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RESEARCH ARTICLE

Repairing disrupted care processes as sources of stability, learning and change in a Finnish hospital: An activity-theoretical study

Anu Kajamaa[1] | Päivikki Lahtinen[2,3] | Karen Mattick[4] | Rob Bethune[5]

[1]Learning and Learning Processes Research Unit, Department of Education and Psychology, University of Oulu, Oulu, Finland

[2]Division of Research and Innovation, University of Agder, Kristiansand, Norway

[3]Center for Research on Activity, Development and Learning (CRADLE), University of Helsinki, Helsinki, Finland

[4]Centre for Research in Professional Learning, University of Exeter, Medical School, St Luke's Campus, Exeter, UK

[5]Academic Department of Colo-rectal surgery, Royal Devon University Helathcare NHS Foundation Trust, Exeter, UK

Correspondence
Anu Kajamaa, Learning and Learning Processes Research Unit, Department of Education and Psychology, University of Oulu, Oulu, Finland.
Email: anu.kajamaa@oulu.fi

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Abstract

Introduction: In high-income countries, it is estimated that one in every 10 patients is harmed while receiving hospital care; 50% of these are preventable. The aim of this study was to deepen our understanding of disruptions of care processes and how the repairing of disruptions can be sources of stability, learning and change in complex health care settings.

Methods: The organisational interactions associated with disruptions in the standard care processes of 15 surgical patients were followed in a public sector hospital in Finland. The patients and medical professionals were interviewed in situ during the observation of the care processes. An activity-theoretically informed methodological framework was used to identify and analyse disruptions and the associated repair efforts and repair solutions.

Results: Disruptions were frequent and found in all 15 care processes. These related to (1) the patient's worsening physiological state, (2) the equipment used in surgical care, (3) the information flow, (4) delays in the care process and (5) the unclear division of labour within the team. The actors carried out three types of repair efforts (technical, cognitive-emotional and extended collaborative) to overcome the disrupted processes, which usually led to repair solutions that restored stability.

Discussion: The different repair efforts required different kinds of collaboration and learning. Extended collaborative repair was most demanding, providing challenges and opportunities for practice change and expansive learning.

1 | INTRODUCTION

In high-income countries, it is estimated that one in every 10 patients is harmed while receiving hospital care due to a range of adverse events; however, as much as 50% of these are preventable. The existing studies in the context of health care usually focus on symptoms of adverse events, traced retrospectively via employee interviews, patient charts or other documentary data, rather than observing them in situ. The retrospectively conducted (typically review) studies often focus on rather severe or major adverse events or failures, such as injuries resulting in the patient's prolonged hospitalisation, disability or death.[1–5] Despite the growing number and significance of health care research on adverse events,[4,6] mistakes and failures,[7–9] ethnographic studies focusing on how small disruptions unfold in mundane everyday care processes are still rare.[10,11]

Widening our knowledge on everyday disruptions in care processes can provide important information to prepare medical students for the complexities of their future work practices. Such studies can

inform prevention of adverse events, mistakes and failures in health care, simultaneously enhancing care quality, process improvement and learning. They can enhance our understanding of how the organisational system is maintained in the face of everyday disruptions. Engaging patients within the study of everyday disruptions can also widen our understanding of how hospitalised patients identify errors or injuries in their care. Furthermore, everyday disruptions provide a useful window to organisational complexity, its management and the learning that can arise from such situations. With these research interests in mind, we ask the following research questions:

1. What kinds of disruptions most frequently emerge during the studied care processes?
2. To what extent and how are the disruptions successfully repaired by the studied medical teams?

Our data were collected in a surgical operating unit of a public sector university hospital in Finland. Surgical care is an interesting and paradoxical context for the study of disruptions because, on the one hand, surgery depends on standardised care protocols and well-framed, historically established routines carried out by highly specialised medical professionals. And on the other hand, there are frequent emergencies and unexpected situations in surgery, and it is constantly vulnerable to unexpected disruptions.[11] Surgery is also reliant on planned disruptions (innovation) to pioneer new approaches. Indeed, the disruptions and their repairing efforts affects team dynamics and performance, being vital also for improving the safety and efficiency of care processes.[12–15]

In this study, we draw from cultural historical activity theory, which has recently gained increasing popularity among medical education and health care research.[16–21] This theory is well suited for our study as it focuses on organisations as complex systems, including practices, disruptions and multiple actors with diverse interests and professional competences. We perceive disruptions as deviations from the normative standardised care pathway protocols (i.e., scripted course of events) in the care process, which emerge in interaction among the medical practitioners and the patients. Further, perceiving disruptions as an inherent feature of complex work processes and social practices,[22] we view them as embodied and mediated by the language, tools and artefacts shared by the participants of a certain community.[23,24]

Typically, the word 'disruption' carries a negative connotation in organisations.[25] Taking an activity theoretical stance, we wish to highlight that disruptions, if recognised and acknowledged in work processes, can function as important drivers for learning, development and organisational change.[26] In this study, inspired by organisation and management studies literature,[10,27,28] we introduce and apply the concepts of repair efforts and repair solutions as means to overcoming everyday disruptions and to learning from these and, by doing, so add novelty to existing activity-theoretical studies conducted in the context of health care and medical education.

