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# Demand Analysis of a German Emergency Medical Service Feedback System

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**Abstract.** *Background:* The number of emergency medical service (EMS) calls in Germany is continuously increasing. The initial assessment, the pre-hospital care and the choice of hospital for further care by the EMS influences the patient's outcome and are the basis for further care in hospital. However, the EMS does not receive any official feedback on its decisions. *Objectives:* This study evaluates the demand for a feedback system from the emergency department (ED) to the EMS, what it should contain, and how it could be integrated in the electronic clinical systems. *Methods:* A semi-structured interview guideline for expert interviews with members of EMS staff (n = 6) and ED staff (n = 17) was developed. A mockup to visualise a possible implementation was designed and included in the interview. *Results:* There is a significant demand for feedback on pre-diagnosis, pre-hospital care and handover of patients from the EMS to the ED. The EDs are very interested in improving the collaboration with the paramedic services through feedback. *Conclusion:* A feedback system is strongly desired by various EMS stakeholders and, according to them, could improve both EMS and ED collaboration and overall patient care.

**Keywords.** emergency medical services, paramedics, emergency department, feedback system, interdisciplinary communication, quality improvement

## 1. Introduction

The number of emergency medical service (EMS) calls is continuously increasing in Germany [1]. Limited on-site medical examinations can lead to incorrect pre-diagnoses by the EMS. A study from Ramadanov et al. showed that 30% of the diagnoses from emergency physician protocols and hospital discharge diagnosis only partially matched and 23.5% totally unmatched [2]. However, there is no official feedback from hospitals to the EMS regarding the diagnoses and initial medical interventions. Feedback could allow the ambulance service to learn and improve, benefiting the ED through better pre-hospital care. No studies on feedback systems to German EMS could be found. This study analysed the experiences of members of EMS and ED staff regarding existing feedback and communication channels between the two healthcare sectors. In addition, both groups were asked about hypothetical automatic feedback systems.

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## 2. Methods

The study design for this research project involved the use of qualitative research methods for data collection, especially through guided expert interviews. The interviewees were selected due to their direct participation in the analysed process. The interviews took place in November and December 2022. The guide provided a possible structure for the interview, but the respondents could answer freely. In order to improve the guide, a pretest was conducted with one member of the EMS staff and one from the ED staff of a hospital.

The guideline was based on studies on feedback for the ambulance service from Australia [3], the USA [4–6] and the UK [7]. A total of 17 topics for the ambulance service and 13 topics for the emergency department were formulated. In summary, the main topics of the interviews were demographic data, collaboration of EMS and ED, current and desired feedback, pros and cons of feedback, benefit for hospitals for additional effort, and questions about the mockup. (The detailed interview guide can be requested from the authors.)

17 members of the ED staff (s. Table 1), of whom 10 worked fulltime, and 6 members of EMS staff (s. Table 2) were selected for the survey. The paramedics all worked for the Bavarian Red Cross. The interviewed physicians and nurses worked for Hospital Fürth, Hospital Nuremberg, University-Hospital Erlangen or Martha-Maria Hospital Nuremberg. The interviewees were recruited via direct requests to the hospitals and emergency services. The interviews were recorded. At the beginning of the interviews, the respondents gave their consent to the recording and the use of the statements for the study. 21 interviews were conducted in presence and 2 online.

**Table 1.** Interviewees from the ED

| Interviewee | Job title | Speciality/ Specialized training | Activity in EMS | Years of service |
|---|---|---|---|---|
| 1 | Attending physician (AP) | Trauma surgery | Current | 25 |
| 2 | Nurse | Emergency Care | Former | 41 |
| 3 | Nurse | / | / | 21 |
| 4 | Nurse | / | / | 17 |
| 5 | Physician specialist (PS) | Neurology | / | 23 |
| 6 | PS | Internal medicine (IM) | Former | 13 |
| 7 | Nurse | / | Current | 1 |
| 8 | Nurse | Emergency Care | / | 21 |
| 9 | Nurse | Emergency Care | / | 12 |
| 10 | Nurse | / | / | 9 |
| 11 | Nurse | / | / | 5 |
| 12 | Nurse | / | / | 12 |
| 13 | Nurse | Emergency Care | / | 11 |
| 14 | Nurse | Emergency Care | Former | 23 |
| 15 | Nurse | / | Current | 4 |
| 16 | Medical assistant | / | Current | 17 |
| 17 | AP | IM | Former | 3 |

