



Evidence-based Practice Center Systematic Review Protocol

Project Title: *Prehospital Airway Management: A Systematic Review*

I. Background and Objectives for the Systematic Review

Background

Airway management is one of the most important aspects of prehospital care. It is critical to patient survival and it affects the potential for recovery from emergent illness or injury. Airway management includes ventilation assistance to promote oxygenation and may include protecting against aspiration, depending on the management approach. Historically endotracheal intubation has been considered the gold standard for airway management. However, the primary objective in the prehospital setting is to assure ventilation of the patient until the transfer of care to an emergency department (ED) or hospital.

Options for airway management involve different levels of invasiveness and complexity that require different technologies and expertise. The simplest approaches are part of general first aid while the most complex involve the use of drugs and surgical techniques. Manual airway management involves jaw thrust or chin lift, while basic airway management includes the use of oropharyngeal (OPA) or nasopharyngeal (NPA) adjuncts (devices inserted orally or nasally to secure an open airway). More advanced airway management techniques include placement of supraglottic airway (SGA) devices, endotracheal intubation (ETI), pharmacologically facilitated intubation (rapid sequence intubation [RSI] or delayed sequence intubation [DSI]), and percutaneous or surgical techniques.

The core dilemma in prehospital care is to match the airway management technique with the needs of the patient and the resources available and then select the one most likely to produce the best patient outcomes. Considering patient needs and resources includes taking into account the patient's condition (e.g., type and severity of illness or injury), the location/environment (e.g., safety, distance to ED, mode of transport), and the available equipment and personnel (e.g., technologies, training, expertise).

Emergency medical service (EMS) agencies are increasingly part of larger healthcare systems, medical direction is now required for all levels of prehospital personnel, and the most seriously ill or injured patients seen in the ED arrive through EMS. Expanded EMS system capacities, including the availability of data collection and information integration, have made more research examining the relationships between prehospital care and patient outcomes possible.

Guideline developers and EMS system leaders want to use data and research to address this core dilemma. Many are striving to develop recommendations that are evidence-based in an environment of expanding options for prehospital airway management. Evidence-based guidelines are needed to establish a standardized approach to airway management in the prehospital setting, and national and local efforts are currently underway.

The challenge is to determine the comparative effectiveness, balancing potential benefits and harms, of the different airway approaches. This is made more difficult by the lack of a definitive gold standard in prehospital care and by the wide range of possible prehospital care scenarios.¹⁻⁵

Purpose of the Review

The purpose of this systematic review is to identify and synthesize the evidence available to support the development of evidence-based recommendations and guidelines for prehospital airway management.

Specifically, this review will focus on comparing the benefit and harms across three different airway management approaches: bag valve mask (BVM), SGA, and ETI. Given the possible variations in the prehospital setting, this review will also consider how the benefits and harms may differ across the following factors: (1) patient characteristics (e.g., demographics, type and severity of illness or injury, and the patient location/environment); (2) the techniques and devices used for each airway management approach; and (3) the characteristics of the EMS personnel (e.g., training, certification, and expertise).

II. Key Questions

The Key Questions were posted for public comment November 22, 2019, through December 20, 2019. Comments emphasized the value of stratifying results as much as possible by modifiers such as airway types, patient characteristics, level of training, and experience. The need for precision in definitions was also emphasized and comments described new technologies. Concern was expressed about the ability of the literature to reflect and report on unrecognized failures to provide adequate airway management. Public comments will be considered to inform the review process; however, the comments did not lead to substantive changes in the proposed Key Questions.

Key Question 1

- a. What are the comparative benefits and harms of bag valve mask versus supraglottic airway for patients requiring prehospital ventilatory support or airway protection?
- b. Are the comparative benefits and harms modified by:
 - i. Techniques or devices used?
 - ii. Characteristics of emergency medical services personnel (including training, proficiency, experience, certification, licensure level, and/or scope of practice level)?
 - iii. Patient characteristics?

Key Question 2

- a. What are the comparative benefits and harms of bag valve mask versus endotracheal intubation for patients requiring prehospital ventilatory support or airway protection?
- b. Are the comparative benefits and harms modified by:
 - i. Techniques or devices used?
 - ii. Characteristics of emergency medical services personnel (including training, proficiency, experience, etc.)?

- iii. Patient characteristics?

