Applying different quality and safety models in healthcare improvement work: Boundary objects and system thinking

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1. Introduction

1.1. Background

In healthcare there has for – at least the last decade – been an ongoing debate about the human contribution to adverse events with an increasing call for changing focus from individual models to systems and organizational approaches to quality and safety [1–5]. Drawing on experience from different industries healthcare has moved in a direction characterized by a greater focus on human factors, organizational learning, modification of staff attitudes, and culture [5]. However, unsafe medical care still causes significant morbidity and mortality globally. Evidence from developed countries shows that between 3% and 16% of all hospitalized patients are harmed by medical care [6].

Improving quality and safety in healthcare is predicated on collaboration between healthcare professionals, managers, and interaction across actors at different system levels [7–10]. There are no easy solutions to the challenge of improving healthcare quality and safety; much depends on the perspectives of users and the attitudes and behaviors of professionals and managers, and the contextual settings of organizations and healthcare teams [11,12]. Implementing evidence based practice or models of improvement is challenging [13], and healthcare managers have generally been slow to adopt and use research evidence [14,15].

The interest in safety theories and accident models (e.g. Reason and the Swiss cheese model; Rasmussen and the Socio-technical risk management model), has emerged as a response to the identified need for a system perspective in addressing adverse events in healthcare [16,17]. Safety models have advanced from being based on simple-linear causality to multiple-linearity to non-linearity, and from being exclusively interested in accidents to addressing the normal functioning of an organization. This development illustrates how the frame of reference for thinking about patient safety and accidents has changed in the literature [18,19]. Quality improvement tools (e.g Total Quality Management, Business Process Reengineering, the Institute for Healthcare Improvements model for improvement, Lean thinking, Six Sigma) have been widely used in hospitals to guide quality improvement [10,20–22]. The quality improvement literature is large and diverse, theories and models are not always well defined and healthcare organizations often draw on a range of tools and...
principles from different approaches \[21\]. Research has shown evidence of improvement in quality, but there is no strong evidence of the effectiveness of organization-wide or system programs over a period of time \[20\]. There is growing awareness that a solely technical approach to quality improvement will not be sufficient to embed and sustain the organizational change necessary to improve quality. Organizational and cultural factors, such as leadership, values and goals, senior management commitment and communication and co-ordination are crucial to the success of quality improvement initiatives \[23\].

There is an urgent need for targeted and well-designed research to understand the causes of recurring deficiencies in the quality and safety of health care \[6\], and to develop and test practical solutions. Theoretical models have been applied to guide health services research studies \[22\], to analyze medical errors, and gain insight and new perspectives into key influences on quality and safety \[4,24–26\]. There is less knowledge of how healthcare organizations apply theoretical models in their own efforts to improve quality and safety, and the implications of applying different models that originate in different traditions of safety science and quality improvement research.

1.2. Theoretical foundation of improvement models

Attempts to manage quality and safety, whether explicitly or not are always based on underlying theories or models of organizational and human behavior. Theories and models create assumptions, expectations and suggest potential actions, thereby directing attention to some issues more than others \[18,27–31\]. It is unsurprising therefore that the different models and theories used to guide quality improvement and patient safety work in hospitals often have significant differences potentially leading to diverse results \[20,29,30,32,33\]. Such theories and models can be compared on a number of dimensions, such as their underlying conceptualization of quality and safety. This can vary from assuming that quality and safety is a product or outcome of certain formal processes or methods to viewing quality and safety as a complex social process involving the human construction of quality and safety \[10,18,34,35\]. Theories have been categorized as either impact theories (describing hypothesis, assumptions, cause, effect and factors determining success or failure) or process theories (referring to the preferred implementation activities – how they should be planned, organized, and scheduled to be effective, and how the target group will utilize and be influenced by the activities). The focus of a theory is important. Many theories identify processes that should be undertaken in practice to improve quality and safety, such as implementing interventions or measuring outcomes. These are models of the process \[30,31\]. Other theories address specific components of the healthcare system such as individuals \[36,37\], teams or technology (e.g. Carayon, \[38\] the SEIPS model) which aim to shape how work is conducted. Other models emphasize the organizational domains that must be addressed to fully mobilize the resources required to improve quality in its context \[4,39\].

1.3. Aim and research questions

The overall aim of this study was to address the current gap in the literature on how healthcare organizations use theoretical models in their own efforts to improve quality and safety. The study describes and compares \(1\) the theoretical foundation of the models: \(a\) the Organizing for Quality (OQ) model \[10\], and \(b\) the Design for Integrated Safety Culture (DISC) model \[40\], and \(2\) explores the practical application of the models and shows how they have been applied to improve quality and safety in practice in two European hospitals – one in England and one in Finland. The choice of the two models to be compared, OQ and DISC, was based on several criteria: our interest in a theoretical comparison of improvement models with origins from different traditions; curiosity in exploring the practical application of dissimilar models in a hospital setting as examples of translating knowledge into practice; and research experience with at least one of the models in hospital settings amongst the authors (including the originators of both the OQ and DISC models).

