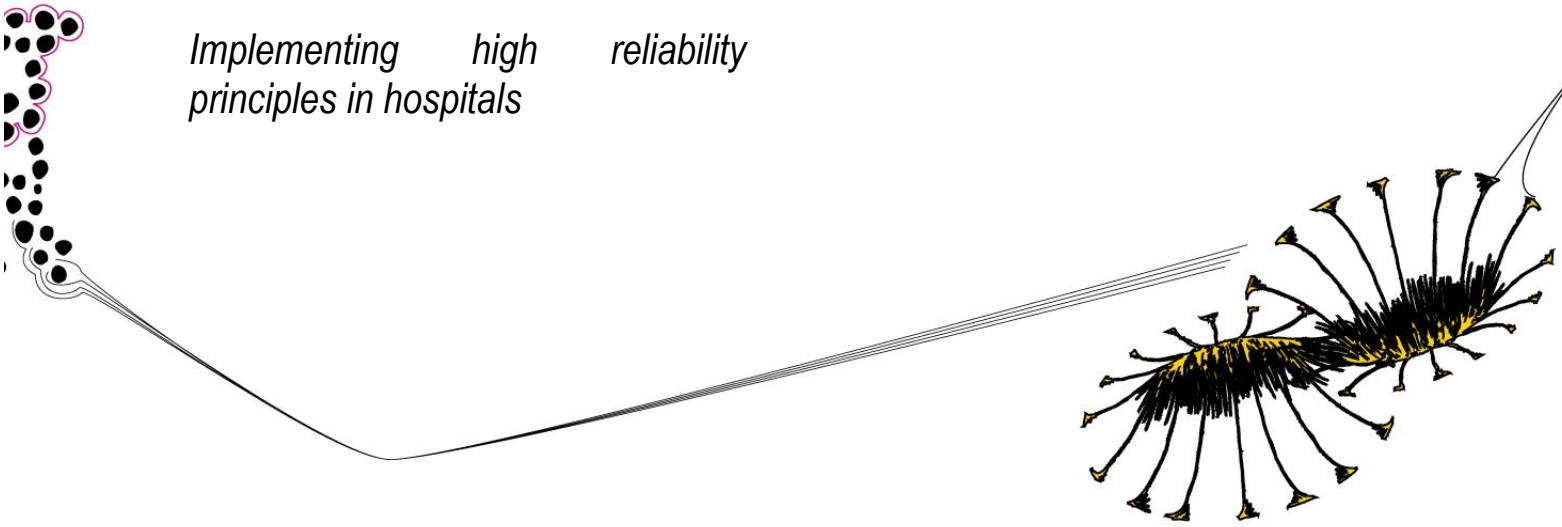
The organization of safety management

Implementing high reliability principles in hospitals



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The organization of safety management

Implementing high reliability principles in hospitals

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Abstract

Quality and safety in hospitals is an important recurring theme in health research. With an increasing number of stakeholders on quality and safety, such as the Health Care Inspectorate and patients, the assurance of quality is becoming more difficult. In this article we take a closer look at the principles of high reliability organizations in hospitals by studying the quality organization of five top clinical hospitals in the Netherlands. Thereby a focus is made on the topics structure, accountability and safety culture of the hospital quality and safety organization.

As suggested in the literature, we find evidence for all hospitals under study, that the presence of (1) a clear mission and vision is needed to move the hospital towards a high reliability organization. In the participated hospitals active leadership of the Board of Directors Medical Staff and staff manager quality and safety is seen as crucial basis to improve quality and safety performance. (2) Clear responsibilities and accountability for projects and processes are essential. Thereby all the respondents indicated that the (3) responsibilities need to be decentralized as much as possible. The (4) safety culture is crucial for the functioning of the organization. Without a just and open culture is it impossible to create a high reliability organization. Parts of the principles of high reliability organizations are implemented in the participating hospitals. However, to become a high reliability organization, further improvements and implementations are needed.

Keywords: quality, high reliability organization, hospitals, the Netherlands

I. Introduction

The organization of quality and safety in hospitals is an important recurring theme. By focusing on the bigger picture of quality management systems in the context of health care, we notice that a gradual evolution has taken place in the public and academic debate. The report 'to Err is Human' (Kohn et al., 2000) and the report 'Crossings the quality chasm' (Bloom, 2002) created an awareness of medical errors and the level of quality of health care provision. External pressure from health insurers, the Health Care Inspectorate and patients has as consequence that hospitals have a continuous recurring focus on quality and safety in hospitals. The assurance of quality and safety in hospitals is becoming more difficult. This is caused by an increasing number of stakeholders. Therewith is the complexity of the organization of quality assurance increased. In recent studies the organization of quality assurance and the implementation of a safety management system in hospitals is a prime topic of research (Weggelaar-Jansen et al., 2015; Chassin & Loeb, 2011; Blok et al., 2013). Hospitals struggle with their internal governance and structure of the quality and safety organization. Next to this are the standards of accreditation programs becoming more complex.

The Joint Commission International (JCI) has set up accreditation standards for hospitals. Concerning the governance hospital leadership is identified and is collectively responsible for defining the hospital's mission and creating the programs and policies needed to fulfil the mission. Hospital leaders prioritize which hospital wide processes will be measured, which hospital wide improvement and patient safety activities will be implemented, and how success of these hospital wide efforts will be measured. Leaders communicate quality improvement and patient safety information to governance and hospital staff on a regular basis. Medical, nursing, and other leaders of departments and clinical services plan and implement a professional staff structure to support their responsibilities and authority. Hospital leaders create and support a culture of safety program throughout the hospital. The higher management implements, monitors, and takes action to improve the program for a culture of safety throughout the hospital. (JCI & JCAHO, 2013)

The Netherlands Normalisation Institute (NEN) supports the standardization process of agreements in the Netherlands in order provide safety and sustainability for the society on products, methods and services. The Netherlands Technical Agreement (NTA) 8009:2014 describes the basic requirements for a safety management system. It gives specifications to set up a system for safety in hospitals for patients and employees it provides definitions for safety, responsibility and the requirements for employees. In the NTA 8009:2014 different themes of quality and safety, like the role of the Board of Directors and leadership are discussed. Visible personal commitment of the Board of Directors is a prerequisite for successful safety management (NTA). The Board of Directors is ultimately responsible for the development and implementation of long-term policy. When management acts as a model for patient safety, it can support the implementation of patient safety policy. The implementation of patient safety policy is a line responsibility. According the NTA culture is in the standards seen as an integral part of all aspects of the management system of a hospital.

