Expert-Identified Practices for Achieving Measurable Performance Improvements With Lean Implementation

Elina Reponen, MD, PhD; Thomas G. Rundall, PhD; Stephen M. Shortell, PhD, MPH, MBA; Janet C. Blodgett, MSc; Ritva Jokela, MD, PhD; Markku Mäkijärvi, MD, PhD, MBA; Paulus Torkki, DSc (Tech)

Background and Objectives: Despite the rapid spread of Lean management in health care, few organizations have achieved measurable overall performance improvements with Lean. What differentiates these organizations from those that struggle with realizing the potential benefits of Lean management is unclear. In this qualitative study we explore measuring the impact of Lean and the recommended practices for achieving measurable performance improvements with Lean in health care organizations. **Methods:** Informed by preliminary quantitative results from analyses of high- and low-performing Lean hospitals, we conducted 17 semi-structured interviews with Lean health care experts on the Lean principles and practices associated with better performance. We conducted qualitative content analyses of the interview transcripts based on grounded theory and linking to core principles and practices of the Lean management system. **Results:** The qualitative data revealed 3 categories of metrics for measuring the impact of Lean: currently used institutional measures, measures tailored to Lean initiatives, and population-level measures. Leadership engagement/commitment and clear organizational focus/prioritization/alignment had the highest weighted averages of success factors. The lack of these 2 factors had the highest weighted averages of biggest barriers for achieving measurable performance improvements with Lean implementation. **Conclusions:** Leadership engagement and organizational focus can facilitate achieving the organization's performance improvement goals, whereas their absence can considerably hinder performance improvement efforts. Many different approaches have been used to quantify the impact of Lean, but currently used institutional performance measures are preferred by the majority of Lean experts.

Key words: best practices, health care transformation, Lean health care, Lean implementation, performance improvement

The health care sector is faced with the enormous challenge of providing more cost-effective care to an aging population. The impetus for change is particularly acute in the United States where health care spending exceeds that of all other Organization for Economic Co-operation and Development countries, yet disparities in access to health care and health status by race and other socioeconomic factors remain significant problems.[1,2] An aging population and the rapidly expanding treatment possibilities of modern medicine combined with increasing health care costs are, however, universal to most developed countries in the world. To ensure high quality and access to care despite these challenges, health care organizations need to execute major reforms in service delivery and management. Many health care organizations are implementing transformational performance improvement initiatives developed in other service industries or manufacturing, one of the most popular being Lean.

Lean is a management philosophy with origins in the post–World War II automobile industry.[3] Lean focuses on improving customer value, eliminating waste, respecting people, and fostering a culture of continuous improvement. For a successful implementation in health care, however, Lean needs to be adapted to fit the extremely complex context of hospitals and other health care organizations.[4]

While some health care organizations have achieved sustainable performance improvements with Lean implementation, others have struggled, and the value of Lean management in health care has been questioned.[5] The inconsistent impact that Lean has had in health care organizations has been attributed to failure to be spread throughout the organization,

Author Affiliations: *Center for Lean Engagement and Research in Healthcare, School of Public Health, University of California, Berkeley (Drs Reponen, Rundall, and Shortell and Ms Blodgett); HUS Helsinki University Hospital, Helsinki, Finland (Drs Reponen, Jokela, and Mäkijärvi); and Department of Public Health, Faculty of Medicine, University of Helsinki, Helsinki, Finland (Dr Torkki).*

Correspondence: *Elina Reponen, MD, PhD, HUS Helsinki University Hospital, PO Box 900, 00029 HUS, Helsinki, Finland (elina.reponen@hus.fi).*

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the inherent complexity of health care organizations, and difficulties in explicitly defining the customer and value.[4,6,7] Other health care–specific factors that impact Lean implementation are a traditionally hierarchical culture[8,9] and a capacity-led design with limited ability to influence demand or to make full use of freed-up resources.[6] Furthermore, there is no consensus on the definition of success in the context of Lean implementation in health care. The Institute of Healthcare Improvement triple aim of simultaneously excelling in improving population health, delivering excellent experience of care, and reducing per capita costs is accepted by many organizations,[10] with others adding caregiver well-being, as a fourth dimension (the quadruple aim)[11] could potentially serve this purpose. In fact, metrics used to measure the impact of Lean implementation are highly variable among Lean health care organizations. In their systematic review, Moraros and coworkers[5] found that 15 of 22 included articles reported process metrics such as length of stay, door to needle time, no shows, or wait times. Only 4 articles reported health outcomes such as 30-day mortality, methicillin-resistant *Staphylococcus aureus* infections, or adverse events, and 3 articles reported both health and process outcomes. In their recent systematic review, Reponen and coworkers[12] proposed a conceptual framework of categorizing outcome measures to facilitate benchmarking in Lean health care with 4 main domains: patients, employed and affiliated staff, costs, and service provision. Of the 22 articles included in the systematic review, 16 used outcome measures related to service provision.