The following research questions have guided the study:

\begin{enumerate}
  \item What are the similarities and differences between the two theoretical models?
  \item What are the similarities and differences between the applications of the models?
\end{enumerate}

By analyzing the theoretical foundation of the OQ and DISC models, and exploring how they have been applied, we illustrate how they can contribute to improvement processes in practice. By discussing the usefulness and role of theoretical models in hospital settings and reflecting on how to select a model to underpin improvement work, the study contributes to better understanding of the translation of knowledge \[41,42\] and theoretical models into practice.

2. Methodological approach

2.1. Research strategy

In this study we use a research strategy involving a theoretical comparison of the OQ and DISC models, and a retrospective comparative case study approach \[43\] of two hospitals, one in England and one in Finland. The English case study explores how the OQ model was applied in practical hospital improvement work, while the Finnish case study covers the application of the DISC model. There are diverse perspectives with regard to the meaning of ‘case’ and ‘case study’ in the literature \[44–46\]. In this study, cases are conceived as empirical units existing prior to the study, not as theoretical constructs developed in the course of the research process. The hospitals are the empirical units defined as the cases which are scrutinized to explore how the two different theoretical models contribute to the improvement of quality and safety processes in the specific hospital contextual settings. The case study research strategy is preferable when exploring a complex phenomenon, and enables the researcher who deliberately wants to cover contextual conditions to incorporate them in a holistic manner \[43,47\]. In this study, the latter is of particular importance, as we cover quality and safety improvement processes that occurred in two different hospital contexts that are; complex and interconnected involving multiple organizational interfaces; and influenced by contextual conditions such as professional interests, previous competence, political and financial pressure, technological development, and leadership \[48,49\]. Consequently, there is a need for a flexible research strategy in order to understand how the two theoretical models were adopted and used to improve quality and safety in practice \[43\].

2.2. Data collection

The data informing our study are based, firstly, on literature relating to the OQ and DISC models \[10,40\], and secondly, on retrospective analysis of the results of interviews, surveys and document analyses undertaken in our two case study hospitals \[50\]. Different approaches were used in the case study hospitals and the methods used were informed by an action research approach \[51–53\].


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2.2.1. English case
This case involves the application of the OQ model in an acute hospital serving a patient population of approximately 180,000 with approximately 2000 staff in England. The OQ model was used to guide fieldwork conducted by a quality improvement facilitator over a three month period in late 2008. Fieldwork comprised 42 face-to-face, audio-recorded, semi-structured interviews, informal discussions, and observations of day-to-day activities such as meetings and staff interactions. The interviews were conducted with a selection of staff from junior frontline staff to director level across different disciplines and departments to provide a cross-organizational perspective of how the organization currently manages change. Interviewees were asked about a range of human and organizational factors based on their experience of quality improvement initiatives in the hospital: what it felt like to work for the organization, how change was viewed from the position of leader, participant or observer, barriers to change and potential areas for improvement. The interview data were analyzed using a content analysis approach and the OQ framework. The results are based on a case study report produced for the hospital senior leadership team by the facilitator who was on secondment from a national quality improvement agency. This report was subsequently shared and discussed with one of the originators of the OQ model, the second author of this paper (GR). The report is used as data material in this study. Identifying details of the hospital have been anonymized for the purposes of our brief case description.

2.2.2. Finnish case
The Finnish case hospital provides acute health care services for 14 municipalities in Finland. The hospital employs approximately 1700 people and is organized into five distinct units. In recent years the hospital has become known in Finland for its visible patient safety improvement efforts. Between the years 2007–2011 several patient safety improvement efforts had been carried out in the hospital (e.g. the implementation of a voluntary incident reporting system as well as practices for supporting safe work at the unit level such as a surgical checklist and a formal process for identifying patients). However, there was a need to understand whether the multiple distinct improvement efforts had led the entire organization in the right direction and to decide on the direction of future improvement work. In January 2011 researchers from VTT took part in evaluating and developing safety culture in the hospital by applying the DISC model. The purpose of the evaluation and development process, the basic premises of the DISC model, and its application process (Fig. 3) were discussed together with the top management of the hospital. The aims of the evaluation and development process were to make sense of where this specific hospital was in terms of safety and to describe the effects of the efforts done in the case hospital so far. In 2008 VTT had previously completed an evaluation of the patient safety culture at the hospital. Methods used were TUKU safety culture survey (n=454) [54] and 10 interviews. The interviews covered the following topics: interviewee’s own work, patient safety as a concept, organizing of work at the hospital, and culture of the hospital. This evaluation acted as a baseline measurement for the 2011 evaluation and improvement process. In 2011 the following data were collected: TUKU safety culture survey (n=553), organizational documents (e.g. patient safety plan), patient safety incident reports, and departmental qualitative quality and patient safety reports. VTT researchers analyzed these different types of data using both statistical analysis methods and qualitative content analysis techniques.

