Assessing trauma care health systems in low- and middle-income countries, a protocol for a systematic literature review and narrative synthesis

John Whitaker1*, Max Denning2, Nollaig O’Donohoe3, Dan Poenaru4, Elena Guadagno4, Andy Leather1 and Justine Davies1,5,6

Abstract

Background: Trauma represents a major global health problem projected to increase in importance over the next decade. The majority of deaths occur in low- and middle-income countries (LMICs) where survival rates are lower than their high-income country (HIC) counterparts. Health system level changes in care for injured patients have been attributed to significant improvements in care quality and outcomes in HIC settings. There is a need for further research to assess trauma care health systems in LMICs to inform health system strengthening for the care of the injured. This study aims to conduct a narrative synthesis of a systematic search of the literature on the assessment of trauma care health systems in LMICs in order to inform the further development of trauma care health system assessment.

Methods: The review will include primary quantitative, qualitative or mixed method studies and secondary literature reviews. No restriction will be placed on language or date. Reports and publications identified from the grey literature including from relevant national and international health organisations will be included. Articles will be screened by two independent reviewers with a third reviewer resolving any persisting disagreement. The search will reveal heterogenous studies not suitable for meta-analysis. A narrative synthesis of the identified papers will be conducted to identify key methodological ideas and paradigms used to assess trauma care health systems. The analysis will consider how the differing methodological approaches could be adopted to understand barriers and delays to seeking, reaching and receiving care within a “Three Delays” framework. An iterative approach will be adopted to categorise identified articles, with the results presented as both within and across study analysis.

Discussion: The results of the review will be disseminated through publication in a peer-reviewed academic journal. The study forms part of a PhD project. The results will inform the development of a trauma care health system assessment applicable to LMICs. As this is a review of secondary data, no formal ethical approval is required.

Systematic review registration: PROSPERO CRD42018112990

Keywords: Trauma, Injury, Health system, Assessment, Evaluation, LMIC, Low-income country, Middle-income country
Background

Rationale

Trauma represents a major global health problem with injuries accounting for more deaths than TB, malaria and HIV combined and with 90% of these deaths occurring in low- and middle-income countries (LMICs) [1]. Along with other non-communicable diseases, death from trauma is set to increase with some projecting road traffic collisions to be the third leading cause of death by 2030 [2]. Non-fatal injuries are common, with 1 billion people sustaining an injury in 2013 that warranted health care [3]. There is also considerable global variation in injury-related morbidity. Disability-adjusted life years (DALYs) in children are 9 times greater in sub-Saharan Africa compared to those in high-income Asia Pacific counterparts [3], likely due to both differences not only in preventative measures but also in the injury care available from health systems. Indeed, if the survival rates following injury in LMICs were to be improved to the rates seen in HICs, the estimated one third of annual global trauma deaths could be avoided [4].

Considering and developing the whole system of trauma care from point of injury to rehabilitation services has resulted in significant improvements in trauma care in high-income country (HIC) settings. Such improvements were particularly amongst the most severely injured [5–7]. Although prevention is rightly a key focus on reducing the global burden of injuries, better trauma care through system improvement could lead to major reductions in global trauma associated mortality and has been strongly advocated [4, 8]. Furthermore, trauma care has been considered a tracer condition that can be useful in assessing wider emergency health system performance [9, 10]. The World Health Organization (WHO) advocates that promoting essential trauma care will concurrently promote wider health care system improvements beneficial for other urgent surgical and non-surgical emergencies [11]. The Lancet Global Health Commission on High Quality Health Systems has highlighted the disparity between global burden of injuries and the lack of available data on care quality provided by health systems. Better assessment of such care is one of the commission’s stated research priorities [10].

