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IDENTIFY THE RISK TO HOSPITAL ADMISSION IN UK-SYSTEMATIC REVIEW OF LITERATURE

Gbolahan Aramide
Department of Computing and Engineering, Sheffield Hallam University, Sheffield, United Kingdom
aramide.gbolahan@gmail.com

Kelly Shona
Department of Health and Wellbeing, Sheffield Hallam University, Sheffield, United Kingdom

Burley Keith
Department of Computing and Engineering, Sheffield Hallam University, Sheffield, United Kingdom

Bunderson Teresa
Department of Computing and Engineering, Sheffield Hallam University, Sheffield, United Kingdom

Abstract

Background: *Hospital admissions are the leading cause of increasing healthcare budget and high demand of hospital utilisation in United Kingdom. There is limited information on the predisposing factors into hospital admission. This study systematically summarizes existing result from different studies in order to identify possible risk factors to hospital admission among patients in United Kingdom.*

Method/ Design: *A systematic review of literature was carried out; identified relevant studies from searching through electronic database: Scopus, PubMed, Ethos, Cinahl, Cochrane, Reference list and other relevant reports.*

Discussion/ Outcome: *Our inclusion criteria identified nine studies; using a predefined inclusion criterion, with factors such as: population setting, study design, risk factors, methodology, drawbacks and a systematically reviewed outcome. This study identified significant risk factors such as: older age, comorbidities, sex and deprivation. The review showed that identified risk factors are highly associated with hospital admission; thus early intervention on identified risk factors could reduce the rate of hospital admission in United Kingdom.*

Keywords

Admission, Risk factors, Readmission, Hospital

1. Introduction

Risk factor to hospital admission is of significant concern to relevant stakeholders to such extent that the rate of hospital admission in some countries has doubled its previous years' rates. Of significant interest is the United Kingdom (UK) with peculiar factors driving its hospital's admission rate, given the population setting and the nature of medical care delivered to patients across its healthcare system. Hospital admission occurs when a patient is hospitalised and discharge from hospital and if re-hospitalised such patient is said to be readmitted. Recurrent hospital admission among patients in UK has significant impact on healthcare demand and the quality of care delivered to patient at a particular time.

In UK the cost of hospitalisation has double and the available fund does not match up with the demand for health service (Walshe, 2015) thus the increasing healthcare demand is now a concern to stakeholders. A suitable approach to admission reduction may be to identify people at risk of future readmission and are followed up, for suitable intervention so as to reduce the rate at which they present in hospital. However it was reported that targeting high risk patient may not be the best option given the outcome of analysis carried out in previous study, whereby regression to the mean was used to estimate patient admission. The result shows that a patient with recurrent admission history may have reduced admission in future than they had in previous years (Roland et al 2005). Further investigations revealed that risk factors to hospital admission are based on patients' demographic and clinical characteristics which are collected at the point of admission or during hospital stay.

However, sometimes patients who were discharged after admission may be readmitted due to obvious reasons which includes lack or inadequate medical care, wrong or misdiagnosis, unprofessional conducts, non-follow-up or lack of completion of treatments, etc. Thus, the objectives of this study is to identify factors responsible for hospital admission in UK, by

exploring patients characteristics using a systematic review of literature to examine key factors in the literature as well as the performance of their predictive model which were measured from their validation sample.

2. Design and Method

This section presents systematic procedures, by means of which the review of literature was conducted, among which are: search strategy, study selection criteria, characteristics of included studies, model analysis, drawbacks and outcome of selected studies which was evaluated to generate valid evidence on risk factors to hospital admission.

