Effectiveness of the Manchester Triage System on time to treatment in the emergency department: a systematic review protocol

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Review question/objective: The review aims to find the best available evidence on the effectiveness of the Manchester Triage System on time to treatment in the emergency department.

Keywords Emergency department; Manchester Triage System; time to treatment

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Background

Emergency department (ED) overcrowding with patients suffering from illnesses of increasing severity is common in countries worldwide and threatens public health and safety.[1] From 1994 to 2011, visits to American hospital EDs increased from 93.4 million to 136.2 million, representing a 45.8% increase.[2,3] These data confirm the importance of triage and that the use of criteria to determine case severity can prevent emergency situations from escalating due to long wait times.[4] Triage, or risk classification, is a clinical management tool used by emergency service providers to guide patient flow when the need for medical attention exceeds the available resources.[5]

Several countries have introduced triage systems, and the most commonly used include the Australian Triage Scale, Canadian Emergency Department Triage and Acuity Scale, Manchester Triage System (MTS) and Emergency Severity Index.[6] The MTS is an important tool that is used to ensure patient safety by determining the wait time suitable for every patient who comes to the ED.[5-7] In 1997, the MTS was created in Manchester, United Kingdom (UK), by the Manchester Triage Group. This group was established in 1994 by a group of physicians and nurses, and the aim was to organize the UK urgent care system and establish a consensus for a triage pattern. In the following years, the MTS was introduced in the UK and other countries in Europe. The MTS is based on evidence from and conforms to international standards of good practice.[6] It shows good results regarding validity, sensitivity, specificity and reproducibility in urgent and emergency services.[8-14]

The MTS has been validated in numerous studies.[15,16] Despite the occurrence of under- and over-triage, studies show good validity for adult and pediatric patients, including patients with coronary syndrome and pulmonary embolism.[10,12,17-19]

Despite these findings, one study published in 2016 showed that the MTS misclassified a substantial number of children requiring intensive care unit admission. However, this study used MTS with modifications for febrile children and did not consider two new flow charts present in the latest edition of the MTS that are specifically aimed at neonates and young children.[20]

The MTS is composed of 55 flowcharts and uses a methodology that defines clinical priority by determining the maximum allowed waiting time for the different levels of urgency: emergent (red) needs immediate medical evaluation, very urgent (orange) within 10 min, urgent (yellow) within 60 min, standard (green) within 120 min and non-urgent (blue) up to 240 min.[21] The MTS logic is that more serious cases must have less waiting time for medical care and, therefore, shorter time to starting treatment.

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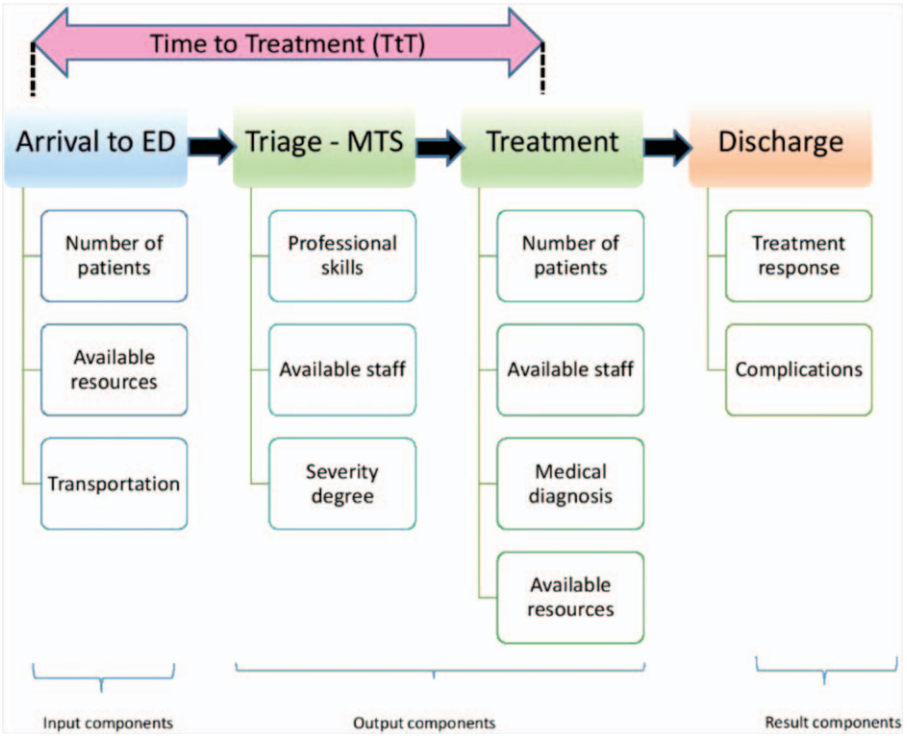

