Title: Emergency nurses working with Manchester Triage - The impact of nursing experience on patient safety

Article Type: Original Research papers

Keywords: Triage, experience, patient safety, nursing, Sweden.

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Abstract: Background: The article describes triage nurses perception of the impact experience and MTS have on patient safety during MTS triage assessment at emergency departments in Western Sweden. Methods: Data was collected from 74 triage nurses using a questionnaire containing 37 short form questions of Likert type, analyzed descriptively and measured the covariance. Data was also collected with two open questions by using the critical incident technique and content analysis. Results: The results described that the combination of the MTS method, the nurses’ experience and organizational factors accounted for 65% of patient safety. The study indicated that nurses’ experience contributed to higher patient safety than the model itself. A standardized assessment model, like MTS, can rarely capture all possible symptoms, as it will always be constrained by a limited number of keywords and taxonomies. It cannot completely replace the skills an experienced nurse develops over many years in the profession. Conclusions: The present study highlights the value of triage nurse's experience. The participants considered experience to contribute to patient safety in emergency departments. A standardized triage model should be considered as additional support to the skills an experienced nurse develops.
Gothenburg, Sweden 17/1/2012

Australasian emergency nursing journal

Dear Editor

Attached please find a new version of our manuscript for publication in the Australasian emergency nursing journal. This article focuses on triage assessment in emergency departments in Western Sweden. The findings in the article indicated that nurse’s experience contribute to higher patient security than the triage model itself. Because of its empirical content and development of theory the article is interesting for both researchers and practitioners. We are sending this article to Australasian emergency nursing journal as the subject of triage assessment has been dealt with in the journal previously.

This article has neither been published nor considered for publication in any other journal.

Yours Sincerely,

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Nurses working with Manchester Triage

- The impact of experience on patient security

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Keywords: Triage, experience, patient security, nursing, Sweden.

SF, BF and EC conceived and designed the study. SF and BF developed the study protocol. EC, SF and BF designed and tested the study instruments. EC supervised data collection. SF and BF analysed the data. BF, SF and EC prepared and approved the manuscript.

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Competing interests

There are neither competing interests nor conflicts of interest.
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Australasian emergency nursing journal (AENJ) editors and reviewer’s comments and answers

Title: Emergency nurses working with Manchester Triage - The impact of nursing experience on patient safety (Ms. Ref. No.: AENJ-D-11-00034).

Dear Editors and anonymous reviewers. We, once again, really appreciate all detailed comments to the paper.

Below you will find our response to the reviewer’s comments. The revised parts are marked yellow in the paper.

Thank you for your patience still considering our work

Sincerely
The authors

Editors:

1. We hope to receive a revised manuscript from you by Jan 26, 2012 if possible.

We will submit before Jan 26, 2012

2. Please review comments from the reviewer 3 listed below, in particular the issues

Please see below

Reviewer 3

1. Whilst experience is important, one of the flaws of reliance on experience alone or as a supplement to a objective system is that it is not reproducible between individuals. Experience can also have a negative effect if there has been no follow through or learning/reflection after an event. This should be made clear.

Please see line 255. Text has been rewritten and marked yellow

2. What you describe is piloting rather than validation but it provides more detail.

Line 133, the word is changed to piloting

3. I am still not convinced of the need for a formal statistical calculation because you are not seeking causality and you cannot generalize from the sample selected.

The formal statistical calculation was a part of the methodological proceeding. We have however tuned down the causality and generalizability of the results somewhat under the subheading, limitations. Please see new text line 318-322, marked yellow.

4. You state that triage is not a predictive tool-triage is a process of assessment, a tool such as the MTS may be used to help identify priority. The process is not predictive. MTS or other
such tools are not designed to replace experience they are there to augment and support decision making. This can be particularly useful with staff of less experience. However experience does not always protect against poor judgement.

Please see line 247-249 and 255-256, Sentences changed and marked yellow.