2.1 Search Strategy

Literature search for this study was initiated by searching online databases using PubMed, Scopus, Cinahl, Cochrane (1980-2016) and other search engines like;Ethos, Google scholar, reference list were also considered. The phrase; ((((risk factor) AND Hospital) AND (admission OR hospitalisation OR admit* OR readmi* OR rehospitalization ((((risk factor) AND Hospital) AND (admission OR hospitalisation OR admit* OR readmi* OR rehospitalization OR presentation OR representation)) NOT USA) AND free full text[sb] AND ("1980/01/01"[PDat] : "2016/12/31"[PDat]) AND Humans[Mesh]))) NOT USA) AND free full text[sb] AND ("1980/01/01"[PDat] : "2016/12/31"[PDat]) AND Humans[Mesh]) was used as a filter in the search engines; which generated results but not all were relevant, thus other criteria were considered in order to get the most relevant papers, which were screened at title and abstract for inclusion in this study.

2.2 Inclusion and Exclusion Criteria

Studies were included base on their relevance to the research topic; (risk factors OR factors OR risk) AND (admission OR hospitalisation OR attendance OR readmission OR rehospitalisation OR re-attendance *presentation OR representation*); other irrelevant records were excluded with reasons. All USA and developing countries' studies were excluded because healthcare system differs from healthcare system in countries like UK, however such papers may not provide applicable result in UK. Studies with low number of participants (≤50) were not considered because their results may not be generalised to other population. Unpublished papers and study that used only descriptive statistics were not considered because their result could not be ascertained. Out-dated papers (before 1980) were excluded. All non-English papers were omitted because there was no access to translators. Papers whose study design were control trials were excluded. Identified papers were screened for quality assessment by reading through the titles and

abstracts to eliminate irrelevant studies, leaving only relevant papers, relating to risk factors of hospital admission in UK.

2.3 Study Selection

Four thousand three hundred and forty (4340) papers were identified using different literature database, excluding 595 duplicate papers, 3,882 irrelevant papers and screened 47 papers at title and abstract, leaving a reminder of 9 relevent papers which address risk factors to hospital readmission in UK. These papers were not limited to spoecific age group, region or ethnicity. All 9 studies were included in qualitative and quantitative synthesis of systematic review of literature. Included studies capture models with derivation and validation sample. This study focus on general context, capturing reasonable amount of factors predisposing patients to hospital readmission. Risk model were sectioned into self report administrative and clinical records with primary outcome of hospital admissionsthat occur when a patient is admitted, discharge and readmitted; however admission is an over night stay in hospital. Included studydesign captures retrospective or prospective cohort study

2.4 Data Extraction

Three reviewers read through the titles and/or abstract of identified records and all irrelevant records and duplication were removed while eligible studies were included in the systematic review of literature. There were disagreement in the selection of study but consideration was given to criteria set for inclusion. We extracted using a standard extraction format in order to justify the outcome of this study.

2.5 Statistical Analysis

A systematic review of literature was carried out with the summarization of heading which includes; data source, population setting, age, study design, risk factors, outcome, limitation of study, methodology, model validation, software and selected variables were extracted from all the 9 studies. The c-statistics which is an operating characteristic was used to determine the discriminative characteristics among sampled patients at risk of admission and to measure the accuracy of results. Model result (< 50%) indicate poor performance of the model; at (50% - 69%) indicates the model performance is on the average, while at (70% - 80%) indicate an acceptable model performance and ultimately when greater than (80%) indicates very good discriminative performance (Schneeweiss, 2001). Sensitivity, specificity and predictive result measure model performance for studies whose c-statistics were not reported. Other assessment captures; validation techniques and predictive variables.

2.6 Result of Selected Studies

Nine studies met the inclusion criteria and were reviewed for narrative synthesis of this study. Most studies were carried out in United Kingdom (7) while two studies were carried out in England. Five studies examined elderly patients above 60 years; one study examined all age groups while three studies did not mention the age range in their work. Most studies used administrative dataset for study design such as; retrospective study (5), prospective study (2), case control (1) and pilot study (1) with sample size ranges from 200 to 3,000,000 patients.

