



# A Case Study of Three Swedish Hospitals' Strategies for Implementing Lean Production

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## ABSTRACT

Many hospitals have recently implemented the management concept lean production. The aim of this study was to learn how and why three Swedish hospitals selected and developed their hospital-wide lean production strategies. Although previous research shows that the concept is implemented in various ways, there is limited research on how and why different hospitals choose different implementation strategies and if the chosen strategies contribute to sustainable participation in organizational development. A case study of three different Swedish hospitals implementing lean production was thus performed. We studied the content of the hospitals' selected implementation strategies, conditions and rationales behind their strategy selection, and how different organizational actors participated in the implementation. Qualitative interviews with 54 key actors at the studied hospitals were performed. In addition, a self-administered survey questionnaire to employees was answered at T1 (2012, n = 557), T2 (2013, n = 554), and T3 (2014, n = 366). The three studied hospitals chose different strategies for implementing lean production due to different contextual conditions and for different reasons. The hospital-wide implementation strategies were related to employees' interest and participation in lean production. The results show that many different actors at different organizational levels need to participate in lean production in order to sustain and diffuse change processes. Furthermore, broad motives including quality of care seem to be needed for engaging different professional groups.

## KEY WORDS

Case study / health care / implementation / lean production / organizational development

## DOI

10.19154/njwls.v6i1.4912

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## Introduction

Many hospitals have recently developed strategies for implementing the management concept lean production (LP), and previous research has shown that a variety of different implementation strategies are applied (Mazzocato et al. 2010; Poksinska 2010). We know, from extensive previous research, that the participation of different organizational key actors, including managers and different professional groups, is critical for successful implementation of strategies for organizational development (OD) like LP (Easterby-Smith et al. 2000; Oreg et al. 2011). There are, however, limited research and a lack of studies on how and why hospitals actually choose different strategies for implementing LP (Brandao de Souza 2009). This case study investigated the strategy choices three Swedish hospitals made for implementing LP in different ways and examined the contexts and conditions behind their distinct LP implementation strategies, including how managers, professional groups, and other organizational key actors participated in the implementation of strategies. In conclusion, the aim of this study was to learn how and why three Swedish hospitals selected and developed their hospital-wide LP strategies. This meant that we were studying the content of the hospitals' selected implementation strategies, and conditions and rationales behind the selection of strategies including how different organizational actors participated in the chosen implementation strategies. The analysis focused on the overall implementation of LP strategies at the hospital level.

### *Research questions*

1. What different strategies for implementing LP were applied?
2. What contextual factors were described to impact the strategy selection?
3. What were the described rationales behind the selection of LP strategies?
4. How did indicators of participation in LP among employees develop over time?

Based on the results of this study, discussions will be held concerning implications for choosing hospital-wide LP strategies that contribute to sustainable participation in LP.

## Background

### LP in health care

Sweden's health care sector has for many decades been under pressure to reduce costs and increase the efficiency of care processes, while simultaneously sustaining or improving the quality of care. Major top-down structural changes, such as merging hospitals with a centralized administration or applying systems for debiting internal costs, have had limited success (Anell 2005) and coincided with increased health problems among health care staff (Arbetsmiljöverket 2012; Dellve et al. 2011; Elstad and Vabo 2008). More recent attempts to improve Swedish health care have focused on mandating, but not prescribing the nature of, intraorganizational redesign, including the use of new OD concepts (Kollberg et al. 2006; SKL 2009). Lately, LP has become the most dominant

concept for OD and over the last 7 years, 85% of the Swedish hospitals have implemented LP (Weimarsson 2011).

LP is an approach to developing organizational processes, with roots in the car industry (Womack et al. 1990). Although there are different views on how to define LP, a common goal of LP in practice is to maximize customer value by eliminating waste, defined as nonvalue-adding processes or tasks (Womack and Jones 2003). Subgoals often include improving or 'smoothing' process flow and reducing errors (Womack and Jones 2003). Another common characteristic of LP is the use of a systematic, scientific approach to identifying and solving problems occurring in work. Frontline employees are often empowered to participate in or even lead problem identification, problem solving, and improvement efforts (Mazzocato et al. 2010). Reviews of the literature on LP in health care show that LP has been applied in several different ways, although most applications focus on process improvements and continuous flows (Poksinska 2010), and frequently involve value stream mapping of patient flow (Brandao de Souza 2009; Holden 2011; Poksinska 2010). Proponents of lean argue that in addition to the lean application of lean tools, successful lean implementations aim to instill an organizational culture of excellence, efficiency, and worker empowerment (Liker and Convis 2011).

### **Implementation strategies**

Implementation strategies of management concepts like LP include different processes to include those concepts in routine work. As mentioned, LP in health care is implemented in various ways. Implementation strategies can here be defined as managerial choices (Velcu 2010) of how to apply LP in the organization. It has been argued that principles and challenges of change management need to be dealt with if the aim of LP includes organizational culture changes (Reijula et al. 2014). Examples of implementation strategies for this kind of change management are the hospital's strategies for choosing implementation leaders (Oreg et al. 2011), involving employees in the implementation, dealing with different stakeholders' interests, and choosing the appropriate form and style for informing and educating workers (Damschroder et al. 2009). Implementation of a management concept like LP can thus be seen as a social process interrelated with its context, that is, the implementation context. The organizations' preexisting knowledge and skills, including previous experience with OD, as well as existing structures for knowledge sharing, have been shown to be important for LP implementation (Radnor et al. 2006; Rahbek et al. 2011). Therefore, specific organizational circumstances like knowledge, resources, cultures, and structures may impact, hinder, or support the implementation (Damschroder et al. 2009). Thus standardized guidelines for how hospitals should form their overall implementation strategies are probably not suitable, and each hospital must make strategic decisions to fit its needs and to align the implementation with its context.