5. The word commence is incorrect. I think you mean initial

Line 171, changed to initial.
Emergency nurses working with Manchester Triage

- The impact of nursing experience on patient safety

Abstract:

Background: The article describes triage nurses perception of the impact experience and MTS have on patient safety during MTS triage assessment at emergency departments in Western Sweden.

Methods: Data was collected from 74 triage nurses using a questionnaire containing 37 short form questions of Likert type, analyzed descriptively and measured the covariance. Data was also collected with two open questions by using the critical incident technique and content analysis.

Results: The results described that the combination of the MTS method, the nurses’ experience and organizational factors accounted for 65% of patient safety. The study indicated that nurses’ experience contributed to higher patient safety than the model itself. A standardized assessment model, like MTS, can rarely capture all possible symptoms, as it will always be constrained by a limited number of keywords and taxonomies. It cannot completely replace the skills an experienced nurse develops over many years in the profession.

Conclusions: The present study highlights the value of triage nurse’s experience. The participants considered experience to contribute to patient safety in emergency departments. A standardized triage model should be considered as additional support to the skills an experienced nurse develops.

Keywords: Triage, experience, patient safety, nursing, Sweden.

What is known about the topic?

In previous studies, the need for theoretical triage assessment training is regarded as central to improve patient safety. Alternative forms of training such as practical case exercises can further increase the ability to identify severely ill patients. Nurse’s experience has been shown to improve decision ability, but there is no evidence that triage nurse experience improves decision accuracy in computer based triage cases.

What this paper adds or contributes?

This study highlights the value of experience. Experience contributes to more patient safety than the studied triage model itself. Extensive experience is established over years of assessing severely ill patients. When triage assessment models are used it should be by experienced nurses, skilled in interviewing techniques and clinical diagnosis.

Introduction

There is an ongoing debate in Sweden about the extent to which the practice of triage contributes to patient’s safety. The debate is based on notification to the Swedish National Social Board where a patient was left in a waiting room with a life threatening condition. Although the triage category was correct according to the decision tool used, the patient’s urgent condition wasn’t identified. The criticism outlined was that in situations where assessment models are used, they might strongly influence priority to a greater degree than the triage nurse’s experience. 1 When a triage assessment is not consistent with the triage nurse’s perception; based on experience, the corresponding model tends to be assigned first priority. If this is the case, the assessment model could be a hindrance and become a real risk to the patient.1, 2, 3 The present study describes 74 nurse’s perception of the impact experience and Manchester triage system (MTS) have on patient safety. Patient safety is defined as to; minimize the risk of patient’s complications or early death as well as to identify the need for hospital care. 4
Triage models

The workload of emergency departments varies according to the number and acuity of the patients.\(^5,6\) An efficient triage system regulate the length of the patients’ waiting times in the emergency department by combining immediate assessments and interventions.\(^5\) In order to properly assess the care patient’s need, triage nurses must understand, identify and evaluate available information from the patient. Triage is intended to ensure that patients are taken care of according to the urgency of the clinical needs rather than the order in which they arrive.\(^5,6\)

Modern emergency department triage was developed in Australia, United Kingdom, Canada and USA.\(^7\) National Triage Scale (NTS) is a five-point triage scale adopted in Australia 1993/94. The British and Canadian scales are based on this system. The NTS scale was revised in 2000/01 to include the patients’ vital signs and symptoms, and was also renamed Australian Triage Scale (ATS).\(^8\) The need for a triage scale in Canada was described in the early 1970’s, but the scale did not become a reality until the 1990’s, when The Canadian Emergency Department Triage (CTAS) was introduced.\(^8\) CTAS is a scale based solely on the vital signs.\(^9\) The Manchester Triage System (MTS) was introduced in the UK in 1996.\(^6\) US hospitals currently use a variety of triage scales, the most widely used and dispersed triage system is a scale called Emergency Service Index (ESI).\(^10\) The Cape Triage Score (CTS) was introduced in 2004 in South Africa. It is a scale appropriate for specific problems, which include a large number of people with HIV infections and severe trauma cases.\(^11\)

