“Still Lost in Transformation? A Literature Review on the Scientific Support of Lean Health Care Transformations”

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Purpose – The purpose of this paper is to review the literature on Lean Transformations in health care settings to highlight research gaps and managerial implications. The focus of this paper is on research contributions concerning enabling factors among employees. In addition, the effects of Lean Transformations on direct and indirect patient outcomes are analyzed to identify research propositions for future studies.

Design/methodology/approach – A comprehensive review of the literature focusing on Lean Transformation in healthcare was conducted.

Findings – The majority of the analyzed papers describe successful case studies, yet they often lack robust generalizable evidence. The derived managerial conclusions are often not thorough and on a high level and lacking a clear description of the transformation process for an entire health care organization. Improvements for patients are typically defined by the Lean philosophy as the major goal of Lean Transformations. However, process-oriented outcomes, as indirect patient outcomes, are mainly addressed in studies on Lean Transformations.

Research Propositions – Based on the review, three main research propositions are identified. First, future research studies need to quantify the effect of Lean Transformations on key performance indicators of healthcare organizations. Second, we need to better understand how to conduct Lean Transformations and how the transformation path should be individually customized based on organizational characteristics, such as readiness for change. Third, we observe a research gap in how patients perceive and value the results of Lean Transformations.

Value – Based on the research gaps in contemporary publications, this paper develops three research propositions that will help the Lean community focus its future research efforts on topics with major implications for health care managers aiming to transform their organizations.

Keywords – Lean health care; transformation path; Lean enabling factors; patient focus; review.

Paper type – Literature review.
1 Introduction

The Lean concept

Lean Management is an approach that seeks to improve outcomes by focusing on process improvements and cultural changes. One key approach is the reduction of waste. Waste is defined as all activities and behaviors that do not create value for the customer (Emiliani 2006) The origin of Lean Management is the automobile industry. It was first established in the Toyota Company, which is why it is also known as the Toyota Production System (de Souza 2009; Nelson-Peterson and Leppa 2007). Lean Management contains strategic guiding principles as well as a wide range of tools at the operational level (Al-Balushi et al. 2014).

After succeeding in the production industry, Lean Management was adapted to other industries and also the service sector. In his analysis, de Souza (2009) concludes that the application of Lean Management to health care started in approximately 2002, approximately 10 years after other service sectors. In this context, the Lean philosophy adds value for the patient as the customer of health services. Value streams are identified and improved from the patients’ point of view. The main aims are to create a continuous flow for patients, reduce waiting times by establishing a patient-focused pull system and improve patient safety through the standardization of process steps and continuous improvement. As an additional benefit, the process efficiency improves, which leads to cost reduction (Cooper and Mohabeersingh 2008; Waring and Bishop 2010; Ben-Tovim et al. 2007). The health care staff is empowered not only to take good care of patients but also to continuously find new ways to improve their work (Poksinska 2010).

Lean Transformations in health care: The search for guidance

Today, there are numerous health care institutions worldwide that have introduced Lean initiatives (Lawal et al. 2014). The majority of the reported outcomes are positive (Poksinska 2010); therefore, authors such as Mazzocato et al. (2010) and Fine et al. (2009) come to the conclusion that the Lean philosophy has been successfully applied in health care. However, even today, authors such as Andersen (2015) criticize the lack of scientific evidence for the success of Lean initiatives in health care. Most of the papers describe isolated initiatives within a hospital, for example the improvement of an ER (Zane 2015; Dickson et al. 2009). This case study approach is valuable, and the benefits of Lean implementations seem highly credible. However, final, generalized proof of the appropriateness of the Lean philosophy as a strategic approach to change a whole organization is still missing.

A health care organization trying to implement Lean has to change the whole organization, which is much more than just stringing together sequential, isolated Lean interventions. The literature has coined the term Lean Transformation for this long lasting, integrated pursuit of operations excellence (Gagnon 2004). As with all long journeys, there is a need for guidance on the road ahead, especially given the strong evidence from industrial settings that most transformations fail (Losonci, Demeter, and Jenei 2011). Practitioners seek a “road map” to guide them in their Lean Transformation. Managers aspiring for their whole organization to become Lean require specific advice on topics such as Lean vision definition, strategy deployment, management systems, training requirements, organizational changes, and controlling structures. Insights in all these topics are required to design their own transformation plan. In her review of the Lean health care literature, Poksinska (2010) came to the conclusion that the
described implementation processes were underdeveloped and that the given examples were rather poor. Therefore, one of the main questions this paper wants to tackle is how well the current Lean literature supports practitioners’ need for guidance on Lean Transformation initiatives.

