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# What Went Wrong in eMedCare? Formative Evaluation of an IT Project in Primary Care in Two Rural Districts

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**Abstract. Introduction** The interaction between nurses and physicians in the primary care setting is challenging with regard to structural, process and technical barriers. In order to overcome these barriers, the eMedCare project was launched and a commercial system was implemented. **Objective** This study aimed at a formative evaluation of the project. The findings should be used retrospectively to understand the failure of the project. **Methods** To this end, two rounds of qualitative interviews with 10 respectively 8 healthcare providers were performed. **Results** The interviews revealed a mixed benefit. Difficulties arose because the initial aim to monitor patients shifted towards improving the communication between the providers, partly due to the poor usability of the monitoring system. Additional workload was imposed because the system was not interoperable with the institutional IT systems. **Conclusion** Projects with an unclear or shifting vision and focus seem to be susceptible to failure. The secure communication applications could have been realised on the intended scale if the national *Telematikinfrastruktur* had been in place.

**Keywords.** Primary care, physicians, nurses, patient monitoring, provider communication

## 1. Introduction

The provision of care across professions and organizations is challenging with respect to continuity of care [1] which is generally true, however particularly when the professionals are scattered over practices and facilities such as it is the case in the primary care setting. Health IT systems, e. g. to support communication, are a means to mitigate these challenges by supporting information continuity, one of the dimensions of continuity of care [1]. Despite its great potential, the use of health IT systems does not remedy these problems alone, in particular as details about the type of cooperation have to be settled before health IT can unfold its power [2]. Furthermore, there are still barriers even once the cooperation has been established which can be broken down into structural,

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ideological, organisational and relational barriers [3–5]. In addition, health IT can be a barrier in itself, e.g. when usability is compromised [6].

While all these barriers are well known and are – in principle – avoidable, there are many projects that do not succeed in supporting to establish information continuity. This paper will therefore take the perspective of a failed project and summarise the lessons learned. The paper is based on a study that aimed to evaluate the use of a health IT system for physicians and nurses in primary care. This formative evaluation should focus on the users' perception of the IT system's impact on the care delivery processes and on the identification of use cases that were well and less well covered by the IT system.

## 2. Methods

### *2.1. Organisational Settings*

The study was embedded into the project eMedCare, conducted by two rural districts in Western Lower Saxony, Germany, of whom one initiated and financially managed the project. After the project funding was granted, a call for tenders was published for the IT system of the project, to which only one vendor responded who then was selected.

In the project, three nursing care facilities (two nursing homes and one home-care service) and four practices of general practitioners (GPs) agreed to cooperate in order to improve the care of their patients by allowing a more continuous monitoring of physiological parameters, such as vital signs, blood glucose level and ECG. Each nursing care facility worked at least with one practice. For each pair of practice – nursing care facility, only patients (n = 28) were included who themselves or their guardians consented to participate.

### *2.2. System description and system in use*

In order to perform the measurements at the point of care an off-the-shelf commercial system was implemented. All devices necessary to measure weight, blood pressure, glucose, pulse, oxygen saturation, peak flow, temperature, heart activity (via ECG) were included in a backpack. These devices could be operated by a tablet computer. Depending on the role of the user, the software on the tablet offered different functions. Physicians were able to order measurements and questionnaires and view the results, nurses could view these orders, perform measurements using the devices from the backpack or enter the measurements manually, and send these data. Nurses were also able to enter information provided by the patients into a questionnaire. While the nurses used the system mainly via the tablet, the physicians requested the measurements/ questionnaire data and viewed the findings typically via a web portal. This web portal also included an alarm function for the physicians which could be calibrated individually for each patient, and different modes of data visualisation. Patients had no direct access to their data in this phase of the project. A general overview of the IT-system is shown in Figure 1.

All three nursing care facilities already used IT systems. Two of them used MediFox Dan, which by that time only included an interface for financial data, but also provided access for physicians [7]. The last nursing care facility used a product from DM EDV, which by that time provided interfaces to applications within the MS suite and for financial data [8].

To evaluate the IT system formatively, two rounds of guided expert interviews were conducted. In the first round (June to August 2019), five general practitioners and five nurses (two from a home care service; three from a nursing home) participated. Two nurses worked as nursing managers while the remaining three had an executive function. Out of all ten participants, there were five males and five females. Focusing on the general setting, ten open-ended questions of the interviews served to reveal the perceived impact of the eMedCare IT system on the care processes. In the second round (February to August 2020 – delays due to Covid-19), four general practitioners and three nurses (one from a home care service, two from nursing homes) were interviewed. In total three males und four females participated. All of them had taken part in the first round as well. Here, the interviews focused on identifying use cases and scenarios which were well or less well supported by the system.

