Integrating Lean and employee involvement in developing the work process and well-being in a hospital setting

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Abstract

This paper describes an intervention project on how to integrate psychosocial risk control and Lean methods. Six Danish hospital wards participated in an intervention study aimed at developing a work innovation tool, combining the workflow analysis in Lean with well-being improvement activities. The methodology builds on value stream mapping (VSM) and aims to improve communication by enhancing relational coordination. Groups of employees carry out VSM of selected processes, follow up with the collection of data on these processes, and develop suitable solutions for them. The evaluation shows that VSM provides new insights, which help employees identify and implement improvements and that these improvements most often have a positive effect on both well-being and production. Employee participation is crucial, but external facilitator assistance to the wards is needed for proper implementation.

Introduction

Hospitals in Denmark and most other countries are under severe economic pressure, due to increasing demands from patients, new expensive treatment possibilities, and limited public budgets. This, in turn, demands increased productivity on the part of staff. Hence, staff experience constant pressure to deliver more, make faster decisions, and coordinate with an increasing number of other professions and units, both in and outside the hospital (Gittell, 2009). This development may have adverse consequences for the staff, such as increased work overload, stress, and burnout, given that they feel hampered in delivering the required quality of care to patients (See an overview in Westgaard & Winkel, 2011).

Since the early 2000s, lean management (Liker, 2004) has become one of the most important tools employed by hospital management in their effort to meet the requirements for productivity increases. In general, the productivity results of lean are mixed (D'Andreamatteo, Ianni, Lega, & Sargiacomo, 2015; Hasle, Edwards, & Nielsen, 2016; Prætorius, Hasle, Edwards, & Nielsen, 2015), the consequences from an employee's perspective are debatable (Hasle et al. 2012), and there is very little research on lean in hospitals (See an example in Ulhassan, Westerlund, Thor, Sandahl, & Schwarz, 2014). Importantly, lean has been criticized for leading to increased work pressure (Harrison, 1994; Landsbergis, Cahill, & Schnall, 1999). However, more recent research developments are painting another picture. Reviews are showing that lean in simple manufacturing work may have a negative impact, but not necessarily in more complex work (Brännmark & Håkansson, 2012; Hasle et al., 2012). Especially in hospitals, several studies indicate that the impact often is more positive than negative (Dellve, Williamsson, Strömgren, Holden, & Eriksson, 2015; Ulhassan et al., 2014). Therefore, one could argue that the effects of lean may depend on how it is applied in practice and to what extent the employees are involved (Hasle, 2014; Holden, Eriksson, Andreasson, Williamsson, & Dellve, 2015).

Employee participation is emphasized in the lean philosophy, yet it may not always be stressed in practice (Hasle, 2014; Womack, 1996). Importantly, previous research suggests that it may have positive effects for the employees (Bamber et al. 2014; Cullinane et al. 2014). As the work pressure in hospitals originates largely from productivity demands, to date, it is not clear whether lean can be used not only to

improve productivity, but also to ease pressure on staff via a focus on participation and, thereby, develop local possibilities for workplace innovation. In this article, we pursue an answer to this question.

Our starting point is Value Stream Mapping (VSM), which is a key tool in lean (Rother & Shook, 2009) and which has proven useful in the context of hospitals (Henrique et al., 2015). VSM is a participatory tool for mapping flow and for the identification of value adding and non-value adding activities, which, subsequently, can be used for process improvements (Rother & Shook, 2009). Insights into the work process can potentially also be used to identify occupational health and safety risks and possibilities for improvements (Jarebrant et al., 2016). We developed a participatory methodology based on VSM aimed at the improvement of the psychosocial work environment (such as control, qualification demands, job demands, social support, feedback, clear job tasks, job security, and reward) (Kristensen, 1999).

We tested the methodology in a qualitative case study in a large university hospital in Denmark. In the following, we present the development and testing of the methodology, discuss how hospital professionals may overcome potential challenges in using the method, and end with a discussion and conclusion regarding the implications for research and practice. As such, we aim to show that a VSM-based methodology focused on employee participation can lead not only to improvements in the psychosocial environment, but also to productivity improvements.

Background

Hospitals can be characterized as professional bureaucracies (Glouberman & Mintzberg, 2001a, 2001b), which are dominated by strong professions – first and foremost, doctors and nurses, but also by other professions such as physiotherapists and lab technicians. The work in hospitals is based on the professions taking their own decisions about proper treatment and care. Hospitals can thus be depicted as organizations in which the professions have a relatively high level of control over and autonomy regarding their own work. Moreover, given that the different professions have typically been in charge of changes in treatment and care (e.g., the introduction of new medicines and technologies), they have, enjoyed relatively high levels of participation in decision-making. However, this professional autonomy and level

of participation is increasingly under pressure. Politicians and management require productivity increases. For instance, there is an increasing focus on improving waiting lists, shortening discharge time, and limiting the professions' control over economic expenditures in line with new public management (Hood, 1995). In addition, individual autonomy is also under pressure as each employee becomes more and more dependent on collaboration with other employees due to the increasing complexity of treatments (Adler, Kwon, & Heckscher, 2008; Gittell, 2009). The consequence of these developments is increased work pressure for employees (Westgaard & Winkel, 2011).