Figure 1: Factors that affect Time to Treatment (TtT) in hospitals, according to the linear logic model. ED: Emergency department; MTS: Manchester triage system

Time to treatment (TtT) is the time interval between symptom onset and therapy initiation. This term is also used to describe the time between a patient's arrival to the ED and receipt of therapy as antibiotics, analgesia and procedures.[22] A shorter TtT is critical to treatment success for many conditions, for example, acute coronary syndromes and sepsis.[23] Factors such as patient acuity and staff qualification can influence TtT. Several studies have correlated ED crowding with an increased TtT.[24-26]

Priority levels can be used to adjust TtT. One study of patients with myocardial infarction found that cases classified as severe were treated more quickly.[27] This demonstrates that correct triage of patients in the ED is critical in adjusting TtT. For example, in patients with ST-segment-elevation myocardial infarction, the fundamental objective is to minimize the time between symptom onset and initial reperfusion therapy (door-to-needle or door-to-balloon time).[27] Reduced time to receive antibiotics has been shown to reduce mortality due to severe sepsis and septic shock.[28,29]

Many factors can interfere in TtT, and the triage system is only one of the factors that can affect these outcomes. Patient age, health condition severity, available staff and available resources are factors that can also interfere with TtT.[30] The influential factors are represented in the linear logic model (Figure 1). All of these factors require consideration as they may affect TtT.

Evaluating and understanding the available evidence regarding the effectiveness of the MTS in reducing TtT in the ED may help to improve patient safety.

Input components are determined by patient demand in the ED and can influence results. Output components are factors that can affect service capacity to achieve favorable patient outcomes. Result components are those that may influence the initially proposed outcome. The linear logic model shows how the input and output components can influence TtT.

Some studies investigating TtT after use of triage systems show lower TtT in urgent screening levels.[31,32] One study investigated the delay between arrival at emergency and discharge, assessing TtT before and after the implementation of the MTS. This study concluded that wait times were better

distributed across urgency levels but that triaging patients resulted in a shorter TtT. Information obtained from triage could lead to more efficient initiation of treatment.[31] Another study investigated the times between emergency arrival, and diagnosis and onset of treatment using the MTS. This study found an association between higher MTS categories and TtT, with high triage levels presenting lower TtT.[32]

Time to treatment was also the focus of a study that evaluated patients with acute myocardial infarction and assessed the influence of the MTS on time to access reperfusion therapy. This study showed longer TtT due to incorrect classification by the MTS of patients with ST-segment-elevation myocardial infarction.[27]

Another study investigated the different phases of emergency care, including TtT. This study found that patient mode of arrival influenced TtT.[33]

A search for systematic reviews or protocols about triage and TtT was conducted at the beginning of 2016, which included the MEDLINE, CINAHL, LILACS, Web of Science, Embase, Scopus, PROSPERO and Cochrane databases but did not find any reviews specifically focusing on this subject. One systematic review evaluated the efficacy of the MTS on patient risk classification and described and analyzed its use through the identification of relevant articles but did not consider the influence of the MTS on TtT.[18] Two systematic reviews published in 2011 evaluated the influence of triage-related interventions on patient flow in the ED.[4,34] However, the focus of these reviews was not on evaluating a specific triage system; the studies described triage but did not refer to a specific triage system such as the MTS.

