






# BMJ Open Exploring the influence of health system factors on adaptive capacity in diverse hospital teams in Norway: a multiple case study approach

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## ABSTRACT

**Objectives** Understanding flexibility and adaptive capacities in complex healthcare systems is a cornerstone of resilient healthcare. Health systems provide structures in the form of standards, rules and regulation to healthcare providers in defined settings such as hospitals. There is little knowledge of how hospital teams are affected by the rules and regulations imposed by multiple governmental bodies, and how health system factors influence adaptive capacity in hospital teams. The aim of this study is to explore the extent to which health system factors enable or constrain adaptive capacity in hospital teams.

**Design** A qualitative multiple case study using observation and semistructured interviews was conducted between November 2020 and June 2021. Data were analysed through qualitative content analysis with a combined inductive and deductive approach.

**Setting** Two hospitals situated in the same health region in Norway.

**Participants** Members from 8 different hospital teams were observed during their workday (115 hours) and were subsequently interviewed about their work (n=30). The teams were categorised as structural, hybrid, coordinating and responsive teams.

**Results** Two main health system factors were found to enable adaptive capacity in the teams: (1) organisation according to regulatory requirements to ensure adaptive capacity, and (2) negotiation of various resources provided by the governing authorities to ensure adaptive capacity. Our results show that aligning to local context of these health system factors affected the team's adaptive capacity.

**Conclusions** Health system factors should create conditions for careful and safe care to emerge and provide conditions that allow for teams to develop both their professional expertise and systems and guidelines that are robust yet sufficiently flexible to fit their everyday work context.

## INTRODUCTION

Healthcare systems provide the formal healthcare delivery structures for a defined population, whose funding, management, scope and content are defined by laws, policies and regulations. They provide services to

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Data for this study were collected during the COVID-19 pandemic, which enabled the research team to observe how novel national policy measures affected the frontline.
- ⇒ The study contributes to resilient healthcare as there have been few multilevel studies looking at how macrolevel factors affect microlevel adaptive capacity.
- ⇒ The combination of observations and interviews provided a substantial amount of data which were then triangulated.
- ⇒ Data collected at the national level are limited as our study focused on the hospital team level.

people, aiming to contribute to their health and well-being. Services are usually delivered in defined settings, such as homes, nursing homes and hospitals. Healthcare systems are complex and adaptive and continuously responsive to multiple factors including patients' needs, innovations, pressures, pandemics and funding structures.<sup>1</sup> Understanding flexibility and adaptive capacities in these complex healthcare systems is a key focus of investigators of resilient healthcare.<sup>2-3</sup> Resilience in healthcare can briefly be defined as 'the capacity to adapt to challenges and changes at different system levels, to maintain high quality care' p6.<sup>4</sup>

To date, research on resilient healthcare has paid most attention to work as done at the sharp end of the system. Less is therefore known about how actions, strategies and practices enacted by regulatory bodies and policy-makers affect every day work at the microlevel, such as hospital teams.<sup>5</sup> While regulations in the form of standards, rules and protocols are known to be key drivers in the structuring of healthcare activities and in the design of healthcare organisations, the interfaces between policy-making, regulation and



resilience are subtle and nuanced, and regulatory strategies to improve quality and safety are therefore complex and multifarious.<sup>6 7</sup> However, the relationship between governmental bodies and adaptive capacity at the sharp end of the system has received insufficient attention and is thus in need of closer examination.<sup>2 8 9</sup>

In this study, we define macrolevel healthcare system actors as governmental bodies, regulators and national and regional bodies, who act or intend to shape, monitor, control and modify practices within organisations in order to achieve an identifiable, desirable state of affairs.<sup>10</sup> They aim to constrain action, optimise performance and attempt to prevent error.

In complex systems like hospitals, much work is performed in teams.<sup>11–13</sup> Understanding the nature of teams and team performance is important to promote team effectiveness. The few studies that have been undertaken are limited in scope as they have not considered how teams are defined and structured, what their functions are or differences across healthcare teams.<sup>11 14</sup> Most research on teams in healthcare has focused on the dynamic domains in healthcare, such as emergency medicine or operating rooms, and teams that are similar to the teams in other industries, for instance in aviation.<sup>15 16</sup> However, not all teams in hospitals operate in an emergency setting. Teams in hospitals differ depending on their goals, tasks, structure, membership and situation, affecting how they adapt to a multitude of contingencies that are encountered in everyday work.<sup>17</sup> Hence, their requirements for support could differ depending on these attributes but this question has not been addressed sufficiently in previous research. Knowledge of these differences may enable optimisation of support and better function for the different teams. This study will address these knowledge gaps.

### Aim and research question

This study aims to explore whether and how health system factors enable adaptive capacity in different types of hospital teams in Norway. We asked: What kind of health system factors enable adaptive capacity in hospital teams, and how do these factors affect adaptive capacity?

## METHODS

### Design and setting

A qualitative exploratory methodology was chosen, using a multiple-embedded case study design.<sup>11 18</sup> A case was defined as one hospital containing four different types of teams. Two case hospitals were recruited to the study, featuring a total of eight teams. The study's design was in line with that of an international comparative study, involving six countries (The Netherlands, Japan, Australia, England, Switzerland and Norway), where this article reports partial findings from the Norwegian case (see protocol of Anderson *et al*).<sup>11</sup> The two Norwegian hospitals and the four team types were recruited in line with the study protocol. Findings from each of the countries

will be written up as country case reports following an agreed on template. Furthermore, an international cross-case comparative analysis will be performed using the Qualitative Comparative Analysis method<sup>19</sup> with the aim of exploring how multilevel system factors interact to support or hinder adaptive capacity in different types of hospital teams in different countries, and how this leads to performance variability. This international comparative analysis is currently in progress. This article stands alone and uses Norwegian data only.

