Emergency Nurse

Factors affecting nurses' triage decision making process

--Manuscript Draft--

Manuscript Number:	EN2123R1
Article Type:	Article - if in doubt use this one
Full Title:	Factors affecting nurses' triage decision making process
Corresponding Author:	Hugh Gorick, MSc Norfolk and Norwich University Hospitals NHS Foundation Trust Norwich, UNITED KINGDOM
Abstract:	Triage decisions made by nurses in emergency departments (EDs) represent a vital part of the system, with decisions influencing how quickly the patients will be seen and treated. Therefore, understanding the influences on these decisions is key to ensuring that the nurses are making the right decisions, improving abilities to prioritise patients and ensuring they are cared for in a timely manner. The review found four themes consisting of twelve subthemes. Decision-making algorithms considers the use and manipulation of triage systems. Patient factors explores the health elements the nurse considers when assessing. Nursing factors explores how experience and training are used to make decisions and the efficacy of each. Environmental factors looks at physical environments and the impact of high patient numbers. Triage decisions represent a complex and multifaceted interaction of many factors, which can have a significant impact on nurses' decision-making process. Further investigation of the accuracy of nurse's decisions, how training can be improved, and how external influences can be reduced is vital to improving triage processes.
Keywords:	Triage; Decision Making; Nursing; emergency department
Additional Information:	
Question	**Response**
Please confirm that you have read and agree to our Publisher's Agreement that is available here	Yes
Have you been asked by RCNi to write this article?	No
Have you submitted this manuscript elsewhere?	No
Has this manuscript already been published?	No
Do you have copyright for all the images, graphics and figures included with your submission?	Yes
What is the word count of your article including the abstract, body text, boxes, tables and figures, and references?	4774
Author Comments:	Submission of edited version of literature review from masters dissertation, reorganised into an article. Many thanks. Revisions made and documents with lists of revisions and comments on requested revisions added. My thanks to the reviewers for their insightful reviews

Factors that affect nurses' triage decision making process

Abstract

Triage decisions made by nurses in emergency departments (EDs) represent a vital part of the system, with decisions influencing how quickly the patients will be seen and treated. Therefore, understanding the influences on these decisions is key to ensuring that the nurses are making the right decisions, improving abilities to prioritise patients and ensuring they are cared for in a timely manner.

The review found four themes consisting of twelve subthemes. Decision-making algorithms considers the use and manipulation of triage systems. Patient factors explores the health elements the nurse considers when assessing. Nursing factors explores how experience and training are used to make decisions and the efficacy of each. Environmental factors looks at physical environments and the impact of high patient numbers.

Triage decisions represent a complex and multifaceted interaction of many factors, which can have a significant impact on nurses' decision-making process. Further investigation of the accuracy of nurse's decisions, how training can be improved, and how external influences can be reduced is vital to improving triage processes.

1. Introduction

This literature review aims to examine the triage decisions made by nurses in emergency departments (EDs), to explore the efficacy of their decisions. In 2018/19 there were almost twenty-five million attendances at emergency departments across the UK, equating to nearly sixty-eight thousand per day (NHS Digital, 2019). These patients are triaged by nurses into acuity categories so patients with the highest severity can be seen in an appropriate time frame. Triage utilises algorithms with

patients being assigned to a category that represents their acuity level based on assessments, usually based around their symptoms and vital signs (Christ et al., 2010; Mackway-Jones, Marsden and Windle, 2014). These categories then provide a timescale that represents how quickly the patient should be seen, within four hours for the lowest to immediately for the highest-ranking category (Mackway-Jones, Marsden and Windle, 2014). The most used algorithms consist of the Manchester Triage System, the Emergency Severity Index and the Canadian Triage and Acuity Scale (Zachariasse et al., 2019).

The correct assignation of triage is a vital part of patient assessment, affecting how rapidly patients receive care, meaning a mistriage could result in potentially fatal delays (Christ et al., 2010). Furthermore, it has ramifications upon the entire department, affecting patient flow by overfilling triage categories and potentially creating obstructions that could have a significant impact on the outcomes of all patients there (Christ et al., 2010; Lentz et al., 2017). Therefore, understanding what influences the accuracy of these decisions not only allows for the improvement of identification of high acuity patients but also helps enhance the performance of departments, further improving patient care.

2. Search Strategy

A systematic search (Figure 1.) was used to identify suitable literature for review. Medline, CINAHL, PubMed, Wiley, Springer, Sage, and Taylor and Francis databases were searched. Inclusion criteria were papers focussed on triage decisions, made by nurses, in EDs. Results orientated around telephone triage were excluded as this method utilises different protocols to face to face triage (McKinstry et al., 2010), and whilst some overlap exists, specific telephone triage is not relevant to this review. Results centred around triage by doctors and physicians were excluded as the focus of this review is on nursing. Four systematic reviews were included, with the other papers consisting of primary research. One paper focussing on doctor-led triage was included after review as its conclusions focused on general triage as opposed to specific doctor practices. Papers from outside the United Kingdom were included where their findings were focussed on general practices as opposed to specific local changes. Whilst this may mean some results are affected by national practices, papers were reviewed to ensure their transferability and generalisability was

