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Østergaard, Kija Lin; Simonsen, Jesper; Hertzum, Morten

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## The Handover from Intensive Care Unit to General Ward: Baseline Performance and Participatory Design of an Electronic Follow-Up Plan

Kija Lin Østergaard<sup>a</sup>, Jesper Simonsen<sup>a</sup>, Morten Hertzum<sup>b</sup>

<sup>a</sup> Department of People and Technology, Roskilde University, Roskilde, Denmark,

<sup>b</sup> Department of Information Studies, University of Copenhagen, Copenhagen, Denmark

### Abstract

*The transfer of patients from intensive care unit (ICU) to general ward involves risk to patient health. To mitigate this risk the present study investigates the current use of follow-up plans in the handover from ICU to general ward and proposes a novel design of follow-up plans. On the basis of a record audit we find that follow-up plans exist for only 16% of the audited transfers, that these plans are rarely used, and that 25% of the patients with a plan die within 24 hours of their transfer. In a subsequent series of participatory-design workshops with ICU and ward nurses we devised an electronic follow-up plan that consists of an attend-to list rather than a checklist. The attend-to list specifies the issues of concern but leaves the process of attaining them for the general-ward nurses to decide, thereby acknowledging and utilizing their expertise.*

### Keywords:

Patient transfer, Patient handoff, Electronic health records.

### Introduction

Patients are habitually transferred from one clinical setting to another, such as from ambulance care to emergency department [1], from one ward to another ward within a hospital [2], and from hospital care to primary care [3]. These transfers involve risks of information loss [4], discontinuity of care [3], and adverse events [5]. To mitigate these risks, patient transfers are accompanied by handovers during which information about the patient is transferred to the receiving staff. In the present study we focus on the handover from intensive care unit (ICU) to general ward. This handover warrants attention because the patients arriving from the ICU will be among the weakest patients at the general wards and because the general wards have far fewer resources for monitoring and treating patients than the ICU.

ICUs cater to patients with severe, life-threatening conditions that require constant monitoring, advanced equipment, and specialist medication to sustain normal bodily functions [6]. As a consequence, the mortality rate is high for ICU patients. Table 1 shows the mortality rate for ICU patients in Denmark, the country in which this study is conducted. Not only do many patients die in the ICU, there are also many patients who die shortly after ICU discharge, and this pattern has been stable over the past several years. In the year July 2016 - June 2017 the 4% deaths within 48 hours of ICU discharge correspond to 986 patients. Temporally these deaths coincide closely with the transfer of the patient from ICU to general ward.

At the studied hospital the handover from ICU to general ward was facilitated by a follow-up plan made for the individual patient by the ICU nurses. The follow-up plan covered the initial 24 hours after transfer and consisted of a prioritized list of tasks for the nurses at the general ward, such as that the patient needed supplementary oxygen. For each task it was indicated when the task should be performed and whether there were special issues to consider. The day after the transfer the ICU nurse would visit the general ward to check up on whether the patient was treated according to the follow-up plan. In spite of the follow-up plans 4% of the patients died within 48 hours of their transfer, see Table 2. In addition, patient mortality within 30 days of ICU discharge was substantially above the national average (Table 1 vs. Table 2) and, thereby, called for scrutinizing follow-up practices.

Table 1 – Mortality of ICU Patients at Danish Hospitals

Mortality measure	2012-13 <sup>a</sup>	2016-17 <sup>a</sup>
In-ICU mortality	13%	11% (2958)
Within 48 hours of ICU discharge	4%	4% (986)
Within 30 days of ICU discharge	21%	21% (5966)

<sup>a</sup> The 12-month period July 1 - June 30. Sources: [7], [8].

Table 2 – Mortality of ICU Patients at the Studied Hospital

Mortality measure	2012-13 <sup>a</sup>	2016-17 <sup>a</sup>
In-ICU mortality	15%	14% (91)
Within 48 hours of ICU discharge	4%	4% (23)
Within 30 days of ICU discharge	27%	27% (167)

<sup>a</sup> The 12-month period July 1 - June 30. Sources: [7], [8].

In December 2012 the studied hospital installed electronic whiteboards at all wards to support interdepartmental communication and coordination. After the whiteboard had been installed the local clinicians were encouraged to configure it for their needs [9]. The whiteboard provided an opportunity to rethink follow-up procedures and introduce electronic follow-up plans instead of the existing paper-based plans. By using the whiteboard for coordinating patient transfers the follow-up plans would become more visible and interactive.

