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Implementation of a Mobile Application in Acute Stroke Care Documentation

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Abstract. Acute stroke care is a time-critical process. Improving communication and documentation process may support a positive effect on medical outcome. To achieve this goal, a new system using a mobile application has been integrated into existing infrastructure at Hannover Medical School (MHH). Within a pilot project, this system has been brought into clinical daily routine in February 2022. Insights generated may support further applications in clinical use-cases.

Keywords. Acute stroke care, clinical documentation, mHealth

1. Introduction

Stroke is one of the leading causes of death and responsible for a large proportion of disability in the adult population. Care of acute strokes is a particularly time-critical process, involving staff members from emergency medicine, neurology, neuroradiology, anesthesiology, and neurosurgery. As time saving has a direct positive effect on the medical outcome [1], an efficient communication is crucial for acute care. Since documentation time can be further reduced by digitalization [2], we brought a mobile application into use within our study. This publication focuses on the technical part.

2. Methods

Starting in March 2021, analyzing the hospital's actual state, technical infrastructure, documentation, and communication processes regarding acute care of stroke patients formed an important basis for implementing further steps. Workflow documentation in the actual state (figure 1) is performed by staff from different departments using a single paper-based document. Viewing and recording of progress data is tied to the physical

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presence of this document. Notification of subsequent wards is done via a phone call. To inform the entire care team, several calls are necessary. In summary, the actual process has potential for optimization especially regarding the availability of progress documentation and communication as marked with lightning symbols in figure 1.

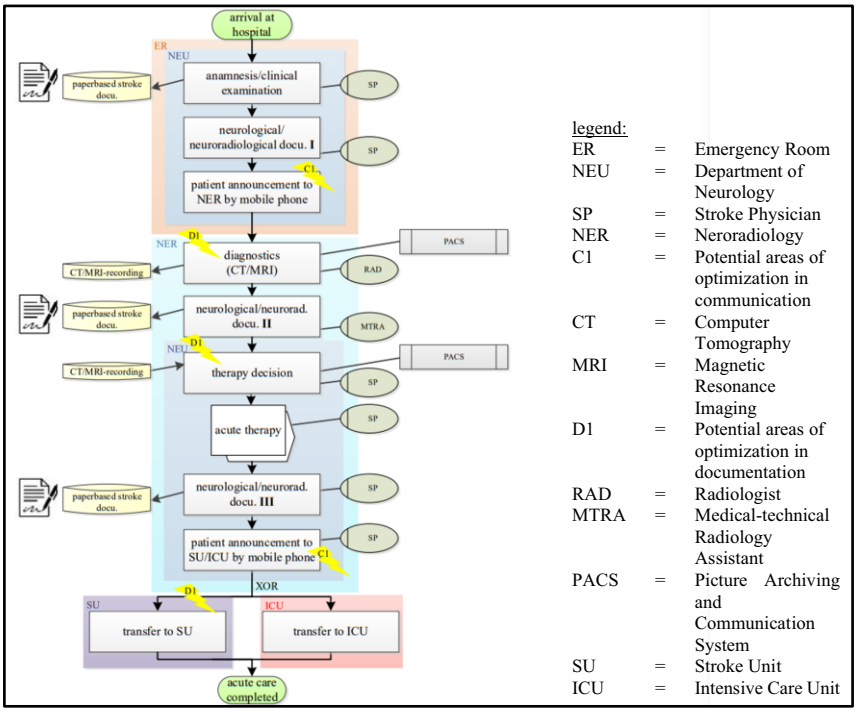

Figure 1. Acute care workflows (actual state; simplified).

The target state (figure 2) uses a mobile application (*Join* from the company Allm Inc. – provided by Allm EMEA GmbH), which enables communication and supports mobile documentation. Patient cases can be created, process times relevant to stroke interval care can be documented and diagnostic image data can be displayed.

Systems at MHH identified to be essential for process transformation to the target state are shown in figure 3. For automatic case creation in the app, a new button was integrated into the clinical information system (CIS). Various interfaces via communication server at MHH had been created to provide bidirectional data flow between the CIS and the mobile application. CT and MRI image data can be forwarded to the app using the DICOM standard by directly connecting the CT modality to the app. To provide further image data (e.g. MRI) when needed, an interface between the PACS and the mobile application had been established.

Data security and data protection concepts had been considered during implementation, e.g. by using secure data transfer, user account control as well as a pseudonym for patient identification. Finally, training of the end users and creation of short instructions as part of the rollout before use in clinical routine became essential to ensure safe handling.