**Findings of previous Lean reviews and derived research gap**

We analyzed the existing reviews on the subject of Lean Transformation in health care settings, as shown in Table 1. Usually, these reviews focus on a general description of Lean concepts and tools that are applied to health care organizations or analyze either input or output factors in this context. Only Poksinska (2010) offers a comprehensive review of input and output factors in Lean health care.

<table>
<thead>
<tr>
<th>Review</th>
<th>Quantity of identified publications</th>
<th>Main focus</th>
<th>Main findings</th>
<th>Identified research gaps</th>
<th>Input/Output focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooper 2008</td>
<td>N.A.</td>
<td>General discussion of Lean aspects</td>
<td>Lean is a strategically important tool to improve cost effectiveness</td>
<td>None</td>
<td>Output</td>
</tr>
<tr>
<td>de Souza 2009</td>
<td>&gt;90</td>
<td>Evolution of trends and methods in Lean health care approach</td>
<td>Agreement about the potential of Lean health care in the literature</td>
<td>No critical perspective on Lean in health care</td>
<td>Output</td>
</tr>
<tr>
<td>Poksinska 2010</td>
<td>~30</td>
<td>State of implementation of Lean in health care</td>
<td>Lean in health care mostly used as a process improvement approach</td>
<td>No Potential advantages and disadvantages of Lean in health care</td>
<td>Input, Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Focuses on three main areas:</td>
<td>No critical perspective on Lean in health care</td>
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<td></td>
<td></td>
<td></td>
<td>• defining value</td>
<td>No empirical evidence</td>
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<td></td>
<td></td>
<td></td>
<td>• mapping value streams</td>
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<td></td>
<td></td>
<td></td>
<td>• eliminating waste</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Two outcomes areas:</td>
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<td></td>
<td></td>
<td></td>
<td>• performance of health care system</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>• development of employees and work environment</td>
<td></td>
<td></td>
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<tr>
<td>Holden 2011</td>
<td>18</td>
<td>The effects of Lean on ED work structures and processes, patient care, and employees</td>
<td>Improvement of patient care after implementation of Lean</td>
<td>No report of patient quality or safety outcomes beyond patient satisfaction</td>
<td>Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Few null or negative patient care effects were reported</td>
<td>Effects of Lean on employees rarely discussed or measured systematically</td>
<td></td>
</tr>
<tr>
<td>Al-Balushi et al. 2014</td>
<td>170</td>
<td>Readiness factors critical to application and success of Lean in health care organizations</td>
<td>Readiness factors</td>
<td>Importance of single readiness factors</td>
<td>Input</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Leadership</td>
<td>Necessity of factors being in place before Lean implementation unclear</td>
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<td></td>
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<td></td>
<td>• Organizational culture</td>
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<td>• Communication</td>
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<td>• Training</td>
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<td>• Measurement</td>
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<td></td>
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<td>• Reward systems</td>
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<td></td>
<td>• Decentralized management style</td>
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<td></td>
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<td>• End-to-end process view</td>
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</table>
Reviews targeting input factors mostly focus on the identification of enabling factors to facilitate the implementation of Lean methods. These include the commitment of the staff, the development of employees and the support of managers (Al-Balushi et al. 2014; Poksinska 2010). The outcomes of Lean in health care are mostly focused on process improvements through the elimination of waste, resulting in a reduction in waiting time for patients and a shorter length of stay (Al-Balushi et al. 2014; Poksinska 2010; Holden 2011). Additionally, Cooper and Mohabeersingh (2008) mention possible cost reductions using Lean methods.

A common finding is that there is a lack of evidence when reporting the effects of Lean health care. Outcomes are usually not measured sufficiently or are reported with speculation (de Souza 2009; Poksinska 2010; Holden 2011). Although patient centeredness is the main goal of Lean health care, patient-related outcomes are typically not measured or limited to the outcome patient satisfaction (Holden 2011). Finally, the existing literature usually does not mention disadvantages or provide a critical view on Lean health care (de Souza 2009; Poksinska 2010).