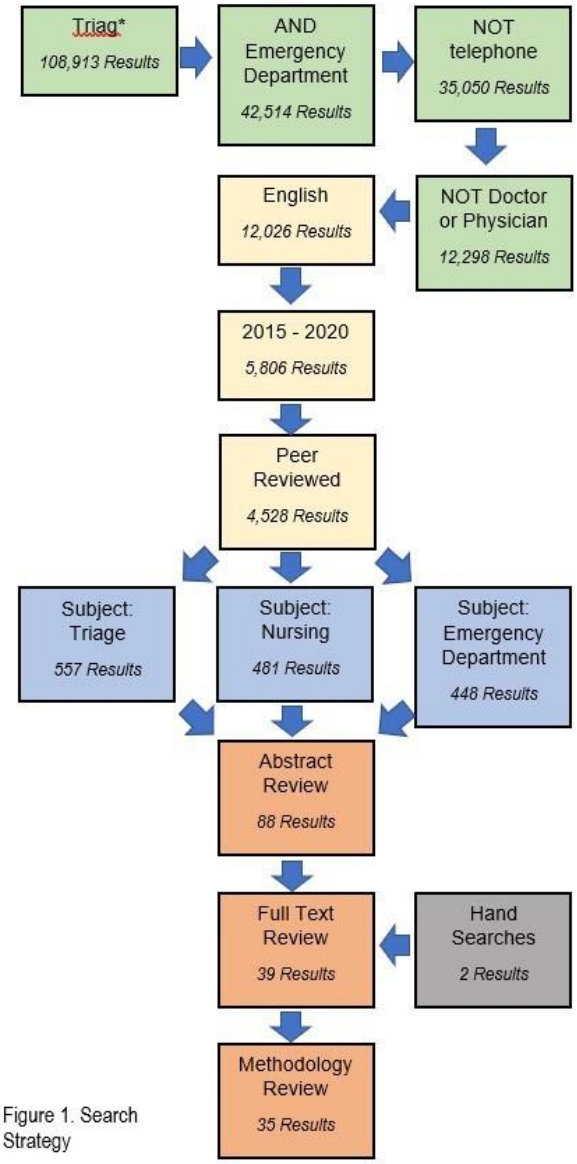

Figure 1. Search Strategy

sufficient, and that their findings would have an impact on triage within the United Kingdom. Results were restricted to 2015 onwards to ensure up-to-date literature was reviewed. The final number of papers used to form the literature base is thirty-three, with four major themes identified consisting of twelve sub-themes (Table 1.). Themes were identified using thematic analysis grids, reviewing papers and noting themes as they emerged, with recurrent examples of themes grouped together to establish frequency.

Table 1. Themes and Subthemes

Theme	Subthemes
Decision Making Algorithms	Application of Algorithms
Patient Factors	Presenting Complaints Vital Signs Visual Presentation Verbal History Attributes
Nurse Factors	Experience Training Risks
Environmental Factors	Physical Environment Workload Colleagues

3. Literature Review

3.1 Decision Making Algorithms

Triage algorithms are described by the literature as having strong validation, with decisions made outside these guidelines presented as incorrect (Chang et al., 2016; Tam, Chung and Lou, 2018; Moon et al., 2019; Lee et al., 2020). However, some of the studies argued that this may not necessarily be the case, with algorithm validation

often performed using patient scenarios instead of analysing actual patient data, resulting in abstracted systems that don't necessarily reflect the reality (Hinson et al., 2018; Iversen et al., 2018; Mistry et al., 2018; Park et al., 2019). This is reinforced by Zachariasse et al. (2016), who reported that these investigations often only use connections between triage level and outcomes to determine validity, as opposed to a full examination considering all available factors. These findings suggest that whilst papers may describe triage decisions in terms of accurate and inaccurate, this does not always reflect the actual acuity of the patient, merely how well the patient's presentation matches the triage algorithm in use.

Varying opinions of the efficacy of triage algorithms were shown, with some nurses feeling they are reliable and others finding inaccuracies (Chang et al., 2016; Hinson et al., 2018; Tam, Chung and Lou, 2018). Triage algorithms are often used by experienced nurses as guidelines that aid decision making but can be disregarded to follow their own internalised guidelines that stem from experience and intuition (Johannessen, 2016; Mistry et al., 2018). Findings exploring this preference examine the nurses' own proficiency in using the algorithm, arguing that those less proficient rigidly follow the guidelines and those who feel more confident in its use apply it more as an aid than a strict guide (Chang et al., 2016; Johannessen, 2016).

Manipulation of the algorithm itself is used to change triage categories, with nurses knowing that selection of certain pathways leads to the triage category they deem necessary, focussing more on symptoms and vital signs that results in these pathways (Clarke et al., 2015; Johannessen, 2017; Park et al., 2019). However other research found adherence to the algorithm was used to simplify decisions where, despite clinical knowledge indicating a different result to the algorithm, the result of the algorithm is perceived to be more beneficial to the patient than the result that the nurse feels is

more accurate (Adams et al., 2016; Johannessen, 2016). Yet, nurses often triage patients to a middle acuity level when uncertain, on the basis that the patient does not need the highest acuity but should not wait as long, resulting in overpopulated middle categories (Mistry et al., 2018; Saban et al. 2019). One key finding was that some nurses feel that when they triage against the algorithms advice it should always increase the category and that they should never downgrade against recommendations due to the inherent risk (Ekins and Morphet, 2015; Goldstein et al., 2017; Johannessen, 2017).