### **Sustainable participation in OD**

Sustainable implementation can, according to the literature, include both that implementation strategies are sustained over time (Buchanan et al. 2005) and that the implementation contributes to improving the work environment, quality of care, and efficacy



of work (Kira et al. 2010). This article focuses on if the studied hospitals' chosen lean strategies contributed to lean being sustained over time. We have chosen this focus because the participation of different key organizational actors can be seen as especially critical for implementing and sustaining management approaches like LP over time. This is because successful implementation requires strategies that develop long-term committed LP leadership (Brandao de Souza 2009; Dickson et al. 2009; Mazzocato et al. 2010; Radnor and Walley 2008). Furthermore, employees' participation in LP and LP ownership among clinicians is believed to be necessary for successfully implementing LP strategies (Dickson et al. 2009; Rahbek et al. 2011). When implementing LP strategies the organization's stakeholders, including employees and managers, interpret and color a management concept like LP based on their interests and motives (Sahlin and Wedlin 2008; Skälén 2002). The interpretation of LP is defined as a process of negotiation between different stakeholders' interests and influences that determine if and how the concept of LP is applied in the specific health care organization (Joosten et al. 2009; Papadopoulos et al. 2011). Previous research has shown that hospital management's rationale for applying different LP methods and tools within health care mainly includes increased efficiency and worker performance (Mazzocato et al. 2010; Poksinska 2010). Parallels can be drawn to research showing that main drivers of quality improvement, including LP, in Swedish industry embrace aspects of cost reduction (Hallgren, and Olhager 2009). As mentioned, rationales of cutting cost have shown to be a hindering factor for employees in public sector committing to LP (Trägårdh and Lindberg 2004; Waring and Bishop 2010), and thus an important obstacle for implementation of LP (Rahbek et al. 2011). Professional rationales for engaging in OD rather relate to professional development (Lindgren et al. 2013), and research shows that moral distress among clinicians arises due to value conflicts between standards of quality of care and demands of cutting costs (Kälvemark et al. 2004). Previous research has shown that clinicians, who are considered as important key actors in LP implementation, can have negative attitudes and low commitment to LP due to perceptions of LP as a concept from the car industry or LP as a mere method for cost reductions (Brandao de Souza and Pidd 2011). However, a literature review by Westgaard and Winkel (2011) points that worker participation during rationalization processes is a modifier contributing to improved health and lesser risk factors for employees.

As research is lacking on how hospitals actually make decisions on LP strategies, we don't know to what extent the LP strategies within health care consider the above-mentioned aspects of sustainable participation of different organizational actors.

## Methods

### Study design

The design was a holistic multiple case study (Yin 2013). Case study design is recommended when (1) the aim is to understand complex interrelations between the phenomena studied (i.e., implementation strategies) and their context (Stake 2000); and (2) the researcher has little control over studied events but is interested in naturally occurring variability (Ragin and Becker 1992). Case studies strive for 'thick' descriptions that represent different perspectives. The study investigated implementation of LP strategies in

three hospitals using multiple sources of evidence, primarily qualitative interviews with key actors at different organizational levels, and secondarily standardized employee and manager surveys. Performing a holistic case study means, according to Yin (2013), that global characteristics of an organization or program are analyzed. In our study this meant that each hospital served as a holistic case of how LP strategies were implemented. Furthermore, in each hospital 3–5 units were selected for illustrating how the strategies had reached out to a unit level. Data were collected from April 2012 to January 2015 and the study was approved by the ethics committee at Karolinska Institutet, Stockholm (ref: 2012/94-31/5). Informed consent was obtained.

**The studied cases**

Three hospitals (see Tab. I) were selected as cases meeting three inclusion criteria: (1) small or medium-sized public care hospital serving an urban area; (2) clinical units minimally including emergency department (ED), intensive care unit (ICU) or acute care, general medical care, and inpatient surgery; and (3) self-described implementation of hospital-wide strategies for LP at the time of the study. Within hospital, we selected a subset of clinical units, listed in Table I. This selection as well as the broader inclusion criteria was designed to achieve baseline comparability between cases without overly restricting the phenomenon of interest, that is, LP implementation strategies. One of each clinical unit (ED, ICU, acute-medical, acute-surgical, ward-medical, ward-surgical) per hospital was recruited for the study, except hospital A which had an ICU but no acute care units, hospitals B and C had acute care units but no ICU, and the surgical department in hospital C declined to participate due to other ongoing research and development projects.

**Table I** Clinics and units included in the study

Characteristic	Hospital A	Hospital B	Hospital C
	App. 100 beds, 700 employees, and served a population of 100,000	App. 500 beds, 4000 employees, and served a population of 300,000	App. 450 beds, 3000 employees, and served a population of 450,000
Units included	<i>One Emergency department</i> <i>One Medicine ward (cardiovascular)</i> <i>One Intensive care unit</i> <i>One Orthopedic ward (part of surgery clinic)</i>	<i>One Emergency department</i> <i>Two Medicine wards (acute medical intake and gastro)</i> <i>Two Surgical wards (acute medical intake and gastro)</i>	<i>One Emergency department</i> <i>Two Medicine wards (acute medical intake and neurology)</i>

**Materials included in the case studies**

We interviewed 54 individuals at different levels representing different perspectives, as summarized in Table II. Interview themes (see Appendix I) covered previous experiences of OD and content of previous and parallel program/projects for improvement

**Table II** Individuals interviewed hospital by hospital

Source of evidence/data	Hospital A	Hospital B	Hospital C	Comments
Hospital director	1	1	2	As the decision about LP was made at a county council level in hospital C, the county council director was, besides the hospital director, also interviewed about the hospital's LP strategies
Second-line manager (managers for clinics)	4	3	2	
First-line manager (managers for wards)	5	3	4	
Working with OD at clinic (local) level	5	4	2	Most of the persons interviewed were working full time with organizational development. Two clinicians working part-time with OD were interviewed in hospitals A and C
Working with OD at strategic level	3	4	11	Three managers responsible for OD, two logisticians, four process leaders, six change agents and three persons working with work environment issues were interviewed. The great number of key actors interviewed on a strategic level in hospital C, compared to the other hospitals, depended on differences in what functions at different organizational levels actually were involved in the implementation of LP
<b>Total N Interviews</b>	<b>18</b>	<b>15</b>	<b>21</b>	

work, described motives and goals for LP, perceived contextual issues impacting LP implementation, described contextual issues impacting efficiency, quality of care and work environment, LP activities carried out, LP tools applied, education in LP provided, implementation leaders involved, perceptions of health care professionals' engagement in LP, follow-up of LP outcomes, and future implementation plans. Most interviews were audio recorded; however, three interviews with top managers were documented by handwritten notes for increasing the possibilities of more honest and free responses to the questions. Two further interviews were also documented by handwritten notes due to technical problems. Interviews lasted between 40 and 90 minutes.

A self-administered survey *questionnaire* to employees was answered at T1 (2012, n = 557), T2 (2013, n = 554), and T3 (2014, n = 366). The employee questionnaire was distributed to all registered nurses, assistant nurses, and physicians working either

part- or full-time at the study units for at least the prior 6 months. At T3 the questionnaire was offered only to those employees who had answered at T1 and/or T2. Medical secretaries at the ED in hospital B were included at T1. The employee questionnaire was distributed by e-mail or if they preferred a sealed envelope. Nonresponding participants got two reminders sent in paper form. In hospital C, the survey was distributed to a relatively large number of physicians at T1 and T2; 56% answered the questionnaire at T1 and 55% at T2 and 62% at T3. The full employee questionnaire included about 200 items on working conditions; work content; the implementation, use, and perceived impact of LP; and perceived changes in patient and employee outcomes.

