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Multidisciplinary teamwork is an important issue to healthcare professionals

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Abstract

Purpose – The aim of this paper is to describe the factors that contribute to understanding how collaboration improves performance in operating rooms (ORs) after introducing the concept of cross-functional OR scheduling teams.

Design/methodology/approach – The concept was investigated at Radboud University Nijmegen Medical Center (RUNMC) in The Netherlands and used on an innovative path based on socio-technical systems (STS) principles designed to address non-routine tasks, variety, interferences and errors related to OR scheduling, with the aim of increasing both staff productivity and patient safety. The effects of implementing preoperative cross-functional teams in the OR were compared qualitatively. The researcher observed all of the team meetings, available data and documentation, and 13 semi-structured interviews were performed with team members for collecting additional data.

Findings – In the literature, it was found that the theory of socio-technical systems and the fields of group dynamics and self-managing teams fit the OR setting. The author applied six elements of these theories (setting common goals, cohesion, openness, single-loop and double-loop learning, feedback, and control options) to the aspects found in the study. The qualitative findings revealed that high-performing teams were able to identify bottlenecks in order to improve continuity of care. The cross-functional teams used several performance indicators to gain insight into their own performance. Consequently, through collaboration, these teams were able to minimise interference and therefore learn. Cross-functional teams learned how to address interferences and improve their quality of service through improved collaboration and the improved use of control mechanisms.

Practical implications – This research highlights the importance of team-based approaches and the need to improve collaboration between healthcare professionals.

Originality/value – The paper confirms the value of implementing the socio-technical systems theory to improve collaboration between healthcare professionals. This case study is a valuable contribution, as it focuses on team-based organisation in preparing an OR schedule.

Keywords Collaboration, Healthcare professionals, Socio-technical systems theory, Medical facilities, The Netherlands, Team working, Team performance, Operating theatres

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Introduction

Modern hospitals are confronted with increased uncertainty and variety with respect to organisation and efficiency. Hospitals are internally complex, as they traditionally are functionally specialised with respect to their organisational structure, and many hospitals should redesign their organisation in order to create a more viable structure (Sitter *et al.*, 1997; Achterbergh and Vriens, 2009). Healthcare is an important social issue, and stakeholders (for example, patients, governments, and insurers) have expectations of latency, throughput, and safety. Therefore, multidisciplinary teamwork is essential for healthcare professionals to improve efficiency and avoid causing unnecessary harm to the patient. However, the principles of socio-technical systems (STS) have not been applied previously to operating room (OR) scheduling in the preoperative phase at this hospital. Furthermore, operating rooms are expensive to the hospital, and capacity should be utilised as much as possible in response to increasing societal demands and rapidly escalating costs. Most of the increase in cost is due to increased health-care consumption (Kuenen, 2011).

In addition, hospitals continuously search for opportunities to improve both productivity and patient safety. For example, Sorbero *et al.* (2008) found empirical evidence supporting the relationship between teamwork and patient outcome. Patient quality is the perceived result of the integrated combination of the cure and care processes rather than the sum of the various parts provided by various specialists (Glouberman and Mintzberg, 2001a).

Teamwork is not a concern for the healthcare field alone. Many industries have recognised the critical role that teamwork plays in effective operation, particularly industries that deal with high-risk, critical safety environments and tasks such as aviation, military operations, and power generation (Kozlowski and Ilgen, 2006). Moreover, in industries such as automotive manufacturing, the value of creating high-performance teams has long been recognised (Cohen and Bailey, 1997; Salas *et al.*, 2008).

In this study, we addressed the complex collaboration between physicians at RUNMC in The Netherlands by studying physicians' deeply embedded professional differences and how these differences influence the performance in ORs after the ORs were reorganised in 2004. Qualitative research was performed by investigating two OR teams that perform well and two OR teams that performed less well (based on their net utilisation). Because performance with respect to OR scheduling in the preoperative phase is determined by self-managing teams and group dynamics, this study combined the characteristics of these two areas. Our research question was as follows:

RQ1. What elements are important for creating cross-functional teams (CFTs) that can efficiently prepare OR schedules in the preoperative phase?

This paper is organised as follows. The next section describes the baseline situation and provides background information regarding how RUNMC performed before the organisational redesign. The theoretical framework based on the concepts of self-managing teams and group dynamics is also presented (Figure 1). Next, the methodology used to perform the qualitative research is described. Thereafter, the results are presented and discussed. The paper concludes by highlighting some important research gaps that can be addressed in future studies.