Most of the existing reviews are missing a holistic view of the subject that focuses simultaneously on inputs as well as outcomes. Reviews focusing on enablers as input factors are limited to identifying enablers. A detailed structural analysis is not provided. Patient centeredness as the main goal in Lean health care is not reflected in a sufficient way. To fill these research gaps, we provide an updated analysis of the literature concerning Lean Transformations in health care settings.

The paper is structured as follows. In the next section, we will describe our research design, which includes a literature search strategy and a framework to categorize and analyze the found literature. The third section presents the literature review results. The concluding section summarizes our results and presents three research propositions for future research.

2 Research design

Database search strategy

To close the research gap, we conducted an extensive literature research on the topic of Lean Transformation in health care settings. In recognition of the interdisciplinarity of this topic, we chose several databases, including databases focusing on business administration and medicine as well as interdisciplinary databases. The databases included were PubMed, ABI/Inform, Factiva, WISO and Web of Science Core Collection.

The search terms used in the databases were “Lean” in combination with “management”, “thinking”, “manufacturing” or “production”. We combined this with the term “transformation” or “change” and the terms “hospital*”, “healthcare” or “health care” (see Figure 1 for an example of the search algorithm). A quick scan of the abstracts of the papers reduced the approximately 850 hits to 314 papers worth reading. Additionally, we scanned the citations for further literature not found in our first search. After critically assessing the individual content of the papers, we reduced our analysis base to 86 scientific papers considered to have a high relevance to our research topic. We did not constraint our search by publication date (exception: Factiva). Our oldest remaining paper was from 2003.
Figure 1. Search algorithm for the ProQuest database.

Framework for paper analysis

The 86 identified papers were systematically analyzed with the help of a framework consisting of three parts: research approach, enabling factors, and outcomes.

To achieve additional insight into the research approach, we categorized the papers as either conceptual or case based. Case based papers have an inductive approach and extract their knowledge from the examination of real-life Lean implementations in health care settings (e.g., Dickson et al. 2009; Vermeulen et al. 2014; Mannon 2014). Conceptual papers deduce implications from theory and reviews of other scientific sources (e.g. Emiliani 2003; Young and McClean 2008; de Souza 2009). For the purpose of the analysis and to obtain clearer results, if a paper included both elements, we made a unique allocation to the more prominent category.

Regarding the enabling factors of Lean Transformations, Esain, William, and Massey (2008) state that additional research is needed to better understand them. Poksinska (2010) conducted a general review of the Lean implementation literature in health care. She identified three change enablers that are consistent with change enablers from any other change project: the commitment of the health care staff, the development of skills among the staff and support form management. This results are consistent with the framework used by Angerer and Früh (2013) in their analysis of Lean initiatives in Swiss hospitals. The concept is based on the fundamental theories of organizational psychologists such as Kurt Lewin (2012), which were further developed by German business psychologists such as Lutz von Rosenstiel (Rosenstiel, Molt, and Rüttinger 2005). The three enabling factors that determine the so-called PWE framework are Proficiency, Willingness and Empowerment.

- Proficiency describes the knowledge and skills of employees to analyze and improve operational processes. Health care staff members are already experts in providing health care services. The Lean approach requires them to also have a good understanding of process analysis and optimization. The goal is to enable them to apply their Lean knowledge in practice to improve the daily processes. Cross functional training has to be provided by Lean experts (Aij et al. 2013). This is a major challenge because trainers with knowledge on both Lean and the healthcare sector are scarce (Poksinska 2010).

- Willingness measures employees’ commitment and willingness to change. The goal is to have staff members that strive to find better ways to take care of patients (Poksinska 2010). Because top-down dictated transformations are more likely to fail (Bass 1999; Emiliani and Stec 2005), it is imperative that the staff members themselves drive the Lean implementation (Bushell and Shelest 2002). For this, the general resistance to change of staff members has to be taken into consideration (see, e.g., Oreg 2003; Pardo del Val and Martínez Fuentes 2003).