For the purpose of this study, we analyzed the following indicators for participation in LP in the employee questionnaire (and the single items): (1) *general participation in LP* (Do you work with lean in your department/clinic?); (2) *Individual attitude to work with LP* (To what extent are you interested and committed to work with lean?); (3) *Specific persons involvement in implementing LP* (Are there specific persons engaged in implementing lean in your department/clinic?); (4) *Top managements engagement in LP* (Do you perceive that the hospital management is interested and engaged in questions related to lean?); *Influence during change* (Have you had enough opportunity to impact the way lean was implemented?). Item one was answered with yes, yes to some extent, I don't know, and no. The other items were answered with a five-point response scale (very little degree/not at all, to a little degree, partly, to a high degree, to a very high degree).

## Analysis of the cases

In order to manage a large volume of qualitative data on several cases, each case had a study protocol (Yin 2013). The case study protocol contained sections describing conditions and rationales behind the different LP strategies (i.e., economical context, motives of hospital management, and history of OD) as well as the content of the implementation strategies (i.e., main characteristics of hospital-wide chosen strategies, LP tools applied, processes/projects targeted with LP, actors participating in the implementation, factors hindering/facilitating the implementation, future visions for implementation of LP, and key actors' views on LP). Interviews were analyzed sentence by sentence and interview passages were allocated to appropriate sections of the respective hospital's protocol. First a descriptive analysis of the interview data was performed describing specific contextual factors, described rationales for choosing LP, characteristics of the implementation strategies, and described motives for choosing specific strategies. The selected units in hospitals served as examples of how the implementation strategies in each hospital were implemented in practice. For example, were unit managers and local implementation leaders describing if and how LP was applied at unit level, or to what extent employees were engaged in the implementation.

Once the initial descriptive analyses were complete, we carried out a procedure similar to Yin's (2013) pattern matching analysis to identify linking contexts, motives, and strategies. This analysis yielded in a main category describing how choices of strategies were aligned to specific conditions in each hospital. The final results were sorted under the headings 'Context described as being important for chosen strategies,' 'Chosen strategies for implementing LP,' 'Stated rationales for strategy selection,' and 'Key actors'



participation in the implementation of LP' presented in the result section hospital by hospital. These results were formed after comparing analysis between the three studied cases identifying important features of LP strategies across hospitals. The validity of the case study descriptions was discussed within the research group as well as with single key actors from the studied hospitals.

The results on participation in LP were besides the qualitative interviews also based on the results from the employee questionnaire. Participation related to each hospital's overall implementation strategy was analyzed with mixed models repeated measurements. The explaining variables for the models were the hospitals and time (T1, T2, T3). The outcome variables were kinds of participation in LP. The analyses were conducted with JMP statistical software version 10.

## Results

First, the results based on the qualitative interviews will be described hospital by hospital. Thereafter the questionnaire results and overall indications of how participation and interest in LP was related to the overall strategies will be presented.

### Results based on the qualitative interviews

All studied hospitals implemented hospital-wide strategies for LP during 2011 and 2012, but their 'starting point' for implementation was hard to determine. However, before 2011, LP-related activities were more limited and could be defined as activities limited to certain units or activities preparing for a broader more hospital-wide implementation of LP. Broad overall rationales for implementing LP were expressed in all three hospitals, including the aims to achieve more efficient care processes and increased quality of care. Key actors were in general emphasizing that LP provided good tools to work with continuous improvements and systematic development work. General motives of choosing LP were also mentioned as part of a general greater movement toward governance through measurement indicators and inspired by current management trends in Swedish health care organizations. However, context-related conditions contributed to, as described below, that the hospitals developed different strategies for implementing LP.

#### Hospital A: To teach clinicians about principles of OD

The hospital chose to work with smaller, unit-level improvements to *teach clinicians about principles of organizational development* (main category). This was manifested in change agents describing how they were taking an active role in supporting and helping clinicians to translate their own suggestions to LP-ideas with help from the LP boards. Change agents, as well as managers from all organizational levels, expressed that at the point of time when LP was started to be implemented, there was low maturity for working with wider improvements including improvement of care processes across units.

### **Context described as being important for chosen strategies**

The maturity for development work was described to differ between different units and between different professional groups in the hospital. However, previous overall experiences of working with process development in a systematic way were, among most interviewed managers and change agents, described as limited.

‘... we are a small hospital and we have limited experience of systematic organizational development work.’ (Manager of clinic 1)

The survival of the hospital and the need to prove the accountability of a small-sized hospital were further more a contextual issue, mentioned by some higher managers as a driving force for implementing LP. Several managers from different organizational levels mentioned that 2013 (T2) was a year with less resources and many cut downs, that is, it was expressed that the hospital needed to find new ways of improving the delivery of care for ensuring the survival of the hospital.

### **Chosen strategies for implementing LP**

Concerned that clinicians, as described by managers and change agents, were not ready for large-scale change, this smaller hospital began with mainly smaller projects at unit level. All interviewed persons viewed LP as providing tools to deal with clinicians’ own suggestions on how to improve work processes and the delivery of care. The chosen strategy for implementing LP thus meant that frontline staff had the opportunity to develop suggestions for change within their unit and to participate through the use of ‘LP boards.’ All units in the hospital had LP boards complemented with paper forms based on the PDSA-wheel (Plan, Do, Study, Act) in order to deal with different improvement suggestions from employees. It was among several expressed that the boards provided means for systematizing units’ ongoing development work within. To help staff work with LP, the hospital hired temporary change agents with nursing backgrounds for each clinic with responsibilities to implement and assist LP work in all units. Resources for change agents at a clinical level were only, however, set aside for a limited time. After 2 years the change agents were phased out and had only little percent of their time for working with OD at a clinical level. Limited resources were furthermore described to have led to a choice of not educating all managers in LP. Some managers were selected for being educated in LP and it was expected that the change agents and the LP-educated managers would diffuse LP knowledge and commitment to LP to all managers and employees over time. The hospital manager described that the first phase of the LP implementation had been about encouraging employees to learn methods for systematic development work but that the vision for the near future included greater governance of LP processes, that is, to switch to top management selecting which projects to pursue.

### **Stated rationales for strategy selection**

Several managers and change agents expressed to work with clinicians’ own improvements as a way of improving employees’ work environment. Most persons interviewed



in hospital A defined LP as a good model for systematic development, and that there was a need for such model in the hospital. Described rationales for LP included the perceived need to implement a model that promoted and systemized the hospitals' overall development work with the long-term goals to improve efficiency, quality of care, as well as the work environment. To improve the quality of care by means of a prioritized model in the region (i.e., LP) was, among several higher managers, furthermore seen as the best chance to compete with bigger hospitals. Several mentioned that earlier there had not been existing resources for change agents at a clinical level. A need for these kinds of resources was expressed among most of the interviewed managers for realizing improvements on quality of care and efficiency. Before starting efforts to implement LP, there had only been persons working with OD on a strategic level. This context and these rationales were, among managers in the top management, described to have led to the decision of giving resources to each clinic for employing change agents responsible for implementing LP in the different units of the hospitals.