### Recruitment and study context

The Norwegian health system is a semidecentralised system with the Norwegian Parliament as its highest decision-making body. The municipalities are responsible for providing primary care for their citizens, mainly through nursing homes, homecare, general practitioners and rehabilitation services. The hospitals are mainly state owned and administered by four Regional Health Authorities. The Norwegian Board of Health Supervision is a national regulatory body, organised under the Ministry of Health and Care Services. County Governors at the regional level oversee services within primary and specialised healthcare. Norway has a comprehensive set of legislation governing the health services, including requirements for the quality of services, regulations for authorised healthcare personnel and service users' rights. These legislated requirements are subject to supervision and investigation by the Norwegian Board of Health Supervision and the County Governors.<sup>20 21</sup>

The two hospitals in this study were selected and recruited based on their size and role in teaching provision.<sup>11</sup> Both hospitals are situated in the same health region in Norway. Hospital 1 is a large teaching hospital and hospital 2 is a middle-sized local hospital which is also responsible for educating healthcare professionals. The four different team types were structural, hybrid, responsive and coordinating, and are displayed in [table 1](#). See Fagerdal *et al*<sup>22</sup> for further descriptions of the teams.

Data were collected through observation, interviews and document analysis, all undertaken between December 2020 and June 2021. Researcher BF and HBL conducted the observations, which entailed following one or more team members for two workdays using an observation guide. Both researchers wrote their own individual fields notes which were both included in the data material. Using the observation guide enabled a structuring of the text in line with the central concepts used in resilience literature.<sup>23</sup> During observations, we looked for various types of demands from the different levels of the organisations, the teams' capacities to meet the demands and types of adaptations that were performed by the teams and team members. The observed teams differed in how they work together and consequently our undertaking of the observations had to align with those differences. The structural and hybrid teams were observed during two shifts, including evening and dayshifts. With the responsive teams, we followed one team member during their

**Table 1** Descriptions of the four different teams studied in each hospital

| Team type           | Organisational structure  | Everyday work  | Location   |
|---------------------|---|--|--|
| <b>Structural</b>   | Ward based, nurses and assistants working together in small units 3–4 persons. Colocated                                      | Receive patients 24/7. Unpredictable workday                                   | Orthopaedic/surgical bed ward (hospital 2)<br>Neurological bed ward (hospital 1) |
| <b>Hybrid</b>       | Permanent staff of nurses, rotating medical staff. Colocated  | Receive acute patients 24/7<br>Unpredictable workday<br>Rapid workflow changes | Emergency department (hospital 2)<br>Short-stay acute unit (hospital 1)          |
| <b>Responsive</b>   | Acute teams responding to alarms. Multiprofessional. Short episodes of teamwork   | Respond to suspected cerebral infarction                                       | Members from different departments   |
| <b>Coordinating</b> | Meeting of ward managers allocating patients to even out demand and capacity in the hospital. Their work spans hospital units | Review overall capacity in the hospital. Optimise patient flow                 | Members from different operational units   |

workday and their response to acute alarms. The coordinating teams meet for 10 min every weekday, and the researchers attended all their meetings during a 14-day period. Due to the COVID-19 pandemic, one of the coordinating teams held their meetings digitally, which we also attended. The observations totalled 115 hours (see [table 2](#)).

All interviews were undertaken post observation by researcher BF using a semistructured interview guide based on content from the Concepts for Applying Resilience Engineering (CARE) model, that is, demand, capacity, misalignments and adaptations,<sup>24</sup> and the four potentials of resilience; monitoring, anticipating, responding and learning.<sup>23</sup> Team members and one leader from each team were interviewed, resulting in 30 interviews (see [table 3](#)). Participants comprised 27 females and 3 males and their ages ranged between 24 and 56. The interview length varied from 40 to 90 min with a median of 55 min. All participants signed a written consent form and were given the opportunity to withdraw without any negative implications; all invited participants accepted the invitation to interview.

### PATIENT AND PUBLIC INVOLVEMENT STATEMENT

A coresearcher employed in the overall Resilience in Healthcare project, of which this study is a part,<sup>11</sup> collaborated in the planning and design of the study, and

access to teams at hospital 1. In hospital 2, we used a local coordinator to help identify and facilitate access to the different teams.

### ANALYSIS

All interviews were audio recorded and transcribed verbatim by researcher BF. Observation notes were included in the analysis, and all notes and interview transcripts were grouped according to hospital and team types to streamline the analysis work. We conducted a within-case analysis of each hospital and a cross-case analysis to identify patterns and themes in our overall material.<sup>18</sup> The data material was first read through in full by all the researchers to get a sense of the whole. The analysis was then done using a combined deductive and inductive approach.<sup>25</sup> The CARE model<sup>24</sup> was used as a framework to assist the deductive part of the analysis as visualised in [figure 1](#).