Table 1: *Characteristics Included Studies*

References	Population setting and age	Study design	Outcome	Study limitation	Methodology	Tool	Fitting procedure	c-statistics
Billings et al., 2006	HES England Data (1999 - 2003)	Retrospective Cohort study	**12** months emergency admission	Missing data and inaccurate codding	Multivariate Logistic Regression	Microsoft Access	NM	Derivation: 17445 Validation: 1500 Threshold:3 ROC :0.69 Sensitivity: 0.86 Specificity: 0.722 PPV:0.843
Chenore et al., 2013	AD NHS Davon UK data (2007 - 2011)	Case control	emergency admission next **12** months	All patients are from same county, coding error, unable to capture EA of people visiting Devon, admission and readmission records were not separated,	Multivariate linear regression was used to test for multi-collinearity using variance inflation factor and binary logistic regression	SQL	x squared test	Derivation: 761625 Validation: 722383 Significance test: (<0.001)
Shalchi et al., 2009	Data from London UK hospital from September 2007 - October 2007	Retrospective observational study	Factors influencing readmission	The use of pie-chart may show some bias in the presentation of result	Exploratory and Descriptive Analysis	SPSS Software	NM	Derivation: 1590 Validation: 69
Bottle et al., 2006	HES England AD data (April 1999-March 2000). All age group	Retrospective Cohort study	Patients at risk of emergency admission	Bias in study since the findings did not occur throughout UK NHS, No access to primary care records of patients for inclusion of diagnosis, Impact of outpatient care were not identified e.g. Prescription	Multiple Logistic Regression	NM	Model fit with residual	Derivation: 2895234 Validation:2747509 Threshold: 3 ROC: 0.75 Sensitivity: 0.86 Specificity: 0.45 PPV: 0.49
Lyon et al., 2009	Data collected with questionnaire from older people aged ≥ 75 years in UK and was validated with HES register	Prospective cohort study	Likelihood of emergency admission to hospital of older people	Didn't use precise medical terms, which may lead to bias in the response. Low no of participants. Non-response bias	Logistic Regression Analysis. Odds ratio and confidence interval were also estimated. Approach to model validation are; boot strap validation and split sample	NM	Forward stepwise selection and Homer-Lemeshow goodness-of-fit. Residual and diagnostic check was used to explain variations and higher value indicate more variation is	Derivation: 3649 Validation:3032 Odds ratio: 1.40 (1.15-1.72) Leg ulcer 1.46 (1.19-1.81) Memory loss 2.16 (1.72-2.72) EA since last 12 Moths ROC: 0.70 Sensitivity: 0.64 Specificity: 0.64 PPV: 0.55 NPV: 0.79 Hosmer-Lemeshow = 0.675. Boot strap Validation = 0.690.

							explained. Sensitivity analysis was used to check the robustness and effect of missing data on the model	Stepwise selection = 0.669 Validation: Boot-strap and split sample method
Lyratzopoulos., et al 2005	HES data from Manchester UK hospital (April 1997 - September 2001)	Retrospective Cohort study	Risk factors for readmission (highly deprived patients, patients with heart failure and COPD)	Results are not generalizable since data comes from only one hospital. Also result may not be ascertained because study is not population based. There may be some degree of bias since data is mainly collected from a hospital in Stockport (Manchester).	Readmission curve for deprivation : Kaplan-Meier Statistical significance test: log ran test. Residual: Adjusted hazard risk ratio. Univariate analysis Multivariable analysis	STATA	NM	Derivation: 21118 Validation:20209 Threshold:4 Hazard ratio: 1.57 (1.45-1.70) Age >75 1.32 (1.02-1.43)
Lancaster et al., 2007	Survey of sample NHS UK, (age 75 and above) with 18 general practice Halton PCT UK	Pilot Study	Predict emergency admission of elderly	Non-response and recall bias could be an issue. Since the distribution assumptions are not met CL could be calculated. The approach was not evident enough to ascertain outcome. No of GP practice was too small i.e. a general number of clusters is recommended. There were other problems encountered in the study e.g. method of randomization	Cluster observational study. Searle's method: CL	NM	Not affirmed but inter correlation coefficient seems reasonable	Derivation: 4000 Validation:486 AV. Cluster Size: 200 Inter-class correlation: 0.00034 (0-0.008) Odds ratio: 3.5 (1.912-5.547). highest history of fall
Williams and Fitton, 1988	UK Patients data (March 1985) collected via interview. Aged 65 and over	Retrospective Cohort study	Factors affecting unplanned readmission	NM	Derivation and validation cohort	NM	Significance Test	Derivation: 226 Validation:133 Significance test presented **5** factors out of 10 variables at (≥0.05).
Blatchford et al., 1999	Data from Glasgow UK medical centre among elderly	Cohort study	Factors associated with emergency admission	NM	Derivation and Validation estimate Odds ratio	SPSS	Forward Stepwise Selection	Derivation: 810422 Validation:43247 Odds ratio Age: 1054 (1.53-1.55) Sex: 1.19 (1.17-1.22) Deprivation: 1.16 (1.15-1.17)

