Adoption of Emergency Severity Index among Nurses in the Emergency Department of Selected Hospitals in Lagos State

Onwochei Adesuwa Detu*[1] Nwaomah Esther Esobuneta[2], Okenla Oyeronke Modupe[3], Omitogun Omolola Morenikeji[4]

*1,2,3,4, Department of Nursing Science
Babcock University, PMB 4003, Ilishan Remo, Ogun State
Nigeria
+234-805-531-7551*

*Corresponding Author's: Email: <adesuwaonwochei@gmail.com,>

Abstract

Emergency Severity Index (ESI) is a triage tool used in rating the acuity and severity of patients in the Emergency Department (ED). This study assessed the adoption of Emergency Severity Index (ESI) among nurses in the Emergency Department of selected hospitals in Lagos state. A descriptive research design was chosen to carry out the research. The study population was 185 nurses working in the emergency department of National Orthopaedic Hospital, Igbobi Lagos [NOHIL], Lagos University Teaching Hospital, Idi-Araba [LUTH], Lagos State University Teaching Hospital, Ikeja [LASUTH] and General Hospital Gbagada. Sample size comprised 139 nurses selected using a convenient sampling technique. A structured questionnaire was used to collect data from the nurses, but only 130 research instruments were retrieved. Data were processed through statistical package for social science (SPSS), version 25. Data collected were analyzed using descriptive statistics and hypothesis tested using Chi-square. Results revealed that only respondents from LUTH used the ESI (20 (15.4%)) while those from the other hospitals used both face value and Professional Nursing

Experience. About 110 (84.6%) of the respondents claimed that they have never used ESI during triage. There was a significant association (p<0.05) between "years of professional work experience" and "extent of adoption of ESI with Chi-square Test (X^2=88.067, p=0.001). The extent of ESI adoption among nurses is poor among nurses in the emergency department of the selected hospitals in Lagos State. This study recommended that the hospital management and stakeholders should adopt ESI in their healthcare facilities in order to enable appropriate, accurate and timely triage procedure.

Keywords: Adoption of ESI, Emergency Severity Index (ESI), Over-triage, Severity, Under-triaged.

Introduction

Emergency Department (ED) is a gateway to myriads of patients entering into the hospital for treatment. These patients need to be prioritized before being attended to by the emergency doctors, so as to determine their severity and acuity for immediate response and the resources that will be needed to attend to the patient's case (Andersen, 2019). To achieve this adequately, the patient's severity and acuity has to be rated, to determine their level of severity and to sort the patient in order of priority by which the patient will be attended to. Applicability of a triage system is necessary for adoption in every ED and its standardization is sacrosanct to regulate the scoring system. Emergency Department without a triage system is like caring for the patient without a direction and leading to cases of mis-triage, where minor cases are rated as severe cases and severe cases are rated as minor cases bringing about lethal effect. There are various standardized triage tools that have been adopted in various countries that enable appropriate and timely triage; among such is the Emergency Severity Index [ESI] (Lee et al., 2020).

Emergency Severity Index (ESI) is a triage tool used in rating the acuity and severity of patients in the Emergency Department (ED) (Emergency Nurses Association [ENA], 2020). It was originally developed by Emergency physicians Richard Wuerz and David Eitel in 1998 after pilot testing of the ESI yielded successful results, this further encouraged them to bring a number of emergency professionals interested in triage together and eventually led to further improvement of the algorithm (Emergency Nurses Association [ENA], 2020). The ESI's triage algorithm has produced rapid, repeatable, and clinically relevant stratification of patients, ranging from level 1 (most urgent) through level 5 (least urgent). Both acuity and resource needs are considered when categorizing ED patients using the ESI. If a patient does not meet a high acuity level criterion (ESI level 1 or 2), a triage-trained Registered Nurse (RN) will assign a lower acuity level (ESI level 3, 4, or 5). When acuity levels are assigned incorrectly, a condition known as mis-triage can negatively impact patient safety, while over-triaging allocates limited resources and beds to patients who do not require immediate care (Johnson, et al., 2018).