- Empowerment represents the style and quality of leadership as described in traditional leadership literature (e.g.,
Proctor and Doukakis 2003; Rosenstiel, Molt, and Rüttinger 2005). A study of Aij et al. (2013) stresses the crucial importance of leadership in removing barriers in Lean Transformations. They recommend several leadership actions and behaviors, such as role modeling the change to increase the success of Lean implementations.

For all three main factors, we derived a priori from the literature sub-factors to understand better the content of the papers. For Proficiency, we especially focused on the sub-factors Lean tools, process management and technology. For Willingness, we looked for preparedness for change and communication of change. Finally, for Empowerment, we focused on the factors leadership and human resources, organization and structure and project management.

In a nutshell, we believe that the PWE framework based on the theory of general transformation and organizational psychology fits well with the health care setting. It is worth noting that the most prominent enabling factor of Lean Transformations are the human resources, in this case, the health care staff members. Other factors, such as physical infrastructure and IT might also play a role, but in this paper that applies the PWE framework, we focus mainly on the human dimension of Lean Transformation enablers.

Finally, we completed our analysis framework to categorize the outcome of Lean Transformations. The central business model of hospitals consists in the treatment of patients to maintain or improve their health status. Therefore, the central outcome of health care service providers has to be directed to this value proposition (Young and McClean 2008). Taking a broader perspective, all actions and processes in a hospital are intended to contribute to patient care. In turn, the success of Lean Transformations aiming to improve the hospital process and organizational structures has to be proven by positive changes in value provision to the patient, as indicated by suitable outcomes (Betka 2012).

Outcomes can be categorized in how they directly target the provided value for the patient. In their study, Lawal et al. (2014) differentiate three levels of outcomes. Health system improvement outcomes include process measures, such as triage time, length of stay and wait time. Patient outcomes, as the second category, address the quality of patient care that is measured by indicators such as patient satisfaction, mortality rates and re-admission rates. Last, professional outcomes subsume employee-related outcomes, such as employee satisfaction. The close look at the categorization by Lawal et al. (2014) reveals that the provided value for the patient can be indicated by the patient outcomes. The two other categories include outcomes that only indirectly contribute to patient value. For the purpose of reviewing the literature on patient outcomes, we therefore categorize the papers found in our literature search based on whether they address patient outcomes at all and, in greater detail, whether the studies directly or indirectly address patient outcomes. This framework facilitates the analysis of how these papers demonstrate the success of Lean Transformations using the effect on patient value. Therefore, we take a more structured approach than in the review of Poksinska (2010), for example. Moreover, we define direct patient outcomes as those indicating the output of Lean Transformation from the perspective of the patient, measured by indicators, such as patient satisfactions, complaints and word-of-mouth, whereas all other processual, structural and patient quality outcomes are defined as indirect patient outcomes. We advance the view that Lean is a set of operating philosophies and methods that help create a perfect patient journey (Goodridge et al. 2015). Therefore, the value for the patient can be directly
perceived by the patient within and after the patient journey.

3 Results

Overall results

The overall distribution of the papers reviewed by this research approach is depicted in Table 2. Two thirds of the 86 papers could be categorized as case based, whereas one third were categorized as conceptual. This confirms De Souza’s (2009) statement that Lean implementations outnumber the currently available literature. Because Lean Transformation in healthcare is a relatively new research field, the research still focuses very heavily on the examination of existing case studies. Intensifying the theoretical base of Lean research can be interpreted as imperative.

Table 2. Reviewed paper by research approach.

<table>
<thead>
<tr>
<th>Paper approach</th>
<th>n</th>
<th>As %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case based papers</td>
<td>56</td>
<td>65%</td>
</tr>
<tr>
<td>Conceptual papers</td>
<td>30</td>
<td>35%</td>
</tr>
<tr>
<td>Total all papers</td>
<td>86</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 3 gives an overview of the content analysis of the papers. It depicts the number of papers found for the enabling factors of our PWE framework and the outcomes. In the following two sections, we will discuss these findings in detail.

Research contributions concerning the enabling factors of Lean Transformations

The first enabling factors in our model is Proficiency (the knowledge of Lean and process optimization). With 35 papers (41% of all 86 papers), this factor was the second largest. This result is not surprising because understanding the Lean tools and concepts is key for any Lean Transformation. Table 4 shows the detailed breakdown of these 35 papers into the aforementioned sub-factors. As one paper can tackle several sub-factors, the sum of the sub-factors is larger than the total of 35 papers.