2.3. Analysis
For the purpose of our comparative study we organized a researcher workshop (2011) in which the initial theoretical foundation analyses and comparison of the OQ and DISC models was conducted. Based on literature underpinning the models and direct researcher experience with each of the models our theoretical comparison emphasized the following key elements: theoretical foundation; origins; definition of core concepts; audience; single level versus multi-level approach; outcome versus process focus; normative versus descriptive orientation; purpose of model use; data gathering tools requested; and the purposes of model applications. The researcher workshop involved the Norwegian and Finnish co-authors and subsequently involved the English co-authors; hence this analytical step was conducted by all researchers. The secondary analysis of the empirical data collection was conducted by the authors involved; the English case study was described by GR whilst the Finnish case study was described by EP, TR, and LM. All researchers then performed the empirical cross case analysis using findings from the single cases to analyze the practical application and implications of the models in hospital improvement work. The analysis of the practical implications focused on: how the models were used; identified organizational improvement challenges (such as structure, culture, leadership); and the implications relating to quality and safety improvement processes.

2.4. Limitations
The single case studies were not initially designed with the purpose of forming a comparative case study of the application of the OQ and DISC models. It would have been preferable to have a common protocol for the individual case studies with the comparison as part of the scope and purpose. However, our retrospective approach means that we have conducted a theoretical comparison of the models and then compared the use of these models in practice settings and how they influenced improvement work. The latter was initially part of the single case studies and therefore enabled the retrospective comparison which is based on defined criteria (see above) of how the models were useful or not for practical improvement work. The use of an action research approach implies that there was strong involvement from the case study hospitals; this is evident in both single case studies but in the English case study the adoption and use of the OQ model – including data collection and analysis to support local implementation – was conducted by a local quality improvement facilitator.

3. Theoretical comparison
Below we describe the two theoretical models and present the comparison of the models emphasizing similarities and differences between them.

3.1. The Organizing for Quality (OQ) model
The OQ model (Fig. 1) has its origin in the quality improvement tradition, with a strong influence from organizational studies and organization theory. It aims to understand the processes of improving quality, both in the complex ways different organizational and human factors influence each other, and in how the different levels of the organization and its outer context can make these processes effective. The OQ model includes the inner and outer context of organizations in its understanding of quality processes. It focuses on organization size, structure and performance as influencing factors (inner context) in quality improvement. According to this model the political, social and regulatory environments (outer context) also need to be addressed, to understand how quality improvement processes interact across system levels (macro–meso–micro level) in the healthcare system. The OQ’s conceptualization of ‘Quality’ comprises three components:
clinical effectiveness, patient safety and patient experience. The model is based on research undertaken by the originators Paul Bate, Peter Mendel, and Glenn Robert [10]. Based on in-depth, multi-level case studies of seven leading hospitals (including from the UK and the Netherlands), this research found that high-performing hospitals were able to achieve, and then sustain, high levels of quality because they recognized and had been extremely successful in addressing – on an ongoing basis – six common challenges. The six common challenges that were identified from the case studies were:

1. structural – organizing, planning and co-coordinating quality efforts;
2. political – addressing and dealing with the politics of change surrounding any quality improvement effort;
3. cultural – giving ‘quality’ a shared, collective meaning, value and significance within the organization;
4. educational – creating a learning process that supports improvement;
5. emotional – engaging and mobilizing people by linking quality improvement efforts to inner sentiments and deeper commitments; and
6. physical and technological – the designing of physical systems and technological infrastructure that supports and sustains quality efforts.

The researchers represented these common challenges by means of a ‘codebook’ which took the form of a checklist that practitioners can use to identify where the organizational gaps in their local improvement efforts may lie and what they may need to do to address them. Based on the systematic review and coding of the organizational case studies, multiple illustrations of the different types of challenges and solutions were extracted from the individual case study narratives and assigned to the different challenges. In total, the codebook includes 56 such solutions spread across the six challenges, all derived ground-up from the organizational cases themselves. The codebook defines each of these solutions in turn, and illustrates how each may contribute to sustained quality and service improvement in the health care setting. In doing so, it seeks to help organizations to carry out a search for a solution by: providing a checklist of the areas and topics any quality improvement effort will need to cover, giving improvement leaders a way of charting where they and their organization are on their improvement journey, identifying any ‘gaps’ in their own quality improvement activities that will need to be addressed (it can therefore be used as a self-administered diagnostic tool), allowing implicit assumptions about the theory and practice of quality improvement to surface and to be thought about (a reflective model), and providing people with a model and language for talking about the issues (a dialogical tool).