In Sweden registered nurses work with triage assessment and there is no standard triage available.\(^12\) Currently three different methods are of use; Adaptive Triage (ADAPT), Medical Emergency Triage and Treatment Systems (METTS), and the Manchester Triage System (MTS). ADAPT and METTS are based on subjective parameters combined with vital parameters such as respiratory rate, oxygen saturation in blood, level of consciousness and pulse rate.\(^4\)

MTS has a five-level scale; immediate care, very urgent, urgent, and two levels of not urgent. The highest category level means that gravely ill patients with a life-threatening condition is assigned red and is given immediate care. Patients with very urgent conditions such as ongoing chest pain is assigned category orange and is given care within ten minutes. Urgent cases are assigned category yellow and can wait up to one hour, less urgent patients are assigned category green and can expect a
waiting time of up to three hours. Other patients are given a blue triage level. They can wait for four hours. They can also be advised to visit a primary care medical clinic. The first step in MTS assessments is when the nurse, responsible for triage chooses a flow chart based on the patient’s reason for contacting the emergency department for example “chest pain”. The chart begins by identifying possible criteria indicating life-threatening conditions for the patient, such as affected breathing, blood pressure or pulse. If none of these conditions exist, the nurse continues along the flow chart asking questions such as; do you have a problem breathing, dyspnea? If the patient describes “pain correlated to breathing” the nurse assigns the patient a yellow category. MTS is considered a sensitive instrument that identifies severely ill patients in need of intensive care. 90% of the nurse’s assigned patients to exactly the same triage categories in a study using fictive scenarios and MTS.

Triage and nurses’ experience

Experience is considered to be an important part of nursing skills. In the present study the definition of an experienced nurse, is a nurse who have acquired assessment skills that recognize symptoms and relate symptoms to known disease categories. Skills are not based on education alone, the transition into a skilled nurse requires experience that can be acquired during clinical work. Triage requires an ability to make independent decisions and a triage nurse is considered to be able to establish trust and confidence with the patient. Dialogue improve trust and confidence between nurse and patient and helps the nurse to collect data about the patient’s condition.

The ideal triage system should quickly and accurately distinguish patients in need for immediate care and patients able to wait for treatment. Triage scales and assessment levels must be absolute comprehensible. Sometimes the MTS model is not sufficient; the nurse has difficulties finding matching keywords to the patient’s subjective parameters or symptoms, which might complicate the assessment.

If the patient is assigned a lower triage priority than required the patient’s health may be jeopardized, however, an over-triage can contribute to a less than optimal use of the emergency
The triage nurses interview technique and the ability to make accurate clinical observations contributes to patient safety. In order to reach an accurate priority quickly, the length of the interview and added examinations must be limited. Time-consuming assessments are balanced with the need to correctly identify a severely ill patient. A misjudgment can lead to unwanted consequences due to incorrect triage category. Prioritizing requires a sufficient basis for evaluation, the nurse must learn techniques to get the patient to focus on their symptoms and pass on relevant information. A common cause of error is a conversation that is too superficial.

Experience has proven to contribute to accurate triage assessments. Nurses who regularly practice triage, have proven to be those who make the best decisions. However, clinical experience do not always make a significant difference. Risks may arise if a nurse generalizes his or her evaluation of the patient's condition, comparing it with previous cases without considering alternative possibilities. The nurse might make hasty assumption, “locks on the target” and acts within a limited set of data. The potential risk of hasty assumptions underpins the need to meet every patient without bias.

Method

Questionnaires were sent to 102 triage nurses in four emergency departments in Western Sweden working with MTS. All informants were registered nurses, working with MTS triage assessment only during regular periods of their work schedule for at least six months. The supervisors at each respective emergency department gave permission to approach staff to the research area.