Table 3. Number of papers by enabling factor and outcomes.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Total</th>
<th>As % of all papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabler 1: Proficiency</td>
<td>35</td>
<td>41%</td>
</tr>
<tr>
<td>Enabler 2: Willingness</td>
<td>39</td>
<td>45%</td>
</tr>
<tr>
<td>Enabler 3: Empowerment</td>
<td>29</td>
<td>34%</td>
</tr>
<tr>
<td>Outcomes</td>
<td>13</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Total all papers</strong></td>
<td><strong>86</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Note: One paper can include several factors; therefore, the sum of all factors is larger than 100%.
Table 4. Number of papers by enabling factor and outcomes.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Total</th>
<th>As % of all papers</th>
<th>As % of all papers</th>
<th>As % of all papers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Conceptual papers</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Enabler 1: Proficiency</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lean tools</td>
<td>32</td>
<td>37%</td>
<td>6</td>
<td>7%</td>
</tr>
<tr>
<td>Process management</td>
<td>14</td>
<td>16%</td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td>Technology management</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0%</td>
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<tr>
<td><strong>Enabler 2: Willingness</strong></td>
<td></td>
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<tr>
<td>Preparedness for change</td>
<td>38</td>
<td>44%</td>
<td>9</td>
<td>10%</td>
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<tr>
<td>Communication of change</td>
<td>2</td>
<td>2%</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Enabler 3: Empowerment</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Leadership and HR</td>
<td>20</td>
<td>23%</td>
<td>8</td>
<td>9%</td>
</tr>
<tr>
<td>Organization and structure</td>
<td>12</td>
<td>14%</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>Project management</td>
<td>3</td>
<td>3%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct patient outcomes</td>
<td>7</td>
<td>8%</td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td>Indirect patient outcomes</td>
<td>11</td>
<td>13%</td>
<td>5</td>
<td>6%</td>
</tr>
<tr>
<td><strong>Total all papers</strong></td>
<td>86</td>
<td>100%</td>
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</table>

Note: One paper can include several (sub-)factors; therefore, the sum of all (sub-)factors is larger than 100%.

As expected, Lean tools had 32 identified papers (37%) by far the largest sub-factor. Tools have a strong appeal to practitioners as they are easily understood and communicated. Therefore, they are often focused on in papers. This finding is supported by the fact that the vast majority of the tool-papers have a case based approach. However, there is always the inherent danger to reducing the Lean philosophy to its tools. Many authors stress the importance of Lean being much more than just a toolbox (Mazur, McCreery, and Rothenberg 2012). The tool most frequently mentioned was value stream mapping (19 papers), followed by 5-S (12 papers) and gemba (6 papers). Value stream mapping was also the most mentioned tool in Poksinska’s (2010) review. More surprising is gemba being in third place because this Lean approach does not appear at all in Poksinska’s analysis. The second largest sub-factor analyzed was process management (14 papers, 16%), including all papers that deal in general with the importance of planning, designing and improving the business processes of the health care organizations. Papers in this category frequently stress the importance of observing, improving and standardizing processes. The process management content is congruent with the typical approach found in the classic Lean literature (Rother and Shook 2003; Womack, Jones, and Roos 1990). Somewhat astonishing is the complete lack of publications dealing with technology. Although most Lean experts would agree that technology (like IT software) does not play a major role in a Lean Transformation, having not a single
paper dealing with this topic is a strong indication of a research gap. Because technology plays a stronger role in the later phases of a Lean Transformation, this finding could be an indicator of the overall lack of maturity of health care organizations implementing Lean.

The second enabling factor in our PWE-framework, Willingness, had the highest count of papers. This outcome is in alignment with the literature, which frequently mentions that becoming a Lean organization is foremost a cultural challenge (Mazur, McCreery, and Rothenberg 2012; Wellman, Jeffries, and Hagan 2010). Therefore, it seems reasonable to observe 39 papers (45%) dealing with this factor. The Lean philosophy states that the transformation must not be a top-down project, but rather it must be supported by all employees (Liker and Convis 2011). Each individual is expected to adopt an attitude of continuous improvement and support the new way of working. Because resistance in the adoption phase has been frequently reported (Waring and Bishop 2010; Breuer 2013), the change management aspect is of major importance. The sub-factor preparedness for change includes papers that address the understanding of the resistance to change among staff employees and how to overcome it. Almost all of the Willingness papers focused on this topic (38 papers, 44%), yet most of them (29 out of the 38) were again based on case studies. We also checked papers in this factor for a key hypothesis found in change literature, i.e., that leadership’s communication of change is key for the success of such projects (Al-Balushi et al. 2014). For example, Kotter’s change management approach has the communication of the new targeted vision as one of its 8 key steps for a successful transformation (Kotter 2011). However, only 2 papers (2%) addressed this key topic. The authors of this paper see a major opportunity for further research in this context.