The WHO defines health systems as the “organisations, people and actions whose primary intent is to promote, restore or maintain health” [12]. Health systems have been described as complex adaptive systems that may respond in non-linear, unpredictable ways to interventions [13]. Health systems consist of an intricate web of relationships between the component parts, embedded within social institutions with human behaviours influencing performance and function [14]. Understanding existing health systems, through their assessment, is important to inform impactful health system improvement efforts [15]. Many different frameworks for describing and understanding health systems exist. Such frameworks have their origins in differing paradigms of understanding and sociopolitical backgrounds [16]. Whilst a universal framework for understanding such complex systems may therefore not exist, choosing a particular health system framework of understanding should be done to fit a purpose [16]. One particular framework that has had success in improving understanding and outcomes in maternal mortality is the “Three Delays” model. It was developed to help evaluate the delays to care driving adverse outcome in maternal mortality in LMICs [17]. The framework has been widely adopted in the field of maternal, neonatal and child health in an attempt to evaluate and drive improvements in care [18–22]. It has also been proposed as a framework through which to evaluate emergency healthcare in LMICs including trauma [23]. The Three Delays framework considers the barriers that result in delays in seeking care (delay 1), reaching care (delay 2) and receiving appropriate care (delay 3) [17].

In order to inform the development of future trauma care health system assessment, we will undertake a review of the existing literature on assessing trauma care health systems. Applying the Three Delays framework of analysis to this literature review will allow future development of a health system assessment strategy based on this approach.

Objective

The objective is to conduct a narrative synthesis of a systematic search of the literature on the assessment of trauma care health systems through a Three Delays model framework of understanding, in order to inform the development of trauma care health system assessment.

Methods

The 2015 guidelines for Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) have been followed in the design of this protocol (Additional file 1). Any amendments to the protocol, although not anticipated, will be reported when publishing the results. This literature review protocol has been registered with PROSPERO reference number CRD42018112990. It is anticipated the review will be complete by Dec 2019. The study is
part of a PhD project, supported by King’s Centre for Global Health and Health Partnerships, Royal College of Surgeons of England and the UK Defence Medical Services.

**Eligibility criteria**
We will include primary quantitative, qualitative or mixed method studies and secondary literature reviews. No restriction will be placed on language or date. We will also include reports and publications identified from the grey literature including from relevant national and international health organisations (listed in Appendix 1). The inclusion and exclusion criteria are illustrated in Table 1.

**Search methods**
A comprehensive search strategy has been developed to electronically search the following databases from inception: MEDLINE (Ovid), Global Health (Ovid), Embase (Ovid), Web of Science (Clarivate Analytics), Cochrane (Wiley), Global Index Medicus (WHO) and Africa Wide Information (Ebsco). The MEDLINE example can be found in Appendix 2, and the full strategy is available on request. The search strategy uses variations in text words found in the title, abstract or keyword fields, and relevant focused subject headings to retrieve articles combining the concepts of (1) trauma, including disaster planning, mass casualty incidents or emergency care along with (2) various types of assessments, evaluations, benchmarking or tools used to create or improve (3) health system programmes. Three-delay models, rapid assessments and verbal or social autopsies will also be verified. Animal studies will be excluded. Articles will be initially collated in Endnote X8 for de-duplication of results. Screening of abstracts and titles will be done collaboratively using the Rayyan QCRI online open-source web application [24]. There is no agreed gold standard for searching the grey literature; however, a four-stage approach has been advocated for seeking relevant grey literature articles [25]. These complementary approaches are searching of grey literature databases, a customised Google search, targeted websites and consultation with experts [25]. We will search the following grey literature databases using the search terms “trauma” OR “injury” AND “assessment” OR “evaluation” AND “health system” modified according to the database requirements. The grey literature databases to be searched are OpenGrey, WorldCat Dissertations and Theses (OCLC) and New York Academy of Medicine Grey Literature Report and Core. We will use advanced Google searches both with and without limiting the domains to .org, .edu, .int and .gov using combinations of the terms “trauma”, “injury”, “assessment”, “evaluation” and “health system”. The top 50 sites will be screened for relevant articles for each search. We will search the specific websites listed in Appendix 1 using the same search terms. We will also include any additional articles recommended by experts in health system research or trauma care that might inform our review. The reference lists of identified articles will be reviewed for any additional articles of relevance to include.