2 | THEORETICAL FRAMEWORK

2.1 | Disruptions and their repair in care processes

Previous practice-based organisation and management studies have developed a growing interest toward disruptions in organisations and institutions.[29–34] Among these studies, 'disruptions' are typically defined as deliberate attacks on institutions or on a specific institutional order.[35] From the viewpoint of organisational change management, disruptions may be seen as opportunities to turn institutional wrinkles into significant tears in the institutional fabric.[10,36]

Recently, organisation and management studies have increasingly focused on non-intentional, unexpected, major societal/global disruptions, such as the Covid19 pandemic, economic crises, political polarisation, climate change and other grand challenges and vulnerabilities, which affect organisations and institutions.[37] Fewer studies have applied ethnographic, observation-centred methodologies, which can widen our understanding of how smaller scale disruptions can provide insight into current institutional rules, norms, expectations, shared understandings and taken-for-granted beliefs and activity patterns.[10,11,38–42] For example, a previous ethnographic study in a hospital stated that smaller scale, everyday disruptions can be sites in which problems are smoothed out.[10]

To better understand disrupted processes and practices in complex organisational settings and systems, the notion of repair has raised research interest among organisation and management studies.[10,27,41,43–50] Among these studies, repair has been defined, for example, as a process, which usually aims at maintaining order, identity and meaning and adjusting the right 'fit' in the interaction of parts of a system.[49] Furthermore, repairing has been defined as a situated and socio-materially mediated activity, emerging in a cultural context where observable, and sometimes implicit, disruptions or breakdowns of human and material interactions take place.[28,49] It can also mean repairing of a material script, which has broken down in an organisation, in a specific instance.[28] Also, amateur repair movements and communities outside formal organisations exist.[27]

Repairing is important for different organisational purposes, especially for overcoming disruptions and breakdowns, which frequently take place in contemporary organisations. It is also crucial for managing existing protocols and practices, and for repurposing, obsolescence, restoring, reuse and maintenance of activities and institutionalised roles.[10] It is also needed for breaking away from the limits of existing protocols and practices.[27,28,49,51] Repairing is also important for development of distributed expertise, and it often has creative, inventive, imaginative, silent, invisible and innovative features for making a difference and to overcoming the unworkable practices and organisational 'stiffness'.[49] Despite its potential power in widening our understanding of organisational stability and change, repair is still a rather neglected organisational phenomenon.[10,49]

2.2 | Activity theory as a lens to studying disruptions and their repair

In this study, we draw from cultural historical activity theory, which focuses on organisations as complex systems, including practices, disruptions and multiple actors with specific and often misaligned objects of activity.[11,52] Taking an activity-theoretical stance, organisational processes here refer to recurrent interaction and activity patterns, which are historically evolved. From this viewpoint, human activity is conceptualised as an activity system consisting of a subject (or group of subjects), an object, mediating artefacts, rules, a community and the division of labour. Every organisation forms a system, which consists of activity systems and their specific objects.[52] The sense and meaning of actions are attached to the object of an activity.[53]

Activity systems exist in relation to neighbouring activity systems and their different objects of activity. On the one hand, the shared object holds the community together and gives it a long-term purpose.[54] On the other hand, the actors focus on their specific objects (such as surgical specialties, anaesthesia and nursing), and a common object, such as patient-centred care practice, maybe difficult to perceive.[11] The existence of multiple, often competing and conflicting objects often creates disruptions, conflicts, dilemmas and tensions in and between activity systems. From an activity-theoretical view, these stem from larger societal contradictions, and the motivation for change in organisations always arises from such contradictions.[26] From this perspective, collective learning is triggered by disruptions, contradictions and concrete innovative actions, and it may lead to the widened understanding of the shared object of an activity. As a result of the renegotiation and reorganisation of collaborative relations and practices, expansive learning and qualitative transformations of the objects of an activity may take place.[55]

In our study, actual, empirical situations at work are observed to depict disruptions, which manifest during care processes of surgical patients. These can be depicted in patterns of talk and action by which the actors react, try to make sense of deal with and transform or resolve an unexpected deviation from the normal scripted course of events in the work process, or routines.[32] In the context of health care, defining disruptions as deviations from the normal (or normative care protocols) scripted course of events in the care process, we view them as an inherent feature of complex work processes that cannot be fully avoided or eliminated. They are of high importance as by making visible the tensions and deviations between the normative care pathway descriptions, and what happens in practice, they can channel team learning, performance improvement and innovation in health care. We use the term innovation to refer to social processes of expansive learning through which new ideas, objects and practices are created, developed and changed in organisations. Furthermore, we acknowledge that in complex care processes, disruptions are not always observable, and they can also be implicit, silent and nonverbal and then impossible for the researcher to detect.[13,32]

In addition to empirical investigation of everyday disruptions, our research interest lies in their repairing efforts taken by the medical team and/or the patients. Previous studies introducing the notion of repair have mainly been conducted from a technology perspective. The studies have focused on repair efforts of information technology, in other words, technological repair of technical systems, human–computer interaction systems, machines, artefacts and devices (such as laptops and iPhones) and the production of technological difference.[27,44,49] From the technological view, humans routinely repair breakdowns of machines in order to cope and live with them and to make them useful.[28,43,44] It is problematic, however, that in technology studies, at the analytical level, material technology often gets separated from the human activity systems and agentive actors and their objects.[28,56] Therefore, in this study, our research attention is focused on human activity, in other words, whether and how mundane disruptions are repaired by the studied medical teams consisting of historically and professionally distinct yet interconnected activity systems of surgery, anaesthesia nursing and the patients. The researchers are also viewed here as activity system carrying out research activities, first in the university hospital and then at their research universities.

On this basis, we define repair efforts as conscious efforts and solutions (verbal or by other actions), performed by the medical team members and/or patients during care processes, to deal with and overcome unexpected disruptions. In our data-driven analysis, we distinguish between what we call repair efforts and repair solutions. Repair efforts were typically helpful initiatives taken by the medical professionals, or the patient, to overcome a disruption and to improve the care process and patient safety. They were singular or chain-like, individually taken or collaborative and negotiated collective efforts. The repair solutions were responses to repair efforts. A repair solution took place when a repair effort, or a chain of multiple repair efforts, led to successful outcomes. This means that efforts resulted in actions that are seen as responses to initiatives taken by the patients or staff.