The third enabler of the PWE framework is Empowerment, meaning the management aspects of a Lean Transformation. With 29 papers (34%), it is the least represented field. From a practitioner’s point of view, this is regrettable because the “Raison d’Être” of management research is to help companies’ leaders solve their business problems by giving them a solid knowledge basis (Ulrich 1970; Rüegg-Stürm 2015). The largest sub-factor identified in the field of Empowerment addresses the complex topic of leadership and more practical aspects in human resource management (liker staffing). Leadership in health care organization is viewed as one of the most difficult challenges for managers (Sellgren, Ekvall, and Tomson 2008) and, at the same time, it is a key for project managers’ success (Geoghegan and Dulewicz 2008). Therefore, seeing 20 papers (23%) dealing with this topic supports the theory well. The split between conceptual papers and case based papers is more balanced in this sub-factor. However, the content of the theoretical approaches discussed do not differ from traditional change leadership theory. We did not find any significant theoretical inputs to new theory on Lean health care transformations.

A health care organization committing to introducing Lean is a major endeavor that transforms many aspects of the organization. We further analyzed two sub-factors in the Empowerment factor to better understand this challenge. On the one hand, we wanted to see if the Lean initiative meant changing the structure of organization itself (e.g., changes in the formal or informal structure of the health care organization, such as establishing a Lean competence center). On the other hand, we counted how many papers looked at the transformation process itself from a project management perspective. Few papers look at the organization and structure impact (12 papers, 14%), and almost none adopt the project management perspective (3 papers, 3%). These low results might
reflect the novelty of the topic and therefore the lack of a broad research base. Only very few hospitals have started a full Lean Transformation. Most of the papers dealt with hospitals still in the pilot phase, where isolated sub-units experimented with Lean. Thus, there is very little evidence on how to design the whole transformation project and how to structurally change the organization. This is unfortunate because researchers can extrapolate lessons from other industries that have already endeavored for complete Lean Transformations and help managers in health care organizations. As more and more hospitals start their Lean Transformation, we hope that more researchers approach this topic. Lean Transformation is complex and requires a high skill level in project management. This can be observed in the existing Lean Transformations we personally examined. For example, Seattle’s Children Hospital has had to coordinate dozens of improvement initiatives over the last few years and train every one of their 5,900 employees. Advanced project management skills are required to accomplish this.

**Research contributions concerning the outcomes of Lean Transformations**

A second focus in categorizing the identified studies was exploring the range of outcomes that are addressed. Of special interest are outcomes that directly assess how patients perceive and value the results of Lean Transformations within their patient journey in health care organizations. The rationale behind this is that the Toyota model of Lean Management focuses not only on how efficiently resources are used but also on what value is added for the customer in every process (Lawal et al. 2014). Applied to the context of health care, Lean Transformations should result in maximum value for patients by reducing waste and waits (Lawal et al. 2014). However, the term “value for the patient” is very broad and may include actions that improve qualities that directly but also indirectly benefit the patient. The literature search reveals that only 13 papers (15%) actually address the outcomes of Lean Transformations (see Table 3). This is the case even in those papers describing a case study of a Lean Transformation. This is in line with the finding of Poksinska (2010), who criticizes the lack of research on outcomes from Lean implementations. Analyzing the 13 papers that address outcomes, we count 11 papers addressing indirect and only 7 papers addressing direct patient outcomes (see Table 4). This result illustrates that research in the field of Lean health care mainly discusses the effects of process outcomes such as time to doctor, waiting times and process durations because they are directly affected by the transformational changes. Only a minority of papers analyze whether the Lean Transformation had an effect on patient value as indicated by direct patient outcomes. Patient satisfaction was found to be the only direct patient outcome that was addressed in the sources we reviewed. Most of these papers found positive effects on patient satisfaction. However, Holden’s (2011) description of the Lean implementation in 15 emergency departments in the United States, Australia, and Canada provides different result. In the 15 emergency departments, patient satisfaction was not or was even negatively affected by the Lean implementation. Taking into account the difficulties associated with the measurement of the causal effect of Lean on patient satisfaction, we assume that conceptual papers about Lean Transformations should at least mention the relevance of direct patient outcomes. However, only four conceptual papers (5%) have a section where direct patient outcomes are discussed. Overall, we conclude from our review that there is a lack of research on the effect of Lean Transformation on relevant outcomes, especially direct patient outcomes.
4 Discussion and Research Propositions

