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Reviews

Use and implementation of standard operating procedures and checklists in prehospital emergency medicine: a literature review[☆]Chulin Chen, MSN, Ting Kan, PhD, Shuang Li, MSN, Chen Qiu, MSN, Li Gui, PhD^{*}

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ABSTRACT

Objectives: This review aimed to analyze published literature to introduce the use and implementation of standard operating procedures (SOPs) and checklists in prehospital emergency medicine and their impact on guideline adherence and patient outcome.

Methods: An English literature search was carried out using the Cochrane Library, MEDLINE, EMBASE, Springer, Elsevier, and ProQuest databases. Original articles describing the use and implementation of SOPs or checklists in prehospital emergency medicine were included. Editorials, comments, letters, bulletins, news articles, conference abstracts, and notes were excluded from the analysis. Relevant information was extracted relating to application areas, development of SOPs/checklists, educational preparation and training regarding SOPs/checklists implementation, staff attitudes and the effects of SOPs/checklists use on guideline adherence and patient outcomes.

Results: The literature search found 2187 potentially relevant articles, which were narrowed down following an abstract review and a full text review. A final total of 13 studies were identified that described the use and implementation of SOPs (9 studies) and checklists (4 studies) in different areas of prehospital emergency medicine including prehospital management of patients with acute exacerbated chronic obstructive pulmonary disease and acute coronary syndrome, prehospital airway management, medical documentation, Emergency Medical Services triage, and transportation of patients.

Conclusions: The use and implementation of SOPs and checklists in prehospital emergency medicine have shown some benefits of improving guidelines adherence and patient outcomes in airway management, patient records, identification and triage, and other prehospital interventions. More research in this area is necessary to optimize the future use and implementation of SOPs and checklists to improve emergency personnel performance and patient outcomes.

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1. Introduction

Prehospital emergency medical services often operate in challenging and stressful environments, which require specialized abilities including conflict resolution, crew resource management, seamless coordination of personnel and rapid communication across disciplines [1]. Parallels can be drawn from manufacturing industries and aviation, where safety is a priority and SOPs and checklists are generally used as a method of error and safety management to decrease the risk to the individual [2,3]. The prehospital environments pose unique challenges in simultaneously managing patient care, ensuring accurate documentation, and providing safe transportation, all with limited resources and personnel. It is well recognized that the higher the acuity of the

situation, the greater the need to remove individual procedural preferences and to adhere to guidelines [1,4]. Numerous guidelines and protocols have been developed for common prehospital emergency conditions [5–7], compliance however, can be a problem [8]. The evidence seems to suggest that guidelines and protocols are in fact good but our compliance with them often leaves room for improvement [9]. So, additional quality assurance tools such as SOPs and checklists should be developed and implemented in delivering prehospital emergency care during “the golden hour”.

Standard operating procedures (SOPs), defined as “detailed, written instructions to achieve uniformity of the performance of a specific function”, have been used in multiple fields including clinical research to promote good clinical practice [2]. Use of SOPs is an important first step, but the implementation of SOPs alone is not sufficient enough to ensure adherence to guidelines. Therefore, checklists are also being suggested as a method to improve care processes [10]. Checklists, by definition, represent a type of cognitive aid to prevent the failure of individual activities due to the inherent limitations of individual attention and memory [11]. There are several types of checklists, including read-do checklists, challenge-confirm checklists and a

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combination of the read-do and challenge-confirm formats, all of which are proved to be useful in preventing errors and reducing morbidity and mortality [12]. Undoubtedly, SOPs and checklists are both essential to minimize human errors while improving team communication and performance of several interventions [2,13].

SOPs and checklists can potentially be applied in all aspects of clinical practice, and recent literature suggests its ever-expanding use [14–26]. This review aims to analyze published literature to introduce the use and implementation of SOPs and checklists in prehospital emergency medicine and their impact on guideline adherence and patient outcomes.

2. Methods

2.1. Eligibility criteria

Original articles describing the process of implementing SOPs and checklists into prehospital emergency medicine, or validating the use of SOPs or checklists and the impact that these SOPs or checklists have on patient outcomes or the evaluation of staff perceptions were included. Selection was restricted to original articles that used the SOPs and checklists in prehospital environments and discussed impact on guideline adherence or patient outcomes. Editorials, comments, letters, bulletins, news articles, conference abstracts, notes, and descriptive articles were excluded from the analysis.