Key Question 3

- a. What are the comparative benefits and harms of supraglottic airway versus endotracheal intubation for patients requiring prehospital ventilatory support or airway protection?
- b. Are the comparative benefits and harms modified by:
 - i. Techniques or devices used?
 - ii. Characteristics of emergency medical services personnel (including training, proficiency, experience, etc.)?
 - iii. Patient characteristics?

Key Question 4

What are the comparative benefits and harms of the following variations of any one of the three included airway interventions (bag valve mask, supraglottic airways, or endotracheal intubation) for patients requiring prehospital ventilatory support or airway protection:

- i. Techniques or devices used?
- ii. Characteristics of emergency medical services personnel (including training, proficiency, experience, etc.)?
- iii. Patient characteristics?

Table 1. PICOS

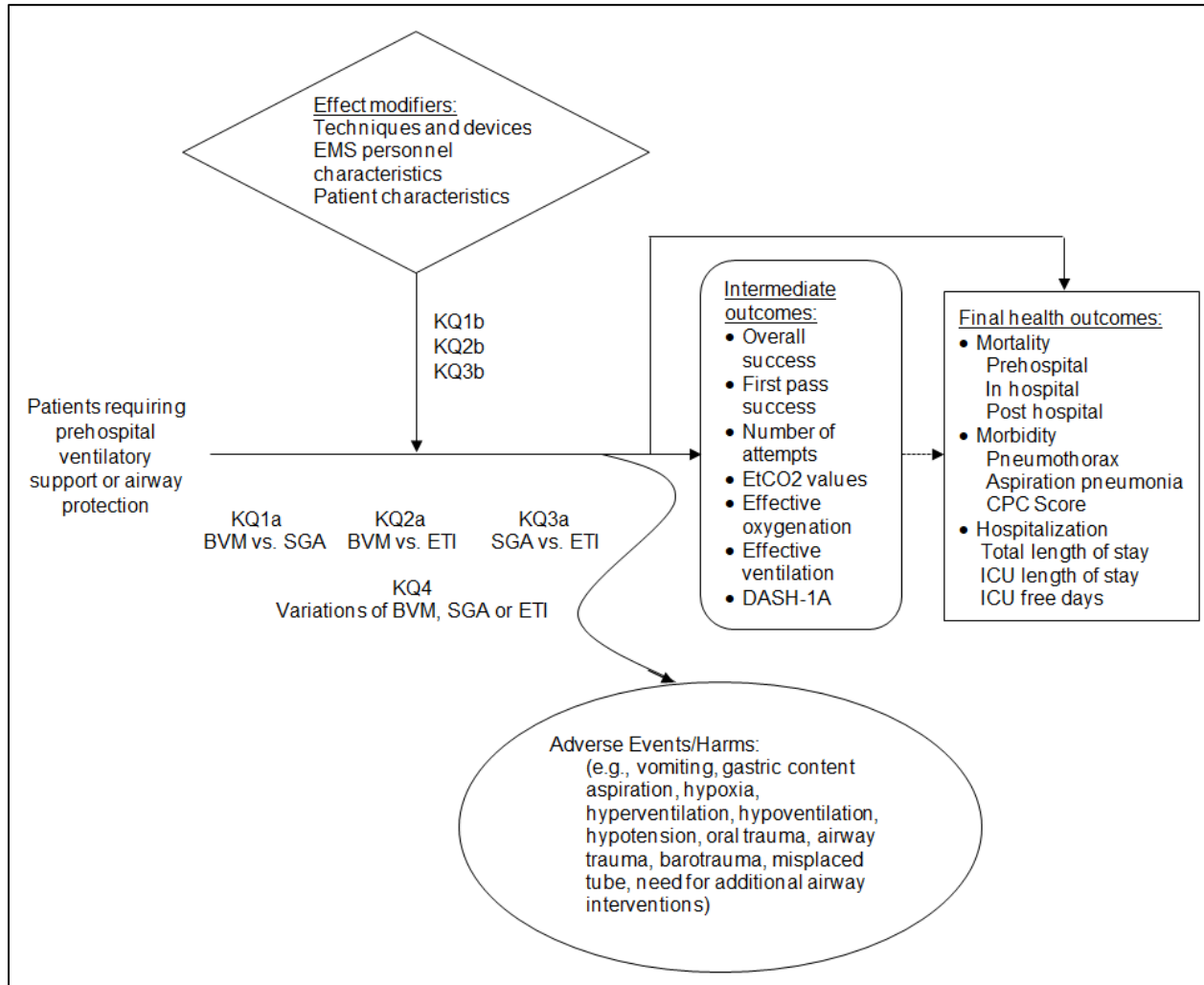
PICOS	Inclusion Criteria	Exclusion Criteria
Populations	Patients requiring prehospital ventilatory support or airway protection who are treated in the prehospital setting by emergency medical services personnel (paramedic, advanced emergency medical technician, emergency medical technician, emergency medical responder, etc.)	<ul style="list-style-type: none"> • Patients treated with naloxone to reverse opioid-related respiratory failure • Patients cared for in other than the prehospital setting
Interventions	<ul style="list-style-type: none"> • Bag valve mask ventilation • Supraglottic airway insertion, including dual-lumen airways • Endotracheal intubation <ul style="list-style-type: none"> ○ Via direct laryngoscopy with or without RSI or DSI ○ Via video laryngoscopy with or without RSI or DSI 	<ul style="list-style-type: none"> • Nasotracheal intubation • Percutaneous devices • Surgical airway procedures • CPAP and BiPAP
Comparators	KQ1: bag valve mask vs. supraglottic airway KQ2: bag valve mask vs. endotracheal intubation KQ3: supraglottic airway vs. endotracheal intubation KQ4: different techniques for any one of the three included types of airways	<ul style="list-style-type: none"> • No airway management