Discussion of overall results

Overall, we can state three main findings from our literature review. First, the majority of the 86 reviewed papers derived their findings from a small number of case studies. Many of these papers observe only one pilot project in one organization over a short period of time. Therefore, robust evidence that the results can be generalized for all types of organizations is missing. As an additional shortcoming, the outcomes are frequently not quantified or compared to benchmarks (e.g., the reduction of patient waiting time).

Second, the lack of papers discussing the concrete transformation path is striking. Seven years ago, de Souza (2009) stressed the need for more concrete, rather than speculative work on Lean in healthcare. Although single Lean tools (e.g., value stream maps) and general leadership recommendations (e.g., active participation of staff in improvements initiatives) are given, there is a lack of a comprehensive and concrete management approach on how to transform complete organizations. Too much weight has been put on Lean introduction into single organizational units (e.g., Ballé and Régnier 2007, who focus on a single hospital ward).

As a third result, the analysis of outcomes showed that Lean Transformations are still too focused on the process output. Too little attention is put on the major topic of patient-centric design.

Research propositions

Based on the mentioned literature shortcomings, we propose the following three research propositions.

Research proposition A: Measuring the results of Lean Transformations

To establish Lean not only as a philosophy for transformations of health care organizations but as an effective management system, health care managers require a comprehensive view of what key performance indicators are affected and to what extent (Betka 2012). Based on this information, health care managers can trade the costs of Lean Transformations against the expected benefits. Furthermore, they can justify the investments in Lean Transformations to shareholders and stakeholders. Therefore, research has to make theoretical as well as empirical contributions to fill this research gap. First, a conceptual model regarding all expected effects and their interrelations in Lean Transformations has to be developed. The model has to consider the interplay of all variables aiming at quantifying the effects of Lean Transformations on key performance indicators. In this way, the direct and indirect effects of Lean Transformations on patient care through structural and processual change can be quantified (Holden 2011). Hierarchical frameworks of key performance indicators for hospitals already exist and can be adapted to the sector and research context (Dahlgaard, Pettersen, and Dahlgaard-Park 2011).

We are aware of the fact that it remains difficult to separate the effects of organizational changes on outcomes. However, several methods exist that can be applied to analyze the contributions of Lean Transformations on outcomes. In particular, the application of experimental study designs could improve knowledge about causal relationships. This would include adequate documentation and statistical analysis of pre- and post-metrics differences as well as a comparison of relevant KPIs between comparable units with and without a Lean Transformation (Holden 2011).

Additionally, structural equation modeling approaches should be utilized to analyze the interplay of enabling factors on relevant outcomes, similar to the approach...
of Angerer, Meier, and Dreves (2015). Within this context, Poksinska (2010) criticizes the scarcity of evidence on how the whole set of tools and techniques of Lean Transformations affects a health care organization. Consequently, future studies should follow a scientific approach that includes the definition of a conceptual framework of the inputs and outcomes of a Lean Transformation, the development of a valid study design and a data analysis meeting statistical standards. In this way, research on Lean Transformations could overcome the mainly case based, practice-oriented perspective.

Research proposition B: A customized path for a Lean Transformation should be scientifically developed

Our second research proposition is based on the strong belief that the main goal of business research is to guide practitioners (Rüegg-Stürm 2015). Our literature analysis showed that this has not yet been accomplished for the topic of Lean healthcare transformation. Regarding the transformation process itself, there is a striking lack of clear guidance available for practitioners. While the overall concepts of Lean are clearly depicted (e.g., waste reduction) and the tools practically explained, the forthcoming research should focus on two elements: the design of a concrete reference transformation path and approaches to customizing that path based on individual organizations’ characteristics.