In this paper we report from our yearlong collaboration with the hospital to investigate existing follow-up practices and design electronic follow-up plans. While the former was achieved through a record audit, the latter involved a process of participatory design. We specifically ask:

- To what extent are follow-up plans made and used when ICU patients are transferred to a general ward?

- What should an electronic follow-up plan look like to support the transfer better than the current paper plan?

Systematic reviews of handover effectiveness recommend the use of electronic tools and of forms that systematize the information to be transferred, but they also report limited effects on patient mortality [4; 10]. In addition, studies of the nursing of former ICU patients show that general wards tend to feel overwhelmed by unrealistic demands [11; 12].

## Methods

This study was conducted at a hospital in Region Zealand, one of the five healthcare regions in Denmark. The hospital had 250 beds and about 35,000 annual admissions. Before the study started it was approved by hospital management. The participants individually consented to take part.

### Record Audit

To determine the extent to which follow-up plans were made and used we audited the records of all patients admitted to the ICU in 2012. First, hospital records were consulted to extract the patients who met our inclusion criteria, then local ICU records were consulted to obtain these patients' follow-up information. The inclusion criteria mirrored the criteria at the ICU for when follow-up should be performed. Follow-up could be initiated for additional patients at the ICU nurses' discretion, but we restricted our study to the patients who met the general criteria for follow-up. That is, we applied these five *inclusion criteria*:

- Patients >18 years of age, because people under the age of 18 were transferred to other hospitals if they needed intensive-care treatment.
- Mechanically ventilated >24 hours (invasively or non-invasively), because the complications associated with ventilation necessitated close monitoring of the patient after ICU discharge.
- ICU admission >72 hours, because the complications following ICU admission increased with its length.
- Unplanned transfers to a general ward in the evening or night (16:00-07:00), because the general wards had fewer staff resources during evenings and nights and, therefore, reduced capacity for unplanned tasks.
- Transfers to a general ward at the hospital, because follow-up was restricted to the hospital and, thus, did not cover patients transferred to other hospitals.

To avoid skewing the results of the audit we *excluded* patients transferred to the general ward for palliative care, because these patients had a high mortality rate irrespective of whether they were transferred from the ICU or from another ward. On the basis of these inclusion and exclusion criteria a total of 304 of the 946 patients admitted to the ICU in 2012 were included in the audit. The included patients were transferred from the ICU to three general wards: the medical ward for pulmonary diseases, the orthopedic ward, and the surgical ward. For each of the 304 included patients we inspected the records for information about whether a follow-up plan existed, whether it had been read at the general ward, whether ICU staff had made a follow-up visit to the general ward, whether the follow-up plan had been completed, and whether the patient died within 24 hours of the transfer to the general ward.

### Participatory-Design Workshops

We applied a participatory-design approach [13] to investigate how an electronic follow-up plan could be designed to support the patient transfers. Following this approach, we aimed at engaging the nurses from the involved departments in mutual learning processes to investigate the realities and challenges of the transfer situation. By iteratively articulating their needs and discussing how these needs might be supported the nurses arrived at a design proposal for a follow-up plan integrated in the electronic whiteboard.

The participatory-design process involved the ICU and the three same general wards as in the record audit: the medical ward for pulmonary diseases, the orthopedic ward, and the surgical ward. To ensure the representation of all nursing staff from these four wards, 24 participatory-design workshops were conducted, each lasting 1-1.5 hours. The workshops were conducted by the first author and spread across day, evening, and night shifts. Each workshop was attended by 1-8 nurses, who were at the same time on call in case the busy clinical environment demanded their attention. Eight workshops were held at the ICU, six at the medical ward, four at the orthopedic ward, and six at the surgical ward. The workshops sought to identify the processes and challenges in the current paper-based ICU follow-up and to discuss ideas for how to address the challenges through an electronic version of the follow-up plan.

On the basis of the 24 workshops a preliminary design proposal was made. This proposal was presented and discussed at two subsequent 3-hour workshops attended by eight representatives, two from each of the four wards. The representatives included four managing nurses, that is head nurse, head nurse assistant, or clinical development nurse. At these two workshops the design proposal was thoroughly discussed and revised into a final design of an electronic follow-up plan [14].

## Results

We first report the results of the record audit and then those of the participatory-design workshops.