Triage is mostly performed by a professional nurse (triage nurse), with the aim of prioritizing patients rapidly so that the greatest need patient is seen before the patient with the less urgent conditions. Triage is generally thought to be better than a 'first come, first served' entry rules because effective treatment for many emergencies is time-critical (Christian, 2019). In contrast, Aljazairi (2019) opined that a substantial number of patients with minor emergencies do not require immediate but later attention. Hospitals across the country, especially the United States of America, as well as university and community hospitals and

teaching and non-teaching institutions, have adopted ESI in their emergency procedures (Friedman et al., 2012). In developed countries, such as the United States, most EDs use three-level or four-level comprehensive triage. However, these comprehensive triage models of practice have been criticized, generally due to poor reproducibility in acuity assignments as well as lack of empirical validation against clinical outcomes (Zachariasse et al., 2018). Nonetheless, a new triage instrument, the Emergency Severity Index (ESI) has demonstrated highly reproducible, clinically valid five-level triage stratification (Zachariasse et al., 2018). The Emergency Severity Index (ESI) is a prospectively developed Level-5 triage instrument that has been validated and shown to be reliable for ED triage prioritization.

One of the benefits of the ESI is the rapid identification of patients who need immediate attention. The focus of ESI triage is on quick sorting of patients in the setting of constrained resources. This provides clinically meaningful differences in projected resource needs and associated operational needs. Moreover, triage trained RNs are expected to use the ESI algorithm correctly for every patient who visits the ED (Mistry et al., 2018). Use of the ESI for this rapid sorting can lead to improved flow of patients through the ED. For instance, levels 1 and 2 patients can be taken directly to the treatment area for rapid assessment and treatment, while lower acuity patients can safely wait to be seen. Likewise, it determines the patients not needed to be seen in the main ED and those who could safely and more efficiently be seen in the urgent care area. In myriads of hospitals, the triage policy varies, some specifying that all ESI level-4 and level-5 patients can be sent to either the medical fast track or minor trauma areas of the ED. The triage policy may also allow some level-3 patients to be sent to urgent care, for instance, patients needing simple migraine headache treatment. ESI level-3 patients triaged to urgent care and all patients sent to the acute area from urgent care for more serious conditions are monitored in the quality improvement program (Maleki et al., 2015).

Some triage instruments (CTAS, ATS, and MTS) set time limits when a certain proportion of patients, depending on treatment priority, must have been evaluated by a doctor. Moreover, the ESI takes a different approach for patients with low priority (ESI level 3 to 5): rather than fixed time limits, the goal is evaluation of these patients as soon as possible depending on current workload. Patients assigned to ESI level 1 must be treated immediately. Patients classified as level 2 receive nursing care straightaway, including continuous monitoring, and evaluation by a doctor must follow within 10 minutes at most. The time to first contact with a doctor in the emergency department is one of the performance indicators in all triage systems and in some of them is used for bench marking. In the Canadian Triage and Acuity Scale (CTAS), the patient's priority level is re-evaluated after a defined time in order to register any deterioration in status as early as possible. The ESI and ATS suggest that re-triage - which is necessary should be carried out only when required. To increase patient safety, in the emergency department it is required to enforce re-triage at defined intervals even when using the ESI (Malmström et al., 2017).

