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Improving Emergency Service Quality and Patient Safety Through the Use of Cross-Sectoral Digital Feedback Systems - An Overview

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Abstract. Background: Feedback is essential for personal and professional development, also in emergency services. However, EMS usually ends at the interface with the emergency department, thus, the long-term effect of initiated emergency measures often remains unclear for emergency personnel. Digital, datadriven tools providing systematic feedback on patients' outcome may be valuable to improve emergency service quality and patient safety. Objectives: To provide an overview about current approaches for cross-sectoral digital feedback systems in EMS. Methods: Literature review in PubMed/MEDLINE and Google Scholar in accordance with the PRISMA statement. Results: The search resulted in 567 articles out of which only three were identified as eligible. In only one study cross-sectoral feedback was used to improve quality. Conclusion: Although feedback is described as a method for improving the quality of the rescue service and feedback is also considered in the description of the requirements for digitization, there seems to be no technical implementation of a cross-sectoral feedback system so far.

Keywords. feedback, intersectoral collaboration, emergency medical service, emergency medicine, Health Communication

1. Introduction

Quality of care is important in health – especially in emergency medicine service (EMS) [1]. High quality in emergency medical service (EMS) and patient safety are ensured by a high level of continuous professional training and education of rescue service staff together with regular exchange of personal experiences. This experience also comprise knowledge about the long-term effect of initiated emergency measures. Thus, gathering more experience also includes learning about the diagnosis and further progress of patients brought to hospital by EMS [2]. Currently, mortality and morbidity (M&M) conferences are one of the few recognized opportunities for gaining knowledge and receiving personal feedback on actions carried-out [3]. However, M&M conferences

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rarely take place and often only deal with special cases. A continuous feedback is not delivered, though, it could help to improve the advanced education of rescue staff [4–6].

Digitalisation in healthcare is growing, including the use of digital tools for documentation and decision-support in both emergency medical services and emergency departments. This progress could be a chance for implementing automated digital, datadriven feedback systems for rescue service and hospital staff facilitating information exchange across these sectors [7].

In this article, we present the results of a literature review focusing digital feedback systems in the cross-sectoral field of EMS.

2. Methods

2.1. Protocol

The systematic review was based on the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement.

2.2. Search Strategy

Relevant articles were retrieved through searching international literature in PubMed/MEDLINE. There were no restrictions to language, publication type, state, and date. Since there are differences between the European EMS [8-9] we decided to add another search in Google Scholar to identify new studies (last five years) specifically originating from German-speaking countries and only published in German language.

Our search terms comprise three "AND"-concatenations representing (1) the functionality of the searched approaches (feedback), (2) the type of implementation (digital technologies) and (3) the care domain (emergency). MeSH-Terms were used because to ensure current and relevant papers were found. The following terms were used:

PubMed/MEDLINE: ((feedback) AND ("information systems"[Mesh] OR "computing methodologies"[Mesh])) AND ("emergency medical services"[Mesh] OR "emergency medicine"[Mesh]) OR "emergency service, hospital"[Mesh])

Google Scholar (not supporting MeSH term search): ((Rückmeldung OR Feedback OR Kontrolle OR Reflexion) AND (Software OR System OR Qualitätsmanagementsysteme) AND sektorenübergreifend)) AND (Rettungsdienst OR Notfallaufnahme)

2.3. Selection Process and Eligibility Criteria

Identified articles were assessed independently by two reviewers (AK, KS) according to pre-defined eligibility criteria (see Table 1). Literature was first screened by title and abstract. Afterwards, full-texts were retrieved and evaluated for relevance and inclusion. In case of disagreement, a third author (AW) was consulted.