***AD: Administrative data, HES: Hospital Episode Statistics, NM: Not Mentioned, COPD: Chronic Obstructive Pulmonary Disease, EA: Early Admission, LA: Later Admission; CL: Confidence; Interval;* ROC: Receiver Operating Characteristic AUC: Area under the Curve, ROC: Receiver Operating Characteristics**

The outcome of risk factors to hospital admission are mostly reported as factors influencing to hospital admission (Shalchi et al., 2009); three studies reported emergency admission within twelve months (Bottle et al2006), three studies examine factors influencing hospital admission; two studies examine risk factors to emergency admission (Lyratzopoulos et al., 2005), one study examine high risk hospital admission in 12 months (Wagner et al., 2005), finally one studies identified patients at risk of emergency admission among elderly (Lyon et al., 2009). Preventable admissions were mostly explained by the existence of readmission prior to index admission

(Cornette et al., 2005); admission history were estimated from identified studies using admission and discharge date records.

Table 2: *List of Risk Factors from the Identified Studies*

NM: Not mentioned*; LOS: Length of stay*

References	Model Components	Risk Factors	Result
Billings et al., 2006	Disease condition, age, sex,, ethnicity, previous admission, No of emergency and non-emergency admission, Av. no. of episode per spell for EA, diagnostic cost group	Age, sex, ethnicity, number of pervious admission and clinical condition	ROC :0.69
Chenore et al., 2013	Age, gender, hospital in previous 2 years	age (85 and older)	Significance test: (≤0.05)
Shalchi et al., 2009	Demographic (age, sex) admission details (day admission and discharge, LOS and medical specialty)	Older patients with complex care needs	NM
Bottle et al., 2006	No of EA in 365 days before index spell, No of EA between 365 day and 3 years before index spell, charlson index of comorbidity, age, ambulatory care sensitive condition, ethnicity, standard admission ratio, life style group, source of admission, deprivation, sex, No of consultant episode in index spell sex.	Age, deprivation, spells, Comorbidity e.g. Asthma, COPD, Hypertension.	ROC: 0.75
Lyon et al., 2009	20 variables consisting of comorbidity life style, medication intake, admission details.	6 variables was selected for the final model: Heart problems, leg ulcers, Mobility, Memory loss, admission details and state of health condition	ROC: 0.70
Lyratzopoulos et al., 2005	Sex, age, diagnostic group, admission method, number of coded co-morbidities, length of stay, deprivation group. *All variables were significant at 0.05 probability level except admission method.*	Sex, age, diagnostic group, number of coded co-morbidities, length of stay, deprivation group.	Hazard ratio: 1.57 (1.45-1.70) Age >75 1.32 (1.02-1.43)
Lancaster et al., 2007	20 binary items (questions) which include demographics lifestyle morbidity and social factor, admission details.	Identify patients with similar characteristics into a cluster and estimated the range and size of each cluster.	AV. Cluster Size: 200 Inter-class correlation: 0.00034 (0-0.008) Odds ratio: 3.5 (1.912-5.547). highest history of fall
Wagner et al., 2006	Caregiver availability, age, health status, coronary heart disease, diabetics, admission history, risk score.	NM	AUC: (0.62 -0.70)
Blatchford et al., 1999	Sex (male and female), age group, deprivation category and co-morbidities	Sex, age, deprivation	Derivation: 810422 Validation:43247 Odds ratio Age: 1054 (1.53-1.55) Sex: 1.19 (1.17-1.22) Deprivation: 1.16 (1.15-1.17)

This study examined various predictive risk factors which are classified into groups, which might have been influenced by population settings, in the location at which the research was carried out.