PICOS	Inclusion Criteria	Exclusion Criteria
Outcomes	<p><u>Patient Health Outcomes (highest priority)</u></p> <ul style="list-style-type: none"> • Mortality/survival <ul style="list-style-type: none"> ○ To arrival at hospital ○ To hospital discharge ○ Any period less than or equal to 30 days post-injury • Morbidity <ul style="list-style-type: none"> ○ Glasgow Outcome Scale, Glasgow Outcome Scale Extended, Modified Rankin Scale, Cerebral Performance Category ○ Pneumothorax ○ Aspiration pneumonia • Length of Stay <ul style="list-style-type: none"> ○ Hospital length of stay (days) ○ ICU length of stay (days) ○ ICU-free days <p><u>Intermediate Outcomes (secondary priority)</u></p> <ul style="list-style-type: none"> • Overall success rate • First pass success rate • Number of prehospital attempts to secure an airway • EtCO₂ values • Effective oxygenation • Effective ventilation • Definitive Airway Sans Hypoxia/Hypotension on First Attempt (DASH-1A) <p><u>Adverse Events/Harms</u></p> <ul style="list-style-type: none"> • Vomiting • Gastric content aspiration • Hypoxia (SpO₂<90%) • Hyperventilation (EtCO₂<35) • Hypoventilation (EtCO₂>45) • Hypotension • Oral trauma, airway trauma • Barotrauma • Misplaced tube • Need for additional airway interventions 	Long-term outcomes (more than 30 days post-injury)
Setting	<ul style="list-style-type: none"> • Prehospital • ED only if needed to fill important gaps where there are no prehospital studies • International studies in English language 	Airway studies conducted in cadaver labs, or simulated environments; operating rooms; or inpatient. ED studies if prehospital studies of the topic are available.
Study Design	<ul style="list-style-type: none"> • RCTs <p>If RCTs do not provide sufficient evidence, the following designs will be included:</p> <ul style="list-style-type: none"> • Prospective comparative studies • Retrospective comparative studies • Case control studies 	<ul style="list-style-type: none"> • Systematic reviews (we will use reference lists to identify studies for possible inclusion) • Case series • Descriptive studies • Letters to the editor • Opinion papers • Studies published prior to 1990

BiPAP = bilevel positive airway pressure; CPAP = continuous positive airway pressure; DSI = delayed sequence intubation; ED = emergency department; ICU = intensive care unit; KQ = Key Question; RCT = randomized controlled trial; RSI = rapid sequence intubation

III. Analytic Framework

Figure 1. Analytic Framework



BVM = bag valve mask; CPC Score = Cerebral Performance Category Score; DASH-1A = Definitive Airway Sans Hypoxia/Hypotension on First Attempt; EMS = emergency medical services; ETI = endotracheal intubation; ICU = intensive care unit; KQ = Key Question; SGA = supraglottic airway

IV. Methods

Criteria for Inclusion/Exclusion of Studies in the Review

The criteria for inclusion and exclusion of studies will be based on the Key Questions and are described in the PICOS (Table 1).