Data were organised using three of the four key concepts in the CARE model matrix: capacities, misalignments and adaptations. The capacities were defined as health system factors in this analysis and represent the factors that influence teams' ability to adapt. All data were in addition coded for team type and hospital which allowed for a cross hospital and cross-team analysis. After the data material had been divided into three parts of text, to enable further analysis, we proceeded with an inductive

**Table 2** Overview of data collection methods and data material according to team types and case sites

| Hospital 1   |                     |           | Hospital 2   |                     |           |
|--------------|---------------------|-----------|--------------|---------------------|-----------|
| Team         | Observation (hours) | Interview | Team         | Observation (hours) | Interview |
| Structural   | 29                  | 3         | Structural   | 29                  | 4         |
| Hybrid       | 14                  | 4         | Hybrid       | 27                  | 5         |
| Responsive   | 3                   | 4         | Responsive   | 1                   | 3         |
| Coordinating | 6                   | 3         | Coordinating | 6                   | 4         |
| Sum          | 52                  | 14        | Sum          | 63                  | 16        |

**Table 3** Overview of the interviewed participants in the study

| Hospital 1                                |   | Hospital 2   |                      |
|---|---|--------------|----------------------|
| Team                                      | Profession                                | Team         | Profession           |
| Structural                                | RN  | Structural   | RN                   |
|   | RN  |              | RN                   |
|   | RN  |              | RN                   |
| Hybrid                                    | RN MS                                     | Hybrid       | RN                   |
|   | RN  |              | RN                   |
|   | RN  |              | RN                   |
|   | Nurse ass.                                |              | Physician            |
| Responsive                                | Physician PhD                             | Responsive   | RN                   |
|   | RN  |              | Physician            |
|   | Physician PhD                             |              | RN                   |
|   | RN  |              |                      |
| Coordinating                              | RN  | Coordinating | RN                   |
|   | RN  |              | RN                   |
|   | RN MS                                     |              | RN MS                |
|   |   |              | RN                   |
| n=14                                      | RN=11<br>Physician=2<br>Nurse assistant=1 | n=16         | RN=14<br>Physician=2 |
| n=30                                      |   |              |                      |
| MS, Masters degree; RN, Registered Nurse. |   |              |                      |

content analysis approach.<sup>25</sup> The categories were inductively reviewed and recoded and further developed into latent themes across the four teams. This process resulted in overarching themes representing health system factors, that influence teams' adaptive capacity (see table 4).

## RESULTS

The national and regional health authorities set the scene for how the hospitals prioritises and arrange their work. System-level decisions filter down through the organisation and influence the team's everyday work. Our analysis shows that the effect of system factors on teams' everyday work and adaptive capacity can be divided into two main themes, each with associated subthemes: (1) organisation according to regulatory requirements to ensure adaptive capacity and (2) negotiation of various resources provided by the governing authorities to ensure adaptive capacity. In table 4, we present the themes along with their subthemes, codes and examples of quotes from the participants or description from the observation.

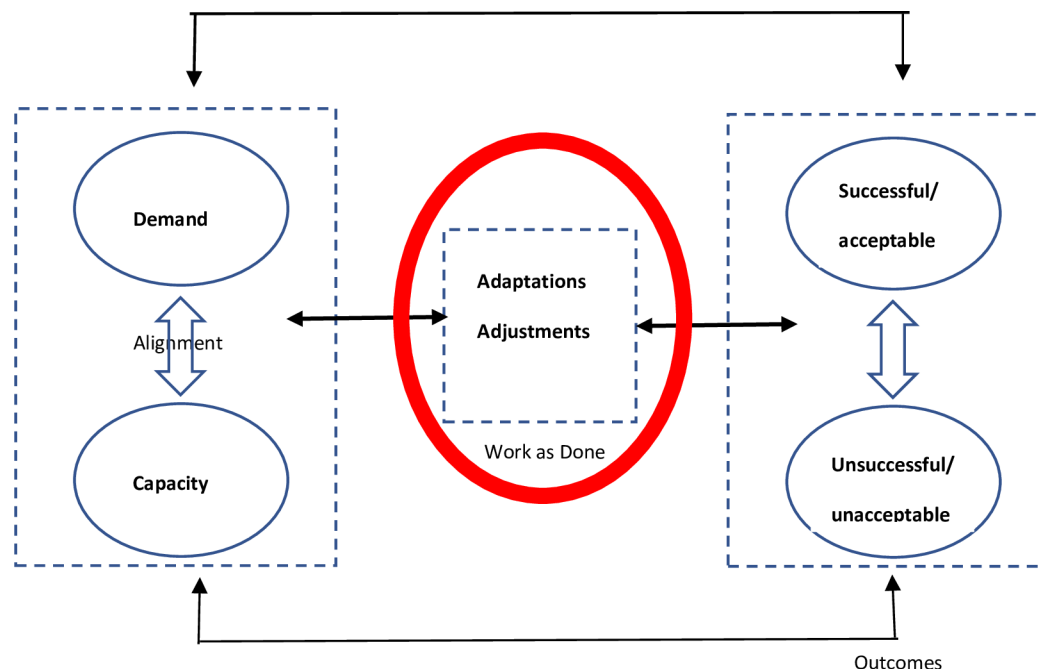
## Organising according to regulatory requirements to ensure adaptive capacity

National and regional guidelines, financial governance and regulatory inspections by the health supervision authorities all shaped the organisation of the hospitals.

### Context and organisational structure

The organisational context was important. It affected how the teams enacted and performed patient care. For instance, the smaller hospital 2 had restrictions and limitations regarding both the types of diagnoses and the number of patients they were able to treat due to regional regulations. These regulations had a large impact on the smaller hospital and their teams in how they organised their work, their competence requirements and what kind of learning opportunities were available to the team members. For instance, since hospital provided an acute function for surgical patients, it could continue to be an educational institution for healthcare personnel, which also meant that healthcare professionals in the structural and hybrid teams could maintain and develop their skills in acute care. In addition, it also impacted the hybrid and structural teams in how they arranged their work by always being prepared for the admission of acute surgical patients during their workday. Furthermore, the regional health authority maintained overall flexibility in acute care provision by having this function in both hospitals.