The researcher has observed that in most hospitals, especially in Lagos State, nurses at the emergency departments do not consider the applicability of a standardized way of triaging, hence patients' severity are still rated based on first come, first served, face value assessment and experience. These methods apart from being archaic and inadequate have been proven to be detrimental to patients' health among which is prolonged patients' waiting time to use the emergency medical service (Medical World Nigeria, 2020). In order to solve this problem, several methods of triaging such as CTAS, ATS, MTS and ESI have been developed over the years especially in developed countries. In spite of these developments, hospitals in Lagos state are yet to fully adopt emergency severity index (ESI) triaging tools especially in situations of under-triaging and over-triaging which may affect patients. If urgent attention is

not given to this problem, it may create a situation whereby Lagos State hospitals will become death traps for patients, which may reduce the credibility of such hospitals. Adoption of modern triage method such as the emergency severity index (ESI) in the emergency unit of hospitals in Lagos was considered as safety nets since it will aid reduction in fatalities in those hospitals. This study assessed the adoption of Emergency Severity Index (ESI) among nurses in the emergency department of selected hospitals in Lagos State. The specific objectives were to identify the triage tools currently used among nurses in the emergency department of selected Hospitals in Lagos State and determine the extent of adoption of ESI among nurses in the emergency department of selected Hospitals in Lagos State.

Research Questions

The fundamental questions which this research tried to answer were:

1. What are the various triage tools currently used among nurses in the emergency department of selected Hospitals in Lagos State?
2. What is the extent of adoption of ESI among nurses in the emergency department of Selected Hospitals in Lagos State?

Hypothesis

This hypothesis was tested at the 0.05 level of significance;

H_01:   There is no significant association between years of experience and extent of adoption of ESI among nurses in the emergency department of selected Hospitals in Lagos State.

Year of experience was used as an explanatory variable in order to measure the emergency nurses' length of experience while utilizing various triage tools, particularly the adoption of ESI tool.

Methodology

The study adopted a descriptive research design to assess the adoption of Emergency Severity Index among nurses in the emergency department of the selected hospitals in Lagos, Nigeria. The study was conducted in four (4) out of twenty (20) hospitals each one from 20 local governments within Lagos state. The twenty (20) hospitals were written on paper and put inside a ballot box. A sample each was selected randomly for four times without replacement to avoid being bias. The selected hospitals in Lagos were: National Orthopaedic Hospital Igbobi Lagos (NOHIL), Lagos University Teaching Hospital, Idi-Araba (LUTH), Lagos State University Teaching Hospital, Ikeja (LASUTH) and General Hospital, Gbagada. The study population included all nurses working in the emergency department of selected hospitals in Lagos State irrespective of rank, gender, specialization and years of service. In the emergency department, there are each 32, 30, 100 (consisting 47 surgical emergencies and 53 medical emergencies) and 23 emergency nurses in NOHIL, LUTH, LASUTH and General Hospital Gbagada respectively. One hundred and thirty-nine (139) questionnaires were administered, but only one hundred and thirty (130) respondents participated in the study.

The research instrument used for this study was a self-structured close-ended questionnaire. The questionnaire was developed from reviewed literature to cover the content of the research.

The face and content validity of the instruments were determined by supervisor and other experts in the School of Nursing Sciences, Babcock University, Ilisan Remo, Ogun State. The instruments were said to have facial relevance and concerned with the subject matter they

claimed to measure. The reliability of the instrument was determined through internal consistency method. Cronbach Alpha was also used to determine the internal consistency of each of the constructs in the questionnaire with an average reliability index of 0.886.. The responses obtained were collated and analysed using descriptive statistics of frequency counts, percentages, mean and graphs, while the hypothesis postulated was subjected to inferential statistics of chi-square. The hypothesis was tested at 0.05 level of significance.