**Table 2.** Interviewees from the EMS

| Interviewee | Job title | Employment type | Years of service | EMS |
|---|---|---|---|---|
| 1 | Emergency Paramedic (EP) | Fulltime | 15 | bavarian red cross (BRK) |
| 2 | EP | Fulltime | 1 | BRK |
| 3 | EP | Fulltime | 30 | BRK |
| 4 | EP | Fulltime | 3 | BRK |
| 5 | EP | Fulltime | 13 | BRK |
| 6 | Emergency medical technician | Voluntary | 7 | BRK |

The design of the mockup (figure 1) was based on the IVENA© software (mainis IT-Service GmbH, Offenbach am Main). This representation is familiar especially to the emergency department staff from their daily work, but all interviewed ambulance staff were already familiar with it as well. For the mockup, fields on PZC, ICD-10, patient status, and filter options (date, Gender, and variance of diagnoses) were added. If there was a discrepancy in the diagnosis, the corresponding fields were highlighted in red. The mapped cases were based on real cases, but have been modified so that they can no longer be assigned to a real person. In order not to bias the staff in their answers, the mockup was placed at the end of the survey.

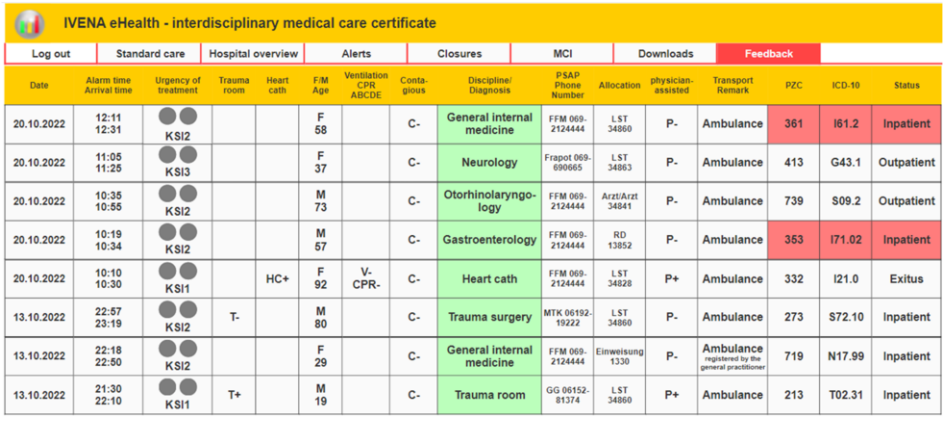


**Figure 1.** Mockup of integrated Feedback in IVENA©-Software (translated into English).

The interviews were evaluated by qualitative content analysis, according to the coding method of Kuckartz [8] and Mayring [9], combining inductive and deductive category making. In this process, the survey results are ordered and structured through the formation of categories in order to reduce complexity. The answers were paraphrased, general statements were identified, redundant statements were removed and a total of 14 categories for the ED staff resp. 19 categories for the EMS staff were defined. Inductive category formation was used to form subcategories within these upper categories to capture the respondents' answers. The analysis process involved compressing the data without altering their essential meaning. The consistent use of this method allowed aspects to be included in the results that would have been harder to find through a questionnaire; e.g. the desire for mutual feedback arose from a conversation outside of the guideline.

## 3. Results

### *3.1. Survey of the EMS staff*

#### *3.1.1. Current Feedback*

The paramedics stated that they do receive feedback, but that it is rarely given, and usually only verbally between doors. Hospital staff are prevented from giving official feedback by data privacy laws or in-house guidelines. Four out of six respondents occasionally ask for feedback, but hardly ever get it. The only possibility is to go back to the same hospital on the same duty shift and ask about a previous patient.

