Leadership in Health Services

LEAN thinking in Finnish healthcare

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Abstract

Purpose – The purpose of this study is to evaluate how LEAN thinking is used as a management and development tool in the Finnish public healthcare system and what kind of outcomes have been achieved or expected by using it. The main focus is in managing and developing patient and treatment processes.

Design/methodology/approach – A mixed-method approach incorporating the Webropol survey was used.

Findings – LEAN is quite a new concept in Finnish public healthcare. It is mainly used as a development tool to seek financial savings and to improve the efficiency of patient processes, but has not yet been deeply implemented. However, the experiences from LEAN initiatives have been positive, and the methodology is already quite well-known. It can be concluded that, because of positive experiences from LEAN, the environment in Finnish healthcare is ready for the deeper implementation of LEAN.

Originality/value – This paper evaluates the usage of LEAN thinking for the first time in the public healthcare system of Finland as a development tool and a management system. It highlights the implementation and achieved results of LEAN thinking when used in the healthcare environment. It also highlights the expectations for LEAN thinking in Finnish public healthcare.

Keywords LEAN thinking, Finnish healthcare system, Healthcare process, Hospital services, Primary healthcare, Development tool

Paper type Research paper

1. Introduction

1.1 LEAN in healthcare

LEAN thinking (or LEAN management) is one of the latest management systems in healthcare (Mazzocato *et al.*, 2014). Originally developed in the car industry in the Toyota Production System (TPS), it focuses on customer value and smooth processes without "waste" (Ohno, 1988). There are positive expectations for LEAN thinking in medicine because it puts the patient first, reduces errors and gives healthcare professionals a chance to redesign their work in a more effective way without requiring extra resources (Mazzocato *et al.*, 2012, 2010). LEAN thinking is considered to be a tool

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set and management system, a method for continuous improvement, employee engagement and problem-solving (Spear and Bowen, 1999). Focusing on processes, it offers potential for solving some of the problems in healthcare management. Although the healthcare industry is considered to be slow in adapting to new management methods, there is evidence of increasing gradual diffusion of LEAN in healthcare (Langabeer *et al.*, 2009). The most common areas in healthcare LEAN implementations are in process-oriented functions, where the most important targets have been time-saving and queuing time (Hydes *et al.*, 2012; Mazzocato *et al.*, 2012, 2010; LaGanga, 2011; Niemeijer *et al.*, 2010). Another main target has been cost reductions and increment of productivity simultaneously (Mazzocato *et al.*, 2012; Niemeijer *et al.*, 2010). The third purpose behind LEAN thinking is to focus on quality and error reduction (Esain *et al.*, 2008). Fourth, LEAN thinking has been implemented with the aim of achieving better patient satisfaction (Hydes *et al.*, 2012). There are a growing number of research articles about LEAN thinking in healthcare. Literature reviews (Andersen *et al.*, 2014; DelliFraine *et al.*, 2010; Mazzocato *et al.*, 2010; de Souza, 2009) classify studies based on various criteria. Andersen *et al.* (2014) focus on finding evidence of the outcomes of LEAN by identifying the facilitating factors in LEAN initiatives, DelliFraine *et al.* (2010) classifies research articles based on the level of evidence, Mazzocato *et al.* (2010) focuses on dividing articles based on the area of application of LEAN and de Souza (2009) classifies articles by study criteria and purpose. The common interest of these literature reviews is to find out what kind of outcomes can be achieved by implementing LEAN thinking in various areas of healthcare and what the enabling factors for success in LEAN initiatives are. Although there is a lot in common amongst Western healthcare systems, the implementation of LEAN in Finnish healthcare is still unexplored.

1.2 The Finnish healthcare environment

Healthcare spending has been rising rapidly in developed countries (WHO, 2013). At the same time, people are ageing rapidly. According to the Ageing Report of the Commission of Europe (2012), there will be significant changes in age structure between 2010-2060 in the European Union. This will lead to a scarcity of healthcare resources. Finland is one of the fastest-ageing countries in Europe, and healthcare spending is rising faster than economic growth is able to withstand (Statistics Finland, 2012; Ryynänen *et al.*, 2006; Kukkonen, 2005). According to the Finnish Ministry of Social Affairs and Health (2012), there is a need for 235,400 new healthcare professionals in Finland during 2008-2025. Healthcare managers in Finnish healthcare are already facing a problem when recruiting new employees (Lammintakanen *et al.*, 2010).

Public healthcare represents most Finnish healthcare, and is intended for every Finnish resident, regardless of their ability to pay. It is organised on several administrative levels: state, province, region and municipality. The national political responsibility for healthcare is with the Ministry of Social Affairs and Health (MSAH). The Central Government does not regulate municipal health services in a detailed manner: rather, it steers and issues guidelines. Local democracy is strong, and with highly varying sizes of communities (the average size being approx. 6,000 inhabitants), this has resulted in various unit sizes that provide primary healthcare. A total of 20 hospital districts provide hospital services, and they are owned and funded by municipalities. Nevertheless, there are boundaries between primary healthcare and hospital services, as they are not under the same administration except for the province

of Kainuu. Also, healthcare financing comes from several sources, the main sources being state taxation and municipal taxation (Lammintakanen and Kinnunen, 2012). Because of the ageing population, challenges in recruiting professionals (Lammintakanen *et al.*, 2010) and increasing costs, there is a need to do more with fewer resources and a requirement to increase unit size in Finnish healthcare. The government agreed to vast social and healthcare reform in March 2014 to provide a larger unit size of public healthcare (Ministry of Social Affairs and Health, 2014). This led to a new challenge: organising and managing healthcare in Finland, especially in the public sector, which represents most Finnish healthcare delivery. Occupational healthcare complements public healthcare and is regulated by law, providing healthcare for people in working life. It focuses on promoting the working ability (Act on Occupational Healthcare, 2001). The funding comes mainly from employers and employees through taxation. Private providers are the third sector, which delivers both primary and hospital services and is funded both by patients and by the Social Insurance Institute of Finland (KELA).