Health care organizations have sought ways to improve their quality and safety performance. In order to reach this improvement health care institutions started to adopt the lessons of high reliability organizations (HRO's) such as nuclear power plants and commercial aviation (Hudson, 2003)

The fact that modern health care systems share several characteristics with other safety critical industries has led to the idea that they should also adopt practises to become High Reliable Organisations. The development and implementation of some of the principles and solutions of the high reliability theory, can promote a cultural change in the health care system which can result in making hospitals safer (Hines et al., 2008; OSHA, 2013). High reliability organizations are known for their exceptionally high level of reliability and excellent way of operating in hazardous settings with reliability and safety. Reliability itself derives from the ability of the organization and individuals to interact in real time with uncertainty or threat from the external environment (Chassin & Loeb, 2011; Chassin & Loeb, 2013; Hudson, 2003; Carroll & Rudolph, 2006; Hines et al., 2008). However, the health care sector differs from the sectors where high reliability theory started namely; nuclear power plants and commercial aviation. Therefore concepts and characteristics of HRO's are not likely to be directly duplicated to the health care sector (Amalberti et al., 2005) and Bagnara et al., 2008). The high reliability principles (these principles will be described further on in the article) promoted by the Joint Commission and Agency for Healthcare Research and Quality (AHRQ) are according to the Occupational Safety and Health Administration (OSHA) very similar to the principles underlying an effective safety management system.

However, the JCI and the NEN, did not develop standards for the implementation of safety management systems. Thereby we notice that the implementation of safety management systems among hospitals is very diverse. Taken the preceding in account the central question in this article is: (1) which theories are formulated about high reliability organizations and health care (2) what are the best practices concerning the implementation of high reliability principles and (3) how can we explain differences in implementation of HRO principles between the Santeon hospitals?

Research context: Top clinical hospitals

In the present article we explore the implementation of high reliability principles by studying the quality organization of five top clinical hospitals in the Netherlands.

To make a comparison with regard to the differences in implantation of the high reliability principles, the staff services of the Santeon hospitals[1] were included. Based on the differences, best practices are formulated. Under the name Santeon six top clinical hospitals, located in different parts of the Netherlands join their forces. Together they aim to enhance the quality and efficiency of medical specialist care and provide a transparent, nationwide service. Santeon encourages innovation by working closely together, sharing knowledge and experience to improve patient outcomes and collectively benefit from collaborating on best practices. The selection of the cases will be further elaborated in the method, a more detailed overview of the hospital organizations can be found in table

[1] St. Antonius in Nieuwegein, het Catharina ziekenhuis in Eindhoven, het Canisius-Wilhelmina ziekenhuis in Nijmegen, het Martini ziekenhuis in Groningen, het Medisch Spectrum Twente in Enschede en het Onze Lieve Vrouwe Gasthuis in Amsterdam.

2 in the appendix. The aim of this research is to explore which best practices can be formulated for the governance of safety management based on the comparison that is made between five top clinical hospitals with regard to the concepts of high reliability organizations.

II. High reliability organizations and their governance

In this section we address the first research question. There has been much debate about how to identify and define a high reliability organization (Lekka, 2011). There are two prominent approaches to understanding accidents in complex systems, namely the High Reliability Theory (HRT) and the Normal Accidents Theory (NAT). The Normal Accidents Theory (NAT) is formulated by Perrow (1972) He hypothesized that regardless the effectiveness of management and operations, accidents in systems that are characterized by tight coupling and interactive complexity will be normal or inevitable as they often cannot be foreseen or prevented. Perrow argues that complexity (the potential for non-linear interactivity among many component parts) and tight coupling (the close interdependency among these parts) in technical systems, makes organizations highly prone to failure. Concerning the governance of high-risk systems Perrow (1984) argued that centralization is the only effective way of preventing failure in tightly coupled systems. However, decentralization is an effective way of preventing failure in complex systems. Here the problem is with the decision-making load. Centralizing all the complexity would overwhelm the senior executives (Bierly & Spender, 1995).

High Reliability Theory (HRT) also considers high-risk technologies but focuses on a subset of high-risk organizations, that is: high reliability organizations that take a variety of extraordinary steps in pursuit of error-free performance. (Weick, Sutcliffe and Obstveld, 2008) Weick and Sutcliff (2007) describe high reliability organizations as an environment of ‘collective mindfulness’. They argue that HRO’s are distinctive because of their efforts to organize in ways that increase the quality of attention across the organization. This enhances people’s alertness and awareness. Weick and Sutcliff (2007) call this collective mindfulness. Mindful organizing requires that leaders pay attention to shaping the social and relational infrastructure of the organization. They need to establish a set of interrelated organizing processes and practices that can contribute to the systems overall culture of safety. Organisations can become more reliable by creating or ‘engineering’ a positive safety culture and reinforcing safety-related behaviours and attitudes (Weick & Roberts, 1993). The big difference between functioning in HRO’s and in other organizations is often most evident in the early stages of crises when the unexpected gives off only weak signals of trouble. Mindfulness preserves the capability to see the significance of weak signals and to respond vigorously. Weick (1987) argued that the cultural mode of control may be the crucial source of administrative control in high risk organizations. He focused on the people who attempt to operate within the system. He argued (1987, p. 112) that accidents occur because the people who manage and are integrated into these complex systems are insufficiently capable to sense and therefore anticipate the system’s problems. On the other hand, the organization’s culture comprises a substantial body of higher level collective knowledge (or mind) which can support individuals when they are under pressure in high risk

organizations. According to Weick (1978) modes of control interlace at different levels. Centralization based at the collective level can coexist with decentralization at the individual level (Bierly & Spender, 1995).

Many characteristics of high reliability organizations are formulated (Bierly & Spender, 1995; LaPorte & Consolini, 1991; Roberts, 1990; Roberts 1993; Weick & Sutcliffe, 2007). Roberts and LaPorte & Consolini identified several characteristics and processes that enabled the organizations to achieve and maintain their excellent safety records. Bierly & Spender focused more on the cultural part of high reliability organizations by researching the nuclear submarine culture. Weick & Sutcliffe (2007) identified five principles that they defined as 'reliability enhancing'. Their principles will be used as guideline in this article. They include: (a) high levels of learning orientation, (b) management commitment to safety and (c) their ability to foster an open and fair culture whereby errors are openly discussed, analysed and used as learning opportunities. Weick & Sutcliffe (2007) distinguished the five following principles:

(1) Preoccupation with failure: refers to the constant preoccupation of HRO's on potential errors and potential failures. High reliability organizations are always alert to signals from a developing new threat to safety. In hospitals for instance near misses need to be viewed as invitations to improve rather than as proof that a system has enough check to prevent a catastrophic failure. (2) Reluctance to simplify interpretations: HRO's resist to simplify observations and experiences from their environment. It focuses on a HRO's ability to collect, analyse and prioritise all warning signs with avoidance of making assumptions. There is no question that when you organize, you simplify. But people can be more deliberate in their choices of what to simplify. In hospitals oversimplifying explanations for how things work risks developing unworkable solutions and failing to understand all the ways in which a system may fail, placing a patient at risk. (3) HRO's are sensitive to operations; they are attentive to the front line, where the real work gets done. The sensitivity to operations refers to the ability to obtain and maintain the 'bigger picture' of operations. People in HRO's know that you cannot develop a big picture of operations if the symptoms of those operations are withheld. Sensitivity to operations in hospitals encompasses more than a check of medications and vital signs. It includes awareness by staff, supervisors and management of broader issues that can affect patient care. (4) Commitment to resilience is the characteristic that HRO's are able to not only effectively anticipate on errors but also deal with and bounce back from errors and unexpected events. The essence of resilience is therefore the intrinsic ability of an organization (system) to maintain or regain a dynamically stable state, which allows it to continue operations after an error. Resilience is seen as a combination of keeping errors small and of improvising workarounds that allow the system to keep functioning. Hospitals can prepare for these failures by training staff to perform quick situational assessments, working effectively as a team that defers to expertise, and practicing responses to system failures. (5) Deference to expertise: when confronted by a new threat/error HRO's have mechanisms in place to identify the individuals with the greatest expertise relevant to managing the new situation and to place decision-making authority in the hands of that person or group. Thereby HRO's push decision making down and around. Decisions are made on the front line, and authority migrates to the people with the most

expertise, regardless of their rank. In hospitals different knowledge and expertise is present. In many situations, different staff members as well as the patient and the family may have information essential to providing ideal care. Deference to expertise entails recognizing the knowledge available from each person and deferring to whoever's expertise is most relevant to the choices being made. According to the authors are these five principles essential for creating a state of mindfulness and thereby in the end exceptionally safe, high quality care.

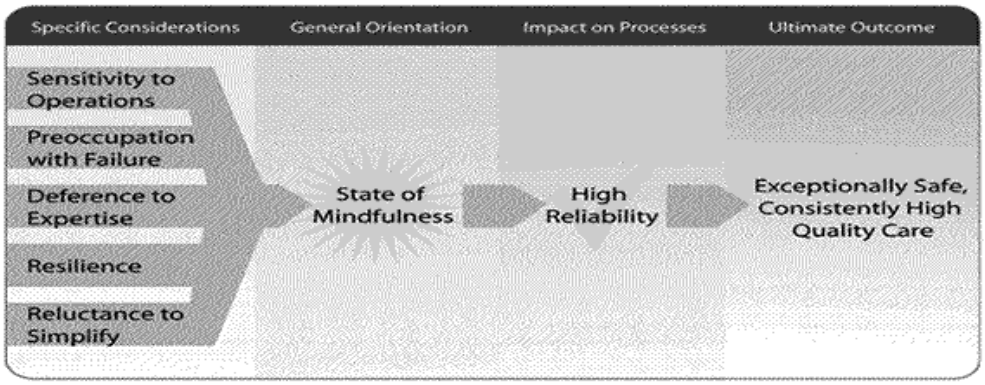

Figure 1. Collective mindfulness (Weick & Sutcliffe, 2007)

Figure 1 shows the relation between the five principles and in the end the ultimate outcome of safe and high quality care. However, Weick and Sutcliffe (2007) do not discuss the consequences for the organizational structure and governance. Concerning the management of a high reliability organization the authors say that it is impossible to manage any organization solely by means of mindless control systems that depend on rules, routines, and fixed criteria for correct performance. Instead, to hold a dynamic system together, you have to organize in ways that evoke mindful work. People need to adopt a style of continuous learning as well as ongoing refinement of expectations.

Based on the five principles of Weick & Sutcliffe (2007) we formulated three core elements and accompanying sub elements. The implementation of the high reliability principles in the Santeon hospitals will be further researched based on these elements. The best practices will be formulated on basis of the core elements, based on the comparison that is made between the five Santeon hospitals.

Structure; In the literature no clear theory about the organizational structure of high reliability organizations are mentioned. Frankel et al. (2006) discuss that without the right values supported by robust structures and systems established and sustained by the governance boards, senior administrative leaders, and clinical leaders it will be impossible to become a high reliability organization that embodies a true culture of patient safety. According to the principle of 'commitment to resilience' the authors say that a HRO is actively concerned with developing people's skills and knowledge, to develop a learning organization. Near misses are treated as information about the health of our system and try to learn from it. This 'preoccupation with failure is not only present in the higher management but in all layers and departments of the organization. Above mentioned topics are included in the mission and vision of the organization. The Board of Directors need to have necessary leadership, skills and knowledge to ensure delivery of the quality agenda. (KPMG; Hines et al., 2008),

Managers demonstrate their commitment to improved safety and health, communicate this commitment, and document safety and health performance. They make safety and health a top priority, establish goals and objectives, provide adequate resources and support, and set a good example (OSHA, Chassin & Loeb, 2013)

Accountability; HRO's are known for their high degree of accountability when an error occurs that has severe consequences (Hines et al, 2008). Regarding the principle 'deference to expertise' people "own" a problem until it is resolved. Employees know who have the expertise and are committed to doing their job well. A flexible strategy for crisis intervention is prerequisite according to the principle 'deference to expertise'. Thereby are people sensitive to operations, they interact often enough to get a clear picture (weick & Sutcliffe, 2007). It is important to hold managers and employees accountable for safety and health responsibilities in the workplace and give them authority to do so. In an organization with multiple layers of management, top management demonstrated its commitment by holding middle managers, supervisors and employees accountable for the implementation and success of the safety management system. Clear roles and accountabilities for the safety management system and thereby for the quality governance are essential.

Safety culture; Culture is an important aspect of an organization. With a positive (safety) culture basics are set and further development and innovation of quality and safety is possible. An open safety culture is a requirement for good functioning hospitals and thereby also for high reliability organizations (Chassin & Loeb, 2013; Hines et al.,2008; Weick & Sutcliffe,2007; Bierly and Spender, 1995). Of course it is the ambition of every organization to have a safety culture where there is active participation at all levels and safety is perceived to be an inherent part of business. The Agency of Healthcare Research and Quality (2008) mentioned also that the culture is the foundation for vision and strategy. Transparency, openness, learning and improvement are necessary factors for a safe environment. Reluctance to simplify needs to be present. Questioning of employees should be encouraged by the higher management; people need to feel free to bring up problems/tough issues. All the staff must feel empowered to identify errors, defects and system failures. Research shows that people need to feel safe to report incidents or they ignore them or cover them up (Chassin & Loeb 2011, 2013; Weick and Sutcliffe, 2007; Hudson, 2003). Employees are not 'attacked' when they report information that could interrupt operations. A culture where people can report mistakes and errors without reprisal or personal risk is a prerequisite. This does not imply that individuals are not held accountable for their actions, but that individuals are not responsible for flawed systems. Managerial practices such as encouraging people to ask questions and rewarding people who report errors or mistakes strengthen an organization wide culture that values reporting. Trust is thereby an essential element (Weick and Sutcliffe, 2007; KPMG, 2013). In table 1 an overview of the core and sub elements is given with the accompanying principles of Weick and Sutcliffe.

	Core elements	Sub elements
High reliability organization	**Structure**	
	Commitment to resilience	Mission
	Preoccupation with failure	Vision
		Leadership
	Accountability	Responsibilities
	Deference to expertise	Ownership
	Sensitive to operations	Clear processes
	Safety culture	Communication
	Reluctance to simplify	Transparency
	Preoccupation with failure	Open culture
		Stimulation safety culture

Table 1. Core elements and sub elements

III. Method of data collection in the Santeon hospitals for the comparison of the implementation of high reliability principles

The implementation of principles of high reliability organizations in hospitals and the differences in implementation of these principles are researched by studying the quality organization of five top clinical hospitals in the Netherlands. Therewith the second and third research question will be answered. Thereby the earlier mentioned core elements of the internal governance of health care organizations will be highlighted: structure, accountability and safety culture. The research has a comparative case study design highlighting the different perspectives on the organization of quality in the light of the high reliability concept. To make a comparison with regard to the structure, accountability and safety culture of the quality organizations of hospitals, the staff services of the Santeon hospitals[2] (n = 5) were included. Although the Santeon hospitals are quite similar regarding their size[3], concerning the organizational structure of their quality and safety system, the hospitals differ a lot. Next to the differences in organizational structure, the research focused on the topics of accountability and safety culture. Thereby experiences and best practices of the hospitals are taken into account. For the research semi-structured interviews were conducted and policy documents were analyzed.

Semi-structured interviews

Semi-structured interviews via face-to-face meetings and telephone conversations were conducted with 10 respondents[4]. The respondents of the interviews in the Santeon hospitals were limited to the manager of the staff service quality and safety and a policy advisor of the staff service. The managers of the staff services of the Santeon hospitals were asked to select a policy advisor of the concerning

[2] St. Antonius in Nieuwegein, het Catharina ziekenhuis in Eindhoven, het Canisius-Wilhelmina ziekenhuis in Nijmegen, het Martini ziekenhuis in Groningen, het Medisch Spectrum Twente in Enschede en het Onze Lieve Vrouwe Gasthuis in Amsterdam.

[3] An overview of the hospitals can be found in table 2 the appendix.
[4] An overview of the respondents can be found in table 1 in the appendix.

staff service. All the respondents were approached for an interview by means of an e-mail which explained the aim of the research and invited them to participate. The interviews lasted between 50-60 minutes. For the interviews a topic list was conducted. The topics for the interviews were based on the theoretical framework and available literature. The core elements structure, accountability and safety culture were included. The sub elements were included to get a better insight and understanding of the core elements. On basis of the sub elements questions for the interviews were formulated. Each sub element was analyzed separately by asking multiple open questions whereby there was room for own input from the respondents themselves. Dependent on the respondent the (follow-up) questions were adapted, suitable for their function and responsibilities. One of the specific strengths of semi-structured interviews was the flexibility and the possibility to ask follow-up questions based on the specific experiences of the respondents, the context of the organization and their administrative settings (Babbie, 2015). All the interviews were recorded and transcribed verbatim. After the transcription the interviews were summarized and send to the respondents for approval.

The transcripts were analyzed. Based on the theoretical framework developed during the research the transcripts were further refined and reduced by grouping the results together in categories (Pope, 2000). Based on the earlier mentioned HRO principles which were coupled with the core – and sub elements the interviews were analyzed. This is done with the help of the audits described by Weick and Sutcliffe (2007). They formulated questions to help organizations develop more awareness of how to institutionalize the five principles. With the help of the audit questions best practices in HRO's can be signalized. Based on the questions of the audits each participating hospital was ranked. This was done with the information gathered during the interviews and the available information in the policy documents. The hospitals were anonymized for this ranking. With the ranking a top three is made (1 for the best performing hospital, 3 for the 'worst' performing hospital) on all the HRO principles. Hospitals with the same total score on a HRO principle, received the same final ranking. Questions that were unanswerable, because the topic was not asked were not taken into account. A detailed overview of the ranking can be found in table 3 in the appendix. The final overview of the ranking can be found in the results in table 2.

Policy documents

Besides the semi-structured interviews, policy documents (e.g. annual plans and if available strategic plans,) were analyzed. Not only in the literature of high reliability organizations are the core elements continuous recurring. Also in the policy documents of the studied hospitals are the core elements and the HRO principles present. Besides the core elements, organizational charts, the division of responsibilities (central or decentralized) the number of employees within the staff services, the FTE in the staff services and 'hierarchical lines' (e.g. who is in the end responsible and who is accountable) in the organizations were analyzed. The numbers of employees and the FTE in the staff organization were provided by the hospitals. Annual policy plans were scanned for quality and safety topics (e.g. the safety culture and received accreditations).

In-depth case study of Medisch Spectrum Twente

After the interviews and the policy analysis one of the top clinical hospitals was in-depth analyzed. Medisch Spectrum Twente was chosen as in-depth case because this hospital was the only hospital of the Santeon hospitals that did not receive the accreditation for the safety management system. Besides this it was useful to further research a safety management system. Medisch Spectrum Twente (MST) is one of the six top clinical hospitals in the Netherlands. MST provides medical care for the region Twente which has a population size of 264000 inhabitants. MST has around 3700 employees whereof 250 medical specialists. On yearly basis MST have 30000 inpatients being hospitalized, 33000 one day patients being hospitalized and 472000 outpatient visits. For this in-depth case respondents were selected for interviews. In total nine respondents were selected with the help of the staff manager quality and safety. The respondents had different hierarchical positions and functions (e.g. a medical specialists, a member of the supervisory board, business managers and advisors quality and safety). The topic list that was used for the semi-structured interviews was adapted for the interviews in MST. The interviews lasted between 50-60 minutes. The interviews were recorded and transcribed. The transcripts were summarized and send to the respondents for approval. The transcripts of the interviews in MST were analyzed based on the earlier formulated core elements. The categories of the sub elements were further refined by selecting sections of data on like or related themes and putting them together. With the help of the in-depth case in MST the results of the semi-structured interviews could be seen in a broader perspective. It leads to a thick description of the processes and an in-depth understanding of the critical processes and decisions that lead to the implementation of the HRO principles in hospitals.

IV. Results

The central question in this article was: (1) which theories are formulated about high reliability organizations and health care (2) what are the best practices concerning the implementation of high reliability principles and (3) how can we explain differences in implementation of HRO principles between the Santeon hospitals? Based on the analyzed interviews and the analyzed policy documents the results can be formulated.

Structure

All the respondents of the participating Santeon hospitals and the respondents of the in-depth case in Medisch Spectrum Twente indicated that a clear mission and vision is essential for a good functioning quality organization. Quality and safety need to be a recurring topic on the agenda of the board of directors but also in strategic documents, annual reports and protocols. This helps to ensure that quality and safety is integrated in the organization at all levels.

The board of directors is responsible for a clear vision, and needs to promote this actively. Clear goals need to be set, as well as strategies to accomplish these goals. Prioritization on quality and safety topics is required. Multi annual policies are advisable. Therewith quality and safety activities get a

more integral approach. Thereby is it essential to involve employees in formulating the multi annual policy to increase the support for the vision of the Board of Directors within the hospital organization.

In some of the participating hospitals a taskforce quality and safety on strategic – tactical level was formed. This taskforce can take care of further concretization of the vision on quality and safety of the Board of Directors. In general a taskforce consists a board member (specialized on quality and safety) a member of the Medical Staff and the staff manager quality and safety. If necessary the taskforce can be expanded by a medical safety officer (medical specialist) and a representative of the business managers of the different specialisms in the hospital. The advantage of a taskforce is that in case of incidents, decisions can be made quickly. Concerning the organization of quality and safety in hospitals, all the respondents indicated that ideally processes and responsibilities are decentralized. The expertise is present at decentralized level. However, to retain a clear overview of all the processes and activities, central coordination is, as indicated by the respondents, desirable. An important point mentioned by all the respondents is the inclusion of medical specialists in the quality organization. Without the support of medical specialists and nurses the implementation of HRO principles can never succeed.

In the quality organization of health care institutions staff services play a central role. Regarding the positioning of the staff service quality and safety it is essential to make the added value clear for the rest of the organization. Frequent contact and providing structural support for the employees on quality and safety topics is one of the roles of the staff service quality and safety. The advisors quality and safety are proactive and make structural links with the employees.
The quality and safety advisors should not be selected solely on their skills, but also enthusiasm and affinity for quality and safety. This point will be further elaborated in the culture aspect. The staff manager quality and safety has a central coordinating role. Making connections, sharing knowledge and having a central overview of the quality and safety topics are seen as essential elements of the linking-pin function of the staff manager.
Regarding leadership, quality and safety need to be a top priority in the organization. Given the importance of quality and safety for the organization it is up to the Board of Directors to consider quality and safety as necessary condition to achieve their further ambitions. Another important aspect of leadership is the monitoring of the processes on quality and safety, inspiring advisors, medical specialists and nurses, making connections and ensuring coordination between processes of different departments within the hospital.

Accountability

Accountability is an important aspect of a high reliability organization. Also, in order to maintain trust in an organization it is required to hold employees accountable for adhering to safety protocols and procedures. Knowing who is responsible for what in terms of quality and safety is not only desirable but also necessary. Respondents indicated that it is necessary to have clarity about the responsibilities of quality and safety. The various parties that play a role in the quality organization need a clear view

on how the decision making process is organized and responsibilities are secured. Managers and medical specialists need to agree who responsible is for the implementation of quality and safety and what the corresponding tasks are. Thereby is it advisable that the implementation of quality and safety take place on a decentralized level. This creates on strategic, tactical ad operational level clarity about the processes and responsibilities of quality and safety.
In the view of accountability is ownership in all levels of the organization an important aspect. Therefore accountability and ownership is often related to the safety culture of an organization. Whether or not employees take responsibility and ownership of a problem can be stimulated by the safety culture of the organization.

Safety culture

A safety culture is a prerequisite for a good functioning hospital were quality and safety are the standard. Also the respondents indicated that the safety culture within the organization is the basis for the rest of the organization. With regard to transparency and communication is it important that information is shared. This needs to be realized between different departments (horizontal), but also between different levels (from the Board of Directors towards their employees, vertical). When employees are informed in an early stage and (if possible) included, the support and acceptance of the policy increases. This does require frequent contact and visibility of the staff service quality and safety, the Board of Medical Staff, the Board of Directors and the Medical Safety Officers in the organization. Direct communication and not via-via is advised.
An open culture is a culture where incidents can be reported blame free and the learning aspect is central. Respondents indicated that in meetings experiences, expertises and tips should be shared. Therefore an open culture is essential. This open culture should also be stimulated.
The stimulation of the safety culture is important. Medical specialists can function as a role model where they can discuss with their co-workers possible mistakes or incidents. In all the participated hospitals the staff service quality and safety has a medical specialist (ambassador) who is responsible for the quality and safety regarding the medical professionals. The function of the ambassador is to stimulate and develop the safety culture further. Next to this the ambassador should attend his peers on the importance of the safety culture. Not only the medical specialists need to give attention to the safety culture, also the Board of Directors and the Board of Medical Staff need to focus on the safety culture. Although in most hospitals a certain level of safety culture is reached, it is important to keep a constant focus on it.

The hospitals were compared concerning the implementation of the principles of high reliability organizations. Based on the received information during the interviews and the analysis of the policy documents the hospitals were ranked. The audit questions of Weick and Sutcliffe (2007) were used for a qualitative ranking. Thereby were the audit questions coupled to the HRO principles. Each hospital was ranked on the different audit questions. For each hospital on each HRO principle a final score was calculated (table 3 of the appendix). An overview of the final scores is given in table 2. The principle

preoccupation with failure was viewed from the core element ‘structure’ as well from the core element ‘safety culture’.

Core elements	Sub elements	HRO principles	Hospitals A	B	C	D	E
Structure	Mission Vision Leadership	Preoccupation with failure	2	**1**	3	2	3
		Commitment to resilience	**1**	**1**	2	**1**	3
Accountability	Responsibilities Ownership Clear processes	Deference to expertise	2	**1**	2	**1**	2
		Sensitive to operations	2	2	3	**1**	3
Culture	Communication Transparency Open culture Stimulation safety culture	Reluctance to simplify	2	**1**	2	3	**1**
		Preoccupation with failure	2	**1**	3	2	3
Total			11	**7**	15	10	15

Table 2. Qualitative ranking of the five hospitals’ implementation practices of the five principles of HRO

According to this ranking best practices and differences between the hospitals are discussed. In comparison with the other hospitals hospital B is performing on the majority of HRO principles very well. Also hospital A and D are performing good. These three hospitals all have a taskforce quality and safety in which continuous future plans and risks are discussed. Because of this continuous focus on quality and safety and it’s relatively small number of participants (maximum 5 persons) decisions can be made fast. By setting clear lines and frameworks it is clear for the decentralized levels of the hospitals what is expected and what (future) plans entail. These frameworks need to be set by the higher management (taskforce) in cooperation with the decentralized level. The implementation and coordination of new rules or policy are thereby in these hospitals as much as possible decentralized. With this decentralization the managers of the departments feel responsible and accountable for their level of quality and safety. In all the hospitals we noticed a high level of deference to expertise. People ‘own’ a problem and feel responsible for it. The level of commitment is generally high and expertise is highly valued. However, in case of a crisis it is not always common that the one with the most expertise is making decisions. It is more common that the person with a higher hierarchical position is making the decision.

In all the Santeon hospitals we noticed a high level of reluctance to simplify. In hospital E and B this level was high because in these hospitals a major and continuous focus was noticed on the safety culture. However, the commitment to resilience, whereby hospitals for example learn from their mistakes was high in the hospitals A, B and D. The steps towards a safety culture in these hospitals were made gradually. It is possible that therefore the continuous learning in the organization is well performed.

The cooperation with the medical staff, medical specialists and nurses is in all the hospitals seen as a prerequisite for a successful safety culture and implementation of innovations, policy and rules. In some hospitals (for example hospital E and B) medical safety officers or medical specialist who are concerned with quality and safety are present. It is noticed that if the cooperation between the staff service quality and safety and the medical staff is of a continuous basis the safety culture and the level of commitment among medical specialists and nurses is higher.

V. Conclusion and discussion

The central question in this article was: (1) which theories are formulated about high reliability organizations and health care (2) what are the best practices concerning the implementation of high reliability principles and (3) how can we explain differences in implementation of HRO principles between the Santeon hospitals? Based on the interviews and the analysis of the policy documents it can be concluded that the implementation of high reliability principles among hospitals is diverse. However, all the hospitals are aware of the ‘urgency’ of risk management and the benefits that high reliability principles can offer. The hospitals are getting more aware of the risks in their organization and start to create a continuous focus on quality and safety among their employees. Quality and safety is becoming a key point in leadership and the Board of Directors starts thereby with committing to the goal of principles of high reliability. Also in the analyzed policy documents quality and safety are key principles in the hospitals mission and vision. Concerning the commitment to resilience a strong focus on training and skills is present in some of the participating hospitals. Especially for the advisors quality and safety of the staff services training and skills are important. Because the advisors quality and safety are the connection between the higher management and the operational level, they need to be able to translate the policy and advise the departments concerning quality and safety topics. In hospital B and hospital D is was remarkable how much energy and time was spend in training whereby the focus was not only on the advisors quality and safety but also on the team of advisors quality and safety and how they cooperated with each other to create a high level of expertise regarding quality and safety topics.

Regarding the structure of an organization the hospitals that perform good (having a final score of 1 or 2) all have a taskforce quality and safety on central level. This taskforce entails a member of the Board of Directors, a member of the Medical Staff, the manager quality and safety and a representative of the business managers of the different departments. Such a taskforce can formulate a clear framework in which the decentralized managers and employees can implement the different principles. These hospitals also have the organizational structure that the advisors quality and safety are coupled to a department. The advisors are in these departments the first contact person regarding quality and

safety topics. The manager quality and safety is responsible for having a central overview of quality and safety in the hospital, and potential risks.

Concerning accountability improvements can be made. In high reliability organizations you see the principle of deference to expertise. In hospitals the decisions in case of incidents or errors are still made by the Board of Directors. However, this decision is comprehensible because in the end the Board of Directors is responsible for the taken actions. To rely in a situation of incidents or errors on an employee lower in hierarchy, but with maybe more expertise, remains difficult. However, in all the hospitals we noticed a high level of responsibility. Especially during the interviews with the respondents of the in-depth case, respondents indicated that a high level of responsibility is necessary for a functioning organization whereby risks that occur are taken seriously and people feel responsible for the risks/problems. The processes in the organization need to be clear so that hospitals can be sensitive to operations and people with the most expertise can operate in case of a crisis. Thereby are decentralized responsibilities and an open and just safety culture on central and decentralized level necessary

The level of trust of the manager quality and safety in the employees and advisors quality and safety is in all hospitals high. The safety culture in hospitals is receiving more attention. A just culture where incidents and errors can be reported blame free is implemented in hospitals. This just culture cannot be directly implemented, but is a growing process. Hospitals are making improvements concerning the implementation of a safety culture. However, progress still can be made regarding the safety culture between different hierarchical levels (for example between nurses and medical specialists). The stimulation of the safety culture needs constant focus, not only from the Board of Directors and the higher management, but also from the nurses and medical specialists. Cooperation and transparency between the medical specialists, nurses and higher management is essential for receiving a culture where they are reluctant to simplify and preoccupied with failure.

Limitations of the study

The risk of selection bias might have occurred and it could have resulted in biased results. The respondents were selected with the help of the staff manager quality and safety and were not randomly selected. A biased view of the Santeon quality organizations might have occurred. The view of Medisch Spectrum Twente is more detailed and specified because MST was selected as in-depth case. In future research it is recommended to include the same number of respondents of each organization, or to research each hospital in-depth to prevent biased results.

Next to this it is important to remember that although there was a topic list; people could interpret the questions different. However, the semi-structured nature of the interview questions allowed for furthers questions if more information related to certain topics was needed or if the questions were not asked in the clear way. That could contribute to more reliable results (Mack & Woodsong, 2005; Pope & Mays, 2006). Further a response bias might have occurred. It is possible that the respondents have given socially desirable answers to the questions in order to represent the organization better than it is

in reality. Furthermore, it is important to take in mind that in this research a focus is made on three specific core elements concerning high reliability organizations. However, high reliability organizations consist of more elements than the three selected core elements. For a complete view it is recommended to include more elements. Finally it should be noticed that in this article not the safety in the hospitals is discussed, only the implementation of high reliability principles. The extent to which the high reliability principles are implemented says nothing about the current safety in the participating hospitals.

Suggestions for further research

Further research might build on our research to examine the affect of the organizational structure on the quality organization, in particular with regard to the high reliability principles. This can be done by including hospitals with different organizational structures in the research sample to investigate whether the organizational structure (more centralized and hierarchically or more decentralized) can explain the extent of implementation of high reliability principles.

In addition the perspective of health care professionals on high reliability principles might be included in further research. As in the research and literature the importance of culture is appointed, the (safety) culture among health care professionals might be further investigated. Next to this are in some researches the applicability of high reliability principles in health care organizations discussed. The dynamic setting were health care professionals in operate is different from the nuclear power plant organizations, this because of the huge variability in patients and circumstances. In health care it is not possible to write for every circumstance a rule. The way health care organizations can anticipate on these dynamic settings can be included in further research.

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VII. References

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VIII. Appendix

Table 1. Overview respondents interviews

Respondent	Function	Organisation
Jozien Bensing	Raad van Toezicht MST (NIVEL) / Universiteit Utrecht	Nivel / Universiteit Utrecht
Jan den Boon	Raad van Bestuur (kwaliteit en veiligheid) MST	Medisch Spectrum Twente (Enschede)
Karin Mulder	Manager stafdienst Kwaliteit en Veiligheid MST	Medisch Spectrum Twente (Enschede)
Jos Lippmann	Adviseur Kwaliteit en Veiligheid MST	Medisch Spectrum Twente (Enschede)
Marieke Holtslag	Adviseur Kwaliteit en Veiligheid MST	Medisch Spectrum Twente (Enschede)
Jeroen van Vugt	Neuroloog/ Voorzitter Medische Staf MST	Medisch Spectrum Twente (Enschede)
Raymond Verheijen	Anesthesioloog- pijnbestrijder / Medical Safety Officer MST	Medisch Spectrum Twente (Enschede)
Ina Kuper	Medisch manager / Reumatoloog MST	Medisch Spectrum Twente (Enschede)
Annemarie Hannink	Bedrijfskundig Manager MST	Medisch Spectrum Twente (Enschede)
Renate Zijlstra	Bedrijfskundig Manager MST	Medisch Spectrum Twente (Enschede)
Leslie Kroes	RVE adviseur Kwaliteit en Veiligheid MST	Medisch Spectrum Twente (Enschede)
Inge Duindam	RVE adviseur Kwaliteit en Veiligheid MST	Medisch Spectrum Twente (Enschede)
Hanneke Beelen	Manager kwaliteit en veiligheid	Catharina Ziekenhuis (Eindhoven)
Leonie Claes	Adviseur Kwaliteit & Veiligheid	Catharina Ziekenhuis (Eindhoven)
Hedwig Mijnheer	Manager kwaliteit en veiligheid	Martini Ziekenhuis (Groningen)
Carla Veldkamp	Manager kwaliteit en veiligheid	Canisius-Wilhelmina Ziekenhuis (Nijmegen)
Suzanne Govers	Adviseur Kwaliteit & Veiligheid	Canisius-Wilhelmina Ziekenhuis (Nijmegen)
Loes Pijnenborg	Manager kwaliteit en veiligheid	St. Antonius Ziekenhuis (Utrecht)
Richelle Griffioen	Adviseur Kwaliteit & Veiligheid	St. Antonius Ziekenhuis (Utrecht)

Table 2. Overview quality organizations Santeon hospitals

	Aantal personen stafdienst kwaliteit en veiligheid	Aantal adviseurs kwaliteit veiligheid	Fte. adviseurs	Decentrale kwaliteitsfunctionarissen	Overige kwaliteitsmedewerkers	Aantal bedden	Aantal medewerkers	Aantal medisch specialisten
St. Antonius ziekenhuis	16 personen (Totaal 12,45 fte.) 4 adviseurs kwaliteit en veiligheid, 4 personen voor indicatoren en datamanagement, 4 klachtenfunctionarissen, 1 manager, 1 medisch manager en 1 managementondersteuner.	4 (exclusief indicatoren en datamanagement) 8 inclusief indicatoren en datamanagement	Exclusief: 3,67 fte. Inclusied: 7,03 fte.	Er zijn nog 2 personen werkzaam direct voor het zorgmanagement, met vooral kwaliteit in hun pakket: 1 voorziter VAR de ook oncologie datamanagement in haar pakket heeft totaal (0,75 fte), en 1 persoon die decentraal innovaties stimuleert (0,75 fte).	Elk (team)hoofd houdt zich met kwaliteit van zorg bezig.	1.102	4.912	274
Canisius-Wilhelmina ziekenhuis	Unit kwaliteit, veiligheid en verantwoording beschikt over 16 personen. (12,21 fte) 1 manager, 1 secretaresse, 1 medewerker documentbeheer, 6 adviseurs kwaliteit en veiligheid, 1 adviseur kwaliteit veiligheid/ intensivist, 1 Verpleegkundig consulent bloedtransfusie/ Donatie	6	5,3 fte.	Decentrale kwaliteitsfunctionarissen bij de laboratoria, klinische farmacie en de centrale sterilisatie afdeling.	In het CWZ ligt de verantwoordelijkheid voor kwaliteit en veiligheid in de lijn, dus het staat inderdaad benoemd in de functieprofielen van de hoofden. Uitvoerende taken worden meestal doorbelegd bij senioren.	632	+/- 3.400	200

	/ transplantatie-functionaris, 1 stafmedewerker, 1 coördinator Zirop, 1 adviseur wet BIG, secretaresse centrale MIP commissie, 1 klynisch fysicus							
Catharina ziekenhuis						541	3.671	211
Martini ziekenhuis	10 personen (8,4 fte) Waaronder 7 adviseurs, 1 leidinggevende, 1 management assistent en één secretaresse. Op dit moment werkt er via Martini Innovatie Projecten tijdelijk nog een adviseur voor oncologie/Kwaliteit&Veiligheid (duur 1 jaar, eindigt 1 september 2015) en een medewerker 1 dag/week als applicatiebeheerder	7	6 fte.	Decentrale kwaliteitsfunctionarissen zijn aanwezig bij bijv. de apotheek, Radiologie, IC. Deze functionarissen zijn niet geregistreerd, dit wordt door de RVE zelf bepaald. De invulling m.b.t. kwaliteit verschilt per afdeling. soms kwaliteitsfunctionarissen, soms invulling door unithoofd).		580	2.400	150

	voor een project documentbeheer (duur 9 maanden eindigt december 2015).							
Medisch Spectrum Twente	17 personen (15,13 Fte.) Waaronder 1 manager, 7 adviseurs, 1 secretaresse stafdienst K&V. 1 bedrijfs-jurist, 2 medewerkers patiëntenvoorlichting, 1 klachtenbemiddelaar, 2 ambtelijk secretarissen, 1 secretaresse klachtencommissie en 1 deskundige steriele med. hulpmiddelen,	7	6,29 fte.	Er zijn 9 decentrale kwaliteitsfunctionarissen werkzaam. Deze zijn werkzaam bij de verschillende groepen.	Er werken decentraal 6 RVE adviseurs Kwaliteit en Veiligheid: in totaal 5,1 Fte. Deze RVE adviseurs zijn werkzaam in de verschillende groepen, vaak voor meerdere RVE's. Teamhoofden en vooral ook verpleegkundigen nemen ook taken op zich op het gebied van kwaliteit en veiligheid.	1.070	4.000	232

Table 3. Audit questions and ranking hospitals.

Assessing Your Organization's Preoccupation with Failure
How well do each of the following statements describe your work unit, department, or organization? Enter next to each item below the number that corresponds with your conclusion:
1 = not at all, 2 = to some extent, 3 = a great deal.

	Hospital A	Hospital B	Hospital C	Hospital D	Hospital E
1. We focus more on our failures than our successes.	3	3	2	2	2
2. We regard close calls and near misses as a kind of failure that reveals potential danger rather than as evidence of our success and ability to avoid disaster.	2	3	2	2	2
3. We treat near misses and errors as information about the health of our system and try to learn from them.	3	3	3	3	3
4. We often update our procedures after experiencing a close call or near miss to incorporate our new experience and enriched understanding.	2	2	1	2	1
5. We make it hard for people to hide mistakes of any kind.	-	-	-	-	-
6. People are inclined to report mistakes that have significant consequences even if nobody notices.	3	3	3	3	3
7. Managers seek out and report bad news.	2	3	3	3	3
8. People feel free to talk to superiors about problems	2	2	2	2	2
9. People are rewarded if they spot problems, mistakes, errors, or failures.	-	-	-	-	-
Total	17	19	16	17	16

Scoring: Add the numbers. If you score lower than eleven, you are preoccupied with success and should be actively considering how you can immediately improve your focus on failure.
If you score between eleven and eighteen, you have a moderate preoccupation with success rather than a fully mindful preoccupation with failure. Scores higher than eighteen suggest a healthy preoccupation with failure and a strong capacity for mindfulness.

Assessing Your Organization's Reluctance to Simplify

How well do each of the following statements describe your work unit, department, or organization? Enter next to each item below the number that corresponds with your conclusion: 1 = not at all, 2 = to some extent, 3 = a great deal.

	Hospital A	Hospital B	Hospital C	Hospital D	Hospital E
1. People around here take nothing for granted.	2	2	2	2	2
2. Questioning is encouraged.	3	3	3	3	3
3. We strive to challenge status quo.	-	-	-	-	-
4. People in this organization feel free to bring up problems and tough issues.	2	3	2	2	3
5. People generally prolong their analysis to better grasp the nature of the problems that come up.	3	3	2	2	3
6. People are encouraged to express different views of the world.	3	3	3	3	3
7. People listen carefully; it is rare that anyone's view is dismissed.	2	2	2	2	2
8. People are not shot down for surfacing information that could interrupt operations.	2	2	2	2	2
9. When something unexpected happens, people are more concerned with listening and conducting a complete analysis of the situation than with advocating for their view.	-	-	-	-	-
10. We appreciate skeptics	3	2	3	2	2
11. People demonstrate trust for each other.	2	3	3	2	3
12. People show a great deal of mutual respect for each other.	2	2	2	2	2
Total	24	25	24	22	25

Scoring: Add the numbers. If you score higher than twenty-four, the potential to avoid simplification is strong. If you score between fourteen and twenty-four, the potential for the potential to avoid simplification is moderate. Scores lower than fourteen suggest that you should actively be considering how you can improve your capabilities to prevent simplification in order to improve your organization's capacity for mindfulness.

Assessing Your Organization's Sensitivity to Operations

Respond agree or disagree with the following statements about your work unit, department, or organization.

	Hospital A	Hospital B	Hospital C	Hospital D	Hospital E
1. On a day-to-day basis, there is an ongoing presence of someone who is paying attention to what is happening and is readily available for consultation if something unexpected arises.	2	3	2	3	2
2. Should problems occur, someone with the authority to act is always accessible and available, especially to people on the front lines.	2	3	3	3	2
3. Supervisors readily pitch in whenever necessary.	-	-	-	-	-
4. During an average day, people come into enough contact with each other to build a clear picture of the current situation.	-	-	-	-	-
5. People are always looking for feedback about things that aren't going right.	2	2	2	2	2
6. People are familiar with operations beyond one's own job.	3	2	2	2	2
7. We have access to resources if unexpected surprises crop up.	-	-	-	-	-
8. Managers constantly monitor workloads and are resources if the workload starts to become excessive.	3	2	2	3	2
Total	12	12	11	13	10

Scoring: Add the numbers. If you score higher than sixteen, the sensitivity to operations is strong. If you score between ten and sixteen, the sensitivity to operations is moderate. Scores lower than ten suggest that you should actively think of ways to improve the sensitivity to operations and capacity for mindfulness.

Assessing Your Organization's Commitment to Resilience

How well do each of the following statements describe your work unit, department, or organization? Enter next to each item below the number that corresponds with your conclusion: 1 = not at all, 2 = to some extent, 3 = a great deal.

	Hospital A	Hospital B	Hospital C	Hospital D	Hospital E
1. Forecasting and predicting the future is not important here.	1	1	1	1	1
2. Resources are continually devoted to training and retraining people on the properties of the technical system.	2	2	2	2	2
3. People have more than enough training and experience for the kind of work they have to do.	3	3	2	3	2
4. This organization is actively concerned with developing people's skills and knowledge.	2	2	2	2	2
5. This organization encourages challenging assignments.	-	-	-	-	-
6. People around here are known for their ability to use their knowledge in novel ways.	3	3	2	3	2
7. There is a concern with building people's competence and response repertoires.	1	1	2	1	1
8. People have a number of informal contacts that they sometimes use to solve problems.	-	-	-	-	-
9. People learn from their mistakes.	3	3	3	3	3
10. People are able to rely on others.	3	3	3	3	3
Total	18	18	17	18	16

Scoring: Add the numbers. If you score higher than twenty, the commitment to resilience is strong. If you score between twelve and twenty, the commitment to resilience is moderate. Scores lower than twelve suggest that you should actively consider how you can immediately begin building resilience and the capacity for mindfulness.

Assessing the Deference to Expertise in Your Organization

How well do each of the following statements describe your work unit, department, or organization? Enter next to each item below the number that corresponds with your conclusion: 1 = not at all, 2 = to some extent, 3 = a great deal.

	Hospital A	Hospital B	Hospital C	Hospital D	Hospital E
1. People are committed to doing their job well.	3	3	3	3	3
2. People respect the nature of one another's job activities.	-	-	-	-	-
3. If something out of the ordinary happens, people know who has the expertise to respond.	2	3	2	3	2
4. People in this organization value expertise and experience over hierarchical rank.	2	2	2	2	2
5. In this organization, the people most qualified to make decisions make them.	2	2	2	2	2
6. If something unexpected occurs, the most highly qualified people, regardless of rank, make the decision.	-	-	-	-	-
7. People typically "own" a problem until it is resolved.	3	3	3	3	3
8. It is generally easy for us to obtain expert assistance when something comes up that we don't know how to handle.	-	-	-	-	-
Total	12	13	12	13	12

Scoring: Add the numbers. If you score higher than sixteen, the deference to expertise is strong. If you score between ten and sixteen, the deference to expertise is moderate. Scores lower than ten suggest that you should actively think of ways to improve the deference to expertise and capacity for mindfulness.