Both the coordinating teams in our study had been established by the hospitals in response to a government policy of preventing corridor beds in hospitals as a means of improving patients' safety. The teams were set up to include all ward managers cooperating to manage patient flow, and with a goal of evening out the overall strain across the hospital. These teams' main assignment was to allocate patients to free beds within the hospital. In addition, a positive consequence of having these teams was that the team members got a better mutual understanding of the overall situation within the hospitals and an improved understanding of each other's challenges across the hospital. This provided them with a greater range of solutions to use when making adaptations to avoid patients in the corridors. The coordinating team in hospital 2 also functioned as an arena for the team members to exchange advice and suggest solutions to other challenges in their work. This was to a certain extent also valid for the team in hospital 1, but due to the comparatively larger size of the team there, it was more difficult for the team members to get well acquainted. In addition to better patient flow and avoiding corridor patients, the hospitals aimed for the teams to focus on building a culture of helping each other across their respective hospitals and to foster a feeling of joint responsibility for the betterment of the hospital overall (see table 4). Similar to the responsive teams, the coordinating teams had been enabled to make quick decisions spanning hospital units, allowing for a wider range of alternative solutions to the problems encountered than if they were to make decisions on their own. Also, team members felt more of a responsibility to



**Figure 1** Concepts for Applying Resilience Engineering model after Anderson *et al*<sup>24</sup> visualising the study's focus on team adaptation.

help each other and found that it was more difficult to say no to requests for free beds when meeting face to face with colleagues. Both the individual team members and the hospital organisation as a whole were thus found to have widened their adaptive capacities after establishing these teams.

#### Aligning with national and regional guidelines

The use of clinical guidelines provided teams with direction in the different treatment courses offered to patients. National guidelines were translated and aligned to work practices within the organisation to fit the current work in the teams. This gave the team a standard to maintain, a structure for their work and also brought them a sense of safety in knowing their boundaries and priorities for adaptation. For instance, the national guideline for sepsis treatment recommends starting antibiotics treatment within 1 hour of the start of symptoms and also lists early important diagnostic signs to look for in patients who are deteriorating. Early intervention and treatment improve the overall survival of these patients and both hospitals needed to ensure proper alignment to these standards (see table 4). The hybrid and structural teams were well aware of this, due to guidelines and information campaigns. The teams thus adapted their work to meet the national demands imposed here, prioritising this work over what were considered other less important tasks, such as helping patients with personal hygiene.

Another example of how guidelines shaped the organisation of hospital teams and how teams acted was seen in the work of both the responsive teams in the study. The two hospitals had to comply with the national requirements of diagnostic and treatment guidelines for cerebral infarction, and both hospitals had created responsive

stroke teams to allow for quick diagnostics and treatment. Tailoring the responsive teams to fit the requirements of the national guidelines, reduced the 'door to needle time' in both hospitals significantly. This was accomplished by providing and designing equipment, procedures, role descriptions and facilities along with the right competent personnel. The responsive teams frequently made adaptations to the clinical procedure to fit with the patient's condition, the proximity of the competent team members and the tailored equipment and location enabled for quick decision-making within the team, instead of encountering communication via phones or waiting for each other to finish other tasks.

#### Negotiating various resources provided by the governing authorities to ensure adaptive capacity

##### Financial incentives

Incentives like the national funding model which generates income for the hospitals impacted both what kind of and how the hospitals prioritised treatment. Governing authorities use financial incentives to orient the hospitals towards planned direction. Budget cuts and other financial restraints imposed on hospitals demanded that both hospitals adapt their priorities, which consequently affected the teams' delivery of treatment and care in the sharp end of the system. The government requirements for increased efficiency in the healthcare system, such as financial incentives for reducing beds, increased the pace of work and often required development of new work practices to cope with these demands. For instance, in both hospitals, there had been a decrease in hospital beds, and a shift towards outpatient treatment due to governing authorities funding schemes. To cope with this, both the hybrid and structural teams in both hospitals treated

**Table 4** Inductive coding structure

| Inductive coding structure  |   |  |  |
|---|---|--|--|
| Theme   | Subtheme  | Category   | Quote  |
| Organising according to regulatory requirements to ensure adaptive capacity.            | Context and organisational structure                                      | Mutual understanding of overall situation in the hospital provided greater range of solutions when adapting to avoid patients on the corridors | 'I think that capacity meeting has become a meeting point, and that we have gathered everybody in one meeting, and that people get to see and hear what it's like in other departments, made the collaboration very, I would say markedly better now than it has been before.... And there is a much greater willingness to help each other now than there was just one year ago.'<br>Leader, co-ordinating team, hospital 1   |
|   | Aligning with national and regional guidelines                            | More workload after new national guidelines for cerebral infarction  | '... the procedure is becoming, I said it was simple, yes, but it's starting to get more and more complex with these changes that have been made recently with extended thrombolysis time and all that kind of stuff. So, there are, there are a lot of patients... And often it's not straight forward if we're outside the thrombolysis window anymore either... and then you have to involve both the neuro radiologist and the specialist on call, right...'<br>Physician, Responsive team, hospital 1 |
| Negotiating resources provided by the governing authorities to ensure adaptive capacity | Financial incentives  | Organising for fewer beds due to governing funding schemes   | 'A lot of work has been done on the preoperative and postoperative features to reduce the length of stay so that the number of beds can be reduced.'<br>Ward manager, Structural team hospital 2   |
|   | Physical surroundings   | Physical surroundings affected the teams work  | 'The department is in an old building. Many different narrow hallways. Patient rooms are without toilets in rooms.'<br>Observation notes, Structural team hospital 1   |
|   | Training and development resources enabled adapting changes               | Mandatory simulation training enabled training for adapting to COVID-19 situation prior to patient encounters                                  | 'So, when we practice, we have simulations, we have it every two weeks. This spring when we rapidly had to transition to a pandemic, we actually had it every week until the summer. Precisely to implement not only the course of stroke, but actually turn everything into an infection control course.'<br>Leader, Responsive team hospital 1   |
|   | Quality improvement resources provided tools for enhancing patient safety | Implementation of tool for discovering deteriorating patients earlier  | 'All patients are scored according to NEWS (national early warning score). In the case of NEWS score above 5 in total or 3 on a parameter, a doctor must be contacted, and at over 10, a doctor must see to the patient.'<br>Observation notes, Structural team hospital 2   |