The overall approach to introducing Lean has mainly focused on a single unit in a health care organization. Sources such as Wu, Liu and Belson (2010) suggest starting with Lean training, mapping the value stream and then piloting improvement initiatives. This aligns with the classical Lean implementation approach as suggested by Womack, Jones and Roos (1990) and is supported by several sources in our review. However, there is a deficiency of papers that take a broader look at Lean Transformations. We did not, for example, find any source that analyze from a hospital CEO’s point of view how to conduct the full transformation. Many operative questions remain unanswered, such as the questions of with which unit the pilot should start and in which order and with what speed should the transformation be scaled to the whole organization. The lack of papers on project management supports this statement. Therefore, we argue for the creation of a holistic reference Lean Transformation path that has an organization-wide view, takes a long-term perspective (practitioners recommend a 5-year plan, e.g., Bercaw 2013) and considers the three enabling PWE factors portrayed in this paper.

However, as Poksinska (2010) has already stated, there is not a single correct way to implement Lean in health care. Therefore, the proposed reference transformation path has to be able to take into consideration the individual characteristics of an organization. There is no clear research available on how the maturity of an organization regarding the three factors Proficiency, Willingness and Empowerment would necessitate deviations from a reference transformation path. As an example, an organization with lower Lean maturity levels might start the process not with training but with a visit to a Lean hospital to first understand the vision behind a Lean organization. A more mature organization with high PWE levels might start its Lean journey with the transformation of a critical unit (e.g., the operating room of a hospital) to use it as a best-practice beacon for the roll-out phase. In contrast, other medium maturity organizations might start with a lower risk initiative that does not impact the core medical processes (e.g., facility management).

Research Proposition C: The patient perspective on Lean Transformations in health care

In addition to the lack of studies that quantify the effects of Lean Transformations, our review shows that
only few studies focus on direct patient outcomes, such as patient satisfaction. This result is surprising given that improved patient value is defined as the main goal of Lean Transformations (Fillingham 2008). Al-Balushi et al. (2014) state that the matter of organizational change has to be linked to the goal of change and that the provision of the best patient service is the primary goal in health care settings. According to Dickson et al. (2009), Lean can be defined as a value-driven technique. Consequently, a strong focus on the effect of Lean Transformations on patient value is indispensable.

Future studies should fill this research gap by targeting three research questions. First, a theoretical model that displays how the organizational changes through Lean Transformations are perceived and evaluated by patients has to be developed. The affective and cognitive responses of patients have to be considered and have to be justified by findings from research on patient behavior (Gill and White 2009). Although patient satisfaction has been found to be a good indicator of how the quality expectations of patients are met (Breuer 2013), the indicator covers and subsumes a variety of positive and negative critical incidents within the patient journey that have to be analyzed in detail to understand the complex impact of Lean Transformations on patient value. Based on more comprehensive conceptual work, the finding from studies such as Holden (2011) that patient satisfaction is not or is even negatively affected by Lean Transformations could be made comprehensible. Promising starting points from existing theoretical concepts would be script theory (Bromley 2012) and the concept of patient co-creation (Etgar 2008).

Second, empirical studies have to quantify the effects of Lean Transformations on patient satisfaction while controlling for interfering factors. Third, the definition of patient value has to be put in a broader context. In health care, there exist several customer groups that have to be addressed as target groups in Lean Transformations. In addition to the patient themselves, the relatives of the patients, caregivers, referring physicians and health insurers can be identified as important customers with different views, expectations and preferences on the output of Lean Transformations (Al-Balushi et al. 2014).

Research conclusion

Regarding our three research propositions, we see substantial research work required to solve these complex topics. Several basic knowledge fundamentals are still missing, such as a reliable method to measure a health care organization’s readiness for a Lean Transformation. Individual Lean organizations in health care have shown impressive results in practice. Now, it is up to researchers to extract the lessons learned from the already existing transformations. Our review showed that the Lean health care research community is just at the beginning of their own research journey towards a comprehensive Lean Transformation theory.
References cited


Appendix

Appendix 1. Listing of papers analyzed