2.2. Information sources

A broad search of the English language literature was performed in January 2016 using MEDLINE, EMBASE, Springer, Elsevier, Wiley, and ProQuest databases, although they have overlaps. A combination of the following key words were used during the search, “prehosp*”, “pre-hosp*”, “out-of-hospital”, “out of hospital”, “emergency medical services”, “emergency care”, “checklist?”, “checksheet?”, “standard operating procedure?”, “SOP?”. The Database of Abstracts of Reviews of Effects and the Cochrane database were reviewed. Reference lists of included studies were searched for other potentially eligible studies.

2.3. Study selection and data collection process

Based on the titles and abstracts, the first selection was conducted by 2 reviewers (CC and LG), who identified all of the potentially relevant articles and excluded the articles that did not fulfill the inclusion criteria. The full articles were obtained for all studies that seemed to meet the necessary criteria. Two reviewers (CC and LG) each screened all the full articles for inclusion if it had both categories of information, including prehospital and checklists/SOPs. Conflicts between reviewers were subsequently discussed until there was full agreement on the final studies to be included.

2.4. Data items

Particular information was extracted from each study, including country of origin, study duration and phases, application areas of prehospital emergency medicine, number of cases underpinned by SOPs/checklists, development of SOP/checklist, educational preparation and training regarding SOP/checklist implementation, person in charge of SOPs/checklists completion, participants involved in SOPs/checklists completion, staff attitudes and perceptions towards the SOPs/checklists, and the overall impact of SOPs/checklists on guideline adherence and patient outcomes. All data were extracted by two independent researchers (CC, LG).

3. Results

3.1. Study selection

Following a thorough search of the MEDLINE, EMBASE, Springer, Elsevier, Wiley, and ProQuest databases, a total of 2187 potentially relevant articles were found. An abstract review was conducted, excluding 2101 articles from analysis. After a full study review of the remaining 86 articles, a total of 13 were deemed suitable for inclusion in this review. The full text articles were eliminated for the following reasons: no application to practice (17 articles); not applicable to prehospital setting (31 articles); incomplete data (25 articles).

3.2. Study characteristics

An overview of these 13 studies is described in Table.

3.2.1. Country of origin

These 13 studies were performed in Germany (4 articles), Denmark (1 article), the United Kingdom (5 articles), the United States (2 articles), and Australia (1 article).

3.2.2. Study duration and phases

Eight articles presented their study duration and phases, ranging from 2 months to 15 years.

3.2.3. Area of prehospital emergency medicine

Among the 13 articles, nine articles described the use and implementation of SOPs in five areas of prehospital emergency medicine: management of patients with acute exacerbated chronic obstructive pulmonary disease (aeCOPD), treatment of patients with acute coronary syndrome (ACS), prehospital critical care anesthesiologists' behavior of prehospital controlled ventilation, medical documentation, and prehospital rapid sequence intubation (RSI); four articles introduced the use and implementation of checklists in five areas of prehospital emergency medicine: prehospital treatment of patients with aeCOPD and ACS, Emergency Medical Services (EMS) triage and transportation of intoxicated individuals, identifying delirium in older patients, and prehospital RSI.

3.2.4. Number of cases underpinned by SOPs/checklists

The number of all reported cases undertaken with SOPs/checklists to date is fewer than 1500. The largest was the report of Kerner et al [23], covering 1480 cases. Francis et al [15] described the next biggest series which included 1025 cases controlled by SOPs/checklists. The rest of the papers included 718 or less prehospital emergency cases, with the smallest one being comprised of 71 cases [22] underpinned by SOPs/checklists.

3.2.5. Development of SOPs/checklists

Eight out of 13 studies presented the development of SOPs or checklists used in the studies, most of which were developed on the basis of guidelines and in accordance with DIN ISO 9000 2000 criteria [27] and created and discussed by a consensus group.

3.2.6. Educational preparation and training regarding SOPs/checklists implementation

The implementation of SOPs and checklists as a rule is preceded by educational efforts, however, only 6 studies reported educational preparation and training. These 6 studies introduced measures including staff meeting held to introduce the SOPs and checklists, emails, lectures, group discussions, seminars, SOPs/checklists placed at everyone's disposal in the EMS base and on the EMS vehicle. No key educational component was mentioned in any of these 6 studies.

3.2.7. Persons participate in the SOPs/checklists completion

There are only 5 articles that reported the person in charge of the SOPs/checklists completion, and their characteristics were quite

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