3.2 Patient Factors

Several studies argued that the patient's presenting complaint is the key factor for assigning triage category, especially for inexperienced nurses who more strictly follow triage algorithms (Stanfield, 2015; Moon et al., 2019; Park et al., 2019). Yet other research considered that the more severe the presenting complaint, the more attention nurses give to secondary factors such as co-morbidities and additional symptoms (Adams et al., 2016; Johannessen, 2016; Lee et al., 2020), resulting in already raised acuity scores being further increased due to uncovering other underlying symptoms with the patient that may or may not have an impact on their acuity. This suggests that patients who initially present as higher acuity will have more attention paid to them during triage, resulting in a more accurate triage decision being made. Symptom duration has an influence on decision making, with longer durations seen as less important due to lack of urgency in the patient's presentation (Johannessen, 2016).

Certain cues were given as factors that result in instant changes in triage category, usually red flags that mean the patient has potential for rapid deterioration (Stanfield, 2015; Roscoe, Eisenberg and Forde, 2016; Moon et al., 2019). Red flags tend to be

identified and used to change triage levels more frequently by nurses with greater experience in performing triage (Saban et al., 2019), potentially due to the increased awareness of them and improved ability to recognise them. When the patients' presentation did not match with the expected symptoms for the presenting complaints, nurses would also increase triage scores, with suggestions that nurses feel patients may require further investigation of problems and so increase triage scores due to uncertainty (Adams et al., 2016).

Vital signs are considered a key component of triage decisions due to representing how patients differ from expected norms (Chang et al., 2016; Roscoe, Eisenberg and Forde, 2016; Bowen et al., 2016). Research shows nurses feel difficulty with satisfactorily triaging patients when they are unable to review vital signs and often change their decisions when later presented with vital signs (Hinson et al., 2018; Wolf et al., 2018). This was further explored by Adams et al. (2016), with nurses considering abnormal vital signs as directing them towards certain acuity categories.

However, Stanfield (2015) found that whilst vital signs are key in a minority of cases, in most they do not significantly affect triage decisions. Later studies concurred, arguing they are examined as responses to the patient's presenting complaint to establish how far outside the normal presentation for that complaint the patient is, with the problem itself forming the basis for the triage decision (Lukin et al., 2015; Petruniak, El-Masri and Fox-Wasylyshyn, 2018; Lee et al., 2020). Overreliance on vital signs alone is linked to undertriage due to the lack of proper weight given to other significant signs and symptoms (Cannavacciuolo et al., 2018; Hinson et al., 2018).

Visual assessment often initially utilises quick-look triage, a common technique that focuses on a sick/not sick basis, relying on intuition to establish whether the nurse

feels the patient is critically ill (Adams et al., 2016; Chang et al., 2016; Wolf et al., 2018). Iversen et al (2018) demonstrated that quick-look triage results differ significantly from the results from decision-making algorithms, showing greater accuracy for predicting short- and long-term mortality, although no other papers explored this and further research may prove beneficial. Patient's overall mannerisms are a significant factor in clinical decision making (Stanfield, 2015; Adams et al., 2016; Johannessen, 2016; Roscoe, Eisenberg and Forde, 2016; Bowen et al., 2016; Yuliandari, 2019), with how they act considered more important than what their vitals show and how they say they feel; patients talking calmly or waiting and playing on their phones are more likely to receive lower acuity ratings that those in visible distress, whether this accurately reflects their acuity or not. Despite this, other studies reported that nurses feel visual cues can be confounding and miss underlying acuity, especially in trauma and mental health presentations (Clarke et al., 2015; Lukin et al., 2015; Goldstein et al., 2017). Mode of arrival is given significant weight, with walk-in patients receiving lower scores on average than those who arrive by ambulance, even with the results adjusted to consider actual acuity (Johannessen, 2016).

Experienced nurses often feel verbal stories from patients increase their ability to accurately triage patients due to the provision of details that may be missed by normal triage algorithms, (Roscoe, Eisenberg and Forde, 2016; Johannessen, 2017; Wolf et al., 2018). Yet some were perceived as a negative influence, with patients exaggerating symptoms, emphasising elements of their condition the nurse considers secondary and downplaying embarrassing symptoms that could provide crucial information (Johannessen, 2016; Roscoe, Eisenberg and Forde, 2016; Johannessen, 2017). Smyth and McCabe (2017) argued communication issues reduce the effectiveness of verbal stories with patients misunderstanding questions or information

not being conveyed resulting in inaccurate assessments. Nurses cite communication issues as reasons to upgrade triage categories to ensure patient safety (Mistry et al., 2018; Petruniak, El-Masri and Fox-Wasylyshyn, 2018).

Paediatric patients and the elderly often have their acuity increased due to perceptions of difficulty recognising illness in these patient groups, as well as an increased potential for deterioration (Ekins and Morphet, 2015; Lukin et al., 2015; Zachariasse et al., 2016; Mistry et al., 2018). Yet, other studies argued that age does not have a large bearing on triage decisions (Petruniak, El-Masri and Fox-Wasylyshyn, 2018; Saban et al., 2019). Differences in these findings could be attributable to differentiation between definitions of age, with research establishing that patients over fifty are more likely to be under-triaged, but once they passed seventy the likelihood of overtriage is greater (Lukin et al., 2015; Johnson and Alhaj-Ali, 2017; Hinson et al., 2018).

