

## Application of Holistic Process Improvement in Healthcare: A Case Study

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### 1. Introduction

Workplace injuries are especially prevalent in healthcare settings. Within healthcare, nursing and residential care facilities, and hospitals have the highest injury rates, significantly greater than the mean injury rate for all industries combined. Figure 1a demonstrates that these two healthcare setting consistently have higher injury rates with days away from work, with job transfer or restrictions, and other injuries. Within hospitals, mean cost per incident are greatest for patient interaction, strains, and slips, trips, and falls (Figure 1b).

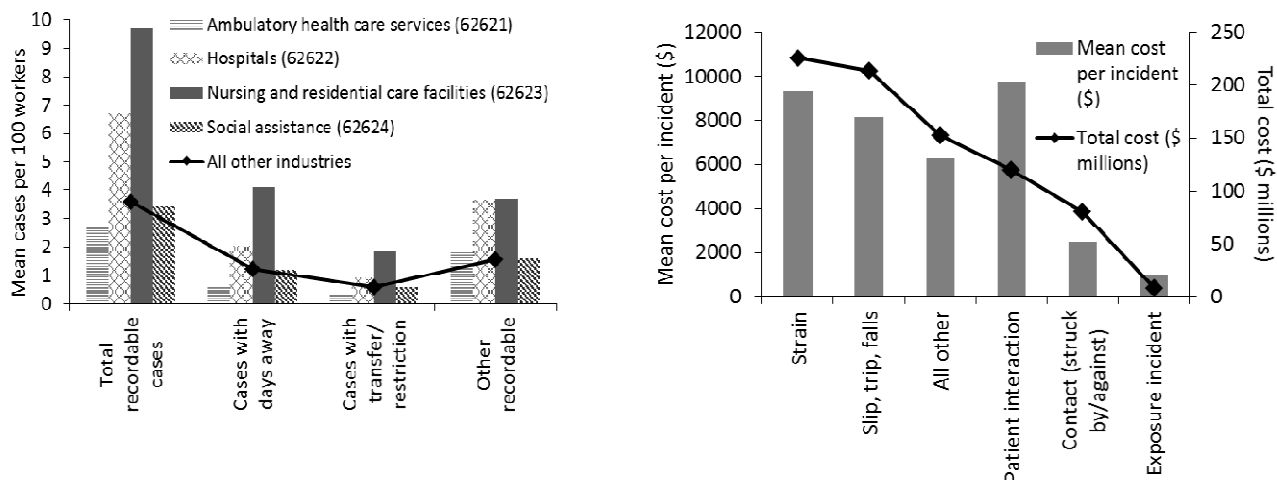


Figure 1. a) Mean Injury Rate by Case Type and Healthcare Setting, b) Mean per Incident and Total Cost of Injuries by BLS Classification. (2013 Employer-reported Workplace Injuries and Illnesses, 2015)

The injury statistics presented in Figure 1 demonstrate that healthcare settings, specifically nursing and residential care facilities, and hospitals, are significantly more at risk than other industries. From 2012-2015 OSHA implemented a National Emphasis Program to combat these injuries in healthcare through increased inspections and citations. The success of this program has prompted OSHA to incorporate these inspection and citation methods into their standard operating procedures. The methods of Lean, Six Sigma, and Ergonomics offer unique and novel tools for combating the development of hazardous conditions which can lead to OSHA inspections and citations. The authors believe that a proactive approach is needed to avoid OSHA citations and decrease workplace injuries.

### 2. HPI in Healthcare: A Case Study

Holistic Process Improvement (HPI) lies on the intersection of Lean, Six Sigma, and Ergonomics (Kumar, Subramanian, Ware, & Fernandez, 2012). Taking a more holistic approach presents the opportunity to add more value to a healthcare system and simultaneously reduce hazards and errors, as the following case study will demonstrate.

This HPI project was conducted to help reduce costs at a regional healthcare organization which specialized in surgical care. An initial investigation revealed that many of the non-value adding costs being incurred were preventable, meaning that they could be reduced applying HPI tools. By defining several key performance indicators (KPIs) we could determine the current state and where there was room for improvement (see Table 1).

Table 1. Key Performance Indicators for a Surgical Healthcare Setting (Subramanian, *et al.* 2015)

Laboratory	Surgical Unit
-profit per laboratory test	-average discharge time of patient
-materials vs revenue ratio	-expense per adjusted discharge
-average laboratory test turnaround time	-average profit per hospital bed
-average total cost per laboratory test	-average non-employee costs per hospital bed
-average non-employee costs per laboratory test	-ratio of employee to non-employee costs per hospital bed

Initial analyses within the laboratory found that workplace injuries comprised a major part of ‘per-test’ costs. Given this a combination of lean and ergonomic approaches was implemented to reduce costs. Specifically the improvements focused on providing tables with adjustable height and adequate leg space, and also implementing Lean ‘5S’ principles to maintain an organized and clean workplace. These improvements were designed to help reduce ergonomic stressors leading to workplace injuries, and ensure equipment was ready and easily accessible respectively. The latter helped to convey an aesthetic appearance of the care unit to patients and their families, and positively affect safety culture. Pre- and post-intervention questionnaires regarding the ease and accessibility of supplies, equipment, and workspace were completed and showed positive increases of 28, 31, and 69% respectively.

The purpose of the project in the surgical unit was to improve the KPIs identified in Table 1. The highest non-value adding times occurred when patients waited after registering (>32 minutes) and waited in pre-operation before beginning surgery (>50 minutes). Over a period of 8 weeks, a cross-functional team, which included process improvement specialists and five full-time employees, analyzed the current processes and developed new methods to reduce waiting time. Based on the current practices, interviews with staff, and fishbone diagrams, the current procedures were broken-down to identify removable processes. Redeveloped standard operating procedures reduced waiting times in registration and pre-operation to 9 and 8 minutes respectively. This increased the throughput and capacity of the surgical unit, adding value to the system.

### 3. Conclusions

The costs of workplace injuries and inefficient processes in healthcare results in high non-value adding costs. Holistic Process Improvement integrates techniques from Lean, Six Sigma, and Ergonomics, with the capability to add significant value to a process. In a healthcare case study several KPIs were identified. A break-down of the processes helped to identify non-value adding costs (injuries and workers’ compensation) and wait times (prior to surgery). Through use of a cross-functional team and HPI, ergonomic improvements were made to reduce costs and wait time was reduced to increase capacity. The authors advocate for a proactive approach to workplace safety and process improvement to avoid OSHA citations and add value to a business

### 4. References

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