only in the UK healthcare system but in many other countries around the world.

1.6 EFFECT OF NeHA

1.6.1 Clinical Effect

This review includes studies that incorporated clinical factors relating to patients' disease or treatment, which occurred either in hospital or community, (such as; medication and co-morbidities), in accordance to (Hunter et al., 2016). Patients are at the receiving end of the

repercussions of high NeHA, in most cases. Similar factor was related to hospital admission, reported in the work of Considine et al., (2015); where NeHA. was associated with higher transience factors to patients' presentation at the ED. In contrast, they found less influence of day of the week and time of admission on patients' mortality from unplanned admissions, reported in (Bankart et al., 2011; Braet et al., 2015; Arulkumaran Harrison and Brett, 2016; Ismail et al., 2017). Such demise might result from other risk factors (such as; inadequate hospital staffing), because there were more hospital presentations than available healthcare staff. This led to pressure on healthcare staff to improve work capacity regardless of the high influx of patients at the ED, confirming to (Derlet and Richards, 2000).

1.6.2 Non-clinical Effect

For the purpose of this review, non-clinical sociodemographic factors are all factors other than patients' medical condition or treatment and they are classified as either fixed or unfixed (Hunter et al., 2016). For instance, deprivation score, that estimates the lack of health facility in the society, was strongly associated with NeHA in the works of Bankart et al., (2011); Long et al., (2016) which are both UK based studies. Patients, who are resident in rural locations and are far from health centres may be deprived of basic health infrastructures that are available in the urban central hospitals. This results in lower quality of care in the rural areas and often leads to unplanned hospitalisation or rehospitalisation, in line with (Bankart et al., 2011; Payne et al., 2013; Long et al., 2016).

Conversely ethnic variation was significant with NeRa in the work of (De Bruijne et al., 2013). Meanwhile inadequate attention is paid to older patients with multiple health conditions that may require urgent or extended care after hospital discharge. This may be the reasons for their repeated unplanned hospital admissions within a short period of time. Furthermore, social factors were considered and predicted in the work of Lin et al., (2014); who reported that patients with suicidal tendencies have social associations' problems that might have occurred through social engagement between two or more people. Unplanned admission may occur as result from physical or emotional abuse, leading to suicidal attempts (Lin et al., 2014). The healthcare provision in rural areas may be interpreted as inadequate in the quality of hospital care delivered to ethnic minority patients. In Netherlands, they are deprived of quality healthcare, given the inadequacy of healthcare centres in their locations, as discussed by (Bruijne et al., (2013).

1.7 RESEARCH AIM AND OBJECTIVES

The aim of this thesis is to examine the extent to which non-clinical sociodemographic risk factors of NeHA(s) are included in research on unplanned hospital admissions.

1.7.1 Research Objectives:

In order to achieve this aim, a number of objectives were formulated:

1. **Objective 1**: To develop a search strategy and screening criteria for the literature.
2. **Objective 2:** To examine the retrieved literature, review and systematically synthesise relevant studies
3. **Objective 3**: To develop a classification system for the risk factors
4. **Objective 4**: To identify which sociodemographic factors impact on NeHA
5. **Objective 5**: To identify within the research which study includes non-clinical risk factors and how consistent is the association with NeHA
6. **Objective 6**: To make recommendations based on findings, towards which non-clinical sociodemographic factors should be included in future research

1.8 SUMMARY

The evaluation of the literature on influencing factors for NeHA(s) is evidently a major concern and there is need to review existing work. An outcome which is expected to provide a clear understanding of the sociodemographic risk factors for NeHA so that the health practice could make informed decision on how the increasing emergency admission is managed. In this chapter, a contextual dialogue has provided the state of the art on NeHA(s), which has been presented in a focused manner. The contemporary situation of NeHA, justification of research, contributions to knowledge, discussed the causes and impact of unplanned admission(s). Further considers the research aim, and objectives which highlights the purpose and systematic activities for this review.

CHAPTER TWO

Methodology

2.1 OVERVIEW

The methodology selected for this review is a literature review. A literature review is a process of bringing together existing research that is relevant to the area of investigation being studied. It is considered to be a piece of secondary research because it reports existing primary research and critically evaluates, classifies, and compares what has already been published on a particular topic.

The use of a well-structured search strategy combined with critical appraisal to find evidence relating to the research question was adopted in this review. This review is not purely descriptive but incorporates critical narratives of the included studies, confirming to (Jesson, Matheson and Lacey, 2011). It evaluates primary research in order to establish a consistent outcome with limited bias (Henderson et al., 2010; Rew, 2011). This chapter defines the purpose for the literature review, the search strategy and inclusion and exclusion criteria, supported by (Lavis et al., 2006; Rew, 2011). Study outcomes of interest, quality appraisal process, ethics, reliability, validity and generalisability of the study were adequately discussed.

2.2 BENEFIT OF LITERATURE REVIEW FOR THIS RESEARCH

This review uses a literature review as an applicable method, which seems different to what is generally used in medical research. As in the case of a traditionally adopted systematic review of literature (SRL) or meta-analysis (Tranfield et al., 2003). LR similar to SRL was adopted to impartially summarise and integrate primary studies; making it transferable and reliable. The selected technique was used in order to solve an on-going healthcare problem, including analysing existing piece of information relating to the risk factors for NeHA. Although there is a debate as to whether a literature review can accurately answer broader health policy questions (Bambra, 2011). The deliberations on the appropriateness and viability of conducting literature review are assumed to answer questions the sociodemographic risk factor for NeHA and more specifically on which non-clinical risk factors are considered in the studies included, an indication of which was mentioned in objective five of chapter one.

As previously known that descriptive review delivers a valuable summary of studies which provides argument with a driven opinion (Aveyard, 2014; Hunt, 2013; Booth et al., 2016). Ranging from an analytical requirement of qualitative and quantitative research, with the assessment of other evidence such as; opinions or discussions of experts in relevant fields, according to (Mays et al., 2005; Booth et al., 2016). Literature review approach was adopted because the methodology enables critical approach of argument formulation, which is backed up by evidence and reinforced with solely quantitative studies (Booth et al., 2016). Using this approach delivered findings which are reproducible, in terms of the methods of data collection, data analysis and in the style of report, supported by (Mays et al., 2005; Aveyard 2014; Booth et al., 2016). A literature review is an appropriate method of investigation for this review because it allows a number of primary studies to be synthesise and enables the author:

- To identify sources of data that were used by other researchers
- To see what was previously investigated and what has not been investigated
- To understand how other researchers measured and defined key concepts
- To contribute to existing knowledge, thus moving research forward
- To exhibit their understanding and ability to critically evaluate research
- To provide evidence that may be used to support their findings.
- To draw conclusions from such findings

Given these benefits, this review therefore adopts a literature review as an applicable methodology for the synthesis of information gathered from relevant studies, supported by (Booth et al., 2016). Literature reviews helped to identify, select and appraise studies of a previously agreed level of quality threshold, which are relevant to the research question. (See page 11). Quite often a research with literature review approach does not adopt multiple methodology as applied in existing studies (Pletcher et al., 2008; Herring et al., 2013) where a Systematic Literature Review (SLR) and Meta-Analysis were combined (Tranfield et al., 2003).

This review solely adopts a literature review as a method with integration of features from SLR, using evidence sources that provided a broader picture of the problem, supported by (Tranfield and Cronin, 2016). This unique process strengthens the methodology adopted in this review given the integration of features from SLR. The synthesis of data that was applied

in this review. It allowed the generation of wider evidence from journal papers, which were assessed through the amalgamation of information in quantitative studies. In this review, data were collected through a comprehensively organised approach and were presented in a detailed methodological structure that are partly similar to SRL; which ensures its validity upon which problems are solved. For this reason, literature review was undertaken in response to the relevant and current literature, so that the purpose of this review could be achieved.

2.3 INFORMATION SOURCES

The information sources; listed below were used to search for data for the literature review and were accessed through Sheffield Hallam University's Library Gateway.

- MEDLINE (EBSCO)
- Scopus (Elsevier)
- CINAHL (EBSCO)
- Cochrane Library (Wiley)

The databases selected are either subject specific or multidisciplinary in scope. Mainly, these four databases were used because they provide large number of relevant papers which is unavailable in another place. Further, content is subject specific to health research and comprises valid and reliable articles, when compared to Google Scholar, which is not subject specific and sometimes return unrelated articles which might be less reliable. However, Google Scholar was used to download articles but was not used as a search engine due to those limitations. Other database (such as; Web of Science, PsycINFO) were also not considered because they are less comprehensive for the topic of this review. For instance, Medline is regularly updated by well-trained data entry officers; their up-to-date data imputation makes the database reliable and was utilised in the work of (García-Pérez, 2011). In Medline, the use of extender and limiter makes it easy to access and extract the most relevant paper for this review; an act that is not easily utilised in other databases (such as; Google Scholar). In addition to the search process, the reference lists of related papers were screened for relevancy; using hand search and reading through the title text in order to extract the most relevant papers that were identified from the four main databases, in accordance with (Jesson, Matheson and Lacey, 2011; Lobiondo-Wood et al., 2014).

2.4 SEARCH STRATEGY

Studies were eligible for inclusion, if they were mostly published between 2010 and 2017. This date limit was considered appropriate because studies conducted before 2010 may no longer be relevant to current health practice. Thus, the avoidance of obsolete perception on the factors influencing NeHA becomes paramount, (Ridley, 2012). A 1999 study, was included because its outcome fits with the outcome of this review and its contents reflects more on the investigation of this review (Chu and Pe, 1999). The English language restriction was considered appropriate, because at the time when this review was conducted, there was no access to translators. In addition, studies undertaken in the United States of America were excluded because the healthcare system differs substantially from all other developed countries. During the screening process stage, studies with only children or adolescent were mostly dropped because children's health might be complex and include other factors relating to their parents. Few studies that are relevant to this context were included because their outcome relates to the risk factors for NeHA. However, getting relevant articles for this review becomes a key factor and requires adequacy in the time and terms used. The terms used, are key wards, relating to emergency admission, which are flexible enough to accommodate changes and adaptability in other search engines.

Table 2.1: MEDLINE Search History

Facet	Query	Limiters/Expanders	Results
S17	S10 AND S14	Limiters - Date of Publication: 20100101-20171231 Narrow by Language: - English Search modes - Boolean/Phrase	**2,609**
S16	S10 AND S14	Narrow by Language: - English Search modes - Boolean/Phrase	4,105
S15	S10 AND S14	Search modes - Boolean/Phrase	4,409
S14	S12 OR S13	Search modes - Boolean/Phrase	9,270
S13	S2 N1 S5	Search modes - Boolean/Phrase	2,333
S12	S1 AND S11	Search modes - Boolean/Phrase	7,143
S11	S2 N1 S4	Search modes - Boolean/Phrase	12,455
S10	S3 OR S6 OR S7 OR S8 OR S9	Search modes - Boolean/Phrase	1,840,873
S9	(MH "Cross-Sectional Studies")	Search modes - Boolean/Phrase	236,477
S8	(MH "Cohort Studies")	Search modes - Boolean/Phrase	205,243
S7	(MH "Retrospective Studies")	Search modes - Boolean/Phrase	628,074

S6	(MH "Prospective Studies")	Search modes - Boolean/Phrase	439,744
S5	AB (Hospitali* OR Rehospitali* OR Re-hospitali*) OR TI (Hospitali* OR Rehospitali* OR Re-hospitali*)	Search modes - Boolean/Phrase	196,584
S4	AB(admission* OR attend* OR admit* OR readmi* OR re-admi* OR reattend* OR re-attend* OR present* OR representation*) OR TI (admission* OR attend* OR admit* OR readmi* OR re-admi* OR reattend* OR re-attend* OR present* OR representation*)	Search modes - Boolean/Phrase	3,961,896
S3	AB (observational OR "population stud*" OR prospective OR retrospective OR "cross sectional" OR cross-sectional OR "cohort stud*") OR TI (observational OR "population stud*" OR prospective OR retrospective OR "cross sectional" OR cross-sectional OR "cohort stud*") OR TI ("case control" **N3 nested) OR AB ("case control" N3 nested)**	Search modes - Boolean/Phrase	1,162,880
S2	AB ((emergen* OR unplan* OR unschedule* OR unpredictable OR unexpected OR "non-elective" OR "non elective")) OR TI ((emergen* OR unplan* OR unschedule* OR unpredictable OR unexpected OR "non-elective" OR "non elective")))	Search modes - Boolean/Phrase	403,104
S1	TI hospital* OR AB hospital*	Search modes - Boolean/Phrase	1,028,424

Acronyms: N3: Near Operator; MH (MESH): Medical Subject Headings, *OR &AND: Boolean Operators*

The searches strategy comprised two main facets: (1) terms to describe non-elective hospital admissions and (2) terms to describe the types of studies sought. The search displayed in Table 2.1 were carried out in order to generate relevant articles, details of which are presented above. The nested proximity search used in facet 3,11 and 13, helped to search for one or more words which exist a number of words from each other. The proximity operator (N) and number (1 and 3) used in the listed facet were applied to specify the number of words that are listed after the key word ‘emergency’. Facet 1, is the term used to search for studies relating to non-elective hospital admissions; while facet 2, are terms describing emergency admission. Facet 3, are the various study type selected for this review with the use of nested proximity search (N3), which extract three close words to the phrase ‘emergency’. Facet 4, describes terms relating to admission; while facet 5, are search terms relating to hospitalisation.

Facet 6 to 9, were searches with study design using a Medical Subject Headings, which are generally used by indexers to describe articles for MEDLINE records while facet 10 to 14, are the integration of different facet using Boolean operators (AND / OR). Lastly, Facet 15 to

17 were searched with similar query but the results are different, because the extenders and limiters were used to streamline the search with date and language; a standard process which is peculiar to Medline database. During the search process there was discussion about including the term "risk factor" as an additional element to the search strategy. Ultimately the term was not used due to the concerns that it would narrow down the search. Also, by searching with a particular outcome in mind; relevant studies could be missed, since the term 'risk factor' was not systematically used in existing studies. Another concern was that, using such term may mean that researchers were searching with the outcome of research, which was unwise to do at the early stage of research.

In addition to the searches in all four databases, the reference lists of papers were manually explored so that all relevant papers could be adequately sought, as applied in the work of **(**García-Pérez et al 2011**).** The limit for inclusion and exclusion was implemented to extract the most recent and relevant study for this literature review, in agreement with (Ridley, 2012). The search strategy used in this review was comprehensively systematic and was presented using a detailed methodological structure, which ensures the strength of this review. Returned results, were mostly studies that relate to risk factors for unplanned hospital admission and/or readmissions; from which selection were made based on the inclusion and exclusion criteria.

2.5 SELECTION PROCESS

All results were exported from the four main databases into the bibliographic software tool (RefWorks); a tool that helped to collate and merged papers from search engines. After which the integrated papers were exported to excel for further dispensation. The multi-stage process of title and abstract screening that was used in this review, captures the identification of studies, selection for eligibility and the inclusion of studies for this review.

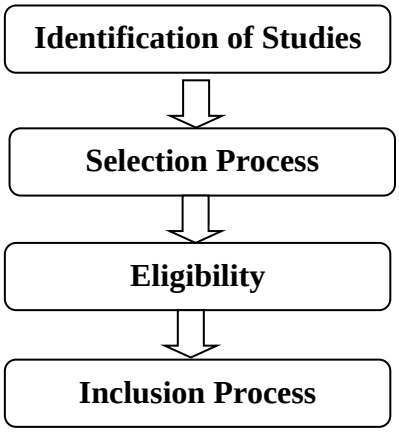


Figure 2. 1 Multi-stage Process for Study Inclusion

This process was carried out by some independent reviewers with most effort from one reviewer (research student). Individual papers were explored based on relevancy to the research title, by reading through the study title and abstract. The reviewer used an automated validation check to remove duplicate papers, before visually checked the papers for relevancy, using an indicator of either "yes" or "no." Another reviewer independently screened at title and abstract for relevancy, thereafter a joint screening was adopted to identify the most relevant papers. All papers at the title stage were screened for inclusion. The reviewers are experts in health research, whose focus area is on health science, (see appendix 7 for a detailed guidance documentation). At the title and abstract screening phase, articles reporting on specific disease conditions were included but were subsequently rejected at the full-text screening because majority of the articles were non-clinical. In the first instance, the title and abstract of each paper were read to determine its inclusion or exclusion from the review. This was followed by a thorough full-text reading of all remaining papers in order to identify the most relevant papers relating to risk factors for NeHA.