### **Key actors' participation in the implementation of LP**

It should be noticed that the change agents, who themselves had backgrounds as nurses, mostly were working with nurses and assistant nurses in wards. Physicians participated only to a limited extent in LP work and change agents and managers described that it was hard to get them involved in the work with LP boards. Clinic managers interviewed related contextual aspects to this, that is, explanations of being a smaller hospital with problems of recruiting younger physicians interested in OD.

Most persons interviewed expressed being worried about what was going to happen when the change agents soon were disappearing. It was expressed that the sustainability of LP depended on the change agents' role as change leaders, that is, their supporting role in communicating problems and possible solutions. It was stated in interviews that except the change agents, few champions for LP had stepped forward. Many of the interviewed unit managers expressed that they did not have enough LP knowledge for leading future LP work. Not educating all managers in LP was by the managers themselves emphasized as shortsighted and an overthought. Almost all first-line managers expressed that they did not have enough time to work with this kind of development work and that they depended on the work of the change agents. Top managers' engagement in LP was among different key functions, including top managers themselves, described as limited.

'The top management group didn't have a single think on their LP board. Now the LP board has been taken down' (Manager of clinic 2)

Table III summarizes the results from hospital A.

### **Hospital B: To have as much impact as possible on development of clinical processes**

Hospital B's implementation strategies can in summary be analyzed as strategies chosen for *having as much impact as possible on development of clinical processes* (main

**Table III** Summary of implementation of strategies in hospital A

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**Context**

- Small, 100-bed public Swedish hospital serving a population of 100,000, adjacent to a city
  - Experience with OD is limited, restricted to fewer units
  - Some top managers perceive continued existence of hospital to be threatened by competitive forces
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**Strategies**

- Mainly began with unit-wise smaller improvements chosen by clinicians, before moving on to hospital-wide projects
  - Deployed 'LP boards' in all units for tracking and discussing project progress
  - Hired nurse change agents for each clinic (each clinic contained multiple units)
  - Began by providing sufficient change agent support for two years
- 

**Rationales for strategy selection**

- To improve quality of care, efficiency, and the work environment
  - To educate employees in one standardized approach to OD
  - To diffuse LP knowledge and commitment to employees over time
- 

**Participation in LP**

- Some professional groups (registered nurses and assistant nurses) are described to be more involved in LP projects than others (physicians)
- 

category). The strategies included working with hospital-wide processes in cross-sectional improvement groups. An extensive multicomponent education program was set up and all managers, change agents, as well as physicians were educated in LP. The strategies can be described as a top-down driven management approach supported by change agents and clinical key functions.

**Context described as being important for chosen strategies**

The analysis of interviews with key actors in hospital B pointed that the choice of implementing LP was related to several contextual conditions that were facilitating for implementing LP. These conditions included a new hospital manager with positive experiences of LP, an interest of LP among leading managers as well as possibilities of collaborating with the university in the region for building capacity for LP. The implementation context of hospital B can be described as extensive previous experiences of process development. The hospital had more than 10 years of experiences of improving patient flows as well as of interprofessional team work. This meant a high maturity for process-oriented development work among different units, and to some extent also among professional groups. Thus strategies for LP were selected for coming even further in the hospital's work with process development. An additional dominant contextual fact impacting the selected strategies was a huge budget deficit that hospital B was facing.

**Chosen strategies for implementing LP**

Part of the chosen LP strategy for meeting the contextual demands was a major focus on improving hospital-wide clinical processes. In order to increase legitimacy to work more



extensively with LP, a described strategy by one of the change agents was to first create 'islands of interests' among managers and clinical professionals. Examples of this were a strategy of engaging and educating clinical key persons to become local champions for LP and encouragement of all second-line managers to go to a national LP conference. After, as described by the change agent, 'a demand for LP' was created among managers, an extensive education program for LP was set up. This meant that the main implementation strategy in hospital B included setting up an extensive multicomponent education program for LP. The program meant that the hospital was working with the hospital-wide case 'acute somatic flow' covering 50% of all patients. Top management and all second-line managers took part in the most extensive parts of the program and these parts were led by an external educator. A copied version of the education program, as well as additional education about LP tools, was internally given to change agents. The focus of the education for these functions was to have a supporting and coaching role in LP implementation. First-line managers and physicians were also given education in LP. All other employees were given the possibility to attend voluntary lectures about LP tools.

'All managers shall have knowledge about how to do improvements, and they should be supported by change agents in the clinics' (Central change agent 2)

The implementation strategy included furthermore the division of five working groups focusing on improvements of the hospital-wide acute somatic flow. The groups included managers representing different units, as well as top managers and change agents. The members in each working group collaborated to define cross-sectional problems and improvement suggestions related to different aspects of the acute somatic flow. In the first implementation period a major focus was on mapping current clinical processes. There were expectations that managers would lead and involve their subordinates in the acute somatic flow project. Strategies were continuously refocused and adapted to resources and context over time. This meant that the implementation strategies after some time were extended to refocus on piloting best-practice models in individual units and using visual management.

### **Stated rationales for strategy selection**

The expressed motive for choosing LP, among change agents and some clinic managers, was to come even further in the hospital's work with process development. Stated rationales for implementing LP included, as expressed among a majority, the potentials of LP to contributing to improved collaboration and improved patient flows between units. LP was viewed to provide tools for increased efficiency. Words like 'optimizing patient flows' and 'continuous improvements' were extensively used in interviews with both managers at different organizational levels and change agents when describing the hospital's current LP-inspired work with OD.

'[We implement]... a flow oriented method of working with continuous improvements with LP as inspiration' (Central change agent 1)

The implementation strategy to work with the hospital-wide case 'acute somatic flow' covering 50% of all patients was thus chosen for having as much impact as possible on

optimizing clinical processes. The choice of especially educating managers and physicians in LP can be interpreted as an approach targeting stakeholders that can be seen as most powerful in hindering or promoting the LP implementation. Change agents and managers described that motives for implementing LP, signaled by the hospital management, were also needed for increased pace in improvement work in relation to expressed explicit aims to get a high budget deficit in balance.