Below are additional details on the scope of this project.

Study Design: For all Key Questions, we will include randomized controlled trials (RCTs). We will also include prospective and retrospective comparative observational studies, and case-control studies, if RCTs do not provide sufficient evidence.

For all Key Questions, we will exclude uncontrolled observational studies, case series, descriptive studies, letters to the editor, opinion papers, and case reports. Reference lists from systematic reviews will be examined to identify additional studies not captured in our search.

Non-English Language Studies: We will restrict to English-language articles, but will review English-language abstracts of non-English language articles to identify studies that would otherwise meet inclusion criteria, in order to help assess for the likelihood of language bias.

Literature Search Strategies for Identification of Relevant Studies to Answer the Key Questions

Publication Date Range: Studies will be included that were published in January 1990 and later. Electronic searches will be updated to identify new publications while the draft report is subject to public and peer review. Literature identified during the updated search will be assessed following the same process of dual review as other studies considered for inclusion in the report. If any pertinent new literature is identified, it will be incorporated in the final version of the report.

Literature Databases: MEDLINE[®], CINAHL[®], the Cochrane Central Register of Controlled Trials, the Cochrane Database of Systematic Reviews, and Scopus[®] will be searched to capture published literature. The search strategy for MEDLINE is available in Appendix 1.

Supplementing Searches: A Supplemental Evidence and Data for Systematic review (SEADS) portal will be available to facilitate submission of published and unpublished studies. The Agency for Healthcare Research and Quality (AHRQ) will post a Federal Register Notice requesting SEADs for this review.

Hand Searching: Reference lists of systematic reviews and included articles will be reviewed to identify additional literature for inclusion.

Contacting Authors: In the event that information regarding methods or results appears to be omitted from the published results of a study, or if we are aware of unpublished data, we will contact authors to obtain this information.

Process for Selecting Studies: Pre-established criteria will be used to determine eligibility for inclusion and exclusion of abstracts in accordance with the Methods Guide for Effectiveness and Comparative Effectiveness Reviews,⁶ based on the Key Questions and PICOS. To ensure accuracy, all excluded abstracts will be dual reviewed to confirm exclusion. All abstracts deemed potentially appropriate for inclusion by at least one of the reviewers will trigger retrieval of the full-text article. Each full-text article will be independently reviewed for eligibility by two team members, including any articles suggested by peer reviewers, or any that arise from the public posting process. During abstract and full-text review, all RCTs and comparative observational studies will be retained and categorized according to which Key Questions they address. No studies will be excluded based on study design at this stage.

Authors of a paper who are on the research team will not review their own publications. Disagreements between the two team members will be resolved by consensus of the investigators.

Determining Studies to Include in Data Abstraction and Synthesis: After all studies that could be potentially included are identified and categorized, we will assess the risk of bias of the RCTs before assessing the observational studies. Then we will evaluate whether the RCTs are sufficient to address a Key Question or sub-question based on the number of studies, the size of the studies, the risk of bias ratings, the outcomes reported, and an initial assessment of consistency and precision of the results. If we believe the RCTs are sufficient, and with the concurrence of our clinical experts, we will then make the decision to exclude observational studies. If the RCTs are not sufficient, we will assess the observational studies for risk of bias and then include the identified observational studies, as well as the RCTs, in our data abstraction and synthesis.

Assessment of Methodological Risk of Bias of Individual Studies

Predefined criteria will be used to assess the quality of included studies. The criteria used will depend on the study design as recommended in the chapter, “Assessing the Risk of Bias of Individual Studies When Comparing Medical Interventions” in the Methods Guide for Effectiveness and Comparative Effectiveness Reviews.⁶ Randomized controlled trials will be evaluated using Cochrane risk of bias criteria,⁷ and observational studies will be evaluated using criteria developed by the U.S. Preventive Services Task Force.⁸

Studies will be given an overall rating of “low,” “moderate,” or “high” risk of bias.

Studies rated “low” are considered to have the least risk of bias, be of high quality, and their results are generally considered valid. Low risk of bias intervention studies include clear descriptions of the population, setting, interventions, and comparison groups; a valid method for allocating patients to treatment; low dropout rates and clear reporting of dropouts; appropriate means for preventing bias; and appropriate measurement of outcomes.