3 | METHODOLOGY

3.1 | Study design

This ethnographic study of surgical processes involved data collection through observations, field notes and interviews. Data analysis was informed by an activity theoretical approach.

3.2 | Setting

The research setting was a surgical operating unit of a public sector university hospital providing highly specialised care in Finland. The health care region in which the hospital operates includes approximately 729 000 inhabitants. The unit's area of responsibility spans across five hospital districts and covers a vast geographical region, including almost half of Finland. The responsibility area of the unit encompasses all surgical specialties. Patients are transferred to the

surgical operating unit mainly from wards and emergency units. Approximately 200 nurses and 100 medical practitioners work in the unit, which has 16 operating theatres shared among surgical specialties. The emergency unit of the hospital is on duty 24 hours a day. The patient's care process typically begins on a regular ward, moves to the operating theatre, then to the recovery room and finally back to the ward. The care processes also included preoperative preparations, such as necessary examinations, x-rays and premedication. The work is highly challenging since the unit conducts the most demanding operations in the hospital district. Multiple sites within the hospital were observed and studied during patients' care processes within the surgical unit and across its organisational boundaries. At the time of the study, the hospital was undergoing a large-scale change program, which aimed to transform the hospital to increase effectiveness (by 10%–15%) and to improve the quality of care, the rapid availability of services and patient safety. The estimated cost of the program was 500 million euros, the most expensive of 25 hospital restructuring projects in Finland.

3.3 | Data collection

Data collection took an ethnographic approach, as described by Marcus.[57] The data comprise 15 observed, audio-recorded and photographed care processes involving surgical patients undergoing different operations (nine emergency, six elective), which created diversity in the data. The followed patients (eight women, seven men) were all Finnish and between 30 and 85 years of age. A senior anaesthetic doctor, who was the operations manager at the surgical unit, assisted the researchers to select and to recruit the patients. Patients were eligible to be involved in the study if they were scheduled for an operation, were clinically stable and not confused and were willing to participate.

The patients were followed individually through their care processes by one of the authors who is a Finnish PhD candidate in adult education, who had been trained on how to conduct workplace-based ethnography. During the care processes, the researcher observed the activities and interactions and wrote detailed field notes and intermittently recorded the interaction. Photographs were taken throughout the care process (e.g., in the regular ward, the operating theatre, the recovery room and the ward), to capture the events at each stage while ensuring that patients were not recognisable from the photos. The patient and the medical professionals were interviewed in situ before each phase of the care process, to learn about their expectations on the care process at hand. We perceive the in situ interviews as explanations of the patient care guidelines (i.e., normative standardised care pathway protocols in use in the studied hospital) and the disruptions as deviations from these. More specifically, the researcher directed special attention to disruptions, in other words, unexpected deviations from the normal scripted course of events manifested in the medical team and patients talk and actions, and those were marked along with other observations in the field notes. The patients and health care professionals were interviewed in situ also during the observation of the care processes. Most of the in situ interviews were transcribed by the researcher; for some, the analysis was reliant on the recordings due to background noise.

Collecting ethnographic data in a hospital was challenging and cognitively, emotionally and physically demanding for the researcher who was an outsider in the field of medicine and surgery. It was not always possible for the researcher to follow an entire care process because the patients were often transferred from the recovery room to the ward during the night or very early the next morning, so the researcher's following of the care pathways often terminated in the recovery room. However, the staff usually communicated with the researcher the next day, providing information on how the patient had been transferred back to the regular ward and how the ending of the care process had gone.

3.4 | Data analysis

Information relevant to each patient (e.g., age, gender and relevant medical history) and operation (e.g., name and type) was provided by the operations manager, with the patient's consent, and compiled anonymously into an Excel spreadsheet. The location and transfers between the units during the care process (e.g., ward, operating theatre, recovery room and ward) were marked in the spreadsheet, as were the times the researcher spent in each location. The photographs were used as an aide memoire to the researchers during the analysis.

3.4.1 | Depiction of disruptions

The first phase of data analysis identified disruptions from the studied 15 care processes reading through the field notes and listening to audio-recordings of the care processes. In our data, the disruptions manifested in patterns of talk and action by which the actors reacted, tried to make sense of, deal with and transform or resolve an unexpected deviation from the normal scripted course of events in the work process. A description of each disruption, based on the researcher's observations and the photographs, and details of who considered or experienced this as a disruption were added to the Excel spreadsheet. Then, categories of the disruptions were created in relation to the parts of the care process in which they were identified, and the categories were added to the spreadsheet.

3.4.2 | Depiction of repair efforts

The second phase of data analysis identified the repair efforts made by the medical team and/or patients following disruptions during the 15 care processes. These were typically helpful initiatives taken by the medical professionals, or the patient, to overcome a disruption and to improve the care process, for example, to speed up some part of the process, to improve the patient's physical condition or to finish

the operation. Each repair effort was identified and marked on the spreadsheet next to the particular disruption which it tried to overcome. Descriptions and excerpts from the data were marked on the spreadsheet, to illustrate the contents of the repair efforts and who the repair efforts caused problems for. Thereafter, categories of the repair efforts were made, and the categories were marked into the spreadsheet.