### Baseline Performance

Follow-up plans existed for only 48 (16%) of the 304 eligible patients. That is, follow-up plans were absent for 84% of the patients for whom such plans should have been present. In addition, Table 3 shows that the majority of the plans that did exist were not accompanied by a follow-up visit by an ICU nurse, not read by the staff at the general ward, and not carried through to completion. Because our exclusion criterion eliminated transfers to palliative care the 48 patients with a follow-up plan were expected to survive. However, 12 (25%) of them died within 24 hours of their transfer to the general ward.

Table 3 – Baseline Performance

Category	Number	Percent
Follow-up plan made by ICU	48	100
Follow-up visit performed by ICU	10	21
Follow-up plan read at general ward	20	42
Follow-up plan completed	15	31
Death within 24 hours of transfer	12	25

For all 12 patients who died the follow-up plans prescribed supplementary oxygen and lung therapy. Nevertheless, the cause of death for two of them was hypoxic heart failure (i.e., insufficient oxygen or lack of supplementary oxygen). For four of

the 12 patients the follow-up plans also prescribed physiotherapy in relation to dysphagia (difficulties swallowing; a common complication after invasive mechanical ventilation). However, the cause of death for two of these four patients was aspiration failure (i.e., food or fluids going down the windpipe). These findings suggest that a redesign of the follow-up plans might improve the handover from ICU to general ward and save lives.

### Design of Electronic Follow-Up Plans

The participatory-design workshops revealed that follow-up plans were poorly implemented in the transfer of ICU patients to the general wards. The idea of facilitating the transfer with a follow-up plan was initiated by an ICU nurse who studied such plans as part of her continuing education four years prior to this study. The ICU managing nurse appreciated the idea of a written follow-up plan, asked the nurse to make a template, and arranged with the general wards to start using follow-up plans. The follow-up plan was introduced at the involved wards in 2008, but since then no systematic evaluation had been made. The follow-up plan was seen as an extra service provided by the ICU; no resources were specifically allocated to producing the plans.

The nurses, especially the ICU nurses, were astonished when they realized the poor baseline performance indicated in Table 3. The workshops uncovered that the follow-up plans were not integrated in ICU routines: Remarkably few were made and even fewer were followed up by visits at the general wards. The ICU nurses mentioned busyness and lack of management attention as primary causes, along with the experience that many of the follow-up plans they did make were not read at the general wards. At the general wards the situation surrounding the follow-up plans was also characterized by poor integration into work routines, busyness, and lack of management attention. In addition, plans were often displaced or not discovered by general-ward nurses. And the plans were generally considered confusing, overly detailed, and unrealistic. The main source of the perceived lack of realism was that the prescriptions in the plans did not fit the conditions and practices of the general wards, especially their staffing (up to 20 patients per nurse). Therefore, the participating nurses from all wards welcomed the initiative to redesign the follow-up plan and its integration into their work practices.

The workshops investigated two different paths for the redesign of the electronic follow-up plan: the checklist and the attend-to list. The checklist reflected an attempt to turn the paper-based follow-up plan into an electronic substitute with similar features. The initial 24 workshops followed this path. At the two final workshops the checklist design was challenged and revised into the attend-to list.

The paper-based follow-up plan was a checklist that contained evidence-based tasks for the general-ward nurses to perform. As such the paper-based plan followed an approach that originated from aviation and formed the traditional way of handling patient safety issues in healthcare, especially in relation to surgery [15]. A checklist is a cognitive aid that supports memory recall during high-stress situations. It seeks to regulate and standardize processes in order to comply with best practices and reduce errors [16]. A checklist-based follow-up plan functions as an aide-mémoire with a list of specific actions to perform and boxes for ticking off each action when completed.

In designing the electronic follow-up plan the ICU nurses established a base list of all the tasks it could potentially be relevant to include in a specific follow-up plan. This base list was largely adopted from the work leading to the paper-based plan. To create a specific follow-up, plan the ICU nurse would walk

through the base list and select the tasks relevant to the patient in question. The proposed design of the electronic follow-up plan included a facility on the electronic whiteboard in the ICU for creating the plan from the base list. When the patient was transferred the follow-up plan would become available on the electronic whiteboard in the general ward. The general-ward nurse responsible for the patient would then follow the plan and indicate the completion of its tasks by signing them off on the whiteboard. This way the administered care would be registered, and it would be made visible how far care had progressed toward completion of the plan. For example, the provision of lung therapy through continuous positive airway pressure (CPAP) would be specified as a task to be performed at 06:00, 10:00, 14:00, 18:00, 22:00 and 02:00 for at least 5 minutes, with a box to tick off the completion of each CPAP instance.