Category	Criteria
inclusing criteria	 feedback from hospital or emergency department to EMS
	• digitalising of the rescue chain used for implementation of feedback systems
	 improvement of quality of preclinical care by cross-sectoral feedback
exclusing criteria	• studies or research projects without feedback on patient's outcome to the EMS
	 description of requirements without application for feedback
	• description of feedback as a method of quality improvement without a project
	or study
	 no cross-sectoral feedback

Table 1. Eligibility criteria

3. Results

3.1. Study Selection

The initial search resulted in 567 articles (see Figure 1). 206 papers were found in PubMed/MEDLINE and 361 results were found in scholar. 551 were excluded by title/abstract screening: 65 articles focus quality improvement without reference to feedback systems. 76 publications examine software or technical solutions without reference to feedback. 112 articles only describe simulation and training situations. 8 studies described requirements for data solutions. 285 results of Scholar and 5 of PubMed were excluded cause there was no reference to the topic "Improving emergency service quality and patient safety through the use of cross-sectoral digital feedback systems".

Afterwards, 15 more papers were excluded after reading the full text. The content and reasons for exclusions of these 15 articles are listed in Table 2.



Figure 1. PRISMA flow chart for study selection.

Number	Reference	Summary
		results of the PubMed search
1	[10]	 congress paper with title and abstract only
2	[11]	 highlighted only the importance of using medical data in emergency cases
3	[12]	 described requirements on data management tools in emergency departments
4	[13]	 neuronal network to identify myocardial ischemia in patients having thoracic pain feedback system was used to increase physician's confidence in this
5	[14]	 neuronal network direct feedback to the emergency medical staff was given after
		 interpretation a transmitted ecg. feedback was given before transport to the hospital assignment of patients with STEMI to hospitals with catheterization options
6	[15]	 analysed the first medical contact to balloon time in patients with myocardial ischemia feedback was given by presenting interim results of the study at the f the end of each quarter no individual feedback
7	[16]	 effect of the quality of a cardiac massage using a technical feedback system
		results of the Scholar search
8	[17]	 requirements in digitalisation in health care without reference to feedback networking of all health care providers secure exchange of information
9	[18]	 requirements of data in emergency care enabling feedback mechanisms for the individual healthcare provider at the case level outcome-oriented evaluation of emergency care is only possible by linking the care data of the different structures and sectors at the patient level
10	[19]	 cross-sectoral networking without reference on feedback digitization in the healthcare sector enables networking of the various players enables a better exchange of knowledge which can be a benefit for patients
11	[20]	 challenges for the management of the EMS medical directors of the EMS are responsible for ensuring the medical supervision of the paramedics and for establishing suitable feedback and training instruments
12	[21]	 sectoral separation into emergency and acute care is a problem the impossibility of rapid transfer of medical information from one sector to the other also poses a problem for patient safety in this context
13	[22]	 current status of quality assurance in EMS EMS do not receive standardized feedback on patient's ongoing disease
14	[23]	 Quality management by implementation of a monthly report using the dataset mV2015.1 of the DIVI for emergency departments (AKTIN) no cross-sectoral feedback system
15	[24]	 described an application for cross-sectoral networking no reference on feedback

Table 2. Overview of excluded articles, assessed by full text screening (1 to 7 found in PubMed/MEDLINEand 8 to 14 found in Google Scholar.

3.2. Synthesis of Results

Finally, we identified only one article reporting on a cross-sectoral feedback system focused on improvement of quality and patient safety in EMS.

Günther et al. presented a cross-sectoral feedback- and control system to improve the quality of the emergency medical service. But feedback was only given in very special situations: cases with death of patients who had EMS contact before but without an emergency physician and without transportation to an emergency department [25]. The authors did not describe if technical solutions were used for the feedback system.

4. Discussion

Although feedback is important for continuous quality improvement [26,27] and digitalisation in emergency care grows, the implementation of cross-sectoral digital feedback systems seems not to have been done now. Especially at interfaces of shared patient care, standards to improve communication but also to promote a feedback culture are important [28].

Currently, data produced in both the pre-clinical emergency and hospital setting is not efficiently used for implementing a comprehensive cross-sectoral feedback system. Actually, there is only a data transfer in one direction, from EMS to hospital. Transferring protocols digitally to hospitals is possible in less than 50% of EMS regions in Germany [29]. In the first place it is necessary to create infrastructure to transfer protocols digitally before building a digital feedback system.

Further research is needed to investigate potentials and challenges of using innovative health informatics solutions for a cross-sectoral digital, data-driven feedback system to improve emergency service quality on patient safety.

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