**Identification of studies**
Key term screening within the Rayyan application will be used to remove any clearly identified as animal or cellular studies. Following piloting of the study selection process, two reviewers will independently screen the

| Table 1 Tabulated inclusion and exclusion criteria for selecting articles for review |
|---------------------------------|------------------|-----------------|---------------------------|
| Include | Exclude | |
| Type of article | Primary quantitative, qualitative or mixed method study | Case reports, academic letter, correspondence or conference proceedings |
| | Literature review | |
| | Report or guideline from national or international health organisation | |
| Type of conditions or care setting | Trauma and injury (used interchangeably) care | Mental health Non-urgent care, primary care, elective care as the main focus of assessment Non-trauma emergency care Non-accidental injury in children Disaster management |
| Subject of study | Whole health system assessment | Measurement of population health profiles and patterns |
| | Assessment of health-seeking behaviour | Research evaluating interventions, diagnostic tests, medicines or technologies |
| | Assessment of community perception of health care access and quality | |
| | Assessment of health system access | |
| | Assessment of health system care quality including technical and patient-centred care | |
| Study setting according to World Bank Income Classification 2018 | Includes low- or lower middle- or upper middle-income country | High-income country only |
articles identified, firstly by title and then abstract. Disagreements over eligibility will be discussed in order to achieve consensus. Where disagreement persists, a third reviewer will arbitrate. Full texts of the abstracts will be obtained and assessed for eligibility by two reviewers. Articles not in English will be translated using Google translate where possible. Articles meeting eligibility criteria will proceed to data extraction. Reasons for exclusion will be recorded. Each grey literature database search, Google search, focused website search and expert request will be conducted by one reviewer with a second reviewer confirming eligibility of identified articles. The level of reviewer agreement will be presented in the final report.

Risk of bias
This review is primarily focused on the methodological approach identified in the article and aims to understand a wide breadth of diverse research approaches used to assess trauma care health systems. The quality of conduct of each specific study and the trustworthiness of results and findings for each article are therefore less important.

Data extraction
A standardised extraction form will be developed and piloted. Information to be extracted will include author; publication year; study type; study clinical focus; conceptual framework used if applicable; which of the three delays are assessed if applicable; the country location; the methodological approach; and author reported strengths and limitations, including time, pragmatism and cost if reported. Two authors will extract the information independently with a third arbitrating in the case of unresolved disagreement.

Analysis of results
The search will reveal heterogeneous studies. Meta-analysis of study findings is not a study objective. A narrative synthesis of the identified papers will be conducted to identify key methodologies used to assess trauma care health systems. The analysis will consider how the differing methodological approaches could be adopted to evaluate barriers and delays to care within a Three Delays framework to best understand trauma care health systems. The methods identified will also be assessed for their suitability to be employed in a rapid assessment, specifically their relative resource requirements including time taken to undertake, pragmatism and cost. An iterative approach will be adopted to categorise identified articles, with the results presented as both within and across study analysis.

Discussion
This narrative synthesis of a systematic search of the literature will summarise the established approaches for assessing trauma care health systems. As part of a PhD project, it will be used to inform the development of a Three Delays model health system assessment of trauma care health systems in LMICs. It is hoped that it will facilitate other health system researchers to develop assessment strategies and facilitate health system strengthening for trauma care. To our knowledge, it is the first attempt to synthesise the literature on health system assessment methods for trauma care.

Appendix 1
List of relevant national and international health organisations’ websites to search

- World Health Organization
- World Bank
- USAID
- United Nations Educational Scientific and Cultural Organization
- Medicins Sans Frontiers
- International Committee of the Red Cross
- The International Federation of Red Cross and Red Crescent Societies
- International Federation of Emergency Medicine
- African Federation of Emergency Medicine
- Asian Society of Emergency Medicine
- International Association for Trauma Surgery and Intensive Care
- College of Surgeons of East, Central and Southern Africa
- G4Alliance

Appendix 2
Search strategy, developed for MEDLINE (Ovid), October 9, 2018.