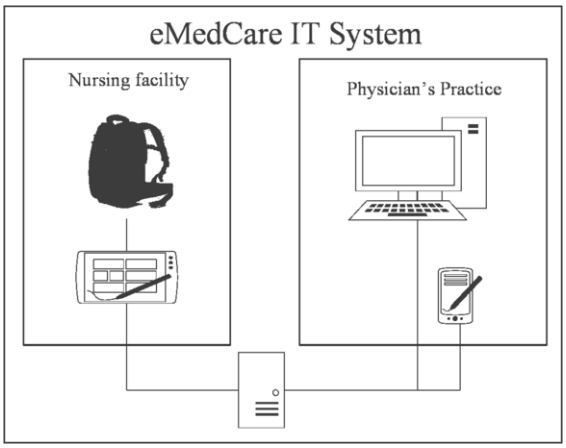


**Figure 1**. Overview of the final IT system structure used in eMedCare

During both phases, each facility was represented by at least one participant. The interviews in both rounds were audio recorded, transcribed and the transcripts analysed according to qualitative content analysis [9]. The transcripts of the second round were furthermore translated into UML use case, process and class diagrams using Visual Paradigm V16 to identify well and poorly supported processes.

It is noteworthy, that major software changes were realised between the first and second round due to the feedback giving in round one. These changes included new features such as a chat that was added to the application on the tablets together with a chat app for the physicians, and a function for taking and submitting annotated photos was integrated as well as the opportunity to submit documents like requests for prescriptions.

After interview round two was finished the project came to an end and the application was abandoned.

## 3. Results

### *3.1. Round one: New processes, more workload, mixed benefit*

*Impact on health care provision*

The healthcare providers noted some benefits. In particular, the GPs reported that the IT system could be used as a tool to prepare visits, and the digital patient record allowed nurses in the home care setting to access data even though they were not at the patient's home. However, there were also major difficulties recognised by the healthcare providers. They complained about a higher workload due to the IT system. The general practitioners stated that they actively needed to look into the portal to find out whether there were new data. Nurses told that they had extra tasks to fulfil. These tasks also led to more documentation as double or triple documentation was necessary due to lacking interfaces between the devices and the institutional IT systems. The participants also reported that the access to data improved, but in some cases the number of direct contacts between the physicians and their patients decreased. Another point referred to the usefulness of devices from the backpack. The nurses did not regard them as very functional.

*Impact on teamwork, communication, and cooperation*

The participants stated that the cooperation as such was not influenced. Although the data were transmitted immediately at the point of care, they were not read by the physicians once they came in. Consequently, they feared to oversee information. Thus, they preferred communication via fax. The nurses stated that the IT-system still required to reach out to a physician via phone and this took time. Recalls from physicians then often reached the next shift, who were not familiar with the reason for the call.

*The project itself*

Participants reported that it took some time to adapt to the changing processes. Some also reported that the workload increased due to the new processes imposed by the project. A physician remarked that the number of tasks should not be too large and the frequency of measurements not too high to avoid time pressure on nurses.

*Outlook*

Due to the limited number of health care organizations included and the small number of patients included into the project, the participants stated that in inclusion of other disciplines and professions and the inclusion of more patients might lead to more communication and therefore to a higher impact. The participants also wished to shift from a system mainly for documentation and monitoring to a system that supported the communication (including video calls) between the healthcare providers. They also proposed to integrate the national medication record ("Medikationsplan").

### *3.2. Round two: Shift of focus*

During the second round of the formative evaluation, it became clear that the project focus had shifted from realising an application for monitoring and documentation

towards an application for communication. The chat app for smartphones was made available that the users had requested.

*Usage of IT*

Out of all functions offered by the IT system at the interview round two, the chat and the photo function were the ones that were predominantly used. Other functions – in particular for measuring vital signs and other physiological parameters – were hardly used, except of measuring the blood glucose level. One reason for not using these monitoring functions was that the devices were still (like in round one) not considered to be suitable for this purpose. For example, the scale was described as too small. Furthermore, it was stated that patients with dementia pulled off the ECG electrodes before all electrodes could be applied and the measurements could start. Another factor was that the backpack was found to be too big, heavy and bulky for female nurses in home care. An overview of use cases available, not used and desirable is given in Table 1. It shows that beyond the measurement functions and the communication functions further applications were found to be desirable but not available in the eMedCare system.

**Table 1**: Use cases available, not used and desirable

| **Use Case** | Currently available | Available but not used | Desirable but not available |
|---|---|---|---|
| Ordering measurements and other tasks (physician -> nurse) | x | | |
| Measuring vital signs and other physiological parameters | | x | |
| Integrating tasks and measurement data in institutional IT-system | | | x |
| Documentation: wound assessment including photo documentation | x | | |
| Chats: writing, reading | x | | |
| eMail / chat: sharing documents | | | x |
| ePrescription: medication | | | x |
| Medication record: sharing, reading ("*Medikationsplan*") | | | x |
| ePrescription: ordering nursing care at home "Häusliche Krankenpflege" | | | x |

*Impact on teamwork, communication, and cooperation*

Due to the integrated chat, the communication between facilities was improved. Instead of calling a practice several times and waiting for someone to respond to the call, asking the physician for an answer and calling back to reply to a question, the nurses used the chat function to write their question and the physician could answer. Only in case of an emergency, the nurses called the practice or directly the ambulance.