One particularly important problem is the increasing demand for coordination between individuals, professions, and between wards. One way of addressing this issue is through improving relational coordination, which is defined as a mutual reinforcing process of communicating and relating for the purpose of task integration (Gittel 2009). Relational coordination implies that communication is frequent, timely, accurate, and problem-solving, which, in turn, would lead to shared goals, knowledge, mutual respect, and improved quality of communication. Relational coordination has been shown to increase employee well-being, which, in turn, has been linked to improved task performance (Gittell et al. 2008 a; Gitttell et al. 2008 b). Furthermore, the improvements are based upon employee knowledge regarding which part of the communications stream in the organisation needs to be improved.

Employee knowledge and participation have furthermore been described by the original lean authors as crucial (Womack & Jones, 1996; Womack, 1996), and participation is, in many cases, found to be a part of lean practices (Shah & Ward, 2007), although lean implementation can also be dominated by management with adverse effects for employees (Stewart et al., 2009). With the point of departure in participation, the lean philosophy follows the consensus in both human resource management and occupational health and safety (OHS) research that participation is essential both for the employees' well-being and for the successful outcome of organizational processes. The importance of participation has a long tradition in research (Emery & Thorsrud, 1969; Karasek & Theorell, 1990). Later research has also proven that not only is control of one's own work important, but also participation in changes (Saksvik, 2009), and more recent reviews confirm the importance of participation (Egan et al., 2007).

However, participation is not necessarily easy to achieve in practice (Boxall & Winterton, 2015). For instance, management may intend to stay in control. They want to feel secure that the employees will follow the management defined framework and in cases of change, they want to ensure that the management's objectives are achieved (Kotter, 1996). Moreover, employees may also evade participation in order to avoid responsibility or due to a lack of necessary competences. To summarize; employee participation is seen as crucial in both the lean philosophy and in improvement processes regarding the psycho social working environment. Nevertheless, employee participation seems to be more complicated in practice, and there is a general dearth of methods available, to help organizations navigate improvement processes.

So far, we have argued that hospitals are in need of new methods that can be used for the improvement of the psychosocial work environment, and we have found such an opportunity in lean management, in particular in the lean tool VSM, as it can be used to focus on both relational coordination and staff participation and can be compatible with the dominating efficiency agenda in hospitals. In the following, we will show, how this was achieved in five hospital wards.

The intervention study

Our study was conducted in a University hospital in Denmark. The hospital has 690 beds and covers both emergency and elective treatments. It has 4400 employees divided into 25 departments. The hospital has organized the OHS management system in accordance with Danish legislation, with an OHS committee at the central level and OHS groups in each department consisting of an elected OHS representative and a management representative. The OHS committee and groups are supported by an organizational development and OHS unit comprised of five professionals. The hospital implements workplace assessment (the Danish version of risk assessment) every three years. To measure psychosocial factors, the hospital has used a questionnaire following the general guidelines from The Copenhagen Psychosocial Questionnaire. The idea was to use the survey results to make action plans for improvements. However, the experience from this activity has been, at best, mixed. Many departments have found it difficult to transform the survey results into practical changes. Therefore, the hospital has been looking for alternative possibilities for the improvement of psychosocial factors, and accepted our invitation to participate in

the development and testing of an intervention methodology, aimed to address the following research question:

How can a dialogue-based and employee participative intervention design improve the workplace capacity to design improvements addressing work processes and well-being simultaneously?

The design of the intervention is based on the following sources:

- The **literature** on lean, VSM (Jarebrant et al., 2016; Rother & Shook, 2009) and participation (DeJoy et al. 2010; Nielsen, 2013; Van Eerd et al., 2010).
- The **context** of the hospital regarding the general organizational development as well as the particular experience with lean and workplace assessment.
- The **experience** of the consultants and researchers from a large number of former intervention activities, particularly based on the concept of Relational Coordination (Gittel 2008, 2009).

We have named the intervention methodology P-lean (for psychosocial factors intervention with lean). The intervention project was developed as a collaboration between researchers, management, and staff at the university hospital. In the spring of 2013, hospital management, the OHS committee, and the researchers agreed to organize an intervention project, for which the goal was to develop new methods based on lean for improvement of the psychosocial work environment. The intervention project was organized with a project group, a research group, and a steering group. The project group had the responsibility for the activities in the project and consisted of two hospital consultants and four researchers. The research group developed the intervention design and analysed the project results. The steering group comprised representatives from the hospital central cooperative committee, with the Deputy CEO as chair and one of the hospital consultants as secretary.

Methodology

It is a challenge for the design and evaluation of organization level interventions to separate the impact of the intervention programmes from other inside or outside changes to the workplace (Cox et al., 2007; Nielsen, Randall, Holten, & Gonzalez, 2010).