1.3 Management in healthcare

The healthcare environment includes special challenges from the managing perspective. Some of these can be considered to be common healthcare-related managerial issues. The healthcare managerial level/middle management face multiple requirements in everyday work. These can include doing more with fewer resources, being under the constant pressure of regulatory bodies and facing an intense and complex working environment with the challenge of a negative climate. At the same time, there is pressure to develop the system and individuals working in various positions (Buchanan *et al.*, 2013; Lammintakanen *et al.*, 2010). Buchanan *et al.* (2013) considers healthcare middle management jobs in hospitals as extreme due to long hours, unpredictable work patterns, tight deadlines with a fast pace, broad responsibility and "non-stop availability" as well as mentoring and coaching responsibility. In this sort of environment, information overload and fragmented attention can contribute to errors.

In the Finnish healthcare system, management typically consists of two separate line organisations: nursing and medical. The overall management system is balanced scorecard-based or management by (financial) results. This results in problems in communication, the flow of information, and cooperation – because different professionals meet and share information at different meetings. As a result, frontline managers have difficulties in allocating resources in accordance with demand (Virtanen and Kovalainen, 2006). Powerful professional groups tend to be loyal to their own profession, although this does not support the idea of team formation and knowledge-sharing. Combining this with the limited number of healthcare professionals available in Finland leads to increasing challenges in human resource management (HRM), especially in primary healthcare (Lammintakanen *et al.*, 2010). Healthcare management groups focus mainly on processing information, financial issues and operations management. HRM issues are primarily handled elsewhere. This leads to a lack of focus in strategic thinking, innovations and development activities. At the unit level of line organisations, operative activities are often not in line with organisation-level goals (Viitanen *et al.*, 2011). There is a need to combine the flow of information, cooperation and HRM at all levels of healthcare management with

evidence-based, patient- and care process-oriented ways of organising healthcare – especially in the Finnish healthcare system, which is undergoing vast changes.

2. Theoretical framework

2.1 Common process-oriented management tools

There are numerous approaches for managing and developing processes as a part of the management system. These include Total Quality Management (TQM), Six Sigma (SS), LEAN Six Sigma (LSS) and LEAN. Common definitions for these approaches can be found in international journals (Table I). However, there is no exact, one-and-only definition for them.

2.2 LEAN as a management system

LEAN thinking has a long history with elements that have been developed in many organisations. Thus, there is no distinctive definition for LEAN thinking and LEAN management. Womack *et al.* (2003) define LEAN thinking as:

> LEAN, because it provides a way to do more and more with less and less – less human effort, less equipment, less time and less space – while coming closer and closer to providing customers with exactly what they want.

Graban (2012) defines LEAN as a tool set and management system, a method for continuous improvement and employee engagement, an approach that allows professionals to solve problems that are important to us as leaders and as an organisation. LEAN thinking can be defined from a historical perspective using approaches from different industries. Common definitions are found in Table II.

The implementation of LEAN thinking can be considered from numerous perspectives, although according to the literature review, the most interesting perspectives may be:

- how it has been deployed/implemented;
- what the depth of implementation is; and
- what the outcomes of LEAN in healthcare are.

Toussaint and Berry (2013) states that LEAN should not be considered as a programme – it is a cultural transformation that changes how organisation works. Andersen *et al.* (2014) found 23 factors enabling LEAN interventions; the most important being management and a supportive culture in the organisation, training, accurate data, physicians and team involvement. They suggest that characteristics and the local application of LEAN – in addition to strategic and cultural capability – need further attention when implementing healthcare quality improvement. Also, the readiness of the healthcare organisation contributes to the implementation of LEAN. Al-Balushi *et al.* (2014) determined that the ability to authorise a decentralised management style and undertake an end-to-end process view is directly related to the successful implementation of LEAN. There are also other enabling or disabling factors that influence the implementation and adaptation of LEAN: a professional culture for adaptation, which includes several reasons (Timmons *et al.*, 2014) and the complexity of care processes (Mazzocato *et al.*, 2014).

Table I.
Some of the most common management systems focusing on processes

Abbreviation	Meaning	Key elements	Definition	Origin
TQM	Total quality management	Leadership, management of people, customer focus, use of information and analysis, process improvement, strategic and quality planning	Management philosophy and methods aiming for increasing organisational performance	Manufacturing industry in Europe, USA, Japan and Australia (*Samson and Teriovski, 1999)
SS	Six sigma	Focus on customer expectations: DMAIC-cycle (define, measure, analyse, improve and control) Measurement of defects and errors, narrowing process variation, tools for performance management of outcomes, formalized infrastructure for implementation involving systematic training, roles and recognition, cultural change in organisation	A management concept that focuses on significant reduction of process defects, the improvement of quality, and customer perspective	Mid-1980 Motorola (*Langabeer *et al.*, 2009; McAdam and Hazlett, 2010)
LEAN	LEAN-thinking, LEAN-management	Standardize work, connect people and machines that are dependent on each other, create smooth processes, empower staff to investigate problems by using scientific methods	Tool set and management system:- method for continuous improvement, employee engagement and problem-solving	Toyota production system (TPS) (*Spear and Bowen, 1999; Graban, 2012)
LSS	LEAN Six Sigma	Combining the elements of Six Sigma and LEAN: DMAIC and PDSA (plan, do, study, act) Focus on doing the right things and doing the things in the right way		Toyota production system (TPS), Mid 1980 Motorola (*Langabeer *et al.*, 2009; Assarlind *et al.*, 2012)

Note: $*p \leq 0.05$

Definition	Detail
Toyota triangle (*Ohno, 1988)	LEAN is: an integrated system of human development technical tools management approaches a philosophy that creates a LEAN organisational culture
Two pillars (*Convis, 2007)	LEAN is: about total elimination of "waste" "respect for people"
"Fixing healthcare from the inside, today" (*Spear, 2005)	LEAN is: work designed as a series of ongoing experiments that immediately reveal problems problems addressed immediately through rapid experimentation solutions, that are disseminated adaptively through collaborative experimentation people at all levels of the organisation taught to become experimentalists
LEAN thinking principles (*Womack and Jones, 2003)	LEAN principles: specify value from the standpoint of the end customer Identify all the steps in the value stream, eliminating every step that does not create value Make value-added steps occur in a tightly integrated sequence, so work flows smoothly Let customers pull value Pursue perfection through continuous improvement

Table II.
Major definitions on LEAN

Note: $*p \leq 0.05$
Source: Adapted from Graban (2012)

According to Clark *et al.* (2013), there are two major elements in LEAN philosophy:

(1) data-driven continuous improvement of processes focused on the needs of the end user; and

(2) respect for the people delivering the service.