‘Even though you usually say that you in LP shouldn’t talk about rationalizations our hospital director has been clear about that the main reasons we do this for maintaining good quality of care and to do it with less money.’ (Unit manager at clinic 4)

### **Key actors’ participation in the implementation of LP**

In order to have an impact on clinical processes, as described above, the chosen strategy was to a great extent involving the top management in LP implementation. The strategy was further more to reach down to the bottom through involving second- and first-line managers, clinical key persons like physicians and change agents in the organization line, and they in turn would involve their subordinates.

‘Speaking of the managers; we need to keep the fire burning, be there with a blowtorch every now and then (...) and support them.’ (Local change agent, Clinic 1)

Change agents and managers interviewed were positive toward the content of the education program as well as to LP as a method, but expressed being worried about LP being introduced at the same time as the big budget deficit. Several acknowledged this as a potential threat to a long-sighted implementation, as resistance toward LP could grow if it was perceived as a method for cutting costs.

‘They talk a lot about economy, but I don’t believe it is the right way of improving flows. So I believe there are too many discussions about money and then not the least the physicians choose not to listen’ (Local change agent at clinic 3).

Table IV summarizes results from hospital B.

### **Hospital C: To implement a county council top-down structure for engaging clinicians in process orientation of clinical work**

Hospital C’s strategy can be seen as a *top-down structure for engaging clinicians in process orientation of clinical work* (main category). This strategy meant to spread a county council standardized model inspired by LP. Top managers from the county council were governing the improvement work with the aim to make clinical work more process-oriented. The strategy included to employ change agents centrally on a county council level and they were involved for supporting the work with the processes through their knowledge about the model, including methods and tools for OD. The strategy included furthermore to support clinical initiatives, and a great focus was to involve clinicians at



**Table IV** Summary of implementation of strategies in hospital B

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**Context**

- Medium-sized, over 500-bed, public Swedish hospital serving a population of 280,000, located in a city
  - Facing a major budget deficit
  - Early national leader in customer focus and process orientation, with over 10 years of experience working on flow and interprofessional teamwork
- 

**Strategies**

- Multicomponent education program: extensive training for managers, classroom education for physicians and change agents, and voluntary lectures for all employees
  - Major focus on mapping, assessments, and improving hospital-wide acute somatic flow
  - High involvement of top managers and expectation that they will lead and involve their subordinates in the acute somatic flow project
  - Strategies were continuously refocused and adapted to resources and context over time
- 

**Rationales for strategy selection**

- To have a big and immediate impact on clinical process efficiency
  - To decrease spending without compromising quality
  - To increase the pace of improvement work and achieve more cross-unit improvement
  - To empower and educate those at the top and have them involve and educate those below them
- 

**Participation in LP**

- A cost reduction focus was feared hindering clinicians' interest in participating in LP
- 

local level. Strategies for meeting clinical relevance included appointing process leaders who were experienced physicians.

**Context impacting chosen strategies**

The implementation context of hospital C was that the hospital's overall maturity for process development was described as low, but good examples of process-oriented work were mentioned to exist in certain clinics. This meant that some units for the last years were internally working with development work defined as LP. For example, systems for optimizing patient flows or for visualizing work processes have been implemented in these units. Work with process flows between units was, however, described among several as very limited and a strong need for process orientation was thus highlighted. Another important contextual factor impacting the implementation of LP in hospital C was that the hospital's development work to a greater extent, compared to other hospitals, was governed by the top management of the county council. Several staff functions, including functions working with OD, that is change agents, were placed on a county council level. Overall strategies for development work were developed on a county council level, but these strategies were by key actors working with OD at strategic level described not to be integrated at a clinical level. The idea and inspiration to choose LP, among other models, came from successful managers of hospitals and county councils during strategic networking.

### ***Chosen strategies for implementing LP***

In response to the described context, the main strategy of the county council included building its own county council standardized model inspired by LP, and to spread the model in the whole county council, including hospital C, through best practice. This strategy meant to start with a limited number of clinical processes, aiming at becoming best practice cases. Examples of chosen processes were the stroke process, the breast tumor process, and the processes related to guaranteeing patient care within legal frames, that is, processes with high clinical relevance. The strategy was implemented through organizing process teams including stakeholders representing different organizational levels. Process teams included members concretely working with the cases of best practice. The process teams were led by a physician with senior clinical knowledge about the process, that is, process leaders. They were selected for having the potential of being champions for LP at clinical level. Change agents, working on a county council level, were supporting the process teams with methods related to the 'own county council model,' including for example mapping of care processes. The county council's change agents were provided extensive education for being able to support the process work. The county council's standardized model meant that process mapping of clinical processes was made in all projects. Other LP tools were used when perceived as needed, and made available through change agents. Steering groups were used at the county council level to govern, supervise, and diffuse the work of each process improvement group.

A steering group, including a process owner, was furthermore assigned to each process team and their role was to govern and supervise the work of the process group as well as to diffuse successful work of each process improvement group. Staff working on targeted processes were encouraged and supported to be involved in LP. This meant that general involvement of managers and subordinates was limited to the targeted clinical processes. Visions for future development work by top managers included, to a greater extent, to support units with knowledge about process work and involve and spread knowledge to unit-level staff and managers.

### ***Stated rationales for strategy selection***

A main rationale mentioned for choosing LP as a model was the county council's wish to impact the process orientation of clinical work, that is, to integrate county council strategies for development work. The strategy was realized through implementing a standardized model of working with improvements in hospital C. Reasons for the implementation included motives of increasing the actual collaboration between clinical and strategic work. Thus, the main stated reasons for the chosen strategy selection included to strengthen the process orientation of clinical work through engaging clinicians in OD. Reasons for this, mentioned by some top managers and change agents, were mainly economical with positive 'bi-effects' on quality of care and work environment.

'[The reasons]... are to get a process-oriented county council. To get the right patients in the right place of the health care organization. [...] The economy is a main part. Motives are about economy, patients [quality of care] and staff [good work environment].' (Central change agent 6)



A strong hierarchal tradition and a strong wish for 'evidence-based steering' were described among top managers. This can be related to that processes first of all were selected for having a strong clinical relevance as well as to assign process owners from the top management as well as clinicians who were physicians.

### **Key actors' participation in the implementation of LP**

Overall, it can be noticed that when unit managers were interviewed about LP they were describing internal development going on in wards or clinics at a local level, and they were seldom relating to the county councils' LP work including the selected processes. The success of the different selected processes was described to differ, some of them being more successful than others. The work with processes was described by some key actors as maybe not so process oriented as the goal from the beginning. There were furthermore no clear descriptions among the interviewed persons how the process-oriented work could be diffused from the process groups to the whole hospital.