Realist evaluation theory provides a possibility to secure a theory-based design of the intervention (Pawson & Tilley, 1997). In the realistic evaluation, the main question is 'What works for whom, in what circumstances, and how?' Realistic evaluation builds generic theory of changes into complex social intervention programmes considering the context. This is performed through investigation of the change mechanisms in the intervention:

"Intervention works when the resources on offer (material, cognitive, social or emotional) strike a chord with programme subjects. This pathway from resource to reasoning is referred to as the 'programmeme mechanism" (Ray Pawson, 2003, p. 473).

Realistic evaluation theory has been used for the design of intervention programmes (Hasle et al. 2012), and we have, in a similar fashion, built a programme theory based on the desired outcome, followed by the mechanisms that could initiate this outcome, and subsequently the activities, which could activate the mechanisms. These sets of activities, mechanisms and outcomes were subsequently sorted into phases, which were used to schedule the sequence of the intervention. The intervention phases cover the mandatory risk assessment phases, that all workplaces in Denmark must implement at least every third year.

An overview of the result in terms of the project's programme theory that covers activities, mechanisms and outputs is outlined in Table 1.

Table 1
The Programme Theory for the Intervention in the P-Lean Project

Intervention phase	Activity	Change mechanism	Expected outcome
Decision about project start	• Facilitator presents a meaningful programme theory	• Visible problem • Confidence in intervention programme	• Ward committed to participation in the project
Project establishment	• Management of the ward forms a local intervention group (one management rep and 1-2 employee reps). • The group meets facilitator 8–10 times throughout the project • The group identifies project focus and measures in collaboration with facilitator	• Competencies to implement organizational changes available • Relevant knowledge and tools to implement change	• A project group with the capability to implement the project • Mutual goals identified
Identification of priority problems	• Value stream mapping (VSM) workshop with a focus on problematic work processes and consequences	• New insights in flow, relations with colleagues and problem causes	• A list of relevant priority problems • Shared knowledge • Growing mutual respect
Problem analysis	• The workshop group and the facilitators make observations of daily work routines related to problematic work process • 2nd VSM workshop focusing on problem causes	• Comprehension of the causes to prioritise problems based on facts	• Problem causes disintegrated from personalities • Shared platform for development of solutions • Growing mutual respect
Development of solutions	• 3rd VSM workshop focusing on development of solutions • Creation of indicators for measurement of achievements	• Realistic and beneficial solutions	• Relevant solutions for pinpointed problems • Reflections on how to make solutions possible
Action plans	• Project group, supported by facilitator, draws up action plan including goals and indicators for impact • Allocation of resources for the implementation of activities	• A transparent implementation process • A manageable and realistic process with the necessary resources	• An implementable action plan • Commitment to implementation
Implementation and follow up	• Implementation of improved work processes • Whiteboard meetings to follow up on progress • Collection and publishing of data on indicators	• Enthusiasm that this will actually work	• Improved work processes • Improved well-being and job satisfaction

As Table 1 shows, the key mechanisms are the creation of motivational resources based on a shared learning process initiated by the activities. The activities are based on a combination of traditional project management and lean. One of the key aims was to provide concrete and transparent data about the workplace, which on the one hand provide the platform for the development of relevant improvements, and on the other, create confidence in the project. Another important point was to allocate professional facilitators to the activities in the wards to support the application of the methodology. In this respect, there were 2 consultants for the development and OHS unit in the hospital.

The design was tested in a pilot project in a ward specializing in lung diseases and, subsequently, adjusted based on feedback from the pilot test. The intervention in each ward consisted of:

- A small planning group, meeting 8-10 times with their appointed facilitator throughout the project duration of 6 months.
- Three VSM workshops which aimed at improving challenges in the psychosocial work environment for selected work processes. Six to eight employees participated as representatives of all involved staff groups together with the planning group. The workshops were facilitated by internal lean and work environment consultants from the hospital.
- Observations and registrations of the wards' daily work routines between the three VSM workshops.
- Action plan and follow-ups integrated in the structure ward meeting and in the planning group meetings.

Selection of intervention wards

The possibility for participation in the project was announced to all wards in the hospital. The research group had established three criteria for participation: 1) the ward should not experience severe internal conflicts, bullying, or harassment; 2) the ward should not be involved in extensive organizational changes and, 3) the ward should express sufficient engagement in the project and provide the resources in terms of time and representatives for all relevant professions. Seven wards volunteered for the project. However, given that two wards did not fulfil the criteria, the intervention was implemented in five wards covering different specialties (see Table 2).