Studies rated “moderate” are susceptible to some bias, though not enough to necessarily invalidate the results. These studies may not meet all the criteria for a rating of low, but no flaw or combination of flaws is likely to cause major bias. The study may be missing information, making it difficult to assess limitations and potential problems. The moderate category is broad, and studies with this rating vary in their strengths and weaknesses.

Studies rated “high” have significant flaws that imply biases of various types that may invalidate the results. They have a serious or “fatal” flaw (or combination of flaws) in design, analysis, or reporting; large amounts of missing information; discrepancies in reporting; or serious problems in the delivery of the intervention. The results of these studies are at least as likely to reflect flaws in the study design as to show true difference between the compared interventions. We will not exclude studies rated high risk of bias a priori, but high risk of bias studies will be considered less reliable than low risk of bias studies when synthesizing the evidence, particularly if there are inconsistencies in study results. High risk of bias studies may be excluded if sufficient low and moderate studies are available.

Two team members will independently assess risk of bias. Disagreements will be resolved by consensus.

Data Abstraction and Data Management

After studies are selected for inclusion, data will be abstracted into categories that include but are not limited to: study design, year, setting, country, sample size, eligibility criteria, population and clinical characteristics, intervention characteristics, and results relevant to each Key Question as outlined in the previous PICOS section. All abstracted data will be verified for accuracy and completeness by a second team member. A record of studies excluded at the full-text level with reasons for exclusion will be maintained.

Data Synthesis

We will construct evidence tables showing study characteristics, results, and quality ratings for all included studies, along with summary tables to highlight the main findings.

Meta-analyses will be conducted if possible to combine data and obtain more precise estimates on outcomes for which studies are homogeneous enough to provide meaningful pooled estimates.⁶ The decision to conduct quantitative synthesis will depend on presence of multiple studies using the same design (e.g., trial or observational), equivalence of interventions, and completeness of reported outcomes. To determine whether meta-analyses are indicated, we will consider the quality of the individual studies and the heterogeneity across several variables including patient characteristics, interventions, and outcomes. Meta-analyses will be conducted using a random effects model. If warranted, we will conduct sensitivity analyses by repeating meta-analyses with and without selected studies and assess the impact of the conclusions.

If pooling studies is not appropriate, qualitative syntheses, which may include summary tables, tabulations of important study features, and narratives, will be conducted and presented by Key Questions and outcomes. As the Key Questions include assessment of the impact of technique, and patient and EMS personnel characteristics, we will stratify results by these characteristics in order to identify divergent results.

Grading the Strength of Evidence for Major Comparisons and Outcomes

Regardless of whether evidence is synthesized quantitatively or qualitatively, the strength of evidence for each Key Question/body of evidence will be initially assessed by one researcher for each clinical outcome (see PICOS, Table 1) by using the approach described in the AHRQ Methods Guide for Effectiveness and Comparative Effectiveness Reviews.⁶ To ensure consistency and validity of the evaluation, the strength of evidence will be reviewed by the entire team of investigators prior to assigning a final grade on the following factors:

- Study limitations (low, moderate, or high level of study limitations)
- Consistency (consistent, inconsistent, or unknown/not applicable)
- Directness (direct or indirect)
- Precision (precise or imprecise)
- Reporting bias (suspected or undetected)

The strength of evidence will be assigned an overall grade of high, moderate, low, or insufficient according to a four-level scale by evaluating and weighing the combined results of the above domains:

- High—we are very confident that the estimate of effect lies close to the true effect for this outcome. The body of evidence has few or no deficiencies. We believe that the findings are stable (i.e., another study would not change the conclusions).
- Moderate—we are moderately confident that the estimate of effect lies close to the true effect for this outcome. The body of evidence has some deficiencies. We believe that the findings are likely to be stable, but some doubt remains.
- Low—we have limited confidence that the estimate of effect lies close to the true effect for this outcome. The body of evidence has major or numerous deficiencies (or both). We believe that additional evidence is needed before concluding either that the findings are stable or that the estimate of effect is close to the true effect.
- Insufficient—we have no evidence, we are unable to estimate an effect, or we have no confidence in the estimate of effect for this outcome. No evidence is available or the body of evidence has unacceptable deficiencies, precluding reaching a conclusion.