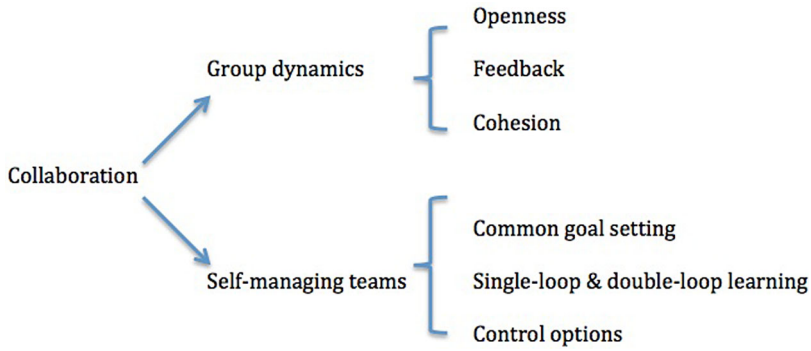

Figure 1.
Theoretical model with operationalisation of core concept of collaboration

The baseline

Before the operating rooms at RUNMC were reorganised in 2004, a designated surgeon in the assigned medical profession prepared the OR schedule. This schedule was then sent to the anaesthesiologist the day before surgery for approval. Adjustments to the schedule were often required due to missing data, a change in the surgeon's plans, increased surgery time, and last-minute cancellations. To meet the patient's needs with respect to the date and time of surgery, patient focus needed to be improved by the healthcare staff.

The redesign was entitled "cross-functional OR scheduling team", meaning that specialised teams were created for each surgical profession, and these teams would then work together as a department (e.g. the orthopaedics department, cardiothoracic surgery department, etc.) and use the OR facilities. The newly created teams became responsible for the planning, outcome and organisation of the specific OR facilities and their patients. The underlying goal of forming multidisciplinary teams is to break the silo organisation (a silo is a tall, narrow structure, indicating that the organisation was too vertical (hierarchical) organisation) and focus on self-interest. This approach creates reliable planning, better utilisation of resources, balanced workload, and good preparation. The purpose of this collaborative approach is to improve group-based planning and therefore improve utilisation. Improving the reliability of planning will also lead to higher patient satisfaction.

The cross-functional teams consist of an anaesthesiologist, a surgeon, a scheduler, an OR nurse, an anaesthesia nurse, a recovery room nurse, and a nurse from the specific ward. The anaesthesiologist chairs the team meetings (Bitter *et al.*, 2012). This team composes the OR schedule for the following week and evaluates OR performance from the previous week. The cross-functional team members inform their colleagues of specific preparations for the surgery of that day, and they are involved in the preparation and continuity of the OR program for the following week.

The theoretical argument

The socio-technical systems theory

A cross-functional team?based organisation was introduced in the operating room (OR) to increase both staff productivity and patient safety. Hospital ORs are high-cost/high-revenue environments, and the facilities are equipped specifically for performing surgical procedures. In this era of rising costs and declining

reimbursements, optimising the effectiveness of the operating room suite and maximising throughput (Krupka and Sandberg, 2006) are essential. Because this facility is usually a hospital's highest cost and revenue centre (Macario *et al.*, 1995), it has a major impact on the performance of the hospital as a whole. However, managing an operating room is challenging due to conflicting priorities and preferences among its stakeholders (Glouberman and Mintzberg, 2001a, b), as well as the scarcity of costly resources. Moreover, healthcare managers must anticipate the increasing demand for surgical services by our ageing population (Etzioni *et al.*, 2003). These factors clearly emphasise the need for improved efficiency and the need to adequately plan and schedule procedures.

OR efficiency is defined functionally in terms of the total time the patients are present in the OR divided by the total amount of allocated OR time per eight-hour day (8:00 through 16:00), multiplied by 100. This definition excludes turnover time and over-utilisation of OR time, and OR efficiency is an important factor in determining OR productivity. (Bitter *et al.*, 2012; Strum *et al.*, 1999; Dexter *et al.*, 2001; Dexter and Traub, 2002). In other words, OR efficiency can be used to compare what is actually produced or performed with what can ideally be achieved using the same resources (e.g. money, time, labour, etc.). RUNMC followed an innovation path that was based on principles of socio-technical systems (STS) and designed to address non-routine variety, interference, and errors in order to improve productivity and the quality of working life.