3.3 Nursing Factors

Nurses feel that experience is an important factor in being able to accurately triage patients, with less experienced nurses lacking the familiarity with patient presentations and triage systems to properly assess acuity, suggesting a need for training and properly developed competencies (Stanfield, 2015; Chang et al., 2016; Aktas and Alemdar, 2017; Bowen et al., 2016; Wolf et al., 2018; Reay et al., 2020). Experienced nurses are more willing to make category changes, potentially due to having greater knowledge available to them, a wider consideration of other factors and a refined intuition (Bowen et al., 2016; Johannessen, 2017; Johnson and Alhaj-Ali, 2017; Yuliandari, 2019). Some studies argued that junior nurses are more likely to over-triage patients as they fear missing a sick patient, and under-triage them as they lack

the knowledge to identify patients whose presentations are outside guidelines (Cannavacciuolo et al., 2018; Mistry et al., 2018).

Findings showed experience has positive impacts on abilities to accurately assess acuity (Stanfield, 2015; Yuliandari, 2019). Yet others argued that experience does not necessarily result in an improved ability to triage patients for all nurses, with their ability to make clinical decisions remaining at novice level despite significant periods working in triage, with suggestions that clinical experiences and expertise have a strong influence on this (Reisi et al., 2018; Wolf et al., 2018). Experienced nurses tend to take longer overall making triage decisions due to more in-depth exploration of patients' stories and symptoms (van der Linden, Meester and van der Linden, 2016; Johnson and Alhaj-Ali, 2017). However, this situation is reversed when the workload becomes greater than nurses can manage (Aktas and Alemdar, 2017; Reay et al., 2020; Yuliandari, 2019), with experienced nurses understanding which parts of the assessment are vital and what can be omitted, which they combine with increased intuitive ability to make rapid decisions.

Many studies argued strongly for intuition being a tool that nurses depend on, albeit noting that it can lead to inaccurate triage decisions (Stanfield, 2015; Adams et al., 2016; Aktas and Alemdar, 2017; Johannessen, 2017; Wolf et al., 2018; Yuliandari, 2019). Nurses trust their own intuition over clinical decision algorithms as they feel their experience allows them to recognise a patient's acuity more accurately (Stanfield, 2015; Chang et al., 2016; Johannessen, 2016; Roscoe, Eisenberg and Forde, 2016), and that triage algorithms cannot account for all variables and contextual information that patients present with; especially in mental health cases (Clarke et al., 2015; Stanfield, 2015; Johannessen, 2016; Johannessen, 2017). However, some argued that using intuition too frequently could lead to complacency, with nurses not closely

examining their decisions and missing key details that would result in more accurate acuity scores (Johannessen, 2017; Smyth and McCabe, 2017; Yuliandari, 2019).

Training increases the use of cognitive methods, resulting in nurses relying less on intuition and more on deductive reasoning, although other studies showed their ability to correctly intuit also rises with good quality triage training (Stanfield, 2015; Aktas and Alemdar, 2017; Smyth and McCabe, 2017). Yet, triage education is frequently lacking, potentially due to deficiency of ability to replicate the impact of environment and workload on triage decision making, resulting in a lessen impact to ability to accurately triage patients, and no significant difference between groups that have regular refreshers and those that do not, although triage tools used and quality of training is also likely to have an impact (Soontorn et al., 2018; Tam, Chung and Lou, 2018). Both Aktas and Alemdar (2017) and Wolf et al. (2018) further contended that many nurses put on triage duty lack formal triage training, instead learning on the job, resulting in decreased understanding of proper triage and increased triage inaccuracies. How this applies to the NHS and what the quality and quantity of training provided is an area that would benefit from future exploration, coupled with assessing how best to improve training.

3.4 Environmental Factors

Some staff were found to change categories if they feel patients will be sent to inappropriate areas, whether due to implemented pathways they consider unsuitable, or if the patient has specific equipment requirements that are unavailable in the prescribed area (Clarke et al., 2015; Chang et al., 2016, Wolf et al., 2018). Yet some nurses triage to inappropriate areas such as rapid assessment clinics despite high patient acuity, reasoning patients will be seen and treated quicker and as such the risk

is lower than not sending them (Reay, Rankin and Then, 2016; van der Linden, Meester and van der Linden, 2016; Mistry et al., 2018).

Calm and private environments are considered vital to establishing acuity as it allows dialogue that encourages confidential discussion of a patient's personal problems, that patients may feel uncomfortable sharing in open environments (Stanfield, 2015; Chang et al., 2016). Johannessen (2016) found open environments increases the chances of workload interruptions, resulting in disrupted thought processes of both the nurse and the patient, combined with difficulties returning to the assessment. However, Johnson and Alhaj-Ali (2017) argued interrupted sessions often have more accurate decisions, potentially due to the enforced increase in concentration and enabling nurses to recover details and rethink decisions. Yet despite this, a more private environment is seen to offer the most benefit (Stanfield, 2015; Chang et al., 2016).