3. Results

Technical implementation and integration of the modified workflow has been realized successfully. Various interfaces provide data flow between the CIS and the mobile application. All CT images for patients with imaging due to acute stroke are transferred automatically to the mobile application. All involved employees are notified via single-call activation in group chat when a new case is created or updated. Usage in clinical practice at MHH started on February 16, 2022. Since then, stroke documentation has been entirely digitalized replacing paper-based documentation.

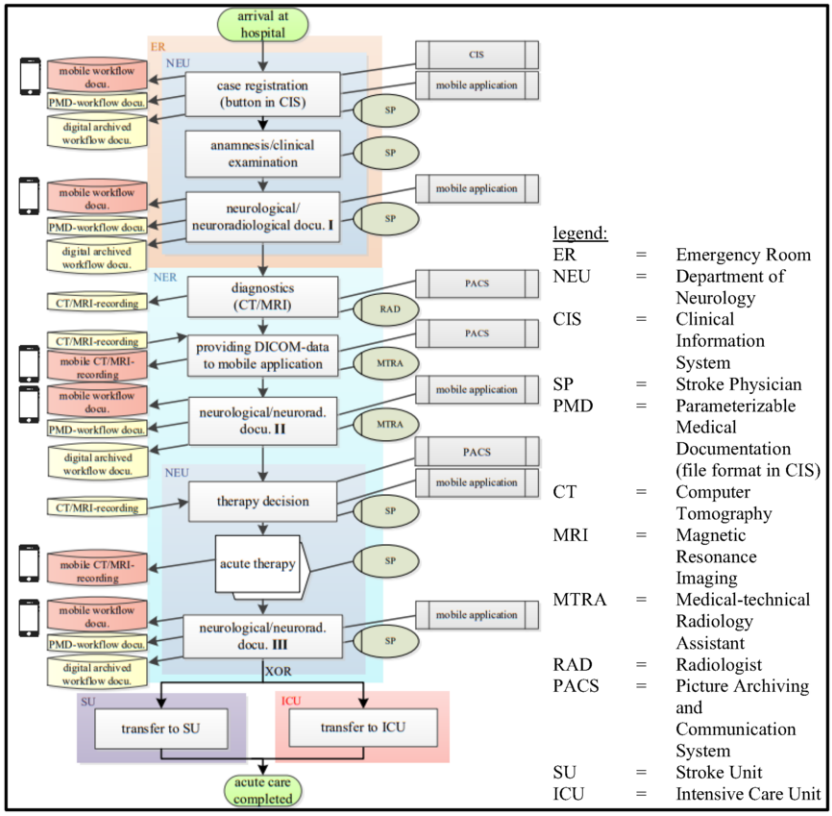

Figure 2. Acute care workflows after process optimization (target state; simplified).

4. Discussion

Although crucial advantages have been reached by implementation of the app, there are important limitations that need to be discussed. Process transformation in the setting of time pressure in the emergency room requested a high level of support. Though a more complete and structured digital documentation has been achieved by the process implementation, it can still be optimized with respect to daily clinical practice. The potential to reduce workflow time through digitalization [3] could not yet be exploited regarding documentation, while reaching a noticeable improvement in data access time.

In Addition, the mobile application used still needs minor further enhancements regarding our needs.

Single-call activation in group chat instead of informing each ward staff individually is a proven method to shorten treatment time of acute stroke [4]. The mobile application was primary designed as a messenger [5]. With documentation, a new function could be established.

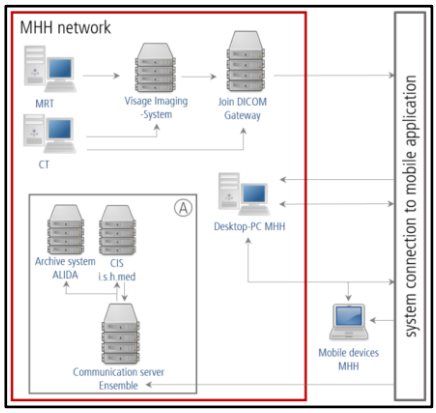

Figure 3. Communication links for implementation.

5. Conclusions

Digital documentation enables data to be available in collaborating systems in real time. Thus, it enables viewing recent progress documentation regardless of location, which is a great advantage in our use-case. Hereafter, experiences from this pilot project may help to implement mobile applications within other clinical use-cases.

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