Quality of reporting in trauma triage prediction model studies in the adult population: protocol for a systemic review.

Administrative information
Registration
The systemic review protocol was registered with the International Prospective register of Systemic Reviews (PROSPERO), on …

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Contributions
MG is the guarantor of the review. AE is drafting the manuscript. MG along with experienced librarians will develop the search strategy for the review. AE, AA, BM, and MG will contribute to the development of the selection criteria and data extraction criteria. AA and AE will extract the data. BM will provide expertise in the methodology of the review.

Amendments
If an amendment is needed in this protocol a date of each amendment will be provided along with description of the change and the rationale for it.

Support
Sources
MG is funded by Karolinska Institutet.

Sponsor
MG will receive a set monetary compensation for work hours from Örebro University by supervising this review. The research for this systematic review will be based in Karolinska Institutet, and the data collected will be registered there accordingly.

Role of sponsor and/or funder
Örebro University and Karolinska Institutet will only provide minor general guidelines on how to develop the study, such as timeframe. They are not involved in any major aspect of the project, such as the design of the project’s protocol, search strategy, the collection of and analysis of articles. The sponsor/funder will have no input on the interpretation or publication of the study results. There is no risk for sponsor/funder bias in the review.
Introduction

Rationale
Trauma accounts for almost nine percent of total global mortality and is a major portion of the global disease burden [1]. An international comparison associated increased pre-hospital times and a higher risk of mortality with poorer nations and identified a need for additional efforts in pre-hospital and emergency care in low- and middle-income countries [2]. Hence, there is a substantial need for cheap and effective methods to decrease trauma-related morbidity and mortality, especially in countries without established trauma systems [3].

Structured triage may be one such method. Today pre-hospital and hospital trauma triage processes are integral parts of many trauma systems and aim to help health care providers optimally treat and transport patients [4]. These processes can be based upon multivariable prediction models that use patient and injury characteristics to predict the risk of specific patient outcomes [5-7]. One systematic review identified five trauma prediction models to be used for triage and noted that the general quality of study design needs improvements [8].

Poorly designed and executed prediction research can give reason to doubt the use of such models. Since the previous systematic review was published new models have been added to the literature [8], and there are now guidelines that can be used as a tool for a structured assessment of such studies [9].

Objectives
To identify studies that describe the development and/or validation of clinical prediction models aimed for triage of adult trauma patients and to assess the quality of reporting in these studies. We aim to answer the following questions:

1. What prediction models aimed for triage of adult trauma patients have been published?
2. What is the general quality of reporting in prediction model studies of trauma triage if checked with appropriate guidelines?
3. Are there any patterns in the quality of reporting specific items in prediction model studies of trauma triage?

Methods

Eligibility criteria
We will include all original research studies that in full or in part can be classified according to the Transparent reporting of a multivariable prediction model for individual prognosis or diagnosis (TRIPOD) statement [9], i.e. as:
1a Development only
1b Development and validation using resampling
2a Random split-sample development and validation
2b Nonrandom split-sample development and validation
3 Development and validation using separate data
4 Validation only

We will include studies reporting the development or validation, including comparison, of clinical prognostic prediction models for triage of adult trauma patients. The outcomes of the studies need to be short-term patient specific (i.e. mortality, risk of intubation, need for intensive care or massive transfusion), and not long-term effects (i.e. need for rehabilitation, 1-year mortality, long-term morbidity).
We will exclude studies reporting only on a paediatric patient population, here defined as < 15 years, and on specific parts of the adult population, i.e. geriatric patients. Studies that describe the development of triage algorithms that include more than one predictor but do not combine these predictors will also be excluded, as will studies for triage of patients with specific injuries (such as thoracic injuries or major bleeding) or specific trauma mechanisms only (such as road traffic injury). We will exclude studies not published in English or without online abstract. There will be no restrictions on the timing or setting of the study.