Studies linked nurses changing triage categories with high patient flow through the ED and how many patients have been triaged to each category (Adams et al., 2016; van der Linden, Meester and van der Linden, 2016; Johannessen, 2017; Wolf et al., 2018; Reay et al., 2020), resulting from a need for triage nurses to have situational awareness of the overall situation, ensuring flow continues and patients receive appropriate care within a suitable time frame. Whilst visual examinations are rapid and vital signs considered key by nurses, verbal histories suffer under high patient numbers (Roscoe, Eisenberg and Forde, 2016; van der Linden, Meester and van der Linden, 2016; Smyth and McCabe, 2017; Reay et al., 2020), with nurses attempting to reduce patients' complex cases to simple sentences to increase speed, risking missing key details and resulting in patients being mistriaged, suggesting a need to ensure that nurses are able to take adequate time to make their assessments. Poor

numbers of staff or inadequate skill levels strongly affected triage (Johannessen, 2016; Wolf et al., 2018; Yuliandari, 2019), with increased workloads resulting in nurses being unable to carry out full assessments and missing key details that may affect decisions. It was also noted as a facilitator of staff burnout due to a combination of staff feeling unable to make safe decisions and overwhelmed with the volume of patients they were required to see (Reay, Rankin and Then, 2016; Wolf et al., 2018; Reay et al., 2020), which leads to nurses' unwillingness to explore patients' presentations in-depth and assigning wrong acuity scores. This further stresses the need for proper staffing levels in triage to ensure both staff and patient safety.

4. Conclusions

Triage decisions represent a complex and multifaceted interaction of many factors; those intrinsic to the patient and those involving external factors both the nurse assessing them and the environment that the interaction is taking place in. Yet even when reduced to contemplating only the patient's acuity, often done through a combination of vital signs, visual presentation and verbal stories, significant differences can occur between recommendations and practice. These differences can occur from nurses not utilising the algorithms; whether due to improper training in their application, through manipulation of the algorithm to achieve the outcome they feel is more suitable, or because their intuition suggests a different acuity than that that has been suggested. The environment that triage takes place in has a strong influence on nurses' ability to properly triage, with high volumes of patients, poor levels of staff, and a lack of private areas to assess patients all having negative effects on both the process and the staff themselves.

5. Recommendations

More studies looking at the accuracy of quick-look triage, and the factors that affect this would provide a suitable avenue for exploration, potentially allowing for improvements in streamlining the triage process, although care needs to be taken to ensure safe assessments are made. Examination of how negative non-intrinsic factors can be reduced and eliminated may prove a viable area for exploration and would be aided with further investigation of how differences between recommendations and practice occur and how they can be resolved, with potential occurring in the need for improved teaching and training. Future exploration of how to improve these, especially from an educational perspective may result in significant gains for triage practice. Consideration of the triage environment itself and how to ensure that adequate staff levels and suitable areas to assess patients in are present would provide extremely helpful for both patient assessment and nursing satisfaction.

This article did not require any funding. The author has no conflicts of interest to declare.

5. Reference List

Adams, E., Goyder, C., Heneghan, C., Brand, L. and Ajjawi, R. (2016) ‘Clinical reasoning of junior doctors in emergency medicine: a grounded theory study’, Emergency Medicine Journal, 34(2), pp.70-75. DOI:10.1136/emermed-2015-205650.

Aktas, Y. and Alemdar, D. (2017) ‘Triage decision-making levels of healthcare professionals working in emergency departments’, Eurasian Journal of Emergency Medicine, 16(3), pp.92-96. DOI:10.5152/eajem.2017.96168.

Bowen, L., Shaw, A., Lyttle, M. and Purdy, S. (2016) ‘The transition to clinical expert: enhanced decision making for children aged less than 5 years attending the paediatric

ED with acute respiratory conditions', Emergency Medicine Journal, 34(2), pp.76-81. DOI:10.1136/emermed-2015-205211.

Cannavacciuolo, L., Ippolito, A., Ponsiglione, C., Rossi, G. and Zollo, G. (2018) 'How organizational constraints affect nurses' decision in triage assessment performances', Measuring Business Excellence, 22(4), pp.362-374. DOI:10.1108/MBE-06-2018-0036.

Chang, W., Liu, H., Goopy, S., Chen, L., Chen, H. and Han, C. (2016) 'Using the five-level Taiwan triage and acuity scale computerized system: factors in decision making by emergency department triage nurses', Clinical Nursing Research, 26(5), pp.651-666. DOI:10.1177/1054773816636360.

Christ, M., Grossmann, F., Winter, D., Bingisser, R. and Platz, E. (2010) 'Modern triage in the emergency department', Deutsches Aerzteblatt Online, 107(50), pp.892-898. DOI:10.3238/arztebl.2010.0892.

Clarke, D., Boyce-Gaudreau, K., Sanderson, A. and Baker, J. (2015) 'ED triage decision-making with mental health presentations: a "think aloud" study', Journal of Emergency Nursing, 41(6), pp.496-502. DOI:10.1016/j.jen.2015.04.016.

Ekins, K. and Morphet, J. (2015) 'The accuracy and consistency of rural, remote and outpost triage nurse decision making in one Western Australia Country Health Service Region', Australasian Emergency Nursing Journal, 18(4), pp.227-233. DOI:10.1016/j.aenj.2015.05.002.