Assessing Applicability

Applicability addresses the extent to which outcomes associated with an intervention in a group of studies are likely to be similar in either a broader, general population or a different context. A different context may include variation in a range of factors including populations, execution of the intervention, how outcomes are assessed, or the environment. We will assess the applicability of individual studies as well as the applicability of a body of evidence following guidance from the Methods Guide for Effectiveness and Comparative Effectiveness Reviews. Our assessment of applicability will focus on potential differences between the study populations and the patient population targeted by EMS guidelines. If we include studies from the ED to fill gaps in evidence, we will assess the applicability of these findings for prehospital care.

V. References

1. Adnet F, Borron SW, Racine SX, et al. The intubation difficulty scale (IDS): proposal and evaluation of a new score characterizing the complexity of endotracheal intubation. *Anesthesiology*. 1997 Dec;87(6):1290-7. doi: 10.1097/00000542-199712000-00005. PMID: 9416711.
2. Caruana E, Duchateau FX, Cornaglia C, et al. Tracheal intubation related complications in the prehospital setting. *Emerg Med J*. 2015 Nov;32(11):882-7. doi: 10.1136/emered-2013-203372. PMID: 25604325.
3. Cook T, Behringer EC, Bengler J. Airway management outside the operating room: hazardous and incompletely studied. *Curr Opin Anaesthesiol*. 2012 Aug;25(4):461-9. doi: 10.1097/ACO.0b013e32835528b1. PMID: 22673785.
4. Garnier M, Bonnet F. Management of anesthetic emergencies and complications outside the operating room. *Curr Opin Anaesthesiol*. 2014 Aug;27(4):437-41. doi: 10.1097/ACO.0000000000000088. PMID: 24762955.

5. Pepe PE, Roppolo LP, Fowler RL. Prehospital endotracheal intubation: elemental or detrimental? *Crit Care*. 2015 Mar 16;19:121. doi: 10.1186/s13054-015-0808-x. PMID: 25887350.
6. Methods Guide for Effectiveness and Comparative Effectiveness Reviews. AHRQ Publication No. 10(14)-EHC063-EF. Rockville, MD: Agency for Healthcare Research Quality; Jan 2014. <https://effectivehealthcare.ahrq.gov/topics/ceer-methods-guide/overview> Accessed December 18, 2019. PMID: 21433403.
7. Higgins J SJ, Page M, et al. Chapter 8: Assessing risk of bias in a randomized trial. In: Higgins J, Thomas J, Chandler J, Cumpston M, Li T, Page M, et al., eds. *Cochrane Handbook for Systematic Reviews of Interventions version 6.0 (updated July 2019)*. Cochrane; 2019. www.training.cochrane.org/handbook.
8. US Preventive Services Task Force. *US Preventive Services Task Force Procedure Manual*. Rockville, MD: Agency for Healthcare Research and Quality; 2015. <https://www.uspreventiveservicestaskforce.org/Page/Name/procedure-manual>. Accessed December 15, 2019.

VI. Definition of Terms

Not applicable.

VII. Summary of Protocol Amendments

If we need to amend the protocol, we will give the date of each amendment, describe the change, and give the rationale in this section. Changes will not be incorporated into the protocol.

VIII. Review of Key Questions

The Agency for Healthcare Research and Quality (AHRQ) posted the Key Questions on the AHRQ Effective Health Care website for public comment. The Evidence-based Practice Center (EPC) refined the Key Questions after review of the public comments and input from Key Informants. We further refined and then revised this protocol after receiving input from the Technical Expert Panel (TEP).

IX. Key Informants

Key Informants are the end-users of research; they can include patients and caregivers, practicing clinicians, relevant professional and consumer organizations, purchasers of healthcare, and others with experience in making healthcare decisions. Within the EPC program, the Key Informant role is to provide input into the decisional dilemmas and help keep the focus on Key Questions that will inform healthcare decisions. The EPC solicits input from Key Informants when developing questions for the systematic review or when identifying high-priority research gaps and new research needs. Key Informants are not involved in analyzing the evidence or writing the report. They do not review the report, except as given the opportunity to do so through the peer or public review mechanism.

Key Informants must disclose any financial conflicts of interest greater than \$5,000 and any other relevant business or professional conflicts of interest. Because of their role as end-users, individuals are invited to serve as Key Informants and those who present with potential conflicts

may be retained. The AHRQ Task Order Officer (TOO) and the EPC work to balance, manage, or mitigate any potential conflicts of interest identified.