patients for a shorter amount of time. For example, the structural teams no longer admitted patients overnight preoperatively and discharged patients earlier postoperatively to primary healthcare service or the home. The teams coped with this by planning the discharge of the patient already at admittance to facilitate a safe and good-quality discharge. However, they often adapted their plans by not discharging patients due to either lack of capacity in primary care services, or disagreement and concern with the level of care offered in the municipalities. This example shows that the teams in practice negotiated the consequences of government funding restrictions to suit the patients' needs.

In addition, they could to some extent handle some demands by determining how they could change procedures to fit certain requirements. For instance, one of the changes the structural team in hospital 2 made to manage

earlier discharge was to have the nightshift staff remove the postoperative urine catheter from patients. The clinical procedure stated that for the patient to be discharged, they had to be able to urinate spontaneously after catheter removal. Catheter removal later in the day regularly meant that the patient had to stay an extra night, so by changing the timing of its removal staff still managed to provide care within the frame of guidelines given.

#### Physical surroundings

Both the hybrid and responsive teams in both hospitals had been placed in new premises designed specifically to accommodate their way of working, with well-designed spaces to facilitate their workday with proximity to necessary equipment, and a nearness to each other that enabled team members to easily assist if needed. Similarly, the structural team in hospital 2 had new premises,

with a uniform design across the new hospital building making it easy for personnel to change teams and wards since their premises were already familiar to them. This uniformity in building design improved the teams' overall adaptive capacity in peak situations, or when there was an absence of key personnel across wards and teams. Staff could easily assist personnel from other wards as they knew where equipment was stored and how the different facilities in the ward functioned (patient rooms, nurses' stations, etc). The structural team in hospital 1, however, worked in old premises with narrow hallways and few physical meeting arenas for the team members, which hampered their workflow in that they had to spend time looking for each other, and otherwise had few opportunities to engage in direct communication with each other during their workday. The physical surroundings of the two coordinating teams differed. Due to the size of the team in hospital 1, the team there used digital software to manage the overall patient flow in the hospital. The smaller team in hospital 2 managed the same using a paper form that each member completed. However, both of the teams used the meeting to elaborate on their numbers with additional information as the numbers alone did not provide a sufficient representation of the overall situation on the wards.

#### Training and development resources

Training and development resources were crucial for a team's adaptive capacity. The national attention on patient safety in recent decades has led to improved treatment courses and changed the focus on how healthcare personnel can learn from adverse events to avoid similar incidents in the future. Consequently, this has led to innovative solutions in how hospital managers organise learning activities for their employees. In accordance with a growing focus on simulation-based training and learning from regulatory bodies and policy-makers, all the teams in the study apart from the coordinating teams increasingly used simulation training (see [table 4](#)). Often, the teams would make simulation scenario cases based on adverse events or incidents that had happened on their ward and used them in their training. For the responsive teams, this type of training was mandatory and part of regulatory requirements for the teams. Also, for these teams that only worked together for limited episodes and had changing membership and different professional cultures, these simulation trainings were their only chance to practice and improve their team communication. During the period of our observation, they developed new cases with COVID-19 themes and used them to train and learn before they received actual COVID-19 patients. This improved their performance, as they had found several shortcomings in their COVID-19 procedure and thus changed it accordingly. For instance, they made efforts to prevent unnecessary contamination of team members and had detected a lack in the procedure of personal protective equipment. This shows that

these types of prescribed training exercises enable teams to adapt procedures to fit their everyday work conditions.