Table 2
The Five Participating Departments with the Target Ward in Brackets

	Specialty	No of empl.	Professions	Structure
Z	Department of Clinical Physiology (Urology examinations)	**84**	• Doctors • Lab technicians • Physicists • Nurses • Nurse assistants • Secretaries	• Management: A lab technician and a doctor. • The department consists of several wards and the selected ward is directly controlled by the management of the department
B	Department of Nephrology (Bed ward)	**153**	• Doctors • Nurses • Nurse assistants	• Management: A doctor and a nurse. • The department consists of two wards. Each ward is managed by one doctor and a nurse.
O	Department of Medicine (Bed ward)	**277**	• Doctors • Nurses • Nurse assistants • Physio- and occupational therapists • Secretaries	• Management: A doctor and a nurse. • The department consists of five wards. Each ward is managed by one doctor and a nurse.
G	Department of gynaecology and obstetrics (Gynaecological examination)	**335**	• Doctors • Midwives • Nurses • Nurse assistants • Secretaries	• Management: A doctor, a nurse and a midwife. • The department consists of 11 wards and the selected ward has a doctor and midwife as local management
E	Department of Paediatrics (Bed ward)	**237**	• Doctors • Nurses • Nurse assistants • Secretaries	• Management: A doctor and a nurse • The department consists of two wards. Each ward is managed by a doctor and a nurse.

Evaluation methodology

The aim of the evaluation was to test the applicability of the programme theory. The focus was on mechanisms and outcomes in order to learn whether a lean approach can initiate improvement of the psychosocial work environment and, subsequently, how it can be implemented in practice. We used a qualitative case study research design (Yin, 2009), based on a realistic analytical approach (Maxwell, 2012) in order to find out what, respectively, advanced and hampered the process. Where possible, results from changes in quantitative indicators collected by the wards were included in the data material.

Data collection included the following elements.

- Shadowing the facilitators' activities in the wards.
- Collection of written information including results from VSMs workshops, written plans, information materials etc.
- Interviews with members of the project group, workshop group and other employees three months after the last VSM workshop, with thorough notes taken during interviews.

Data analysis

The data from each ward were analysed by extracting elements that supported and hampered the process as well as the outcome of the process. Subsequently, we compared these elements with the programme theory and the intended mechanisms (Pawson & Tilley, 1997) in the intervention design. The findings from each ward were subsequently presented and discussed in the research group and compared across wards in order to identify generalizable results. The analysis evaluated each of the intervention phases in our programme theory for each ward, looking at both drivers and barriers in the process.

Results from the implementation of the intervention

All five departments completed the project with positive results. However, two departments deviated from the intervention design by either reducing VSM workshops (department B) or completely dropping VSM (Department O), given that the department project group decided that interruptions in the medicine dispensing room

were too disruptive and better dealt with without the VSM. An overview of the results for all five departments is depicted in Table 3.

Table 3
Summary of Outcomes from the Five Participating Wards

	The processes selected for VSM	Project activities	Improvements
Z	The good reception of patients	• Three VSM workshops • Descriptions of morning situations • Observations • Registrations • Patient questionnaires	• A redesign of the reception process (including a new position as team coordinator). • Disturbance from other colleagues during morning planning stopped. • Cooperation and climate improved between receptionist and coordinators. • All patients examined, even those not properly prepared on arrival. No patients are rejected and sent back for a new appointment. • Time for four extra examinations daily identified in VSM.
B	Information in shifts and delegation of job tasks in accordance with qualifications	• One whole day VSM workshop • Facilitator observed morning procedures	• Clear morning procedure for reading patients' information • Delegation through qualifications made transparent.
O	Disruptions in medicine dispensing room	• Registration of interruptions in three dispensing rooms	• The importance of informal communication recognized and moved outside the dispensing room. • Film produced by the employees, showing disturbances in the dispensing room.
G	A good balanced workday. The nuchal scan was selected as the process which most often disturbed the balance of the work day	• Three VSM workshops situations • Interview with patients • Registrations of time used for the scanning methodology	• Small solutions regarding towels, PC's, parking, letters to patients, information signs. • Action plan for different scenarios for reorganizing the whole scan procedure, including the demand for resources and competences.
E	Well-structured workday beginning with well-structured meetings	• Three VSM workshops • Facilitator observed and evaluated morning meetings	• Well-structured and well prepared morning meetings. • Job tasks in line with the competencies of the nurses (and doctors). • Reorganizing teams. • Time outs for coordination. • More respectful communication between doctors and nurses. • Small changes such as moving the coffee table, local medical supply depots etc.

An important barrier for the overall intervention that emerged during the analyses was cross-department communication and activities. Several wards identified problems that were directly related to communication with other departments. An example would be the ward for urology examinations in department Z, where lack of information from the emergency ward during the night shift created planning difficulties. In this case, similar to the other wards, the project groups abstained from raising these issues as they expected them to be too sensitive and would limit the chances for a successful outcome.

Below, we will discuss in more detail the results from the bed ward in the Department of Paediatrics (case E in Table 1 and 2), in order to give a better understanding of the process, the activities and the results of the intervention. The ward is one of the three wards in our study, which closely followed the intervention methodology. The two other wards showed a rather parallel process regarding engagement in the project and the resulting outcome.

Department E: The children's ward

The children's ward at the hospital volunteered for the project due to problems with high staff turnover, flawed information flow between shifts, and staff expressing professional insecurity in treating patients.

