Lean Belt Certification: Pathway for Student, Resident, and Faculty Development and Scholarship

No sponsorships or competing interests have been disclosed for this article.

Abstract
Since July 2013, 20 trainee participants have completed the quality improvement curriculum within the Indiana University Department of Otolaryngology–Head & Neck Surgery, including 7 otolaryngology residents, 6 otolaryngology-bound medical students, and 7 psychiatry residents. Nine faculty and staff attended. Participants were highly satisfied with the quality and effectiveness of the program. Following program implementation, 2 otolaryngology residents and 2 medical students initiated their own quality improvement projects. Lean training directly resulted in oral and poster presentations at national conferences, journal publications, and institutional research and quality awards. Students completing the program established a local affiliate group of an international health care quality organization. Quality improvement training can be successfully incorporated into residency training with overwhelming program satisfaction and results in greater scholarly and professional development for motivated participants. The skillset acquired by participants leads to projects that improve patient care, increase value, and justify equipment and personnel retention and expansion.

Keywords
Lean, quality, improvement, safety, education, residency

Received November 16, 2015; revised February 2, 2016; accepted February 5, 2016.

Implementation
In July 2013, the department incorporated a 3-month dedicated research block into the Post-Graduate Year (PGY) 3 year, transitioning from unscheduled research time spread among the PGY 2 to 5 years. This allowed for attendance of multiday QI training programs, which would have been

Council for Graduate Medical Education (ACGME) has noted the importance of training future otolaryngologists in these areas, mandating that program directors ensure residents are integrated and actively participate in interdisciplinary clinical quality improvement (QI) and patient safety programs. By June 2015 exposed the absence of literature describing successful methods of integrating QI training into otolaryngology–head and neck surgery (OHNS) residency curricula, and this present commentary seeks to provide an additional voice in this area.

“Lean” is a process improvement methodology originating in the manufacturing industry that is increasingly being applied to enhance quality in a variety of health care settings. The Department of OHNS at Indiana University School of Medicine (IUSM) sought to develop a robust yet flexible program providing residents and medical students the opportunity to learn about QI techniques. This was pursued through Lean Belt certification and subsequent use of Lean methods to help improve the patient experience, reduce waste, advance organizational objectives, and engage in scholarly development. This study qualified for institutional review board exemption according to the policies of the Indiana University Office of Research Compliance.

Background
A report by the Lucian Leape Institute states that “substantive improvements in patient safety will be difficult to achieve without major medical education reform at the medical school and residency training program levels.” The report goes on to state that following introduction of patient safety concepts in medical school, “these competencies should become fully developed during the residency training period.”1,2 The Accreditation

Corresponding Author:
Todd J. Wannemuehler, MD, Department of Otolaryngology–Head & Neck Surgery, Indiana University School of Medicine, 1120 W. Michigan St, Gatch Hall Suite 200, Indianapolis, IN 46202, USA.
Email: tjwannem@iupui.edu
otherwise precluded by clinical duties. Faculty involvement in process improvement began before this transition, resulting in deeper collaboration with the Systems Redesign QI initiative at the Richard L. Roudebush Veterans Affairs Medical Center (VAMC) and facilitating subsequent OHNS participation. Many VAMC sites have associated initiatives dedicated to training physicians, nurses, administrators, and staff in Lean concepts.

A pilot program was constructed that provided training, examination, Lean Belt certification, and project implementation either through the VAMC or IUSM-affiliated medical centers. Psychiatry residents and medical students were also invited to participate.

Lean Yellow Belt certification (Figure 1) begins with a 2- to 3-day training workshop in which Lean concepts are taught and discussed. Following this, the trainees participate in a Rapid Process Improvement Workshop (RPIW), in which they are involved in the various steps of a Lean project, including design, process mapping, and implementation. The summary of the RPIW is cataloged in an A3 (Appendix 1, available at www.otojournal.org/supplemental), a 9-panel summary that provides an effective overview of the project conception, implementation, and evaluation. Upon project completion, the A3 is presented and the participants are encouraged to complete an examination that results in Lean Yellow Belt certification.

Lean Green Belt certification (Figure 1) involves the development of a data-driven, high-impact QI project sponsored by a faculty mentor with Lean experience and a VAMC specialist. Trainees are responsible for creating an A3, designing and implementing an RPIW, completing the proposed changes, and collecting data to demonstrate effects of the project. Upon completion, the trainee has the opportunity to complete a Lean Green Belt certification exam.

**Outcomes**

To date, 29 participants have completed the Yellow Belt curriculum. This includes 7 otolaryngology residents, 6 medical students applying to otolaryngology, 7 psychiatry residents, and 9 faculty and staff. One resident and 1 faculty member completed the Green Belt curriculum.

Of the 20 trainee participants, responses to immediate postparticipation surveys were overwhelmingly favorable with no significant differences between cohort responses. To date, the scholarly and professional development effects of Lean training within the OHNS department have been numerous. Two faculty members published a QI study of office-based ultrasound-guided biopsy in the head and neck, while another led a clinic scheduling QI project at the VAMC and obtained Green Belt certification. A resident project to reduce adenotonsillectomy instrument processing led to Green Belt certification and an oral presentation at a national OHNS conference with subsequent publication. In addition, this inspired a medical student to create a similar project based around mastoidectomy instrument trays. Another resident and 1 medical student (who subsequently matched into OHNS) completed a project on delays in head and neck cancer diagnosis with a manuscript currently under review.