Results

Table 1: Socio demographic data

Variable	NOHIL (%)	LUTH (%)	LASUTH (%)	Gbagada GH (%)	Total (%)
Gender					
Male	4 (3.1)	4 (3.1)	8 (6.2)	2 (1.5)	18 (13.8)
Female	20 (15.4)	16 (12.3)	61 (46.9)	15 (11.5)	112 (86.2)
Age					
21-25	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
26-35	6 (4.6)	5 (3.8)	12 (9.2)	6 (4.6)	29 (22.3)
36-45	7 (5.4)	10 (7.7)	28 (21.5)	8 (6.2)	53 (40.8)
46-55	10 (7.7)	4 (3.1)	24 (18.5)	2 (1.5)	40 (30.8)
56-65	1 (0.8)	1 (0.8)	5 (3.8)	1 (0.8)	8 (6.2)
Marital status					
Single	3 (2.3)	2 (1.5)	6 (4.6)	1 (0.8)	12 (9.2)
Married	19 (14.6)	16 (12.3)	60 (46.2)	14 (10.8)	109 (83.8)
Widowed	1 (0.8)	1 (0.8)	2 (1.5)	1 (0.8)	5 (3.8)
Divorced	1 (0.8)	1 (0.8)	1 (0.8)	1 (0.8)	4 (3.1)
Educational Qualification					
Diploma	14 (10.8)	10 (7.7)	39 (30.0)	14 (10.8)	77 (59.2)
BSC	10 (7.7)	10 (7.7)	28 (21.5)	3 (2.3)	51 (39.2)
MSc	0 (0.0)	0 (0.0)	2 (1.5)	0 (0.0)	2 (1.5)
PhD	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Years of experience					
<5 year	1 (0.8)	1 (0.8)	3 (2.3)	1 (0.8)	6 (4.6)
5-10 years	6 (4.6)	2 (1.5)	18 (13.8)	2 (1.5)	28 (21.5)
11-15 years	8 (6.2)	4 (3.1)	25 (19.2)	6 (4.6)	43 (33.1)
16-20 years	4 (3.1)	5 (3.8)	8 (6.2)	3 (2.3)	20 (15.4)
>20 years	5 (3.8)	8 (6.2)	15 (11.5)	5 (3.8)	33 (25.4)
Institutions	**NOHIL**	**LUTH**	**LASUTH**	**Gbagada, GH**	**Total**
	24 (18.5)	20 (15.4)	69 (53.1)	17 (13.1)	130 (100.0)

Source: Author's computation from field survey (2023)

Result in Table 1 shows that majority of the respondents 112 (86.2%) are females. Most of the respondents 53 (40.8%) are between the age 36 and 45 years. Majority of the respondents 109 (83.8%) are married. More than half of the respondents 77 (59.2%) have attained Diploma in Nursing sciences. Majority of the respondents 43 (33.1%) have practiced between 11 and 15 years.

Research Questions

Research Question 1: What are the various triage tools currently used among emergency Nurses of selected hospitals in Lagos State?

In analyzing the question, frequency counts and percentage was used to illustrate the responses to items (1 – 7) in section B of the Questionnaire.

Table 2: Various triage tools currently used among emergency nurses

S/N	ITEMS	NOHIL (%)	LUTH (%)	LASUTH (%)	Gbagada GH (%)	Total (%)	Remark
1.	Emergency Severity Index (ESI)	0 (0.0)	20 (15.4)	0 (0.0)	0 (0.0)	20 (15.4)	poor
2.	WHO Interagency Integrated Triage Tool	0 (0.0)	0 (0.0)	19 (14.6)	0 (0.0)	19 (14.6)	poor
3.	Face Value	8 (6.2)	0 (0.0)	8 (6.2)	0 (0.0)	16 (12.3)	poor
4.	Professional Nursing Experience	16 (12.3)	0 (0.0)	55 (42.3)	17 (13.1)	88 (67.7)	good

Source: Author's computation from field survey (2023)