One of the reasons for the high turnover in the ward is the winter workload. Children tend to become more frequently ill during wintertime. Many children's lung and respiratory problems worsen during that period and the number of patients increases. Moreover, the work in the children's departments demands highly specialized skills. Patients' ages range from 0 to 18 years and the children can be diagnosed with almost any disease. The nurses are forced to expand their knowledge to all forms of possible diagnosis. This is in contrast to other wards where the number of potential diagnoses is more limited.

The high turnover resulted in hiring relatively new and inexperienced nurses, which reported feeling professionally inadequate. This, in turn, was openly expressed by the nurses as being a main problem for their well-being. Communication problems with some of the older doctors also emerged during the first planning meetings, since a small group of doctors did not consult with the nurses nor did they treat the nurses'

observations respectfully. This was a particular problem at the morning meetings where the nurses reported on the development of the patients during the last 24 hours and presented their assessment of the children the doctors should see first. A small group of doctors disturbed the meetings by constantly interrupting the speaking nurse and by not staying on topic during the meetings. Whereas the department doctor attended the second and third VSM workshops and the managing department doctors were introduced to and provided their support to the project, the problem created by this small group of doctors was not otherwise directly addressed in the project.

In the first VSM workshop, the activities of the whole day shift were put up on a big brown paper in the staff's lunch room. For each activity, problems with the work flow were marked with a red 'post it' and the connected challenges in the work environment, for instance, frustration, irritation, and conflict with other staff members were noted on orange 'post it' notes. 'Green post its' were used for possible solutions and made their way onto the brown paper during the discussion of each work activity. However, the facilitator held back from deciding on a specific solution, trying to make room for a more profound analysis of the challenges and an inclusion of opportunities to learn more though data collection and observations of the daily routine.

The first VSM workshop in Ward E revealed that the morning hours from seven to nine were crucial for the whole day. The problems for the day shift started due to the inability of the night shift to provide relevant and precise information in a short and concise way. Therefore, the two-day shift teams of nurses' day shift experienced a rather turbulent sifting through patients in the two teams they split to, after the night shift had left. The teams tended to shift between distributing patients and sharing information in a setting where staff were coming and going, drinking coffee and missing information. Moreover, the whole meeting session sometimes did not stop before a quarter to eight although it started at 7 am. The ward had a subsequent nine o clock meeting that included both nurses and doctors. These meetings were described by the nurses as a horrifying experience. Especially the coordinating nurse had difficulties. She had the task of providing information about patients and updating information on the electronic screen regarding which doctors should be assigned to which patients. However, the meeting was continuously interrupted by some of the

older doctors who raised irrelevant questions, made disrespectful remarks about both staff and patients, and often started disputes among themselves trying to avoid the assignment of too many patients.

The workshop group decided to improve the two morning meetings. The goal was that the initial meeting at 7.00 am should take only 10 minutes and that the meeting with the doctors should be calmer, more respectful, and should focus on the main agenda for the meeting. The facilitator subsequently participated in the morning meetings and recorded observations from the meetings, which were subsequently presented in the next workshop.

At the second workshop, the nurses were really eager to implement some changes. The facilitator introduced the priority matrix that showed how much effort the ward should invest and the expected outcome. Their suggestions included both small and easy improvements as well as some more extensive organizational changes. The workshop group chose four priority improvements from the first workshop, two rather small (moving the coffee table and local medical supply depots) and two more extensive (the structure of the 7 o'clock meeting and using nurses' competencies in delegating patients in the morning). The group also made an action plan regarding who, how, and when changes in the work processes should start. The workshop took place in the common lunch room and the result of the workshop in the form of the brown paper stayed on display in order to make all the project ideas and priorities transparent.

There were approximately six weeks between each of the three workshops. The facilitator often observed the two morning meetings and, gradually, began to ask at the end of the meetings, how those involved evaluated them. Gradually, the morning meeting changed to become more structured, and the nurses, both those responsible for the day and the night shifts began to prepare themselves for these meetings. Still, the turbulence created by the doctors was more difficult to resolve.

Before the third workshop, the planning group received information that two of the older doctors would retire in a few months and that the third one had received a warning from the managing doctor. The workshop group continued working on developing the two morning meetings, discussing the different scenarios they had experienced and how to deal with them. They shifted from sitting down in two groups

to standing in front of the whole group before the electronic screen during the first morning meeting. Regarding the idea of better using the nurses' competencies in patient assignments, they made the assistant chief nurse responsible for this part of the morning meeting, securing a balance between the considerations regarding knowledge of patients, need for education, and the workload for each nurse.

Information to the whole staff about the progress of the project as well as the issues selected for discussion was secured by weekly newsletters from the head nurse.