1. Admission history: Number of admissions, Length of stay, Hospital spell.
2. Co-morbidities: Hypertension, Asthma, Diabetics
3. Demographics: Ethnicity, Health authority, Age, Sex, Deprivation score
4. Laboratory test: Cholesterol level, Haemoglobin, Liver function
5. Life style: Smoking status, Alcohol intake

6. Physical signs: Body mass index
7. Vital signs: Blood pressure

Risk factors presented in Table 1.2:"age, sex, comorbidities and deprivation" are the main predictive risk factors to hospital admission in identified studies which varies among inhabitants, sex and gender; especially when some population are dominant than others. Study that examined hospital admission within 12 months identified age, sex, comorbidities and clinical values as risk factors to emergency admissions (Bottle et al., 2006).

Five studies identified older patients with complex care need as risk factors to emergency admission, one study identified length of stay and poor pre-admission as factors influencing readmission (Lyratzopoulos, et al., 2005). A unique outcome was reported in the work of Lyon et al., (2009), who specifically identified memory loss and leg ulcers as predictive risk, factor to likelihood of emergency admission. Similarly Bottle et al., (2006) discovered spells as a key risk factor to readmission. Findings of this nature might have been influenced by the nature of data at which the research was carried out, thus the impact of population setting to any research is highly significant.

Selected variables were fitted in the model using various approaches such as forward stepwise selection with statistical significance at (< 0.05 p-value). All insignificant variables (≥ 0.05) were excluded while significant variables (< 0.05) were included in the models. (Lyon et al 2009) initialised the selection process with 20 variables but only 6 were significant for model fit, using selection approach earlier mentioned. In contrast all variables were significant and selected for model fit in the work of Lyratzopoulos et al., (2005) at (p-value < 0.05). Statistical significance test was used to identify suitable variables for model fit in some studies (Williams and Fitton, 1988) while Par-score significance test and odd ratios was used in the work of (Wagner et al., 2006).

Odd ratio at 95% confidence interval determines the viability of variable to retain in the model. Ratio of two odds is estimated as probability of 1 at 95% confidence interval; estimates (≥ 1) indicates good probability of outcome (parameter) being a risk factor to hospital admission. (Lyon et al., 2009) reported "memory loss" and "leg ulcers" as risk factors, whereby memory loss (2.16(1.72-1.81)) indicate high probability of being a risk factor compare to leg ulcers having a lower probability (1.40 (1.15-1.72) of being a risk factor to emergency admission. (Lancaster et al., 2007) reported "fall history" (3.5(1.91-5.54)) which seems to have higher probability compare to the outcome of (Lyon et al., 2009).

Three studies used multivariate logistic regression to develop their model, one study used kapla-meier significance test (Lyratzopoulos, et al., 2005); one study used both linear and logistic regression (Chenore et al., 2013); one study used exploratory and descriptive analysis (Shalchi et al., 2009); one study used observational cluster analysis to predict emergency admission in elderly (Lancaster et al., 2007) and two studies used derivation and validation estimate to identify factors influencing emergency admission (Blatchford et al., 1999). Multivariate logistics regression appears to be the most commonly used in many studies with outcome "age" as a predictive risk factor to hospital admission.