Findings showed that majority (67.7%) of the nurses assess patients based on their professional nursing experience while only 15.4% of the nurses use emergency severity index (ESI). Regarding the triage systems / tools currently used among emergency nurses, National Orthopaedic Hospital, Igbobi Lagos [NOHIL] used Face Value (6.2%) and Professional Nursing Experience (12.3%). Lagos State University Teaching Hospital, Ikeja [LASUTH] used WHO Interagency Integrated Triage Tool (14.6%), Face Value (6.2%) and Professional Nursing Experience (42.3%) respectively. Lagos University Teaching Hospital, Idi-Araba [LUTH] used the Emergency Severity Index [ESI] tool (15.4%) while General Hospital, Gbagada used Professional Nursing Experience (13.1%).
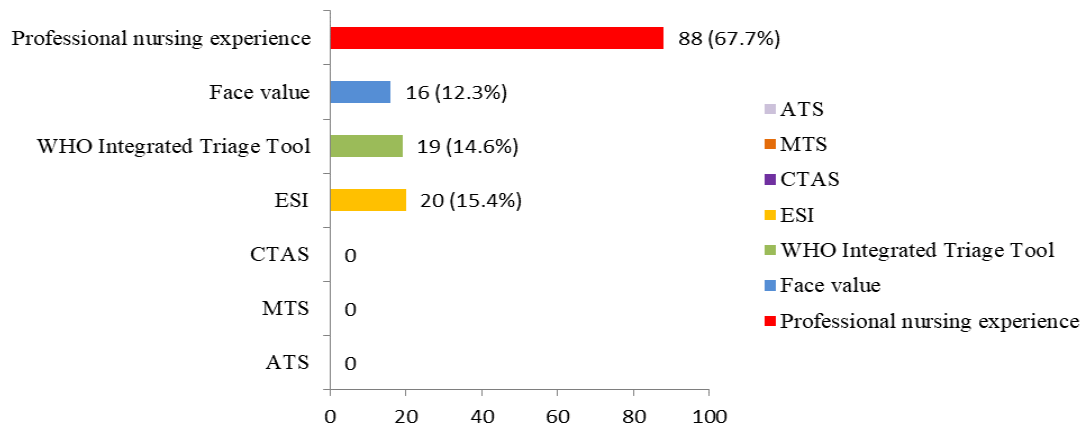
Figure 1: Bar chart showing the various triages tool and their level of use

In the figure above, majority of the emergency Nurses assess patients based on their professional nursing experience (67.7%) followed by the use emergency severity index (ESI) with only 15.4%.

Research Question 2: What is the extent of adoption of ESI among nurses of selected hospitals in Lagos State?

Table 3: Extent of adoption of ESI among nurses

Variables	Always (%)	Sometimes (%)	Rarely (%)	Never (%)
You usually prefer using ESI when you triage than other tools	68 (52.3)	45 (34.6)	10 (7.7)	7 (5.4)
How often do you use ESI when you triage and assign acuity-levels?	16 (12.3)	3 (2.3)	1 (0.8)	110 (84.6)
How often do you prefer to use ESI when you complete the triage template?	12 (9.2)	6 (4.6)	2 (1.5)	110 (84.6)
How often do you accurately follow the ESI guidelines?	16 (12.3)	3 (2.3)	1 (0.8)	110 (84.6)
How often do you use the embedded ESI template when you triage patients?	14 (10.8)	4 (3.1)	2 (1.5)	110 (84.6)
If you complete the embedded ESI template, how often did it assist you with your acuity-level decisions?	13 (10.0)	6 (4.6)	1 (0.8)	110 (84.6)
How often do you encounter a problem when identifying and categorizing the number of resources for the different levels of ESI acuity-levels?	28 (21.5)	81 (62.3)	11 (8.5)	10 (7.7)

Source: Author's computation from field survey (2023)

In answering this question, data on the extent of adoption of ESI were collected from the responses of the respondents to items under Section C (item 1 – 7) in the questionnaire. The data were collated and analysed using descriptive statistics such as frequency counts and percentage.

Result in Table 3 shows that 68 (52.3%) of the respondents indicated that they always prefer using ESI when you triage than other tools. Some 110 (84.6%) of the respondents claimed that they never used ESI when they triage and assign acuity-levels. About 110 (84.6%) of the respondents stated that they never refer to use ESI when you complete the triage template. Also, 110 (84.6%) of the respondents argued that they never accurately follow the ESI guidelines and never use the embedded ESI template when they triage patients.