Lean practices cannot be simply spread. They have to be carefully applied to each organization's context.[13] Simply deploying a set of Lean tools and methods is not sufficient to achieve sustainable and transformational results.[6,14,15] Instead, case reports of successful Lean health care organizations suggest that these tools should be used as part of a comprehensive management system complemented by institutional culture change and new leadership practices.[16] The ways in which Lean implementation practices differ between health care organizations that have achieved success with Lean methods and those that have not have been poorly described in the existing literature.[17-19]

We aim to fill this knowledge gap by asking the following research question: Why do some Lean health care organizations thrive while others fail? Instead of the implementation of Lean itself or a hybrid design,[20] the focus of this qualitative study is on identifying the underlying reasons for the inconsistent results of implementing Lean initiatives in health care rather than directly assessing implementation itself.[20] We interviewed experts to identify the underlying reasons for inconsistent results of Lean initiatives in health care. Specifically, we address the following questions:

1. What do Lean experts consider to be the best metrics for assessing the impact of Lean in health care organizations?
2. What are the success factors and the biggest barriers to achieving measurable performance improvements using Lean?

METHODS

The Institutional Review Board at the University of California, Berkeley, reviewed and approved this study (protocol number 2016-11-9303). All interview participants gave their consent for data collection.

Selection of interview participants and gathering qualitative data

A purposive snowball sampling method enabled us to identify potential interview participants among the Center for Lean Engagement and Research co-chairs' network of Lean health care experts. The Center's Lean Healthcare experts include the President and Chief Executive Officers (CEOs) of leading Lean educational and consulting organizations in the United States, and quality and systems improvement experts working in leading hospitals, health systems, and clinics in the United States. Examples of positions held by these experts were CEO, Director of Quality, Chief Innovation Officer, and Senior Transformation Manager. The organizations they represented ranged from large academic medical centers to safety net health care organizations at different stages of the Lean journey. The only inclusion criterion was the interviewee's expertise in Lean health care transformation. The exclusion criteria comprised failure to contact the potential interviewee or the interviewee declining the invitation to participate. We first contacted 14 candidates by email, with a brief description of the project and main findings of the preliminary quantitative analyses described in more detail below. Ten of the 14 candidates responded giving their consent for the interview and were contacted again by email to schedule a 60-minute semi-structured telephone or in-person interview. One candidate identified an additional candidate, who also consented. After the first 11 interviews, saturation of concepts and themes was assessed through content analysis adhering to the principles of grounded theory described in more detail below, and additional interviews were deemed necessary. During the second round we contacted 8 new candidates, 5 of whom responded giving their consent. Again, 1 candidate identified an additional candidate, who also consented. After the interviews with the 6 additional participants were completed, saturation of concepts and themes was reached yielding a total of 17 interviews.

We used an interview guide with probe questions developed specifically for the purposes of this study (see Supplementary File 1, available at: http://links.lww.com/QMH/A75). Drawing on the Lean health care literature relevant to study questions, topic areas focused on (1) Lean activities and implementation strategies with positive or negative effects on performance measures and (2) recommended methods for measuring the impact of Lean implementation.

We used the results from preliminary quantitative analyses of performance on diverse outcomes of a large sample of hospitals using Lean (see Supplementary File 2, available at: http://links.lww.com/QMH/A76, and Supplementary Tables 1 and 2, available at: http://links.lww.com/QMH/A77 and http://links.lww.com/QMH/A78) in the development of the interview guide to probe specific elements of Lean that showed interesting trends or potential differences between the highest- and lowest-performing hospital quartiles. All interviews were conducted by a single interviewer (E.R.). With the participant's permission, each interview was audio-recorded for the purposes of subsequent verbatim transcription to allow for qualitative content analysis. The codes identified through reviewing the transcripts were reviewed by 2 researchers (E.R. and T.R.) independently, and an agreement about grouping the codes into themes was reached through reconciliation.