#### *3.1.2. Wished Feedback:*

The paramedics interviewed want feedback on the diagnosis and condition of the patient, especially in critical cases. They want feedback on each case, especially on their own work and the quality of the handover. They preferred to get the feedback immediately or within 1-2 weeks after the handover. They prefer digital feedback, via existing systems; ideally from involved hospital employees or the treating physician.

#### *3.1.3. Benefits of Feedback*

All EMS expect positive effects from more feedback. They believe that more feedback will have a positive impact on their professional skills and on the care of future cases. The interviewed paramedics also expect that more feedback will increase personal well-being and work motivation.

#### *3.1.4. Concerns about a feedback system*

Two main concerns were named by the interviewees. Firstly, they fear negative consequences from the information that accumulates, including detailed patient information, but also information about treatment errors, which could have a negative consequence on the respective employee. Nevertheless, they expressed that there are some things that the supervisor needs to know, for example cases of potential patient harm. Secondly, they expressed concerns about the financing and technical implementation of the feedback system. Half of the paramedics (3/6) do not believe that their emergency organization will pay for such a system. However, the positive aspects seem to compensate the concerns.

#### *3.1.5. Collaboration with hospitals*

The paramedics mainly work with the ED. The majority of the paramedics (4/6) prefer feedback from the nurses, others (2/6) prefer feedback from other departments that have a confirmed diagnosis or from the doctors who treated the patient. One paramedic interviewed does not think nurses are appropriate to give feedback on diagnosis. Instead, he would like to have access to the patient's records in the clinical workplace system to see for himself.

### 3.1.6. Mockup

The paramedics interviewed consider the mockup presented to be a good approach. Some (3/6) recommended an optional free-text field to add information about the patient's status. Some (2/6) EMS interviewees expressed their appreciation of the familiar design and their wish to implement it immediately.

## 3.2. Survey of the ED staff

### 3.2.1. Feedback for emergency staff

About two-thirds of emergency department staff (11/17) know that ambulance staff do not receive official feedback on patients' diagnoses. They mention that EMS staff actively ask for feedback in an unofficial way. EMS also inquired after the care was completed about the well-being of the patients and whether they were correct in their assessment and care. One interviewee pointed out that every case remains unclear to EMS. ED staff also expect positive effects from official feedback for the ambulance service. For this reason, they expressed a high willingness and motivation to give feedback, even if it means additional work. However, they would limit it to a part of the cases. Alternatively, they could also imagine an automatic system, as this would be the simplest solution. They would prefer a familiar system, such as IVENA©.

### 3.2.2. Benefits of Feedback

All (17/17) interviewees suppose that the ambulance service and future patients would benefit from feedback to the ambulance service. The majority of the interviewees (16/17) see an advantage for their own work through better pre-hospital care and better communication between EMR and ED (Figure 2).

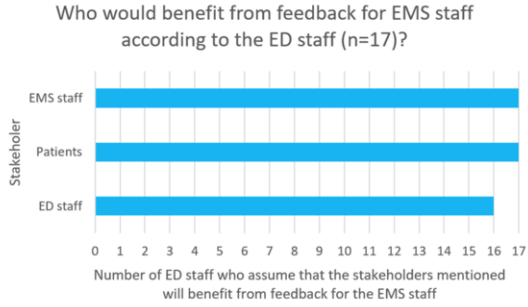


**Figure 2.** Who would benefit from feedback for EMS staff (translated into English).

### 3.2.3. Concerns about feedback

The most common answer (7/17) was that there were either no concerns at all or that these were clearly outweighed by the positive aspects of the feedback. The concerns mentioned relate to the issue of data protection (5/17) and the fear that paramedic staff would react negatively to negative feedback (5/17), making it more difficult to collaborate.

### *3.2.4. Collaboration of EMS and ED*

The EMS and the ED collaborate daily, with an average of 14 patients per duty shift being handed over from the EMS to the ED (range between 3 and 50). The collaboration between the EMS and the ED is rated as "good" by most interviewees (10/17). Recommendations for improvement include better handover by EMS, improvements in the area of the integrated regional headquarters and better care of patients by the EMS.