Testing of Hypothesis

Hypothesis 1: There is no relationship between professional years of experience and extent of adoption of ESI among nurses of selected hospitals in Lagos State.

Chi-square test was performed to determine the relationship between professional years of experience and extent of adoption of ESI among nurses of selected hospitals in Lagos State.

Decision Rule: Reject Ho if $P<0.05$
                   Accept Ho if $P>0.05$

The decision rule is that if the *p*-value is less than the level of significance of 0.05, the null hypothesis will be rejected while the alternate hypothesis is accepted. But if the *p*-value is greater than, 0.05 level of significance we accept the null hypothesis and reject the alternate.

Years of work Experience and Extent of adoption of ESI Cross tabulation

		Extent of adoption of ESI				Total
		Always	Sometimes	Rarely	Never	
	Less than 5 years	6	0	0	0	6
Years of work Experience	5-10 years	10	3	1	14	28
	11-15 years	0	0	0	43	43
	16-20 years	0	0	0	20	20
	Above 20 years	0	0	0	33	33
Total		16	3	1	110	130

Table 4: Chi-square Test

	Value	df	*p*-value
Pearson Chi-Square	88.067[a]	12	.000
Likelihood Ratio	76.072	12	.000
Linear-by-Linear Association	43.930	1	.000
N of Valid Cases	130		

Table 4 showed that the Chi-square Test of the item is significant at: (X^2=88.067, *p*<0.001). The null hypothesis is therefore rejected. This implies that there was significant association between professional years of experience and the extent of adoption of ESI among nurses of selected hospitals in Lagos State.

Discussion

Finding shows that majority of the respondents are females. Most of the respondents are between the age-group 36-45 years. Majority of the respondents are married. More than half of the respondents have attained Diploma in Nursing sciences. Majority of the respondents have practiced between 11-15 years.

Regarding the various triage tools utilized among nurses in the emergency department, findings showed that most of the nurses assess patients based on their professional nursing experience, however very few (15.4%) nurses adopted emergency severity index (ESI). The study is however limited because it fails to show the adoption of ESI among three of the selected hospitals, except one (Lagos University Teaching Hospital, Idi-Araba). It was revealed that National Orthopaedic Hospital, Igbobi Lagos [NOHIL] used both face value (6.2%) and professional nursing experience (12.3%) during triaging. Lagos State University Teaching Hospital, Ikeja [LASUTH] used WHO Interagency Integrated Triage Tool (14.6%), Face Value (6.2%) and Professional Nursing Experience (42.3%) respectively. Lagos University Teaching Hospital, Idi-Araba [LUTH] used the Emergency Severity Index [ESI] tool (15.4%) while General Hospital, Gbagada used Professional Nursing Experience (13.1%). The finding showed that what is adopted in a particular hospital may not be applicable in other hospitals as each facility has its own peculiarity. This finding differs from the submission of Elsayed et al. (2021) who indicated that Australasian Triage Scale and Emergency Severity Index are applicable. In the study, Elsayed et al. (2021) arrived at the conclusion that both Australasian Triage scale and Emergency Severity Index (ESI) are applicable, however, ESI has limitations. Although the ESI correctly performs the emergency classification function, with it, patients over 65 years of age are twice as likely to be

classified as sub-triage, a phenomenon similar to that observed with other validation studies in triage systems (Grossmann et al., 2017). The study is however limited because it fails to show the applicability of the study in all regions. It fails to realize that what is applicable in a particular region may not be applicable in another region as each region of the world has its own peculiarity. Hence, the study showed the level of knowledge triages that is applicable in Nigeria in general and Lagos State in particular.