At the two final workshops the general-ward nurses raised concerns about the checklist-based design proposal. They felt that their professional integrity was compromised, and their competences questioned. The rigid checklist format was perceived as the ICU nurses stating in detail how the follow-up process should be performed, as if the general-ward nurses were novices. Furthermore, the checklist prescribed actions to be done according to ICU routines. The general-ward nurses were responsible for performing the tasks on the checklist, but they were not able to do it according to the detailed instructions in the proposed follow-up plan. The prescribed follow-up process did not align with the staffing and routines of the general wards. As an example of misalignment with general-ward routines, the ICU and the general wards calculated the patients' fluid balance at different times during the day. Thus, when a patient was transferred either the ICU or the general ward had to recalculate the patient's fluid balance. The times at which fluid balances were calculated depended on the time at which the nurses in each ward started their shifts, on their workload, and on the need to align their activities with those of other clinicians, such as the physicians' medical rounds. The differences in work contexts and the associated difficulties for the general-ward nurses to comply with the detailed task prescriptions in the follow-up plan were considered main reasons for the non-use of the paper-based plans. The general-ward nurses were compelled to perform only those tasks that were practicable under general-ward conditions and leave the rest of the follow-up plan undone. This problem was not addressed in the checklist-based proposal for an electronic follow-up plan. Rather, it was aggravated by timestamping the general-ward nurses' activities and, potentially, giving the impression of non-compliance and low quality.

To resolve the problems with the checklist-based plans the participants at the two final workshops redesigned the electronic follow-up plan into an attend-to list. This list itemized the issues that required the general-ward nurses' attention. While the list specified the issues of concern, it left it to the general-ward nurses to decide how best to attend to these issues within the constraints of the general ward. That is, the attend-to list described the pursued goals and left the process required to meet these goals for situated specification by local actors, see Table 4. For example, balancing a patient's fluids could be described as maintaining a fluid balance that was positive by 1000 ml. As another example the avoidance of aspiration could be described as regaining the patient's swallowing function or mobilizing mucus, rather than by prescribing when and how to perform CPAP. The workshop participants felt that the attend-to list supported the general-ward nurses' memory and optimized the communication between ICU and general ward, thereby preserving the positive features of the checklist. The ICU nurses were to select the issues of concern from a base list. This approach would make the selection quick for the ICU nurses and

safeguard against accidental omissions. The final design included a base list of 39 issues – seven of which with links to standard clinical guidelines – arranged under five overall tasks.

*Table 4 – The Checklist Compared to the Attend-to List*

The checklist	The attend-to list
Process-oriented	Goal-oriented
<ul style="list-style-type: none"> <li>• Prescribes the process of a task but not necessarily its goal</li> </ul>	<ul style="list-style-type: none"> <li>• Describes the goal (issue of concern) without prescribing the process</li> </ul>
Controlled processes	Contextual processes
<ul style="list-style-type: none"> <li>• Processes are standardized to bolster quality and safeguard against errors</li> </ul>	<ul style="list-style-type: none"> <li>• Process decisions are left to the nurse's discretion in the given context</li> </ul>
Novice-oriented	Expertise-oriented
<ul style="list-style-type: none"> <li>• Relies on instruction to tell the general-ward nurse how to care for the patient</li> </ul>	<ul style="list-style-type: none"> <li>• Relies on the general-ward nurse's competence to decide how best to proceed</li> </ul>

## Discussion

Our results (a) document the risk associated with the handover from ICU to general ward at the studied hospital, (b) reveal a handover reality that is quite different from how it was perceived by, especially, the ICU nurses, and (c) provide a novel design of electronic follow-up plans that consist of an attend-to list rather than a checklist. A follow-up plan existed for only 16% of the audited patient transfers. Furthermore, as much as 25% of the patients with a follow-up plan died within 24 hours of their transfer; in several of these cases the cause of death suggested that the general-ward nurses had remained inattentive to information specified in the follow-up plan. Thus, it is evident that improved handover practices are needed in the ICU, which is responsible for making the follow-up plans, as well as in the general wards, which are responsible for the patients after their transfer.