Qualitative analyses

The qualitative content analyses of all interview questions were done according to the principles of grounded theory, a systematic methodology commonly used in social sciences and organizational research.[21,22] Grounded theory uses inductive reasoning to identify recurrent concepts emerging from qualitative data, which are tagged with codes and subsequently grouped into themes.[23] In our analyses, the themes served to consolidate the responses of interview participants. In addition to inductive themes and categories based on the grounded theory approach, when appropriate we grouped responses into the existing widely used Lean conceptual framework of 4Ps: philosophy (long-term thinking), people (respect, challenge, and growing trust), process (waste elimination), and problem-solving (continuous improvement and learning).[3] We report percentages of responses that fall under each theme.

In 2 of the interview questions, the participants were asked to name 3 factors in order of importance. The first question asked for factors supportive of Lean-related performance improvement, and the second asked for barriers to it. After conducting content analysis to harmonize the codes into themes, we calculated a weighted rating for each theme for each participant, and assigned a weight of 3 for the theme they rated as most important, 2 for second place theme, and 1 for third place. We standardized the total score for each theme by dividing the sum by the total number of interview participants. The semi-quantitative calculation of weighted averages facilitated ranking the themes and summarizing the results. We categorized the general success factors and biggest barriers using 2 frameworks: the Lean conceptual framework of 4Ps[3] (philosophy, people, process, and problem solving) and 4 inductive categories (leadership and commitment, alignment and focus, culture, and tools, training, and processes) identified through the qualitative content analysis. We calculated the sums of weighted averages of factors in each category of the 2 frameworks.

RESULTS

Measuring the impact of Lean in health care organizations

When participants were asked to identify the optimal metrics for measuring the effect of Lean in 4 performance categories (patient outcomes, patient satisfaction, employee satisfaction, and financial performance), 3 types of metrics emerged: (1) currently used institutional measures such as the operating margin or the net promoter score (58.8%); (2) measures tailored to Lean initiatives such as waiting times to be seen by a doctor in the emergency department or speed of antibiotics for sepsis patients (41.2%); and (3) population-level measures such as risk-adjusted population-based quality of life measures or population-based costs (17.6%). Interview participants also proposed individual metrics such as readmissions and methods such as benchmarking (Table 1).

Identifying success factors and the biggest barriers to achieving measurable performance improvements with Lean

Each interview participant was asked to give their assessment of the strengths and weaknesses of the Lean implementation, as well as to provide examples of initiatives that resulted in measurable performance improvement in their respective organizations. Beyond their own organization, participants were also asked to list, in order of importance, 3 most important general success factors and 3 biggest barriers for achieving measurable performance improvements with Lean. The top 5 success factors and biggest barriers both locally in the participant's organization, and in general, are presented in Table 2. Both in the local context and in general leadership commitment and achieving focus/alignment were among the top 2 success factors, whereas the lack of these attributes ranked among the top 2 biggest barriers. The sums of weighted averages for 4P categories are presented in Figure 1a and for the inductive categories in Figure 1b.

The examples of specific Lean activities that can be linked to measurable performance improvements in the participants' organizations included focused

Table 1. Proposed Methods and Individual Metrics for Measuring the Impact of Lean

Methods	Individual Metrics
Measures that are aligned and relevant across the levels of the organization	Time: applicable to all 4 performance categories, "a currency of Lean"
Correlating Lean interventions to relevant metrics (n = 2)	Readmissions, metric of the success of the previous hospital visit (n = 2)
Benchmarking with similar organizations (n = 2)	Balanced measures, paired process, and outcome metrics (n = 2)