The roots of the developing theories regarding cross-functional teams can be found in the STS theory. The STS approach is designed to harness the personal and technical aspects of organisational structures and processes in order to achieve joint optimisation, with a focused emphasis on achieving excellence in terms of both technical performance and the quality of people's work. The overall goal is to continuously improve performance by setting goals, monitoring and analysing their progress, and identifying and solving problems on a regular basis (Sitter *et al.*, 1997; Cherns, 1976; Achterbergh and Vriens, 2009).

The starting point in this approach is to recognise that organisations must cope with increasing uncertainty and variety. The internal complexity of a hospital's organisational architecture stems from traditional functional specialisation, which amplifies external complexity and can serve as a source of interference, errors, variance, and accidents. These factors can be difficult to address due to a lack of effective collaboration between autonomous individual professionals. Redesigning the organisation can often revitalise the organisation, and decreasing organisational complexity by reducing functional concentration and increasing local control will create optimal conditions for cross-functional teamwork (Sitter *et al.*, 1997; Achterbergh and Vriens, 2009; Bitter *et al.*, 2012).

OR-based cross-functional teams (CFTs) with high self-organisation capabilities and feasible mandates can cope with variety, interference, and errors more effectively. Integrating tasks using a cross-functional team?based approach will reduce sources of interference (for example, X-ray equipment being unavailable or scheduling changes that are inadequately discussed among the staff). Furthermore, fully mandated cross-functional teams are equipped to regulate interference and errors, and can learn to improve planning under adverse circumstances such as scarce resources and high variability. The CFT approach has led to an organisational learning effect (Bitter *et al.*, 2012).

The main goal of this OR redesign was to reduce organisational complexity and the risk of interference by lowering the number of patient transfer points by decreasing functional concentration and increasing local control capabilities. This redesign was necessary in order to create the optimal conditions for collaboration and cross-functional teamwork. Improving collaboration between healthcare professionals and applying STS design principles were expected to improve the quality of working life as well as significantly increase organisational productivity and patient safety. Integrating tasks into a cross-functional team?based organisation can reduce the number of the interference sources. Furthermore, cross-functional OR scheduling teams can cope with local interference and errors and can improve the allocation of scarce resources (Sitter *et al.*, 1997; Achterbergh and Vriens, 2009). As a result, interference sensibility can be decreased. Interference sensibility is the sum of human errors, patient variation, conflicts of interest among participants, lack of resources, and variations in of procedure times. According to interference sensibility, if interference cannot be controlled at the source, it will escalate and ultimately affect performance.

Nevertheless, collaboration between OR professionals does not come naturally in The Netherlands (Klopper-Kes *et al.*, 2011). Establishing effective collaboration between professionals is dependent on attitude, culture, and structure. Therefore, RUNMC opted to change the pre-existing structure, culture, and attitude of its OR and staff (Bitter *et al.*, 2012).

Most hospitals lack the ability to measure whether or not they provide safe patient care. One of the common sources of interference and errors is poor communication between physicians and nurses, who typically interact with each other but not between groups. Similar to the care pathways described by Pronovost *et al.* (2006), the goal of redesign intervention is to improve culture and help physicians and nurses learn from their mistakes. In this approach, the principles of highly reliable organisations are applied, with particular attention paid to institutional variables, team variables, and task variables. After the redesign, the hospitals can then reduce unnecessary complexity and variation by standardising the delivery of care and protocols.

In this process, organisational complexity should be reduced by decreasing functional concentration and increasing local control capabilities in order to create the optimum conditions for collaboration and cross-functional teamwork. The intensive collaboration provided by cross-functional teams accelerates the development of routines, thereby reducing interference and facilitating the team's ability to cope with interference when it arises.

Autonomy and teamwork

The ultimate goal of working together is to establish an effective collaboration (Shortell *et al.*, 2004; Smalarz, 2006). Autonomy is both an individual and team concept; some researchers stress that teamwork involves a low level of individual autonomy (Wellins *et al.*, 1990), whereas others do not rule out the contribution of individual autonomy to effective teamwork (Cohen and Ledford, 1994). This attempt to achieve both individual autonomy and a cohesive team can result in tension within a team, creating a paradox (Manz, 1993) that can only be resolved by reaching a suitable balance. If team cohesiveness is relatively high, effective collaboration within the team can be maintained, which is essential for effective teamwork (Langfred, 2000).