The present study highlights that handover procedures such as follow-up plans must cater to the differences between the ICU and the general wards. This finding echoes previous studies. For example Kauppi et al. [12] observe that the “gap between how care is structured and practiced in a general ward in comparison with an ICU requires adaptation of care in order to ensure a smooth transition”, point to the need for “the best possible preparation and collaboration between the nurses at the ICU and the nurses in the general wards”, and suggest to “improve the reporting and documentation prior to the ICU discharge.” Similarly, Enger and Andershed [11] emphasize the importance of a good handover report and observe that the general-ward nurses “often found reports to be suboptimal, without a clear caring plan for the patient, or too long, containing too much information about the procedures and medications given in the ICU.” The present study shows that failing to heed these insights may have fatal consequences for the transferred patients.

The participatory-design workshops with nurses from the ICU and three general wards constitute an extensive collaborative effort to reflect on the transfer situation and propose ways of improving it. The importance of a collaborative approach has previously been stressed by Enger and Andershed [11], who “encourage an interdisciplinary dialogue” by observing that the general-ward nurses “lacked a greater understanding of the work in the ICU”, whereas the “ICU nurses did not understand how much work they had to do on the general ward.”

The main result of the participatory-design workshops was the realization that checklist-based follow-up plans were suboptimal, and the design of an alternative based on attend-to lists. A

checklist-based follow-up plan imposes a specified process on the general ward. The general-ward nurses perceive this approach as being treated like novices when they struggle to apply the prescriptions from the ICU. As Bosk et al. [17] note they “come to feel that checklists undermine their claims to expertise.” The limitations of the checklist-based approach are consistent with how Markus [18] characterizes the knowledge re-use situation of the expertise-seeking novice. The contextual differences between the ICU and the general wards result in a follow-up plan with de-contextualized prescriptions that could easily be re-contextualized back into the ICU but were near impossible for the general-ward nurses to re-contextualize into their work.

Instead of the checklist-based plan the workshop participants propose an electronic follow-up plan based on attend-to lists. This alternative acknowledges the differences between the ICU and the general wards by avoiding detailed process prescription. At the same time the attend-to list enables the ICU nurses to convey their expert knowledge about the patient to the general ward in terms of specified issues of concern. The attend-to list specifies the goals (e.g., maintaining a fluid balance that is positive by 1000 ml) but leaves the process of attaining and sustaining them for the general-ward nurses to decide. Thereby, the attend-to list also acknowledges and utilizes the general-ward nurses' expertise.

The checklist and attend-to list represent two very different strategies for supporting the handover. Checklists subscribe to the same line of thinking as accreditation, a quality-improvement strategy that has dominated the healthcare sector in Denmark for more than a decade [19]. That is, checklists value behavior control [20] and aim to improve quality by standardizing work processes [21]. Conversely, the attend-to list corresponds to outcome control [20] and aims to ensure quality by leaving the decisions about how to conduct work in the hands of trained and skilled individuals [21]. The former is effective when the work can be planned in detail, while the latter is effective when the work is characterized by frequent exceptions and the need for situated adjustments. The attend-to list acknowledges the reality of a “gap between how care is structured and practiced” [12]. This gap limits the possibilities for pre-planning the patient transfer from ICU to general ward. Instead, the proposal to base follow-up plans on attend-to lists leaves the process of deciding how to handle the issues of concern to the discretion – and expertise – of the nurses at the receiving ward.

In interpreting the results of this study, it is important to remember its limitations. First of all, the attend-to list has been devised but its use has not been evaluated in clinical practice. Such evaluation is important future work. The present study provides a baseline against which to compare the results of introducing follow-up plans that consist of attend-to lists. A second limitation is that this study is restricted to one hospital. While its above average patient mortality within 30 days of ICU discharge calls for improving handover practices, it may also indicate differences in the composition of the patient population compared to other parts of Denmark. Such differences may, in turn, influence the work in the ICU and general wards. The handovers at the studied hospital are, however, complicated by issues similar to those discussed in previous studies.

## Conclusions

Discharge from the ICU involves risk to patient health. At the studied hospital 25% of the patients for whom the ICU has made a follow-up plan die within 24 hours of their transfer to a

general ward. Part of the reason for these deaths is that the follow-up plans fail to consider the staffing and other practical realities at the general wards and, therefore, mostly remain unread or uncompleted. An alternative design of the follow-up plans was devised in collaboration with ICU and general-ward nurses. This design made use of the electronic whiteboard already in use across the hospital and consisted of an attend-to list rather than a checklist. The attend-to list specifies the issues of concern and leaves it for the general-ward nurses to heed these issues in the way they deem right on the basis of their situated understanding of general-ward work.

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## Address for Correspondence

Kija L. Østergaard, Department of People and Technology, Roskilde University, Roskilde, Denmark, email: kijal@ruc.dk.