Goldstein, L., Morrow, L., Sallie, T., Gathoo, K., Alli, K., Mothopeng, T. and Samodien, F. (2017) 'The accuracy of nurse performance of the triage process in a tertiary hospital emergency department in Gauteng Province, South Africa', South African Medical Journal, 107(3), pp.243-247. DOI:10.7196/SAMJ.2017.v107i3.11118.

Hinson, J., Martinez, D., Schmitz, P., Toerper, M., Radu, D., Scheulen, J., Stewart de Ramirez, S. and Levin, S. (2018) 'Accuracy of 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(1), pp.3. DOI:10.1186/s12245-017-0161-8.

Iversen, A., Kristensen, M., Østervig, R., Køber, L., Sölétormos, G., Lundager Forberg, J., Eugen-Olsen, J., Rasmussen, L., Schou, M. and Iversen, K. (2018) 'A simple clinical assessment is superior to systematic triage in prediction of mortality in the emergency department', Emergency Medicine Journal, Epub, pp.emermed-2016-206382. DOI:10.1136/emermed-2016-206382.

Johannessen, L. (2016) 'How triage nurses use discretion: a literature review', Professions and Professionalism, 6(1), pp.1446-1463. DOI:10.7577/pp.1446.

Johannessen, L. (2017) 'Beyond guidelines: discretionary practice in face-to-face triage nursing', Sociology of Health & Illness, 39(7), pp.1180-1194. DOI:10.1111/1467-9566.12578.

Johnson, K. and Alhaj-Ali, A. (2017) 'Using simulation to assess the impact of triage interruptions', Journal of Emergency Nursing, 43(5), pp.435-443. DOI:10.1016/j.jen.2017.04.008.

Lee, B., Chang, I., Kim, D. and Park, J. (2020) 'Factors associated with triage modifications using vital signs in pediatric triage: a nationwide cross-sectional study in Korea', Journal of Korean Medical Science, 35(16), pp.E102. DOI:10.3346/jkms.2020.35.e102.

Lentz, B., Jenson, A., Hinson, J., Levin, S., Cabral, S., George, K., Hsu, E., Kelen, G. and Hansoti, B. (2017) 'Validity of ED: Addressing heterogeneous definitions of over-

triage and under-triage', The American Journal of Emergency Medicine, 35(7), pp.1023-1025. DOI:10.1016/j.ajem.2017.02.012.

Lukin, W., Greenslade, J., Chu, K., Lang, J. and Brown, A. (2015) 'Triaging older major trauma patients in the emergency department: an observational study', Emergency Medicine Journal, 32(4), pp.281-286. DOI:10.1136/emermed-2013-203191.

Mackway-Jones, K., Marsden, J. and Windle, J. (2014) Emergency triage. 3rd ed. Chichester: Wiley Blackwell.

McKinstry, B., Hammersley, V., Burton, C., Pinnock, H., Elton, R., Dowell, J., Sawdon, N., Heaney, D., Elwyn, G. and Sheikh, A. (2010) 'The quality, safety and content of telephone and face-to-face consultations: a comparative study', British Medical Journal Quality & Safety, Vol.19 (4), pp.298-303. DOI:10.1136/qshc.2008.027763.

Mistry, B., Balhara, K., Hinson, J., Anton, X., Othman, I., E'nouz, M., Avila, N., Henry, S., Levin, S. and De Ramirez, S. (2018) 'Nursing perceptions of the emergency severity index as a triage tool in the United Arab Emirates: a qualitative analysis', Journal of Emergency Nursing, 44(4), pp.360-367. DOI:10.1016/j.jen.2017.10.012.

Moon, S., Shim, J., Park, K. and Park, C. (2019) 'Triage accuracy and causes of mistriage using the Korean Triage and Acuity Scale', PLOS ONE, 14(9), pp.e0216972. DOI:10.1371/journal.pone.0216972.

NHS Digital (2019) Hospital accident & emergency activity 2018-19. London: NHS Digital.

Park, J., Lee, J., Kim, Y., Lee, J. and Lim, T. (2019) 'Reliability of Korean triage and acuity scale: interrater agreement between two experienced nurses by real-time triage

and analysis of influencing factors to disagreement of triage levels', Journal of Korean Medical Science, 34(28), pp.e189. DOI:10.3346/jkms.2019.34.e189.

Petruniak, L., El-Masri, M. and Fox-Wasylyshyn, S. (2018) 'Exploring the predictors of emergency department triage acuity assignment in patients with sepsis', Canadian Journal of Nursing Research, 50(2), pp.81-88. DOI:10.1177/0844562118766178.

Reay, G., Rankin, J. and Then, K. (2016) 'Momentary fitting in a fluid environment: A grounded theory of triage nurse decision making', International Emergency Nursing, 26, pp.8-13. DOI:10.1016/j.ienj.2015.09.006.

Reay, G., Smith-MacDonald, L., Then, K., Hall, M. and Rankin, J. (2020) 'Triage emergency nurse decision-making: Incidental findings from a focus group study', International Emergency Nursing, 48, pp.100791. DOI:10.1016/j.ienj.2019.100791.

