

Assessment of Paramedic Ultrasound Curricula: A Systematic Review

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Abstract

Objective: Prehospital ultrasound is being applied in the field. The purpose of this systematic review is to describe evidence pertaining to ultrasound curricula for paramedics specifically, including content, duration, setting, design, evaluation, and application.

Methods: Electronic searches of MEDLINE, Embase, CINAHL, and the Cochrane Center Register of Controlled Trials were conducted following Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Primary literature describing acute care ultrasound curricula for paramedics were included. Two authors independently extracted data and assessed quality using 2 validated tools.

Results: Twelve studies with 187 paramedics were included. Curricula duration varied, with effective curricula teaching focused assessment with sonography for trauma (FAST) in 6 to 8 hours and pleural ultrasound in 25 minutes. FAST, pleural, and fracture-detection ultrasound are being applied in the field by paramedics; however, no literature exists describing application to detect cardiac standstill. Curricula combined didactic and hands-on components including simulation and evaluated competency using sensitivity and specificity of paramedic-performed ultrasound.

Conclusions: Paramedic ultrasound curricula in FAST and pleural ultrasound is feasible and time effective with successful application. Although fracture detection ultrasound is being used by the special operations forces, no comprehensive curriculum was described. Curricula designed to detect cardiac standstill have been too short, and successful application by paramedics has not been shown.

Introduction

Ultrasound is being more commonly used in the acute care setting, including emergency medicine and critical care medicine, and in the prehospital setting.¹⁻⁶ It is becoming more commonly incorporated into the algorithm of clinical decision making at various levels of patient care. The historic standard of simply stabilizing and transporting a patient in the prehospital setting is changing to reflect the notion that early diagnosis and intervention are important.^{2,4,7} The use of ultrasound has been shown to impact several aspects of medical care such as transportation and triage, titration of medications, and management decisions and diagnosis.^{2,4,6,8-13} Although there is widespread utilization of ultrasound in both emergency and critical care medicine for the in-hospital setting, training of prehospital health care providers in ultrasound and the application of ultrasound technology in the prehospital setting have only recently started to gain popularity.^{5,6,14-17}

Currently, an estimated 4% of emergency medical service systems in North America report the use of ultrasound in the prehospital setting, with most of these programs incorporating flight physician use of ultrasound.¹⁸ Flight physicians are using prehospital ultrasound to perform the focused assessment with sonography in trauma (FAST) examination, obtain pleural windows to screen for pneumothorax and pulmonary edema, detect early stroke, and assess hemodynamic status.^{2,4,6,8,14-17,19-21} This has led to changes in management in 21% to 30% of patients including abandoning placement of a chest tube, change in destination hospital, stopping cardiopulmonary resuscitation, initiating inotropes, initiating fluid, and withholding fluid.^{2,4,22,23} Evidence pertaining specifically to paramedic-performed ultrasound is limited, and current literature combines results of studies on both physician and nonphysician prehospital health care providers (nurses, ultrasound technicians, and paramedics).^{5,6,9,24-27} This makes it difficult to evaluate paramedic-performed ultrasound and elucidate the optimal curriculum for paramedics specifically.

This systematic review describes the literature pertaining to prehospital ultrasound curricula for paramedics in order to provide insight for future ultrasound curriculum development. Specifically, we sought to report the optimal content, duration, setting, design, and evaluation for an ultrasound curriculum for paramedics based on the available evidence in the literature.