Physicians claim and obtain autonomy in designing and executing their work based on their expert authority. However, managers do not necessarily have authority over

physicians due to different levels of education. Therefore, it is essential for both physicians and managers to think and act collectively in order to ensure collaboration and achieve organisational improvements. Effective collaboration enables the hospital to deliver services that are both high in quality and cost-effective (Shortell *et al.*, 2004; Smalarz, 2006).

Single-loop and double-loop learning

Argyris (1976) distinguishes between single-loop and double-loop learning. Single-loop learning focuses on solving increasingly unilateral changes and the problems that result from those changes. Double-loop learning is closer to the cause of the problem and is based on feedback received with respect to a prior action. Therefore, according to Argyris (1976), gaining insight into the cause of a problem and finding an effective means to solve that problem are necessary.

The result of combining unilateral professional orientation and far-reaching specialisation is that long-term employee knowledge is only applicable to a limited field of work. As a result, one might (unintentionally) risk creating a specialisation trap. Thus, although the work is initially more secure, a specialisation trap occurs when the professional sees only his own task, and problems are therefore not connected to other tasks to solve them. The employees will be increasingly "condemned" to their own specific expertise and will develop a routine way of working while always dealing with the same category of questions. Because of routine, this quickly becomes a known method, and solutions fail, leading to a "creativity trap" (van Delden, 1991). Reflection skills are not necessary in this trap and therefore become lost. Without reflection, the learning cycle is not complete, and the CFT will not improve. Self-reflection, self-criticism, and open-mindedness are all neglected, and skills are underdeveloped (van Delden, 1991; van Amelsvoort, 2007). The specialisation trap reduces the employee's/ professional's ability to feel responsible for the entire process. Consequently, the feeling of being part of a social partnership is less pronounced, and the effects and benefits of direct action are not seen or felt. Professionals then find the relationship with their immediate colleagues difficult, and their involvement within the organisation can be troublesome. A professional has successfully established certain professional routines that are continuously improved through single-loop learning. However, with establishing non-routine double-loop learning, these routines are removed and professionals are questioned. When these improvements continue to occur, the learning circle is complete (van Amelsvoort, 2007).

Job demands and job control

In cross-functional OR scheduling teams, job control arises through the development of routines, and this allows employees to deal with interferences. Single-loop and double-loop learning, constructive feedback (Argyris, 1976), and trust in each other's qualities (Jones and George, 1998) are all important aspects of these routines.

Cross-functional OR scheduling teams are characterised by the fact that their responsibilities are positioned low in the organisation. It is therefore important that they are able to deal with interferences. The Job Demand-Control model of Karasek (1979) demonstrates why this is so important. This model is based on the psychological demands of the job and the ability of professionals to reflect upon their own work. According to the model, negative and positive health outcomes can be predicted by these two characteristics. Psychological job demands are stressors that are present in working environments that include high pressure, high work pace, and physically

and/or mentally demanding work. Management opportunities are closely linked to the worker's ability to oversee his/her duties and behaviour. A positive outcome (e.g. motivation and active learning behaviour) occurs when the psychological job demands and self-reflecting options are high. According to the model, the most negative health outcome occurs when the psychological job demands are high and when social support and self-reflection options are low.

The members of a CFT must work closely together in order to create an optimal OR schedule. Therefore, it is extremely important to sustain team effectiveness in order to minimise interference and achieve high OR performance. With effective collaboration, the members of the CFTs can achieve common objectives.

Mathieu *et al.* (2008) provides a number of characteristics of team effectiveness. In their review spanning a decade of research regarding communication and cohesion within teams, they identified several key points. These key points have a positive effect on the result reached by Mathieu *et al.* Improvements in the team process can be achieved when employees ask for feedback, discuss errors, and try new methods with the aim of making adjustments and improvements.

Single-loop learning is the only operational adjustment that does not question norms and values. In double-loop learning, the change in norms and values is central to the operational processes in order to continuously improve these processes (Argyris, 1976; Achterbergh and Vriens, 2009). Moreover, interpersonal processes between team members have a large impact on the effectiveness of the entire team (Jehn *et al.*, 1999; De Dreu and Weingart, 2003).