It was in this context, described among change agents, that it was harder than first thought to find best practice projects and to sustain the process-oriented development work, as it demanded efforts from many different actors and that a too limited number of unit managers and clinicians were involved in sustaining the LP processes. One process leader described furthermore how he felt that he could not lobby for the implementation of the work of the process group as much as he wanted, due to being overscheduled, but also due to the fact that this kind of engagement from his side would not be so accepted among his clinical colleagues. Several persons interviewed (including top managers and change agents) described that the county council region had a culture of not allowing persons representing professional groups standing out when it comes to engagement in OD.

Furthermore, one change agent criticized that the hospital was working with too many concepts at the same time, for example, six sigma, LP, and the county councils' 'own model.' This was thought to be confusing for employees and clinical managers.

Table V summarizes results from hospital C.

## **Results based on the survey questionnaire to employees**

### **Implementation strategies and participation among clinicians in the three hospitals**

The results from the questionnaire to employees showed that the implementation strategies in the different hospitals resulted in different patterns of reports of working according to LP. These results from the questionnaire are summarized in Tables VI and VII, and selected results of interest are presented in more detail below.

### **Reports of working according to LP among clinicians**

That hospital A's LP strategies had reached out to most employees was confirmed in the employee questionnaire as 99% of the employees reported working according to the

**Table V** Summary of implementation of strategies in hospital C

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**Context**

- Medium-sized, over 450-bed, public Swedish hospital serving a population of 250,000, located in a city
- County council has a relatively large influence over the hospital's development work
- Overall low maturity with process development, but high levels of experience with patient flow optimization and process visualization in some clinics

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**Strategies**

- County council's standardized model of process improvement
- Extensive education provided to county council's change agents
- To start with five clinical processes initially selected by the county council based on clinical relevance
- Assembled project teams, each led by a senior physician with knowledge of the process (process leader) and supported by change agents from the county council
- Use of process mapping in all projects, though other tools made available through change agents
- Use of steering groups at the county council level to govern, supervise, and diffuse the work of each process improvement group
- Staff working on targeted processes, though not all staff encouraged and supported to be involved in LP

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**Rationales for strategy selection**

- To implement the county council's model of process improvement to the hospital's clinical work
- To increase the hospital's cross-unit clinical process improvement efforts
- To engage clinicians in improvement work
- To increase efficiency, with improvements to quality of care and the work environment as by-products

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**Participation in LP**

- Descriptions of difficulty sustaining high degree of process orientation, particularly due to limited number of clinicians and unit managers available for each project
- 

principles of LP in their work unit at T1. However, reports of working according to principles of LP to some extent decreased in hospital A between T1 and T3 (see Tab. VII).

The results from the questionnaire confirmed that the LP strategies in hospital B were associated with increased working according to the principles of LP in their work unit among clinicians. This meant for example that the number of clinicians answering they were working according to the principles of LP increased from 46% to 71% between T1 and T2, indicating that the implementation of LP, as planned, had spread.

In hospital C the implementation strategies did not seem to impact the reports of working according to the principles of LP in their work unit as clinicians reported relatively unchanged medium levels of working according to LP (see Tab. VII).

The levels of working according to LP (see Tab. VII) were significantly higher at all three times of measures in hospital A compared to hospitals B and C.

**Key actors' participation and interest in LP**

In hospital A clinicians reported being rather/to a little extent interested in LP and these levels were unchanged over time (Fig. I). In hospital B clinicians reported to a great extent being interested in LP at T1 but this decreased to levels of being rather interested over time. In hospital C clinicians reported to a great extent/rather extent



**Table VI** Mixed models repeated measures of participation in LP based on the survey questionnaire to employees

Model	T1 LSM* (SE**)	T2 LSM* (SE**)	T3 LSM* (SE**)	Difference within group T1–T2 Over time Estimate (SE) <i>p</i> value	Difference within group T1–T3 Over time Estimate (SE) <i>p</i> value
Individual attitude to work with LP					
Hospital A	2.626 (0.073)	2.753 (0.143)	2.507 (0.112)	0.127 (0.171) 0.46	0.120 (0.142) 0.40
Hospital B	3.270 (0.103)	3.175 (0.143)	2.803 (0.136)		
Hospital C	3.351 (0.084)	3.124 (0.085)	3.026 (0.093)	0.094 (0.197) 0.63	0.467 (0.186) 0.01
Certain persons involvement in implementing LP					
Hospital A	3.899 (0.078)	3.808 (0.152)	3.466 (0.121)	0.091 (0.183) 0.62	0.4331716 (0.154) 0.01
Hospital B	3.606 (0.111)	3.434 (0.154)	3.179 (0.150)	0.171 (0.211) 0.4164	0.4267308 (0.205) 0.038
Hospital C	3.476 (0.091)	3.591 (0.091)	3.349 (0.100)	0.116 (0.146) 0.40	0.127 (0.138) 0.36
Top managements' engagement in LP					
Hospital A	3.051 (0.077)	3.152 (0.150)	3.277(0.117)	0.101(0.183) 0.58	0.226 (0.148) 0.13
Hospital B	3.991 (0.111)	3.627 (0.141)	3.654 (0.141)	0.364 (0.207) 0.08	0.336 (0.198) 0.09
Hospital C	3.152 (0.088)	3.304 (0.088)	3.371 (0.096)	0.152 (0.141) 0.28	0.219 (0.134) 0.10
Influence during change					
Hospital A	2.678(0.054)	2.844 (0.056)	2.712 (0.070)	0.166 (0.084) 0.05	0.145 (0.076) 0.06
Hospital B	2.546 (0.049)	2.521 (0.054)	2.612(0.076)	0.024 (0.079) 0.76	0.066 (0.092) 0.47
Hospital C	2.659 (0.052)	2.916 (0.050)	2.804(0.058)	0.257 (0.084) <0.01	0.145 (0.076) 0.06

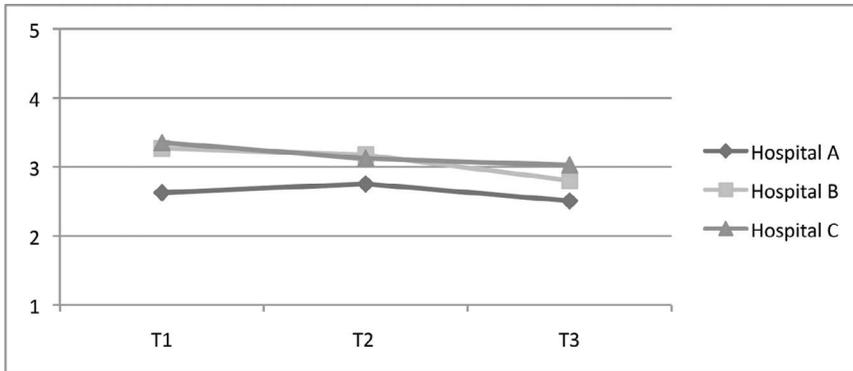
In each of the models different hospitals and time are explanatory variables.