**Information sources and search strategy**

We will search for all original studies on trauma triage prediction models. The specific search strategy will be developed by the university library search consultation group at Karolinska Institutet in dialogue with us. We will search Medline, Embase, Web of Science Core Collection and Cochrane Library using appropriate search terms (i.e. trauma, triage, predict, model, prognos). Grey literature will not be searched. References of included studies will be checked for additional studies not presented in the original search.

The full search strategy report can be viewed in appendix 1.

**Study records**

*Data management*

We will use Mendeley and Microsoft Excel to organize the included and excluded studies in this review, and extract data using an a priori designed Qualtrics survey. Data will be analysed in R.

*Selection process*

Two authors, AA and AE, will independently screen the studies for inclusion in a three-stage process: including and excluding studies by titles, then by to abstract, and then by the full text. Disagreements in inclusion and exclusion during the title and abstract screening phases will be resolved by including the study. Disagreements in full text review will be resolved by discussion primarily or by a third reviewer (MG or BM). We will attempt to contact the authors of the full text reports by email if we have any questions regarding eligibility. All reasons for exclusion will be reported.

*Data collection process*

Data collection will be performed independently by two authors, AE and AA. Data will be collected in Qualtrics and will include the TRIPOD checklist items, study ID, author names, primary author affiliation, journal of publication, date of publication, country of origin and setting of the studies. The TRIPOD items will be graded as present, absent, not applicable, or unclear. When graded as unclear we will provide our rationale for this grade. Whenever present the actual item data will be extracted from selected items of special interest for analysis (appendix 2). Disagreements will be resolved by discussion and if needed by including a third senior reviewer (MG). We will attempt to contact the authors of the full text reports by email if we have any questions in the data collection process.

*Data items*

The studies included will be divided into three major categories; model development (type 1a and 1b), model development and validation (type 2a, 2b and 3) and validation only (type 4) according to TRIPOD. The correct TRIPOD checklist will be used for the corresponding
category of studies (appendix 3). TRIPOD is a 22 item checklist with a total number of 31, 37 and 31 item points for each of the three categories respectively.

In addition to the TRIPOD items we will also extract study ID, authors, author affiliation, journal of publication, date of publication, country of origin and setting of the study.

**Outcomes and prioritization**
The outcome of this review is to investigate to what extent the TRIPOD items are reported in trauma triage prediction model studies.

**Risk of bias in individual studies**
TRIPOD does not include bias assessment as an item, however, the developers of TRIPOD states that the checklist is a method to enable bias assessment [10]. Since the objective of this study is to investigate the quality of reporting in the included studies, a summarized risk of study bias and how it affects this systematic review is not as relevant. The risk of bias will not be directly addressed in this review but will be brought up for discussion.

**Data Synthesis**
The objective for this study is to evaluate the quality of reporting in prediction model studies of trauma triage, thus making narrative synthesis the preferred way of presenting results. Summary characteristics of specified checklist items is considered in this review and may be presented quantitatively, as medians with associated inter-quartile ranges or proportions as appropriate, or visually using appropriate plot types.

**Meta-bias(es)**
This review will not search for unpublished studies or in grey literature. We will hand-search included studies’ reference lists for additional relevant studies. The searches will have no restrictions to country of origin or setting, however, only studies in English will be available for inclusion. There will be no retrospective time restriction for the search. Since the objective of this review is to evaluate the quality or reporting and not specific outcomes in included studies, the risk for meta-bias affecting review outcome is small.

**Confidence in cumulative evidence**
Using a recommended model to summarize the confidence in the body of evidence is not necessary in this review. The reason being that the objective of this review is not to provide clinical guidelines but rather give an insight to the quality of reporting in publications. We are not planning to do a meta-analysis.

**Appendix 1**
Full search strategy report

**Appendix 2**
Data extraction items in TRIPOD checklist.

**Appendix 3**
TRIPOD for model development
TRIPOD for model validation
TRIPOD for model development and validation