Table 2. General and Local Success Factors and Biggest Barriers

Success Factors		Biggest Barriers	
Top 5 Local	**Total Participants, % (n = 17)**	**Top 6 Local**	**Total Participants, % (n = 17)**
1. Daily management system, alignment, integration, and comprehensive implementation	58.8	1. Lack of focus, discipline, or accountability and unclear expectations	52.9
2. Leadership and communication	47.1	2. Leadership behaviors and lack of support	41.2
3. Respecting and empowering people	35.3	3. Sustainability	35.3
4. Perseverance and continuous improvement	35.3	4. Cultural change resistance and physician engagement	35.3
5. Individual Lean methods and tools including Gemba, visual management, value stream mapping, and standard work	35.3	5. Financial issues, policy-orientedness	17.6
		6. Shortcomings in Lean implementation, education, and communication	17.6
Top 5 General	**Weighted Average**	**Top 5 General**	**Weighted Average**
1. Leadership engagement and commitment	1.71	1. Lack of leadership engagement and commitment	1.35
2. Focus, prioritization, and alignment	1.06	2. Lack of focus, prioritization, and alignment	1.12
3. Baselining and measuring	0.53	3. Culture	0.53
4. Culture change	0.47	4. Not getting reliable data, people intimidated by data	0.29
5. People engagement and empowerment	0.41	5. Independent physicians, systems incentives not aligned	0.29

improvement projects or rapid improvement events (70.6%), new models of care or redesign of existing care models (47.1%), daily management system and Lean tools (47.1%), continuous improvement and PDSA (plan-do-study-act) cycles (35.3%), spreading best practices (29.4%), and behaviors, mindsets, and culture (17.6%). Four participants expressed, that rather than individual Lean activities, measurable performance improvements were attributable to the overall impact of Lean implementation.

Important elements for achieving measurable performance improvements with Lean

Thirteen (76.5%) participants indicated they believed there is a "secret sauce" (a key activity, attribute, or characteristic that elevates the Lean implementation to a success story) differentiating organizations that achieve measurable performance improvements with Lean from those that do not, whereas 4 participants (23.5%) were ambivalent. Figure 2 presents the suggested crucial elements for achieving measurable performance improvements with Lean.

We asked the interview participants to define the role and impact of the central improvement team, and the perceived consequences of the total or relative absence of one. The 2 most frequently mentioned roles of the central improvement team were educational (12 participants, 70.6%) and supportive (9 participants, 52.9%). All perceived roles of the central improvement team are summarized in Figure 3a. The most frequently mentioned consequence of having no or insufficiently resourced central improvement team was having no standards in improvement and being eaten up by operational priorities (Figure 3b).

When asked whether the number of units (departments, wards) doing Lean is an important contributing factor to measurable performance improvements, 12 participants (70.6%) responded positively, 2 (11.8%) negatively, and 3 (17.6%) were ambivalent. The most common reason supporting the importance of the number of units was critical mass, scope, and pace (35.3%). The importance of what is actually being done was used as an argument both by those who responded positively (17.6%) and those who responded negatively (11.8%). The number of units was also seen as a gauge of culture (11.8%). Furthermore, 2 participants (11.8%) expressed that an organization should go "all in" to truly bridge the silos.

Standard work was unanimously identified by the participants as a key to improving clinical outcomes and patient satisfaction. Possible mechanisms by which standard work improves clinical outcomes and patient satisfaction included improved efficiency and reduced variation (47.1%), ensuring consistent evidence-based practices (41.8%), and decreasing memory burden and freeing capacity to clinical problem-solving (17.6%). Five participants (29.4%) recognized that realizing the full potential benefits of standard work requires established ways of using, updating, and auditing the standard work. Four participants (23.5%) expressed that standards are fundamental for improvement: "without standards, there can be no improvement." Furthermore, 2 participants (11.8%) emphasized the importance of the