3.2. The Design for Integrated Safety Culture (DISC) model

The DISC model (Fig. 2) is a model for evaluating and developing organizations from a safety point of view. It is grounded in safety science and especially safety culture and system safety theories. The model has been developed based on theoretical work and empirical case studies carried out in several safety critical organizations in different domains, including nuclear industry and healthcare. It is a normative model aimed at depicting the ideal characteristics (functions and safety objectives) of safety critical organizations. The DISC model assumes that cultural phenomena affect safety and they need to be taken into account. The DISC model understands safety as an emergent property of the

Fig. 1. Six common challenges [10].
functioning of the entire socio-technical system. Safety culture refers to the ability and willingness of the organization to take care of the hazards and create safety. As safety is an emergent non-reducible property of the system it needs to be studied and
developed through safety culture: safety culture can be seen as an approximation of the potential the organization has for performing safely. The DISC model is also based on the premise that cultural characteristics can be designed in the organizations. Culture is something that is not easily managed or implemented from top-down, however it is assumed that it can be systematically affected and steered by organizational structures, investments, technology and other organizational solutions as well as everyday social interaction. The DISC model also emphasizes integration. It assumes that safety should be integrated into normal activities and that all the safety functions should be working towards the same direction. Coherence should be strived for.

The DISC model describes six organizational-level criteria for good safety culture (inner part of Fig. 2).

1. Safety is a genuine value in the organization and reflects to decision making and daily activities.
2. Safety is understood as a complex and systemic phenomenon.
3. Hazards and core task requirements are understood thoroughly.
4. Organization is mindful in its practices.
5. Responsibility for the safe functioning of the entire system is taken.
6. Activities are organized in a manageable way.

These criteria can also be understood as the goals of safety management. It is assumed that if an organization meets these six organizational criteria in its structures and practices it can be said to have good potential for safety or good safety culture. It is not sufficient that the organization fulfills one or two of the criteria; they are all needed in creating safety in everyday activities. In order to be called organizational-level criteria, each criterion should manifest itself in several elements of the organization. The criteria should manifest in practices, structures and mindset of the personnel as well as in their understanding. Besides the criteria, the DISC model also depicts the functions: leadership, hazard management, strategy, pro-activity, work processes, working conditions, competence, supervision, contractor relations, and change management (outer part of the disc in Fig. 2) that need to be performed appropriately in an organization in order for it to approach the six objectives [40].

3.3. Similarities and differences between the models

Table 1 summarizes the theoretical foundations for OQ and DISC, their origins and purposes, conceptualization of core concepts, and how the models are intended to guide researchers and practitioners in quality improvement and patient safety improvement. The models have their origins in diverse scientific traditions. The OQ has its origin in quality improvement research using organizational studies and organizational theory, while DISC has its origin in safety science, safety culture, and system safety theories. The core concept of the models differ. Whereas OQ focuses on quality – in which safety is considered a subset – the DISC model has a much more specific target and the center of attention is safety and safety culture. Even though focusing respectively on quality (OQ) and safety culture (DISC) both models enact a process view and emphasize a systemic perspective focusing on quality and safety as emerging from non-linear interactions within the organization and with the environment. Both models focus on quality improvement and safety processes in their conceptualization of how quality and safety is achieved in practice, even though DISC pays more attention to single variables than OQ. The OQ model is empirically driven and developed based on longitudinal studies of high performing hospitals, while the DISC is more theoretically based. This may be the reason for a difference in the models’ normative versus descriptive orientation. They both attempt to guide improvement work by conceptually distinguishing various domains of activity that are required to improve quality. The DISC model is normative in the sense that it describes the goal of improvement, the cultural characteristics that should be present in a safety critical organization and towards which the organization should be steered. OQ is also normative in its emphasizing of the six common challenges that should be addressed, but in addition OQ pays attention to the descriptive aspect of how quality improvement processes occur in practice and thus additional aspects and challenges emerge as themes.

In sum, both models aim to understand the processes, functions and characteristics necessary for organizations to improve quality (OQ) and safety (DISC). The main differences relate to the DISC model being more theoretically driven with a stronger link to variables and quantitative measures compared to the OQ model. The OQ model pays more attention to process explanations, divides context into outer and inner context, and focuses more on the interaction between macro, meso and micro levels in the socio technical system.

4. Practical application

We now present descriptions of how the theoretical models were applied in the case hospitals as part of practical efforts to improve quality and safety, and compare similarities and differences between the applications of these two particular models.

4.1. Applying the OQ model in an English hospital

The context of the English hospital reveals a relatively small organization in acute health care terms ‘with limited resources’ where it was ‘important that the hospital ran efficiently and that staff felt supported to implement, manage and sustain improvement.’ The hospital management wanted to understand why improvement was difficult to achieve and sustain. The aim was
not to ‘be prescriptive but aim to stimulate thought, discussion and debate’ to inform the development of a quality improvement agenda at the hospital (Quotes from the case report).

Preliminary results from the interviews were presented to key individuals in the organization and a wider audience for additional feedback, discussion and comment. The findings were presented in the form of a written report that considered each of the six OQ challenges (structural, political, cultural, educational, emotional, and physical & technological) separately (although noting that ‘there are connections and overlap between them’). A selection of quotations from interviews was provided to illustrate – in the interviewees’ own words – the nature of the improvement challenges faced; these were grouped into twenty themes and organized under the six OQ challenges. The quotations were highlighted to indicate whether each was from ‘directors & senior management’, ‘middle management’ or ‘other staff’. A summary of the facilitator’s interpretation of the staff interviews was included against each challenge in the report. Specific issues identified by staff were also noted. Table 2 includes brief extracts from the report illustrating how the material was organized and the format in which it was fed back to senior management of the case hospital.