At the three month follow up, the researchers observed the two morning meetings. The first meeting took place in front of the electronic screen, where the night nurses delivered well-prepared information about the patients. After 10 minutes, the night shift left and the assistant nurse took over assigning patients to the nurses - according to their knowledge of the patients, their diagnosis and the competence development plan. At 7.20 hours, everybody was with their patients and the nurses subsequently returned to the screen and noted the latest information. At a quarter to nine, a new meeting was organized in front of the electronic screen. Two nurses went through the patients together with the doctors for about 10 minutes and then left them to their own delegation of patients.

In the subsequent evaluation, the head nurse, assistant head nurse, the doctor, and three nurses were interviewed about the process and the outcome. All interviewed persons expressed that the project had made the workday much more structured and calm and secured the necessary information for everybody. The previous chaotic and long-winded meetings were over, leaving more resources to concentrate on work with patients and their families. What had surprised them was that their need to organize the day shift in two teams had disappeared. It was possible to meet as a whole group, sharing precise information as well as having spare time to meet for time outs and help each other across the whole department.

The head nurse expressed her interpretation of the outcome of the project by asking the facilitator just before the third workshop:

"Couldn't we expand the project to a period of three years? It is changing so many things and involves the staff in a way that I did not dare to dream of. But we need to keep you as facilitator; we are not able to do this ourselves."

The evaluation interviews showed that the ward undertook a long series of changes on how information was delivered using structured, precise and relevant communication. This led to a more structured way of delegating tasks and following up on one's own tasks. It also increased the capacity to help colleagues when necessary, because they had the necessary overview. The department has made many changes in organizing such as moving the coffee table, meeting space, reception desk, and small medical equipment depots. However, what the evaluation interviews revealed was that they had developed a new way of discussing and solving daily work processes, and, this, in turn, led to more empowerment and mutual help and understanding between the different staff members.

Discussion

Hospitals constitute a typical example of a professional bureaucracy (Glouberman & Mintzberg, 2001a). It is therefore well in line with the problem of professional silos that communication and coordination proved to be the focus points for all the intervention wards. Indeed, when constraints appear in their work, people are inclined to attribute the resulting problems to persons and personalities rather than to the organization of the workplace. It is therefore key to understand and solve these problems to improve social relations in communication and coordination.

This study demonstrates that the P-lean tool – value stream mapping (VSM) – provides new opportunities for hospital wards to identify, understand, and improve their communication processes. The participation of the staff opened the way for a mutual discussion of possible improvements and secured support for the implementation of new procedures and a clarification of roles. Instead of pointing the finger at other people or at the overall structure and lack of resources, it was a relief for those involved that, by focusing on often very small micro processes, the workflow became transparent and it became much easier to find possible solutions.

VSM opens new insights into the processes and the flow connecting the processes, which facilitates a transfer of the problem-framing from one of personal conflicts to one of the organization of work. The involvement part of the VSM process resulted in two main lessons. The first one is that only employees have the necessary in depth, practical knowledge of the process in order to carry out a VSM, which digs sufficiently

deep to create new insights. The second one is that solutions can only be identified, accepted, and implemented in practice if they are meaningful for the employees and if, and when, the solutions integrate both a consideration of patient care and employees' psychosocial work environment.

The study also found that, whereas, the improvement activities regarding the structural and between-wards challenges were addressed in the project and the VSM workshops, they were not solved in the further process. This suggests that the design is able to make incremental changes and improve areas within the wards' own work area, but is not able to spur more radical changes outside the wards, nor change structural work process challenges across the hospital. One of the constraints for the test of the P-lean methodology is, therefore, the lack of experience with cross-departmental issues such as the transfer of patients from one ward to another. All the wards chose to work with their internal problems first as explicitly shown by the ward E case. The employees apparently do not believe that they have sufficient power within the hospital to initiate changes across wards, even though they are able to correctly identify and describe the structural problems in the hospital.

The results indicate that outside assistance is needed for successful achievements. While the ambitions of the design were to create a self-implementable methodology, the wards lacked sufficient competence and outsiders were needed to help create the momentum necessary for progress. Since larger hospitals in Denmark, and probably also in many other industrialized countries have access to internal consultants with expertise in HR, OHS, and/or lean, it should be possible to accommodate this requirement. Especially since the intervention takes place within a limited timeframe.

Conclusion

Value stream mapping has the potential to give the staff at hospitals important insights into their own work as well as the work of their colleagues. It is an insight, which is normally blurred by the daily requirements for immediate response and fast decisions as well as the large number of relations with other staff members. It follows from the literature as well as from the experience of testing P-lean that such a methodology needs strong commitment from management and support for the technical implementation as well as a strong adaptation to each local context.

In this intervention, it proved possible to integrate the productivity and the psychosocial work environment issues. The focus on the cross-professional work flow and creating value for the patients was important in order to avoid a clash between the two. In fact, the direct improvement of work performance had an indirect positive impact on the experience of frustration, irritation, and feelings of insecurity regarding both one's own competencies and the safety of the patients.

Our study highlights that it is the communication process (or relational coordination) which is the key to successful results. The need for coordination in hospitals is huge and P-lean represents one possibility to identify, understand, and improve the day to day practical communication.