The abovementioned studies evaluated different triage systems or different outcomes with respect to the MTS (e.g. time to doc).[4,18,34] Time to doc or time to doctor is the time to first examination by a doctor for patients attending an ED.[35] The current review will differ from these studies in that it will focus primarily on assessing the effect of a specific triage system (MTS) on TtT.

A sufficiently short TtT is necessary to avoid complications. For example, shorter TtT of patients with ST-segment-elevation myocardial infarction is associated with reduced mortality and morbidity.[27] It is expected that the MTS can determine the correct priority for medical care and that with its use, patients with more severe conditions will experience shorter TtT.

Inclusion criteria

Participants

The current review will consider studies that include patients (adults or children) visiting the ED with any complaints or medical diagnoses that have been classified by the MTS and in which TtT is measured.

Comparator and intervention(s)/phenomena of interest

The current review will consider studies that evaluate the use of the MTS by nurses or doctors without modification for patient risk classification. Studies comparing the use of MTS with other triage systems or the absence of triage systems will be included.

Outcomes

The current review will consider studies that include the following outcomes: TtT (interval between ED arrival and receipt of medical treatment) for patients who have been evaluated by the MTS.

Study types

The current review will include experimental and epidemiological study designs, including randomized controlled trials, non-randomized controlled trials, quasi-experimental studies, before and after studies, prospective and retrospective cohort studies, and analytical cross-sectional studies.

Search strategy

The search strategy aims to find both published and unpublished studies. A three-step search strategy will be performed in this review. An initial limited search of MEDLINE and CINAHL will be followed by an analysis of the text words contained in the title and abstract, as well as the index terms used to describe the article. Second, a search using all identified keywords and index terms will then be performed across all included databases. Third, the reference list of all identified reports and articles will be searched for additional studies. Studies published in English, Spanish, Portuguese, French and German will be considered for inclusion in this review. Studies published after 1994 (year that Manchester Triage Group was created) will be considered for inclusion in this review.

The databases to be searched include MEDLINE, CINAHL, LILACS, Web of Science, Embase, Scopus and Cochrane Register of Control Trials.

The search for unpublished studies will include Google Scholar, ProQuest Dissertations and Theses, Banco de Teses – CAPES and Digital Dissertations.

Initial keywords will include: Manchester Triage, emergency, time-to-treatment, time, waiting times, door-to-needle, door-to-balloon, time to antibiotics, time to analgesia

Assessment of methodological quality

Papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI) (Appendix I). Any disagreements that arise between the reviewers will be resolved through discussion or by a third reviewer.

Data extraction

Data will be extracted from papers included in the review using the standardized data extraction tool from JBI-MAStARI (Appendix II). The data extracted will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

Data synthesis

Quantitative data will, wherever possible, be pooled into a statistical meta-analysis using JBI-MAStARI. All results will be subject to double data entry. Effect sizes will be expressed as odds ratios for categorical data (triage categories); weighted mean differences and 95% confidence intervals will be calculated for continuous data. Heterogeneity will be assessed statistically using the standard Chi-square test and explored using subgroup analyses based on the different study designs included in this review. Where statistical pooling is not possible, the findings will be presented in narrative form, including tables and figures to aid in data presentation where appropriate.

Subgroup analyses will be conducted to consider patients with specific pathologies such as trauma or myocardial infarction; additional analyses to assess groups with different degrees of severity or triage categories will be considered.

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Appendix I: Appraisal instruments

MAStARI appraisal instrument

JBI Critical Appraisal Checklist for Randomized Controlled Trials

Reviewer_____Date_____.

Author _____Year_____Record Number _____.