The level of implementation of LEAN in healthcare can be classified on the basis of approach and in-depth usage. It can be a major part of the whole healthcare system or organisation, where high-level executive decision-making defines the application of LEAN to all its management processes. It can also be applied in as a single service or care pathway within the healthcare system, or it can be a toolkit aiming to remove waste by experts from outside the organisation (Clark *et al.*, 2013).

The penetration of LEAN into healthcare and the results followed by implementation are somewhat confusing when still focusing on the level of evidence of the research done (Dellifraine *et al.*, 2010). Many studies are single-case studies and have narrow technical application and/or limited organisational reach (Andersen *et al.*, 2014). The implementation of LEAN and Six Sigma in hospitals has been studied with the goal being a theoretical perspective with the main focus on goal attainment, organisational commitment and organisational resistance. The level of measurement of goals in

financial terms or concrete metrics is not always clear (Langabeer *et al.*, 2009). It is known that both the commitment of top management and middle management are crucial success factors for implementing major organisational change (Manville *et al.*, 2012; Alänge and Steiber, 2009; Clark *et al.*, 2013; Toussaint and Berry, 2013). It requires resources from various levels of the organisation, time and effort to gain results in practice (Grove *et al.*, 2010). New roles and responsibilities of healthcare professionals in LEAN organisation culture result in a decentralisation of authority, and this may lead to challenges in LEAN implementation (Drotz and Poksinska, 2014). There is evidence that the best approach with regard to the results is to apply LEAN thinking in healthcare when it is applied as part of all management processes (Clark *et al.*, 2013). Because healthcare managers are facing multiple challenges from limited resources (Lammintakanen *et al.*, 2010; Foshay and Kumziemsky, 2014), a working environment that requires input from many professional groups (Sullivan and Williams, 2012) and conflicting priorities with tight deadlines (Buchanan *et al.*, 2013), there is a need for evidence-based real-time data and clear processes.

One of the key elements of LEAN thinking is finding out the root causes of problems, which requires accurate, real-time observational data collection (Graban, 2012). Traditional data collection methodologies in healthcare have been compared to observational data collecting methods closely aligned with LEAN thinking. Instead of management reviewing healthcare processes and making recommendations to the organisation on the basis of traditional data, data collected by shop-floor staff result in the a more apparent need for change and urgency. This kind of approach allows instant root-cause analysis, rapid feedback and a feeling of involvement amongst those who participated (Castle and Harvey, 2009). The findings of Andersen *et al.* (2014) also support this approach, as accurate data and team involvement were among the most important facilitating factors as enabling factors for the LEAN initiative. Because there is a need for real-time, evidence-based data in healthcare management, this may be an approach for further study. It also emphasises the idea that LEAN thinking may be a valuable tool in healthcare management – with local application and facilitating success factors.

3. Methods

For the background information, a literature review was made in most common healthcare databases with the following criteria:

- an article published after 2008;
- peer-reviewed;
- written in English;
- key words "LEAN" and "healthcare" in the abstract.

The results of the literature review (6/2013) resulted 220 hits. This was followed by a complementary literature review with ABI/Inform. Also, a snowball approach was used for supplementary articles. As a result of this process, a number of interesting papers concerning LEAN and healthcare were found (Table III).

Research process started from defining which healthcare units in Finland are big enough to have the potential to implement new care and patient process development

Table III.
Some interesting papers with different approaches to LEAN and healthcare

Author(s)/Year	Country	Design	Approach/perspective	Key findings
Al-Balushi *et al.* (2014)	Oman, Australia	Literature review	To determine readiness factors critical to application/success of LEAN operating principles in healthcare organisations	Authors found several commonly attributed readiness factors. However, successful implementation of LEAN required setting able to authorize decentralized management style and an end-to end process view
Andersen *et al.* (2014)	Norway	Literature review	To Identify factors facilitating intended outcomes from LEAN interventions and to understand when and how different facilitator contribute	23 factors enabling a successful LEAN intervention in hospitals were identified
de Souza (2009)	UK	Literature review	To provide a review of the existing literature on LEAN healthcare. To describe how this concept has been applied and to assess how trends and methods of approach in LEAN healthcare have evolved over the years	There seems to exist an agreement about the potential of LEAN in healthcare, but evaluation under more critical perspective is required from academics and practitioners about LEAN healthcare
Chiarini and Bracci (2013)	Italy	Research paper	To understand how and in what conditions the LEAN Six Sigma model might be adapted to healthcare context, with a focus on the issues around people and process	Three main issues were recognized: Institutional, cultural and technical
D'Andreamatteo *et al.* (2015)	Italy	Literature review	To identify empirical and theoretical articles published up to September 2013	LEAN is best understood as a means to increase productivity. Theoretical works have mainly focused on barriers challenges and success factors
Drotz and Poksinska (2014)	Sweden	Research paper/ case study	To contribute deeper understanding of new roles, responsibilities and job characteristics of employees in LEAN healthcare organisations	The implementation of LEAN had great influence on the roles, responsibilities and job characteristics of all employees. The focus shifted from healthcare professionals, where clinical autonomy and professional skills have been the guarding principles of patient care, to process improvement and teamwork
Esain *et al.* (2008)	UK	Research paper/ case study	To draw empirical evidence gathered from LEAN programme, focusing on 5S	Evidence from this case study suggests that both planned and emergent approaches to change will exist in an organisation, particularly when dealing with large, hierarchical structures associated with public services
Grove *et al.* (2010)	UK	Research paper	To present the findings of a 13 month implementation of LEAN in NHS primary care health visiting services from May 2008 to June 2009	The value-stream mapping (VSM) demonstrated that there were 67 processes in the original health visiting services. Analysis revealed that 65% of these processes were waste and could be removed

(*continued*)

Table III.