\*LSM = Least Squares Means; \*\*SE = Standard Error

**Table VII** General participation in LP. Percentages of employees answering yes on the survey question 'Do you work with lean in your department/clinic?' at T1 (year = 2012), T2 (year = 2013), T3 (year = 2014)

	T1 (%)	T2 (%)	T3 (%)
<b>Hospital A</b>	99	95	89
<b>Hospital B</b>	46	71	67
<b>Hospital C</b>	65	69	60

**Figure 1:** Individual attitude to work with LP, based on the survey question ‘To what extent are you interested and committed to work with lean?’ at T1 (year 2012), T2 (year 2013), and T3 (year 2014). 1 = to a very little degree, 2 = to a little degree, 3 = partly, 4 = to a high degree, and 5 = to a very high degree.



being interested in LP and the reports decreased to some extent these levels over time. At T1 and T2 there were statistical differences in individual attitudes to work with LP between hospital A and hospital B (T1  $p < 0.01$ , T2  $p = 0.04$ ) with respect to hospital C (T1  $p < 0.0001$ , T2  $p = 0.20$ ). These differences remained statistically significant only between hospital A and C at T3 ( $p < 0.01$ ).

In hospitals A and B clinicians’ reports on certain persons being involved in LP decreased to moderate levels (to some extent) over time. In hospital C clinicians reported unchanged moderate levels of certain persons being involved in LP over time. To be noted is that in hospital A, which initially had change agents at unit level, 76% of the employees to a high degree perceived that certain persons were engaged in implementing LP. In 2014 this had declined to figures more comparable to the other hospitals (app 50%). There was only significant difference in reports of certain persons being involved in LP between hospitals A and B ( $p = 0.03$ ) with respect to hospital C ( $p < 0.01$ ) at T1.

In hospitals A and C clinicians reported that the top management was moderately (to some extent) engaged in LP and these reports were unchanged over time. In hospital B clinicians reported at T1 that the top management to a high degree was engaged in LP and there was a tendency that these reports were decreasing to moderate levels over time (ns). The differences between hospitals A and B were significant at all three points of measurements (T1  $p < 0.01$ , T2  $p = 0.03$ , T3  $p = 0.04$ ). The differences between hospitals B and C were only significant at T1 ( $p < 0.01$ ). All clinicians perceived low influence during change at T1. Between T1 and T2 these reports increased in hospital A ( $p = 0.05$ ) and hospital C ( $p < 0.01$ ) and were significantly higher compared to hospital B ( $p < 0.01$ ).

## Discussion

### Sustainable participation in the studied hospitals?

This study showed that the studied hospitals selected different strategies for implementing LP and the selection of strategies was influenced by differences in the hospitals’



maturity for process development, differences in resources and structures for OD, and differences in rationales for implementing LP (Tab. VIII). The result from the complementary quantitative analysis showed that the implementation strategies seem to result in different patterns of reports of working according to LP and interest in LP over time.

**Table VIII** Summary of the three hospitals' strategies for implementing LP and reports of working according to LP and interest in LP

	<b>Hospital A</b>	<b>Hospital B</b>	<b>Hospital C</b>
<b>Main categories describing choices of strategies</b>	To teach clinicians about principles of organizational development	Having as much impact as possible on development of clinical processes	A top-down structure for engaging clinicians in process orientation of clinical work
<b>Main content of implementation strategies</b>	Employment of change agents supporting health care professionals' work with LP at unit level	Education program mainly targeting managers and assessments of a major hospital-wide clinical process	Project teams working with hospital-wide clinical processes selected and supported by county council level
<b>Summary of results on clinician reports of working according to LP and interest and participation in LP over time</b>	High reports of working according to LP but unchanged low interest in LP over time among clinicians Reports on certain persons being involved in LP decreases over time Reports on top managements' involvement in LP unchanged over time Reports on influence in change during implementation of LP increase to some extent over time	Increased reports of working according to LP over time but the high interest in LP among clinicians decreased to some extent over time Reports on certain persons being involved in LP decreases over time Reports on top managements' involvement in LP tend to decrease over time Report on low and unchanged influence during change over time	Unchanged levels of reports of working according to LP and interest in LP over time Unchanged reports of certain persons and top managements' involvement in LP over time Reports on influence in change during implementation of LP increases to some extent over time

In hospital C reports of working according to LP were relatively unchanged following the implementation of LP strategies. Interviews with key actors indicated that the answers of the employee questionnaire also included internal work with LP, not related to the overall work with LP governed by the county council. It is probable that the county councils' strategies for LP have had a limited impact on clinicians' reports as the work by the county council governed process group was only diffused to a limited extent to unit level. The importance of local ownership of LP ideas for sustainable participation

can in this context be highlighted (Rahbek et al. 2011). To be further noted is that the interest in LP among clinicians was rather high but to some extent decreased over time in hospital C and that perceptions of influence in change to some extent increased between T1 and T2. The results from hospital C indicate that top-down strategies for LP focusing on improvements to some extent may support clinicians' reports of influence during change processes.

Hospital A's strategies included employing change agents coaching clinicians on LP at unit level. This resulted in 99% of the clinicians already at T1 reporting that they worked according to LP and the perceptions of influence in change increasing between T1 and T2. The results showed, however, that the chosen strategies of hospital A did not, over time, succeed in maintaining the very high levels of reports of working according to LP. Nor did they succeed in increasing the low interest in LP among clinicians. Not educating all managers in LP and not being able to gain the commitment of physicians may be contributing factors for hospital A not gaining sustainable participation in LP over time. A critical factor for sustaining OD following management concepts is champions promoting the implementation (Damschroder et al. 2009). Few champions for LP stepped forward in hospital A after the resources for change agents were reduced. Securing resources for replacing staff in work shifts was in another study shown to be a facilitating factor for staff participation in LP activities (Winkel et al. 2015). A more sustainable hospital-wide participation in LP in hospital A would probably also require more education and engagement of managers and physicians, as well as more support and follow-ups by the top management. The value of picking implementation leaders with similar professional backgrounds as the employees to be involved in LP processes has in this context been highlighted in previous research (Damschroder et al. 2009).