Reisi, Z., Saberipour, B., Adienh, M., Hemmatipour, A. and Abdolahi Shahvali, E. (2018) 'The level of awareness of the emergency department nurses of the triage principles in teaching hospitals', Journal of Nursing and Midwifery Sciences, 5(1), pp.32-38. DOI:10.4103/JNMS.JNMS_5_18.

Roscoe, L., Eisenberg, E. and Forde, C. (2016) 'The role of patients' stories in emergency medicine triage', Health Communication, 31(9), pp.1155-1164. DOI:10.1080/10410236.2015.1046020.

Saban, M., Zaretsky, L., Patito, H., Salama, R. and Darawsha, A. (2019) 'Round-off decision-making: Why do triage nurses assign STEMI patients with an average priority?', International Emergency Nursing, 43, pp.34-39. DOI:10.1016/j.ienj.2018.07.001.

Smyth, O. and McCabe, C. (2017) ‘Think and think again! Clinical decision making by advanced nurse practitioners in the emergency department’, International Emergency Nursing, 31, pp.72-74. DOI:10.1016/J.IENJ.2016.08.001.

Soontorn, T., Sitthimongkol, Y., Thosingha, O. and Viwatwongkasem, C. (2018) ‘factors influencing the accuracy of triage by registered nurses in trauma patients’, Pacific Rim Int J Nurs Res, 22(2), pp.120-130. No DOI.

Stanfield, L. (2015) ‘Clinical decision making in triage: an integrative review’, Journal of Emergency Nursing, 41(5), pp.396-403. DOI:10.1016/j.jen.2015.02.003.

Tam, H., Chung, S. and Lou, C. (2018) ‘A review of triage accuracy and future direction’, BMC Emergency Medicine, 18(1), pp.58. DOI:10.1186/s12873-018-0215-0.

van der Linden, M., Meester, B. and van der Linden, N. (2016) ‘Emergency department crowding affects triage processes’, International Emergency Nursing, 29, pp.27-31. DOI:10.1016/j.ienj.2016.02.003.

Wolf, L., Delao, A., Perhats, C., Moon, M. and Zavotsky, K. (2018) ‘Triaging the emergency department, not the patient: United States emergency nurses’ experience of the triage process’, Journal of Emergency Nursing, 44(3), pp.258-266. DOI:10.1016/j.jen.2017.06.010.

Yuliandari, K. (2019) ‘A literature review in triage decision making: supporting novice nurses in developing their expertise’, Belitung Nursing Journal, 5(1), pp.9-15. DOI:10.33546/bnj.635.

Zachariasse, J., Kuiper, J., de Hoog, M., Moll, H. and van Veen, M. (2016) ‘Safety of the Manchester Triage System to detect critically ill children at the emergency

department', The Journal of Pediatrics, 177, pp.232-237.e1. DOI:10.1016/j.jpeds.2016.06.068.

Zachariasse, J., van der Hagen, V., Seiger, N., Mackway-Jones, K., van Veen, M. and Moll, H. (2019) 'Performance of triage systems in emergency care: a systematic review and meta-analysis', BMJ open, 9(5), pp.e026471. DOI:10.1136/bmjopen-2018-026471

Revisions

All page numbers refer to original manuscript

Pg. 1

- Further explained importance of making accurate triage decisions
- Added fourth theme of “decision-making algorithms”.
- Added twelfth subtheme of
- Changed “heavy workload” to “high patient numbers”
- Changed “how accurate nurses’ decisions are” to “the accuracy of nurse’s decisions”
- Added paragraph about commonly used triage algorithms
- Added “literature” to clarify nature of review

Pg. 2

- Added databases searched
- Added types of papers included
- Added discussion of papers geography.
- Removed section on nurses performing triage more frequently

Pg. 3

- Clarified decision to include doctor focussed paper.
- Added explanation of methodology for developing themes.
- Added twelfth theme to table
- Added paragraph about efficacy of triage algorithms

Pg. 4

- Changed “main problem” to “presenting complaint”
- Added “such as co-morbidities and additional symptoms”

Pg. 5

- Changed “other to “underlying symptoms”
- Added “that may or may not have an impact on their acuity”
- Added analytic sentence
- Separated red flag presentations and non- fit presentations
- Added sentence exploring reasoning behind experienced nurses’ identification of red flags
- Changed “their baseline” to “expected norms”
- Changed “as providing directions for exploration to establish acuity” to “directing them towards certain acuity categories”
- Changed “whilst this is true” to “whilst vital signs are key” and changed “vital signs” to “they” for clarity
- Changed “main problem” to “presenting complaint”
- Added “for that complaint”

Pg. 6

- Added “Visual assessment often initially utilises”, changed “is” to a comma, removed “to make the first rapid assessment” for clairity
- Expanded on research surrounding Iversen’s findings and need for further research
- Added whether this accurately reflects their acuity or not
- Removed Lee et al. from sentence based on walking in
- Added “even though this may not reflect the reality of the situation”

Pg. 7

- Changed “Nurses feel” to “experienced nurses often feel”
- Changed “quicker” to “more quickly”.
- Changed “unflattering” to embarrassing”
- Changed “vital” to “vital signs”
- Changed “verbal histories” to “verbal stories”
- Rearranged sentence regarding communication issues to reflect inaccuracy of assessment and that miscommunication may result in important information being missed.