The analysis of the staff interviews identified a number of issues for the hospital to consider as it developed a strategy to build quality improvement capability. These were presented in the report alongside examples from the Bate et al. [10] case studies of examples of solutions used by the leading healthcare organizations that had been originally studied. These solutions were ‘presented to illustrate a range of responses made by high performing organizations to the identified challenges in order to assist discussion and consideration of the key issues facing the organization in developing and implementing a quality improvement strategy and implementation plan’.

By applying the OQ model in practical improvement work the overall results showed that (a) structural processes to support quality improvement activity were lacking and it was recommended that a quality improvement effort should initially focus on getting basic structures in place; and (b) the culture at the hospital was a real strength; there was a strong, shared sense of organizational identity and a pride in the organizations many achieve-ments which provided an emotional tie between staff and the organizations and motivated staff to go the extra mile for patients, colleagues and the hospital.

The practical use of the OQ model resulted in suggestions for establishing a programme to build quality improvement throughout the hospital. The results showed that the following topics should be addressed in that programme:

- the lack of a link between various quality improvement activities and the hospital’s goals;
- the lack of an infrastructure to support quality improvement and the need for a process of planning, co-ordinating, measuring and monitoring improvement projects (whilst recognizing that ‘any introduction of a more formal culture’ will need to be carefully managed’);
- initiatives to encourage teamwork, such as the formation of multi-disciplinary, cross-functional teams;

Table 1

<table>
<thead>
<tr>
<th>Aspects of the models</th>
<th>Organizing for quality (OQ)</th>
<th>Design for Integrated Safety Culture (DISC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin and theoretical perspective</td>
<td>Quality improvement, organizational studies, organizational theory.</td>
<td>Safety science, safety culture, system safety theories.</td>
</tr>
<tr>
<td>Purpose of model design</td>
<td>To understand the process of improving quality, both in the complex ways that different organizational and human factors influence each other, and in how the different levels of the organization can make this process effective.</td>
<td>To depict characteristics of organizations with good safety culture and the functions needed for developing those characteristics in the organizations.</td>
</tr>
<tr>
<td>Design settings and context in which the model was developed</td>
<td>High-performing hospitals in the US and Europe.</td>
<td>Safety critical industries (e.g. health care, nuclear industry, railways).</td>
</tr>
<tr>
<td>Definition of core concept</td>
<td>‘Quality’ comprises three components: clinical effectiveness, patient safety and patient experience. Quality is conceptualized in a social process perspective.</td>
<td>‘Safety’ is understood as an emergent property of the functioning of the entire socio-technical system.</td>
</tr>
<tr>
<td>Audience</td>
<td>Researchers, hospital leaders, quality improvement specialists.</td>
<td>Researchers, regulators, safety experts, managers, personnel in safety critical organizations.</td>
</tr>
<tr>
<td>Single level or multi-level perspective</td>
<td>Multi-level perspective in the model including macro, meso and micro level of the healthcare system. Specify inner and outer context.</td>
<td>Single perspective in the sense that it focuses on the organizational level (e.g. hospital). Multilevel in the sense that safety culture is viewed as a multilayered phenomenon.</td>
</tr>
<tr>
<td>Search for variables or processes</td>
<td>Process explanations</td>
<td>Mainly variables.</td>
</tr>
<tr>
<td>Outcome or process focus</td>
<td>Mainly empirical.</td>
<td>Mainly theoretical.</td>
</tr>
<tr>
<td>Empirically or theoretically driven</td>
<td>Mainly descriptive as the model does not describe the functions that should be carried out in order to improve quality or the criteria/characteristics of good quality. Normative in the sense that it emphasizes the general challenges every organization faces and thus should manage.</td>
<td>Descriptive in the sense that it seeks to understand the culture in question and how the control functions manifest in it. Normative as it describes the six criteria of good safety culture and the ten control functions necessary for achieving it.</td>
</tr>
<tr>
<td>For what purpose has the model been applied</td>
<td>Research and practical purposes.</td>
<td>Research and practical purposes.</td>
</tr>
<tr>
<td>Data gathering tools for applying the model</td>
<td>Code book is developed for practitioners.</td>
<td>Evaluation and organizational development from safety point of view.</td>
</tr>
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A boundary object is something that is shared and sharable across different problem solving contexts. They can be processes, artefacts, documents, or technical language or vocabulary in common use among practitioners [56].
Organizational structure and roles:

<table>
<thead>
<tr>
<th>Quotations</th>
<th>Findings</th>
<th>Issues</th>
</tr>
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<tbody>
<tr>
<td>Current approach to quality improvement – scattersgun, not planned enough. Not enough account of other workloads. Need someone to oversee and decide when appropriate to implement with timescale [middle management]</td>
<td>In terms of quality improvement the organizational structure does not include formal quality improvement roles and during interviews staff either did not know if anyone was responsible for quality improvement, or they thought it was the responsibility of the General Managers ... a number of staff felt that the organization should consider creating formal roles and responsibilities for quality improvement to provide leadership, focus and support.</td>
<td>Organizational silos</td>
</tr>
<tr>
<td>Approach to quality improvement – nothing structured across the organization [other staff]</td>
<td>The hospital has a very strong, positive and shared culture and descriptions commonly used to describe this included ‘can do’, ‘family’, ‘forward thinking’, ‘patient-centred’ and ‘caring’. There is a strong sense of organizational identity and a strong ethos ... the hospital is seen to value patients, patient care and patient safety as well as achieving targets, enhancing its reputation and saving money.</td>
<td>No formal quality improvement roles. Responsibility for quality improvement is unclear</td>
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Group collaborative culture:

| Can do. I love working here. Staff are amazing. There is a [hospital] way. It feels great to work here. Everyone has a part to play [other staff] | The hospital has a very strong, positive and shared culture and descriptions commonly used to describe this included ‘can do’, ‘family’, ‘forward thinking’, ‘patient-centred’ and ‘caring’. There is a strong sense of organizational identity and a strong ethos ... the hospital is seen to value patients, patient care and patient safety as well as achieving targets, enhancing its reputation and saving money. | Collective shared culture and organizational identity |
| Forward thinking, passionate people. Ad hoc, reliant on specific people and fall apart without them. No processes. Change depends on who is involved and do they have the right ear [directors & senior management] |

- executive sponsorship of quality improvement projects to manage the ‘politics’ of staff engagement;
- the hospital’s strong organizational culture could be used to leverage and embed a future quality improvement agenda;
- provision of quality improvement training combined with a process to share knowledge across the organization in order to raise awareness of the quality agenda, provide ‘know how’ and start to develop a critical mass of trained staff to spread and sustain good practice;
- implement a skills audit and talent management process to overcome the problem of the same individuals being asked to deliver change; and
- provision of protected time, tools and resources to support quality improvement to encourage staff to take ownership of and effect change in their areas of control.

As a result of this diagnostic work informed by the OQ model, the hospital developed a new quality improvement strategy ‘with the aim of maintaining or improving the quality of care and patient safety in the presence of severe financial constraints.’ Hospital Board papers in April 2009 noted that, “It is recommended that an approach based on improving services and quality is likely to gain greater organizational support than a conventional cost reduction programme and be the most effective way of delivering required efficiency gains. This approach is based on the diagnostic work … over the past six months’. The action plan for creating ‘a service improvement climate within [hospital]’ was explicitly based on the six OQ challenges and included 19 specific actions. The action plan including the creation of a quality improvement guide and toolkit for all staff, and develop an in-house quality improvement training capability. Moreover it included the establishment of a variety of mechanisms to involve staff in quality improvement work, for example, action learning sets, rapid improvement events. It also emphasized that the Board of Directors and Risk & Delivery Committee members needed to provide leadership and visible support to quality improvement.

4.2. Applying the DISC model in a Finnish hospital

The typical process of applying the DISC model for evaluating and supporting the development of an organization is described in Fig. 3 (process direction is described by a bottom-up arrow from the initial starting point 1 in the figure). After clarifying the purpose and guiding principles of the evaluation and development process, data is systematically gathered and analyzed in order to get an understanding of the safety culture in the hospital. Different types of data gathering tools can be used. The TUKU safety culture survey [54] has been developed to specifically address the functions depicted in the DISC model and to shed light on the six criteria of good safety culture. In addition to the TUKU questionnaire, other means of data gathering are also needed in order to form a complete picture of an organization’s safety culture. For instance interviews, workshops, incident reports, and document analysis can be used in data gathering. Results of the process are reflected upon in interaction with the hospital personnel and development needs are identified. Results are then summarized and communicated to the organization in order to facilitate the implementation of the improvement efforts in the everyday work. The application of the DISC model for evaluating and developing an organization relies on the following general assumptions:
- the personnel must be involved in the evaluation and development process;
• the process aims at helping the organization in getting an overall picture of its culture and an estimation of the direction the organization is heading in terms of the six criteria of good safety culture;
• the improvement efforts planned and carried out should be in line with each other and they should be linked to other improvement efforts going on in the organization;
• an outsider can help to raise discussion on issues that the organization does not consider or appear as too delicate to bring up;
• it is important for the outside expert to bring out his/her assumptions as explicitly as possible;
• the DISC model can act as a “boundary object” between the experts and the personnel, it can support the objectivity of the evaluation and development, help in integrating different types of data and support the communication between the experts and the organization; and
• safety culture improvement is a long span process that needs constant attention.

