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Assessing Readiness for Lean Change in Emergency Department

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Abstract

Reducing inefficiencies in Emergency Departments (EDs) is a priority in many US hospitals. The goal of this research is to assess how individual readiness and attitudes for change and attitudes towards lean methodology of ED employees affects the success of lean improvement efforts in EDs. Drawing on the system improvement and change management literatures, we developed a survey instrument and tested it using data collected at the end of the first year of lean implementation efforts. As a result, we provide insights for the early stages of lean implementation.

Keywords
lean healthcare, lean culture, lean management, ED operations

1. Introduction
Emergency Departments (EDs) are cited as some the most inefficient departments in US hospitals [1]. Unexpected patient arrival, a frantic working environment and poor communication with other departments are only a few reasons that contribute to poor medical outcomes, frustrated and unhappy patients, and increased cost from waste and rework. Reducing unnecessary delays is critical to improving all aspects of care in emergency departments. The literature shows that lean methodology is effective in resolving EDs' inefficiencies [2]. Change management literature also shows that sustainable lean improvements often depend on employees' readiness for change, and leadership and management support [3-6]. Therefore, this research examines healthcare professionals' attitudes towards lean change using a survey instrument developed based on work of Armenakis et al [7]. In addition, insights provided by Kotter's framework [8] on leading change were used to better understand the lean implementation process in an ED. As a result, insights for effective and efficient lean process improvement efforts in EDs are provided.

2. Background Information
Toyota Production System (TPS) is perhaps the most powerful model devised to date for efficient design and management of large-scale operations. Academics and practitioners who espouse the virtues of TPS or lean typically describe lean on two levels. At a high level, lean is a philosophy, a perspective that abhors waste in any form, relentlessly strives to eliminate defects, and continually attacks both in a never-ending pursuit of perfection [9]. At the operational level it is a set of practices that range from overall material flow in the organization to detailed work and equipment design and human resource practices [10-11]. Lean methodology, if appropriately implemented, has proved to be effective in healthcare settings [2].

The majority of lean improvement efforts in EDs directly involve front line professionals who closely examine patient flow and wasteful activities. Therefore the focus of this study was nurses and technicians. Lean engagements can be either rewarding or traumatic for front line professionals depending on the nature of the lean implementation process. In this study researchers use five measurable constructs proposed by Armenakis et al [7] as indicators of

individual attitudes towards lean improvement efforts in an ED. The first construct is *self-efficacy*, or how sufficiently employees feel they have the knowledge and skills needed to participate in lean improvements and to complete their new roles in a changing job environment. The second construct is *valence*, or how the employees think lean is benefiting them and the organization as a whole. *Principal support* is a construct to measure employees' beliefs about management and executive leadership commitment to lean change and the principles that they are implementing. The fourth construct deals with *appropriateness* of lean methodology for the organization and its needs. Finally, the *discrepancy* construct measures the level of urgency to implement lean in the ED.

To better understand the implementation efforts of lean in an ED, researchers used Kotter's[8] eight phases of change implementation as a blueprint for evaluating results. Kotter suggests that to successfully implement change, leadership must first develop a high sense of urgency for the change effort. Next, a powerful guiding coalition needs to be established to lead the change from the top. Subsequently, vision and strategy needs to be drafted and clearly communicated. This is followed by acts of empowerment for broad-based action to generate and consolidate short-term wins that anchor new approaches in the culture. We used Kotter's eight phases of change framework in our analysis and reflections on individual readiness with respect to lean implementation process in an ED.

3. Methodology

This research was conducted in the 41 bed ED at Rex Hospital in Raleigh, NC. Rex Hospital, a member of the University of North Carolina Health Care System, is a private, not-for-profit health care system, with 4,400 employees. Rex Healthcare has 665-beds (433 general acute beds, 6 inpatient hospice and 226 skilled nursing) and treats more than 26,000 inpatients each year. Rex is also the first hospital in the Triangle, and one of only 10 in North Carolina, to receive Magnet Recognition, which places Rex's nurses among the top two percent in the country. Also, in 2008, Rex was listed as one of the nation's 100 Top Hospitals® by Thomson Healthcare. Rex was also named a Top 100 Performance Improvement Leader by Thomson Reuters. Recently, Rex was named one of the Best Places to Work in Healthcare by *Modern Healthcare*. Sections 3.1 to 3.3 respectively describe the sample, lean implementation process in an ED, and survey instrument used to collect data.

