



May 2017 – SUPPORT Summary of a systematic review

# Do pre-hospital trauma systems reduce mortality?

The majority of trauma deaths in low- and middle-income countries occur outside of hospitals. Improving pre-hospital trauma care, such as emergency care through first responders and timely transport to an appropriate facility, has been suggested as a mechanism for reducing mortality and morbidity.

## Key messages

- Pre-hospital trauma systems may reduce mortality.
- Pre-hospital trauma systems may reduce the response time from injury to first medical contact in the field.
- Most of the included studies were conducted in middle-income countries.



## Who is this summary for?

People deciding whether to introduce pre-hospital trauma systems

### ! This summary includes:

- **Key findings** from research based on a systematic review
- **Considerations about the relevance of this research** for low-income countries

### X Not included:

- Recommendations
- Additional evidence not included in the systematic review
- Detailed descriptions of interventions or their implementation

## This summary is based on the following systematic review:

Henry JA, Reingold AL. Prehospital trauma systems reduce mortality in developing countries: a systematic review and meta-analysis. The journal of trauma and acute care surgery. 2012;73(1):261-268.

## What is a systematic review?

A summary of studies addressing a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise the relevant research, and to collect and analyse data from the included studies

**SUPPORT** was an international project to support the use of policy relevant reviews and trials to inform decisions about maternal and child health in low- and middle-income countries, funded by the European Commission (FP6) and the Canadian Institutes of Health Research.

**Glossary of terms used in this report:**  
[www.supportsummaries.org/glossary-of-terms](http://www.supportsummaries.org/glossary-of-terms)

**Background references on this topic:**  
See back page

# Background

The immediate period after injury is when resuscitation and stabilization is most beneficial to the patient. There is therefore a brief window of time in which to provide emergency care and rapid transport to hospital of people with injuries, in order to reduce mortality and morbidity.

The capacity to provide this immediate, basic level of care is lacking in many poor countries. Pre-hospital trauma care involves a set of interacting elements that includes triage, airway management, oxygen administration, intravenous fluid administration, splinting, spinal immobilization, wound care and patient transport. Pre-hospital trauma care can be categorised into two approaches: (1) first responders, and (2) ambulance services.

## How this summary was prepared

After searching widely for systematic reviews that can help inform decisions about health systems, we have selected ones that provide information that is relevant to low-income countries. The methods used to assess the reliability of the review and to make judgements about its relevance are described here: [www.supportsummaries.org/how-support-summaries-are-prepared/](http://www.supportsummaries.org/how-support-summaries-are-prepared/)

## Knowing what's not known is important

A reliable review might not find any studies from low-income countries or might not find any well-designed studies. Although that is disappointing, it is important to know what is not known as well as what is known.

A lack of evidence does not mean a lack of effects. It means the effects are uncertain. When there is a lack of evidence, consideration should be given to monitoring and evaluating the effects of the intervention, if it is used.

## About the systematic review underlying this summary

**Review objective:** To assess the effectiveness of pre-hospital trauma systems in developing countries.

Types of	What the review authors searched for	What the review authors found
<b>Study designs &amp; Interventions</b>	Randomised trials, non-randomised trials, controlled before-after studies, uncontrolled before-after studies and cohort studies assessing the effectiveness of pre-hospital trauma systems.	14 included studies of which 8 were included in a meta-analysis (3 non-randomised trials, 4 before-after studies and 1 retrospective cohort study).
<b>Participants</b>	(1) Community members; and (2) professionals delivering pre-hospital trauma care for communities.	Communities of rural areas (4 studies) and urban areas (4 studies).
<b>Settings</b>	Developing countries (International Monetary Fund's World Economic Outlook Report 2010).	Mexico (2 studies), Iran (2) and one each from Afghanistan, Brazil, Cambodia, Iraq and Trinidad and Tobago.
<b>Outcomes</b>	Mortality (primary outcome), injury severity, physiologic severity, and pre-hospital time.	Mortality and pre-hospital time analysed by injury severity.

**Date of most recent search:** December 2010

**Limitations:** This is well-conducted systematic review with only minor limitations.

Henry JA, Reingold AL. Prehospital trauma systems reduce mortality in developing countries: a systematic review and meta-analysis. The journal of trauma and acute care surgery. 2012;73(1):261-268.

# Summary of findings

14 studies were included in the review of which eight were included in a meta-analysis.

Four of the eight studies included in the meta-analysis were conducted in rural areas without an ambulance system. In three of these studies, a two-tiered response system with lay (non-professional) first responders was established. The fourth study was conducted in a combat zone where paramedics were trained to provide advanced trauma life support.