Table 2.2: Pre-selected Selection Criteria

Criteria	Justification
Papers published between 2010 and 2017 were mostly considered	Some studies conducted before 2010 may no longer relevant to the current health practice
Included papers that were published in English	Although the risk of publication bias may increase, there was no access to a translator for this review
Studies were not limited to any specific location except to exclude countries with fragmented health system (such as; USA)	Lack of universal healthcare Service
Included groups of condition (such as; mental health or cancer)	These papers focus on factors specific to the condition rather than generic risk factors
Excluded studies with only descriptive analysis; or qualitative research or studies with no identified factors	Factors interact and only multivariate analysis can provide some confidence about the statistical significance of a particular factor
Papers included are Prospective or Retrospective or Cross-sectional cohort study design	The study design needed to identify risk factors
Mostly excluded papers that only focused on children and adolescent (under the age of 18 years)	It might be too complicated for this review because, the health of children is more complex and risk factors may include other factors (such as; their parents).
Studies has to explicitly state in abstract or title any unplanned admission in hospital and whose aim and objectives focus on the said context were included	To specifically meet the research outcome
Opinion pieces, editorials, commentaries and review papers were excluded	Not the specified study designs and generally not peer reviewed
Studies that occurred solely in ED or health centres or care home or any other place aside hospital were not considered	To fit in with the outcome of this review
Included studies with sample size above 40	Lesser sample size studies, may not be generalised to other population, given the low sample size
Excluded papers that were designing a predictive clinical model	To explicitly review papers that support the research context
Excluded paper if not available from SHU document supply services or from the authors	To improve the access to literature

Acronyms: USA: United State of America

The full text of a study was obtained when the inclusion criteria were met or when the eligibility of a study was impossible to determine using only the title and abstract. The reasons for exclusion were also documented; a full list of the inclusion/ exclusion criteria used at title, abstract and at full-text screening phases is presented in Table 2.2. Thereafter, all remaining papers were screened for relevancy. Where the full text of a study was not available at Sheffield Hallam University, a request was made to the British Library or directly from the author; if the request was unsuccessful, the paper was excluded. At full-text screening, itemised exclusion criteria (see Table 2.2) were used to eliminate unwanted papers (such as; not in hospital). At this stage a study had to explicitly state that admissions were unplanned, otherwise it was excluded. The possibilities of bias were reduced because the research process was well presented and the author of this review was able to articulate the focus area of this research. Adequate information on the sociodemographic risk factors influencing unplanned admission(s) were also gathered. Thus, relevancy was adjudicated by

the selection criteria section, including; setting, outcome, fitting procedure, study design, methodology, significant risk factor and c-statistic.

2.6 QUALITY APPRAISAL PROCESS

Papers included in the review were critically assessed to evaluate the quality of the study design and reporting. The inclusion of a quality assurance (QA) process is supported by (Dixon-Woods et al., 2007). The Critical Appraisal Skills Programme (CASP) quality checklist, (CASP, 2017) was used. It is an accredited tool that has been used in many literature reviews, (Campbell, Seymour and Primrose 2004; García-Pérez et al., 2011; Kansagara et al., 2011; Wallace et al., 2014). Its usage as a checklist in this review, offered transparency and guided the review process through the use of an identical set of quality appraisal questions applied to each included paper.

Table 2.3 Final Quality Assessment Questions and Score

SN	Questions	Response n/14
1	Did the study focused issue were clearly addressed	13
2	Was the cohort recruited in an acceptable way?	14
3	Was the exposure accurately measured to minimise bias?	13
4	Was the outcome accurately measured to minimise bias?	14
5	Have the authors identified all important confounding factors?	8
6	Have they taken account of the confounding factors in the design and/or analysis?	7
7	Was the follow up of subjects complete enough?	11
8	Was the follow up of subjects long enough?	11
9	What are the results of this study?	14
10	How precise are the results?	11
11	Do you believe the results?	14
12	Can the result be applied to a local population?	14
13	Do the results of this study fit with other available evidence?	13
14	What are the implications of this study for practice?	14

Acronym: n: number of responses; SN: Serial Numbers

The CASP tool comprises 14 questions, (see the detailed questions in in the column headers above in (Table 2.3) addressing the aspects as follows: (a) if the study addressed a clearly focused issue (b) if the authors identified all important confounding factors (c) how precisely the results are presented (d) if the results of the study fit with other available evidence (e) whether subject follow-up were complete and long enough. Majority of these questions were answered from the studies included except for the question on; (f)) have they taken account of the confounding factors in the design and/or analysis. This question was only answered by 7 studies, which might be that risk factors (such as; age), might falsely establish a relationship with emergency admission since older patients are more at risk for NeHA.

According to CASP criteria, if a study performs unsatisfactorily against some or all the questions, the study design is understood to be less robust; while studies that provide satisfactory answers to some or all the questions are ranked with paper quality above average. Of note, this strategy does not serve as criteria for exclusion in this review, rather it reflects how well a study was designed and implemented against a standard for high quality studies. This approach is aligned with Thomas, (2008); who asserts that there is little empirical evidence to based exclusion decisions in quality assessment.

The studies with the highest quality scores came closest to adhering to a rigorous research standard, which arguably makes the evidence from these studies more valuable, as compared to studies that are considered to be of a poorer quality and as such, present an assertion whether the research design is internally or externally valid. In this review, critical appraisal was performed by one reviewer (AG) and the second reviewer (SK), independently, double-checked the process. Discrepancies were resolved through discussion. The table (see table 2.3) above explains the quality appraisal outcomes from the selected studies, where a total score was calculated and studies that fell below the mean score of 7 were classed as having a quality score below average, while studies that have a mean score of 7 and above were classed as having an adequate quality score, since the scores are above 7.

2.7 DATA EXTRACTION AND SYNTHESIS

In this review, data synthesis allowed the generation of wider evidence (such as; research studies, expert opinion) which are generally achieved through the combination of quantitative and qualitative studies. The synthesis of evidence helped to find out the known and unknown facts of what works and what does not, according to (Booth et al., 2016). An outcome of which would generate thrustworthy answers to the investigation of risk factors influencing NeHA (Booth et al., 2016). For this reasons, a data extraction form was created, piloted and circulated for agreement among reviewers. Items including the authors' name, population, setting, age, country, data type, study design, risk factors and study outcome; were captured from the included studies. From this abstracted information: the risk factors, methodological quality and outcome from included studies were examined to determine the patterns and relationship in the studies. A reciprocal translational analysis, which involves the exploration and explanation of contradictions between individual studies, was adopted in this review.

The risk factors that were considered in the studies included were categorised into groups using a critical analysis of information. This process enabled the identification of research gaps, and by using papers that offered a theoretical point of view, which permitted formulation of future research. A qualitative synthesis of results was applied, which focused on study discrimination, the populations in which the study had been tested, the practical aspects of study implementation, the variables included in each study, and ultimately the sociodemographic factors associated for unplanned hospital admissions. Meta-analysis was not appropriate for this review due to the heterogeneity of the components in the studies included. In this review, an independent reviewer examined the synthesis of literature included and another reviewer screened it, so that the quality and confidence of outcome generated would be unbiased to the stakeholders; whom the author communicates the quality of studies and the strength of available evidence to (Aveyard, 2014; Booth et al., 2016).

2.7.1 Abstraction of Data

The prepared extraction sheet captured information as follows:

Study details

- Author's name – to allow tracking of the paper
- Age group: classified as younger (16-40) middle aged (41-60) and older population (61 and above)
- Country: location of the patients
- Population setting: sample data set
- Healthcare area, including ED, in-hospital care

Study design

- Prospective cohort study
- Retrospective cohort study
- Cross-sectional study

Statistical methods and outcomes

- Incidence of NeHA
- Evaluation of the statistical analysis including fitting procedure, statistical test and goodness of fit measure
- Statistical confidence in the results in studies included such as; c Statistics, R Squared, Odd ratio at 95 percent confidence interval

- The magnitude of significant risk factors in the studies included

Assessment

- CASP: how well were the methods described in the papers to permit replication by other researchers?

Risk Factors

- Initially listed and later classified as described in Section 3.3

The sociodemographic components explored, in the studies included was grouped, out of which fixed non-clinical risk factors (such as; sex, age and ethnicity) that could not be changed were captured. The unfixed socioeconomic characteristics (such as; insurance, employment, income), which are changeable factors were also extracted and classified. An actualisation of which is a unique achievement in this review (see appendix: 5, for a three-level classificatory system). This classification system shows the grouping of collapsed components in the studies included, where components were combined into fewer categories. Out of which, the clinical characteristics, which are hospital or community-based features were explored in the included studies in order to meet the purpose of research. These are described later in this review and refer to a unique contribution to knowledge in this review

2.8 ETHICAL CONSIDERATION

This review does not involve primary data collection from human participants rather it uses information from previously published literature. Thus, the need for ethical approval, prior to the commencement of this review is inapplicable, supported by (Gerrish and Lacey, 2010). As per the University regulation, the ethical applications (Shurec 1 and 2) were submitted to Sheffield Hallam University Ethics Committee. Approval was granted by the committee prior to the commencement of the literature review (see appendix 8 for ethical approval statement). There were no known health and safety concerns highlighted.

2.9 RELIABILITY, VALIDITY AND GENERALISABILITY

2.9.1 Reliability

Reliability is the overall consistency of results and an accurate representation of the population under investigation, as defined by (Golafshani, 2003). This review seeks to be transparent and reproducible; consequently, all steps of the review process have been described and, where appropriate approaches have been justified using reference to the

academic literature. The search strategy used was provided, alongside the screening criteria and a proportion of all results were screened by a second reviewer. The quality appraisal and data extraction processes were piloted; from which a proportion of papers checked by a second reviewer for accuracy. This substantiates the reliability of this review; of which a similar conclusion may be generated if the similar steps and evidence are adopted, taking into account other diverse opinions. The reliability of this review increases given the relevancy of studies included and the step by step process of how studies were selected for inclusion.

2.9.2 Validity

This refers to the extent to which a study supports what it claims to assess, including; answering the research question and staying within the relevant topic, reported by (Fink, 2013). This review provides validity in the respect that it measures and fulfils its main aim, including the delivery of answers to the research question. Another key point to note is the strength of the included studies in this review. The approach of selection, screening, extraction and quality appraisal for included studies was developed a priori, Some of the questions that underpin the criteria are:

- Does it use relevant literature?
- Does it answer the research question?
- Does the study include the full methodology?

For accuracy sake, three independent reviewers thoroughly screened selected papers at title, abstract and full text before inclusion into the review and was checked by the third reviewer. The search strategy, quality appraisal, extraction metrics and all other key factors used in this review were adequately examined.

2.9.3 Generalisability

The literature review model used in this review could be adopted in other studies by using the same strategy or by utilizing a comprehensive model (such as; SRL). Additional technique may be included to generate similar outcomes in order to be presented in a more systematic way. The outcome of this review may be similar to the findings reported in other studies, given the nature of this review; where studies were systematically selected across the board. A confined conclusion was generated from the large volume of information explored in such studies, an example of which can be found in (Golafshani, 2003). However, the approach for this review can be replicated or extended, provided the strategy is similar to what is used for this review. With that having been said, the outcome of this review is comparable to other

populations because the validity of data extraction of this review is consistent, therefore the result is assumed to be valid, reliable and applicable in other populations to a reasonable extent, supported by (Golafshani, 2003).

2.10 SUMMARY

The use of literature review as a methodology for this review has provided a descriptive and critical exploration of the literature on risk factors to NeHA. The review process included a search of the literature using a range of information sources and a comprehensive search strategy. The study selection process was thorough, quality appraisal used a validated instrument and data to be extracted was identified a priori. This chapter has presented a detailed discussion on the study methodology, which explains the review approach. The chapter that follows provide information on the process of review for this review.

CHAPTER THREE

Results of the Review Procedure

3.1 OVERVIEW

This chapter presents the process of review; which describes how the review was conducted so that its purpose could be achieved. The strategy of which consist of activities of each reviewer, research direction, data extraction and analysis of selected studies.

3.2 PROCESS OF REVIEW

A total of 6889 studies were identified in the database searches and were reviewed at title and abstract (T&A) stage. The searches were initially scrutinised by one reviewer (AG). Following this, a small amount of the studies was independently assessed by the second reviewer (SK). The third reviewer (DH) examined the screening process quality and ensured moderation on the criteria for selected articles. A full copy of all identified studies was obtained for further review; such that their abstract contained, any of the relevant outcome measures, that was listed in Chapter 2 or where the relevance of the study could be ascertained in the journal articles. Discrepancies on study relevancies were resolved by dialogue among reviewers.

Studies to be reviewed were generated from only four databases, with exploration of their references list in order to check if additional relevant studies could be found. Duplicate papers were identified using both RefWorks and Excel; thereafter a visual check was conducted to search the remaining papers at T&A, from which further irrelevant papers were identified with consideration of the selection criteria. The remaining papers were further assessed for eligibility at full text; from which some papers were excluded typically because the admission did not occur in the hospital.

3.3 CLASSIFYING THE SOCIODEMOGRAPHIC RISK FACTORS

The components in the studies included were extracted and were categorised into finite terms, so that appropriate groups of components could be produced (see appendix 5). Then, a three-level classificatory system was generated from the collapsed components, given the overlap and the number of risk factors that were considered in the included studies. An outcome of which is consistent with the list of sociodemographic factors identified by previous scholars (such as; Yonekura and Soares, 2011; Kert et al., 2015). These scholars generated

sociodemographic characteristics as part of category including demographic, socioeconomic, organisational, and social factors.

The risk factors in studies included were further categorised into clinical and non-clinical factors. The clinical factors were grouped into hospital and community based clinical factors while the non-clinical factors were congregated into fixed and unfixed factors; capturing sociodemographic and socioeconomic characteristics, (See Figure 4.2). The grouping allowed the comparison of risk factors that were conceptually similar but technically different. For example, both education and income are measures of socioeconomic status. A clear identification of sociodemographic category for unplanned hospital admission were carried out, while the detail information of the risk factors examined in the studies included are presented in chapter four.

3.3.1 *Risk Factors Explored in the Studies Included*

The studies included explored verities of risk factors, where both clinical and the non-clinical risk factors were captured in the three-level classificatory system. The components were classified in order to identify non-clinical risk factors for NeHA, which is the key focus of this review.

The clinical risk factors

- **Admission Measures**, which highlight different types of admissions and other related characteristics such as; Admission history/ types could be elective / non-elective admission
- **Community Supportive Services,** which present subject's functional characteristic such as; Fall in previous year, Out of hospital care
- **GP Practice Characteristics**, presents practice level activities in relation to the general practice such as; being able to book specific GP appointment
- **Comorbidities**, which are the list of co-morbid conditions in patients (such as; metastatic cancer, hypertension, stroke, diabetes, mental health and anaemia) or a count of the number of co-morbidities which includes (2 or 3 co-morbid conditions)
- **Time**; presents the period of NeHA event (such as; clock time)
- **Date:** presents the period of NeHA event (such as; calendar time)

The Non-clinical risk factors

- **Socioeconomic Status**, presents a social position in relation to others such as; income, education, occupation, deprivation, having health insurance
- **Sociodemographic Status**, presents a sociological and demographic features which are fixed characteristics including: age, sex and ethnicity

3.4 SUMMARY

This review represents an evidence-based that was independently carried out by reviewers (see appendix: 7 for the extracted information in studies included). This chapter has succinctly described the process of review in a clear manner, such that the step by step approach on how the entire review would be conducted was presented. In addition, the evaluation of variables used in the studies included, were evidently stated. There was discussion on data abstraction, as well as the classification and assessment of sociodemographic risk factors for this review. A detailed presentation of findings from the exploration studies included are presented the next chapter.

CHAPTER FOUR

Findings

4.1 OVERVIEW

This chapter focuses on the presentation of results, including study identification, demographic analysis of narratives from included studies and incidence of unplanned hospital admissions. Additional results discussed in the chapter include; study design, CASP quality assessment of selected studies, methodological evaluation, study outcome, classification of components explored and the sociodemographic risk factors for NeHA(s).

4.2 STUDY IDENTIFICATION

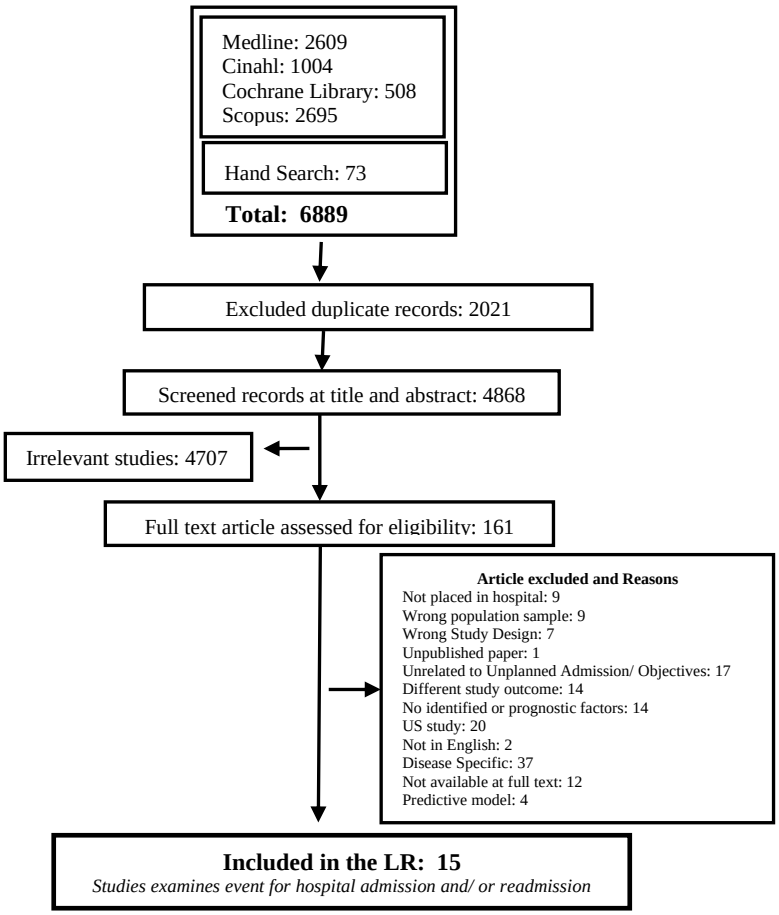


Figure 4.1: Prisma flow diagram for included studies

Figure 4.1 above, presents the process by which included studies were collected. Among the 6889 papers that were returned from the search, 161 full-text studies were eligible for assessment after 2021 duplicate studies and 4707 irrelevant papers were dropped. There were 146 studies that failed to meet the selection criteria, and these were also excluded. Thereafter

the full- text assessment of literature produced 15 unique papers, which were selected for inclusion in the literature review. Relevant studies were selected in order to be able to get papers that investigate influencing factors for NeHA(s); therefore, the purpose of this review could be achieved.