It was further revealed that the extent of adoption of ESI among nurses remains poor. This shows that nurses in the emergency department of the selected hospitals in Lagos state have not fully adopted ESI usage in their triage procedure. In contrast to the present study, Alexander et al. (2016) posited that the reliability and validity of ESI have been evaluated and observed. Consequently, Hinson et al. (2018) resolved that the adoption and reliability of ESI relies heavily on the healthcare providers' choice. However, relevant to the study, Maleki et al. (2015) asserted that ESI tool is a successful model to improve ED time metric data for quality outcomes for patients. Further, Fullerton et al. (2017) evaluated Over triage (OT) rates in level 1 trauma Centre using the most recent criteria and guidelines. In doing this, OT rates during a 12-month period were measured using six definitions. The results showed that there exists no appreciable difference in the OT rate with the use of length of hospital stay (LOS) less than one day and ISS less than nine definition compared with the addition of procedures and consults and that increasing the LOS to three days tend to double the overall OT rate to close to 50 percent. The study went further to reveal that when OT was defined as no use of the operative (OR) care or intensive care unit (ICU), the OT rate was close to 70 percent and that based on these data, it can be concluded that the most reasonable definition of OT is LOS less than one day and ISS less than nine.

In concluding, the study agrees that field triage according to the current criteria and guidelines leads to acceptable OT rates at the hospital while physiologic and anatomic criterion and guideline remains the best predictions for appropriate trauma team activation. The work is relevant to the present study because it shows the importance and relevance of adoption of triage in treatment of emergency cases. According to the study conducted by Maleki et al (2015) who implemented the ESI tool to assess ED metric quality outcome indicators, their findings indicated that use of the ESI tool decreased wait times and triage times, which in turn facilitated more timely interventions with acute and critically ill patients (Maleki et al., 2015). Similarly, the study carried out by Singer et al. (2016) found that the five-level ESI tool led to increased patient satisfaction scores and improved accuracy in triage. These findings agreed that the ESI tool is a successful model to improve ED time metric data for quality outcomes for patients (Singer et al., 2016).

In hypothesis testing, it was revealed that the Chi-square Test (X^2=88.067, p<0.001) of the item is significant because p<0.05 upon which measures of association computed is a constant. The null hypothesis is therefore rejected. This implies that there was significant relationship between professional years of experience and extent of adoption of ESI among nurses of selected hospitals in Lagos State. Recounting the uses or importance of the ESI, Cathy et al. (2020) posited that nursing professional experience seem necessary in addition to requesting that patient should be seen first, before adopting ESI to consider what resources are necessary to move the patient to a final disposition. The present study reveals that the extent of ESI adoption is minimal. Moreover, Hinson et al. (2018) resolved that the adoption and reliability of ESI relies heavily on the healthcare providers' choice which is not in support of the research findings.

Conclusions

Sequel to the findings of this study, it was identified that most nurses in the emergency department of the selected hospitals in Lagos State assess patients based on their professional nursing experience, however very few nurses adopted emergency severity index (ESI). It was further established that the extent of adoption of ESI among nurses is poor, though there was a significant association between professional years of experience and extent of adoption of ESI among nurses of selected hospitals in Lagos State.

Recommendations

Based on the findings of this study, the following recommendations were made.

1. Policy makers and nursing administrators should put measures in place to ensure that nurses in the emergency department adopt emergency severity index (ESI) in rating their patients. This could be achieved through the procurement of ESI tools and provision of adequate training on how it can be applied effectively.

2. There should be periodic workshops and seminars on the adoption and application of ESI for nurses in the emergency department to equip them with the needed skills and confidence to apply it.

3. Periodic training on "Embedding ESI" is also necessary to encourage accurate and timely use of ESI which may lead to an efficient triage process.

Acknowledgements

References

Alexander, D., Abbott, L., Zhou, Q. P., & Staff, I. (2016). Can triage nurses accurately predict patient dispositions in the emergency department? *Journal of Emergency Nursing, 42*(6).