The questionnaire design

A questionnaire was chosen as the best method for conducting the initial investigation to describe the impact of emergency nurses' experience during MTS triage assessment on patient safety. The instrument was designed by the authors to provide a possibility to answer the research question. The survey included nurses basic demographic details; age, work experience, years working with triage assessment, the education level and additional medicine courses. Other areas were job satisfaction related to their nursing work at the ED, such as interesting and stimulating task, possibilities to take initiative and to act independently.
Questions about their job satisfaction related to their triage assessment task, such as additional triage training, triage organization and attitudes to the MTS and patient safety. The questionnaire contained 37 questions with five possible Likert type answers. Data was also collected with two open questions using the Critical Incident Technique (CI). The informants were asked to describe two triage assessment scenarios in text - one which they thought was satisfactory and one which they thought was unsatisfactory (see appendix).

The instrument was piloted by five nurses responsible for triage assessment at respective emergency departments. The purpose was to test the questionnaire on a small group of volunteers, as similar as possible to the target group. This led to small adjustments to clarify some of the questions.

A power calculation was performed before the study. With a power of 75%, and given the number of included predictors (i.e. an alpha value at 0.05) a total of 70 participants were needed to be included in the study. The instrument’s internal reliability was tested by calculating Cronbach’s alpha. The results varied between 0.68 and 0.84, which is considered to be variable but satisfactory. Questionnaires were numbered and the variables were defined and fed into the computer program, Statistical Package for the Social Sciences (SPSS) 14.0. Statistical Significance was established at $p < 0.05$. The quantitative part of the analysis consisted of descriptive data, bivariate and multivariate regressions. The CI was used to capture the informants’ views on the triage assessment. The technique focuses on a factual incident, which may be defined as observable and integral episode of human behavior. The incident must have had an impact on some outcome; it must have either a positive or negative contribution to the accomplishment of some activity of interest. The qualitative analysis meant that the obvious part of the answers was extracted from each respective question.

Ethics

The study complied with ethical procedures according to Swedish law, and the Declaration of Helsinki. Participants fulfilling the inclusion criterions was included with the help from senior managers and by the human resource departments. The questionnaire contained an introductory letter
where the background of the study was described. It contained detailed instructions and information stating that participation was voluntary. Participants were informed that they were free to withdraw at any time. They were assured of strict confidentiality and secure data storage. Swedish statutes do not require ethics approval for research that does not involve a physical intrusion that affects the participants.44

Results

The survey response rate was 75%. The age of the informants were evenly distributed between 25 and 64, most of the nurses (25%) was between 35-44 years. Sixty three percent of the nurses who participated in the study had more than five years’ nursing experience, and 70% had practiced MTS for more than a year. Sixty two percent of the triage nurses had undergone a one-day MTS training course. Thirty percent had studied trauma care at university level. Only one of the nurses had been to university to specialize in triage.

When asked if their employers had offered them any on-the-job additional triage training besides the MTS introduction over the past six months, 20% of the nurses answered yes. The additional training included briefings about fictitious patient cases and different triage situations. **Sixty one percent** expressed a need for initial and additional triage training. Of these 46% felt that they specifically needed more training on simulated patient cases.

The questionnaire contained questions concerning the nurse’s personal attitudes, to experience, reliability and patient safety regarding triage assessments using the MTS method. There were 70% of the informants that felt the need for experience. Seventy-eight of the informants thought that MTS was patient safe and 77% thought that it was a reliable method. Asked if the nurses were given sufficient time for the triage assessment 90% of the nurses answered yes. Sixty one percent had sufficient time for analysis and 66% gained support for the task and cooperation at the ED.

The relationship between the participant’s perception of the impact of MTS and nursing experience on patient safety was tested in a number of bivariate regressions. The MTS triage model was considered to contribute to patient safety (R = 0.65, R² = 0.42). The triage nurse's skills as a result of experience were however considered to be even more valuable. Experience was considered to improve
the patient’s safety ($R = 0.73, R^2 = 0.54$). The patient safety was considered to increase the longer the nurse had worked with triage ($R = 0.33, R^2 = 0.11$).

Additional contributors to patient safety than nursing experience were found in the data. Patient safety was considered to increase slightly when the nurse had enough time for assessment ($R = 0.24, R^2 = 0.06$) and enough time for subsequent analysis ($R = 0.26, R^2 = 0.68$). If the organization offered peer support to the triage nurse, patient safety was considered to increase even more ($R = 0.31, R^2 = 0.10$) (tab:1).