The remaining four of the eight studies included in the meta-analysis were conducted in urban areas. In three of these studies, an uncoordinated ambulance system was in place and these systems were re-organized as part of the studies and training provided to ambulance personnel. In one study, firefighters were trained to provide trauma care and an ambulance system was established.

- ➔ **Pre-hospital trauma systems may reduce mortality. The certainty of this evidence is low.**
- ➔ **Pre-hospital trauma systems may reduce the response time from injury to first medical contact in the field. The certainty of this evidence is low.**

## About the certainty of the evidence (GRADE) \*

⊕⊕⊕⊕

**High:** This research provides a very good indication of the likely effect. The likelihood that the effect will be substantially different† is low.

⊕⊕⊕○

**Moderate:** This research provides a good indication of the likely effect. The likelihood that the effect will be substantially different† is moderate.

⊕⊕○○

**Low:** This research provides some indication of the likely effect. However, the likelihood that it will be substantially different† is high.

⊕○○○

**Very low:** This research does not provide a reliable indication of the likely effect. The likelihood that the effect will be substantially different† is very high.

\* This is sometimes referred to as 'quality of evidence' or 'confidence in the estimate'.

† Substantially different = a large enough difference that it might affect a decision

See last page for more information.

Pre-hospital trauma systems compared to no pre-hospital trauma system		
<b>People</b>	Patients from rural areas and urban areas	
<b>Settings</b>	Community	
<b>Intervention</b>	Pre-hospital trauma systems	
<b>Comparison</b>	No pre-hospital trauma system	
Outcomes	Impact	Certainty of the evidence (GRADE)
<b>Mortality</b>	Relative risk reduction of 25% (95% CI 15 to 34%) - Rural areas 29% (95% CI 14 to 41%) - Urban areas 21% (95% CI 6 to 35%)	⊕⊕○○ Low
<b>Response time from injury to first medical contact in the field</b>	May be reduced in both rural (without an ambulance system, reduction of 66 minutes (95% CI 24 to 108 minutes)) and urban (with an ambulance system, reduction of 6 minutes (95% CI 5.47 to 6.53 minutes)) settings	⊕⊕○○ Low
CI: Confidence interval GRADE: GRADE Working Group grades of evidence (see above and last page)		

# Relevance of the review for low-income countries

→ Findings	▷ Interpretation*
APPLICABILITY	
<p>→ All studies included in the systematic review were conducted in low- and middle-income countries (most were in middle-income countries)</p>	<p>▷ These findings are likely to be applicable in many low-income country settings. However all of these interventions require the availability of lay or professional health workers who can be trained to provide first response care following trauma.</p> <p>▷ In resource-poor settings, the costs of additional training and trauma response infrastructure, as well as wider human resource for health constraints, may be obstacles to implementing these interventions.</p>
EQUITY	
<p>→ There is limited evidence that pre-hospital trauma systems may have larger impacts on mortality and response times in rural areas</p> <p>→ There was little further information in the included studies regarding the differential effects of the interventions on different levels of resource-disadvantaged populations</p>	<p>▷ The training of lay (non-professional) people as first responders may help to reduce inequities if these lay people are drawn from and then work in resource-poor areas.</p> <p>▷ Rural areas with poor trauma response systems may benefit particularly from interventions to improve pre-hospital trauma systems. This probably relates to the distances that people in rural areas need to travel to reach a hospital that can provide appropriate trauma care.</p>
ECONOMIC CONSIDERATIONS	
<p>→ The systematic review did not address economic considerations</p>	<p>▷ Scaling up of these interventions may require considerable resources.</p> <p>▷ Using lay (non-professional) rather than professional first responders and focusing on basic life support may require fewer resources. Such approaches may therefore be more appropriate in settings where resources are very constrained.</p> <p>▷ Local costings should be undertaken to inform decisions on implementation and on the sustainability of these interventions.</p>
MONITORING & EVALUATION	
<p>→ The available evidence on the impacts of pre-hospital trauma systems is of low certainty</p>	<p>▷ Larger and more rigorous studies are required to determine the effects and the cost-effectiveness of pre-hospital trauma systems, particularly in low-income countries.</p> <p>▷ Future studies should provide details of the interventions used, describe the contexts in which they were delivered and assess standardized trauma outcomes.</p> <p>▷ Attention needs to be paid to the sustainability of these interventions over time.</p>

\*Judgements made by the authors of this summary, not necessarily those of the review authors, based on the findings of the review and consultation with researchers and policymakers in low-income countries. For additional details about how these judgements were made see: [www.supportsummaries.org/methods](http://www.supportsummaries.org/methods)

# Additional information

## Related literature

### These systematic reviews provide complementary information:

Beuran M, Paun S, Gaspar B, et al. Prehospital trauma care: a clinical review. *Chirurgia*. 2012;107(5):564-570.