The study shows how a participatory and facilitator-supported process can be designed and implemented to make improvements in the work processes, which result in direct improvements of the work processes and indirect improvements of the OHS in the workplace. We hope, that his integration of both improving the work itself and the wellbeing of the staff conducting the work, will inspire more organizational psychologists to design and test more integrative improvement methods.

References

Adler, P. S., Kwon, S. W., & Heckscher, C. (2008). Perspective--Professional Work: The Emergence of Collaborative Community. *Organization Science*, 19(2), 359–376.

Bamber, G. J., Stanton, P., Bartram, T., & Ballardie, R. (2014). Human resource management, Lean processes and outcomes for employees: Towards a research agenda. *The International Journal of Human Resource Management*, 25(21), 2881–2891. DOI:10.1080/09585192.2014.962563

Brännmark, M., & Håkansson, M. (2012). Lean production and work-related musculoskeletal disorders: Overviews of international and Swedish studies. *Work - A Journal of Prevention Assessment & Rehabilitation*, 41, 2321–2328.

Cox, T., Karanika-Murray, M., Griffiths, A., & Houdmont, J. (2007). Evaluating organizational-level work stress interventions: Beyond traditional methods. *Work and Stress*, 21(4), 348–362.

Cullinane, S.-J., Bosak, J., Flood, P. C., & Demerouti, E. (2014). Job design under lean manufacturing and the quality of working life: a job demands and resources perspective. *The International Journal of Human Resource Management*, 25(21), 2996–3015. DOI:10.1080/0958519 2.2014.948899

D'Andreamatteo, A., Ianni, L., Lega, F., & Sargiacomo, M. (2015). Lean in Healthcare: a comprehensive review. *Health Policy*, 119(9), 1–13.

DeJoy, D. M., Wilson, M. G., Vandenberg, R. J., McGrath-Higgins, A. L., & Griffin-Blake, C. S. (2010). Assessing the impact of healthy work organization intervention. *Journal of Occupational and Organizational Psychology*, 83(1), 139–165.

Dellve, L., Williamsson, A., Strömgren, M., Holden, R. J., & Eriksson, A. (2015). Lean implementation at different levels in Swedish hospitals: The importance for working conditions and stress. *International Journal of Human Factors and Ergonomics*, 3(3–4), 235–253.

Emery, F. E., & Thorsrud, E. (1969). *Form and content in industrial democracy.* London: Tavistock.

Gittell, J. H. (2009). *High performance health care - using the power of relationships to achieve quality, efficiency and resilience.* New York: McGraw-Hill.

Gittell, J. H., Weinberg, D., Bennett, A. L., & Miller, J. A. (2008a). Is the Doctor In? A Relational Approach to Job Design and the Coordination of Work. *Human Resource Management*, 47(4), 729–755.

Gittell, J. H., Weinberg, D., Pfefferle, S., & Bishop, C. (2008b). Impact of relational coordination on job satisfaction and quality outcomes: A study of nursing homes. *Human Resource Management Journal*, 18(2), 154–170.

Glouberman, S., & Mintzberg, H. (2001a). Managing the care of health and the cure of disease - Part I: Differentiation. *Health Care Management Review*, 26(1), 56–71.

Glouberman, S., & Mintzberg, H. (2001b). Managing the care of health and the cure of disease - Part II: Integration. *Health Care Management Review*, 26(1), 72–84.

Harrison, B. (1994). *Lean and mean. The changing landscape of corporate power in the age of flexibility.* New York: The Guildford Press.

Hasle, P. (2010). Professional assessment and collective standards - lean in a cancer department. *In P. Vink & J. Kantola (Eds.), Advances in occupational, social, and organizational ergonomics* (pp. 345–354). CRC Press / Taylor & Francis Ltd.

Hasle, P. (2014). Lean production - An evaluation of the possibilities for an employee supportive lean practice. *Human Factors and Ergonomics in Manufacturing*, 24(1), 40–53.

Hasle, P., Bojesen, A., Jensen, P. L., & Bramming, P. (2012). Lean and the working environment: A review of the literature. *International Journal of Operations & Production Management*, 32(7), 829-849.

Hasle, P., Nielsen, A. P., & Edwards, K. (2016). Application of Lean Manufacturing in Hospitals-the Need to Consider Maturity, Complexity, and the Value Concept. *Human Factors and Ergonomics in Manufacturing*, 26(4), 430-442. DOI: 10.1002/hfm.20668

Hasle, P., Kvorning, L. K. V, Rasmussen, C. N., Smith, L. H., & Flyvholm, M. A. (2012). Designing Working Environment Intervention Programmemes for Small Enterprises. *Safety and Health at Work*, 3, 181–191.

Henrique, D. B., Rentes, A. F., Godinho Filho, M., & Esposto, K. F. (2015). A new value stream mapping approach for healthcare environments. *Production Planning & Control*, 7287 (August 2015), 1–25. http://doi.org/10.1080/09537287.2015.1051159

Holden, R. J., Eriksson, A., Andreasson, J., Williamsson, A., & Dellve, L. (2015). Healthcare workers' perceptions of lean: A context-sensitive, mixed methods study in three Swedish hospitals. *Applied Ergonomics*, 47, 181–92.