X. Technical Experts

Technical Experts constitute a multi-disciplinary group of clinical, content, and methodological experts who provide input in defining populations, interventions, comparisons, and outcomes, and identify particular studies or databases to search. They are selected to provide broad expertise and perspectives specific to the topic under development. Divergent and conflicting opinions are common and perceived as healthy scientific discourse that results in a thoughtful, relevant systematic review. Therefore study questions, design, and methodological approaches do not necessarily represent the views of individual technical and content experts. Technical Experts provide information to the EPC to identify literature search strategies and suggest approaches to specific issues as requested by the EPC. Technical Experts do not do analysis of any kind nor do they contribute to the writing of the report. They have not reviewed the report, except as given the opportunity to do so through the peer or public review mechanism.

Technical Experts must disclose any financial conflicts of interest greater than \$5,000 and any other relevant business or professional conflicts of interest. Because of their unique clinical or content expertise, individuals are invited to serve as Technical Experts and those who present with potential conflicts may be retained. The AHRQ TOO and the EPC work to balance, manage, or mitigate any potential conflicts of interest identified.

XI. Peer Reviewers

Peer Reviewers are invited to provide written comments on the draft report based on their clinical, content, or methodological expertise. The EPC considers all Peer Review comments on the draft report in preparation of the final report. Peer Reviewers do not participate in writing or editing of the final report or other products. The final report does not necessarily represent the views of individual reviewers. The EPC will complete a disposition of all Peer Review comments. The disposition of comments for systematic reviews and technical briefs will be published 3 months after the publication of the evidence report.

Potential Peer Reviewers must disclose any financial conflicts of interest greater than \$5,000 and any other relevant business or professional conflicts of interest. Invited Peer Reviewers may not have any financial conflict of interest greater than \$5,000. Peer reviewers who disclose potential business or professional conflicts of interest may submit comments on draft reports through the public comment mechanism.

XII. EPC Team Disclosures

EPC core team members must disclose any financial conflicts of interest greater than \$1,000 and any other relevant business or professional conflicts of interest. Related financial conflicts of interest that cumulatively total greater than \$1,000 will usually disqualify EPC core team investigators.

XIII. Role of the Funder

This project is funded under Contract No. 290-2015-00009-I from the Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services. The AHRQ Task Order Officer reviewed contract deliverables for adherence to contract requirements and quality. The authors of this report will be responsible for its content. Statements in the report should not be construed as endorsement by the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human Services.

XIV. Registration

This protocol will be registered in the international prospective register of systematic reviews (PROSPERO).

Appendix 1. MEDLINE Search Strategy

Database: Ovid MEDLINE(R) ALL 1946 to November 20, 2019

1. exp emergency medical services/ or exp "transportation of patients"/ or triage/
2. ("emt" or "ems" or "emergency medical" or field or "paramedic*" or "prehospital" or "pre-hospital" or transport* or trauma or traumatic).ti,ab,kf.
3. 1 or 2
4. exp Airway Management/
5. (intubate or intubation or airway or ventilation or ventilatory).ti,ab,kf.
6. (endotracheal or supraglottic or tracheal or prehospital or "pre-hospital" or field).ti,ab,kf.
7. 5 and 6
8. "bag valve mask".ti,ab,kf.
9. (airway adj5 manage*).ti,ab,kf.
10. 4 or 7 or 8 or 9
11. 3 and 10
12. limit 11 to yr="1990 - 2020"
13. (random or control or trial or cohort or case* or prospective or retrospective).ti,ab,kf,tw.
14. 12 and 13
15. exp cohort studies/
16. cohort\$.tw.
17. controlled clinical trial.pt.
18. exp case-control studies/
19. (case\$ and control\$).tw.
20. or/15-19
21. randomized controlled trial.pt.
22. (random* or placebo* or control* or trial or blind*).ti,ab.
23. (animals not humans).sh.
24. (comment or editorial or meta-analysis or practice-guideline or review or letter).pt.
25. (21 or 22) not (23 or 24)
26. 20 or 25
27. 12 and 26
28. 14 or 27
29. limit 28 to english language
30. "prehospital emergency care".jn.
31. "prehospital & disaster medicine".jn.
32. "resuscitation".jn.
33. "military medicine".jn.
34. or/30-33
35. 10 and 34
36. limit 35 to yr="1990 - 2020"
37. 29 or 36