3.4.3 | Depiction of repair solutions

The third phase of data analysis identified instances, from the 15 care processes, in which successful repair solutions to overcome the disrupted routines took place. The repair solutions were responses to repair efforts. This means that efforts resulted in actions that are seen as responses to initiatives taken by the patients or staff. They typically consisted of providing additional information to patients at their request or changing routines in anaesthesia, improving the care process or the patient's condition. Yet not all repair efforts led to repair solutions. The repair solutions were marked next to the disruptions, alongside the repair efforts from which they resulted. Descriptions and excerpts from the data were marked on the spreadsheet to illustrate the contents of the repair solutions, and those involved in the repair solutions were indicated.

Thereafter, to elucidate the complex proceeding of the care processes, we drew visual representations (i.e., process models) of all 15 care processes. Of these, we chose three care processes, accompanied with explanatory narratives, to illustrate some of our key findings. Then, we related our data-driven analysis and interpretations to the existing activity theoretical and organisational and management literature applying the notion of repair. Lastly, we worked our findings into a process model, taking us beyond the studied case examples and showing how disruptions lead to repair efforts and solutions, which may result in stability or change.

To establish the reliability of the analysis, the second coder, the first author, who is a Finnish professor in the field of education, scored a representative sample of the data by applying the same analysis framework. The research team, in other words, the first and the second authors together with two medical doctors from the United Kingdom, one of them being a surgeon, discussed any disagreements in coding (e.g., some of the coding rules were further clarified) until there was agreement.

3.4.4 | Ethical considerations

The Northern Ostrobothnia hospital district committee in Finland confirmed in writing that approval from a fully constituted research ethics committee was not required for this study, in keeping with national practice in Finland at the time. All procedures performed in this study were in accordance with the ethical standards of the regional research committee and with the 1964 Helsinki Declaration and its later amendments. Written permission to conduct the research was acquired from the hospital senior management, the patients and the employees. Participation in the research was voluntary. Participants provided informed consent to be involved in the research and were free to withdraw at any time with no detriment. Field notes and transcripts were anonymised prior to analysis. The patient's personal and medical data always needed to be confidential. The researcher collecting the data also adhered to an ethnographic ethical position that do no harm is a prime injunction[58] and therefore ensured that they did not interrupt the care processes or burden the patients.

4 | RESULTS

4.1 | Descriptive overview of disruptions, repair efforts and repair solutions

Table 1 provides an overview of the disruptions, repair efforts and repair solutions and their frequencies in the 15 studied surgical care processes. We identified 150 disruptions from the data, ranging from 1 to 15 disruptions per care process, 59 of which related to problems in the patient's worsening physiological state. The other disturbances concerned the equipment used in surgical care (32/150), information flow (31/150), delays in the care process (21/150) and unclear division of labour within the medical team (7/150). We found 136 repair efforts in total and formed three categories of these (technical, cognitive-emotional and extended collaborative). The most frequent repair efforts were technical and cognitive-emotional, and most repair solutions related to these. Altogether, 106 repair solutions were identified.

4.2 | Examples of disruptions

There were five main categories of disruptions, and examples of each are provided in Table 2.

4.3 | Examples of repair efforts

Three main categories of repair efforts were identified: (1) *technical repair* (68/136 [50% of the repair efforts]), (2) *cognitive-emotional repair* (50/136) and (3) *extended collaborative repair* (18/136). Examples of each are given in Table 3. All five categories of disruption triggered repair efforts, but 14/150 disruptions did not lead to a repair effort. This may be explained by the fact that it is unlikely that all actors will react in the same way, and given multiple work pressures, actors belonging to their activity systems with specific, designated duties (i.e., surgery, anaesthesia, nursing and patients), will need to prioritise what they deem to be the most important or urgent action at that moment (which might not have been a repair effort). It is also possible that not all repair efforts were observable to the researcher.

TABLE 1 An overview of the disruptions, repair efforts and repair solutions and their frequencies in the 15 studied surgical care processes.

Type of disruption	Repair efforts		Repair solutions
The patient's worsening physiological state ($N = 59$)	Repair $N = 55$		Repair $N = 41$
	Technical	17	12
	Cognitive-emotional	34	25
	Extended collaborative	4	4
Equipment used in surgical care ($N = 32$)	$N = 30$		$N = 29$
	Technical	26	25
	Cognitive-emotional	0	0
	Extended collaborative	4	4
Information flow ($N = 31$)	$N = 29$		$N = 20$
	Technical	11	9
	Cognitive-emotional	13	7
	Extended collaborative	5	4
Delays in the care process ($N = 21$)	$N = 17$		$N = 13$
	Technical	9	6
	Cognitive-emotional	3	3
	Extended collaborative	5	4
Unclear division of labour within the team ($N = 7$)	$N = 5$		$N = 3$
	Technical	5	3
	Cognitive-emotional	0	0
	Extended collaborative	0	0
Total 150	Total 136		Total 106

The most frequent types of repair efforts were 'technical' or 'cognitive-emotional'. There were far fewer 'extended collaborative' repair efforts, which took place iteratively between several actors, acting as a chain of multiple, connected repair efforts, and included cognitive-emotional and technical repair efforts. For example, in care process 8, which featured extended collaborative repair (Table 3), multiple disruptions occurred, and the course of the care involved constant movement between failure and success. For the medical team, such repair efforts required a dialogue with the patient, expertise and innovativeness.

4.4 | Examples of repair solutions

Two main categories were identified within the 106 repair solutions, which either restored the routines and stability or, less frequently, included innovative features for making a difference and to overcoming the unworkable practices[49] or shifted the problematic practice to a new routine. As the actors had to prioritise what they viewed as the most important and urgent actions, 30 repair efforts did not lead to a repair solution. It is also possible that not all repair solutions were observable to the researcher.