4.3 DEMOGRAPHIC RISK FACTORS IN THE INCLUDED STUDIES

Several demographic risk factors relating to NeHA were identified in the 15 studies included, examples of which are; age, sex and ethnicity. These risk factors, are characteristics of sociodemographic risk factors for NeHA. Studies reported them to have impacted the rate of NeHA, which resulted to unexpected presentation in the hospital. The table 4.3 below describes the consistency of which risk factors was included in each study.

Table 4.1 below shows that aside UK (n=6), other locations where studies were conducted includes; Hong Kong (n=1), Taiwan (n=1), Australia (n=2), Spain (n=1), Belgium (n=3) and the Netherlands (n=1). Most studies used administrative data which were generally obtained from hospital data (such as: Long et al., 2016; Reilly et al., 2011; Payne et al., 2013). Several risk factors relating to NeHA were identified in the 15 studies included (such as; age, sex and ethnicity). All 15 studies examined the risk factors for either unplanned admission and/ or readmissions.

Seven studies examined patients with risk factors to NeRa (readmissions) while 8 studies examined patients with risk factors to non-elective admissions within the hospital. From the studies with NeRa (see table 4.5), 4 studies reported patients with readmission within 30 days of discharge (Gili-Miner, et al., 2014; Braet et al., 2015; De Bruijne et al., 2013; Deschepper et al., 2017); 2 studies examined patients with risk factors to NeRa within 28 days (Kirby et al., 2012; Li et al., 2015); while one study (Deschodt et al., (2015)), examined patients with risk factors to NeRa within 1 – 3 months. One would not expect a substantial difference in the risk factors between 28 and 30 days but they may differ from the study which examined readmission for up to 3 months. Studies with 30 days readmission were not conducted in Europe and they all have a good population sample size.

Table 4.1: Demographic Characteristics of Studies Included

Authors	**Braet et al., 2015**	**Bankart et al., 2011**	**Long et al., 2016**	**Ismail et al., 2017**	**Lin et al., 2014**	**Appleton, Abel and Payne 2014**	**Reilly et al., 2011**	**Gili-Miner, et al.,. 2014**	**Payne et al.,. 2013**	**Deschepper et al., 2017**	**Kirby et al., 2012**	**De Bruijne et al., 2013**	**Chu and Pe, 1999**	**Li et al.,., 2015**	**Deschodt et al., 2015**
Sample Size	1130491	86586	11033	19734	468	180815	867	2076958	180815	33122	15806	433501	760	12371	54280
Country	Belgium	UK	UK	England	Taiwan	UK	UK	Spain	UK	Belgium	Australia	Netherland	Hong Kong	Australia	Belgium
Admission Type	Readmission	Admission	Admission	Admission	Admission	Admission	Admission	Readmission	Admission	Readmission	Readmission	Readmission	Readmission	Readmission	Admission
Age	NR	65 years and older	0-74 years	16 and older	14 years and older	≥ 20 years	18 years and older	18 years and older	20 years and older	NR	Mean Age (40.69) years	0 years and older	aged 65 and older	aged 18 years and older	75 years and older
% Sex (Female/ Male) (Separated)	51/ 49	50/ 50	17/ 83	49/ 51	80/ 20	51/ 49	63/ 37	9/ 91	51/ 49	48/ 52	47/ 53	54/ 46	52/ 48	55/ 45	60 /40
% Ethnicity or Race (Highest/ Smallest)	NR	White: 91 (median score)		Asian or Asian British: 27; White: 46; Black or Black British: 12; Mixed Background: 2; Others: 13	NR	NR	White :88; Others: 12	NR	NR	NR	Australia born: 81 Others: NR	NR		NR	NR

Acronyms: NR: Not reported (Null Value); UK United Kingdom

Nine of the included studies reported the age categories that were examined in their studies. From those studies, Long et al., (2016) examined age group from 0 and above, Ismail et al., (2017); included patients from age 15 years and above, while Lin et al., (2014) included patients with age group 14 years and above. These studies were included because their investigations are similar to the purpose of this review and the majority of unplanned admissions occurred among older age groups. The remaining 12 studies that examined age group 18 years and older, classified their age into groups (such as; young, middle and older age group); of which older population were generally reported to be associated with NeHA (examples of which are; Chu and Pe, 1999; Li et al., 2015; Long et al., 2016; Ismail et al., 2017).

Sex was always a dichotomous variable in the studies; male sex was mostly reported to be significantly more at risk of NeHA than female sex. This might be that female sex was generally used as the reference category in the multivariate analysis but in one study, both genders were compared with NeHA (Gili-Miner et al., 2014). The study with the largest population, reported 1.37% of male and 1.62% of female patients, who experienced 30 days NeRa, but both genders were not significant in the multivariate analysis, as presented in the work of (Gili-Miner et al., 2014). The reason for the higher proportion of female patient might mean that the cohort might be dominated with more female patients but it's uncertain to know since the study included age group 18 years and above and did not categorise their age groups. Thus, it might be difficult to explore the gender association with NeRa, since the reference or comparison group were not reported; making another risk factor associated with gender.

In this review, ethnicity was measured in 2 out of the 3 study designs types that were examined (such as; prospective and retrospective study design). Ethnicity was considered and tested in 4 out of the 15 studies included in research which was carried out in United Kingdom and Australia; with investigation mainly on risk factor for NeHA (Bankart et al., 2011; Ismail et al., 2017; Reilly et al., 2011; Kirby et al., 2012). Three studies explored white ethnic group (Bankart et al., 2011; Ismail et al., 2017; Reilly et al., 2011), one study explored Asian or Asian British (Ismail et al., 2017) and one study explored Australian born (Kirby et al., 2012). The study with the largest population sample within that category, also found the white ethnic group to have greater rates of NeHA in their analysis, but was not significant.

4.3.1 Types of Clinical Study Designs in the Selected Literature

As indicated in table 4.2 below, 15 studies that were reviewed, 5 studies utilised a cross-sectional study design (Ismail et al., 2017; Braet et al., 2015; Bankart et al., 2011; Long et al., 2016; Lin et al., 2014). and 7 were retrospective studies (Appleton, Abel and Payne, 2014; Gili-Miner et al., 2014; Payne et al., 2013, Deschepper et al., 2017; Kirby et al., 2012; Reilly et al., 2011; De Bruijne et al., 2013). In the cross-sectional studies, only 3 out of the 15 studies were conducted outside Europe (such as; Taiwan and Australia), the remaining 12 studies were conducted either in the UK or Belgium. This indicates that European countries majorly analyse data from a population over a shorter period, as compared to other continents, who usually takes cohort of subject over a longer period of time. Researchers in Europe might generally be precise given that, the shorter length of time which investigation would be conducted, when compared with Australia and Hong King.

Table 4.2 Types of Study Designs

Authors	**Braet et al., 2015**	**Bankart et al., 2011**	**Long et al., 2016**	**Ismail et al., 2017**	**Lin et al., 2014**	**Appleton, Abel and Payne, 2014**	**Reilly et al., 2011**	**Gili-Miner, et al. 2014**	**Payne et al., 2013**	**Deschepper et al., 2017**	**Kirby et al., 2012**	**De Bruijne et al., 2013**	**Chu and Pe, 1999**	**Li et al., 2015**	**Deschodt et al., 2015**
Sample Size	1130491	86586	11033	19734	468	180815	867	2076958	180815	33122	15806	433501	760	12371	54280
Country	Belgium	UK	UK	England	Taiwan	UK	UK	Spain	UK	Belgium	Australia	Netherland	Hong Kong	Australia	Belgium
Study design	CSS	CSS	CSS	CSS	CSS	RS	RS	RS	RS	RS	RS	RS	PS	PS	PS

Acronyms: CSS: Cross-Sectional Studies; RS: Retrospective Studies; PS Prospective Studies; UK: United Kingdom

All the retrospective studies were carried out in Europe except, Kirby et al., (2012) who was conducted in Australia and only 6 of retrospective studies were conducted in the UK. The 3 prospective studies were conducted in various countries including Belgium, Australia and Hong Kong (See table 4.2 above). Out of which these prospective studies, Chu and Pe, (1999); Li et al., (2015); Deschodt et al., (2015) that were reviewed, only Chu and Pe, (1999) and Deschodt et al, (2015), disclosed that age was not significant in their studies. The sociodemographic risk factors that were significant in the prospective studies is age, also the retrospective studies presented age and sex to be significant. The cross-sectional studies concluded that all three identified sociodemographic risk factors were significant, which gives a notion that adequate number variables might have been examined in those studies. The fact, that only one cross-sectional study was conducted outside Europe seems interesting because it might indicate that the prevalence of NeHA is more common in the European countries; given their high rate of emergency hospital admission among older aged population at the time when the research was conducted.

4.4 ASSOCIATION CONSISTENCY IN THE STUDIES INCLUDED

Table 4.3: Consistency of Association in the Non-clinical Risk Factors

Author	Included Non-clinical Risk Factors	Tested	Significant risk Factors	Association Consistency
Long et al.,. (2016)	Yes: Age, Sex deprivation Settlement type	No	Yes : Age, Sex deprivation	No; only three were significant
De Bruijne et al., (2013)	Yes: Sex, Age, Ethnicity, SES quartile, Insurance	No	Yes: Ethnicity, Age	No: only ethnicity and age are significant
Ismail et al., (2017)	Yes: (Ethnicity, Sex, Age)	Yes	Yes: (Ethnicity, Sex, Age)	Yes; All were significant
Braet et al., (2015)	Yes: (Age, Sex)	No	No	No; none were significant
Appleton, Abel and Payne (2014)	Yes: (Deprivation, Sex, Age)	No	Yes: (Deprivation, Sex, Age)	Yes; All were significant
Bankart et al., 2011	Yes: (Deprivation, Ethnicity, Sex, Age)	Yes	Yes: (Deprivation, Ethnicity; Age)	No: Only deprivation, Ethnicity and age are significant
Gili-Miner, et al.,. (2014)	Yes:(Age, Sex)	Yes	No	No; none were significant
Payne et al.,. (2013)	Yes: (Sex, Age, Deprivation)	No	Yes (Sex)	Yes; All were significant
Reilly et al.,. 2011	Yes: (Age, Sex, Ethnicity, Deprivation	Yes	No	No; none were significant
Chu and Pe (1999)	No	Yes	No	CT
Li et al., (2014)	Yes: (Sex, Age)	Yes	Yes: (Age (85 years and older)	No; only age was significant
Deschodt et al., (2015)	Yes: (Age, Sex, living situation, Home care, Cleaning help, Shopping assistance, Help of finance, Personal alarm system	Yes	No	No: none were significant
Deschepper et al., (2017)	Yes: (Sex, Age)	Yes	Yes: (Age)	No: only age was significant and no prior test
Lin et al., (2014)	Yes (Age Sex Interpersonal relationship issues, Social stress	Yes	Yes: Interpersonal relationship issues	No: Only Interpersonal relationship issues was significant and no prior test
Kirby et al., (2012)	Yes: Age, Sex Ethnicity	Yes	Yes: (Age)	No Only age was significant

Acronyms: CT: Can't Tell

From table 4.3 above, only 10 studies tested their variables before fitting a model and the overall consistency of association is 3 out of 15, which implies that only few studies found their association to be consistent after fitting a model. Age was included in 14 out of 15 studies, but was significant in 8 out of 15 studies. This implies that there is less association consistency for age. Sex was included in 14 out of 15 studies but has 4 out of 15 association consistency, which is very low when compared to the rate of inclusion in the model. Ethnicity was included in 5 out of 15 studies, but was significant in 3 studies. The association consistency seems low given the lesser number of times being significant in the studies included

The sparsely included ethnicity variable in the previous studies, might be that researchers believed race should not be a determinant factor for hospital admission. Also, there might be consideration for a non-differential racial view, that made researchers avoided such questions during data collection, as observed in the works of Payne et al., (2013); Appleton, Abel and Payne (2014), Long et al., (2016). Nevertheless, age was consistently included in the studies compared to other risk factors. Age is an important risk factor when capturing patients' health information; its necessity for inclusion is therefore eminent to investigate the sociodemographic risk factors for NeHA.

4.5 QUALITY APPRAISAL FOR INDIVIDUAL STUDIES

Table 4.4 Quality Assessment Process for Studies Included

Abstract	Did the study address a clearly focused issue?	Was the cohort recruited in an acceptable way?	Was the exposure accurately measured to minimise bias?	Was the outcome accurately measured to minimise bias?	Have the authors identified all important confounding factors?	Have they taken account of the confounding factors in the design and/or analysis?	Was the follow up of subjects complete enough?	Was the follow up of subjects long enough?	What are the results of this study?	How precise are the results?	Do you believe the results?	Can the result be applied to a local population?	Do the results of this study fit with other available evidence?	What are the implications of this study for practice?	Quality Score (n/14)
Braet et al., 2015	Yes	Yes	Yes	Yes	CT	CT	Yes	Yes	Patients discharge on Friday, patients with long length of stay	2-3 SF used	Yes	Yes	Yes	Higher number of ED visit was proved to be a predictor for unplanned hospital readmission	**12**
Long et al., 2016	Yes.	Yes	Yes	No	CT	CT	Yes	Yes	Male sex has high risk of EA for violence; Younger population and highly deprived area have high risk of EA ...RR is highest in age (10-14); higher in Male (RR 4.55 (4.31-4.81))	2 SF	Yes	Yes	Yes	Inequalities in the risk of emergency admission for violence was a key factor.	**11**
Chu and Pe, 1999	SB	Yes	Yes	Yes	CT	CT	NR	28 days read missi on	Adverse drug reaction (4.19 (1.56-11.2); end stage renal failure (5.48 (1.69-17.75); advance malignancy (2.45, (1.37-4.37)	3SF	Yes	Yes	Yes	Definite medical, functional and socio-economic factors were found to be risk for early emergency admission among the elderly medical patients	**12**
Deschepper et al., 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No significant association between pain and unplanned hospital admission	4SF	Yes	Yes	Yes	Pain score at discharge in combination with the use of pain medication and age is a risk factor to unplanned readmission	**12**
Gili-Miner, et al.,. 2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	AUD independent predictor for experiencing URA (1.56 (1,.50 - 1.62); Higher hospital cost (2885 Euros or 3858 US Dollars); Higher risk of death (216 (1.92 - 2.44)	Power of 6	Yes	Yes	Yes	Alcohol disorder, risk of death, LOS and over expenditure are associated with unplanned 30-days readmission	**14**
Ismail et al., 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NC	Deprivation was strongly associated with admission; 4-hours target (3.61 (3030-3095)	Yes	Yes	Yes	Yes	Ethnicity and deprivation were strongly associated with emergency admission	**13**

Lin et al., 2014	Yes	CT	No	Yes	Yes	Yes	Yes	Yes	Previous psychiatric intervention (p= 0.008), Previous consultation (p=0.012); Interrelationship issues (p=0.039); ... Male and female ratio surviving suicide are 1:4; average age is 33.6;	2 or 3 SF	Yes	Yes	Yes	There are link between patients with suicidal tendencies and emergency admission	**12**
Payne et al., 2013	Yes	Yes	Yes	Yes	NC	NC	Yes	Yes	Increased physical multi-morbidity was associated with unplanned admission (5.89(5.45-6.32) and preventable admission (14.38(11.87-17.43)	2-3SF	Yes	Yes	Yes	Mental health characteristics and socioeconomic deprivation are associated with unplanned admission	**12**
De Bruijne et al., 2013	Yes.	Yes	CT	Yes	Yes	Yes	CT	No	Ethnic minority has increased risk of URA, Significant variation in URA and excess LOS (Previous visit to ED 4.65(4.25-5.08)	Yes	Yes	Yes	Yes	There is short coming in the quality of care delivered to ethnic minority patients, given the association btw URA and excess LOS	**10**
Bankart et al., 2011	Yes	Yes	Yes	Yes	NC	NC	Yes	Yes	Being able to see the GP reduces EA rate, while older patients, short distance from hospital, female gender, white race, increase deprivation were highly associated with EA	No	Yes	Yes	NC	Age, ethnicity, gender and deprivation are important predictors for admission rate	**11**
Deschodt et al., 2015	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Older patients are associated with high readmission rate	3SF	Yes	Yes	Yes	Older age-related risk is associated with high readmission rate	**14**
Li et al., 2015	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Adjusted relative risk for: LOS (1.34); Charlson index (1.28); cardiac failure 1.48); discharge summaries 1.16	2-3 SF	Yes	Yes	Yes	Readmission of general medicine patients within 28 days was relatively common and was associated with clinical factors and pattern	**14**
Reilly et al., 2011	NC	Yes	Yes	Yes	NC	NC	Yes	Yes	Diagnosis and increased LOS was associated with EA	3SF	Yes	Yes	NC	Number of primary and secondary diagnosis were contributors for increase in LOS for emergency admission	**10**
Appleton, Abel and Payne 2014	Yes	Yes	Yes	Yes	Yes	Yes	CT	CT	Cardiovascular medicine not associated with unplanned non-cardiovascular medicine	NR	Yes	Yes	Yes	Poly-pharmacy hazardous and poor care was a risk factor unplanned hospitalisation	**12**
Kirby et al., 2012	Yes	Yes	Yes	Yes	NM	NM	Yes	Yes	Older patients with minor injury and urgency condition and with non-psychotic mental health condition are associated with emergency readmission	CT	Yes	Yes	Yes	Older patients with low urgency, non-psychotic mental health conditions, admission during winter and after hours are more likely to present as unplanned returned visit.	**11**

Acronyms: CT: Can't Tell; NC: Not Clear; SF: Significant Figure (Shows how precise the measurement are); LOS: Length Of Stay; ED: Emergency Department; URA: Unplanned Readmission
Rating: No; NC; NM = 0; Yes; CB = 1

The quality of reporting in each study was evaluated using the 14 CASP quality appraisal questions. All the studies had a CASP score of 10 or more indicating good quality of the research (such as; Gili-Miner, et al., (2014), Deschodt et al., (2015); and Li et al., (2015)), each having highest possible score of "14" (see table: 4.4), for studies' quality assessment and score). Exposure assessment was not the same in all the studies included. Thirteen out of fifteen studies included answered "yes" to the question whether the exposure was accurately measured to minimise bias, while 2 studies answered "no" or "can't tell." The question whether the study addresses a clearly focused issue was positively answered by all the studies. The issue of whether the result fits with other available evidence, was inadequately reported by only two studies (Bankart et al., 2011; Reilly et al., 2011). The work of Long et al., (2016) presented an outcome that is in accordance with previous studies (such as; Bellis et al., 2008; Cusimano et al., 2010). In those studies, deprivation is strongly associated with NeHA. This implies that those studies are generalisable to a certain extent.