Hospital B had more of a top-down approach with high ownership of LP among important key actors including top managers within the hospital. Their strategies led to the fact that the number of employees working with LP significantly increased over time between T1 and T2. However, the interest in LP among clinicians decreased to some extent over time. The results may reflect a context of many cut downs, meaning that reports of working according to LP can be promoted by a top-down approach but the interest in development work like LP is decreasing in a context of economic pressure. Previous research confirmed that rationales of cutting cost have shown to be a hindering factor for employees in the public sector committed to LP (Rahbek et al. 2011). Top-down governed rationalizations within health care have, in other research, shown to be threatening employee health (Westgaard and Winkel 2011). Previous research has reported that when LP is implemented with a narrow focus on increased efficiency, there are risks of intensification of work, increased stress, and deteriorating health among employees (Genaidy and Karwoski 2003; Parker 2003), that is, the opposite to sustainable OD (Kira et al. 2010). It is in this context important to stress that hospital B was facing major cut downs independent of LP and that LP was implemented in order to mediate the negative effects of cut downs. Hospital B included initially, however only to a limited extent, issues of work environments in their strategies for LP and the clinicians reported low perceptions of influence in change. To include issues of employee health and to have a participatory approach can be seen as especially critical when dealing with potential negative effects of rationalizations (Westgaard and Winkel 2011).



## Implications for change management

It has been argued that LP does not fit health care, due to complex care processes and the existence of different rationalities. A more transformative approach to LP is, however, suggested, meaning that the implementation of LP is adapted to the special characteristics of health care (Nielsen and Edwards 2011). This study shows that such a transformative approach has already taken place, as all three hospitals have tried to adapt their LP strategies to their contextual challenges. However, what seems to be needed in all three studied hospitals is a more holistic approach to managing change. This includes that the extent of which LP in all three studied hospitals will contribute to long-term sustainable change probably depends on the degree of responsiveness and mutual adaptation of motives and strategies between different stakeholders, that is, top managers, middle managers, change agents, and clinicians. A classic error in transformative changes is to declare success too soon. To reach sustainable change the new behaviors and routines need to be institutionalized, incorporated in the culture, and secured over time (Kotter 1995). Overall, participatory approaches to change management have been described as one of the most important approaches for enhancing both productivity and employee well-being (Vink et al. 2008). All three hospitals in this study were chosen for initiating top-down strategies for LP. Winkel et al. (2015) studied the implementation of the lean tool value stream mapping in hospitals in three Nordic countries. They conclude that implementation processes pushed from top-down in general did not seem to work well for involving employees in change processes. In the research field of participatory ergonomics it is in this context argued that it is essential to secure participation among different organizational actors in the different implementation steps (Vink et al. 2008). Vink et al. (2008) argue that the top as well as the middle management first of all need to be involved and ensure improvement goals are in line with selected strategies in the early steps of planning change processes. The importance of involving middle managers as well as employees is stressed in the continuation of implementation as they best understand consequences on performance of the actual work (Vink et al. 2008). None of the hospitals had as a main strategy to approach unit managers during the implementation of LP. We have focused the implementation of LP at unit level of the hospitals in another study showing that workplaces having a higher degree of LP at operative levels also have managed to improve their work conditions (Dellve et al. 2015). It is probable that the unit managers had a crucial role for the change processes in these units. This research shows the importance of involving middle managers as they may reinforce strategies, allocate resources, effectively deal with resistance, and convince employees to participate (Dopson and Fitzgerald 2006; Mantere 2008).

## Method Discussion

Overall reports of LP were studied hospital by hospital in this study. A strength of this article is that a broad number of different key actors were interviewed for this study, representing many different views and perceptions of the different hospitals' strategies for implementing LP. Another strength is the repeated measurement over time, through several surveys, of clinicians' perception of the implementation of LP. However, the broad descriptions of this article can also be seen as a limitation as in-depth analysis of results

at workplace levels was not included. The hospital-wide strategies might impact perceptions about LP differently among different units and different professional groups. In-depth analyses of the results of the strategies are given in other papers (Dellve et al. 2015; Holden et al. 2015; Williamsson et al. 2016). The intended main contribution of this article was to give more general descriptions of the studied hospitals' implementation strategies.

## Conclusions

The three studied hospitals chose different strategies for implementing LP due to different contextual conditions and different reasons for why LP was perceived as important to implement. The hospital-wide implementation strategies seem to be related to employees' interest and participation in LP. The conclusion is that that strategies of employing change agents coaching clinicians at unit level contributed to high reports on working according to LP in hospital A, but more key actors in the hospital need to be involved for obtaining sustainable participation in LP. Further, in hospital B, a high ownership of LP among key actors, including top managers, led to increased reports of working according to LP over time, but the lack of participatory approach toward clinicians seems to have negative implications for their participation in LP. Lastly, a top-down approach focusing on clinical processes with high clinical relevance in hospital C did not seem to contribute to the implementation of LP, but may have contributed to increased perceptions of influence in change among clinicians during the first year of implementation. The results suggest many different actors at different organizational levels need to participate in LP in order to sustain and diffuse LP processes. Furthermore, broad motives including quality of care seem to be needed for engaging different professional groups. The importance of involving unit managers and finding local champions for LP can in this context be stressed.

## Message to the Practitioner

For successfully diffusing top-down implementation strategies it is important to gain implementation leaders and champions for LP at different organizational levels. It is important to plan for involvement of top management, unit managers, as well as different professional groups of clinicians in strategies for implementing LP. It can also be recommended to address aspects of work environment and to work with development work with high clinical relevance for obtaining sustainable participation in LP over time among clinicians.

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**Appendix I:** Themes for the qualitative interviews

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**(a) Local context**

- Person factors: Nature of staffing? Training? Unit-/hospital-specific personnel competencies and requirements?
  - Task factors: What are core production processes? Nature of patient demands? Unit-/hospital-specific task requirements?
  - Organization factors: Social architecture, age, maturity, size of unit/hospital? Budget resources?
  - Development/Improvement work: Previous experiences, ongoing program/projects?
  - Management structure? Unit-/hospital-specific structures, policies, or practices?
  - Environment factors: Unit culture? Hospital culture? Relations with other units? Physical environment? Work environment?
  - External factors: Market conditions? Relevant regulations, recommendations, or programs? Community issues (special challenges, local population health, and socioeconomic status)?
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**(b) LP implementation context\***

- Change programs (e.g., quality improvement projects) attempted in the past? Any projected change programs?
  - Goals ("Why?"): Why is LP being considered? What motivated initial interest in lean? Initial goals of LP? Who determined goals? Did goals change?
  - Content ("What?"): What are the plans for LP? What was the extent of LP? Which tools used? Which philosophies adopted?
  - Process ("How?"): How were decisions made? Who is given education in LP? Involvement of change agents? Nature of worker involvement? Involvement of leadership? Allocation of resources for lean (e.g., budget)? Challenges encountered? Maturity and extent of deployment for each implemented component of LP? Follow-up of results? Future plans for LP?
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\*Note: Based on P. Carayon, 2006, *Applied Ergonomics*, **37**(4), 525–535; L.J. Damschroder et al., 2009, *Implementation Science*, **4**(1), 1–15; J. Petterson, 2009, *The TQM Journal*, **21**(2), 127–142.