The results from the Finnish case study showed continuous informal interaction between researchers and the quality manager of the hospital during the process of using DISC in practical safety improvement work. In addition two formal interaction sessions were organized as part of the process: a hospital management group meeting and a feedback seminar day with the hospital personnel (90 people attended). In these seminars researchers and personnel at the hospital discussed and interpreted together the findings from the different types of data. The seminars also offered an opportunity to discuss and diagnose what kind of development activities were already carried out in the hospital and how these corresponded to the development needs that were identified during the evaluation. In the personnel seminar the representatives from each of the organizational units planned what should be done with the identified issues in the evaluation. Later the results were also discussed in the management groups of each organizational unit without the researchers being present.

The apparent strengths and challenges facing the hospital were summarized by the Finnish researchers on the basis of the DISC model. It was concluded that many aspects of safety culture had improved in the hospital since 2008. More specifically, the results showed that the safety investments made during the intervening years had helped develop increased mindfulness in the organization and highlighted the importance of safety in the organization. Safety thinking in the organization had also become more systematic and systemic in terms of safety thinking. For example, in some cases well-intentioned safety activities were already carried out in the hospital and how these corresponded to the development needs that were identified during the evaluation. In the personnel seminar the representatives from each of the organizational units planned what should be done with the identified issues in the evaluation. Later the results were also discussed in the management groups of each organizational unit without the researchers being present.

The improvement process based on the DISC model resulted in specific outcomes related to strategies and practice. In April 2011 the Human Resource department of the hospital launched a new personnel strategy for ensuring the adequacy of skillful personnel. Even though patient safety was not the original reason for launching it, the suggestions of the evaluation gave new meaning and energy to the strategy. Later the organization also introduced a new operations model for induction training; this organization level induction training was formalised and reconsidered from a patient safety point of view. More than a year after the start of the evaluation and development process, the hospital was still working to take the suggestions of the evaluation into account in its everyday practices. More recent efforts include the revision of the plan for quality and patient safety. Relating to the suggestions made in the evaluation, the new version of the plan aimed to integrate safety efforts more clearly with the overall quality improvement – and other core – functions of the organization. In 2012, the quality manager started reviewing each of the organization’s operational functions (starting from technical services) in collaboration with the representatives of each function in order to identify what ensuring patient safety meant in practice for them.

4.3. Similarities and differences in applications of the models in hospital improvement work

Our retrospective case studies of how different models were applied in two hospitals demonstrate significant differences in the use of methods, level of researcher involvement, data collection tools, and type of data. In both case studies there was close collaboration between researchers/facilitators and the hospital management using an action research approach. One could expect to find several differences in the practical application, results, and the kind of improvement aspects addressed in both hospitals, as the models differ significantly. However, what we found was that the models focused attention and awareness on quite similar dimensions in the case hospitals (for example, relating to issues of structure, clarification of roles, responsibility, competence, education, training, and culture). The application of both models contributed to the establishment of new (or revision of existing) structural elements in terms of strategies and plans in both case hospitals. In the Finnish case hospital emphasis was placed on the systematic improvement of personnel competence in terms of patient safety in the new personnel strategy, and patient safety was given more emphasis and became better integrated in the overall quality effort at the hospital. Similarly we found that the English case hospital developed a new quality improvement strategy focusing on establishing formal structures for improving service quality, and this strategy also emphasized a strong focus on maintaining and taking advantage of the positive organizational culture in ongoing improvement work. In both cases we found staff involvement important although in slightly different ways. In the Finnish case staff were involved in the entire evaluation process; although this was also the case in the English case, the importance of staff participation was emphasized additionally as a key element
in the action plan that resulted from the diagnosis based on the application of the OQ model.

In both case hospitals the application of the respective models contributed to a systematic and systemic conceptualization or operationalization of the quality and safety concepts. In the English case this is evident in terms of elements in the programme to build quality improvement throughout the hospital (e.g. understanding quality processes dependent on links between quality improvement activities and hospital goals, and the role of team work, the role of infrastructure, leadership and organizational culture as important factors that shape quality processes). In the Finnish case the model application contributed to a stronger awareness of patient safety as a core concept of running a hospital and a process dependent upon interactions across hospital units.

The results from both case studies also showed that the outer context dimensions were not particularly prominent in the internal improvement processes in the hospitals. The internal processes were directed towards improvement aspects that were possible to manage internally, even though these aspects potentially could be affected by external contextual dimensions such as regulation and funding.

5. Discussion

Taking the theoretical comparison of the OQ and DISC models into account together with the results from how the models have been used in practical improvement efforts we argue that both models are diagnostic in nature— they are designed to allow for identification of organizational gaps that need to be addressed in order to improve quality and safety. Since both of the models are quite general they can be applied in a variety of ways and for several purposes, for example, according to the audience and whether or not the models are applied by researchers or practitioners.