Criteria on whether participants were accurately accounted for; describes who was recruited, how many people were recruited, when they removed and why they were dropped in the analysis. However, only two papers did not meet these criteria. (Lin et al., 2014), did not state how the subjects were selected nor did De Bruijne et al., (2013) present any information on the validity of subject selection; this identifies some deficiencies in their work. However, the two studies (Lin et al., 2014; De Bruijne et al., 2013) that that did not report their recruitment process, yet presented high-quality scores ("12" and "10" respectively); which is above "7".

In contrast, Ismail et al., (2017) adequately described how the participants were selected in their study. This minimised the bias in their work given the appropriate measures taken before analysis. Studies with higher quality score (such as; Li et al., (2015); Deschodt et al., (2015); Gili-Miner et al., (2014)), may be classed to have a better-quality study execution and by such, presented findings that are more likely to be true. Studies with lesser quality score (such as; Reilly et al., 2011; De Bruijne et al., 2013) may not be grounded when compared to studies with higher quality. Overall, the recruitment process in the studies included were adequately described, since 12 studies presented their recruitment process; this implies a good review quality for this review.

4.6 ANALYTIC METHODOLOGICAL ASSESSMENT OF STUDIES INCLUDED

Qualitative studies that presented only descriptive statistics were not considered for inclusion

because of the inadequacy of results presented. Most studies Braet et al., (2015); Bankart et al., (2011); Gili-Miner, et al., (2014); Payne et al., (2013), used a combination of descriptive statistics, univariate or bivariate analysis (t-test, chi-square) and multivariate analysis (logistic regression) for their statistical analysis (see appendix: 6). Ten studies tested their variables using a bivariate or univariate analysis before applying a multivariate logistic regression model (Chu and Pe, 1999; De Bruijne et al., 2013). Five of the studies included, (such as; Reilly et al., (2011); Long et al., (2016); de Bruijne et al., (2013); Appleton, Abel and Payne (2014); Gili-Miner et al., (2014)), controlled for age, gender and ethnicity without testing their statistical significance.

Those studies did not test their variables before developing the model, and therefore had more non-significant variables included in their final analysis, according to (Appleton, Abel, and Payne, 2014). Univariate analysis was performed in the work of Gili-Miner et al., (2014); they analysed 36 variables in order to examine the association between alcohol use disorder and unplanned readmission; of which only 6 variables were not statistically significant ($p<0.05$). This implies that more variables were included in the analysis without testing. Such study might have a problem with model over-fitting since too many variables were included in the model. The result in such study may be affected, since increased error is peculiar to overfitted model. The purpose of this initial testing is to select the best variables for model fitting and helps to reduce the issue of having too many parameters relative to the number of observations.

The categorization of age groups helped to understand the specific ages that are risk factors to NeHA. There was classification of individual variable in all studies except; Kirby et al., (2012); Chu and Pe, (1999); Gili-Miner, et al., (2014); Deschepper et al., (2017); Bankart et al., (2011); Deschodt et al., (2015); who allowed the distinctive presentation of age groups that are associated with NeHA, when a logistic regression model was fitted, the outcome of which present the geriatric populations to be at risk of NeHA. Only 2 0ut of 6 studies; Deschepper et al., (2017); Bankart et al., (2011), did not report the difference by age and kept the age variable continuous. Bankart explored patients who are 65 years and older while Deschepper explored ages 75 years and older. In these two studies, age was reported to be associated with NeHA in the work of (Bankart et al., 2011). Also, older population was a risk factor to emergency hospital admission with mainly male patients.

Logistic regression model was used for analysis in 10 out of 15 studies that were included (Kirby et al., 2012; de Bruijne et al., 2013; Payne et al., 2013; Appleton, Abel and Payne 2014; Lin et al 2014; Deschepper et al., 2017; Chu and Pe, 1999; Gili-Miner et al., 2014; Braet et al., 2015; Ismail et al., 2017). When a logistic regression model was fitted, ethnicity was reported to be a risk factor to NeHA in the work of Ismail et al., (2017); but was not categorised by (Bankart et al., 2011). However, Ismail et al., (2017) report black ethnic group to be more at risk of NeHA when compared to other ethnic group. Non-black ethnic group were reported to have p-values outcome that are greater than 0.05, which is a stsndard significant measure. Nevertheless, no study reported non-white ethnic groups to have hidden risk of NeHA. The peculiarity of black patients with NeHA might be that people have multiple risk factors or it may be that a greater proportion of the non-white were elderly and age was more important in the multivariate analysis. However certain conditions are peculiar to black ethnic group and may not be common with the white patients. This, of course present a need for the clinicians to investigate deepl,y on the cause of black patients' presentation into hospitals, especially in the UK.

4.7 INCIDENCE OF UNPLANNED ADMISSION

Analysis of admission frequency over the years in each study allows readers to understand the trend and pattern of admissions in the study included. The incidence of admission and readmission into the hospital and via ED in the included studies are summarised in Table 4.5

Table 4.5: The proportion of admission and readmission in each study

Author	**Year**	**No of Participants**	**Admission type**	**Percentage Rate, %**
Chu and Pe	1999	760	Readmission	NR
Bankart et al.,	2011	86586	Admission	0.092
Reilly et al.,	2011	867	Admission	NR
Kirby et al.,	2012	15806	Readmission	5
Payne et al.,	2013	180815	Admission	6
De Bruijne et al.,	2013	1177304	Readmission	2.9
Appleton, Abel and Payne	2014	180815	Admission	4.2
Lin et al.,	2014	468	Admission	13.5
Gili-Mine, et al.,	2014	2076958	Readmission	3
Li et al.,	2015	12371	Readmission	11.6
Deschodt et al.,	2015	54280	Admission	16
Braet et al.,	2015	1130491	Readmission	5.2
Long et al.,	2016	11033	Admission	3.5
Ismail et al.,	2017	19734	Admission	4
Deschepper et al.,	2017	33122	Readmission	3

Acronyms: NR: Not Reported (Null Value)

There is no trend in admission rate over the years (see Table 4.5 above) although the patients come from a variety of countries and medical systems. An example of which, are the recruited patients in the work of Deschodt et al, (2015) who experienced NeHA with the highest admission rate of 16%, while Bankart et al., (2011) reported the lowest admission rate of 0.092%. However, Li et el 2015, reported the highest NeRa of 11.6% and De Bruijne et al., (2013) reported the lowest readmission rate of 2.9%, which may be as a result of the good nature of Netherland's health system. Particularly the fact that their health legislation mandates every inhabitant to have basic health insurance that covers medicals, pharmaceutical and nursing. The accessibility to health care in Netherland may results to their lower rate of hospital readmission. Nevertheless, the increased readmission rate in Li et al., (2015), may be that the health system in the area where participants were recruited is poor. Although it is expected that hospital readmission might be at lowest in the countries with the best health system, (Laessig, Jacob & AbouZahr, 2019) but this is not the case in the work (Li et al., 2009); having higher readmission rate.

The lowest admission rate (0.092%) for patients who experienced NeHA was reported by Bankart et al., (2011) while Deschodt et al., (2015) has the admission rate of 16%. Despite the intense exploration of sociodemographic factors in Deschodt et al., (2015), age seems to be more likely to be a risk factor for emergency admission; which might be as a result of the nature of participants included in the model. Among the studies that were carried out in the UK, Payne et al., (2013) reported the highest admission rate of 6%, while Bankart et al., (2011) has the lowest admission rate over the years explored. These results, suggest that UK has lower admission rates when compared to other countries. There might be a leverage in favour of the UK's healthcare system, when compared with countries like Canada, having provincial healthcare differences.

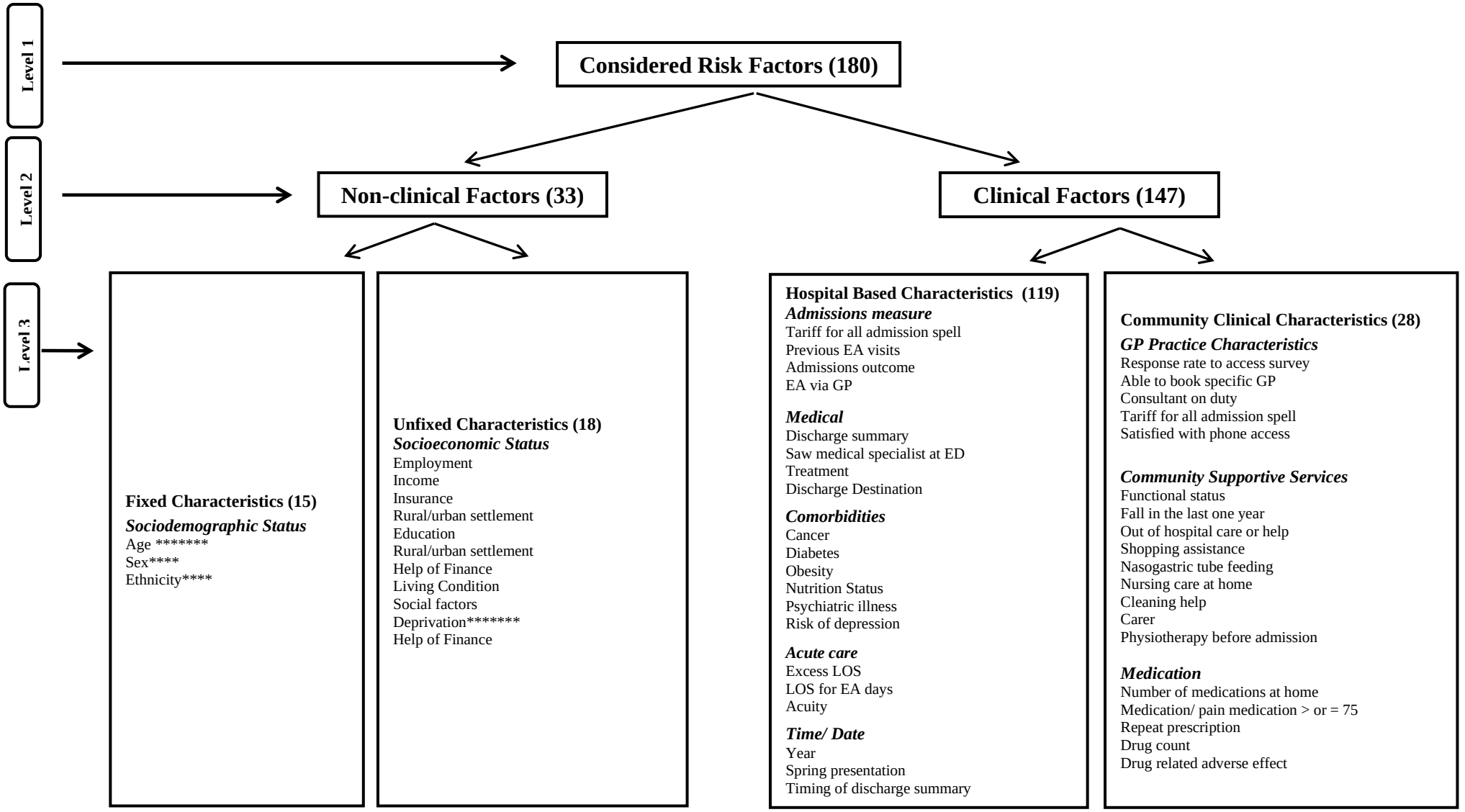
4.8 CLASSIFICATION OF COMPONENTS EXPLORED IN THE STUDIES

It may be challenging to categorise risk factors for unplanned admission into clinical and non-clinical groups, given the overlapping factors that exist, reported by (Hajjaj et al., 2010). In this review, an artificial descriptor of components was used for classification of considered risk factors, in order to focus thinking on a wide range of terms used in the studies included. In the second level, the clinical component was classified into the hospital and community-based care; while the non-clinical factors were classified into fixed and unfixed characteristics. In the third level, the hospital-based risk factors are events that occurred in the

hospital, including treatments and diagnosis, while the community-based care are events that occurred in the community, relating to GP Practice Characteristics or whether a patient have out of hospital care/ help.

The fixed non-clinical factors are variables that could not be changed (such as; sex, age), while the unfixed characteristics are changeable characteristics such as; insurance, employment, and income. Figure 4.2, shows the three level classificatory systems that was produced from the components considered in the studies included, which is one of the unique achievements in this review. The classification system shows the grouping of collapsed components in the study included, from which the sociodemographic characteristics explored in each study was identified, so that the purpose of this review could be met; an investigation which aim to identify the sociodemographic risk factors that influence NeHA.

The categories in the three-level classification system were designed in a way that captures all the risk factors explored in the studies included, which allows the sociodemographic risk factors to be appraised (See figure 4.2). The reason for focusing on the non-clinical factors is to affirmatively present how consistent, is their association with NeAH. Among the 180 variables that were considered in the included studies, only a few were non-clinical factors. The first classification in level two shows that 147 variables are clinical factors and 33 variables are non-clinical factors; while second classifications in level three indicate; 15 fixed 18 unfixed factors, 119 hospital-based characteristics and 28 community-based characteristics (See detailed classifications in appendix 5).



*Acronyms: ED: Emergency Department; GP: General Practice; EA: Emergency Admission; LOS: Length of stay; *: More studies present the significant risk factors*

Figure 4.2: A three levels classification system for considered risk factors in the studies included

4.8.1 Non-clinical factors

The fixed and unfixed group of the second level, non-clinical factors are presented in Figure 4.2, with sub-category (including; sociodemographic and socioeconomic factors). All 15 studies (Braet et al., 2015; Reilly et al., 2011; Gili-Miner, et al., 2014; Deschepper et al., 2017; Kirby et al., 2012; Li et al., 2014; Chu and Pe, 1999; Long et al., 2016; Ismail et al., 2016; Lin et al., 2014; Appleton, Abel and Payne 2014; Payne et al. 2013; Deschodt et al., 2015; De Bruijne et al., 2013; Bankart et al., 2011), considered at least one non-clinical risk factors. The sociodemographic risk factors (such as; age and sex), were identified to be mostly statistically significant in the those included studies except that ethnicity was found to be statistically significant in only 3 studies (Ismail et al., 2016; Bankart et al., 2011; Kirby et al., 2012); a detail of which could be found in Table 4.6 below.

Age was considered in 12 studies, out of which 8 reported it, to be significant (such as; Payne et al., 2013; Long et al., 2016; Ismail et al., 2017; Appleton, Abel and Payne 2014; Bankart et al 2011; Li et al 2014; Kirby et al., 2012; De Bruijne et al., 2013). Ethnicity was considered 5 times, from which only 3 studies (Bankart et al., 2011; Ismail et al., 2016; De Bruijne et al., 2013), reported ethnicity to be significant. The black British seems to be the greater user of ED compared to the white patients (Bankart et al 2011; Ismail et al., 2017). Sex was considered 8 times, out of which, 4 of those studies reported sex to be significant (such as; Long et al., 2016; Ismail et al., 2017; Appleton, Abel and Payne, 2014; Payne et al., 2013). Female sex is the greater user of ED compared to the male sex (Appleton, Abel and Payne, 2014; Payne et al., 2013) but male sex is more likely to be at risk of NeHA. As presented in table 4.6, the sociodemographic risk factors seem to be highly explored when compared with socioeconomic status, which are classed under unfixed characteristics.

Socioeconomic factors were considered in 8 of the studies included (such as; Chu and Pe, 1999; Appleton, Abel and Payne 2014; Long et al., 2016; Bankart et al 2011; Payne et al., 2013; Ismail et al., 2017; De Bruijne et al., 2013; Deschodt et al., 2015); but were significant in only 7 of these studies except (Deschodt et al., 2015). The well-developed deprivation factor was tested and found significant in 4 of the studies included, which were mostly carried out in the UK (Bankart et al., 2011; Long et al., 2016; Appleton, Abel and Payne 2014; Payne et al., 2013). However, only one of the studies included, reported deprivation not to be significant; which is quite low and it indicates its peculiarity as a good UK measure.