3.1. Lean Implementation Process at ED

Training and education is critical in quality improvement work. Therefore, at the beginning of the lean journey, the ED management team, including the ED director, manager and two team leaders received two days of training. In general, during this session the participants learned the following:

- The role of managers in lean
- The change management issues during the various stages of lean implementation
- Lean history and philosophy
- Lean tools to drive improvements including 5S, A3, and Kaizen

Next, a high-level Value Stream Map (VSM) of patients in the ED was constructed and analyzed to arrive at key bottlenecks in the department. Using the VSM analysis, a project schedule was prepared to initiate lean events. Before the start of the first lean event, a set of lean awareness sessions was conducted. These sessions focused on creating awareness of lean tools and thinking among front line professionals and demonstrated how they would be involved throughout the department. Specifically, the following projects were conducted in the ED:

- ***Small scope 5S project:*** One ED trauma room was improved using the 5S methodology over two days with ED nurses, technicians and additional help from facility services. Figure 2 shows the before and after pictures. The efforts from this project were sustained.
- ***Moderate scope 5S project:*** This 5S project included the registration area, patient waiting area, and security personnel area. The changes introduced in this 5S project were sustained.
- ***Lean experiment:*** A two-day experiment was designed to test a fast track concept in the ED. The fast track concept allowed patients with minor problems to follow a different, highly expedited process, compared to patients with more major problems. The results of the experiment were not implemented.

Figure 2 – ED Trauma Room: before (left) and after (right) 5S

- ***Kaizen:*** A four-day event was dedicated to develop, test, and implement a *pull system* at the ED. The pull system was based on a fundamental change in the daily routine to *pull* patients to the beds right away if a bed was open. Therefore, the patient steps to 1) register; 2) go to the waiting room; 3) go to triage, 4) go back to the waiting room; and finally 5) go to a bed were consolidated into a one step process at the bed site with physician assistance. The pull system was implemented at the ED, however, encountered moderate resistance over time.
- ***Large scope 5S:*** A goal to standardize all patient rooms in the ED was undertaken. This 5S project was divided into phases to allow for a smooth transition of patients through the department [12]. At the time of the survey administration six out of forty-one rooms were properly standardized.

3.2. Survey Instrument

After conducting the five lean events described in Section 3.1 a survey study was conducted. The survey used in this study was approved by the North Carolina State IRB to ensure appropriateness for both academia and the hospital. Table 1 presents all 15 questions used in the survey along with response scales for each question.

Table 1: Survey Instrument

	Question	Scale
1	Do you understand what changes the Rex Lean Team has made in the ED?	1 I have not heard of them 2 Poor Understanding 3 Moderate Understanding 4 Good Understanding 5 Excellent Understanding
2	Do you know how your job has been affected by the change?	1 My job is unchanged 2 I've had to do one or two things differently 3 My job is a little bit different 4 My job is a lot different than before 5 I feel like I have a new job
3	Do you understand why the changes have been made?	1 No understanding 2 Poor Understanding 3 Moderate Understanding 4 Good understanding 5 I could teach a class on Lean Practices
4	Do you feel like your opinions and/or the opinions of your coworkers influenced these changes?	1 No we have been ignored 2 Yes, but only a little bit 3 Yes, we are very involved with Lean Change
5	How important is Lean Change to ED Management?	1 Not important 2 Little importance 3 Moderate Importance 4 Very Important 5 It is their first priority
6	How often does management respond to your concerns/suggestions?	1 Never 2 Rarely 3 About half the time 4 Most of the time
7	How important is Lean Change to Administrative Leadership?	1 Not important 2 Little Importance 3 Moderate Importance 4 Very Important 5 It is their first priority
8	How often do you see evidence of Administrative Leadership supporting Lean Change?	1 I have not seen any evidence 2 I rarely see them 3 I often see them 4 Almost every day
9	How important is Lean Change to your Co-workers?	1 Not important 2 Little importance 3 Moderate Importance 4 Very Important 5 It is their first priority
10	How has Lean Change affected the amount of errors that occur in the ED?	1 There are many more errors 2 There are a few more errors 3 About the same 4 There are less errors 5 There are many fewer errors
11	How has Lean Change affected your workload?	1 I have a lot more work to do 2 I am a little bit busier 3 I do about the same amount of work

		4 I am a little busy 5 I do much less work in a day
12	How has Lean Change affected your stress level?	1 I am stressed out more often 2 There is no change in my stress level 3 I am stressed out less often
13	Do you think Lean Change is benefiting the patient?	1 Patients are doing much worse than before 2 Patients are doing a little worse than before 3 Patients are doing about the same 4 Patients are benefiting a little bit 5 Patients are benefiting a great deal
14	How much of a priority is it for you to support Lean Change?	1 I refuse to conform to Lean Change 2 Only if my boss is watching me 3 I will put a moderate effort towards conforming 4 I will put a good deal of effort towards conforming 5 Lean Change is a priority
15	Do you believe Lean Change can achieve sustainable success?	1 No 2 Yes (We just need to keep working on it) 3 Yes (But the culture needs to change before it will work)

Of the 15 questions on the survey, two deal with self-efficacy (1 and 2), 4 with principal support (5,6,7,8), three with appropriateness (10,13,15), three with valence (4,11,12), and three with discrepancy (3,9,14). The surveys were distributed at the morning shift report and the evening shift report on November 12, 2009. Overall, 33 out of 36 distributed surveys and matching consent forms were collected between two shifts, giving a 91% response rate.