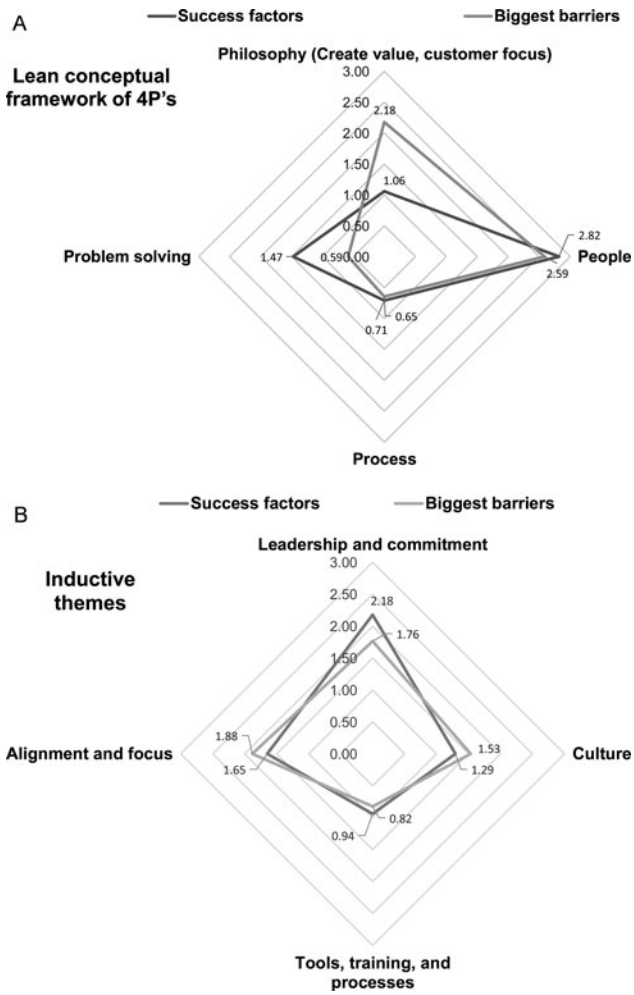

Figure 1. Success factors and biggest barriers for achieving measurable performance improvements with Lean. Weighted averages for Lean 4P (a) and inductive (b) categories.

work that goes behind creating and updating standard work.

DISCUSSION

Leadership engagement and commitment, together with organizational alignment, clear organizational focus, and prioritization, appear to be the foundation for achieving measurable performance improvements with Lean. Organizational alignment entails setting coherent goals that span all levels of the organization, whereas organizational focus involves selecting a limited number of goals and prioritization establishes the hierarchy among the selected goals. The absence of these factors may prevent the organization from reaching its performance improvement goals. Our findings are in line with previous research reporting leadership commitment and active support shaping outcomes of Lean initiatives and the importance of aligning the Lean initiative with the organizational mission.[16,24,25] Our results extend those findings by highlighting the importance of clear organizational focus and prioritization as additional key Lean implementation components.

The qualitative content analysis revealed that multiple different approaches have been used to quantify the effect of Lean implementation and to link Lean efforts with changes in performance metrics. The majority of Lean experts suggested that, in an ideal situation, the impact of Lean of initiatives should be reflected in the institutional performance measures. Establishing performance metrics may facilitate discussions but any savings achieved by adhering to Lean practices may not be immediately reflected in financial performance metrics since the freed resources may be used for investment elsewhere in the organization. Furthermore, participants voiced concerns about focusing too much on outcomes or focusing solely on costs instead of looking for improvement in processes of delivering care.

The success factors and biggest barriers for achieving measurable performance improvement with Lean implementation highlight the sociotechnical nature of Lean. These Lean implementation success factors are also consistent with the literature on the implementation of patient-centered medical homes and related initiatives to improve health care delivery.[26,27] While standardization, tools, and methods representing the technical dimension of Lean are important in Lean implementation, organizational culture, people, and communication representing the social dimension are equally important. Figure 1 illustrates the overlapping relationships between the social and technical elements of Lean, and the success factors and biggest barriers of achieving measurable performance improvements with Lean. In the 4 inductive categories, the weighted averages for both success factors and the biggest barriers were very similar, suggesting that the presence or the absence of these factors has an equally large effect on achieving measurable performance improvements with Lean. In the Lean 4P conceptual framework, however, the magnitude of People and Processes is equal in both success factors and biggest barriers, whereas Problem-solving is emphasized in success factors and Philosophy in biggest barriers, perhaps reflecting a mismatch between the principles of Lean and the prevailing organizational culture. Depending on the stage and chosen strategy for Lean implementation in an individual organization, one or the other of the 2 dimensions may be emphasized and the emphasis may change over the course of the organization's Lean journey. Achieving measurable performance improvement with Lean requires mastering both technical and social dimensions and finding a good balance suitable for the organization's scope and context. Interestingly, most of the elements identified in our study as components of the secret sauce that gives some organizations success with Lean implementation represent the social dimension of Lean.