However, a study from Australia also used deprivation, which indicates some similarities between the UK and Australia

The significant factors in the socioeconomic group measure the economic impact of unplanned admission. Income was statistically significant in the work of Chu and Pe (1999), whose research focused was on the risk factors accounting for early readmission in the elderly medical patients. The view that insufficient income is a driver for NeHA; may result to patients delay in seeking appropriate healthcare early enough. Patients with low income may be disadvantaged, given the inability to afford treatment cost. However, the expectation that income was significant in the study conducted in Hong Kong seems realistic, given the inadequacy in the healthcare system and the nature of employment that was reported in the work of (Chu and Pe, 1999). Unstable income overtime may also pose difficulty to patients being able to seek suitable healthcare at the appropriate time, which may be expectedly common in a populated country like Hong Kong, (Chu and Pe, 1999).

Table 4.6: Considered and Significant Risk Factors in the Non-clinical Group

NON-CLINICAL RISK FACTORS															
Authors	**Braet et al., 2015**	**Bankart et al., 2011**	**Long et al., 2016**	**Ismail et al., 2017**	**Lin et al., 2014**	**Appleton, Abel and Payne 2014**	**Reilly et al., 2011**	**Gili-Miner, et al. 2014**	**Payne et al. 2013**	**Deschepper et al., 2017**	**Kirby et al., 2012**	**De Bruijne et al., 2013**	**Chu and Pe, 1999**	**Li et al., 2015**	**Deschodt et al., 2015**
Sample Size	1130491	86586	11033	19734	468	180815	867	2076958	180815	33122	15806	1177304	760	12371	54280
Country	Belgium	UK	UK	England	Taiwan	UK	UK	Spain	UK	Belgium	Australia	Netherland	Hong Kong	Australia	Belgium
SDS															
Age	NSS	**SS, NSS**	**SS** (all but), NSS (babies)	**SS**	**SS**	**SS**		NSS	**SS**	NSS (Age>75)	**SS**			**SS** (above 85), NSS (65-85)	NSS
Sex	NSS	NSS	**SS**	**SS**	NSS	**SS**		NSS	**SS**						
Ethnicity		**SS**		**SS; NSS**			NSS				NSS	SS			
SES															
Rural/urban settlement			NSS												
Social factor					**SS**: NSS										
Income													**SS**		
Help of Finance/ Living Arrangement													**SS**		NSS
Living situation															NSS
Deprivation/ Deprivation score/ Distance from the hospital; IMD Score		**SS**	**SS**, NSS	**SS;** NSS (Quintile 2)		**SS**; NSS			**SS**						NSS

Acronyms: NSS: Not Statistically Significant; SS: Statistically Significant; SS, NSS: Some group were significant, while some were not significant; UK: United Kingdom; SDS: Sociodemographic factors; SES: Socioeconomic factors; IMD: Index of Multiple Deprivation; Quintile 2: Category of deprivation

4.8.2 Clinical Factors

The reason for level 2 categories of clinical factors was to appropriately identify the focus area for this review. Thus, a brief review of the clinical factors is relevant. Two studies that examined, and found, specific-disease factors relating to mental illness were significant under the comorbiditiy category, which can be seen in the works of; Payne et al., (2013); Lin et al., (2014), while Reilly et al., (2011) did not find mental and behaviour disorders to be significant. Meanwhile, pain, was significant in the work of Kirby et al., (2012) but not in the work of Deschodt et al., (2015), which might be as a result of their accessibility to physiotherapy care. Rather, risk of depression, which might have resulted from their lonely life style, was significant. Although Reilly et al., (2011) and Deschodt et al., (2015) have methodological commonnalities and the presence of older population in their cohort but difference in sample size; yet their results do not support each other.

Only 2 of the total 15 studies (Bankart et al., 2011; Ismail et al., 2017), considered risk factors relating to GP characteristics, specifically appointment booking with specific GP to be protective with an OR= 0.993(95% CI; 0.990-0.996). The work of Bankart et al., (2011), reported practices with greater number of elderly patients that are over 65 years old, to be significant at ($p<0.001$). Other factors that were accountable for increasing unplanned admission is percentage able to book with specific GP. at ($p<0.001$). However, the study did not declare its age group classification, thus making it difficult to estimate its variable classification and the percentage of elderly patients in the study was unaccountable. Older patients being more at risk of non-elective hospital admission at the practice level may be as a result of lack of healthcare facilities in the area where they live and/ or their inability to schedule GP appointments (Bankart et al., 2011).

Among the individual level components explored, variables that indicate patients' having specific medical condition was often included in analysis. These conditions include cancer, hypertension, stroke, diabetes, mental health, and anemia. The hospital-based clinical factors admission measures were less likely to be predictive, making the number of admissions as the highest occurrence in the group and were significant in the works of (de Bruijne et al 2013; Reilly et al., 2011). In the community-based, clinical care group, "physical inactivity" was the most common risk factor that were considered, but such risk factor was not significant in any of the all the studies included. However, group of conditions of different disease were significant in the medical component group out of which cardiovascular disease has the

highest odd ratio (such as; Appleton, Abel and Payne 2014; Gili-Miner et al., 2014). On a general note, studies incorporate clinical measures of disease state in their model because they are essential determinants of emergency admission according to the thoughts from many medical practitioners but social factors are less considered. Many emergency admission investigations are initiated from knowing patients' health status and the availability of clinical record information, which justify the integration of clinical factors.

4.9 SOCIODEMOGRAPHIC RISK FACTORS FOR NEHA(S)

The sociodemographic risk factors, which are fixed social and demographic characteristics as defined by (Liberatos, Link and Kelsey, 1988), are the key focus of this review. The data captured for this review were collected from the studies that were conducted within different population sample. Their variables were captured through administrative data collection in the hospital and the purpose of their collection was to identify the risk factors for non-elective hospital admission(s) and/ or readmission(s), which adequately meets the purpose of this review (see appendix: 6 for detailed information).

Table 4.7: Significant and Non-significant Sociodemographic Risk Factors

Risk factors	Significant Studies	Non-significant Studies	Not-Tested
Age	Bankart et al., (2011); Payne et al., (2013); Li et al., (2014); Long et al., (2016); Ismail et al., (2017); Appleton, Abel and Payne (2014); Kirby et al., (2012); (Lin et al., (2014)	Braet et al., (2015); Bankart et al., (2011); Gili-Miner, et al. (2014); Deschepper et al., 2017; Deschodt et al., (2015)	Reilly et al., (2011); Long et al., (2016); de Bruijne et al., (2013); Appleton, Abel and Payne (2014); Gili-Miner et al., 2014
Ethnicity	Ismail et al., (2016); Bankart et al., (2011); Kirby et al., (2012)	Reilly et al., 2011; Kirby et al., (2012)	Reilly et al., (2011); De Bruijne et al., (2013)
Sex	Payne et al., (2013); Appleton, Abel and Payne (2014), Long et al., (2016); Ismail et al., (2016)	Bankart et al., (2011); Braet et al., (2015); Lin et al., (2014); Gili-Miner, et al., (2014)	Reilly et al., (2011); Long et al., (2016); de Bruijne et al., (2013); Appleton, Abel and Payne (2014); Gili-Miner et al., 2014

Table 4.7 above, presents the significant, non-significant and not-tested sociodemographic risk factors to NeHA(s) in the studies included. Mostly, the significant sociodemographic variables were tested with a dependent variable for NeHA(s). Ethnicity that was significant in the analysis, may be that certain race with similar cultural background were more likely to be a predictive risk factor for NeHA. In fact, only 3 of 5 studies in the review included ethnicity and reported it to be significant, so there is insufficient information to draw conclusions, expect to say that ethnicity may be importantly protective and therefore should be measured. On the other hand, gender was measured in the work of Payne et al., (2013); Appleton, Abel and Long et al., (2016); Ismail et al (2017); Bankart et al (2011); Braet et al (2015); Lin et al

(2014); Gili-Miner, et al., (2014); De Bruijne et al., (2013), but was only reported to be significant in 4 out of the 15 studies included (Payne et al., 2013; Appleton, Abel and Payne 2014, Long et al., 2016; Ismail et al., 2016). One study having more female presentations at the ED reported a comparison male gender to be significant at p =<0.0001. Regardless of this observation, the overall conclusions in the literature indicate that "male sex" are more likely to experience NeHA given their number of significance in many of the studies included. Admissions frequency did not sufficiently discuss the gender risk of unplanned admission due to certain conflicting factors that might exist during the estimation process, (Bankart et al., 2011; Braet et al., 2011; Lin et al., 2011; Gili-Miner, et al., 2011; De Bruijne et al., 2013); rather, other influencing factors may be responsible.

However, the sociodemographic risk factor "age" was consistently significant in most of the studies, all of which were dominated by older patients. Age was considered and significant in 8 of the 15 studies included, when compared with other sociodemographic risk factors that were examined. Most authors concluded that age was the most significant risk factor presented in the included studies. (such as; Appleton, Abel and Payne 2014 (aged 40-59); Bankart et al 2011 (aged 65 and above); Payne et al., 2013 (aged 65 and above); Li et al., 2014 (aged 85 and above); Deschepper et al., 2017 (aged 75 and above) and Ismail et al., 2017 (aged 65 and above)). These results suggest that most of the studies, where age was classed to have influenced NeHA, were studies where older patients are classed to be a risk factor of unplanned admission. An exception is Appleton, Abel and Payne, (2014), who found that being middle-aged (40-59) was a risk factor of unplanned admission. Such group of patient can also be classed as adult population; invariably one might have a general opinion that "older patients" are more at risk of hospitalisation across boards when compared to the younger population (18-39); who are not reported to be significant in any of the studies included (Ismail et al., 2017; Payne et al., 2013; Li et al., 2014).

4.10 SUMMARY

This chapter has discussed an overview of association in the groups, specifically the non-clinical factors and the identification of topmost sociodemographic factors that impact non-elective hospital admissions. Thus, the key objectives in this review has been achieved in this chapter. The next chapter presents further discussion so that appropriate connection could be established between the pieces of literature.

CHAPTER FIVE

Discussion

5.1 OVERVIEW

In this review, age, sex and ethnicity, are the most considered sociodemographic risk factors have been identified as the influencing factors for non-elective hospital admission, since the included studies reported their extent of association with NeHA. Identification of sociodemographic risk factors to non-elective hospital admission(s) among the older aged patients is a useful finding for policy and hospital management, so that appropriate decisions could be made for older patients.

This discussion chapter is structured around themes which include: discussion of findings in the review, research implication to practice, strength and weakness of this review, as well as recommendation for further research. These are incorporated in order to provide a better understanding on the predisposing sociodemographic risk factors to non-elective hospital admission(s). This chapter presents further discussion so that appropriate connection could be established between the pieces of literature, supported by (Leach, Neale and Kemp, 2008).

5.2 DISCUSSION OF FINDINGS IN THE REVIEW

This review has shown that non-elective hospital admission is a universal issue but there is no literature that focused on the influence of sociodemographic risk factors on non-elective hospital admission. Primarily, the literature on causes are derived from opinions of health practitioners using clinical data, who consider NeHA in isolation and within a medical-only framework. Increasing NeHA is symptomatic of many different issues and result in excessive usage of the health services, increased presentation and hospitalisation of patients that might have visited the ED. Most of the literature attributes the increase in emergency hospital admissions and overcrowding of ED to decreased bed availability but pay minimal attention to the root cause of sociodemographic risk factors predisposing patients to NeHA, for example (Crooke et al., 2004). Much of the literature on risk factors for unplanned admission is anecdotal or rhetoric and the focus is on the implications of the problem. rather than underlying causes. The risk factors that were mostly identified in previous studies generally result from clinical risk factors relating to hospital treatments and/or diagnosis. There is less evidence on studies that included non-clinical risk factors and their measure of the relationship with NeHA. Consequently, making the literature on sociodemographic risk

factors for NeHA is scarce and not consistently included in analyses, which is a gap which this review partly fills.

The majority of the literature reviewed attributes to assesses the evidence for age and sex while only a minority also assessed ethnicity. More papers that considered age and sex also found them significant compared to all other demographic risk factors; thus, this result could be generalised to other populations. The discovery that older patients are risk factor to NeHA may be due to certain social factors that are peculiar to older patients, examples of which are: inadequate or unavailable home carer, physical inactiveness or mobility issues as reported in the work of (Deschodt et al., 2015). Other reason, may be that health generally declines with age. Perhaps the provision of adequate intervention for identified older patients with long-term condition should be made available given that older male patients with comorbidities were found to be at significantly greater risk for NeAH in some of the included studies (such as; Li et al., 2011; Payne et al., 2013; Bankart et al., 2011). In a broader perspective, there is limited evidence to support the claim that sociodemographic risk factors influence NeHA, given that few related factors in the fixed sociodemographic group (such as; language or communication barrier) were not reported to be significant. More so, some other studies reported age to be neither considered (Deschodt et al., (2015); Reilly et al., (2011)) nor significant Braet et al., (2015); Bankart et al., (2011); Gili-Miner, et al. (2014); Deschepper et al., (2017) in their multivariate analysis. The need to include more sociodemographic risk factors relating to patients' age becomes imperative in the investigation of influencing factors for NeHA.

In contrast, the association between ethnic variation in NeRa and excess length of stay (LOS) was reported by De-Bruijne et al., (2013), an outcome of which is consistent with the result from some US studies (Jah et al., 2007; Joynt et al., 2011). The explanations, that the US authors gave in those studies are not allied to those offered by (De Bruijne et al., 2013). They mentioned the shortcomings in the quality of hospital care delivered to ethnic minority patients; which resulted to the health differences in the patients and community level factors. Perhaps, the fragmented health system in the US might be a key reason why some ethnic groups' healthcare is more prioritised when compared to some other ethnicity (such as; the African American community). More death rates are being recorded for the black ethnic groups when compared to the white ethnic groups in USA, supported by (Case and Deaton, 2015). This might have resulted from the unequal quality of care which some black ethnic group may have experienced. In the light of

these observations, there are needs for the health authority to look into the unequal quality of care that are delivered to various ethnic groups in the developed countries (such as; Netherlands). However, the outcome that ethnicity is significant in this review supports the works of Ismail et al., (2017); Bankart et al., (2011), who reported black and white ethnic, group (respectively), to be significant and having more white patients with greater rate of admission than the other ethnic group. Even though the white ethnic group sample size in Bankart et al., (2011) is higher when compared with the black ethnic group in Ismail et al., (2017), yet the results in both studies are similar to this review. The reasons for such outcome may be that those studies as well as this review were carried out in the UK; thus, the necessity of rendering appropriate intervention towards specific ethnic group becomes paramount in the UK.

Meanwhile, gender is at increased risk to NeHA; an alternate gender was significant when sex was explored in the analysis (such as; Bankart et al., 2011; Payne et al., 2013; Appleton, Abel and Payne 2014). In this review, male gender was reported to be a risk factor to non-elective hospital admission and supports the work of Payne et al., (2014), where male gender is more at risk to NeHA. A similar outcome was also reported in (Long et al., 2016; Bankart et al., 2011; Appleton, Abel and Payne 2014). There studies reported male sex to be a risk factor to NeHA and were all carried out in the UK. The authors suggest the need for health authorities to implement interventions that would help manage male patients that unexpectedly visit UK hospitals. A recent investigation in the UK, (Ismail et al., (2017)), suggests a contradictory outcome of female patients being a risk factor to NeHA. The gender shift might be a result of the fact that females live to a greater age compared to male and by age 90, there might be 8 females for one male. This suggest the higher proportion of female patients experiencing NeHA; thus, it is important for health authorities to take appropriate measure towards aged patients who are identified at risk of NeHA.

Other issues identified in reforming emergency care are; inadequate staff capacity in ED; inadequate hospital capacity; discharge delays; Delay in ED waiting time; fragmented health system and incomprehensible health standards across the system, as reported by (Derlet and Richards 2000; Laudicella, 2017). In order to ameliorate these problems, the collaborative involvement of the entire healthcare community and the development of emergency care networks is suggested supported by (Von Korff et al., 1997; NHS, 2010). These programs allow a collaborative learning among healthcare staff, where problems are analysed, tested and

measure the implemented patient care. The influence of non-clinical sociodemographic factors on admission decision for patients presenting at the emergency department should become a feasible target for alternative care pathway supported by (Hunter et al., 2016). Identified risk factors should not be handled with levity given the need to reduce the prevalence of non-elective admission in hospitals.

In the UK there has been more concentration on the causes of unexpected hospital admission which generally occurs via ED; but other countries focus on the diversion of ambulance and occupancy of the cubicle, as reported by (Cooke et al., 2004). A scale of overcrowding was suggested in America (Darlet at al., 2002), where there is utilization of a variety of timing outcome measures, (such as; arrival at the triage, to see doctor or nurse practitioner, decision to admit or discharge from ED, arrival to departure time from ED and diversion of ambulance). Department sizes are often mentioned in some studies, but rarely give sufficient information to allow comparison. For instance, Reilly et al., (2011) excluded certain social and demographic characteristics (including: age) from their analysis. These excluded variables are often a symptom of the problem across the whole health system and may cause variation in the generalisability of these studies. Many researches concentrate on healthcare system performance rather than on patient social characteristics, which includes sociodemographic risk factors. Thus, studies outside the NHS have to be considered with care, before their generalisability in the UK is accepted. In particular, literature originated from Australia, having same health system with Canada, where Medicare, private health-insurance and personal payments covers treatment cost as a private patient. Some groups are disqualified from certain types of medical care given their ethnic group or unavailable health insurance policies.

5.3 THE IMPLICATION OF REVIEW TO PRACTICE

This section basically explains the impact that this review might have on future research, policy decision, patients, clinicians, academics or on a related research area. More specifically, describes it impact on older male ethnic minority patient within a community such as the UK. This review has demonstrated that non-elective hospital admission is a general problem, but as much has is known, there is no literature that has specifically described the extent of sociodemographic risk factors influencing unplanned admissions and its possible causes. The majority of the literature on causes of NeHA are derived from the logical view of admission and

or readmissions, which is an alternative investigation of fixed sociodemographic factors influencing unplanned admission. This review has produced a fist of its kind literature which explain the links between sociodemographic risk factors and NeHA. A useful piece of report for many health practices towards making a better emergency admission policy.