The most repair solutions ($N = 41$ [39%]) were related to disruptions in 'the patient's worsening physiological state' (Table 2). In this category, the most repair solutions followed from cognitive-emotional repair efforts ($N = 25$ [61%]). The second most frequent category of repair solutions was related to disruptions in the 'equipment used in surgical care' ($N = 29$ [27%]). Within the category, the repair solutions followed mostly the technical repair efforts ($N = 25$ [86%]). The following Table 4 provides examples of how the activity moved from disruptions, to repair efforts and repair solutions in five exemplar care processes.

Next, we will narratively reconstruct three of the 15 studied care processes (i.e., care processes number 3, 7 and 8) to illustrate some of our key findings. In each of the three example care process, we will describe, based on the field notes, photographs and the transcribed data, its route as we observed it, moving from the regular ward where examinations were made, to the operating theatre, to the recovery room and back to the ward. To illustrate the multiple disruptions and their repair efforts and solutions, we have added three types of images to the visual representations we created of the followed care processes (see Figures 1–3). The lightning type arrows in the figures show the places where the ruptures in the care process occurred, highlighting the gap between the care pathway protocol and the actual care process. In Figures 1–3, the images of light bulbs represent the repair efforts carried out by the medical team or the patients during the care process. The images of stars stand for the repair solutions that were successfully carried out. The letters A, B, C, D, and so forth in the illustrations of the care pathways refer to the disruptions, which led to repair effort and repair solutions we selected here for presentation.

TABLE 2 Examples of the five types of disruptions in the data.

Type of disruption	Example
1. The patient's worsening physiological state	*Care process 7: 30-year-old female patient*. The patient was in increasing pain on the ward. She requested analgesia on multiple occasions, and this was not given. From the patient's viewpoint this was a disruption as she became increasingly anxious
2. Equipment used in surgical care	*Care process 3: 59-year-old male patient*. During the operation, the theatre nurse dropped 'locking screws' that the orthopaedic surgeon had requested. He/she then instructed the nurse to remedy the situation.
3. Information flow	*Care process 8: 65-year-old female patient*. The patient mentioned on arrival at the hospital that she was allergic to silicone which was a component of the face mask that would have been used when anaesthetising the patient. The patient had previously been operated on in the same hospital unit and said that her allergy had been discussed then; however, this information was not recorded in her patient records.
4. Delays in the care process	*Care process 10: 52-year-old-male patient*. An emergency operation was delayed repeatedly, for reasons outside the medical team's control.
5. Unclear division of labour within the team	*Care process 11: 69-year-old-male*. This patient was scheduled for a revision of his total hip replacement. The patient was prepared for the operation and given pre-operative medications. However, the operation was scheduled for a specific surgeon who was not present and so the surgery had to be cancelled

TABLE 3 Examples of the three types of repair efforts (with direct quotes translated from Finnish).

Type of repair effort	Example
Technical	*Care process 3: 59-year-old male patient*. The surgeon told the surgical nurse to find new locking screws. The nurse responded by making telephone calls and managed to get replacement sterile screws from another operating theatre. The anaesthesia needed to be extended by 20 minutes. The surgeon seemed satisfied with the surgery overall and moved to the next operation. No clear harm was observed, but this delay increased the risk of infection as well as delaying the start of the next case. Surgeon: 'Go and get the new screw quickly. We need to get this sorted rapidly to finish the operation … call operating theatre 4 and tell them we need new screws.'
Cognitive-emotional	*Care process 7: 30-year-old female patient*. The patient asked if the anaesthetic could be given on the ward. She was very anxious about having it in theatre. The anaesthetist adapted his/her normal practice and administered it on the ward. Patient: 'I would like you to anaesthetise me on this bed. I often panic with anaesthesia.' The anaesthetist: 'Is that so? I'll see what I can do.'
Extended collaborative	*Care process 8: 65-year-old female patient*. A first disruption took place when the patient's operation was postponed because an emergency operation was prioritised. A ward nurse explained that this sudden change created pressure on the medical team handling the increased patient flow and was thus a disruption from their viewpoint. On arrival, the patient mentioned her silicone allergy, so the anaesthetist had to replace equipment containing silicone with alternatives. During the operation, another disruption occurred as the anaesthetic had not worked effectively and the patient felt pain. The anaesthetic nurse talked to the patient to calm her. A further disruption emerged as the anaesthetist realised that the patient did not tolerate thyroxine. However, she consulted a colleague, and the disturbance was overcome. The patient was actively involved in the care process and she and the medical team seemed satisfied with the end result. Anaesthetist: 'I wonder what kind of reaction you [indicating to the patient] get from the silicone?' Patient: 'It gives me blisters. So, the reaction is really bad.'

4.4.1 | Example I: care process 3

This is a care process of a 59-year-old male patient who had been admitted to the hospital's surgical unit for elective joint replacement surgery. The researcher started to follow the care process at the regular surgical ward at 9:51 AM, following the patient from there to the operation theatre, viewing his operation and proceeding to the recovery room with him. The researcher left at 6:41 PM and could not follow the patient back to the regular ward where he was taken some hours later. During this care process, eight disruptions took place; five repair efforts were made of which four led to repair solutions. Figure 1 provides a processual illustration of this care process, indicating the disruptions, repair efforts and repair solutions within it.

4.4.2 | Example II: care process 7

In this case, a 30-year-old woman was admitted to the hospital's surgical unit for an emergency debridement of an infected wound. The patient was in a wheelchair because of paraplegia (i.e., an impairment in motor or sensory function of the lower extremities). The researcher started to follow the care process at the regular surgical ward at

TABLE 4 From disruptions to repair efforts and repair solutions.