Callesse TE, Richards CT, Shaw P, Schuetz SJ, Issa N, Paladino L, Swaroop M. Layperson trauma training in low- and middle-income countries: a review. *J Surg Res*. 2014;190(1):104-10.

Callesse TE, Richards CT, Shaw P, Schuetz SJ, Paladino L, Issa N, Swaroop M. Trauma system development in low- and middle-income countries: a review. *J Surg Res*. 2015;193(1):300-7.

Jayaraman S, Sethi D, Wong R. Advanced training in trauma life support for ambulance crews. *Cochrane Database of Systematic Reviews* 2014; 8: CD003109.

Obermeyer Z, Abujaber S, Makar M, Stoll S, Kayden SR, Wallis LA, Reynolds TA; Acute Care Development Consortium. Emergency care in 59 low- and middle-income countries: a systematic review. *Bull World Health Organ*. 2015;93(8): 577-586G.

Sun JH, Shing R, Twomey M, Wallis LA. A strategy to implement and support pre-hospital emergency medical systems in developing, resource-constrained areas of South Africa. *Injury*. 2014;45(1): 31-8.

### This manual describes the core strategies, equipment, supplies, and organizational structures needed to create effective pre-hospital trauma systems:

Sasser S, Varghese M, Kellermann A, Lormand JD. *Prehospital Trauma Care Systems*. Geneva: World Health Organization; 2005.

### This summary was prepared by

Agustín Ciapponi, Instituto de Efectividad Clínica y Sanitaria, Buenos Aires, Argentina

### Conflict of interest

None declared. For details, see: [www.supportsummaries.org/coi](http://www.supportsummaries.org/coi)

### Acknowledgements

This summary has been peer reviewed by: Timothy Craig Hardcastle and Jaymie Henry.

### This review should be cited as

Henry JA, Reingold AL. Prehospital trauma systems reduce mortality in developing countries: a systematic review and meta-analysis. *The journal of trauma and acute care surgery*. 2012;73(1):261-268.

### The summary should be cited as

Ciapponi A. Do pre-hospital trauma systems reduce mortality? May 2017. [www.supportsummaries.org](http://www.supportsummaries.org)

## About certainty of the evidence (GRADE)

The “certainty of the evidence” is an assessment of how good an indication the research provides of the likely effect; i.e. the likelihood that the effect will be substantially different from what the research found. By “substantially different” we mean a large enough difference that it might affect a decision. These judgements are made using the GRADE system, and are provided for each outcome. The judgements are based on the study design (randomised trials versus observational studies), factors that reduce the certainty (risk of bias, inconsistency, indirectness, imprecision, and publication bias) and factors that increase the certainty (a large effect, a dose response relationship, and plausible confounding). For each outcome, the certainty of the evidence is rated as high, moderate, low or very low using the definitions on page 3.

For more information about GRADE: [www.supportsummaries.org/grade](http://www.supportsummaries.org/grade)

## SUPPORT collaborators:

**The Cochrane Effective Practice and Organisation of Care Group (EPOC)** is part of the [Cochrane Collaboration](http://www.cochrane.org). The Norwegian EPOC satellite supports the production of Cochrane reviews relevant to health systems in low- and middle-income countries. [www.epocoslo.cochrane.org](http://www.epocoslo.cochrane.org)

**The Evidence-Informed Policy Network (EVIPONet)** is an initiative to promote the use of health research in policymaking in low- and middle-income countries. [www.evipnet.org](http://www.evipnet.org)

**The Alliance for Health Policy and Systems Research (HPSR)** is an international collaboration that promotes the generation and use of health policy and systems research in low- and middle-income countries. [www.who.int/alliance-hpsr](http://www.who.int/alliance-hpsr)

**Norad**, the Norwegian Agency for Development Cooperation, supports the Norwegian EPOC satellite and the production of SUPPORT Summaries. [www.norad.no](http://www.norad.no)

**The Effective Health Care Research Consortium** is an international partnership that prepares Cochrane reviews relevant to low-income countries. [www.evidence4health.org](http://www.evidence4health.org)

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