Another implication is that the finding of this review would help researchers understand that very few non-clinical risk factors for NeHA has been studied in the past. It is therefore important, for future research to conduct their findings in such area. Given the sociodemographic risk factors (age, sex and ethnicity) that were identified in this review; sick older male ethnic minority patients, will understand the need for getting required check-ups and treatments early enough before their health degenerates. The findings of this review suggest that older patients are more likely to experience NeHA; an outcome of which would make the health policy to be in favour of the aged population, so that their hospital admission rate could be significantly reduced. The hospital management would target diseases that are peculiar to black older male patients, in a way that would effectively manage affected patients' health need and as such decrease their hospital presentation rate, supported by (Deschepper et al., 2017).

5.4 POLICY AND PRACTICAL RECOMMENDATION BASED ON FINDINGS

Health authorities may provide more funds into the health sector so that necessary healthcare needs could be met, especially with the ethnic minority group. An example of such was implemented in Canada, where the healthcare budget went up by $178 million to support patients' immediate social needs, reported by (Boyle et al., 1992). Based on the finding of this review, health practitioners could provide appropriate collaborative interventions network that focus on mitigating and reducing NeHA among older male ethnic minority patients, an example of which was mentioned in (Von Korff et al., 1997). They could come up with new stratagem or increase awareness on prevention strategy that focus on individual's health condition, which invariably may also limit the number of times they unexpectedly visit the hospitals, either for treatment or investigation purposes. During the suggested awareness period, which prevents the increasing volume of NeHA, health practitioners may work with health policy makers, towards achieving set goals. In order for them to attain a meaningful outcome, a practical suggestion of which are as follows:

- Associated sociodemographic risk factors among older male patients could be adequately investigated by ensuring appropriate health checkups for older men

- Electronic health system which allows health care professionals to evaluate, diagnose and treat older male patients at distance may be utilized, (such as; telemedicine), supported by (Panlaqui, 2017).
- Specialised caregivers, for specific old male patients with special health need could be provided
- An improved health care quality within the black ethnic community areas should be made available.
- Health care plan could be reviewed, for older male patients within the black ethnic community, so that their hospital admission rate could be reduced or managed.
- Finally, there could be more collection of patients' demographic information so that subsequent future analysis could include the sparsely included ethnicity variable or its related components.

5.5 STRENGTH AND WEAKNESS OF REVIEW

Not only that the set objectives for this review was achieved; this review has identified a body of research; produced an inherent classification system for NeHA, (see appendix: 5); which were applied to the included studies and drawn conclusions from those studies. From my perspective, the categorisation approach is novel, in that it provided a lucid catalog of risk factors included in the studies, which were not seen in the broader literature review on NeHA. In addition, an appropriate data items were extracted from the studies examined (See appendix: 6), which gave comprehensive information of the studies' content. Secondly, the significant risk factors in the studies included were also presented in a legible order, which helped to answer the research question that investigates the sociodemographic risk factors for NeHA.

Lastly, the outcome of this review is generalisable to some population both local and international, given that similar relationships were found in different studies and were processed in different countries with different data systems. The relationship between NeHA and sociodemographic factors are realistic; which means that findings for age and sex are generalisable, but there is not enough evidence for ethnicity in this review. To certain extent, the adequacy of comparison with existing studies is being actualised, thus this review has been able to show that a semi-systematic approach of a literature review is appropriate to identify the sociodemographic risk factors for NeHA.

The limitation of this review was the low number of papers that were available for this review, might limits the power of this review. Thus, led to the identification of few non-clinical sociodemographic components (such as; ethnicity). Another limitation was the selection of papers with age group not up to 18 years; this might generate some bias since the health of children are more complex and risk factors may include other factors (such as; their parents). Such inclusion might be a little bit complicated for this review. The inclusion of studies in other European countries, having different health system from the UK might possibly be a limitation for this review, because their health system is unified but not completely free. Their related study, outcome was an important consideration for their inclusion in this review. Despite these limitations, this review confirms the significant difference between clinical and non-clinical risk factors. Thus, reveals the sociodemographic risk factors that are significant in the studies included.

5.6 FURTHER STUDY

This review was conducted on a small number of primary studies over a specific period; making it a secondary analysis of existing studies. Further research is therefore required to identify the sociodemographic risk factors of non-elective hospital admission(s) using a real dataset which is identified with a particular population, so that the risk factors (age, sex and ethnicity), that are found significant in this review could be examined. In addition to this, a broader group of factors could be examined within the non-clinical groups, to explore other out of hospital patient's characteristics (such as: race). Ethnic variations could also be investigated further after excluding confounding factors. Similarly, strategic and operational responses of national health services need to be evaluated in order to help generate an evidence-base of what works and what doesn't work, when trying to minimise the increasing rate of NeHA(s) within a specific population sample.

5. 7 SUMMARY

This chapter has efficaciously discussed the link between the findings of this review and existing studies, with much emphasis on the key themes on the impact of this review to practice, research limitation and strength of review, as well as further study. The outcome of this review (age sex and ethnicity) has been adequately evaluated with previous studies; a key objective which has been achieved in this review.

CHAPTER SIX

Conclusion

6.1 SUMMARY OF RESEARCH FINDINGS

The first objective, which aimed to develop a search strategy and screening criteria for the literature was achieved. A search strategy, from which literature relating to the research questions were generated. The exclusion and inclusion criteria were clearly spelt out and the databases used were described (see chapter 2). A particular strength of this search strategy was the justification provided for each selection criteria as well as the rationale provided for the choice of databases used to gather relevant studies. Although different terms were explored during the database search, but the terms used are relevant to the study which adds to the strength of this review

In order to examine the retrieved literature; included studies were reviewed with an appropriate literature review approach followed by thorough synthesis of information and the application of CASP tool for assessment of study quality. The synthesis of data that were generated from primary studies strategically contributes to the body of knowledge on the sociodemographic determinants for NeHA(s). Information of which was well organised and presented findings from garnered evidence which were critically swotted to generate conclusions that helped to answer the research questions. Risk factors in the included studies were collapsed into finite terms and a three-level classificatory system was created, with the use of a novel approach of classification. The classification strategy helped in the identification of distinct sociodemographic risk factors that were considered and found significant in the study included. Also, the sociodemographic risk factors influencing NeHA were also identified, which is another objective that was achieved in this review. In addition, studies that include non-clinical risk factors were identified and the consistency of association within those studies was adequately explained. This review suggest which non-clinical factors should be included in future work, (such as; age, sex and ethnicity).

The extents of their significance were deduced from the estimation of multivariate analysis results in each study, (such as; odd ratio and p-values); and were mostly validated with c-statistics. For example, older patients were significant at p-value$\leq$ 0.005 in the work of Li et el, (2014); outcome of which was validated with c-statistics. The findings from this review, contributes to existing body of knowledge by reviewing previous literature in a unique way to

give better understanding on the influencing factors for NeHA(s) and suggested the implication of findings to health practices. The strength of the findings of this review was validated through the qualitative synthesis of information extraction from included studies and the use of CASP too for quality assessment. Additionally, the findings of this review were independently reviewed by a research candidate with guidance from senior researchers; whose research background is in health science and their research interest relates to the context of this review. Also, it provides some degree of rigor into the review process, by incorporating a systematic quality appraisal process (CASP 2017) which check the quality of papers included in this review. Further, a PRISMA Checklist, which could be found in the later part of this review, was also used to validate the review process. (see appendix:2). The magnitude at which the non-clinical sociodemographic risk factors of NeHA(s) that are included in existing research on unplanned hospital admissions has been adequately examined in this review; an outcome of which reveals that all itemised objectives has been met

6.2 LESSONS LEARNT IN THIS REVIEW

The generation of 15 out of thousands filtered studies, reveal a possibility that the resource search process could be improved in future research, either by using new databases or modifying the search terms. However, this review followed a replicable process with the use of a semi-systematic review approach with improved accessibility to literature. It enabled the searches for relevant studies and synthesis of information, in order to identify which sociodemographic risk factors are included in previous research. Although the use of RefWorks, a tool used for collecting and sorting searched literature, was initially challenging. The software was unable to handle large numbers of references and its recurrent malfunctioning caused delay in the study identification process. If such blip had not happened, one would not realise the setback in handling larger number of literature. After a thorough work-through with a RefWorks expert in the University, the software was able generate relevant papers, which were sorted and included in this review.

In this review, the categorisation approach is novel, in that it provided a lucid catalog of risk factors included in the reviewed studies, which was not seen in the broader literature review on NeHA. An innovative approach of categorizing the risk factors in the studies included was developed, for a clearer understanding of risk factors that were previously explored. The terms that were previously used were complex and repetitive, but the reviewers grouped those terms into a 3-level, four distinct categories, by merging related terms in order to present more

understandable risk factors. However, more light was shed into the limited numbers of non-clinical risk factors that were included in previous studies. If these processes had not taken placed, the identification of sociodemographic risk factors in studies included would not have been known. The categorisation process exposed the shortage in the non-clinical characteristics; which necessitate the need for more studies to be conducted on the sociodemographic risk factors for NeHA.

6.3 DEDUCTIONS AND CONTRIBUTIONS TO KNOWLEDGE

This review suggests that all three sociodemographic risk factors that were considered in the studies included are associated with NeHA(s); except that the evidence in ethnicity are more mixed. Generally; these risk factors (age, sex and ethnicity) depict their influence on non-elective hospital admission, with different level of associations. Based on these findings, patients are able to understand the importance to seeking appropriate healthcare, when they are unwell, especially among the older black ethnic minority groups; since they are more likely to be at risk of NeHA. This review has delivered insightful knowledge to researchers in the identification of studies, where sociodemographic risk factors to NeHA were considered and included in the literature. Thus, clinical practice should research and develop effective intervention programs towards the identified sociodemographic risk factors affecting NeHA so that the number of patients that unexpectedly present at the hospital can be well managed. In my opinion, such intervention may focus on the older male patients of certain ethnic group.

The necessity of addressing the sociodemographic risk factors for NeHA, using a literature review; some distinct contributions are itemised as follows:

- A three-level classificatory system of components explored in the 15 studies included was produced
- The findings of which identified sociodemographic risk factors for NeHA(s).
- The consistencies of their association with NeHA were evaluated.

Given these achievements, there could be a reduction in unplanned hospitals attendance; a key problem that this review investigated. It is my belief that the identified sociodemographic risk factors to admission and/ or readmissions would help health policy makers understand suitable interventions programs. These accomplishments contribute to the body of knowledge within the academic and general practices towards making a better admission decision.

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APPENDICES

Appendix 1: Study Selection Criteria

Inclusion Criteria

1. Papers included are Prospective or Retrospective or Cross-sectional cohort study design
2. Although studies were not limited to any specific location but all studies in USA were not considered due to lack of access to healthcare system
3. Age group, mostly 18 years and older were considered for inclusion
4. Selection was focused on published papers mostly between 2010 and 2017because there has been a significant change in healthcare policy since then
5. Publication in English language only
6. Studies has to explicitly state in abstract or title any unplanned admission in hospital and whose aim and objectives focus on the said context were included
7. There was some statistical analysis that compared the risk factors
8. Paper was peer-reviewed
9. Papers on readmission through ED are included
10. Groups of condition (such as; mental health or cancer) are included

Exclusion Criteria

2. Studies with low number of participants (≤ 40) were not considered because such studies may not be generalised to other population, given the low sample size
3. All non- human participants were excluded
4. Papers that were designing a predictive clinical model
5. Studies that occurred solely in ED or health centres or care home or any other place aside hospital were not considered
6. Excluded paper if not available from SHU document supply services
7. Articles on qualitative research were excluded
8. Articles whose outcome did not identify predisposing factors to non-elective hospital admission were removed
9. Studies with no identified factors (such as; P-value, OR, confidence interval) were not considered.
10. Excluded papers with age group mostly under the age of 18 years, that only focused on children and adolescent

11. Exclude studies that only provided descriptive analysis of the data
12. Exclude opinion pieces, editorials and commentaries
13. Exclude review papers
14. At tittle and abstract, articles specific disease condition were included but were excluded at full text because majority of the articles screened were non-clinical

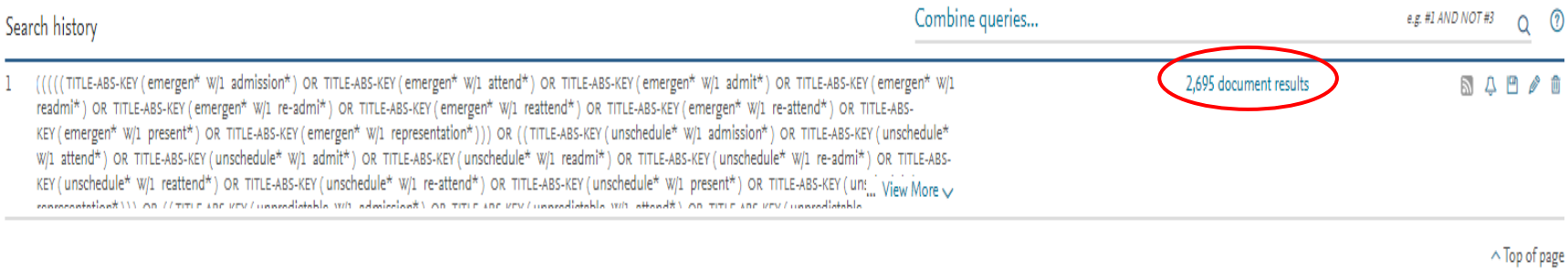
Appendix 2: PRISMA Checklist (Moher et al., 2015)

Title	Review of factors that influence non-elective hospital admission(s)
Author	Related studies were reviewed
Introduction	A clear and précised introduction included
Methodology	A fully and well explained Literature Review methodology was included
Search Strategy	Databases used and flexible terms were presented (see content in thesis)
Inclusion / exclusion criteria	Presented with reasons
Ethics	Considered briefly
Results	The outcome of this review indicate that age, sex and ethnicity are the sociodemographic risk factors influencing non-elective hospital admission

Appendix 3: Other database searches

SCOPUS SEARCH HISTORY

(((((TITLE-ABS-KEY (emergen* W/1 admission*) OR TITLE-ABS-KEY (emergen* W/1 attend*) OR TITLE-ABS-KEY (emergen* W/1 admit*) OR TITLE-ABS-KEY (emergen* W/1 readmi*) OR TITLE-ABS-KEY (emergen* W/1 re-admi*) OR TITLE-ABS-KEY (emergen* W/1 reattend*) OR TITLE-ABS-KEY (emergen* W/1 re-attend*) OR TITLE-ABS-KEY (emergen* W/1 present*) OR TITLE-ABS-KEY (emergen* W/1 representation*))) OR ((TITLE-ABS-KEY (unschedule* W/1 admission*) OR TITLE-ABS-KEY (unschedule* W/1 attend*) OR TITLE-ABS-KEY (unschedule* W/1 admit*) OR TITLE-ABS-KEY (unschedule* W/1 readmi*) OR TITLE-ABS-KEY (unschedule* W/1 re-admi*) OR TITLE-ABS-KEY (unschedule* W/1 reattend*) OR TITLE-ABS-KEY (unschedule* W/1 re-attend*) OR TITLE-ABS-KEY (unschedule* W/1 present*) OR TITLE-ABS-KEY (unschedule* W/1 representation*))) OR ((TITLE-ABS-KEY (unpredictable W/1 admission*) OR TITLE-ABS-KEY (unpredictable W/1 attend*) OR TITLE-ABS-KEY (unpredictable W/1 admit*) OR TITLE-ABS-KEY (unpredictable W/1 readmi*) OR TITLE-ABS-KEY (unpredictable W/1 re-admi*) OR TITLE-ABS-KEY (unpredictable W/1 reattend*) OR TITLE-ABS-KEY (unpredictable W/1 re-attend*) OR TITLE-ABS-KEY (unpredictable W/1 present*) OR TITLE-ABS-KEY (unpredictable* W/1 representation*))) OR ((TITLE-ABS-KEY (unexpected W/1 admission*) OR TITLE-ABS-KEY (unexpected W/1 attend*) OR TITLE-ABS-KEY (unexpected W/1 admit*) OR TITLE-ABS-KEY (unexpected W/1 readmi*) OR TITLE-ABS-KEY (unexpected W/1 re-admi*) OR TITLE-ABS-KEY (unexpected W/1 reattend*) OR TITLE-ABS-KEY (unexpected W/1 re-attend*) OR TITLE-ABS-KEY (unexpected W/1 present*) OR TITLE-ABS-KEY (unexpected W/1 representation*))) OR ((TITLE-ABS-KEY ("non-elective" W/1 admission*) OR TITLE-ABS-KEY ("non-elective" W/1 attend*) OR TITLE-ABS-KEY ("non-elective" W/1 admit*) OR TITLE-ABS-KEY ("non-elective" W/1 readmi*) OR TITLE-ABS-KEY ("non-elective" W/1 re-admi*) OR TITLE-ABS-KEY ("non-elective" W/1 reattend*) OR TITLE-ABS-KEY ("non-elective" W/1 re-attend*) OR TITLE-ABS-KEY ("non-elective" W/1 present*) OR TITLE-ABS-KEY ("non-elective" W/1 representation*))) OR ((TITLE-ABS-KEY ("non elective" W/1 admission*) OR TITLE-ABS-KEY ("non elective" W/1 attend*) OR TITLE-ABS-KEY ("non elective" W/1 admit*) OR TITLE-ABS-KEY ("non elective" W/1 readmi*) OR TITLE-ABS-KEY ("non elective" W/1 re-admi*) OR TITLE-ABS-KEY ("non elective" W/1 reattend*) OR TITLE-ABS-KEY ("non elective" W/1 re-attend*) OR TITLE-ABS-KEY ("non elective" W/1 present*) OR TITLE-ABS-KEY ("non elective" W/1 representation*)))) AND (TITLE-ABS-KEY (hospital*))) OR (((TITLE-ABS-KEY (emergen* W/1 hospitali*) OR TITLE-ABS-KEY (emergen* W/1 rehospitali*) OR TITLE-ABS-KEY (emergen* W/1 re-hospitali*) OR TITLE-ABS-KEY (unplan* W/1 hospitali*) OR TITLE-ABS-KEY (unplan* W/1 rehospitali*) OR TITLE-ABS-KEY (unplan* W/1 re-hospitali*) OR TITLE-ABS-KEY (unschedule* W/1 hospitali*) OR TITLE-ABS-KEY (unschedule* W/1 rehospitali*) OR TITLE-ABS-KEY (unshedule* W/1 re-hospitali*))) OR ((TITLE-ABS-KEY (unpredictable W/1 hospitali*) OR TITLE-ABS-KEY (unpredictable W/1 rehospitali*) OR TITLE-ABS-KEY (unpredictable W/1 re-hospitali*) OR TITLE-ABS-KEY (unexpected W/1 hospitali*) OR TITLE-ABS-KEY (unexpected W/1 rehospitali*) OR TITLE-ABS-KEY (unexpected W/1 re-hospitali*) OR TITLE-ABS-KEY ("non-elective" W/1 hospitali*) OR TITLE-ABS-KEY ("non-elective" W/1 rehospitali*) OR TITLE-ABS-KEY ("non-elective" W/1 re-hospitali*))))) AND (TITLE-ABS-KEY (observational OR "population stud*" OR prospective OR retrospective OR "cross sectional" OR "cross-sectional" OR "cohort stud*")) AND (LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012) OR LIMIT-TO (PUBYEAR, 2011) OR LIMIT-TO (PUBYEAR, 2010)) AND (LIMIT-TO (LANGUAGE,"English "))