Author(s)/Year	Country	Design	Approach/perspective	Key findings
Langabeer *et al.* (2009)	USA	Research paper	Adaptation of LEAN and six sigma in healthcare industry–question of industry "fit"	Efficacy of quality improvement initiatives in healthcare may be impeded by the lack of goal clarity and measurement
Mazzocato *et al.* (2014)	Sweden	Research paper	To explain, how different emergency services adopt and adapt the same hospital-wide, LEAN-inspired intervention and how this reflected to in hospital process performance data	The complexity of care process influenced how access to care was achieved
Mazzocato *et al.* (2010)	Sweden	Literature review	To understand how LEAN thinking has been put into practise in healthcare and how it has worked	A wide range of LEAN applications was found. All (33) reviewed articles reported positive results
Niemeijer *et al.* (2010)	The Netherlands	Research paper/ case study	Reduction of average length of stay (LOS) in Trauma nursing Department of University Medical centre Groningen	The implementation of the improvement plan reduced almost 50% of the inappropriate hospital stay
Timmons *et al.* (2014)	UK	Research paper/ case study	To examine the implementation of LEAN methods in an ED and role of professions in this process	National policy, unique clinical environment and status of the professional project for doctors (in ED) led to more engagement and enthusiasm (to LEAN project) than usually reported in literature

methods/management systems. After the exclusion process, all 20 hospital districts and 15 major cities (primary healthcare) remained. These are shown in Table IV.

Because there was no previous literature available about LEAN and healthcare in the Finnish healthcare system, research questions had to be formulated based on existing international literature and the available data of Finnish healthcare. Therefore, the ideal approach to learn about LEAN thinking in Finnish healthcare was to compose open-ended research questions and try to gather specific information via a mixed-method approach, utilising both qualitative and quantitative data. There was:

- a need to categorise respondents on the basis of common knowledge about LEAN;
- a need for questions aimed at understanding expectations, usage and results of LEAN in healthcare; and
- a need to describe data about the use of LEAN.

There was a set of questions (both qualitative and quantitative), which were based on an assumption that no previous research had been one in the field of LEAN and healthcare in Finland. After many rounds of reprocessing, learning from theoretical frameworks of previous studies and from different approaches available, there was a set 28 of questions for a Webropol survey. These questions were evaluated by five professionals with a track record of developing healthcare processes with LEAN. Changes were made on the basis of comments by evaluators. One question was removed. The final changes were made after constructing a Webropol questionnaire, which ended as a triple pathway questionnaire – depending on what kind of answers were given for the first two questions (Figure 1).

To ensure an ethical approach to the research, all the healthcare units included were directly contacted by telephone to determine whether there was a need to obtain research permission. Also, a preliminary inquiry was made with regard to potential receivers of the Webropol questionnaire. The first-contacted professionals were mainly from the central administration or top management because development activities and research permission are monitored from there. Telephone inquiry resulted in more contacts, which were contacted by email or telephone and asked whether they knew more potential Webropol respondents. After gathering this information with the snowball approach, contact information was available consisting of 248 healthcare professionals from all levels of the organisation who worked directly with care and

Table IV. Healthcare providers/ units included in this study

Healthcare unit	Type	Name
Hospital district	Public/hospital services	South Karelia, South Ostrobothnia, South Savo, Helsinki ja Uusimaa, Itä-Savo, Kainuu, Kanta-Häme, Central Ostrobothnia, Central Finland, Kymenlaakso, Lappi, Länsi-Pohja, Pirkanmaa, North Karelia, North Ostrobothnia, North Savo, Päijät-Häme, Satakunta, Vaasa, Southwest Finland, Åland
City/community	Public/primary healthcare	Espoo, Helsinki, Hämeenlinna, Joensuu, Jyväskylä, Kemi, Kouvola, Kuopio, Lappeenranta, Lahti, Oulu, Pori, Tampere, Turku, Vaasa, Vantaa

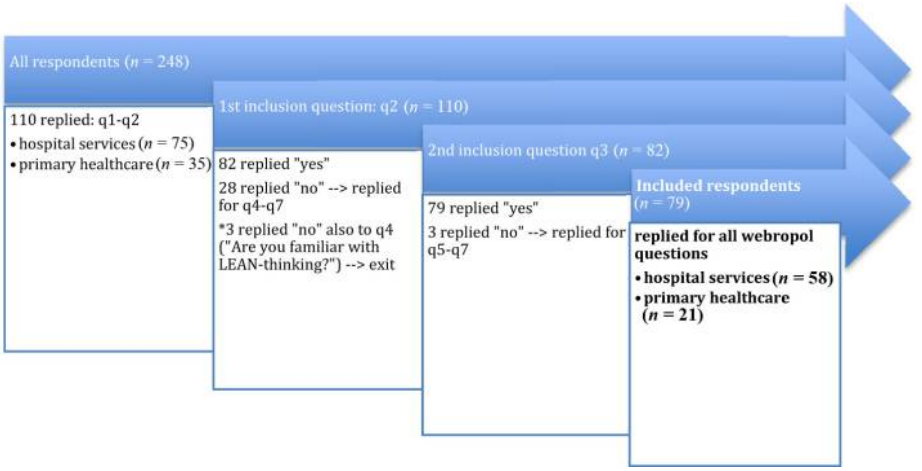

Figure 1.
Structure of Webropol questionnaire

patient process development. This provided enough knowledge to act as respondents in the Webropol questionnaire. Research permission was required and applied for from 15 hospital districts. No permission was required by five hospital districts and primary healthcare units, except for the City of Helsinki. The Webropol questionnaire (Appendix) was sent to recipients between February and June 2014.

After receiving all the Webropol answers, the data were gathered on an Excel sheet, and all questions were separately analysed and double-checked against the original data. Statistical analysis was completed using two commercial statistical software programs: Minitab 16 (Minitab 16 Statistical Software [Computer software]. State College, PA: Minitab, Inc.) and SPSS (IBM Corp. 2013, IBM SPSS Statistics for Windows, Version 22.0, Armonk, NY:IBM Corp). Minitab was used to run the chi-square test and SPSS was used to run Fisher's exact test.

4. Results

4.1 Response rate

The Webropol questionnaire was sent to 248 responders working in public healthcare. In total, 110 of them replied, which resulted in a total response rate of 44.4 per cent. The respondents represented hospital service organisations/public hospitals ($n = 75$) as well as primary healthcare organisations/healthcare centres ($n = 35$).

Further, 79 respondents replied "yes" to Questions 2 and 3, meaning that they had (or have had) at least one ongoing LEAN initiative focusing on the patient or care process in their organisation. The total number of responses varied from 57 to 79 on each of the following questions, producing a response rate of 22.9-31.9 per cent for the included respondents.