Table 3: *Model Characteristics*

References	Population and Settings	Derivation Cohort	Validation Cohort	Outcome	Readmission Rate %	Model Discrimination
Billings et al., 2006	HES England Data (1999 - 2003)	17445	1500	12 Months Emergency Admission	54	ROC :0.69
Chenore et al., 2013	AD NHS Davon UK data (2007 -2011)	761625	722383	Emergency Admission next 12 Months	5.6	Significance test: (<0.001)
Shalchi et al., 2009	Data from London UK hospital from September 2007 - October 2007	1590	69	Factors influencing readmission	4.3	NM
Bottle et al., 2006	HES England AD data (April 1999- March 2000). All age group	2,895,234	2,747,509	Patients at risk of emergency admission	9.8	ROC: 0.75
Lyon et al., 2009	Data collected with questionnaire from older people aged ≥ 75 years in UK which was validated with HES register	3649	3032	Likelihood of emergency admission to hospital of older people	20	ROC: 0.70
Lyratzopoulos, et al., 2005	HES data from Manchester UK hospital (April 1997 - September 2001)	21118	20209	Risk factors for readmission (highly deprived patients, patients with heart failure and COPD)		Threshold:4 Hazard ratio: 1.57 (1.45-1.70) Age >75 1.32 (1.02-1.43)
Lancaster et al., 2007	Survey of sample NHS UK, (age 75 and above) with 18 general practice Halton PCT UK	4000	486	Predict emergency admission of elderly	19	AV. Cluster Size: 200 Inter-class correlation: 0.00034 (0-0.008) Odds ratio: 3.5 (1.912-5.547). highest history of fall
Wagner et al., 2006	Patient AD data collected from, Germany, UK, Switzerland. Aged 65 and over. Data collection: Questionnaire	18932	9713	High risk hospital admission (12 months)	51	AUC: (0.62 -0.70)
Roland et al 2005	HES England data of admitted patients (1998 - 2002). Aged (≥ 65)	227,206	223,993	Proportion of readmission	9.3	Sensitivity: 0.13
Williams and Fitton, 1988	UK Patients data (March 1985) collected via interview. Aged 65 and over	266	133	Factors affecting unplanned readmission	6	Significance test presented **5** factors out of 10 variables at (≥0.05).
Billings et al., 2012	HES England data (April 2004 - March 2010)	576868		Identify Patients at risk of re-admission within 30 days discharge		ROC:0.70
Blatchford et al., 1999	Data from Glasgow UK medical centre among elderly	810422	43247	Factors associated with emergency admission	5.3	Odds ratio Age: 1054 (1.53-1.55) Sex: 1.19 (1.17-1.22) Deprivation: 1.16 (1.15-1.17)
Donnan et al., 2008	Historical data from general practice Scotland UK (1996-2004), aged 40 years and over.	410,000	6793	Predicting emergency admission in 12 months	NM	ROC: 0.80

LAP: Living alone patients; EHP: patients facing economic hardship; AV: Average; ROC: Receiver Operating Characteristic AUC: Area under the Curve, ROC: Receiver Operating Characteristics

Table 1.3, shows there was a lower readmission rate (9.8%) for Bottle et al., (2006), compare to (54%) for Billings et al., (2006) in studies carried out in England; Both studies have model discrimination receiver operating characteristic (ROC) of 0.75 and 0.69 respectively. Although Billings et al., (2006) reported an average model performance but Bottle et al., (2006) reported a better performance in the same year. In UK readmission rate seems to have steadily drop 1999 and suddenly increased in 2006 then dropped again in 2013; while in 2009, readmission rate reported in the works of Lyon et al (20%) and Shalchi et al., (4.3%) seems surprising, because different rate were estimated in the same location and year. So also Halton has higher readmission rate in UK compare to other regions such as Manchester, London, Davon and Glasgow.

From the included studies, five models has similar model discriminative characteristics as regards to ROC, two models used significance test (< 0.05 p-value), two models used odds ratio at 95% confidence interval, one model used hazard ratio and one model used average cluster size. The c-statistics from all studies reported, have ROC results ranges from (0.62-0.78), which indicate reasonable discriminative ability in their work. A discriminative characteristic (ROC: 0.69), was used to examined twelve months emergency admission using administrative data from HES (Hospital Episode Statistics) as reported by (Billings et al., 2006); the model performance indicates a modest performance while Wagner et al (2006) with discriminative characteristics of (0.56) reported indicates an average model performance.