CINAHL SEARCH STRATEGY

#	Query	Limiters/Expanders	Last Run Via	Results
S17	S10 AND S14	Limiters - Published Date: 20100101-20171231 Narrow by Language: - English Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	**1,004**
S16	S10 AND S14	Limiters - Published Date: 20100101-20171231 Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	1,016
S15	S10 AND S14	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	1,451
S14	S12 OR S13	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	3,381
S13	S2 N1 S5	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	943
S12	S1 AND S11	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	2,510
S11	S2 N1 S4	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	4,446
S10	S3 OR S6 OR S7 OR S8 OR S9	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	534,082
S9	(MH "Cross-Sectional Studies")	Search modes - SmartText Searching	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	421
S8	(MH "Cohort Studies")	Search modes - SmartText Searching	Interface - EBSCOhost Research Databases	418

			Search Screen - Advanced Search Database - CINAHL Complete	
S7	(MH "Retrospective Studies")	Search modes - SmartText Searching	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	436
S6	(MH "Prospective Studies")	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	317,766
S5	AB (Hospitali* OR Rehospitali* OR Re-hospitali*) OR TI (Hospitali* OR Rehospitali* OR Re-hospitali*)	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	56,413
S4	AB(admission* OR attend* OR admit* OR readmi* OR re-admi* OR reattend* OR re-attend* OR present* OR representation*) OR TI (admission* OR attend* OR admit* OR readmi* OR re-admi* OR reattend* OR re-attend* OR present* OR representation*)	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	550,422
S3	AB (observational OR "population stud*" OR prospective OR retrospective OR "cross sectional" OR cross-sectional OR "cohort stud*") OR TI (observational OR "population stud*" OR prospective OR retrospective OR "cross sectional" OR cross-sectional OR "cohort stud*") OR TI ("case control" N3 nested) OR AB ("case control" N3 nested)	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	320,405
S2	AB ((emergen* OR unplan* OR unschedule* OR unpredictable OR unexpected OR "non-elective" OR "non elective")) OR TI ((emergen* OR unplan* OR unschedule* OR unpredictable OR unexpected OR "non-elective" OR "non elective")))	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	113,121
S1	TI hospital* OR AB hospital*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	294,885

COCHRANE LIBRARY SEARCH

ID	Search	Hits
#1	hospital*	246578
#2	emergen* or unplan* or unschedule* or unpredictable or unexpected or "non-elective" or "non elective"	34985
#3	observational or "population stud*" or prospective or retrospective or "cross sectional" or cross-sectional or "cohort stud*" or "case control"	219790
#4	admission* or attend* or admit* or readmi* or re-admi* or reattend* or re-attend* or present* or representation*	182402
#5	Hospitali* or Rehospitali* or Re-hospitali*	38342
#6	MeSH descriptor: [Prospective Studies] this term only	81447
#7	MeSH descriptor: [Retrospective Studies] this term only	9329
#8	MeSH descriptor: [Cohort Studies] this term only	7980
#9	MeSH descriptor: [Cross-Sectional Studies] this term only	4246
#10	#3 or #6 or #7 or #8 or #9	219790
#11	#2 near/1 #4	671
#12	#1 and #11	593
#13	#2 near/1 #5	409
#14	#12 or #13	965
#15	#10 and #14	508

Appendix 4: Components Collapsed and Classification

Components	Collapsed Components	Level 1 Classification	Level 2 Classification	Level 3 Classification
Acuity	Acuity	C	HBF	AC
Excess LOS	Excess LOS	C	HBF	AC
LOS for EA days	LOS for EA days	C	HBF	AC
Length of stay	Length of stay	C	HBF	AC
Admission	Admission	C	HBF	AM
Woods LOS	Admission	C	HBF	AM
Elective admission	Admission	C	HBF	AM
Urgent	Admission	C	HBF	AM
Patients with under three admissions in the year	<3 admission/year	C	HBF	AM
Admission method	Admission method	C	HBF	AM
Admission outcome	Admission outcome	C	HBF	AM
Discharge mode	Discharge mode	C	HBF	AM
Number of admissions	No of admissions	C	HBF	AM
No of admissions	No of admissions	C	HBF	AM
Last hospitalization <3 months	Last hospitalization <3 months	C	HBF	AC
No of admissions	No of admissions	C	HBF	AM
Number of EA spell	previous EA visits	C	HBF	AM
Previous visit to emergency department	previous EA visits	C	HBF	AM
Arrival mode	Arrival mode	C	HBF	AM
Emergency admission GP	Emergency admission via GP	C	HBF	AM
Orthopaedic after care	Orthopaedic after care	C	HBF	CC
Dysphagia	Dysphagia	C	HBF	CM
Drug use disorder	Drug use disorder	C	CBF	CM
Nutritional status	Poor nutritional status	C	CBF	CM
Hemiplegia or paraplegia	physical disability	C	CBF	CM
Physical illness	Physical illness	C	CBF	CM
Physical inactivity	Physical inactivity	C	CBF	CM
Diagnosis	comorbidities	C	HBF	CM
Other arthropod born disease	Specific condition - other	C	HBF	CM
No of ICD10 chapters	Comorbidities	C	HBF	CM
Charlson comorbidity index	Comorbidities	C	HBF	CM

Comorbidity	Comorbidities	C	HBF	CM
Comorbidity	Comorbidities	C	HBF	CM
No of comorbid disease	Comorbidities	C	HBF	CM
Total clinical points	Comorbidities	C	HBF	CM
No of Physical conditions	Comorbidities	C	HBF	CM
Diabetes	Diabetes	C	HBF	CM
Diabetes with chronic complications	Diabetes	C	HBF	CM
Diabetes without chronic complications	Diabetes	C	HBF	CM
Neurosis	Mental health condition	C	HBF	CM
Past psychiatric history	Mental health condition	C	HBF	CM
Previous psychiatric history	Mental health condition	C	HBF	CM
Psychiatric illness	Mental health condition	C	HBF	CM
Risk of depression	Mental health condition	C	HBF	CM
Dementia history	Mental health condition	C	HBF	CM
Mental health conditions	Mental health condition	C	HBF	CM
Non cardiovascular condition	Non cardiovascular condition	C	HBF	CM
Number of ADL impairments	Number of ADL impairments	C	HBF	CM
Obesity	Obesity	C	HBF	CM
Metastatic cancer	Specific condition - cancer	C	HBF	CM
Active malignancy	Specific condition - cancer	C	HBF	CM
Cancer Leukaemia or lymphoma	Specific condition - cancer	C	HBF	CM
Malignancy	Specific condition - cancer	C	HBF	CM
Myocardial infraction	Specific condition - cardiovascular diseases	C	HBF	CM
Peripheral vascular disorder	Specific condition - cardiovascular diseases	C	HBF	CM
Pulmonary circulation disorder	Specific condition - cardiovascular diseases	C	HBF	CM
PVD	Specific condition - cardiovascular diseases	C	HBF	CM
Cardiac arrhythmias	specific condition - cardiovascular diseases	C	HBF	CM
Cardiovascular condition (Hypertension	specific condition - cardiovascular diseases	C	HBF	CM
Cerebrovascular disease	specific condition - cardiovascular diseases	C	HBF	CM
CHD prevalence	specific condition - cardiovascular diseases	C	HBF	CM
CHF	Specific condition - cardiovascular diseases	C	HBF	CM
Cogesrive heart failure	specific condition - cardiovascular diseases	C	HBF	CM
Congestive heart failure	specific condition - cardiovascular diseases	C	HBF	CM
Heart failure)	specific condition - cardiovascular diseases	C	HBF	CM
Hypertension	specific condition - cardiovascular diseases	C	HBF	CM
Hypertension complicated	specific condition - cardiovascular diseases	C	HBF	CM

Hypertension uncomplicated	specific condition - cardiovascular diseases	C	HBF	CM
IHD	specific condition - cardiovascular diseases	C	HBF	CM
Stroke	specific condition - cardiovascular diseases	C	HBF	CM
Valvar disease	specific condition - cardiovascular diseases	C	HBF	CM
Artial fibrillation	specific condition - cardiovascular diseases	C	HBF	CM
Peptic ulcer disease	specific condition - GI	C	HBF	CM
Constipation	specific condition - GI	C	HBF	CM
Other unspecified non-infectious gastroenteritis and colitis	specific condition - GI	C	HBF	CM
Vomiting	specific condition - GI	C	HBF	CM
Blood loss anaemia	specific condition - other	C	HBF	CM
Deficiency anaemia	specific condition - other	C	HBF	CM
Coagulopathy	specific condition - other	C	HBF	CM
Fluid and electrolyte disorder	specific condition - other	C	HBF	CM
Mild liver disease	specific condition - other	C	HBF	CM
Moderate or severe liver disease	specific condition - other	C	HBF	CM
Rheumatic disease	specific condition - other	C	HBF	CM
Respiratory distress	specific condition - other	C	HBF	CM
COPD	specific condition - other	C	HBF	CM
Renal Colic	specific conditions - renal	C	HBF	CM
Renal disease	specific conditions - renal	C	HBF	CM
Renal disorder	specific conditions - renal	C	HBF	CM
End stage renal failure	specific conditions - renal	C	HBF	CM
Pain	symptoms	C	HBF	CM
Abdominal pain	symptoms	C	HBF	CM
Backache	symptoms	C	HBF	CM
Headache	symptoms	C	HBF	CM
Pain score at discharge	symptoms	C	HBF	CM
Tobacco dependence	Tobacco dependence	C	HBF	CM
Urgent conditions	urgent conditions	C	HBF	CM
Weight loss	Weight loss	C	HBF	CM
Alcohol disorder	health adverse behaviours	C	CBF	CM
ED Diagnosis	ED Diagnosis	C	HBF	CM
Response rate to access survey	GP Practice Characteristics	C	CBF	GP Practice Characteristics
Satisfied with opening hours	GP Practice Characteristics	C	CBF	GP Practice Characteristics
Satisfied with phone access	GP Practice Characteristics	C	CBF	GP Practice Characteristics

Able to book 2 days ahead	GP Practice Characteristics	C	CBF	GP Practice Characteristics
Able to book specific GP	GP Practice Characteristics	C	CBF	GP Practice Characteristics
Able to get appointment within 48h	GP Practice Characteristics	C	CBF	GP Practice Characteristics
Tariff for all admission spell	GP Practice Characteristics	C	CBF	GP Practice Characteristics
Tariff for emergency admission	GP Practice Characteristics	C	CBF	GP Practice Characteristics
Discharge destination	Discharge destination	C	HBF	Medical
Discharge destination	Discharge destination	C	HBF	Medical
Discharge summary	Discharge summary	C	HBF	Medical
Hospital mortality	hospital characteristics	C	HBF	Medical
Type of hospital	hospital characteristics	C	HBF	Medical
Psychiatrist consultation at ED	saw specialists in ED	C	HBF	Medical
SW assessment at ED	saw specialists in ED	C	HBF	Medical
Dressing & Sutures	treatment given	C	HBF	Medical
Other group	Other group	C	HBF	Medical
Unspecified follow up	Unspecified follow up	C	HBF	Medical
Number of medication at home	Rx	C	CBF	Medication
Repeat prescription	Rx	C	CBF	Medication
Drug count	Rx	C	CBF	Medication
Drug related adverse effect	Rx	C	HBF	Medication
Medication	Rx	C	HBF	Medication
Total organisational points	Total organisational points	C	CBF	Organisational
Fall in the last one year	Fall in the last one year	C	HBF	CSS
Nasogastric tube feeding	has clinical support	C	CBF	CSS
Nursing care at home	has out of hospital care/help	C	CBF	CSS
Personal alarm system	has out of hospital care/help	C	CBF	CSS
Previous visit nursing service	has out of hospital care/help	C	CBF	CSS
Private homes for aged vs. others	has out of hospital care/help	C	CBF	CSS
Carer	has out of hospital care/help	C	CBF	CSS
Cleaning help	has out of hospital care/help	C	CBF	CSS
Meals on wheels	has out of hospital care/help	C	CBF	CSS
Shopping assistance	has out of hospital care/help	C	CBF	CSS
Physiotherapy before admission	Physiotherapy before admission	C	CBF	CSS
Psychosocial intervention	Treatment given	C	HBF	CSS
4-hours target	time	C	HBF	TIME (T/D)
After hours presentation	time	C	HBF	TIME (T/D)
Arrival date	time	C	HBF	TIME (T/D)

Day of the week	time	C	HBF	TIME (T/D)
Spring presentation	time	C	HBF	TIME (T/D)
Time	time	C	HBF	TIME (T/D)
Timing of discharge summary	time	C	HBF	TIME (T/D)
Weekend	time	C	HBF	TIME (T/D)
Winter presentation	time	C	HBF	TIME (T/D)
Year	time	C	HBF	TIME (T/D)
Weekday discharge	Weekday discharge	C	HBF	TIME (T/D)
Winter presentation	Time	C	HBF	TIME (T/D)
Age	demographics	NC	FF	SDF
Sex	demographics	NC	FF	SDF
Gender	demographics	NC	FF	SDF
Practice with white ethnicity	ethnicity	NC	FF	SDF
Australian born	ethnicity	NC	FF	SDF
Ethnicity	ethnicity	NC	FF	SDF
First generation	ethnicity	NC	FF	SDF
Distance from the hospital	geographic	NC	FF	SDF
Age	Demographics	NC	FF	SDF
Age	Demographics	NC	FF	SDF
Age	Demographics	NC	FF	SDF
Age	Demographics	NC	FF	SDF
Age	Demographics	NC	FF	SDF
Age	Demographics	NC	FF	SDF
Age	Demographics	NC	FF	SDF
Age	Demographics	NC	FF	SDF
Sex	Demographics	NC	FF	SDF
Sex	Demographics	NC	FF	SDF
Sex	Demographics	NC	FF	SDF
Gender	Demographics	NC	FF	SDF
Gender	Demographics	NC	FF	SDF
Deprivation	SES	NC	UFF	SES
Deprivation quantile	SES	NC	UFF	SES
Deprivation score	SES	NC	UFF	SES
Rural/urban settlement	SES	NC	UFF	SES
Living condition	SES	NC	UFF	SES
Interpersonal relationship issues	non-clinical factors	NC	UFF	SES

Help of Finance	SES	NC	UFF	SES
Income	SES	NC	UFF	SES
Insurance	SES	NC	UFF	SES
Quantile	SES	NC	UFF	SES
Socioeconomic quartile	SES	NC	UFF	SES
Social stress issues	SES	NC	UFF	SES

Acronyms: CCS: Clinical classification software; CM: Comorbidities; AC: Acute care; CC: Community care; SDF: Sociodemographic factor; SES: Socioeconomic status; FF: Fixed factors; UFF: Unfixed factors; HBF: Hospital based factors; CBF: Community based factors; AM: Admission Measure; CSS: Community Supportive Services