4.2 Common conspicuousness of LEAN

All respondents (110) considered developing healthcare processes as "very important (5)" (90 per cent) or "important (4) " (10 per cent) on a scale of 1-5. In Finnish healthcare, process development and process management LEAN methodology is often renamed to "fit" better in the healthcare environment. Therefore, there was a preword letter at the beginning of the questionnaire (Appendix). Of the total number of respondents (110),

three did not know what LEAN meant (replied "no" to Question 4 and who were excluded from the rest of the Webropol). Commonly used LEAN tools were well-known among both respondents groups:

- those who were included ($n = 79$) to answer for all Webropol questions; and
- those who ($n = 28$) only answered for the first seven questions (Figure 2).

Although awareness of LEAN methods was lower in the latter group, there was a similar trend, and statistical differences between the groups were not analysed. A total of 84.1 per cent of respondents believed that the greatest potential of LEAN in healthcare is in patient/care processes ($n = 107$), and even from the excluded respondent group ($n = 25$), 84 per cent reported that they considered launching a LEAN project/initiative in their organisation.

4.3 Differences between hospital and primary care organisations

Hospital organisations differ from primary healthcare organisations in certain features with respect to LEAN:

- the common conspicuousness of some LEAN tools (Table V);
- how or by whom LEAN is brought to the organisation (Table VI);
- whether or not there is a LEAN expert in the organisation (Table VI);
- what the most important advantage resulting from a LEAN initiative or project in healthcare has been (Table VII, described as disabling and enabling factors for LEAN); and
- what the main obstacles or challenges in LEAN initiatives/projects are (Table VIII).

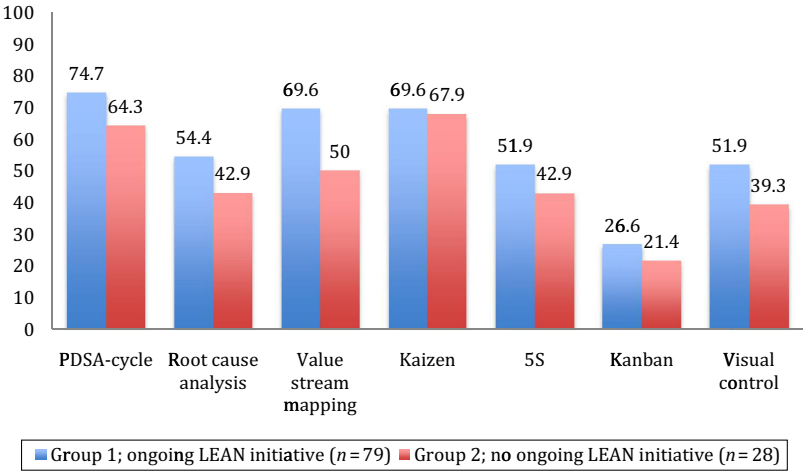

Figure 2.
Percentage of respondents who recognised LEAN tools/methods

Organization type	Root cause analysis	Value stream mapping	Kaizen	5S	Kanban
Hospital service organisation $n = 74$ (public hospital) vs Primary healthcare organisation, $n = 33$ (healthcare centre)	Chi-square = 7.058, $p = 0.008$	Chi-square = 15.227, $p = 0.000$	Chi-square = 17.427, $p = 0.000$	Chi-square = 6.236, $p = 0.013$	Chi-square = 4.873, $p = 0.027$

Note: Analysed with Minitab 16

Table V.
Conspicuousness of LEAN methods, differences between hospital and primary healthcare units ($n = 107$)

Table VI.
Implementation of LEAN in hospital – and primary healthcare organisations

Topic	Response	Public primary care (%)	Public hospital services (%)	*p*-value (statistical test)
When did you launch the first LEAN initiative or project in your organisation? Hospital organisation ($n = 57$) Primary healthcare ($n = 21$)	Less than three years ago	57.1	61.4	$p = 0.733$ (chi square test)
	More than three years ago	42.9	38.6	* Webropol response classes combined (1 + 2 and 3 + 4) for analysis
Most important reason to launch a LEAN initiative/project in your organisation? Hospital organisation ($n = 55$) Primary healthcare ($n = 19$)	Financial savings/increased productivity	52.4	61.4	$p = 0.149$ (Fisher's exact test)
	Better quality of care	19.0	29.8	* Excluded from analysis
	Better patient satisfaction	19.0	5.2	
	(Other)	(9.5)	(3.5)	
How many LEAN initiatives/projects have you implemented in your organisation? Hospital organisation ($n = 55$) Primary healthcare ($n = 19$)	1-5	78.9	60.0	$p = 0.111$ (Fisher's exact test)
	6 or more	21.1	40.0	
Who brought LEAN thinking to your organisation? Hospital organisation ($n = 56$) Primary healthcare ($n = 21$)	Doctor, nurse	4.8	30.4	$p = 0.077$ (Fisher's exact test)
	Supervisor/first-line manager	23.8	19.6	
	Middle management	28.6	12.5	
	Top management	19.0	23.2	
	Someone from outside the organisation	23.8	14.3	
How has LEAN been implemented in your organisation? Hospital organisation ($n = 58$) Primary healthcare ($n = 21$)	LEAN- thinking is used on a daily basis (management and methodology)	14.2	15.5	$p = 0.525$ (Fisher's exact test)
	LEAN-thinking is systematic, but not on a daily basis (only methodology)	4.8	13.8	
	LEAN thinking is part of a single process or process development (only methodology)	33.3	19.0	
	LEAN thinking is used in our organisation but not systematically	47.6	50.0	
	(LEAN thinking has been used, but not anymore)	(0.0)	(1.7)	* Excluded from analysis