Care process number	Disruption	Repair effort	Repair solution	Outcome
3	*Equipment used in surgical care*: The surgical nurse dropped the screws onto the floor, and the surgeon demanded that the nurse fix the situation.	*Technical*: The nurse responded by making several telephone calls.	The nurse managed to get sterile screws from another operating theatre.	Stability
7	*The patient's worsening physiological state*: The patient was fearful of the operation.	*Cognitive-emotional*: The patient proposed that the anaesthetic to be administered on the ward.	The anaesthetist administered the anaesthetic on the ward.	Innovation
8	*Information flow*: The patient mentioned that she was allergic to silicone, which is used when anaesthetising the patient.	*Extended collaborative*: The medical team and patient collaborated to find an alternative to silicone.	The team used paraffin to lubricate the anaesthetic face mask.	Innovation
10	*Delay in the care process*: The patient was expecting to be operated on soon.	*Technical*: The patient refused to eat because he is waiting for an operation.	The patient kept the position in the operation queue.	Stability
11	*Unclear division of labour within the team*: The patient is given anaesthesia and is ready for the operation but there is no surgeon available.	*Technical*: The nurses call their colleagues to find another surgeon.	Another surgeon was available and carried out the operation.	Stability

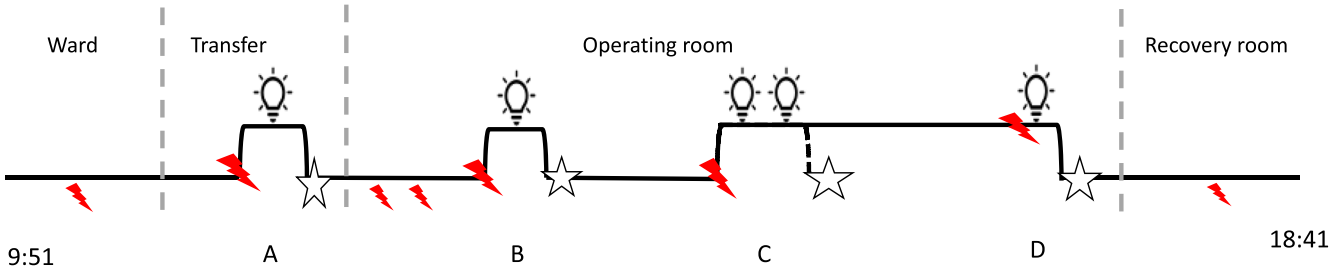

FIGURE 1 A processual illustration of the care process number 3.

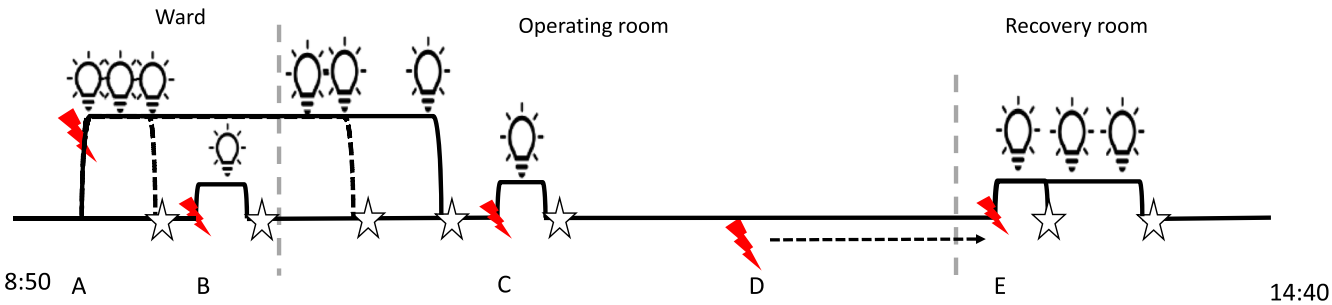

FIGURE 2 A processual illustration of the care process number 7.

08:50 AM, following the patient from there to the operation theatre, viewing her operation and proceeding to the recovery room with her. The researcher left at 2:40 PM. During this care process, five disruptions took place, and 11 repair efforts were taken. We find this case particularly interesting since, in our interpretation, the six identified, 'additional' repair efforts did not directly relate to any of the observed disruptions, which may showcase the implicit, silent and nonverbal nature of some disruptions in everyday care processes. Neither the

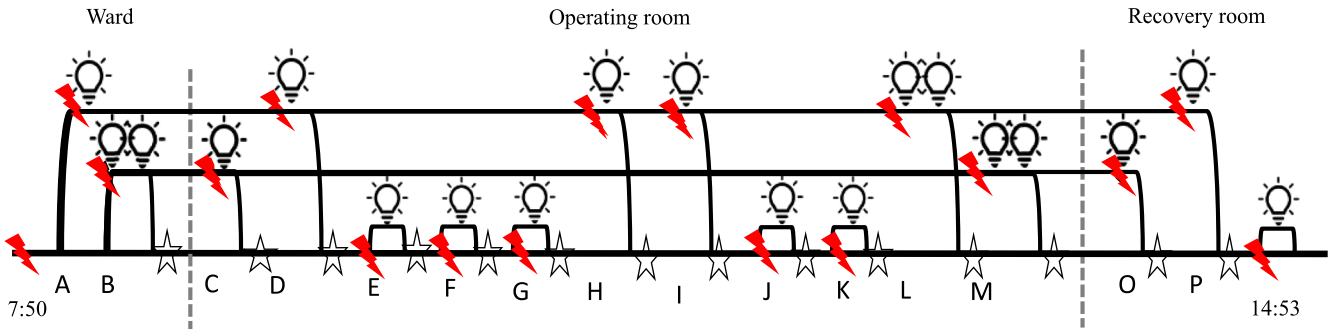

FIGURE 3 A processual illustration of the care process number 8.