*The project itself*

Within the project each nursing care facility cooperated with one or two practices, though they had patients from different general practitioners. Also, each general practitioner cooperated with only one nursing care facility within the project, though they might have

patients in other nursing settings as well. Out of this small number of patients, not all participated in the project. This led to a very small number of patients being included into the project. Therefore, the participants always used the "normal" way to communicate, the communication via eMedCare came on top. For each patient, the participants had to look whether they were part of the eMedCare project. Thus, a nursing care facility and a practice might have to use eMedCare for patient A and the "normal" communication for patient B.

One participant did not see the need to change communication ways as the current ways were rated as sufficient. However, a missing commitment to communicate via the new chat function was also criticised and an obligation to do so was demanded.

*Outlook*

In addition to the outlook of round one, participants wished for a reproduction of the whole prescription process (request for a prescription, medication record, ePrescription) within the IT system in order to improve their workflow.

## 4. Discussion

Although the nurses and physicians recognised some benefits of the eMedCare IT system, the functions provided did not match the expectations overall. Due to usability and interoperability issues, the integration into the workflows was poor. The nurses performed extra tasks in addition to the already high workload. Furthermore, the eMedCare system as a monitoring turned out to be only partly useful and functional. On top of this, the focus of the users shifted during the use towards a communication application. All these deficits emerged during the course of the project, because there was no real agreement to change the collaboration and communication processes - for the few patients in this project and for a larger number in the future.

Even though the number of patients was a barrier, some of the problems which arose during the project, would also have come up with more patients. The lacking interfaces between devices and IT systems would still have led to a higher documentation burden. Many of the perceived difficulties arose from a lack of pertinent applications within the national IT infrastructure for health care (*Telematikinfrastruktur*), such as a national electronic health records, secure communication systems like e-mail and chat, and applications for medication processes, as well as the missing obligation to provide interoperable systems. Whether these services will become available as promised [10] remains to be seen.

In the end, the project members abandoned the eMedCare system after the project had finished. They did not request the two districts to continue or to extend the project. Abandonment is a phenomenon rather neglected in research but seen in practice and addressed by the NASSS framework that brings together issues of non-adoption, abandonment, scale-up, spread, and sustainability (NASSS) [11]. The authors of the NASSS framework contend that complicated scenarios tend to be prone to abandonment. Most strikingly were the following criteria that match the statements of the users in eMedCare (Table 2).

The findings from this project have to be regarded as an illustration of how projects can fail. They do not claim to be representative and the generalisation is therefore limited. One might argue that with more patients and more healthcare provider included the

system would have had a better chance to enfold its power. On the downside, the projects had inherent problems which could have maximised these deficiencies.

## 5. Conclusion

In response to the initial question "What went wrong in eMedCare?", there are three answers. The first point is that digital health is no solution but needs a shared and clear vision about the added value and an understanding of the processes required to achieve these goals. The second point is that each IT system must be evaluated for its usability in a given context. The final point is that the legal and technical framework provided by the national healthcare system must match the use cases envisioned. This applies to the German *Telematikinfrastruktur* on the part of the technology and the legal regulations of how physicians and nurses interact in primary care and how this is financially reimbursed.

**Table 2**: Comparison between selected NASSS criteria and the findings from the eMedCare project

| | **NASSS criteria** | **eMedCare** |
|---|---|---|
| **Technology:** | *freestanding, not yet developed or fully interoperable;* | Tablet and portal software not integrated into IT system of the organisation; no relevant applications of the national *Telematikinfrastruktur* were available. |
| **Organisation:** | *Limited slack resources; Multiple organizations with partnership relationship; Some work needed to build shared vision, engage staff, enact new practices, and monitor impact* | IT system and processes increased the workload; there was no shared vision between nurses and physicians. |
| **Value proposition:** | *The value proposition of the technology was unclear, in terms of a viable business venture for its developer or in terms of a clear benefit for patients and an affordable real-world service model.* | The value proposition was unclear: The software provider originally pursued a different type of added value (mobile monitoring of patients) than the eMedCare consortium (communication). The value for the patient was never discussed. |
| **Wider context:** | *Complexity in external (financial, regulatory, legal, policy) issues—of which reimbursement seemed to be particularly key—stalled the mainstreaming and spread of the program.* | The interaction between nurses and physicians in primary care is regulated by the *Verordnung für Häusliche Krankenpflege* which does not include this general monitoring scenario for which the nurses did not get reimbursed. |

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**Declarations**

For both interview sessions a positive vote was obtained from the Ethics Commission of Hochschule Osnabrück (final VoteID: HSOS/2020/1/4).
The authors contributed to this study and this paper as follows:

- MP and LP: data gathering and analysis
- MP and UH: conceptualization and writing,
- LP, AB, and MS: review and editing.
- MS: project management
- UH, AB, and MS: supervision

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