Note: $*p \leq 0.05$

Topic	Response	Public primary care	Public hospital services	*p*-value
Did you require specific (measurable) targets when you initiated the LEAN project? Hospital organisation ($n = 57$) Primary healthcare ($n = 21$)	"yes"	71.4	54.4	$p = 0.175$ (chi-square test)
	"no"	28.6	45.6	
Did you achieve the required targets? Hospital organisation ($n = 31$) Primary healthcare ($n = 14$)	"yes"	35.7	16.1	$p = 0.143$ (chi-square test)
	"partially"	64.3	83.9	
	("no")*	(0.0)	(0.0)	* excluded
Do you consider your LEAN initiative/project to be successful? Hospital organisation ($n = 56$) Primary healthcare ($n = 20$)	"yes"	95.0	85.7	$p = 0.431$ (Fisher's exact test)
	"no"	5.0	14.3	
What has been the most important advantage resulting from the LEAN initiative/project for your organisation or unit?	Economic savings/better efficiency	33.3	50.0	$p = 0.023$* (Fisher's exact test)
	Better quality of care/error reduction	19.1	32.8	
	Better patient satisfaction	28.6	5.2	
	Other	19.0	12.0	

Note: $*p \leq 0.05$

Table VII.
Project targets, defining success and enabling factors

Table VIII.
Enabling and disabling factors for successful LEAN initiative/project, percentage of responses (n = 78/76)

Topic	Hospital organisation – enabling factors (%)	Primary healthcare – enabling factors (%)	Hospital organisation – disabling factors (%)	Primary healthcare – disabling factors (%)	p-value
Commitment of management/lack of commitment	23.2	21.4	11.3	2.9	$p = 0.571$ (Enabling factors) $p = 0.020$* (disabling factors) (Fisher's exact test)
Committed employees/lack of commitment	31.6	30.4	15.7	8.6	
Good financial resources/lack of resources	1.3	0.0	8.7	22.9	
Sufficient time resources/lack of time	11.6	10.7	33.0	5.7	
Sufficient training for LEAN/insufficient training	18.7	14.3	13.9	11.4	
Good flow of information/lack of information	11.6	16.1	14.7	5.7	
Other	1.9	7.1	2.6	14.8	

Note: *$p \leq 0.05$

Professionals working in the hospital environment seem to be more aware of root cause analysis, VSM, Kaizen, 5S and Kanban, and there is more often a LEAN expert working in the hospital organisation.

4.4 Implementation and usage of LEAN

Implementation of LEAN was the following:

- less than one year ago, 20.5 per cent;
- 1-2 years ago, 39.7 per cent;
- 3-5 years ago, 32.1 per cent; and
- more than 5 years ago, 7.7 per cent.

Answers were analysed with and without combining classes. There were no statistical differences between organisations. The most important data about implementation and usage of LEAN are in Table VI.

4.5 LEAN experts in healthcare organisations

Healthcare organisations have varying resources for implementing LEAN. More often, a specialised LEAN expert is available in the hospital organisation. A total of 84.2 per cent of hospital ($n = 57$) and 45 per cent of primary healthcare ($n = 20$) organisations had a LEAN expert ($p = 0{,}001$*, chi-square test). LEAN experts' educational background favoured practical education: 55.7 per cent of replies complied with either "practical experience of LEAN projects" or "self-studied" and 26.9 per cent of replies complied with either "certified LEAN expert" or "other formal education". A total of 17.3 per cent of replies complied with "not aware of".

4.6 Financial savings from LEAN initiatives and financial investments for LEAN initiatives

Financial savings and increased productivity are the most important reasons to launch a LEAN initiative or project in Finnish healthcare (Table VI). However, in 89.6 per cent of the responses, there were no data available concerning financial savings. Moreover, financial investments are small. According to the respondents, in 34.7 per cent of the responses, there was no information available with regard to the level of financial investment in healthcare organisations. A total of 25 per cent replied "no financial investment/done as a part of job". A total of 40.3 per cent of respondents replied that their organisation had invested in a LEAN initiative financially (more than €30,000, 11.1 per cent; €16-30,000, 15.3 per cent; €5-15,999, 8.3 per cent; and less than €5,000, 5.6 per cent).

4.7 Measurement success and defining targets for LEAN initiatives/projects

The measurement success of LEAN projects depends on how the project targets have been defined. Targets are not always specified and defining success is not clear according to respondents (Table VII). Of those who replied that specific targets had been required, all replied that required targets had been achieved at least partially. Almost all respondents considered that their LEAN project/initiative had been successful, even if no exact target had been defined. Economic savings and better efficiency were the most important advantages from the LEAN project/initiative: however, there was a statistical difference between hospital and primary care organisations ($p = 0.023$*) (Table VII).

4.8 Challenges of LEAN initiatives/projects

Enabling factors for LEAN initiative/projects share similar trends regardless of the respondent's organisation, the most important being the commitment of both management and employees. However, there is a statistical difference between hospital and primary healthcare organisations in disabling factors ($p = 0{,}020$*). When considering resistance to LEAN initiatives/projects based on a professional group (physician, nurse, other professional group related to patient care) or organisational position (supervisors, middle management, top management), 50.8 per cent replied that physicians and 20.3 per cent that nurses were most frequently against the LEAN initiative/project. The reasons for resistance were reported as:

- the will to maintain old ways of doing things (36.4 per cent);
- lack of information about LEAN (25 per cent);
- fatigue over development projects (21.2 per cent);
- discrepancies between professional groups; and
- other reason (4.5 per cent).

Only one (0.8 per cent) replied "negative experience from a previous LEAN initiative" (Table VIII).

5. Findings and discussion

5.1 Answers to research questions

This paper answers the questions:

RQ1. How LEAN thinking is used as a management and development tool in Finnish healthcare?

RQ2. What kind of outcomes have been achieved or expected when using it.

We found, as an answer to *RQ1*, that: LEAN is quite a new concept in Finnish healthcare and has not been implemented deeply. It is mainly used as a development tool to seek financial savings and improve efficiency. It seems that the Finnish healthcare system is following the international trend of the gradual diffusion of LEAN (Langabeer *et al.*, 2009). Because of a challenging demography (Commission of Europe, 2012), scarcity of resources (Ministry of Social Affairs and Health, 2012; Lammintakanen *et al.*, 2010), rising healthcare costs (Statistics Finland, 2012) and financing mainly obtained from taxation (Lammintakanen and Kinnunen, 2012), it is no wonder that efficiency and financial savings have been in focus. The majority of all respondents (85 per cent) in this study considered the development of patient and care processes important or very important. This reflects the pressures that Finnish public healthcare is facing.