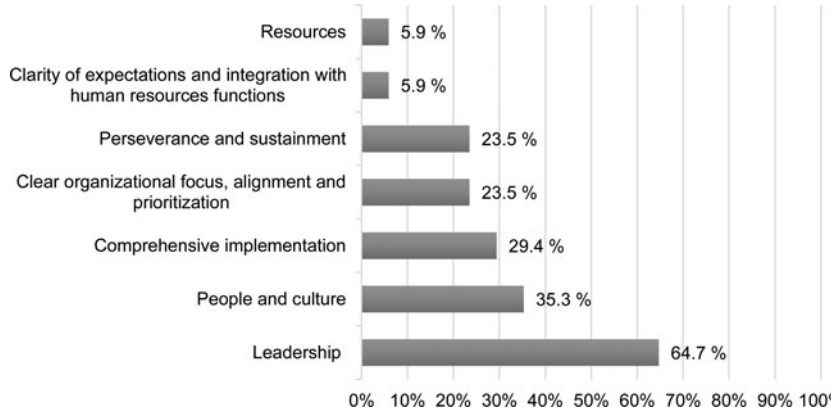

Figure 2. Suggested crucial elements for achieving measurable performance improvements with Lean. Percentage of the 17 interview participants who mentioned each individual element.

Strengths and limitations

The strengths of this study include drawing concepts from the existing Lean literature and using findings from preliminary quantitative analyses of Lean hospital performance in the development of the interview guide. Furthermore, the interview participants were highly experienced Lean health care experts from several states across the United States contributing to the relevance of the identified factors.

This study also has some limitations. First, the preliminary analyses that guided the development of the interview guide were based on 2015 performance data due to the unavailability of more recent data at the time. Second, the number of interview participants was limited (n = 17). However, recruiting participants continued until saturation of concepts and themes was reached. Third, the purposive sampling method may limit the generalizability of the interview participants'

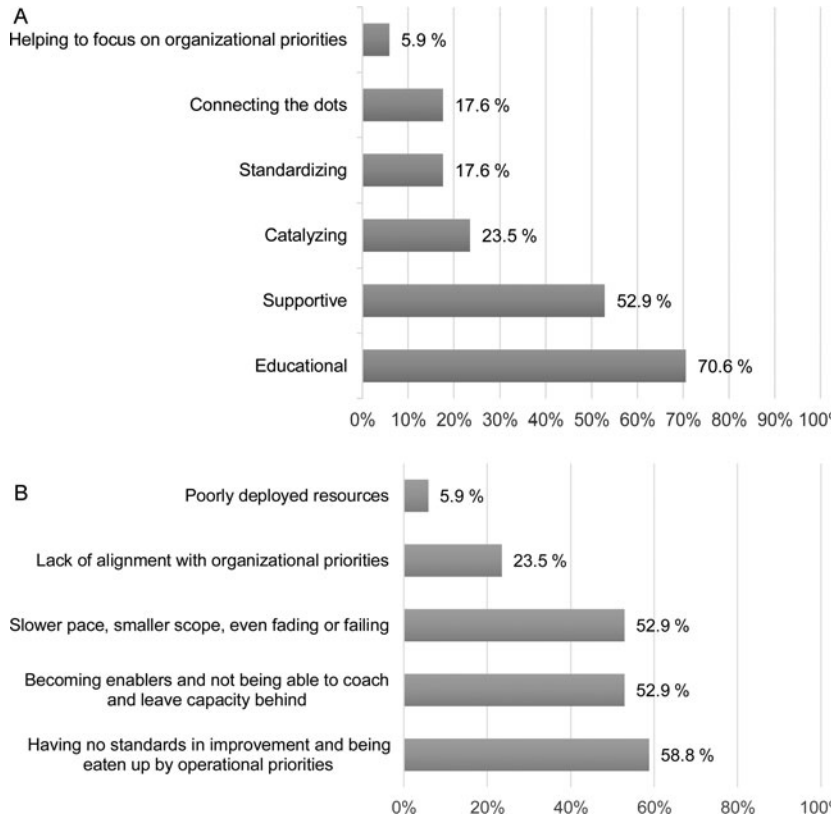

Figure 3. (a) Perceived roles of the central improvement team. Percentage of the 17 interview participants who mentioned each individual role. (b) Perceived consequences of having no or insufficiently resourced central improvement team. Percentage of the 17 interview participants who mentioned each individual theme.

views to other Lean health care organizations and selection bias cannot be excluded.

CONCLUSIONS

Leadership engagement and organizational focus can facilitate achieving the organization's performance improvement goals, whereas their absence can considerably hinder performance improvement efforts. Many different approaches have been used to quantify the impact of Lean, but currently used institutional performance measures are suggested by the majority of Lean experts interviewed in this study. The success factors and biggest barriers reported by Lean experts participating in the study revealed that both social and technical elements play an important role in achieving measurable performance improvements with Lean.

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