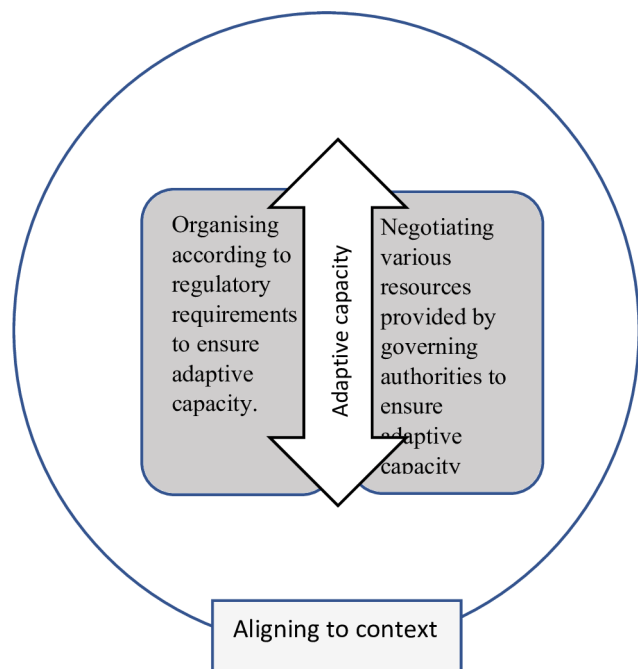
#### Quality improvement resources

Quality improvement resources outside the hospital organisation supported team's adaptive capacity. The national and regional healthcare authorities arrange various conferences and campaigns for hospitals and other healthcare institutions. Here, policy-makers, leaders and healthcare professionals meet and create reflexive spaces. As part of such efforts, the best practices are displayed and workshops are provided to encourage and translate quality and safety improvement into practice in different ways, alongside guidelines, learning tools and other materials for the different organisations to use and implement in their quality improvement work. Having this competence base within the health regions and at the national level to support teams added knowledge and increased adaptive capacity as it required knowledge transfer and new ideas anchored in research and practice. Moreover, the patient safety focus within the wards and teams like the safe care screening programme and safety huddles, launched by the Norwegian Directorate of Health and implemented through the regional health authorities, increased the team's awareness of patient safety culture. The increased amount of quality measures the clinicians had to undertake and report on in their daily work were generally seen as good quality measures from both the organisations and the team's point of view. However, it sometimes felt counterproductive constantly having to cope with balancing patients' needs with the requirements of screening procedures, especially if staff felt they had little room for autonomous clinical assessment. For instance, the safe care screening programme where every patient over the age of 18 had to be screened for their risk of falling, bedsores and possible malnutrition within 24 hours was questioned. Screening young patients for this felt unnecessary and if there were other more pressing tasks that were seen as more important, they adapted the way they prioritised.

#### DISCUSSION

This study investigated the relationship between health system factors and adaptive capacity in hospital teams. Our results have shown that health system-level factors influence adaptive capacity in the teams through the provision of guidelines and resources, and how the teams align these to their current demands and capacity situation. Their effects on different teams are not uniform; some are advantageous to one team but disadvantageous to another.<sup>5 6</sup> We argue that it is the team's opportunity to align these factors to context that are key for enabling adaptive capacity, as illustrated in [figure 2](#).

All levels of a health system can influence each other, especially in an integrated and tightly coupled system. Higher system levels can affect lower levels through, for example, explicit instructions, by the provision or



**Figure 2** Illustrating the teams aligning system-level factors to context for adaptive capacity.

limitation of resources, or by establishing incentive systems.<sup>26–28</sup> On the other hand, lower system levels may use discretion when they interpret and implement directives from higher levels, and they may control the information flow to higher levels.<sup>26</sup> Our results show that decisions made at one level of the system can support or hinder adaptive capacity at other lower hierarchical levels of the system.<sup>29–31</sup> Accordingly, the system-level governing factors affect adaptive capacity at the sharp end by setting the framework and boundaries within which activity can take place. Regulatory bodies have system-wide responsibilities and must respond to system-wide disturbances, without detailed knowledge of how work is done in practice at the sharp end. Consequently, the sharp end must adapt to respond appropriately to disturbances within its own field of responsibility.<sup>32</sup>

This study has operationalised adaptation using the CARE model<sup>24</sup> to see how different teams at the sharp end work in practice to negotiate system-level factors, such as regulations and guidelines. The findings show that factors at the macrolevel required different forms of adaptations within different team types to managing everyday work. Enabling adaptation at the team level by taking action at the macrolevel to attempt to reconcile work as imagined with work as done (figure 1). The system-level factors also represent long-term planning and transformation of practices rather than short-term adaptations or adjustments in the system.<sup>33</sup> They envisage setting up the processes that design, produce and circulate resources that underpin safety, and prevent errors through standardisation, regulation and training.<sup>32</sup> How the teams negotiate these long-term transformations to their everyday work determines

their adaptive capacity as our results have shown. Adaptation and adjustments to local context are inevitable in healthcare.<sup>9 11 34 35</sup> However, the vast number of protocols, policies, checklists, standards, guidelines, pathways and other regulatory requirements may lead those working at the sharp end to feel overwhelmed.<sup>6</sup> If not aligned with goals, tasks and current challenges, these governing factors may end up being counterproductive.<sup>5</sup> The teams studied talked about their everyday work and their primary focus on patient care along with their willingness to act in the best interest of the patients.<sup>36</sup> They talked about feeling a compound pressure in order to align system-level demands with their context and patients' wishes and needs.<sup>37 38</sup> Taking the perspective of the patient into account was important to the teams.<sup>39 40</sup> Consequently, different teams had to align system-level demands differentially to ensure quality care for patients.

Our study showed that teams must balance continuous efficiency with thoroughness assessments<sup>32 41–43</sup> in everyday work (eg, making the nightshift prepare discharge adding more work to reduce corridor patients). Ways that the teams in our study continuously adapted regulatory requirements to their work context illuminated how resilient systems must have robust yet flexible structures to assist the system to deal with both everyday work and unexpected events.<sup>8 30 44 45</sup> System-level factors must therefore provide flexibility to fit different situations and types of teams, as teams differ in how they cooperate and function in everyday work. To ensure alignment of perspectives between macrolevel and microlevel actors, common arenas and structures for mutual feedback and reflections between stakeholders are crucial.<sup>7</sup> Furthermore, system factors need to entail robustness in the directions they provide to practice and the implementation of improvement efforts.<sup>33</sup>

The findings show that for the responsive and coordinating teams the size of the hospital played a significant role in their ability to adapt. These two team types operated in part at the mesolevel of the hospital organisation, spanning hospital departments. Their work was characteristically ad hoc, dynamically changing team memberships and members who work primarily in other teams. The large size of hospital 1 hampered development of relationships between the team members in both the responsive and the coordinating team, whereas in the smaller hospital 2 it was easier to develop close relationships between colleagues. This implies that ad hoc teams, and especially large ones, need to have structure and guidelines in place that direct their work, and support to adapt their work based on the team members understanding of the tasks and their roles. The structural and hybrid teams were colocated and this seemed to allow for the development of long-term collegial relationships, better cooperation between team members, more flexible adaptation of their work and also seemed to allow for working with greater levels of independence



and a larger room for self-organisation. Their work is influenced by system-level demands, but the size of the organisation does not affect their day-to-day work to the same degree as for the coordination and responsive teams.