Table 1: The importance of nurse’s experiences, MTS and other contributors as a determinant of patient safety, bivariate regression.

<table>
<thead>
<tr>
<th></th>
<th>Pearsons R</th>
<th>R-square</th>
<th>F-value</th>
<th>T-value</th>
<th>Sign.</th>
<th>Sign.95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competence as a facilitator to patient safety</td>
<td></td>
<td></td>
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<tr>
<td>A. Nurse experience</td>
<td>0.73</td>
<td>0.54</td>
<td>81.16</td>
<td>2.24</td>
<td>0.03</td>
<td>sign</td>
</tr>
<tr>
<td>MTS as a facilitator to patient safety</td>
<td></td>
<td></td>
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<tr>
<td>B. MTS as a reliabel method</td>
<td>0.65</td>
<td>0.42</td>
<td>50.00</td>
<td>7.07</td>
<td>0.00</td>
<td>sign</td>
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<tr>
<td>Other contributors to patient safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>C. Sufficient time in the triage situation</td>
<td>0.24</td>
<td>0.06</td>
<td>4.41</td>
<td>5.21</td>
<td>0.04</td>
<td>sign</td>
</tr>
<tr>
<td>D. Sufficient time for analysis</td>
<td>0.26</td>
<td>0.68</td>
<td>5.07</td>
<td>2.25</td>
<td>0.03</td>
<td>sign</td>
</tr>
<tr>
<td>E. Support gained for the task</td>
<td>0.31</td>
<td>0.10</td>
<td>7.44</td>
<td>3.59</td>
<td>0.01</td>
<td>sign</td>
</tr>
<tr>
<td>F. Good cooperation at the emerg. dept.</td>
<td>0.21</td>
<td>0.04</td>
<td>3.07</td>
<td>1.54</td>
<td>0.13</td>
<td>not sign</td>
</tr>
</tbody>
</table>

A multiple regression showed that nurses’ skills, MTS as a method, and organizational factors together accounted for 65% of patient safety ($R^2 = 0.65$). This meant that 35% remained unexplained. Two variables were still significant, nurse’s experience, and MTS as a method. The remaining variables displayed low t-values, and were lacking significance on their own. The reason could be that they co-variate or that they were present as an earlier link in connection to the cause. Results indicate that experienced nurses combined with sufficient time for assessment and analysis while working with MTS contributes to patient safety (tab:2).

Table 2: The importance of nurse’s experiences, MTS and other contributors as a determinant of patient safety, multiple regressions.

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>A. Nurse experience</td>
<td>0.73</td>
<td>0.53</td>
<td>0.20</td>
<td>5.92</td>
<td>0.00</td>
</tr>
<tr>
<td>B. MTS as a reliabel method</td>
<td>0.65</td>
<td>0.34</td>
<td>0.31</td>
<td>3.89</td>
<td>0.00</td>
</tr>
<tr>
<td>C. Sufficient time in the triage situation</td>
<td>0.24</td>
<td>-0.05</td>
<td>0.29</td>
<td>-0.60</td>
<td>0.55</td>
</tr>
<tr>
<td>D. Sufficient time for analysis</td>
<td>0.26</td>
<td>0.07</td>
<td>0.19</td>
<td>0.82</td>
<td>0.41</td>
</tr>
<tr>
<td>E. Support gained for the task</td>
<td>0.31</td>
<td>0.16</td>
<td>0.15</td>
<td>1.51</td>
<td>0.14</td>
</tr>
</tbody>
</table>
Open questions

The results of the quantitative part of the study were confirmed by the answers to the open questions in the survey. Fifteen of the nurses gave comments on the positive value of MTS. They argued that the method contributed to patients being cared for safely. When the nurse and the patient met, the conversation was normally held in an environment characterized by peace and quiet, where the nurses’ communication skills were used optimally. Patients were rapidly assessed, even if the workload was high. One nurse also stated that the model contributed to early finding and identifying patients with life-threatening conditions.