On the whole, research has demonstrated that constructive feedback has positive effects on the motivation of team members, interpersonal trust (Jones and George, 1998), and ultimately the performance of the team. Furthermore, mutual trust and openness within the team are essential, and a collective belief in success has a positive influence on efficiency. Team climate has been shown to affect the attitude and behaviour of the team members, and a feeling of safety within the team can have a large impact on team effectiveness (Ilgen *et al.*, 2005; Mathieu *et al.*, 2008; Edmonson, 1999).

In focusing on the healthcare system, Glouberman and Mintzberg (2001a, b) identified four quadrants in the healthcare industry: care, cure, control, and community. These four quadrants demonstrate that there are boundaries that limit communication and collaboration between licensed professions and alternative-care providers. In their research, Glouberman and Mintzberg (2001a, b) found that those kinds of hospitals end up in four entirely separate organisations, as each part structures itself in an independent way. Setting different goals makes collaborating difficult because of the delicate balance between private and public interests.

One of the most striking challenging in managing a hospital arises when the members of the board attempt to reconcile the goals of the physicians and managers. On one hand, a physician's primary goal is to treat individual patients in the best possible way. On the other hand, the manager's primary goal of is to provide continuity for the entire organisation and to deliver high-quality, cost-effective healthcare services to the population. These differences in perspective are a clear source of potential conflict. For a hospital to be manageable, the professional autonomy and organisational position of its physicians are key factors (Kaissi, 2005; Edwards, 2003; Davies *et al.*, 2003).

Establishing group goals and receiving feedback are inextricably linked in their ability to affect performance (Locke and Latham, 2002). For example, receiving timely

feedback can improve performance and efficiency and result in the establishment of more challenging goals (Stansfield and Longenecker, 2006).

In hospitals, collaboration between professionals is not self-evident (Kaissi, 2005; Edwards, 2003; Davies *et al.*, 2003). A variety of theories describe common goal setting, control options, cohesion, openness, single-loop and double-loop learning, and feedback as essential variables for improving collaboration. These variables are the starting point for this research. One of the main causes of the redesign was that patient's surgeries were often cancelled at the last minute. Better planning will lead to strong collective results rather than sub-optimisation and will shift the focus of the team to the patients. Instead of the professional's agenda taking priority, the patient's needs are at the centre following the redesign. Improving the scheduling of patients in the OR is based more on control of the work and continuously improving through learning. Therefore, these theoretical foundations and variables were chosen (Figure 1).

Methodology

The primary goal of this research is to improve OR performance, and the level of improvement is determined by the level of collaboration (Santa *et al.*, 2010; Delarue *et al.*, 2008). Here, we performed a qualitative case study to investigate a contemporary phenomenon in a real-life context. In a real-life context, the boundaries between phenomenon and context are not clearly evident, and multiple sources of evidence are used (Verschuren, 2003). From a holistic point-of-view, the researcher – whose goal is to avoid tunnel vision – uses data triangulation. Data triangulation uses various sources of information in order to increase the validity of the study (Thurmond, 2001). Here, we used participant observation and qualitative content analysis of written and audio-visual documents.

Qualitative research was performed for four cross-functional teams. The Orthopaedics Department and the Oral-Maxillofacial Department were studied because of their consistently high performance over the seven consecutive years that were measured. We also studied two lesser-performing cross-functional teams (the Cardiothoracic Surgery Department and the General Surgery Department), based on their net utilisation performance over the same seven–year period. The goal of the study was to examine how team-based collaboration impacts team effectiveness in a Dutch University Medical Centre by studying the effect of implementing preoperative cross-functional teams in the OR.

Using published findings from the literature, the crucial variables were common goal setting (Locke and Latham, 2002), control options (Karasek, 1979), cohesion (Zaccaro and Lowe, 1988), openness (Hobman *et al.*, 2004), single-loop and double-loop learning (Argyris, 1976; Achterbergh and Vriens, 2009), and feedback (Argyris, 1976; Achterbergh and Vriens, 2009; Stansfield and Longenecker, 2006). Thirteen in-depth, semi-structured interviews were conducted with members of the RUNMC cross-functional OR scheduling teams. The key questions were pre-established, and the interview was also conversational, with questions following from previous responses whenever possible. We specifically selected these specialties because of their better or worse performance with respect to net utilisation of the OR facilities during the seven consecutive years. In each team, the respondents consisted of an anaesthesiologist, a surgeon, a scheduler, an OR nurse, an anaesthesia nurse, and a recovery room nurse; in addition, a nurse from the specific ward was included for the Oral-Maxillofacial Department. The interviews were recorded with the consent of the

interviewees. Coding techniques and procedures for developing Grounded Theory were performed for data processing and reduction of raw data. The Grounded Theory approach is a systematic methodology used the social sciences for the discovery of theory through the analysis of data. This theory is used primarily in qualitative research studies (Strauss and Corbin, 1998; Boyatzis, 1998).