Our comparison showed that irrespective of the model used, attention and awareness were directed along quite similar dimensions (structure, clarification of roles, responsibility, competence, education, training, and culture) in the case hospitals. The importance of these dimensions is also highlighted in a recent large-scale research programme in England where Dixon-Woods et al. [57] concluded that improvement attention must be paid to systems, culture, and behaviors. This implies: setting coherent and challenging goals and monitoring progress towards them; empowering staff; and encouraging and exemplifying sound professional practice [57]. The reason for attention being paid to similar dimensions in both our Finnish and English case hospitals might be found in the theoretical comparison of the different dimensions in the two models. The six challenges of OQ (structural, political, cultural, educational, emotional, and physical/technological) correspond to several of the inner circle criteria (values, complexity, core tasks, mindfulness, responsibility, and organizing) and the outer circle functions (leadership, hazard management, strategy, pro-activity, work processes, working conditions, competence, supervision, contractor relations, and change management) of the DISC model.

The theoretical models differ with regards to how they incorporate and analyze the organizational context, and different results could have been expected with regards to attention to contextual aspects. The OQ model attends to both outer and inner contextual factors in analyzing quality improvement processes within the hospitals and how these processes are influenced by the context relations (e.g. why are patient experiences emphasized by macro level organizations but not within the hospital meso and micro level?). The DISC model also includes outer context interaction (e.g. managing contractor relations and supervisory activity) but to a less specific level compared to the OQ. Interestingly, results from both case studies showed that the outer context dimensions were not particularly prominent in the internal improvement processes in the hospitals, even though the wider literature often highlights the environmental conditions and outer context as vital to inner context improvement work [7,58–60].

The interpretation of the implications of the models for practice might be explained by other factors than the model content and their theoretical foundation. It could be related to the organizational context, organizational readiness for change [61], leadership priority in quality and safety [62], researcher involvement [52], and the role of the models as boundary objects (see below) [56,63–66]. Such suggestions call for further research to improve our understanding of how quality and safety theoretical models are translated and contribute to practical improvement processes.

Different theories and models have their strengths and weaknesses [67], and the choice of model in guiding improvement work in hospitals, can vary from being more or less unsystematic to a more rational choice. Based on our analysis of how the two hospitals in our retrospective study used the two quality and safety theoretical models in their practical improvement work, we argue that an important aspect is how the different models both operated as boundary objects directing attention towards organizational and system thinking, culture, and collaboration in improvement processes. Both models acted as diagnostic, reflexive, and dialogic mechanisms linking key people within the organizations, directing attention to certain aspects of the improvement processes, and generating commitment in general and especially among leaders enacting quality or safety. Our findings are in accordance with the wider literature on boundary objects as keys in knowledge interaction and sharing of meaning [56,64,66]. A boundary object is something that is shared and sharable across different problem-solving contexts. They can be processes, artefacts, documents, or technical language or vocabulary in common use among practitioners and are able to link different social communities so that they can collaborate on shared tasks. They are usually flexible enough in structure to enable different interpretations in their meaning in different social worlds, but robust enough to enable shared meaning and communication [56]. Studies of boundary objects in healthcare demonstrate how they have been applied to enhance inter-professional collaboration [68,69] by using for example a specific standardized communication tool [70]. In our cases the models represented boundary objects. They were explicit in nature (something visible) [66] and provided a means for: discussion and identification of quality and safety problems; bridging professional hierarchies, collective learning, transforming knowledge into goals, clarifying roles, and promoting a common culture between professionals and leaders.

Our findings imply that awareness should be given to the underlying assumptions of any model [30] to the extent that these are relevant for considering what aspects will be discussed and shared when using the model as boundary object [56,64,65]. In our study, the underlying assumption in the OQ and DISC models—that quality and safety needs to be at the core of organizational performance—also emerged as a key theme during the diagnosis and evaluation process in the case study sites. In both hospitals attention was directed towards integration of quality and safety into the ordinary tasks of running hospitals. Both hospitals acknowledged the need for stronger integration (England) and proactivity (Finland), along with specific tasks related to education and training in order to increase attention to and socialize quality and safety into the organizations. These are all in line with the model assumptions and, as suggested by Allen [68], “quality” and “safety” themselves are boundary concepts with strong cohesive
power that facilitates communication and cooperation between members of distinct groups without obliging members (such as doctors, nurses and managers) to give up the advantages of their respective social identity [68].

This study has contributed to a better understanding of the role of theoretical models for practical improvement purposes. However, we acknowledge that questions remain about whether the choice of model is important in determining success, and how contextual factors influence the outcome of improvement work should be explored in further work. There is also a need for further research to understand the role of knowledge brokers [71] in translating theoretical models into such practical improvement work.

6. Conclusion

Our analysis of the OQ and the DISC model, and our case study examples have shown that differences appear in both the theoretical foundations, and practical approaches and applications of the two models. Nevertheless, the study has indicated that the choice between the OQ and DISC models was of less importance for practical improvement work than the role of the model as a boundary object. Quality improvement requires collaboration between professionals and managers from different disciplines. This is challenging because they have different concerns and goals and use different professional vocabularies. In the case study hospitals, the models acted as boundary objects, assisting collaboration by presenting a coherent strategy for change, and directing attention towards organizational and system thinking, and culture. This is in line with recent research that emphasizes the importance of these factors in improving quality and safety in healthcare [57].

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