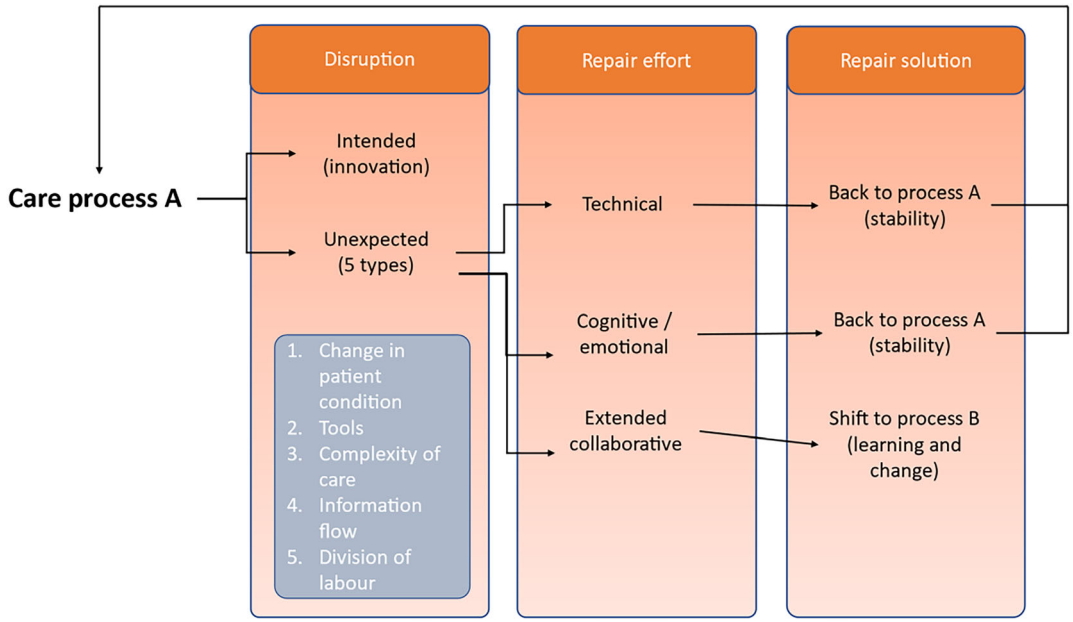

FIGURE 4 Process model showing how disruptions lead to repair efforts and solutions, which may result in stability, learning and change.

researcher identified any disturbances underlying these repair efforts, nor did the participants of the medical team verbally or physically indicate them. The 11 repair efforts led to seven repair solutions (so there were more repair solutions than the original five disruptions). Figure 2 provides a processual illustration of this care process.

4.4.3 | Example III: case process 8

This was an especially complex care process of a 65-year-old female patient who had been admitted to the hospital's surgical unit for an elective thyroidectomy operation (i.e., an operation that involves the surgical removal of all or part of the thyroid gland). The researcher started to follow the care process at the surgical ward at 07:50 AM, following the patient from there to the operation theatre, viewing her operation, proceeding to the recovery room and then back to the regular surgical ward with her. The researcher left at 2:53 PM. During this care process, the patient's multiple and severe allergies and her poor hearing and use of hearing aids caused disruptions at the various stages of the care process. In this process, there were 17 disruptions, 19 repair efforts and 14 repair solutions. Figure 3 provides a processual illustration of this care process.

5 | DISCUSSION AND CONCLUSIONS

The aim of this study was to deepen our understanding of mundane everyday disruptions in care processes and how the repair of these disruptions can be sources of stability, learning and change in complex health care settings. In the studied 15 care processes, in a Finnish hospital, disruptions were frequent and the different repair efforts and repair solutions were revealing. Repair was a conscious effort in response to an unexpected disruption and repair efforts were singular or chain-like, individually taken initiatives or collaborative and

negotiated collective efforts. A repair solution took place when a repair effort, or a chain of multiple repair efforts, led to successful outcomes. In other words, a disruption was overcome, the course of the activity changed in one way or another, and simultaneously, there was the potential for care provision, patient safety and patient experience to improve. However, as our study shows, disruptions and their repair efforts are not always observable, and they can also be implicit, silent and nonverbal.[13,49]

Technical repair efforts usually stayed within a single activity system and involved a small number of actors. Cognitive-emotional repair efforts were more likely to involve patients and take place between the activity systems of the patient and the medical team to establish common ground and possibly generate technical solutions. Extended collaborative repair efforts typically involved medical team and patient contributions and were infrequent compared to the other two repair strategies. They took place iteratively between several actors and multiple activity systems, unfolded in several steps over longer periods of time, and included both cognitive-emotional and technical repair efforts. The cognitive-emotional and technical repair efforts that were included in this category differed in quality from the previous ones. They were not single incidents, but solving them required either the involvement of another activity system or they turned into a disruption in another stage of the treatment process (such as hearing aid removal by the request of the patient before the operation, which caused a new disruption in the recovery room because the patient could not hear the instructions from the nurses which were meant to ensure the successful surgical result). Extended collaborative repair required negotiation and reorganisation of collaborative relations and practices, as well as establishing a dialogue with the patient, and thus, it is especially demanding. However, it is particularly important as it (in activity-theoretical terms) offers opportunities for expansive learning and qualitative transformations of the object of the collective activity.[55]

In line with previous research,[49] our study demonstrates that repairing is also important for development of distributed expertise. The analysed disruptions and their repair also provide information on how patients' experience disruptions, and how they can (as experts of their own illness) contribute to their care, which is still an understudied topic.[3] We thus wish to highlight that the recognition of disruptions and their repair can importantly strengthen the patient voice and their influence in the care process. To enhance the quality-of-care processes and patient safety, repair among the medical practitioners, and with the patient, are needed and repair needs to be understood as a continuous, expansive learning process involving multiple agents.