“During triage you can directly identify patients with severe symptoms. One can quickly bring them into the emergency room and start the assessment.”

“A patient with minor subjective symptoms was examined in the emergency room but had a high pulse rate. It did not seem so serious but MTS gave him a high priority and the patient was taken care of faster than usual. It was fortunate because the patient had a ventricular fibrillation shortly afterwards and his life was saved.”

“The patient had an undefined chest pain, which we thought was nothing serious, but it turned out to be a heart attack. I am glad that such discomforts are given a high priority.”

There were also critical voices expressing that MTS was sometimes a hindrance to patient safety. They could not find matching keywords or flow charts to substantiate their decisions. They regarded the model as sometimes “ambiguous”, which could make it hard to identify serious conditions. One nurse described an unsatisfactory triage assessment;
“A patient arrived suffering from mild abdominal pain. He had different blood pressures in his arms. There was no keyword for this. The patient was given low priority because he had almost no pain when arriving at the emergency room. Fifteen minutes after arrival the patient was dead. He died of an aortic aneurysm, despite intensive CPR.”

Experienced nurses could sometimes have a “gut feeling” or intuition that something important had been missed in the assessment. The MTS however, gave no scope of action for this. The model was based on observations sorted under a limited number of headings. When the nurse’s perception did not agree with the triage model they sometimes chose not to express their concerns. The nurses did not want to appear to be unclear or vague in their assessment. However, in some cases the nurses assessed according to their “gut feeling” in order to safely care for the patient

"When my intuition says that the patient should have a higher priority than MTS provides, it makes me feel uncomfortable. It is a situation that is difficult to manage."

“Sometimes, patients have many different symptoms. After a short conversation, I usually give a higher priority to these patients, because I know they cannot manage to sit and wait for a long time in the waiting room.”

Discussion

The informants in this study stated that a standardized assessment model, like MTS rarely captures all possible symptoms. MTS as a tool will always be constrained by a limited number of keywords and taxonomies. It may be used to help identify priority and give support in decision making, but it seems unlikely to replace the skills an experienced nurse develops over many years in the profession.

Identifying pattern recognition, intuition and “gut feeling” is the hallmarks of nursing. Repeated exposure to certain conditions gives nurses’ confidence in their abilities to recognize potential danger areas. On the other hand, an experienced nurse sometimes has a tendency to associate the patient’s needs to a simplified classical condition and hence determine a priority level too quickly. They could
thus rely on their experience and “lock on the target” by failing to carry out additional checks to confirm the assessment. Experience can have a negative effect on nurse’s if there has been no follow through or reflection after a serious event. It is important for nurses to question their experience and meet each patient openly and unbiased. The nurses in present study reported while using MTS they discovered subtle but serious symptoms that could otherwise have been missed. Both of these risks, the limitation of MTS to identify serious conditions, as when a patient arrived suffering from mild but lethal abdominal pain and on the other hand, nurses who performed the assessment too quickly and assigned an incorrect priority – might be prevented by combining the model’s benefits with an experienced nurse’s abilities (Fig. 1).

**Fig.1**

![Diagram](image)

**Comments fig. 1.** The figure shows three types of triage assessments based on the nurse’s experience and MTS. A is representing a combination of experience and MTS. In position A it is probable that the patient will be properly assessed. B is based on experience and C on the model’s keywords and taxonomies. Both B and C decrease the patient safety. At B, generalizations can be made. The nurses can rely in their own experience and make a hasty prioritization, associating the patient’s condition with a classical condition. At C, the model leads to problems in assessing patients correctly because of the lack of keywords. B can decrease the risk by using the work processes of the standardized model, and the risk of C can be prevented by the nurse’s experience.