Second, LEAN methodology is quite well-known. In the hospital environment, some of the LEAN tools are more familiar than in primary healthcare. There is also more often a dedicated LEAN specialist found in the hospital organisation. Regardless of this finding, there were no differences between organisations in the approach to how goals or success were defined when a LEAN initiative or project was launched. Often there were no specific, measurable goals defined prior to implementation of LEAN. These findings also support the fact that LEAN has just

begun diffusing into Finnish healthcare: it is not systematic, and neither has concrete metrics always been clear elsewhere (Langabeer *et al.*, 2009). Late diffusion of LEAN is also supported by the fact that most LEAN initiatives were started less than five years ago. LEAN methods are easier to adapt than LEAN as a complete management system or philosophy. LEAN interventions are described as social, complex and content-dependent (Andersen *et al.*, 2014). This challenges healthcare organisations in Finland when they use LEAN as more than just a toolbox.

In answer to *RQ2*, we found firstly that measurable outcomes (mainly financial) are not yet monitored systematically: the data are mostly lacking. This also refers to only partial implementation: LEAN with no facilitating or success-enabling factor in the form of accurate data (Andersen *et al.*, 2014). This is in line with another common assumption, i.e. only partial implementation of LEAN causes a lack of evidence for LEAN initiatives in healthcare. In other words, lack of evidence may be the result of partial implementation of LEAN. This may cause unwillingness to launch new LEAN initiatives, which is in opposition to one of the key elements of LEAN: finding out the root causes of problems, which again require accurate, real-time observational data collection (Graban, 2012).

Second, experiences of LEAN projects are encouraging. All the respondents defined LEAN initiatives or projects as successful. This may be a result of dedication to LEAN as part of a job instead of just taking part in a well-coordinated (possibly consultant-led) LEAN initiative. Implementing LEAN is known to have an effect on the roles of healthcare professionals (Drotz and Poksinska, 2014) and teamwork (Ulhassan *et al.*, 2014) in varying ways. According to the data from this study, this trend has been positive. Enabling factors for LEAN projects were seen to be the same in both hospital and primary care organisations, but disabling factors were regarded differently ($p = 0.020$*). There is a trend for LEAN to be brought to the hospital organisation more often by a physician or nurse, and in primary healthcare, this seems to be more a management or supervisor issue, but there is no statistical difference between organisations. This may have an impact on enabling and disabling factors that are experienced, and vice versa. Also, if there was a common resistance to development projects in the organisation, it was among physicians (50.8 per cent). The main reason was the will to maintain old ways of doing things. This is potentially caused by limited possibilities to influence development projects by physicians in cases when the development idea derives from another professional group. The focus on clinical autonomy is, for example, shifting to process improvement and teamwork in LEAN organisations (Drotz and Poksinska, 2014). However, LEAN initiatives in public Finnish healthcare are mainly carried out as part of the job, and for that reason, it can be assumed that multiple professional groups are already involved. This enhances teamwork, which is required in LEAN organisations.

Finally, expectations for LEAN are positive and there were no negative experiences from LEAN (except for one respondent). In this study, managing patient and care processes was seen as the area of LEAN with the richest potential.

5.2 Limitations of this study

Potential limitations of this study rise from:

- coverage – the assumption that only large healthcare units are implementing LEAN in patient and care processes may be wrong. There are still a huge number of smaller healthcare units excluded from this study.
- Despite the fact that the cover letter encouraged respondents to reply even in the case of no previous LEAN experience, respondents with LEAN experience are possibly more active respondents. This may rule some respondents out.
- In some cases, there were only one or a few respondents from an organisation, and, in some cases, there were many respondents representing the same organisation. This may result in over-representation of certain organisations, since all respondents were considered equally important.

6. Implications for practice/society

The Finnish healthcare system will undergo vast changes in the reorganisation of functions and finance. According to government plans, this will require new social and healthcare production areas instead of single community-provided social and health services. This instead puts pressure on the reorganising processes and functions of both social and healthcare since they are under the same administration and finance (Ministry of Social Affairs and Health, 2015). One of the planned incentives is saving money and making Finnish healthcare more efficient. There is evidence for the potential of LEAN as a management and development tool. In Finland, this may require a deeper and more systematic implementation of LEAN in healthcare and more educated LEAN experts especially in primary care organisations. Deeper implementation also requires better definition of success/goals, understanding of process metrics and measurement, which currently seem to be lacking. Financial investments are currently modest, which leaves us with a paradox of "no resources for saving resources". Most of those respondents (84.1 per cent) who had no previous experiences of the LEAN initiative are considering launching LEAN. This is an encouraging sign for LEAN supporters in Finnish healthcare, since the environment for LEAN is now ready in Finnish healthcare.

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Appendix. Webropol survey questions and instructions

WEBROPOL-questions.

There are many development initiatives going on in Finnish healthcare where LEAN thinking or methods are being widely used, but the concept of LEAN is renamed. In this Webropol, LEAN thinking or LEAN methodology means patient or care process-related methods or principles of LEAN thinking. These can be, for example, eliminating waste from a process and the principle of continuous improvement. Targets can be, for example, cost reduction, reduction of queues or better productivity in patient or care processes.

In this study, the patient or care process refers to a directly care-related activity (medical treatment procedures, nursing, sample collection or administering of medication) and organising staff, treatment and care. Healthcare support functions (laboratory, finance, housekeeping, etc.) are not included in this study:

(1) Do you have an ongoing (or have you had) a LEAN initiative(s) or project(s)? (Inclusion/exclusion question)
- Yes/No
- if 'no', webropol directs to questions number 3-7

(2) Does/Do the LEAN initiative(s) or project(s) focus on patient/treatment processes? (Inclusion/exclusion question)
- Yes/No
- If 'no', webropol directs to questions number 3-8

(3) How important do you consider the development of healthcare processes? 1-5 (1= low importance, 5= high importance)

(4) Are you familiar with LEAN thinking/LEAN management/LEAN methodology? (Inclusion/exclusion question)
- Yes/No
- If 'No', webropol ends. If 'yes', webropol directs to questions number 5-7

(5) Have you considered using LEAN methology/LEAN thinking in your organisation?
- Yes/No
- only for those who replied 'no' to questions number 1-2