4. Results

Table 1 represents the statistical summary of the responses to each survey question. With the recommendations by Garsen [13] for qualitative research with a relatively small sample size and subjectivity due to personal opinions/feelings, the significance level of 0.1 was set. The reliability measure of a psychometric instrument was calculated using Cronbach's alpha for each set of questions under each construct in the survey. All Cronbach's alpha results fell between 0.6 and 0.95, an acceptable range to ensure reliability of the survey questions [14].

Table 2: Survey Results

Number	Average	Standard Deviation	Minimum	Maximum
1	3.45	0.90	1	5
2	2.18	1.02	1	4
3	3.15	0.93	1	4
4	1.67	0.47	1	2
5	3.48	1.06	1	5
6	2.83	0.73	2	4
7	3.75	1.02	2	5
8	2.71	0.88	1	4
9	2.35	0.83	1	4
10	2.84	0.89	1	4
11	2.53	0.80	1	4
12	1.87	0.42	1	3
13	3.33	0.78	2	5
14	3.63	0.71	1	5
15	2.1	0.75	1	3

The analysis at the construct level revealed the following insights. First, responses to *self-efficacy* questions demonstrate that recipients felt like they had a fairly good understanding of lean changes that took place in the ED. At the same time, recipients felt like their jobs were almost unchanged, which allowed them to feel psychologically

safe about the lean initiative in their department. Second, the responses to principal support questions showed that the ED management and administrative leadership teams were inconsistently responding to improvement suggestions. Furthermore, the results show that neither team is present on the floor often enough to support daily improvement ideas of front line professionals. Third, the appropriateness section is meant to gauge how well the changes are affecting both patient care and the operations of the emergency department. The results are fairly neutral with respect to how successfully the recipients' believe the changes in the department benefit patient and ED operations. Fourth, the valence section suggests that nurses and technicians do not see themselves as drivers of lean change. They also perceive that their workloads and stress levels were virtually unchanged or rose minimally. Finally, the discrepancy construct reveals that nurses and technicians moderately well understood why lean changes were made. At the same time they indicated that they would put in a moderate to good effort to support lean changes at the department. Interestingly however, they perceive lean changes to be of little importance to their co-workers.

We found these results important and supportive of past research [15] that has shown that managers' behavior influences workers' motivation. Tucker and Edmonson [3] found that physical and active involvement of administrators and managers in improvement efforts can increase feelings of workers' competence and help create a culture that values improvement efforts. Our results indicated that while individual workers were aware of and supportive of the lean change efforts, they were unaware of the beneficial outcomes and felt no connection to the efforts of coworkers, managers and administration. Therefore, we believe that administrators and managers must learn lean management methods for sustainability and accountability and not only for improvement implementation efforts. They must spend considerable time and effort in their departments to establish and support the growth of lean culture. Without such commitment, they are unlikely to achieve the operational excellence and high commitment to patient safety possible with lean implementation [16, 17].

Combining the analysis from this survey with Kotter's [8] suggestions for change management the following critical implications for administrators and managers are proposed:

1) "Walk-the-talk" by engaging nurses and technicians on the hospital floor more often to support daily lean improvements.
2) Communicate lean efforts and results to all stakeholders using any available resources at frequent time intervals.
3) Do not rush the lean engagement '*speed'* as it potentially can cause negative consequences. Be patient and let front line professionals develop their readiness including competencies and psychological safety.
4) Enable front line professionals to become scientists and allow for constructive and safe experimentation and innovation on the hospital floor.

5. Conclusions

We hope that the proposed implications and discussions will help ED managers to achieve robust improvements using lean improvement efforts. In addition, the proposed insights into this area have the potential to enhance the professional development of healthcare managers and administrators. The practical implications extend to the development of better strategies for lean implementation in healthcare organizations. The authors believe that it is essential that lean management strategies be developed with the consideration of frontline healthcare professionals' perceptions of the change management process.

This study was conducted in only one organizational setting. The survey used this study requires further validation with a larger sample size across different ED settings with respect to size, scope of ED practice, geographic location, and/or population served. Ultimately, a relationship could be established between the implementation plan and proposed management strategies for leading lean efforts. This would enable the organizational leaders to determine a superior lean implementation plan that will best serve their needs.

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