The data were analyses in the following three steps: open coding, axial coding, and selective coding. Strauss and Corbin (1998, p. 61) described open coding as "breaking down, examining, comparing, conceptualisation and categorising" data. The starting point in this phase is the research material. Codes are a summary format for a piece of text, in which the meaning of the fragment is expressed, is highlighted and given a summary name under which it is stored. Axial coding refers to "a set of procedures whereby data are put back together in new ways after open coding, by making connections between categories" (Strauss and Corbin, 1998, p. 96). The first aim of axial coding is to identify the major and minor elements of the study. The second aim is to reduce the size of the data and the number of codes. Axial coding is used to organise the codes obtained from the first stage. Axial coding reduces the number of concepts and relates the concepts hierarchically. In selective coding, the goal is "selecting the core category, systematically relating it to other categories, and filling in categories that need further top refinement and development" (Strauss and Corbin, 1998, p. 116). After unravelling the data, the researcher combines and structures the data. In the selective coding phase, the emphasis is on integrating the data and linking the categories.

The authors of this paper analysed and interpreted the data after assigning the key concepts of the study into dimension groups. For each dimension, the results of the study documentation, the respondents' answers, and the observations obtained from the consultation were compared, resulting in a description of the actual state of collaboration (Strauss and Corbin, 1998).

Collaboration was investigated as an independent variable and was operationalised in variables such as single-loop and double-loop learning and feedback (Argyris, 1976; Achterbergh and Vriens, 2009), openness, common goal setting and cohesion (Mathieu *et al.*, 2008; Zaccaro *et al.*, 1988), and control options (Karasek, 1979). We chose this method in order to explore the qualitative nuances in these relationships, as these relationships could not be analysed using quantitative research methods. We questioned our respondents regarding the way the members of the cross-functional team perform with respect to collaboration, as well as how collaboration positively influences the way in which they perceive the relationship between collaboration and OR performance.

Results

The important foundations of a CFT are to establish common goals, achieve job control (mandate), and apply single-loop and double-loop learning. These three variables differed between the well-performing CFTs and the CFTs that performed less well. The other three variables (openness, cohesion, and feedback) differed to a lesser extent than the first three variables. In the well-performing teams, openness (the atmosphere and collaboration) was rarely the subject of discussion, even though this topic should be discussed regularly (Hobman, 2004). The well-performing teams showed cohesion, but conflicts arose when the team members were unable to reach a consensus regarding an issue. In this regard, relationships between the team members are critical (Beal *et al.*, 2003). Most conflicts arise when one or more team member is not properly informed.

Although feedback was given in the well-performing teams, it was not always given directly to the person involved. Retrospective feedback was aimed at the process rather than the person. Nevertheless, receiving timely feedback can lead to improved performance, higher efficiency, and establishing more challenging goals (Stansfield and Longenecker, 2006).

After analysing the interviews, documents, and observations, a distinction was made between the well-performing CFTs and the teams that performed less well. This distinction was based on the presence of a learning curve during seven consecutive years and the maximum net OR utilisation. Data were collected from January 1, 2005 through December 31, 2011. All data were registered electronically in the Hospital Information System by the OR nursing staff and validated by the surgeon and anaesthesiologist in charge. Table I summarises the outcomes of the semi-structured interviews, documentation, and observations.