Appendix 5: Significant Risk factors in the Studies Included

Authors	Braet et al., 2015	Bankart et al., 2011	Long et al., 2016	Ismail et al., 2017	Lin et al., 2014	Appleton, Abel and Payne 2014	Reilly et al., 2011	Gili-Miner, et al,. 2014	Payne et al,. 2012	Deschepper et al., 2017	Kirby et al., 2012	De Bruijne et al., 2013	Chu and Pe, 1999	Li et al,., 2015	Deschodt et al., 2015
Admission Measure															
Previous visit to emergency department	**SS**														
LOS	NSS						NSS					SS		**SS**	NSS
Arrival mode				**SS**											
Discharge mode	NSS														
Discharge summary														**SS**	
Patients with under three admissions in the year											**SS**				
Number of admissions	NSS														
Last hospitalization <3 months															**SS**
Admission in 10 minutes prior to 4 hours				**SS**											
Unplanned readmission in patients ≤ 45 years												NSS			
Unplanned readmission in patients > 45 years												NSS			
Unplanned readmission in second generation ≤ 45 years												NSS			
Unplanned readmission in first generation ≤ 45 years												NSS			
Organisational															
Site				**SS**											
Additional workload measures				**SS**											
Comorbidities															
Peptic ulcer disease								**SS**							
Peripheral vascular disorder								**SS**							
Physical illness					NSS										
Nutritional status															NSS
Previous psychiatric history					**SS**										
Psychiatric illness					**SS**										
Pulmonary circulation disorder								**SS**							

PVD						**SS**									
Rheumatic disease								**SS**							
Risk of depression															**SS**
Stroke						**SS**									
Tobacco dependence								**SS**							
Valvar disease								**SS**							
Vomiting											**SS**				
Alcohol disorder								SS							
Cancer Leukaemia or lymphoma								**SS**							
Cardiac arrhythmias								**SS**							
COPD													**SS**	**SS**	
Deficiency anaemia								**SS**							
Cerebrovascular disease								**SS**							
Abdominal pain											**SS**				
Active malignancy														**SS**	
Atrial fibrillation						NSS									
Blood loss anaemia								**SS**							
CHF														**SS**	
Coagulopathy								**SS**							
Cognitive heart failure								**SS**					**SS**		
Cognitive impairment suspicion															
Comorbidity index	NSS				**SS**			**SS**					**SS**	**SS (>3), NSS (2-3)**	
Constipation											**SS**				
Dementia history													NSS		
Diabetes with chronic complications								**SS**							
Drug use disorder								**SS**							
Dysphagia													**SS**		
Fluid and electrolyte disorder								**SS**							
Hypertension						**SS**									
Hypertension complicated								NSS							
Hypertension uncomplicated								NSS							
IHD						NSS								**SS**	
Mental health conditions/ score									**SS**				NSS		
Metastatic cancer								**SS**							
Mild liver disease								**SS**							

Neurosis											**SS**				
Non cardiovascular drug count						**SS**									
Non cardiovascular comorbidity count						**SS**									
Headache											**SS**				
Heart failure						NSS									
Hemiplegia or paraplegia								**SS**							
Malignancy													**SS**		
Moderate or severe liver disease								**SS**							
Myocardial infraction								**SS**							
Nasogastric tube feeding													NSS		
No of comorbid disease													**SS**		
No of Physical conditions									**SS**						
Pain															NSS
Number of ADL impairments													**SS**		
Pain score at discharge aged > = 75										NSS					
Pain score at discharge										**SS**					
Delirium															NSS
Urine incontinence													NSS		
Bowel incontinence													NSS		
Acuity	NSS														
Fetal attempt					NSS									SS	
Wounds / Cutting					NSS										NSS
Weight loss								**SS**							
Detection of malignant neoplasms							NSS								
Disease of the nervous system							NSS								
Disease of the eye and adnexa							NSS								
Infectious or parasitic disease							NSS								
Mental and Behaviour Disorder							NSS								
Disease of respiratory system							NSS								
Injury/ poison					NSS		NSS								
Colorectal															
Purgent condition											**SS**				
IADL disability															NSS
Whether CMLTC patients can be identified on hospital system							NSS								

Number of primary and secondary diagnosis							**SS**								
Severity illness	SNN														
TIME (T/D)														NSS	
Timing of discharge summary														NSS	
Year			**SS** (All but), NSS (2008/2009)												
Weekday discharge	NSS														
After hours presentation											**SS**				
Winter presentation											**SS**				
Arrival time				NSS											
Community Supportive Services															
Personal alarm system															NSS
Physiotherapy before admission															**SS**
Carer													NSS		
Fall in the last one year															**SS**
Chair/Bed bound vs. others													NSS		
Barthel Index													NSS		
Meals on wheels															**SS**
Orthopaedic after care											**SS**				
Previous visit nursing service													NSS		
Private homes for aged vs. others													**SS**		
Renal disease								**SS**			**SS**		**SS**	**SS**	
Medical															
Psychiatrist consultation at ED					**SS**										
Type of hospital								**SS**							
Unspecified follow up											**SS**				
Discharge Destination	NSS													**SS**	
Dressing & Sutures											**SS**				
Hospital mortality	NSS														
Physiotherapy															NSS
Nursing care at home															**SS**
Home care															NSS
Other hospital														**SS**	
ESI Score															NSS
SDS															
Age	NSS	**SS, NSS**	SS (all but), NSS (babies)	**SS**		**SS**		NSS	**SS**	NSS (Age> 75)	**SS**			**SS (above 85), NSS (65-85)**	NSS
Sex	NSS	NSS	**SS**	**SS**	NSS	**SS**		NSS	**SS**						
Ethnicity		**SS**		**SS; NSS**			NSS				NSS	SS			
GP Practice Characteristics															

Satisfied with opening hours		NSS													
Abel to book specific GP		**SS**													
Consultant on duty				**SS**											
% of practice male		**SS**													
% of practice with white ethnicity		**SS**													
Medication															
Cardiovascular drug count						**SS**									
Drug related adverse effect													NSS		
Medication/ pain medication > or = 75										NSS					
Medication/ pain medication										NSS					
Number of medication at home															NSS
Repeat prescription											**SS**				
Social Factor (SES)															
Rural/urban settlement			NSS												
Social factor					**SS** , NSS										
Income													**SS**		
Help of Finance															NSS
Living situation															NSS
Deprivation/ deprivation score/ Distance from the hospital; IMD Score		SS	**SS, NSS**	**SS, NSS (quintile 2)**		SS, NSS			SS						NSS
Living Arrangement													**SS**		
Unknown															
RCF; DM														**SS**	
Presence of ACSC				**SS**											
CIRS															NSS
SWEET 16															NSS

Acronyms: CCS: Clinical classification software; CM: Comorbidities; AC: Acute care; CC: Community care; SDF: Sociodemographic factor; SES: Socioeconomic status;
FF: Fixed factors; UFF: Unfixed factors; HBF: Hospital based factors; CBF: Community based factors; AM: Admission Measure; GP: General Practice; ESI: Not score during night time
CIRS: Modified Cumulative Illness Rating Scale; IADL: Instrumental activities of daily living; ADL: Activities of daily living; COPD: Chronic obstructive pulmonary disease

Appendix 6: All Extraction Matrix

Author	Population/ Data source	Setting	Outcome	Methodology	Significant Risk Factor
Long et al.,. (2016)	Wales (UK) populations (2.8 million)	March 2008 - April 2014	Risk of emergency hospital admission for violence associated with demographic and socio-economic factor	Relative risk; Confidence Interval	Males; Deprived areas
Bruijne et al., (2013)	Cohort of patients in (Dutch) Netherlands hospital AD	(1995- 2005)	Investigate the ethnic variation in unplanned admission and excess LOS	Logistic Regression	Ethnic variation for Dutch Non-western patients
Ismail et al., (2017)	Patients data UK (England)	2016	Factors associated with emergency admission	Univariate analysis logistic regression	Black ethnicity; 4-hour target:
Braet et al., (2015)	Belgium hospital discharge data (AD)	2008	Identify the risk for UNRA and risk for readmission	Logistic Regression	Previous visit to ED
Appleton, Abel and Payne (2014)	Scotland UK Primary care data	2006	Relationship between cardiovascular medicine and unplanned non- cardiovascular hospital admission	Logistic regression	Non-cardiovascular high comorbidity count Non-cardiovascular admissions
Bankart et al., 2011	Leicestershire UK Hospital admission data	April 2006 - March 2008	Identify characteristics of GP associated with EHA	Descriptive statistics; Univariate Analysis, Binomial regression	Practice white ethnicity; Practice deprivation score Able to book with specific GP
Gili-Miner, et al.,. (2014)	AD Spanish hospital	2008 - 2010	Association between alcohol users unplanned readmission	Univariate analysis, logistic regression	AUD independent predictor for experiencing URA Higher hospital cost Higher risk of death
Payne et al.,. (2013)	AD hospital data UK	2006	Examined association between UHA and physical multi-morbidity, mental health and socio-economic deprivation	Univariate analysis, logistic regression	Increased physical multi-morbidity was associated with unplanned admission and preventable admission
Reilly et al.,. 2011	Manchester UK	July 2005- October 2006	Evaluation of the implementation and impact of case management for long-term conditions in 10 primary care trust	Univariate analysis; Regression analysis	Primary and secondary diagnosis
Chu and Pe (1999)	Hospital data Hong Kong	1999	Risk factor for early readmission in the early medical patient	Univariate analysis ; logistic regression	Adverse drug reaction, End stage renal failure; advance Malignancy
Li et al., 2014	Australia Hospital AD and clinical database	January 2007 - December 2011	To identify factors and patterns associated with 7-28 days readmission in hospital	Univariate analysis , Multivariate Poisson regression	LOS; Cardiac failure; Discharge summaries
Deschodt et al., (2015)	Hospital AD Belgium	November 2011- February 2012	Assess the predictive rule for unplanned admission of high pain score at discharge	Univariate analysis, logistic regression	Meals on wheels; Last hospitalisation <3 months
Deschepper et al., (2017)	Ghent University Hospital dataset in Belgium	February 2015 - February 2016;	Assess the predictive rule for unplanned admission of high pain score at discharge	Descriptive Statistics, Univariate analysis; logistic regression	No significant association between pain and unplanned hospital admission rather medication (p= 0.0044) and age (p=0.0017) were significant
Lin et al., (2014)	Hospital data in Taiwan	June 2004 - May 2005	Determine the characteristics, management and aftercare of patients who attempt suicide and then taken to ED	Univariate analysis, logistic regression	Previous psychiatric intervention, Previous consultation, Interrelationship issues
Kirby et al., (2012)	Hospital data in SW Australia	2008	Identify patients' characteristics associated with 28 unplanned return visits to hospital	Univariate analysis, logistic regression	Older patients with minor injury; urgency condition and non-psychotic mental health condition

Acronyms: UK: United Kingdom; AD: Administrative data; EHA: Emergency Hospital Admission; UHA: Unplanned hospital admission; AUD: Alcohol Use Disorder ED: Emergency admission; LOS: *Length of stay*

Appendix 7: Guidance Documentation

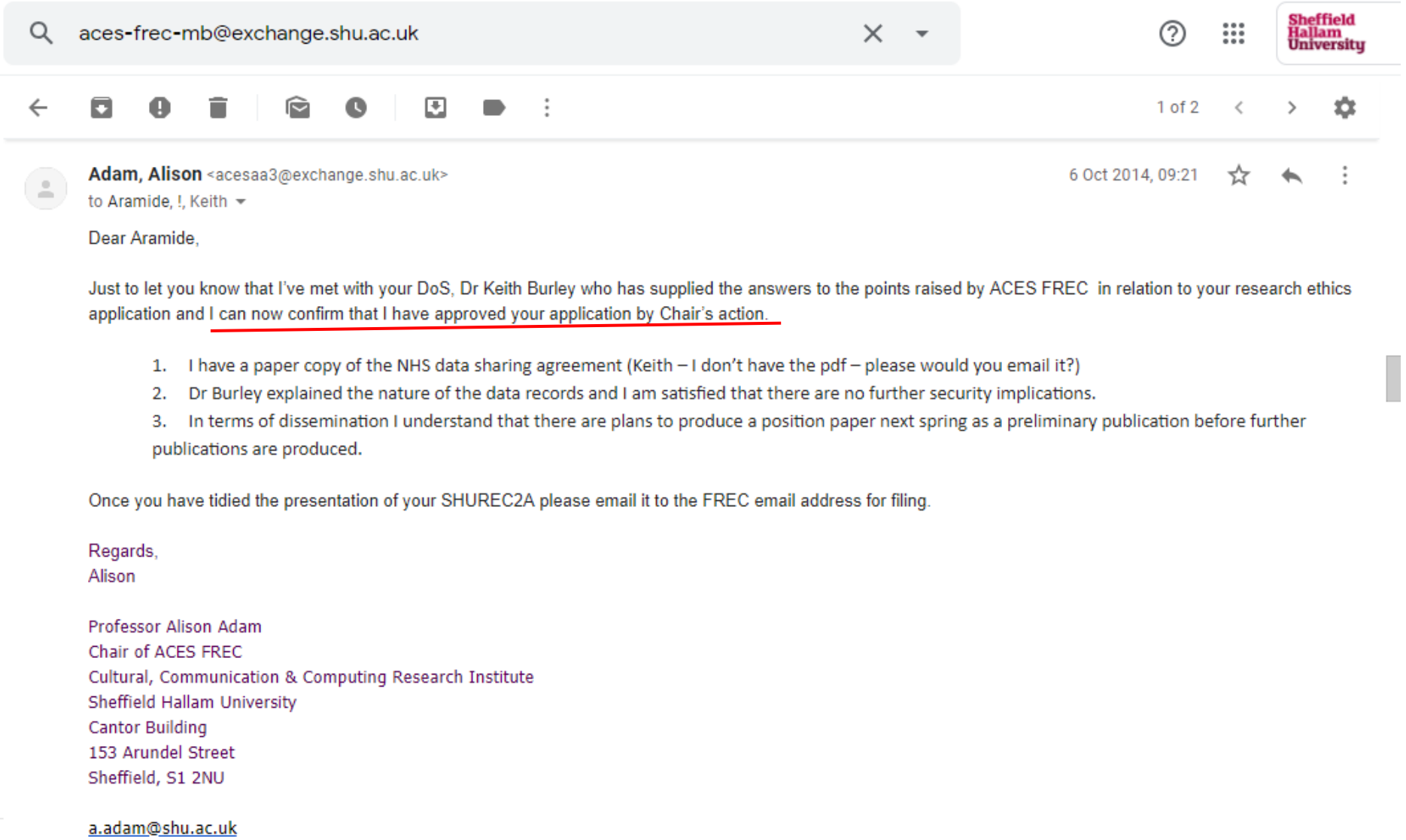
Table: Reviewers Contribution

Name	Where they the same pair as the previous reviewers?	How were they recruited?	What was their expertise?	What guidance were they given?
AG	Yes	Student Researcher	Research Student	Developed the process and the content of the entire review
SH	Yes	DOS and was recommended by the Faculty (ACES)	Professor of Interdisciplinary Health Research at SHU; who collaboratively published an article that is related to this review (Ibrahim et al., 2013).	She gave guidance in most part of the review, starting from the introduction to conclusion. Her support/ recommendations on the submitted text was helpful towards the completion of this thesis.
DH	Yes	Included by my DOS	She is an information scientist at faculty of health and wellbeing SHU collegiate campus	She guided me through most part of my chapter two. In the early period of this review, we discussed extensively on the search strategies and criteria for selecting relevant studies. Her contributions helped in collecting 15 most relevant papers, that were included in this review.

Acronyms: DOS: Director of Studies; ACES: Faculty of Arts, Computing, Engineering and Sciences; SHU: Sheffield Hallam University

There are no other pair of reviewers involved in the completion of this review, asides the ones mentioned in the table above; except that FS assisted in proofreading the submitted write-up at the early stage of the review. She suggested some modifications, which were corrected by AG, who later submitted the corrections to the supervisory team for further review. AG independently computed the text and developed the review process which was checked and validated by other two reviewers (DH and SK). The searches in the review were initially scrutinised by AG; while small proportion of the study was independently assessed by SK. Thereafter, the entire quality of the screening process was examined by DH, who ensured moderation on the selection criteria and the quality appraisal process, which was duly followed.

Appendix 8: Ethics Approval Letter



aces-frec-mb@exchange.shu.ac.uk

Sheffield Hallam University

1 of 2

Adam, Alison <acesaa3@exchange.shu.ac.uk>
to Aramide, !, Keith

6 Oct 2014, 09:21

Dear Aramide,

Just to let you know that I've met with your DoS, Dr Keith Burley who has supplied the answers to the points raised by ACES FREC in relation to your research ethics application and I can now confirm that I have approved your application by Chair's action.

1. I have a paper copy of the NHS data sharing agreement (Keith – I don't have the pdf – please would you email it?)
2. Dr Burley explained the nature of the data records and I am satisfied that there are no further security implications.
3. In terms of dissemination I understand that there are plans to produce a position paper next spring as a preliminary publication before further publications are produced.

Once you have tidied the presentation of your SHUREC2A please email it to the FREC email address for filing.

Regards,
Alison

Professor Alison Adam
Chair of ACES FREC
Cultural, Communication & Computing Research Institute
Sheffield Hallam University
Cantor Building
153 Arundel Street
Sheffield, S1 2NU

a.adam@shu.ac.uk

! ACES Research Ethics Committee (FREC) <aces-frec-mb@exchange.shu.ac.uk> 8 Apr 2016, 09:51

to Alison, me

Dear Aramide,

Excellent thank you for sending these through, I believe this is indeed confirmation that your application was approved from Alison - I will file them accordingly.

Best wishes

Andrea

Andrea Bows
Administrator / Personal Assistant to Prof. Dave Waddington & Prof. Paul Chamberlain
Working Hours: Tuesday 9.30am – 5.00pm, Thursday 9.30am – 2.00pm and Friday 9.30am – 5.00pm
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