### Strengths and limitations

A strength of the study is that by combining observation and interviews we have gathered in-depth data of the team's everyday work.

Data collection during COVID-19 pandemic could hamper everyday work practice; however, we collaborated closely with the sites to avoid any problems for the involved teams and units. Only two hospitals contributed to the data collection and including additional hospitals could add more than we have from two hospitals. However, the inclusion of eight teams, the total amount of data gave rich information to analyse our research questions.

Interview data from the macrolevel could have added additional perspectives from the regulators and policy-makers. We suggest further studies to integrate this in their activities to uncover the role of system factors seen from the policy-makers' and regulators' perspectives.

### CONCLUSIONS AND IMPLICATIONS

This study illuminated how teams negotiate the health system factors that shape their work to provide as much adaptive capacity as possible and attempt to align system-level regulation and guidelines with everyday work demands. The results show that the size of both the organisation and team had an effect on adaptive capacity. Our findings imply that healthcare systems need to facilitate conditions that allow for teams to develop their professional expertise and develop systems that are robust and flexible to fit the context. Teams should be enabled to adapt to the functions and structure of the health system to carry out their everyday work in a changing environment.

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### REFERENCES

- 1 Wears RL, Hollnagel E, Braithwaite J. Resilient health care, volume 2. In: *Resilient Health Care*. 2017. Available: <https://www.taylorfrancis.com/books/9781317065142>
- 2 Anderson JE, Ross AJ, Macrae C, et al. Defining adaptive capacity in Healthcare: a new framework for researching resilient performance. *Appl Ergon* 2020;87:103111.
- 3 Hollnagel E, Sujan M, Braithwaite J. Resilient health care – making steady progress. *Safety Science* 2019;120:781–2.
- 4 Wiig S, Aase K, Billett S, et al. Defining the boundaries and operational concepts of resilience in the resilience in healthcare research program. *BMC Health Serv Res* 2020;20:330.
- 5 Smaggus A, Long JC, Ellis LA, et al. Government actions and their relation to resilience in Healthcare during the COVID-19 pandemic in New South Wales, Australia and Ontario, Canada. *Int J Health Policy Manag* 2022;11:1682–94.
- 6 Macrae C. Reconciling Regulation and Resilience in Health Care, in *Resilient Health Care*. CRC Press, 2019:111–22.
- 7 Wiig S, Aase K, Bal R. Reflexive spaces: leveraging resilience into healthcare regulation and management. *J PATIENT Saf* 2021;17:e1681–4.
- 8 Øyri SF, Wiig S. Linking resilience and regulation across system levels in Healthcare - a multilevel study. *BMC Health Serv Res* 2022;22.
- 9 Øyri SF. Healthcare regulation and resilience: a Norwegian Multilevel case study. In: *Healthcare Regulation and Resilience - a Norwegian Multilevel Case Study*. Norway: University of Stavanger, 2021. Available: <https://ebooks.uis.no/index.php/USPS/catalog/book/90>
- 10 Hutter BM. Regulation and risk. In: *Regulation and risk: occupational health and safety on the railways*. Oxford: Oxford University Press, 2001. Available: <https://academic.oup.com/book/5008>
- 11 Anderson JE, Aase K, Bal R, et al. Multi-level influences on resilient Healthcare in six countries - an international comparative study protocol. *BMJ OPEN* 2020;10:e039158.
- 12 Christian JS, Christian MS, Pearsall MJ, et al. Team adaptation in context: an integrated conceptual model and meta-analytic review. *Organizational Behavior and Human Decision Processes* 2017;140:62–89.
- 13 Roberts APJ, Webster LV, Salmon PM, et al. State of science: models and methods for understanding and enhancing teams and teamwork in complex Sociotechnical systems. *Ergonomics* 2022;65:161–87.
- 14 Lavelle M, Reedy GB, Cross S, et al. An evidence based framework for the temporal observational analysis of teamwork in healthcare settings. *Appl Ergon* 2020;82:102915.
- 15 Manser T. Teamwork and patient safety in dynamic domains of healthcare: a review of the literature. *Acta Anaesthesiol Scand* 2009;53:143–51.
- 16 Ballangrud R, Husebø SE, Aase K, et al. Teamwork in hospitals”: a quasi-experimental study protocol applying a human factors approach. *BMC Nurs* 2017;16:34.
- 17 Burke CS, Stagl KC, Salas E, et al. Understanding team adaptation: a conceptual analysis and model. *J Appl Psychol* 2006;91:1189–207.
- 18 Yin RK. Case Study Research: Design and Methods. 5th Ed. Los Angeles, Calif: SAGE, 2014.
- 19 Byrne D, Ragin C. The SAGE handbook of case-based methods. In: *The case for qualitative comparative analysis (QCA): adding leverage*