(6) Are you familiar with the following LEAN methods: (choose those that you know something about)

a) PDSA – cycle (defining and solving problems: 'plan, do, study, act')
b) root causes (finding out the root causes of a problem)
c) value-stream mapping (describing customer value in a process map)
d) kaizen (or continuous improvement: Improving and aiming for better results in everyday activities)
e) 5S (methodology that aims for better coordination: 'sort, set in order, shine, standardise and sustain')
f) kanban (visual tool – often a card – aiming at, for example, better flow of material)
g) visual control (using visual codes, colours and markers, signal tapes, etc.)
h) None of the above

(7) In your opinion, where or in what healthcare functions does LEAN thinking/methology have the greatest potential?
a) healthcare support functions (laundry, accounting, transportation, general administration, etc.)
b) healthcare functions indirectly involved in patient processes (pharmacy, laboratory, etc.)
c) Patient processes/patient treatment processes
d) None of the above
e) other, where? (open answers)

For included respondents:

(8) Are you familiar with the following LEAN methods:
(choose those that you know something about)
i) PDSA – cycle (defining and solving problems: 'plan, do, study, act')
j) root causes (finding out the root causes of a problem)
k) value-stream mapping (describing customer value in a process map)
l) kaizen (or continuous improvement: Improving and aiming for better results in everyday activities)
m) 5S (methodology that aims for better coordination: 'sort, set in order, s hine, standardise and sustain')
n) kanban (visual tool – often a card – aiming at, for example, better flow of material)
o) visual control (using visual codes, colours and markers, signal tapes, etc.)
p) None of the above

(9) In your opinion, where or in what healthcare functions does LEAN thinking/methology have the greatest potential?
f) healthcare support functions (laundry, accounting, transportation, general administration, etc.)
g) healthcare functions indirectly involved in patient processes (pharmacy, laboratory, etc.)
h) Patient processes/patient treatment processes
i) None of the above
j) other, where? (open answers)

(10) When did you first launch a LEAN – project/initiative?
   a) More than five years ago
   b) 3-5 years ago
   c) 1-3 years ago
   d) Less than one year ago

(11) What was the initial reason for initiating LEAN in your organisation?
(answer only ONE of the following)
The need for:
   a) Financial saving/increasing productivity
   b) Better quality of care/fewer errors
   c) Better patient satisfaction
   d) Other – what?

(12) Who introduced the first LEAN – initiative/project in your organisation?
(answer only ONE of the following)
   a) member of the front line staff (nurse, physician, technician, etc.)
   b) supervisor level (chief nurse, chief physician, etc.)
   c) middle management (nurse manager, physician manager)
   d) Executive level/top management
   e) Somebody outside your organisation

(13) Do you have a LEAN expert in your organisation?
   • Yes/No

If 'yes', please also answer the following question:

(14) What is his/her educational backgroud for LEAN (choose that/those which describes it in the best way)
   a) LEAN education or certification
   b) related formal education at a general university or university of applied sciences (process engineering, etc.)
   c) 'Self-educated' by means of literature, seminars and in practice
   d) 'practical' learning (managing or taking part in LEAN projects)
   d) N/a

(15) How many LEAN initiatives/project have you had in your organisation? (for example, process optimisations with LEAN methodology)
   a) More than 10
   b) 6-10
   c) 2-5
   d) 1

(16) In your opinion, how has LEAN been implemented in your organisation?
   a) LEAN thinking is a part of our organisation's daily operations (management system and methodology)
   b) LEAN thinking is systematic, but is not included as part of daily operations/management (methodology)

c) LEAN thinking is part of process development (methodology)
d) LEAN thinking is used in our organisation but not systematically
e) LEAN thinking has been used, but is not currently in use

(17) What LEAN methods have you used in your organisation/unit?
(choose those that you have been using)
a) LEAN thinking as a management system
b) PDSA cycle (defining and solving problems: 'plan, do, study, act')
c) root causes (finding out the root causes of a problem)
d) value-stream mapping (describing customer value in a process map)
e) kaizen (or continuous improvement: Improving and aiming for better results in everyday activities)
f) 5S (methodology that aims for better coordination: 'sort, set in order, shine, standardise and sustain')
g) kanban (visual tool – often a card – aiming at, for example, better flow of material)
h) visual control (using visual codes, colours and markers, signal tapes, etc.)
i) Other, what?

(18) What is the amount of money invested in your LEAN initiative(s) or project(s)?
a) More than €30,000
b) €16–30,000
c) €5-15,999
d) Less than €5,000
e) No money invested/done in daily work
f) N/A

(19) What (if measured) is the amount of money saved with LEAN – initiative(s) or project(s)?
a) More than €500,000
b) €251,000–500,000
c) €101,000–250,000
d) €50,000–100,000
e) Less than €50,000
f) N/A

(20) Do you or did you require specific or measurable goals when initiating (when you initiated) a LEAN project?
- Yes/No
- If 'Yes', please answer the following question

(21) Did the project achieve its goals?
- Yes/No

(22) In your opinion, have LEAN initiative(s) or project(s) been successful in your organisation?
- Yes/No

(23) What is the most important benefit that LEAN thinking/mothodology has brought to your organisation?

a) Economic savings/better productivity
a) Better quality of care/fewer treatment errors
c) Better patient satisfaction
d) Other, what?

(24) What were the enabling factors for LEAN initiatives/project?
a) Committted management
b) Committed employees
c) Good financial resources
d) Enough time for projects
e) LEAN education
f) Good flow of information
g) Other, what?

(25) What were the disabling factors for LEAN initiatives/project?
h) Lack of commitment of management
i) Lack of committed employees
j) Good financial resources
k) Sufficient time for project
l) Sufficient training in LEAN
m) Good flow of information
n) Other, what?

(26) Which professional group (if it can be specified) was the least supportive of your organisation's LEAN initiative(s) or project(s)?
a) Nurses
b) Physicians
c) Other personnel involved in patient/treatment processes
d) Supervisors
e) Middle management
f) Executive management

(27) What are (in your opinion) the reasons for resistance to LEAN initiative/projects?
a) Tired of development projects
b) Lack of knowledge
c) The will to maintain old ways to do things
d) Discrepancies between professional groups
e) Negative experiences from previous LEAN initiatives
f) Other, what?

Respondent specifications:

(1) Speciality care
(2) Primary care

(3) Hospital district
(4) City
(5) Position
(6) Name

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