Aljazairi, A.F. (2019). Triage. In O. Karcioglu, & M. G. Eneyli (Eds.), Emergency Medicine and Trauma. *IntechOpen*. https://doi.org/10.5772/intechopen.86227

Andersen, B.M. (2019). Triage: Serious Infections. In *Prevention and Control of Infections in Hospitals* (1069-1071). Springer, Cham

Cathy, N., Tanabe, P., Travers, D. & Rosenau, A.M., (2020). *Emergency Severity Index: A Triage Tool for Emergency Department Care* (U.S.A: Emergency Nurses Association, 2020), 2-10.

Christian, M.D. (2019). Triage. Crit Care Clin.; 35(4), 575–589

Elsayed, Z. M., El-zeny, Asmaa, B., Moustafa, Z.S. &Ellouly, H.A. (2020), Comparison Between Australasian Triage Scale and Emergency Severity Index, *The Egyptian Journal of Surgery*, 39, 455460

Emergency Nurses Association [ENA], (2020). Implementation Handbook. Emergency Severity Index. A Triage Tool for Emergency Department Care version 4

Fullerton, R.A, Graham, W., Donald, M.D, Henry, C.G., Catherine, E.L., Ali, Chealto, M.D., Marilyn, R.N., AretiTillou, M.D. (2017). Trauma System Overtriage: Are we on Track? *The American Surgeon*, 80, 960-964.

Friedman, S. R., Infante, A. A., Oppenheimer, C. C., West, C. A., & Siegel, B. (2012). The use of and satisfaction with the Emergency Severity Index. *Journal of Emergency Nursing*, *38*(2), 120–126. https://doi.org/10.1016/j.jen.2010.07.004

Grossmann F., Zumbrunn T., Frauchiger A., Delport K., Bingisser R., Nickel C.H. (2017). At Risk of Undertriage? Testing the Performance and Accuracy of the Emergency Severity Index in Older Emergency Department Patients. *Ann. Emerg. Med.*; 60,317–325.

Hinson, J. S., Martinez, D. A., Schmitz, P. S. K., Toerper, M., Radu, D., Scheulen, J., Stewart de Ramirez, S. A., & Levin, S. (2018). Accuracy and emergency department triage using the emergency severity index and independent predictors of under-triage and over-triage in Brazil: A retrospective cohort analysis. *International Journal of Emergency Medicine, 11* (3).

Lee, S.Y.,Chinnam, R.B., Dalkiran, E. Krupp, S. & Nauss, M.. (2020). Prediction of emergency department patient disposition decision for proactive resource allocation for admission. *Health Care Manag Sci.;*23, 339–359.

Maleki, M., Fallah, R., Riahi, L., Delavari, S., &Rezaei, S. (2015). Effectiveness of five-level emergency severity index triage system compared with three-level spot check: An Iranian experience. *Archives of Trauma Research, 4*(4), 1-5.

Malmström, T., Harjola, V., Torkki, P. Kumpulainen, S. & Malmström, R. (2017). Triage quality control is missing tools—a new observation technique for ED quality improvement, *International Journal for Quality in Health Care*, 29 (2), 295–300.

Medical World Nigeria. (2020). UNDERSTANDING EMERGENCY CARE IN HOSPITALS https://medicalworldnigeria.com/post/understanding-emergency-care-in-hospitals?pid=41485

Mistry, B., Stewart-De Ramirez, S., Kelen, G., Schmitz, P. S., Balhara, K. S., Levin, S., Martinez, D., Psoter, K., Anton, X., & Hinson, J. S. (2018). Accuracy and reliability of emergency department traige using the emergency severity index: An international multicenter assessment. Annals of Emergency Medicine, 71(5). doi:10.1016/j.annemergmed.2017.09.036

Singer, R., Infante, A., Oppenheimer, C., West, C., & Siegel, B. (2016). The use and satisfaction with the emergency severity index. *Journal of Emergency Nursing, 38*(2), 120-126.

Zachariasse, J.M., van der Hagen, V., Seiger, N., Mackway-Jones, K., van Veen, M., Moll, H.A. (2019). Performance of triage systems in emergency care: a systematic review and meta-analysis. *BMJ Open*; 9(5), e026471