Independent variable	Well-performing cross-functional teams	Lesser-performing cross-functional teams
Common goal setting	Patient is central rather than self-interest Clear focus on common result	Different policy principles Different insight and understanding of work organisation
Cohesion	A strong sense of shared responsibility Participants demonstrate understanding of each position Collaboration is organised in a healthcare chain	Tension between the participants because of their own interests Participants do not always show up for meetings Professional puts pressure on proposed OR schedule Collaboration in silos
Openness	The atmosphere and collaboration are not often the subject of discussion	Limited policy dialogue underlying insights The true discussion is regularly evaded
Single-loop learning	Weekly evaluation provides improvements Planning horizon for two weeks is introduced	Insufficient uniformity for performance indicators (i.e. definition of turnover time) Planning not prepared well Many last-minute repairs necessary regarding OR schedule
Double-loop learning	Thinking is multidisciplinary Policy meetings quarterly Continuous learning Doubt regarding norms and values	Thinking in links No policy meetings Learning cycle is not complete
Feedback	Direct feedback during meetings and evaluations Retrospective feedback is aimed at the process, not to the person involved	Little or no insight on performance Little or no feedback (appreciation) Learning cycle is not complete
Internal control options	Tension between the financial incentive to maximize utilisation versus the workload for staff	No direct consequences for participants involved Little guidance on planning deviation
External control options	External control options are present but constrained by budgets and patient flow	Insufficient cross-examination collaboration

Table I.
Outcome of analysed interviews, documentation and observations

The interviews yielded the following results for the six variables:

(1) *Common goal setting:* A shared goal allows employees to focus more on the overall results. If a difference in opinion arises between employees due to self-interest, patient focus can be disrupted. Therefore, understanding each other's role is important in order to foster mutual respect during the decision-making process.

(2) *Cohesion:* The well-performing teams arranged suitable replacements in the event of an absence. For example, replacing a permanent team member during a holiday can give rise to conflict if the replacement is not properly informed of the established procedures. Each team member has respect for other members' opinions, and they usually view a topic from a distance before reacting. Issues must be taken seriously, but cohesion can be lost if no suitable solution or consensus can be reached. The lost of cohesion is less present in non-controllable factors surrounding the planning.

(3) *Openness:* In the teams that perform less well, the true discussion was regularly avoided, and improvements took longer and did not always create the desired efficiency. Interviewees indicated that openness to discuss the issues and openness with each other are necessary in order to create a pleasant and safe atmosphere. In the well-performing teams, atmosphere and collaboration were not often the subject of discussion.

(4) *Single-loop and double-loop learning:* One of the differences in performance between the two sets of teams was the presence of double-loop learning. In single-loop learning, the CFT members modify their actions according to the difference between expected and obtained outcomes. In double-loop learning, the members of the CFT question the values, assumptions, and policies that led to the actions in the first place; if they are able to view and modify their actions, double-loop learning has taken place, and the transformation from input to output will be improved.

(5) *Feedback:* Interviewees indicated that feedback is neutral and always coloured by the person who gives the feedback (his/her norms, values, and self-image) and by the relationship between the giver and receiver of the feedback. The more personal the relationship, the greater the likelihood that the feedback receiver will accept the feedback. On the other hand, if the feedback giver has given valuable hurtful feedback, this will likely lead to either an improvement or worsening of the relationship between the two parties.

(6) *Control options:* A CFT with control options (mandate) can handle interferences and solve problems more easily. Because the CFT is positioned low within the organisation (near the workplace), they have access to insights into making improvements. A CFT can arrange their work schedule and their responsibilities for themselves, but they are constrained by budgetary limits and patient flow. With the CFT, decisions are made in order to ensure quality patient care, both internally and externally. Within the CFT, information is processed independently by the members in order to reach good decisions. The CFT has also external control options, such as the ability to temporarily increase OR capacity.

Discussion

The goal of cross-functional OR scheduling teams is to ensure that the scheduled patients receive the surgery according to the weekly schedule after it is established. Collaboration can reveal conflicting interests, and working together can be complicated by personal communication barriers. By creating a cross-functional OR scheduling team, the interests of the team can become apparent much more quickly. However, collaboration between professionals is not always guaranteed. The organisation of the team meetings with respect to the attitude and behaviour of the team members are key factors for achieving success. Standardisation and establishing protocols can help the team prepare the OR schedule.

