

RESEARCH ARTICLE

USE OF LEAN MANAGEMENT TO INCREASE EFFICIENCY AND OSTEOPATHIC MANIPULATIVE TREATMENT IN A FAMILY MEDICINE RESIDENCY

Andrew Eilerman, DO, FACOFP¹; Ryan Jay, OMS-III²; Chelsey Smith, PharmD³; Charles Fisher, DO⁴; Jill Porter, DO³; Tejal Patel, DO³; Jennifer Reynolds, LSW³

¹ Doctors Hospital Family Practice Residency, Grove City, OH
² Ohio University Heritage College of Osteopathic Medicine, Dublin, OH
³ Doctors Hospital Family Practice Residency, Grove City, OH
⁴ O’Bleness Hospital Family Practice Residency, Athens, OH

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| KEYWORDS: | ABSTRACT: |
| Family Medicine Residency | Objectives: To determine Lean management's ability to improve the efficiency of residents and increase osteopathic manipulative treatment (OMT) in a family medicine residency clinic. |
| Key Performance Indicator | Methods: A Key Performance Indicator Board (KPI), a process of Lean management, was created in a residency clinic by various staff. Patient wait times were chosen for the quality measure and daily huddles took place to track progress. A “5-why” was conducted to determine the reasons for failure to meet goals. Faculty used this information to create the 5 “S” of Efficiency method to help residents improve timeliness in caring for complicated patients. Comparisons of the number of patient visits failing wait time goals and total OMT performed before and after the intervention was analyzed. Chi-square was used for statistical analysis and the p-value was set at 0.05. |
| Lean Management | Results: Implementation of the 5 “S” of Efficiency method resulted in a significantly lower percentage of days failing the wait time goal in comparison to months before the intervention (p = 0.00001): the average percentage of failed days decreased from 43.1% to 10.4% with the intervention. Enacting Lean management also resulted in a significantly greater percentage of billed OMT billing codes (6.8% vs. 5.3%) (p = 0.03). |
| Osteopathic Manipulative Treatment | Conclusion: This study indicates that the use of Lean may reduce patient wait times and lead to increased OMT use among family medicine residents. Use of Lean or the 5 “S” of Efficiency method may help other osteopathic programs attempting to improve care; however, further research is indicated. |
| Patient Wait Time | |

INTRODUCTION

Lean management (or Lean) is a thought process for team environments that analyzes current workflow processes to eliminate non-value-added activities and improve outcomes in areas of time, cost or safety. Though it began in the industrial field, Lean has been gradually applied to the health care sector, particularly in the hospital domain (such as in surgery or emergency departments).¹ Reviews support the trend of successful

Lean utilization within larger health care institutions that serve urban populations.^{2,3} One such large health care organization of a midwestern city described in this study has utilized Lean through the use of Key Performance Indicator (KPI) boards. These boards require all department areas to regularly meet to discuss goals (or performance indicators) while also tracking daily progress in improvement. Daily huddles around KPI measurements bring awareness to issues, track small improvements and foster a modality for continuous refinement. KPI boards have been implemented successfully across the system’s affiliated hospital units, but only recently have they been explored in its ambulatory settings.

Ambulatory clinics are amenable to the improvements in efficiency and productivity that Lean offers, but few studies exist. In one example, the University of Virginia Gynecologic Oncology clinic implemented Lean to significantly decrease total mean wait

CORRESPONDENCE:

Andrew Eilerman, DO, FACOFP | Andrew.Eilerman@ohiohealth.com

times from 119 minutes to 82 minutes.⁴ Review of the literature indicates even less exploration of Lean in ambulatory medical education residency clinics. The few studies available in Internal Medicine and Family Medicine Residency provide some insight into the benefits gained. Lean principles helped to significantly decrease patient wait times⁵ or improved patient volumes and satisfaction through a better workflow in these residency settings.⁶ Such time efficiency could be useful to a residency clinic where residents learn to optimize patient care and integrate osteopathic manipulative therapy (OMT) into visits.

In a family medicine residency clinic in central Ohio that has received accreditation from the Accreditation Council for Graduate Medical Education (ACGME) and osteopathic recognition (OR), efficiency has been an ongoing goal. The faculty teach residents that improved efficiency will increase patient satisfaction, performance on system-based scorecards and time availability to perform OMT. It has been reported that lack of time is the main reason physicians express failure to use OMT⁷ and similar reasoning has been expressed to faculty in this program. As an OR program, methods must be utilized to increase OMT opportunities through gained time efficiency. Residents balance the development of knowledge, time management skills, physician to patient dynamics and application of osteopathic principles regularly. As such, the faculty believed that the residents were amenable to the continuous feedback afforded by Lean to improve.

This project was a retrospective review of data on Lean management's effects on patient wait times and utilization of OMT over several months at a central Ohio family medicine residency clinic. This quality improvement study had the following specific aims:

AIM #1: Compare the percentage of average visits with prolonged wait times before and after implementing Lean techniques for time efficiency (the 5 "S" of Efficiency, as described in methods.)

AIM #2: Compile data regarding the reasons for each failed occurrence in meeting the wait time goal.

AIM #3: Compare the percentage of OMT in patient visits performed before and after the implementation of Lean.

Due to its reported successes in many areas important to patient care,^{1-6, 8} Lean management was hypothesized to help achieve decreased wait times and increased utilization of OMT in patient visits. It was also thought that data from this study could assist other osteopathic recognized family medicine residency clinics in improving efficiency and enhancing time organization for better patient care.