When excessive influence is given to MTS, the experienced nurses’ ability to convey a “gut feeling” or intuition could be hampered. The “gut feeling” or intuition is a synthesis of all information the nurses register implicitly. Such information is for example; a visual, auditory or a tactile impression associated with previously experienced situations and events. The nurses in this study were not always able to describe the association, or put it into words at that moment, but the reaction is still valid and the signals are often important to the triage assessment. This phenomenon has been
termed “tacit knowledge”, knowledge based on experience which cannot be classified in an explicit triage model. Nurses’ concerns that seem vague or evasive may contribute to key findings being ignored. If a standard triage model is given such a superior dominance that no objection can be raised against its taxonomies, the nurse’s experience will be neglected. Such a situation can reduce the safety of the patient. The results of this study indicated that a nurse’s experience contributed to higher patient safety than the model itself. This means that if the opportunity to object to the model is reduced, patient safety will be significantly reduced. A triage model should therefore be considered as additional support in order not to miss serious conditions. On the other hand, MTS contributed to increased patient safety because the scheme reduced the risk of missing important parameters in the assessment. The risk of the nurse missing serious conditions was reduced because the model forced the nurse to ask key questions and make vital inquiries.

In previous studies regular training develops the triage nurses ability to identify the patient’s degree of urgency and was regarded central to improve patient safety. Present study highlights the value of experience. Although training is important, inexperienced nurses should not perform triage assessments without appropriate supervision, even if they are well educated. Experience is established through years of assessing severely ill patients. An alternative form of training, which may contribute to acquiring experience, is practical case exercises, because this training can increase the ability to identify severely ill patients. When standardized assessment models are used, they must be combined with skills in interviewing techniques and experience in clinical diagnosis, which is acquired through hands-on exercises.

**Strengths and Limitations**

This study highlights the value of experienced nurses performing triage. Experience seems to contribute to more patient safety than the studied triage model itself. Extensive experience such as interviewing techniques and clinical diagnosis is established over years of assessing severely ill patients. It should also be possible to question the priority that a standardized triage model indicates.

The limitations in the present study include the fact that the findings may not be able to be generalized to emergency departments outside Western Sweden. Although 74 nurses from four
suburban and urban emergency departments and trauma centers participated in the study, hospital emergency departments from other parts of Sweden were not included. This study only describes nurses working with MTS.

The fact that the study is based on a questionnaire measuring the perceived effects of experience and MTS on patient safety can be considered as limitation. When analyzing results based on a questionnaire a possibility of over- or underreporting cannot be ignored. In order to verify the causality and generalizability of the results a study not just based on a questionnaire should be performed. A study of the effects of experience versus triage models on the health status of patients treated in emergency departments would give additional and important information.

A third limitation might be the fact that the informant’s descriptions of their critical incidents related to the triage assessment are only short stories. A possibility to perform personal interviews on the nurse’s perception of patient safety would have been valuable to the study.

In this study triage nurse’s experience proved to contribute to patient safety in emergency departments. However, an experienced nurse might fail to notice important parameters through over-reliance on his or her own reasoning. On the other hand, there is a risk that triage models may miss a patient’s serious condition. Experience together with MTS minimizes the risk of patient’s complications or early death as well as to identify the need for hospital care.

**Competing interests**

There are neither competing interests nor conflicts of interest.

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References


31. Cone K. The development and testing of an instrument to measure decision making in emergency department triage nurses. Faculty of the Graduate School Missouri; St Louis University; 2000.


23.


42. Altman DG. Practical statistics for medical research. London: Chapman & Hall.


APPENDIX: Questionnaire (reduced and translated from Swedish, likert scales not presented)

Demographics
Your Age? For how long have you been working as registered nurse? For how long have you been working with triage assessment?

Work contentment in general
Do you find your work interesting? Do you find your work stimulating? Are you given opportunities to take initiatives at your work? Are you able to make your own decisions at work? Is it your opinion that; “you have a good work environment”?

Educational level
Have you attended and/or graduated from any additional medical courses? Have your employer offered you any additional training in triage during the last six months? Have you attended any additional training based on simulated patient cases? Do you feel the need for commence and additional triage training – generally? Do you feel the need for commence and additional triage training based on simulated patient cases?