	Yes	No	Unclear	NA
1. Was true randomization used for assignment of participants to treatment groups?	☐	☐	☐	☐
2. Was allocation to treatment groups concealed?	☐	☐	☐	☐
3. Were treatment groups similar at the baseline?	☐	☐	☐	☐
4. Were participants blind to treatment assignment?	☐	☐	☐	☐
5. Were those delivering treatment blind to treatment assignment?	☐	☐	☐	☐
6. Were outcomes assessors blind to treatment assignment?	☐	☐	☐	☐
7. Were treatments groups treated identically other than the intervention of interest?	☐	☐	☐	☐
8. Was follow-up complete, and if not, were strategies to address incomplete follow-up utilized?	☐	☐	☐	☐
9. Were participants analysed in the groups to which they were randomized?	☐	☐	☐	☐
10. Were outcomes measured in the same way for treatment groups?	☐	☐	☐	☐
11. Were outcomes measured in a reliable way?	☐	☐	☐	☐
12. Was appropriate statistical analysis used?	☐	☐	☐	☐
13. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

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JBI Critical Appraisal Checklist for Case Series

Reviewer_____Date_____

Author _____Year_____Record Number _____

	Yes	No	Unclear	Not applicable
1. Were there clear criteria for inclusion in the case series?	☐	☐	☐	☐
2. Was the condition measured in a standard, reliable way for all participants included in the case series?	☐	☐	☐	☐
3. Were valid methods used for identification of the condition for all participants included in the case series?	☐	☐	☐	☐
4. Did the case series have consecutive inclusion of participants?	☐	☐	☐	☐
5. Did the case series have complete inclusion of participants?	☐	☐	☐	☐
6. Was there clear reporting of the demographics of the participants in the study?	☐	☐	☐	☐
7. Was there clear reporting of clinical information of the participants?	☐	☐	☐	☐
8. Were the outcomes or follow up results of cases clearly reported?	☐	☐	☐	☐
9. Was there clear reporting of the presenting site(s)/clinic(s) demographic information?	☐	☐	☐	☐
10. Was statistical analysis appropriate?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

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JBI Critical Appraisal Checklist for Cohort Studies

Reviewer_____Date_____

Author _____Year_____Record Number _____

	Yes	No	Unclear	Not applicable
1. Were the groups similar and recruited from the same population?	☐	☐	☐	☐
2. Were the exposures measured similarly to assign people to both exposed and unexposed groups?	☐	☐	☐	☐
3. Was the exposure measured in a valid and reliable way?	☐	☐	☐	☐
4. Were confounding factors identified?	☐	☐	☐	☐
5. Were strategies to deal with confounding factors stated?	☐	☐	☐	☐
6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?	☐	☐	☐	☐
7. Were the outcomes measured in a valid and reliable way?	☐	☐	☐	☐
8. Was the follow up time reported and sufficient to belong enough for outcomes to occur?	☐	☐	☐	☐
9. Was follow-up complete, and if not, were the reasons to loss to follow-up described and explored?	☐	☐	☐	☐
10. Were strategies to address incomplete follow-up utilized?	☐	☐	☐	☐
11. Was appropriate statistical analysis used?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

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JBI Critical Appraisal Checklist for Case Control Studies

Reviewer_____Date _____.

Author _____Year_____Record Number_____.

	Yes	No	Unclear	Not applicable
1. Were the groups comparable other than the presence of disease in cases or the absence of disease in controls?	☐	☐	☐	☐
2. Were cases and controls matched appropriately?	☐	☐	☐	☐
3. Were the same criteria used for identification of cases and controls?	☐	☐	☐	☐
4. Was exposure measured in a standard, valid and reliable way?	☐	☐	☐	☐
5. Was exposure measured in the same way for cases and controls?	☐	☐	☐	☐
6. Were confounding factors identified?	☐	☐	☐	☐
7. Were strategies to deal with confounding factors stated?	☐	☐	☐	☐
8. Were outcomes assessed in a standard, valid and reliable way for cases?	☐	☐	☐	☐
9. Was the exposure period of interest long enough to be meaningful?	☐	☐	☐	☐
10. Was appropriate statistical analysis used?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

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Appendix II: Data extraction instruments

MAStARI data extraction instrument

JBI Data Extraction Form for Experimental / Observational Studies

Reviewer _____ Date _____

Author _____ Year _____

Journal _____ Record Number _____

Study Method

RCT ☐ Quasi-RCT ☐ Longitudinal ☐

Retrospective ☐ Observational ☐ Other ☐

Participants

Setting

Population

Sample size

Group A _____ Group B _____

Interventions

Intervention A

Intervention B

Authors Conclusions:

Reviewers Conclusions:

