How operating room efficiency is understood in a surgical team: a qualitative study

EREBOUNI ARAKELIAN1, LENA GUNNINGBERG2,3 AND JAN LARSSON4

1Department of Surgical Sciences, Uppsala University, SE-751 85 Uppsala, Sweden, 2Department of Public Health and Caring Sciences, Section of Caring Sciences, Surgical Centre, Uppsala University, SE-751 22 Uppsala, Sweden, 3School of Nursing, University of California, San Francisco, USA, and 4Department of Public Health and Caring Sciences, Health Services Research, Uppsala University, SE-751 22 Uppsala, Sweden

Address reprint requests to: Erebouni Arakelian. Tel: +46-18-611-45-70/46-18-611-29-93; Fax: +46-18-51-41-37/46-18-55-66-87; E-mail: erebouni.arakelian@akademiska.se

Accepted for publication 7 October 2010

Abstract

Objective. Building surgical teams is one attempt to ensure the health-care system becomes more efficient, but how is ‘efficiency’ understood or interpreted? The aim was to study how organized surgical team members and their leaders understood operating room efficiency.

Design. Qualitative study.

Settings. A 1100-bed Swedish university hospital.

Participants. Eleven participants, nine team members from the same team and their two leaders were interviewed.

Methods. The analysis was performed according to phenomenography, a research approach that aims to discover variations in peoples’ understanding of a phenomenon.

Results. Seven ways of understanding operating room efficiency were identified: doing one’s best from one’s prerequisites, enjoying work and adjusting it to the situation, interacting group performing parallel tasks, working with minimal resources to produce desired results, fast work with preserved quality, long-term effects for patient care and a relative concept. When talking about the quality and benefits of delivered care, most team members invoked the patient as the central focus. Despite seven ways of understanding efficiency between the team members, they described their team as efficient. The nurses and assistant nurses were involved in the production and discussed working in a timely manner more than the leaders.

Conclusions. The seven ways of understanding operating room efficiency appear to represent both organization-oriented and individual-oriented understanding of that concept in surgical teams. The patient is in focus and efficiency is understood as maintaining quality of care and measuring benefits of care for the patients.

Keywords: leadership, quality management, qualitative methods, general methodology, teamwork, human resources

Introduction

Operating departments are accountable for a large part of hospital costs and production [1]. Therefore, many efforts have been made to maximize cost efficiency and production through increasing operating room efficiency [2]. In many operating settings, surgical teams work with a limited number of diagnoses, specializing in particular types of surgery: this speeds up the work process and makes care safer for patients [2, 3].

‘Lean production’ is one example of how the work process can be made efficient and has been used in health care for improving quality of care with minimum cost and for delivering what patients need at the right time. In lean production, multi-professional teams are built, and decisions about ‘how to work and achieve goals’ are given to these teams. The aim is to reduce all steps that have little or no value for the patients in the care chain. Team members are involved in creating a smooth patient flow, reducing waiting time for patients and improving the quality of care [4–6].

The concept of efficiency has been defined in several different ways [7–10]. Some authors mean that every performance leading to cost reduction without affecting quality is called efficient performance [7]. Others state that the word ‘efficiency'
means, ‘doing right things’. In other words, efficiency consists of the concept of both productivity (doing things the right way) and quality [8, 9]. In economic theory, efficiency is described as a condition in which no productive resources are wasted in the manufacture of a certain product. This is the case when output or a result is produced at a minimum of cost, or the level of output is maximal at a given cost [10].

Different definitions of the concepts of efficiency and productivity in operating departments may lead to confusion among team members, which makes it difficult for them to know their goals and duties. A team becomes efficient when each member has a clear understanding of his or her own responsibility and that of other team members, while seeing the entire work process [11–13]. In order to increase effectiveness in organizations, supervisors have to improve workers’ competence, asking themselves why some workers perform better than others [14]. Furthermore, it is important for supervisors to clarify the concept of operating room efficiency and to create a common understanding among team members [15]. The aim here was to study how organized surgical team members and their leaders understood operating room efficiency.

Methods

Theoretical framework

This study focused on people’s thoughts and experiences, which can best be studied through qualitative research methods. The research approach used in the study was phenomenography, originally developed in an educational research setting but later used to study competence at work [16]. According to phenomenography, any phenomenon is experienced or understood by people in a limited number of ways. Phenomenographers base their research on non-dualist ontology, they see people and the world as internally related and the world as constituted of people experiencing it. In phenomenographic research, in-depth interviews are usually used to discern the variation in how a phenomenon is understood. During the research process, the researcher focuses on the relationship between people and the phenomenon [17–19].

Context of the study

The study was performed in an 1100-bed university hospital in Sweden. The hospital has six operating departments. The central operating department is organized into a number of teams, each working with patients undergoing similar operations. Each team consists of nurse anaesthetists, operating room nurses, assistant nurses, surgeons and anaesthesiologists. The team selected in this study differed from the other teams in that it had specific well-defined goals as described below, and the team was given precondition to plan their work process themselves. The team members (except for the anaesthesiologists, who also took part in other teams) worked only with patients undergoing one defined type of major abdominal surgery. The study participants were involved in how to care for their patients during the entire perioperative period in the best possible way. This way of working fulfilled the criterion for thinking about lean production, as described in the Introduction section [4–6]. There were two patients scheduled per week. The nurses’ work task was extended into the perioperative period and the nurses visited the patients before and after surgery. The team started its work early in the morning and left the hospital only after the case was finished, which could be late in the evening, as operations lasted up to 16 h. The team members had been working together for 1.5–2 years in the same team at the time of the interview.

The study participants

Twelve people, 10 members of the selected team and two leaders, were asked to participate in the study. Of the 12, 11 (five men and six women) accepted; one surgeon declined participation. Thus, two nurse anaesthetists, two operating room nurses, two nurse assistants, one head surgeon, two anaesthesiologists, the nurse manager and the director of the department were interviewed. The participants were between 36 and 62 years old and had from 1.5 to 33 years of work experience at the hospital. They provided written information prior to the study and participation was voluntary and confidential.

Interviews

The first researcher (E.A.) performed interviews, with open-ended questions, at the department during March and April 2008 [15]. Three questions were asked about what ‘work-flow’, ‘obstacles and hassles’ and the word ‘efficiency or being efficient’ meant to the participants. The participants were encouraged to speak freely about their thoughts and experiences, and to give examples from their daily work. The researcher returned to the questions in the interview guide several times during the interview through probing questions. The interviews lasted from 28 to 65 min and each interview was tape recorded and transcribed verbatim.

Analysis

The phenomenographic analysis was in five steps. After reading the transcripts, those parts not pertaining to the topic of interest, efficiency, were removed from the text. Significant descriptions, namely what aspect of efficiency was in focus and how it was described in each interview, were identified. The descriptions from 11 interview texts were compared and similar descriptions were grouped. From these groups, categories representing different aspects of efficiency were created. Finally, the description of each category was re-formulated to express the meaning as clearly as possible [20]. During the entire process of analysis, the researchers returned to the interview transcripts to ensure the meaning was not affected by their pre-understanding.

The first researcher (E.A.) conducted the first two steps of the analysis independently. Then the three researchers performed the remainder of the analysis together: determination
of the categories was a result of a series of discussions between the three authors.

At the end of the analysis, the authors returned to the interviews and decided what characterized each interview. The most conspicuous understanding in each interview was labelled as predominant (Table 1): other ways of understanding efficiency that could be discerned in the interviews were labelled less dominant.

**Ethical considerations**

At the time the study was performed, consent from the ethics committee was not required for this type of study (Swedish Law 2003:460). Formal consent was given from the director of the department prior to the study and the study followed the principles in the Declaration of Helsinki [21].

**Results**

Seven ways of understanding operating room efficiency were identified. Six of the participants demonstrated more than one way of understanding efficiency; one of these was defined as predominant in each interview (Table 1) and quotations from the interviews are presented in Table 2.

The categories identified were the following.

**Category 1: Doing one’s best and doing what must be done to achieve good workflow**

Efficiency is being one-step ahead, working goal-oriented and calmly but quickly, and doing one’s best to achieve good workflow. To see what should be done and do it without being asked meant efficient performance. Efficiency was doing one’s best with the prerequisites available and making things work without performing any unnecessary tasks.

**Category 2: Working with joy, changing one’s work tempo, saving energy by adjusting it to different situations**

Enjoying work leads to efficiency and increased work stamina; therefore, one can work harder. Staff members should use their working capacity in different ways, depending on the demands from the working conditions. Sometimes energy should be saved for later use.

**Category 3: Interacting well together, utilizing team members’ work capacity in the best way, working with the right tasks at the right time**

Team members working with parallel tasks, utilizing the working capacity of the team members in the best possible way, reducing waiting time for each other or the work tasks to be performed. Having the same goal, all members of the team should work with the anaesthetized patient at the same time and in parallel with each other.

**Category 4: Getting the desired results with minimum resources**

Efficiency in teamwork was to obtain desirable results with the minimum of resources. A result-oriented and economic performance was considered an efficient performance and it was important to invest resources in a sensible and correct manner and to achieve the best possible results.

<table>
<thead>
<tr>
<th>Category (work experience)</th>
<th>Doing one’s best from one’s prerequisites</th>
<th>Enjoying work and adjusting energy to the situation</th>
<th>Interacting group performing parallel tasks</th>
<th>Desired results with least resources</th>
<th>Fast work with preserved quality</th>
<th>Long-term effects for patients</th>
<th>A concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse anaesthetist (&lt;10 years)</td>
<td>+ + + +</td>
<td>+ +</td>
<td>+ +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Nurse anaesthetist (&gt;10 years)</td>
<td>+ + + +</td>
<td>+</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Operating room nurse (&gt;10 years)</td>
<td>+ + + +</td>
<td>+</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Operating room nurse (&lt;5 years)</td>
<td>+</td>
<td>+ +</td>
<td>+ +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Assistant nurse anaesthetist (&gt;10 years)</td>
<td>+ +</td>
<td>+</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Operating room nurse assistant (&gt;10 years)</td>
<td>+ + + +</td>
<td>+</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Surgeon (&gt;10 years)</td>
<td>+ +</td>
<td>+</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Anaesthesiologist (&lt;10 years)</td>
<td>+ +</td>
<td>+</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Anaesthesiologist (&gt;10 years)</td>
<td>+ +</td>
<td>+</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Operating room supervisor (&lt;5 years)</td>
<td>+</td>
<td>+ +</td>
<td>+ +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Operating room supervisor (&gt;10 years)</td>
<td>+ +</td>
<td>+</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
</tr>
</tbody>
</table>
Individual efficiency

**Category 1: Doing one's best from one's prerequisites**

... that things work as they should, that things keep ticking over when work is being done, that the work done has the effect it is supposed to... I do my best with the prerequisites I have. (Nurse Anaesthetist 1)

That one does what one can... calmly, quickly, and effectively. Not a series of inconsequential details, but that one does what one must do in the best possible way... one quickly progresses in a purposeful way... that one does one’s best in both the simplest and wiser way. (Operating Room Nurse 2)

**Category 2: Enjoying work and adjusting energy to the situation**

Efficiency is like harmony for me... one stores up one's energies... changes of tempo... to save oneself for the required moment and have capacity left when something else is needed... adapt to the situation... perhaps labour-saving... a little economizing... to keep house is to be efficient for me... I work a lot and I work hard all the time with great joy, that gives me efficiency. (Leader 2)

**Category 3: Interacting group performing parallel tasks**

... that there is no waiting time between different tasks... to avoid dead time so that one never waits for anybody else but instead works in parallel, and that each person's capacity and education and experience is utilized in the best possible way. (Nurse Anaesthetist 2)

Yes, in a perfectly functioning group that makes... the right things at the right time... If one is part of a tight group, one knows exactly what should be done and the group is efficient. Then one has a good flow in the work so that the work is done more efficiently. (Operating Room Nurse 2)

**Category 4: Desired results with least resources**

It is to get the desired result... as quickly as possible and with the least possible effort... with the least possible effect... good results quickly... not only quickly but also is just the right period of time... That one must invest one's money and one's staff in a sensible way to achieve the best possible result... (Anaesthesiologist 1)

**Category 5: Fast work with preserved quality**

That one does relevant and correct things in the least possible time... that must be valuable... (it isn’t okay to be as efficient as anything because then the quality goes down)... efficiency is to work as quickly as possible while maintaining the quality. (Operating Room Nurse)

**Category 6: Long-term effects for the patients**

Efficiency is related to the patient. That is, it is about whether we do something useful for the patient or not... What I really mean is to use the word efficiency for patient well-being... if this prosthetic has really solved the patient's problem, if the patient is no longer in pain... (Leader 1)

**The concept of efficiency**

**Category 7: A concept**

... efficiency for one person is completely different from that for another. A resident doctor can’t be as time or resource efficient as an experienced anaesthetist, but he can be efficient in his way... efficiency must be related to time, to resources and to the individual... it’s about educating, informing, creating a routine. What is a good team? That one creates a good working environment that is the prerequisite. (Anaesthesiologist 2)

**Category 5: Working with preserved quality of care as fast as possible**

Any performance should be achieved with high quality and significant and meaningful tasks should be undertaken correctly and as quickly as possible while maintaining the quality of care. Efficiency was to get results with given resources and preserved quality of care.

**Category 6: Achieving desired long-term effects for the patients**

The benefits of given care determined how efficient the efforts of the care received by patients was. In health-care systems, many resources are invested in care and treatment of the patients. The quality of care was constantly improving, and long-term quality control was a measure of efficiency.

**Category 7: Efficiency is a relative concept that should be related to an individual's background and experience and to the resources of a working group**

The concept of efficiency should be related to time, resources or a person's experience. A novice was unlikely to be as efficient as an experienced colleague; however, he/she may nevertheless be as efficient. For a group of people, it is...
important to have resources, education, information, a good working environment and daily routine to become efficient.

Discussion

The seven ways of understanding operating room efficiency appeared to represent both individual-oriented and organization-oriented understanding. Categories 1, 2 and 3 represent individual-oriented understanding such as knowing what to do and doing one’s best, enjoying work and cooperating with other team members in performing the right tasks. Categories 4, 5 and 6 described a more complex and organization-oriented aspect of quality of care for the patient, which represents some of the foundation principles in lean production. However, the team participating in this study had not consciously chosen to work according to lean production. To improve their teamwork and quality of care, the study participants aimed to develop new methods actively and systematically, evaluating the old ones and focusing on patients’ needs. During the interviews, the participants described their work process in terms of lean production.

According to those who have tried to use lean thinking in health care, it is important to separate and manage a single so-called ‘value stream’ at a time, in order to increase the overall efficiency in the entire work process [22]. A value stream can be a group of patients whose care process is similar, e.g. patients with the same diagnosis [22]. One important step in this direction is to standardize the work and calculate the time consumption for each step in the entire process [23]. Another step towards lean thinking is to give every worker responsibility for improving the production process where it does not fulfil the requirements of the set goal, perfection. This is a continuous task for improving quality and should progress the whole time [23]. Creating organized surgical teams who strive to improve the quality of care appears to change the focus from the staff to the patient. In lean production, special attention is paid to the consumer, which is the patient in health care. Perfection cannot be attained without knowing what the patients’ needs are or what is important to them. Everything other than what is valuable for the patients is considered a waste [4, 5, 23]. Although every patient is unique and may require unique care, it is important to standardize the work process when working with patients undergoing major surgery. As there are many steps to consider, this process is difficult and complex but was essential for the team under study, and the members worked actively in that direction.

A study performed in an operating department without organized surgical teams [15] highlighted that the leadership, the anaesthesiologists and surgeons with increased responsibilities for production, understood efficiency as producing per time unit or completing an assignment, whereas the staff members understood efficiency in terms of having the right qualifications and knowing what to do (Table 3). The patient and quality of care were barely mentioned during the interviews [15]. This study suggested that the leadership, who understood there are variations in understanding efficiency, have prerequisites for developing the same platform for their staff, leading them towards the same goal by defining the concept of efficiency.

The present study indicated that working in a team, and for example according to lean thinking, despite different ways of understanding efficiency, may put organization-oriented understanding of efficiency in focus rather than an individual’s own efficiency.

Understanding more than one aspect of one’s work leads to increased possibility of action in real life when facing problems, which in turn helps develop greater competence [24]. Competence does not develop solely from knowledge and skills, but reflections about one’s work and understanding it is important in becoming competent in a profession [25, 26]. Thus, lean thinking and competence development should be a part of the training programme and daily work.

The study has some limitations. Two authors (E.A. and J.L.) had earlier worked with some of the participants in the study and a knowledge of the environment helped the researcher better understand the interviewee’s descriptions; however, it might have affected the interpretations of the results. This was minimized by the other author (L.G.), who worked in a different environment.

The goal was to study the variation in understanding operating room efficiency among members of an organized surgical team, who in their daily work had come close to lean production. The team fulfilled the demands for teamwork and not just ‘task work’, which means the knowledge and the skills for each member’s professional competence are used in more than one specific team [27].

In a phenomenographic study, the number of interviews must ensure sufficient variation in ways of seeing the phenomenon, but should also avoid an unmanageably large number of interviews: ‘Two people would be too few and two hundred would be too many’ [28]. Between 20 and 30 interviews is ideal and 10–15 is a minimum [29], but an interesting pattern of understanding can usually be discerned as early as 5–10 interviews [13–15, 30]. In this study, the selected team had 10 members who worked with an unusually narrow focus on one distinct patient group: 11 people were interviewed; this was less than ideal, but was sufficient to allow a variation to be discerned. However, to understand more about efficiency, it would be more viable to perform studies with more participants and with teams in different settings [31–33].

The lack of studies of this kind rendered it difficult to compare the results with those of others. Nevertheless, it was important to understand efficiency from both team members’ and their leaders’ point of view and to implement the concept of ‘how to be efficient’ in daily routine among staff members, as is the case with lean production.

Conclusion

Despite different ways of understanding efficiency, surgical teams involved in organizing patient care may also have an organization-oriented understanding of efficiency in focus and not only the individual’s own efficiency. The patient was
Table 3 A comparison between a team (actual study) and a non-team (previous study) organization in how operating room efficiency is understood by different members of staff and their leaders

<table>
<thead>
<tr>
<th>Team organization</th>
<th>Non-team organization*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: The staff doing their best and doing what they have to do to achieve good workflow</td>
<td>A: The staff having the right qualifications, knowing what to do, and being able to prevent problems</td>
</tr>
<tr>
<td>2: Working with joy, changing one’s work tempo, saving energy and adjusting it to different situations is the basis of an efficient workday full of harmony</td>
<td>B: Staff enjoying work by seeing the meaning within it</td>
</tr>
<tr>
<td>3: Team members interacting well together utilizing the members’ work ability/capacity in the best way, working with the right tasks at the right time</td>
<td>C: Planning and having good control and overview, creating smooth patient flow</td>
</tr>
<tr>
<td>4: Getting desirable results with the least resources</td>
<td>D: Each professional performing the correct task</td>
</tr>
<tr>
<td>5: Working with preserved quality of care as quickly as possible</td>
<td>E: Completing a work assignment within the given time frame</td>
</tr>
<tr>
<td>6: Achieving long-term benefits for the patients</td>
<td>F: Producing as much as possible per time unit</td>
</tr>
<tr>
<td>7: Efficiency is a concept that should be related to an individual’s prerequisites and experience and a group’s resources</td>
<td></td>
</tr>
</tbody>
</table>

*Previous study [15].

in focus and efficiency was understood as maintaining quality of care and measuring benefits of care for the patients.

However, there is a need to know more about team organization and the members’ perception of the concept of efficiency. Another important step is to involve the patients undergoing major surgery both with the team and in their own care, in order to discuss their needs and benefits of care.

Acknowledgements

The authors thank all the nurse anaesthetists, operating room nurses, nurse assistants, anaesthesiologists, surgeons and leaders who participated in this study.

Funding

This study was supported by Swedish County Council in Uppsala County, the Surgery Division at Uppsala University Hospital, Uppsala, Sweden and grants (Sädd-ALF) from Uppsala University Hospital, Uppsala, Sweden.

References