Positive departmental outcomes directly attributable to Lean training include multiple research awards, national presentations, and publications in high-impact OHNS journals (Table 1). In addition, the students who completed Lean Belt certification established a local affiliated chapter of the Institute for Healthcare Improvement and are working to incorporate QI and patient safety concepts into the medical school curriculum to increase student awareness of QI training and project opportunities.
Conclusion

The results of our implementation are encouraging; QI training can be successfully incorporated into an OHNS residency program in accordance with recent ACGME guidelines and simultaneously be offered to medical students and faculty. This training is not only satisfying but also productive, inspiring residents and medical students to observe and correct the inefficiencies and patient safety quandaries they encounter daily. Successful and cost-neutral implementation depends on using resources that are likely already available to residency programs: adequate research time for residents, faculty interest, and partnering with an organization with established QI training programs such as Lean. We feel that Lean Belt certification is an effective way to give residents and students the skills they require to be active participants in effectively shaping the future of health care.

Author Contributions

Alhasan N. Elghouche, design, data analysis, data interpretation, drafting and revision, and agreement to be accountable for all aspects of the work; Brian C. Lobo, conception, design, data analysis, data interpretation, drafting and revision, final approval, and agreement to be accountable for all aspects of the work; Todd J. Wannemuehler, conception, design, data analysis, data interpretation, drafting and revision, final approval, and agreement to be accountable for all aspects of the work.

Table 1. OHNS Department Projects Directly Related to Implementation of Lean QI Training over Prior 2 Years.

<table>
<thead>
<tr>
<th>Project Title (Duration)</th>
<th>Problem of Interest</th>
<th>Outcome(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSS applied to US-FNA biopsy in the H&amp;N⁶ (2013-2014)</td>
<td>Process for obtaining US-FNA recognized as inefficient, causing patients with an H&amp;N mass to experience increased time and costs to arrive at a diagnosis</td>
<td>33-day mean reduction in time to US-FNA</td>
</tr>
<tr>
<td>LSS applied to adenotonsillectomy instrument sets⁷ (2013-2014)</td>
<td>Certain instruments present in sets are consistently not used for a case; Sterile processing of unused, superfluous instruments wastes time and money</td>
<td>Avoidance of unnecessary laboratory and imaging studies; &gt;$2000 cost reduction per patient; Peer-reviewed journal publication; AAO-HNSF podcast appearance; $800 annual reduction in instrument processing costs; $1500 cost reduction in purchase of each new instrument set; Receipt of health care system-wide QI award; National meeting poster presentation; Peer-reviewed journal publication; Green Belt certification for ENT resident; Yellow Belt certification for ENT student; Improvement in surgical scheduling efficiency by ENT clinic personnel; Improvement in interdepartmental communication framework; Improved patient education/contact processes; Revised EMR scheduling templates; Green Belt certification for ENT staff; Most common causes of delays and errors related to H&amp;N cancer diagnosis identified within a specific hospital; Subsequent improvement opportunities recognized; Receipt of health care system-wide QI award; Findings submitted for peer-reviewed journal publication; Yellow Belt certification for ENT student</td>
</tr>
<tr>
<td>LSS applied to VA clinic surgery scheduling (2013-2014)</td>
<td>ENT scheduled cases experience high avoidable cancellation rates; Result in patient dissatisfaction with wait time for rescheduling and delays in treatment and diagnosis for high-priority patients</td>
<td>Improvement in surgical scheduling efficiency by ENT clinic personnel; Improvement in interdepartmental communication framework; Improved patient education/contact processes; Revised EMR scheduling templates; Green Belt certification for ENT staff; Most common causes of delays and errors related to H&amp;N cancer diagnosis identified within a specific hospital; Subsequent improvement opportunities recognized; Receipt of health care system-wide QI award; Findings submitted for peer-reviewed journal publication; Yellow Belt certification for ENT student</td>
</tr>
<tr>
<td>LSS applied to diagnostic delays and errors in H&amp;N cancer (2014-2015)</td>
<td>IOM recognizes diagnostic delays and errors as major improvement opportunities⁸; These specific delays and errors have not previously been investigated in the context of H&amp;N cancer</td>
<td>Receipt of health care system-wide QI award; Findings submitted for peer-reviewed journal publication; Yellow Belt certification for ENT student</td>
</tr>
<tr>
<td>LSS applied to mastoidectomy instrument sets (2015-present)</td>
<td>Certain instruments present in sets are consistently not used for a case; Sterile processing of unused, superfluous instruments wastes time and money</td>
<td>Project in progress, outcomes to be determined</td>
</tr>
</tbody>
</table>

Abbreviations: AAO-HNSF, American Academy of Otolaryngology—Head and Neck Surgery Foundation; EMR, electronic medical record; ENT, ear, nose, and throat; H&N, head and neck; IOM, Institute of Medicine; LSS, Lean Six Sigma; QI, quality improvement; US-FNA, ultrasound-guided fine-needle aspiration; VA, Veterans Affairs.
accountable for all aspects of the work; Kimberly E. Johnson, conception, design, data acquisition, drafting, final approval, and agreement to be accountable for all aspects of the work; Bruce H. Matt, analysis and interpretation of data, revision, final approval, and agreement to be accountable for all aspects of the work; Heather K. Woodward-Hagg, design, revision, final approval and agreement to be accountable for all aspects of the work; Mimi S. Kokoska, conception, design, data analysis, data interpretation, drafting and revision, final approval, and agreement to be accountable for all aspects of the work.

Disclosures
Competing interests: None.
Sponsorships: None.
Funding source: None.

Supplemental Material
Additional supporting information may be found at http://otojournal.org/supplemental.

References