Sensitivity measures model performance in finding cases that may be suitable for intervention. Lyon et al (2009) shows good model performance with moderate sensitivity of (0.64). The result is lower when compared to Billings et al (2006) with sensitivity (0.86); whose result is justified because selected variables were validated using t-test and probability estimate prior model development. However lower predictive risk of (0.46) generated a very good sensitivity (0.86) in the work of Bottle et al., (2006); since high risk score threshold generate low sensitivity and large number of patients with emergency admission was excluded from the model. The outcome in Bottle et al (2006) indicates reasonable amount of patients with emergency admission, were included in the model. Conversely high risk threshold is likely to result with a better positive predictive value (PPV) which indicates more patients may likely have emergency hospital admission. Meanwhile Billings et al (2006) with high PPV (0.84) has readmission rate (54%) while Bottle et al., (2006) with lower PPV (0.49) have lower readmission rate (9.8%).

Outcome of studies who used administrative data shows some extent of reliability compare to studies that used primary data to develop their model; which may have some degree of bias. Most secondary data would have been process and tested for validation before being used as in the

case of HES data but the reliability of some primary data could not be ascertained. Meanwhile the reliability of studies that excluded inapplicable data before model fit could be affirmed as in the case of Billings et al., (2012), compare to studies who did not exclude inapplicable records.

Identified limitations in many studies were the issues of missing data, inaccurate codding and wrong admission estimate (Billings et al., 2006); outcome of some studies could not be generalised since data was captured in single location and some could not be linked with HES data (Bottle et al., (2006; Chenore et al., 2013); The use of pie chart might have presented inaccurate estimation leading to some degree of bias in the study carried out by (Shalchi et al., 2009). The uses of medical jargon made participants' gave vague information about their diagnosis (Lyon et al 2009; Lancaster et al., 2007); while other drawback is the lack of satisfactory analytical description of the methods used in some studies (Williams et al., 1998; Blatchford et al., 1999). However the strength of our systematic review of literature is the exploration of various study designs in UK to identify the risk factor to hospital admission; linking patients' characteristic from different regions within the country and the limitation is low numbers of studies examined.

Using a systematic review in this study provides an evidence-based research that relates clinical issue of interest (Morlow et al., 1998), to generate an examined clinical proofs and its potential utility to patients' management. The systematic review of literature was used by (García-Pérez et al., 2011; Kansagara et al., 2011), to assess, summarize, compare and contrast relevant literatures in the context of risk factor to hospital admissions. The outcome of which processsignificant degree of epistemological strength and improve the accuracy of estimated contents with limited bias.

3. Recommendation and Conclusion

This study has examined various analyses in different studies, as regards to AUC, PPV, ROC, sensitivity, specificity and odds ratio. Some models presented similar outcome as risk factors to hospital admission while others presented new outcome which might have been influenced by their population settings. Some studies unreliability given the estimation of their validation cohort for model development; however some analysis could be applied or replicated in future research. Some studies found unique results which were quite different from others such as "leg ulcers and memory loss" but the most common outcome in included studies are age, sex comorbidities and deprivation.

It's require it make suitable recommendations given the outcome of included studies on identified risk factors to hospital admission in UK. Early intervention on these factors could reduce

the rate of hospital admission in United Kingdom. To achieve this, management should focus more on suitable intervention for older population with complex care needs such that their health conditions are adequately managed. Telemedicine tools could be used for patients with severe health condition; such patients could be trained to manage their health condition on their own. There should be appropriate case-management strategy for identified sex within UK, while a specialist clinic could be created for patients living in deprived locations so as to have accessibility to adequate healthcare services.

Conflict of Interest

There were conflicts of interest in selection of literature for this research.

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Correspondence

Gbolahan A.T; Faculty of Arts, Computing and Engineering, Sheffield Hallam University, Sheffield, United Kingdom. Email: **aramide.gbolahan@gmail.com**

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