Hood, C. (1995). The "new public management" in the 1980s - Variations on a theme. *Accounting Organizations and Society*, 20(2-3), 93–109.

Jarebrant, C., Winkel, J., Hanse, J. J., Mathiassen, S. E., & Öjmertz, B. (2016). ErgoVSM: A Tool for Integrating Value Stream Mapping and Ergonomics in Manufacturing. *Human Factors and Ergonomics in Manufacturing & Service Industries*, 26(2), 1–14.

Karasek, R. A. (1979). Job Demands, Job Decision Latitude, and Mental Strain: Implications for Job Redesign. *Administrative Science Quarterly*, 24(2), 285–308.

Kotter, J. P. (1996). *Leading Change.* Boston: Harvard Business School Press.

Kristensen, T. S., Hannerz, H., Høgh, A., & Borg, V. (2005). The Copenhagen Psychosocial Questionnaire - a tool for the assessment and improvement of the psychosocial work environment. *Scandinavian Journal of Work Environment & Health*, 31(6), 438–449.

Landsbergis, P. A., Cahill, J., & Schnall, P. L. (1999). The impact of lean production and related

new systems of work organization on worker health. *Journal of Occupational Health Psychology*, 4(2), 108–130.

Liker, J. K. (2004). *The Toyota way - 14 management principles from the world's greatest manufacturer.* New York: McGraw Hill.

Maxwell, J. A. (2012). *A realist approach for qualitative research. Los* Angeles: Sage.

Nielsen, K. (2013). Review Article: How can we make organizational interventions work? Employees and line managers as actively crafting interventions. *Human Relations*, 66(8), 1029–1050.

Nielsen, K., Randall, R., Holten, A. L., & Gonzalez, E. R. (2010). Conducting organizational-level occupational health interventions: What works? *Work and Stress*, 24(3), 234–259.

Pawson, R. (2003). Nothing as Practical as a Good Theory. *Evaluation*, 9(4), 471–490.

Pawson, R., & Tilley, N. (1997). *Realistic evaluation.* Los Angeles, London, New Delhi, Singapore, Washington DC: Sage.

Plsek, P. E., & Greenhalgh, T. (2001). Complexity science - The challenge of complexity in health care. *British Medical Journal*, 323(7313), 625–628.

Prætorius, T., Hasle, P., Edwards, K., & Nielsen, A. P. (2015). Towards the collaborative hospital – harnessing the potential of enabling care processes and structures. *In M. Elg, P.-E. Ellström, M. Klofsten, & M. Tillmar (Eds.), Sustainable development in organizations* (pp. 57–76). Edgar Elgar Publishing Ltd. Cheltenham.

Rother, M., & Shook, J. (2009). *Learning to see: Value stream mapping to add value and eliminate MUDA (version 1.4)*. Cambridge, MA: Lean Enterprise Institute.

Saksvik, P. Ø. (Ed.) (2009). *Prerequisites for healthy organizational change*. Bentham Science Publishers.

Shah, R., & Ward, P. T. (2007). Defining and developing measures of lean production. *Journal of Operations Management, 25, 785–805.*

Stanton, P., Gough, R., Ballardie, R., Bartram, T., Bamber, G. J., & Sohal, A. (2014). Implementing lean management/Six Sigma in hospitals: Beyond empowerment or work intensification? *The International Journal of Human Resource Management*, 25(21), 2926–2940.

Stewart, P., Richardson, M., Danford, A., Murphy, K., Richardson, T., & Wass, V. (2009). *We sell our time no more - workers' struggle against lean production in the British car industry.* London: Pluto Press.

Ulhassan, W., Westerlund, H., Thor, J., Sandahl, C., & Schwarz, U. von T. (2014). Does Lean implementation interact with group functioning? *Journal of Health Organization and Management*, 28(2), 196–213.

Van Eerd, D. L., Cole, D., Irvin, E., Mahood, Q., Keown, K., Theberge, N., & Cullen, K. (2010). Process and implementation of participatory ergonomic interventions: a systematic review. *Ergonomics*, 53(10), 1153–1166.

Westgaard, R. H., & Winkel, J. (2011). Occupational musculoskeletal and mental health: Significance of rationalization and opportunities to create sustainable production systems - A systematic review. *Applied Ergonomics*, 42(2), 261–296.

Womack, J. P. (1996). The psychology of lean production. *Applied Psychology, An International Review,* 45(2), 119–122.

Womack, J. P., & Jones, D. T. (1996). *Lean thinking.* New York: Simon & Schuster.

Womack, J. P., Jones, D. T., & Roos, D. (1990). *The machine that changed the world.* New York: Rawson Associates.

Yin, R. K. (2009). *Case study research: Design and methods.* London: Sage Publications.