Pg. 8

- Rewrote section on race for clarity and conciseness
- Added “as well as an increased potential for deterioration”
- Added “suggesting a need for nurses to be properly trained in triage protocols, and specialist nurses to be involved in the triage process”

Pg. 9

- Added “suggesting a need for training and properly developed competencies”
- Deleted extra full stop
- Added hyphens to over-triage and under-triage
- Changed comma to full stop
- Deleted “however”
- Added “with suggestions that clinical experiences and expertise have a strong influence in this”
-

Pg. 10

- Changed “gut feelings” to “Intuition”
- Added “although triage tools used and quality of training is also likely to have an impact”
- Changed “low increases in” to “a lessen impact to”

Pg. 11

- Added “How this applies to the NHS and what the quality and quantity of training provided is an area that would benefit from future exploration, coupled with assessing how best to improve training.”
- Added “not getting the patient seen in a timely enough manner”
- Added “some” to start of sentence to clarify not all nurses

- Changed “resulting in comparisons between the two forms to establish where the most potential harm to patients lies” to “resulting in analysis of where the most potential harm to patients lies, by following guidelines or not”
- Changed “confident” to “experienced”
- Added “and as such the risk is lower than not sending them”
- Deleted “there”

Pg. 12

- Added “Yet despite this, a more private environment is seen to offer the most benefit (Stanfield, 2015; Chang et al., 2016).”
- Changed “how heavy the workload is in individual acuities” to “how many patients have been triaged to each category”
- Added “with these decisions being affected by risk assessment and likely to feature impact from nurses on experiences and biases”
- Added “by nurses” to “vital signs considered key”
- Changed “heavy workloads” to high patient numbers”
- Changed “Improper levels of staff” to “Poor numbers of staff or inadequate skill levels”
- Added “and resulting in patients being mistriaged, suggesting a need to ensure that nurses are able to take adequate time to make their assessments”
- Expanded sentence about restricting patients to acuity to explore consequences and solutions
- Added “due to a combination of staff feeling unable to make safe decisions and overwhelmed with the volume of patients they were required to see”
- Added “This further stresses the need for proper staffing levels in triage to ensure both staff and patient safety.”

Pg. 13

- Added “yet these are factors that could be addressed through proper staff training to ensure that they are making the right decisions in the first place”
- Changed “Yet sometimes” to Furthermore, some”
- Rewrote conclusions
- Separated conclusions and recommendations into two sections
- Rewrote recommendations

<u>Sections removed for word count</u>

Please note these sections were removed after the above edits and so some of them may not be present in the paper anymore.

Section on pg. 6 concerning ambulance crews. Whilst this is interesting information I felt that it detracted from the overall narrative and focus on patients, nurses and environments. Furthermore, as reviewer 2 noted, some of the papers concerned factors from outside the UK, and it featured opinions and judgements that may be highly subjective.

Section on pg. 7 regarding reductive means of questioning.I felt this section was overly complicated, and only produced minor findings that sometimes nurses hurry

through, something that I feel is adequately covered in the section on heavy workloads.

Pg. 8. Removed sections regarding gender and race. The section on gender was small and did not add much to the narrative. The section on race was less concerned with patient factors and more with nurses opinions, and the studies that examined them are difficult to apply to the UK.

Pg. 9 removed section relating to feeling unable to deal with patients. Felt disjointed and not enough exploration of subjects.

Pg.11 removed section on risk analysis. Whilst potentially important to how the decisions are made, this is not one of the factors that affects triage, but part of the overall decision-making process. Furthermore, I felt this section was not well written and complicated the perspective for the reader.

Pg. 12 removed section on uptriaging and downtriaging patients as it is not very well explored

Pg. 12 removed section on restricting patients in acuity categories as it was not very well explored

Commentary on requested revisions

Pg. 2

- Whilst Christ et al., 2010 is an older paper, the underlying processes it examines have not changed significantly in the time period, and the findings referred to are still as applicable today.
- Whilst Reviewer 2 is completely right that the cost-effectiveness of using nurses instead of doctors when performing triage and the differences between nurses and doctors when performing triage would provide an interesting avenue of exploration (and may direct some of my future research), this is outside the scope of this review, and the wordcount is already tight. I have edited this section down for conciseness and as to not introduce confounding factors. This also removes two of the older papers from this review.

Pg. 5

- Regarding inability to review vital signs, yes, this was the findings from the studies, that vital signs are not immediately available when making triage decisions. Whilst triage systems do rely on vital signs, the unfortunate reality of emergency triage is that these are not always obtained immediately. This represents a failing in practice that requires rectifying, potentially through training.

Pg. 6

- Regarding Iversen's findings, yes this is saying that they found that quick look triage had more accuracy than the triage algorithms. None of the other papers agreed with this, but none disagreed either. It is an area that requires further examination (I will add this to recommendations)

Pg. 8

- Regarding racial factors, whilst these are influenced by nurses' perceptions, they were grouped with patient factors as opposed to nursing factors as race is inherent to the patients themselves, not something that the nurse can affect. The same applies to gender and age.

Pg. 10

- Discussion of triage algorithms already added on page 3

Pg. 12

- Whilst I have previously discussed how vital signs were not always essential, they were still considered key by nurses. Changed sentence to reflect this.