In the literature, we found that the fields of groups dynamics and self-managing teams fit the OR setting. We applied six elements of the fields of group dynamics and self-managing teams to the aspects found in our study. This led to the following recommendations, which can facilitate effective collaboration in order to help CFTs efficiently prepare the OR schedule in the preoperative phase:

- Address common goals for a collective focus towards reaching a common result.
- Arrange control options (mandate) for decision-making at the lowest possible level as close as possible to where the outcome is realised.
- Single-loop and double-loop learning: provide a weekly evaluation of the work (single-loop learning) and periodically question the norms and values and improve as needed (double-loop learning).
- Create an environment of openness and cohesion in which people can hold each other accountable regularly, and in which everyone can contribute something in a safe and receptive environment.
- Create a safe environment in which feedback between the CFT members is constructive and neutral. Timing of this feedback is also important.

Although the results presented in Table I are self-explanatory, one of the main reasons underlying the differences in OR performance is the extent to which scheduling uncertainty and reliability are reduced. These factors are relevant for collaboration. The research revealed that the key differences between well-performing teams and less well-performing teams are common goal setting and single-loop and double-loop learning, which are essential for continuous improvement. In particular, double-loop learning and control mandates were important in the higher-performing teams, which were able to accommodate multidisciplinary professions and therefore improved continuously during the study period. Cohesion, openness and feedback are indirectly essential to improving performance. The less well- performing teams did not hold their members accountable for their actions, and the learning circle was not complete. Showing understanding of each other's role was also lacking.

The team members' self-interest regularly took precedence over the public's interest in the less well-performing cross-functional teams. When this happens, the team's chairperson must intervene to prevent this undesirable behaviour, and the participants themselves must be critical of one another and give constructive feedback.

The cross-functional teams act primarily as well-informed, professional organisations, although frustrations remain and must be addressed. The participants are given the opportunity to be honest and have discussions regarding the organisation, processes, attitudes, and behaviour in a safe environment. In the less well-performing

teams, these factors could have been improved by creating a better partnership, a fruitful dialogue, increased job control, and more effective conflict handling.

The results of this qualitative research revealed that the best-performing teams could identify bottlenecks in order to improve continuity and productivity. The CFTs gained insight into their performance using several performance indicators. Consequently, through collaboration, a cross-functional team can both control and learn. Cross-functional teams learn how to address interferences and can continuously improve their services through better collaboration and by using control mechanisms more effectively.

This research revealed that implementing cross-functional OR scheduling teams directly improves OR performance. Proactively preparing the preoperative processes through teamwork yields a better outcome on the day of the surgery due to less interference.

As a result of traditional functional specialisation, the internal complexity of a hospital's organisational architecture is an amplifier of external complexity and a source of interference, errors, variability, and accidents. These complications are difficult to handle, due to the lack of effective collaboration between autonomous individual professionals. This behaviour and characteristics can be changed in a complex organisation by creating a multidisciplinary team with double-loop learning, mandates, and the establishment of a common goal. CFTs are responsible for the planning, results, and organisation of the specific OR facilities and its patients. To establish a common goal, the board of directors must formulate a clear objective.

With its socio-technical design, a hospital's cross-functional OR scheduling team is better prepared to address over-utilisation, under-utilisation, and schedule deviations and, thereby preventing cancellations. With higher employee satisfaction and an increase in the number of patients administered, the facility's scarce resources can be optimally utilised. Consequently, control options play an essential role in collaboration within a cross-functional OR schedule team.

Collaboration yields a single-loop learning effect. By giving feedback with respect to organisation, processes, attitudes, and behaviour, the cross-functional team can learn from previous experiences and therefore improve continuously. In policy meetings, a double-loop effect is achieved by discussing norms and values and adjusting as needed.

In this study, collaboration within four cross-functional teams was investigated. The teams were chosen based on the performance of the surgical service, measured as net utilisation. Using performance indicators of net utilisation is likely not the only explanation for the results obtained. For example, the planning horizon, the composition of non-investigated teams, and other trusted variables were not included in this research.

The overall performance of a surgical service can be affected by multiple variables, including the mixture of patient cases, the scarcity of resources, and the OR's planning horizon. These variables can be investigated in future studies. In addition, performing a study similar to this in other medical centres with The Netherlands will allow comparisons and support the initial conclusions of our study.

This research focused on the organisational process, not the quality of the medical care itself. Although the less well-performing cross-functional teams were well-organised in some respects, in order to improve continuously, these teams should focus on what improvements can be made in the near future.

The outcome of this new strategy to improve OR efficiency demonstrates that introducing CFTs can improve OR performance by allowing the individual healthcare

workers to function as a team. Although this study is preliminary, it can serve as a starting point for more comprehensive studies to expand these initial findings.

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