### *3.2.5. Significance of the EMS information*

One of the reasons why paramedics' information is very important is that they have access to different sources of information than emergency department staff. For example, the EMS staff sees the patient in situ or his housing situation and can talk to the relatives. The paramedic's assessment is essential in preparing the patient for further care in the ED, but the ED estimates that the paramedic is wrong in 35% of the cases. Mistakes in assessment can result in the patient being admitted to the wrong department, leading to longer waiting times and a longer duration of treatment. In the worst case, the delay can lead to the death of the patient if the emergency department staff do not notice the mistake in time. Therefore, an option to learn is essential for the paramedic service.

### *3.2.6. Mockup*

Most of the participants (13/17) liked the mockup. They expressed the wish for a free-text field to provide further information. One respondent expressed the wish to also receive feedback from the paramedic service in reverse via the feedback system. The respondents expressed concerns because the interface for such a system was not yet available and the human factor could be lost.

## 4. Discussion

EMS personnel rarely or never receive feedback on patients' diagnoses or well-being. This lack of feedback prevents quality improvement and highlights gaps in communication between EMS and ED.

A study from the USA [10] has shown that paramedics in other countries also never receive feedback, or receive it only one third of the time. Interviewed paramedics have expressed their wish for more feedback from the hospitals, and a study has shown that the majority of paramedics consider feedback from the emergency department to be helpful. A study by Bleijenberg from the Netherlands [11] showed the direct positive impact of feedback to paramedics on patient care, using cardiopulmonary resuscitation as an example.

An automated, IT-based feedback system could provide a solution. Both paramedics and emergency staff would like to have a free-text field for additional information as feedback. Funding plays a crucial factor in the development of such a system. Software providers (e.g. IVENA©), hospitals and emergency services would have to cooperate in the implementation.

One of the major concerns is the worry about possible sanctions due to negative feedback. A possible solution would be that staff members only receive the feedback on the patients they were involved in. A supervisor only gets an overview without the possibility to link the respective staff member to a case.

During the interview, the wish to provide feedback in both directions was expressed by both groups. This would also allow EDs to learn from EMS. This can further improve the communication and collaboration between both groups and could reduce misunderstandings. General collaboration could be enhanced as a result.

The current German laws do not allow an official feedback for paramedics from EDs. To solve this problem, a collaboration with data protection officers and responsible offices could be necessary to balance data protection and patients' health benefits.

The study has certain limitations that need to be acknowledged. Firstly, the data was only collected from a limited geographical area, namely Middle Franconia. Additionally, the data was only gathered from employees of one EMS organization and four hospitals. To ensure the generalizability of the results, it would be desirable to conduct a larger scale survey covering Germany in total, both rural and urban regions, and involving employees from multiple EMS providers and acute hospitals. Furthermore, other relevant groups should also be surveyed. Secondly, the voluntary nature of participation in the interviews could have led to a bias in the results, which needs to be considered. Finally, the study only focused on emergency department staff and nonphysician paramedics, and it would be interesting to survey other hospital departments and management levels, including the watch director, ambulance medical director, department head, nursing director, and medical director. A survey of the depositors would also be beneficial.

## 5. Conclusion

In summary, feedback is important and wished for by paramedics as it can improve patient care and collaboration between medical actors. Lack of feedback often results from a lack of time and opportunity, and feedback is often given in an informal setting. Feedback is essential for quality improvement in emergency services. The introduction of an automated feedback system could provide a solution. An initial pilot project, possibly integrated into existing software such as IVENA© would be a possible next step.

## Declarations

*Ethical vote:* There is no legal obligation to consult.

*Conflict of Interest:* The authors declare that there is no conflict of interest.

*Contributions of the authors:* MK, MV, JC, WR: conception of the work; MK, WR: data acquisition and interpretation; MK, MW, JC: patient recruitment; MK, MV, JC, WR: writing the manuscript. All authors approved the manuscript in the submitted version and take responsibility for the scientific integrity of the work.

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