Echoing previous ethnographical organisation and management studies on repair,[10,11,28,41] the smaller scale disruptions depicted in our study provided insight into institutional rules, norms, expectations, taken-for-granted beliefs and activity patterns of the studied context. In this study, instead of something to be 'swept under the carpet', disruptions in care processes are an important window into opportunities for learning, change[13,32] and improvement of managerial practices in organisations[12] and in educational development.[59] In medical education, disruptions thus need to be viewed as an inherent feature of organisational processes, which cannot be fully avoided or eliminated and can be drivers for learning, development and organisational change.[26] The analysis of disruptions extends our understanding about the conditions under which maintaining and changing organisational beliefs and practices is necessary.[10] It provides important material for medical education as it makes visible the tension and deviations between so called normative care pathway descriptions in hospitals,[60] allowing us to understand these as mutually constituted processes[61] and learn from these. As a result of identifying disturbances, clinicians and medical educators can get closer to a more comprehensive understanding of the care process, where at one stage even the smallest repair solutions have an impact on the construction of a treatment path.

We have summarised the findings of the study in a process model (Figure 4), which shows how disruptions lead to repair efforts and solutions, which may result in stability, learning or change. Importantly the process model illustrates how stability is regained after a disruption and how disruption can lead to positive change, either when it is planned and intended or when an unexpected disruption enhances expansive learning, and establishment of a new practice or innovation. The stabilisation, learning and change take place with these different but continuous repair efforts and repair solutions, carried out by individual actors and groups. The stability of care processes and organisational routines and roles, as well as their change,[10,60–62] the overcoming of common problems and disruptions experienced by the health care professionals and the patients, [63]as well as creation of new innovative ways of working and expansive learning[64] take place via repair. We suggest that this dynamic movement between stability, learning and change is the glue for developing an organisation as a system.

Our findings from a public sector university hospital in Finland inform medical education on how mundane everyday disruptions and their repair can enhance medical teams' preparedness for and responsiveness to unintended or unexpected incidents and learning from these. Through analysing everyday disturbances, medical education may provide more understanding of what kind of implications of ignoring (even smaller disturbances) can lead to. Ignoring disruptions may be accumulated at some later stage of the care process and may lead to errors, failures, or major adverse events.[4,6,7] Our study also illustrates how repair efforts of the disrupted care processes unfold, in other words, the ways in which teams try to deal with and to overcome disruptions take place in practice. Importantly, it also shows how everyday disruptions and their daily repairing secure the stability of routinised work processes and the maintenance of institutionalised roles. Broader understanding and acknowledgement of disruptions and their repairing as an inherent and important part of medical practice can lead to improvements in medical students and medical professionals' learning and practice.

The strengths of this study include its close-to-practice ethnographic research methodology, which provides insights that can lead to enhanced learning opportunities and direct improvements in patient care, and the author team reflecting different background disciplines and different country contexts. In terms of study limitations,

real-world research often involves 'messy' data, and this study used field notes written in busy clinical environments and audio that was disrupted in places by background noise. Although this meant that not all the data could be transcribed verbatim, the fact that a single researcher collected the data, transcribed the interviews and led the analysis lessens the risk that this might otherwise have posed. The data were also collected prior to the Covid-19 pandemic, although we have no reason to believe the findings are less relevant or applicable today. Future research might involve other close-to-practice research methods[13] over extended periods in complex health care settings. Future education practice will need to embed learners within teams and help them to understand and learn from everyday disruptions, which are often hidden in plain sight.

AUTHOR CONTRIBUTIONS

Anu Kajamaa and the Päivikki Lahtinen conceived and designed the study. They have contributed equally to the production of this article. Päivikki Lahtinen gathered and preliminarily analysed the data, wrote the case examples 1–3 and drew the process models (Figures 1–3). Anu Kajamaa further analysed the data. Anu Kajamaa designed and wrote the theoretical framework and analysis and further analysed the data in the paper. Karen Mattick reviewed the paper several times, made suggestions and modifications throughout the manuscript, and drew the Figure 4. Rob Bethune, who is a surgeon, reviewed the manuscript and made corrections, especially to the tables, cases and the terminology concerning surgery. All authors approved the final manuscript for publication.

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CONFLICT OF INTEREST STATEMENT

We hereby confirm that this work is original and has not been published elsewhere, nor is it currently under consideration for publication elsewhere. The data included in this study have not been analysed nor published previously. We declare no conflicts of interest with respect to the research, authorship, and/or publication of this article.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

The Northern Ostrobothnia hospital district committee in Finland confirmed in writing that approval from a fully constituted research ethics committee was not required for this study, in keeping with national practice in Finland at the time. All procedures performed in this study were in accordance with the ethical standards of the regional research committee and with the 1964 Helsinki Declaration and its later amendments. Written permission to conduct the research was acquired from the hospital senior management, the patients and the employees. Participation in the research was voluntary. Participants provided informed consent to be involved in the research and were free to withdraw at any time with no detriment. Field notes and transcripts were anonymised prior to analysis. The patient's personal and medical data always needed to be confidential. The researcher collecting the data also adhered to an ethnographic ethical position that do no harm is a prime injunction and therefore ensured that they did not interrupt the care processes or burden the patients.

ORCID

Anu Kajamaa https://orcid.org/0000-0002-6397-545X

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