MEDLINE [Ovid] (October 9, 2018)
Ovid MEDLINE(R) and Epub ahead of print, in-process and other non-indexed citations, Ovid MEDLINE(R) Daily <1946 to present>

<table>
<thead>
<tr>
<th>Query</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. exp &quot;Wounds and Injuries&quot;/</td>
<td>685,268</td>
</tr>
<tr>
<td>2. exp *Emergency Service, Hospital/</td>
<td>40,504</td>
</tr>
<tr>
<td>3. exp *Emergency Medicine/</td>
<td>9475</td>
</tr>
<tr>
<td>4. exp *Emergency Treatment/</td>
<td>67,739</td>
</tr>
<tr>
<td>5. exp *Emergency Medical Services/</td>
<td>82,657</td>
</tr>
<tr>
<td>7. *Traumatology/</td>
<td>2723</td>
</tr>
<tr>
<td>8. Traumatology/og, st, sn</td>
<td>889</td>
</tr>
</tbody>
</table>
Appendix 2 (Continued)

1. exp "Wounds and Injuries"/ 685,268
2. *Disasters/ 13,701
3. *Disaster Medicine/ 599
4. exp *Terrorism/ 8845
5. *Relief Work/ 2679
6. *Emergency Shelter/ 83
7. *Rescue Work/ 1344
8. or/1-7 845,684
9. exp *surveys and questionnaires/ 40,830
10. Interviews as Topic/ 55,343
11. *Needs Assessment/ 8221
12. exp *Quality Assurance, Health Care/og, st 29,186
13. Vital Statistics/ 5050
14. Medical Errors/ 15,457
15. *Registries/ 22,443
16. Injury Severity Score/ 14,406
17. *Hospitalization/sn 11,858
18. *Quality Improvement/ 9657
19. Benchmarking/ 12,274
20. *Quality Indicators, Health Care/ 7910
21. or/16-20 223,545
22. exp "Delivery of Health Care"/ or Delivery of Health Care/mt, st 591,826
23. exp *Health Services Accessibility/ 54,186
24. **Health Services Needs and Demand"/ 21,052
25. *outcome assessment (health care)/ 26,940
26. Medical Errors/ 9293
27. or/15-26 825,765
28. exp *quality assurance health services/ or Health Services Quality/ 14,406
29. Vital Statistics/ 11,858
30. exp *quality improvement health services/ or Health Services Quality Improvement/ 9657
31. Medical Errors/ 15,457
32. or/23-28 822,626
33. exp *Risk Assessment (Health Care)/ 5050
34. *Triage/ 13,979
35. *Risk Assessment/int 6076
36. *Risk Assessment/mt 57,581
37. *Trauma centers/st 4659
38. or/29-37 69,765
40. 15 and 28 and 40 470
41. or/23-39 2044
42. *Trauma Centers/st 1927
43. Triage/ or Triage/og or (Triage/ and Health Services ResearchV) 558
44. Program Evaluation/ 57,581
45. exp *Delivery of Health Care"/ or Delivery of Health Care/mt, st 591,826
46. or/41-48 8359
47. Animals/ not (Animals/ and Humans/) 4,469,363
48. ((animal or animals or cat or cats or dog or dogs or feline or hamster* or mice or monkey or monkeys or mouse or murine or pig or pigs or piglet* or porcine or primate* or rabbit* or rats or rat or rodent* or sheep*)) not (human* or patient*),ti,kf.
49. ((trauma* or postrauma* or emergency* or emergencies*) adj3 ((time* or length or duration*) adj1 (delay* or factor*)),ti,kf.
50. 49 not (50 or 51) 8266
51. from 52 keep 1-5000 5000
52. remove duplicates from 53 4992
53. from 52 keep 5001-8266 3266
54. remove duplicates from 55 3266
55. from 54 keep 56 3266
56. from 55 keep 57 8258
57. from 56 keep 58 8258

Additional file

Additional file 1: PRISMA-P checklist. (DOCX 22 kb)

Abbreviations
HIC: High-income country; LMIC: Low- and middle-income country

Acknowledgements
None

Authors’ contributions
JW, JD and AL conceived of the project, JW, JD, AL, DP and EG developed the study design, JW, DP and EG developed the search strategy, JW, JD, AL, MD and NOD refined the inclusion and exclusion criteria. All authors contributed to the manuscript and approve of the final version.

Funding
Financial support for this PhD project is provided by the Royal College of Surgeons of England, the King’s Centre for Global Health and Health Partnerships and the UK Defence Medical Services. The protocol was developed by the authors only, without influence from the supporting organisations.

Availability of data and materials
Not applicable

Ethics approval and consent to participate
Not applicable

Consent for publication
Not applicable

Competing interests
The authors declare that they have no competing interests.