- for thick cross-case comparison. *The Sage handbook of case-based methods*. 1 Oliver's Yard, 55 City Road, London EC1Y 1SP United Kingdom, 2009: 222–42. Available: <https://methods.sagepub.com/book/the-sage-handbook-of-case-based-methods>
- 20 Saunes IS, Karanikolos M, Sagan A. Norway: Health System Summary, in European Observatory on Health Systems and Policies. Copenhagen: WHO Regional Office for Europe on behalf of the European Observatory on Health systems and Policies, 2022:20.
  - 21 Saunes, I.S., M. Karanikolos, and A. Sagan, Norway. In: *Norway, Health system review, in Health system in Transition*, R. Busse, et al., Editors. Copenhagen: WHO European Observatory on Health Systems and Policies, 2020: 163.
  - 22 Fagerdal B, Lyng HB, Guise V, et al. Exploring the role of leaders in enabling adaptive capacity in hospital teams – a multiple case study. *BMC Health Serv Res* 2022;22:908.
  - 23 Hollnagel E. Safety-II in practice. In: *Safety-II in Practice: Developing the Resilience Potentials, in Safety-II in Practice*. Taylor and Francis: Milton, 2018. Available: <https://www.taylorfrancis.com/books/9781351780766>
  - 24 Anderson JE, Ross AJ, Back J, et al. Implementing resilience engineering for Healthcare quality improvement using the CARE model: a feasibility study protocol. *Pilot Feasibility Stud* 2016;2:61.
  - 25 Elo S, Kyngäs H. The qualitative content analysis process. *J Adv Nurs* 2008;62:107–15.
  - 26 Rosness R. Organisational Accidents and Resilient Organisations: Six Perspectives. Rev. 2. Ed. SINTEF Rapport (SINTEF: 2006-: Trykt Utg.). Vol. STF38 A17034. Trondheim: SINTEF, Technology and Society, Safety Research, 2010.
  - 27 Rasmussen J. Risk management in a dynamic society: a modelling problem. *Safety Science* 1997;27:183–213.
  - 28 Bergström J, Dekker SWA. Bridging the macro and the micro by considering the meso: reflections on the fractal nature of resilience. *E&S* 2014;19:22.
  - 29 Blanchet K, Nam SL, Ramalingam B, et al. Governance and capacity to manage resilience of health systems: towards a new conceptual framework. *Int J Health Policy Manag* 2017;6:431–5.
  - 30 Salehi V, Veitch B. Measuring and analyzing adaptive capacity at management levels of resilient systems. *Journal of Loss Prevention in the Process Industries* 2020;63:104001.
  - 31 Woods DD. Essential Characteristics of Resilience. CRC Press, 2006:21–34.
  - 32 Hunte GS, Wears RL, Schubert CC. Structure, Agency, and Resilience. In 5th Symposium on Resilience Engineering Managing Trade-offs. 2014.
  - 33 Lyng HB, Macrae C, Guise V, et al. Exploring the nature of adaptive capacity for resilience in healthcare across different healthcare contexts; a metasynthesis of narratives. *Appl Ergon* 2022;104:103810.
  - 34 Ree E, Johannessen T, Wiig S. How do Contextual factors influence quality and safety work in the Norwegian home care and nursing home settings? A qualitative study about managers' experiences. *BMJ Open* 2019;9:e025197.
  - 35 Øyri SF, Braut GS, Macrae C, et al. Exploring links between resilience and the macro-level development of healthcare regulation- a norwegian case study. *BMC Health Serv Res* 2020;20.
  - 36 Pype P, Krystallidou D, Deveugele M, et al. Healthcare teams as complex adaptive systems: focus on interpersonal interaction. *Patient Educ Couns* 2017;100:2028–34.
  - 37 Dillon EC, Tai-Seale M, Meehan A, et al. Frontline perspectives on physician burnout and strategies to improve well-being: interviews with physicians and health system leaders. *J Gen Intern Med* 2020;35:261–7.
  - 38 Hofmeyer A, Taylor R, Kennedy K. Fostering compassion and reducing burnout: how can health system leaders respond in the COVID-19 pandemic and beyond. *Nurse Educ Today* 2020;94:104502.
  - 39 Lown BA, Shin A, Jones RN. Can organizational leaders sustain compassionate, patient-centered care and mitigate burnout *J Healthc Manag* 2019;64:398–412.
  - 40 Svensson I, von Knorring M, Hagerman H, et al. Unfolding alignment - how top management work to align demand and capacity: an ethnographic study of resilience in a Swedish healthcare region. *BMC Health Serv Res* 2023;23:321.
  - 41 Ellis LA, Churrua K, Clay-Williams R, et al. Patterns of resilience: a scoping review and bibliometric analysis of resilient health care. *Safety Science* 2019;118:241–57.
  - 42 Glette MK, Wiig S. The role of organizational factors in how efficiency-thoroughness trade-offs potentially affect clinical quality dimensions – a review of the literature. *IJHG* 2021;26:250–65.
  - 43 Hollnagel E. The ETTO principle: efficiency-thoroughness trade-off. In: *The ETTO Principle: Efficiency-Thoroughness Trade-Off: Why Things That Go Right Sometimes Go Wrong*. Boca Raton, FL: CRC Press, 2017. Available: <https://www.taylorfrancis.com/books/9781317033615>
  - 44 Grote G, Kolbe M, Waller MJ. The dual nature of adaptive coordination in teams: balancing demands for flexibility and stability. *Organizational Psychology Review* 2018;8:125–48.
  - 45 Øyri SF, Braut GS, Macrae C, et al. Hospital managers' perspectives with implementing quality improvement measures and a new regulatory framework: a qualitative case study. *BMJ Open* 2020;10:e042847.