General attitudes related to triage
Is it your opinion that: A triage nurse should possess certain characteristics? If often or sometimes: Give an example Is it your opinion that: A triage nurse should possess these characteristics (in order to minimize patient complications or early death as well as to identify the need for hospital care)? Triage assessment is a nursing task? If never or seldom: Explain…

Working conditions related to the triage assessment task
What was your attitude towards the implementation of Manchester triage? Is it our opinion that: You get sufficient time to evaluate and interpret the information you get from the patient You have sufficient time to evaluate the triage decision You get support gained for the task (from your colleagues and staff at the ED) You have a good cooperation with all the other staff when you are responsible for the triage task

MTS the method
Is it our opinion that: It is difficult to use the Manchester triage system The MTS is a reliable method MTS minimize patient complications or early death as well as to identify the need for hospital care? Every (all nurses) can learn how to practice MTS Not every nurse is suited to work with triage Any nurse can, by training, become more competent in their triage assessment task

Work satisfaction related to the triage assessment
Is it our opinion that: There is a need for triage at your ED Manchester triage is the key to (lead to) a more “prompt” care of the patient The patients are more content after the implementation of Manchester triage It is patient safe to work /perform according to MTS

Describe a triage assessment that you perceive satisfactory Describe a triage assessment that you perceive as unsatisfactory
## Table 1  Bivariate regression

<table>
<thead>
<tr>
<th></th>
<th>Pearson's R</th>
<th>R-square</th>
<th>F-value</th>
<th>T-value</th>
<th>Sign.</th>
<th>Sign.95%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Competence as a facilitator to patient safety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Experience</td>
<td>0.73</td>
<td>0.54</td>
<td>81.16</td>
<td>2.24</td>
<td>0.03</td>
<td>sign</td>
</tr>
<tr>
<td><strong>MTS as a facilitator to patient safety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. MTS as a reliable method</td>
<td>0.65</td>
<td>0.42</td>
<td>50.00</td>
<td>7.07</td>
<td>0.00</td>
<td>sign</td>
</tr>
<tr>
<td><strong>Other contributors to patient safety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Sufficient time in the triage situation</td>
<td>0.24</td>
<td>0.06</td>
<td>4.41</td>
<td>5.21</td>
<td>0.04</td>
<td>sign</td>
</tr>
<tr>
<td>D. Sufficient time for analysis</td>
<td>0.26</td>
<td>0.08</td>
<td>5.07</td>
<td>2.25</td>
<td>0.03</td>
<td>sign</td>
</tr>
<tr>
<td>E. Support gained for the task</td>
<td>0.31</td>
<td>0.10</td>
<td>7.44</td>
<td>3.59</td>
<td>0.01</td>
<td>sign</td>
</tr>
<tr>
<td>F. Good cooperation at the emerg. dept.</td>
<td>0.21</td>
<td>0.04</td>
<td>3.07</td>
<td>1.54</td>
<td>0.13</td>
<td>not sign</td>
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</tbody>
</table>
### Table 2  Multiple regression

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>R-square 0.65</th>
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</thead>
<tbody>
<tr>
<td>A. Experience</td>
<td>0.73</td>
</tr>
<tr>
<td>B. MTS as a reliable method</td>
<td>0.65</td>
</tr>
<tr>
<td>C. Sufficient time in the triage situation</td>
<td>0.24</td>
</tr>
<tr>
<td>D. Sufficient time for analysis</td>
<td>0.26</td>
</tr>
<tr>
<td>E. Support gained for the task</td>
<td>0.31</td>
</tr>
</tbody>
</table>
Fig. 1.

A \hspace{1cm} B \hspace{1cm} C

experience \hspace{1cm} triage model
Ethics

The study complied with ethical procedures according to Swedish law, and the Declaration of Helsinki. Participants in the intervention group were selected by senior managers and by the human resource departments. The survey contained an introductory letter where the background of the study was described. It contained detailed instructions and information stating that participation was voluntary. Participants were informed that they were free to withdraw at any time. They were assured of strict confidentiality and secure data storage. Swedish statutes do not require ethics approval for research that does not involve a physical intervention that affects the participants.