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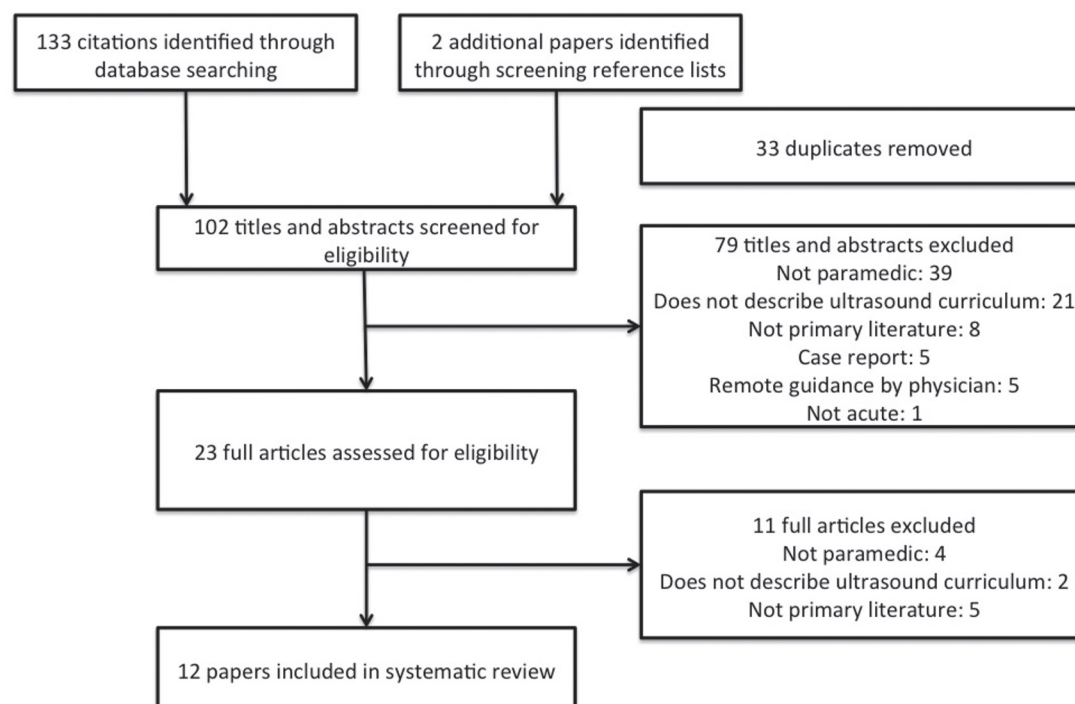
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Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram.



Materials and Methods

We designed the protocol for this study according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.²⁸ A medical librarian performed searches of MEDLINE (1945-2013), Embase (1974-2013), CINAHL (1982-2013), PsycINFO (1597-2013), and the Cochrane Center Register of Controlled Trials (1991-2013) on January 14 and 16, 2013, and removed duplicates.

A search strategy was used that combined Medical Subject Heading terms and free text words in the title and abstract around 3 categories (Appendix 1). The categories included ultrasound terms such as “ultrasou*,” “echocardiogram*,” or “sonogram*”; emergency medical services terms such as “pre-hospital,” “pre hospital,” “paramedic*,” “ambulance,” “helicopter,” or “medevac*”; and education terms such as “curricul*,” “train*,” “teach*,” or “educ*.” The full search criteria used for each database can be found in Appendix 1.

Included studies were limited to those that described acute care ultrasound curricula for paramedics. The paramedic populations included ground and flight paramedics, emergency medical technicians, and emergency medical service providers who were not nurses or physicians. Articles were included if they were published in English in peer-reviewed journals without limitations on journal publication date. Full-text articles for all articles deemed relevant were obtained and screened for inclusion against a predetermined list of exclusion criteria (Fig. 1) (J.M., H.D.K.). Disagreement regarding eligibility was resolved by a third reviewer (E.V.). Exclusion criteria included articles describing ultrasound curricula for nonparamedics (physicians, medical students,

and allied health care providers), articles missing a description of the curriculum (content, duration, setting, design, and evaluation), articles describing nonacute ultrasound, reviews and case reports, and articles describing remote guidance and telemedicine (Fig. 1).

Outcome Measures

Data abstracted from the articles included the paramedic population, examination type, duration of curriculum, composition, setting of the curriculum, and application in the field (Table 1). Outcome measures included evaluation on written and practical examinations, sensitivity, specificity, and duration of the ultrasound examination (Table 1).

Data Collection and Processing

Data were abstracted from articles into a Microsoft Excel spreadsheet (Version 14.4.7; Microsoft Corporation, Redmond, WA). If outcome information was missing from the articles, authors were contacted by e-mail. The Medical Education Research Study Quality Instrument (MERSQI) was developed to assess the methodological quality of studies in medical education, which has a maximum score of 18.²⁹ This tool was used because it specifically addresses the methodological quality of education research studies. In addition, the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) cross-sectional checklist was used to identify any missing elements in the studies (Appendix 2).³⁰ MERSQI questions and the STROBE checklist were entered into an Excel spreadsheet for the assessment of articles.

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