METHODS

We proposed a retrospective review of wait times and use of OMT from data obtained after the implementation of Key Performance Indicator (KPI) Board huddles in a family medicine residency. The data collected included all patient visits seen by both residents and attending physicians at the ambulatory clinic from August 2018 through May 2019. Only the days when physicians were working and seeing patients were included. An overview of the project parameters is found in Table 1.

TABLE 1:

Outline of parameters collected for the study.

| CATEGORY | DATA POINTS |
|--|--|
| Wait time goal | Days when wait time goal was or was not met before implementation of Five-S of Efficiency method |
| Reasons for failed occurrences in meeting the wait time goal | <ol style="list-style-type: none"> 1. Doctor running behind 2. Unavailable staff 3. Complicated patient 4. Delay from testing |
| Proportion of OMT used | <ol style="list-style-type: none"> 1. Percentage of OMT used during appointments before and after implementation of 5 "S" of Efficiency method 2. Numbers of various OMT Current Procedural Terminology (CPT) codes billed before and after intervention |

KEY PERFORMANCE INDICATORS (KPI)/LEAN INITIATION

The project utilized data compiled from KPI board huddles. A KPI board uses a visual tracking system that records processes and effects of Lean management on specific indices (chosen by a team) for five indicators: Safety (S), Quality (Q), Delivery (D), Productivity (P) and Cost (C). A data collection page was used to show whether or not goals were met and a living Pareto chart recorded the reasons why a goal was not achieved. A Pareto chart is a bar graph that lists reasons for a particular outcome and assumes a majority of problems stem from a common cause.

Resident efficiency was chosen for the KPI indicator of "Quality" (Q) shortly after the Lean process was initiated and patient wait time was selected as its index. Daily KPI board huddles, attended by faculty, residents and staff, allowed a modicum to discuss measures (such as the wait time goal), whether or not goals were met and reasons for any failure.

The initial goal for the Quality ("Q") indicator stated that patient wait times would be less than one hour from the time of rooming to the time the resident entered the exam room (Table 2). The medical assistants and front desk staff recorded the information related to wait time. However, in the spirit of Lean, continuous assessment led to the amendment of the wait time goal throughout the study period, as listed in Table 2.

TABLE 2:

Outline of the wait time goals throughout the study.

| MONTH | GOAL |
|------------------------------|---|
| August 2018 – November 2018 | Patient wait time < 1 hour from rooming to 1st resident doctor visit |
| December 2018 – January 2019 | Patient wait time < 90 minutes from appointment time to checkout time |
| February 2019 – March 2019 | < 3 patients wait 90+ minutes from appointment time to checkout time |
| April 2019 – May 2019 | < 2 patients wait 90+ minutes from appointment time to checkout time |

WAIT TIME GOALS

The wait time goal was amended based on the trend of results and the KPI board members' opinions. In February, due to better ease of tracking and attaining more valuable information, the revised goal was to have less than or equal to three patients daily fall outside a wait-time goal of 90 minutes. This change factored in care variables, such as additional testing, treatments, emergency services or other unforeseen circumstances outside resident control. In April, the goal was reduced to less than two patients for the entire day due to success with the intervention and idealization for even better outcomes.

Primary Intervention: The 5 “S” of Efficiency

The KPI huddle participants conducted a “5-why” process to help outline reasons for and steps leading to failure using a living Pareto chart. Over time, the Pareto identified that organizing complex patient problems during a visit was the most common reason misses occurred. Therefore, the faculty created the 5 “S” of Efficiency method, which was implemented at the start of October 2018 and ultimately acted as the study's primary KPI/Lean intervention. This 5-step method had the resident organize each appointment by doing the following (Table 3): 1) Start the visit, 2) Set the agenda, 3) Stick to the plan, 4) Succinctly summarize and 5) Serve the patients/staff well. Faculty taught the process to residents at didactic sessions, provided pocket cards to carry in white coats listing the 5 “S” of Efficiency method and reviewed it regularly during case discussions. The KPI board and daily huddles continued to track data after the installment of this intervention.

For the OMT portion of the study, a retrospective review of OMT data was obtained from the same time frame of August 2018 through May 2019 using Current Procedural Terminology (CPT) codes for OMT (98925-98929). A comparison of the percentage of OMT used before and after the initiation of the 5 “S” method was analyzed. We reviewed the total number of codes billed, as well as the complexity of the CPT codes in these periods. Higher CPT code levels denoted more body systems upon which OMT was used during a visit.

TABLE 3:

Explanation of the 5 “S” of Efficiency method.

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|--|
| 1. Start the visit: a. Pre-chart (<i>working before the visit to prepare for the day</i>) b. Predict (<i>predicting what the patient's needs will be based on past progress note review, prescriptions needing refilled, etc.</i>) c. Prime the day (<i>huddling with a medical assistant on the day's schedule and starting the first patient on time</i>) |
| 2. Set the agenda: (<i>organizing the visit at the beginning for better, more efficient use of time</i>) |
| 3. Stick to the plan unless history or physical exam suggest otherwise: (<i>Following the agenda unless conditions warrant straying from it, using clinical resources, such as the behaviorist and pharmacist to help manage conditions and having standard methods to review problems, such as templates</i>) |
| 4. Succinctly summarize: (<i>When presenting to the attending, omitting unnecessary detail</i>) |
| 5. Serve the patients/staff well: (<i>Keeping in mind the importance of always addressing the patient's needs sufficiently, regardless of the time it takes</i>) |

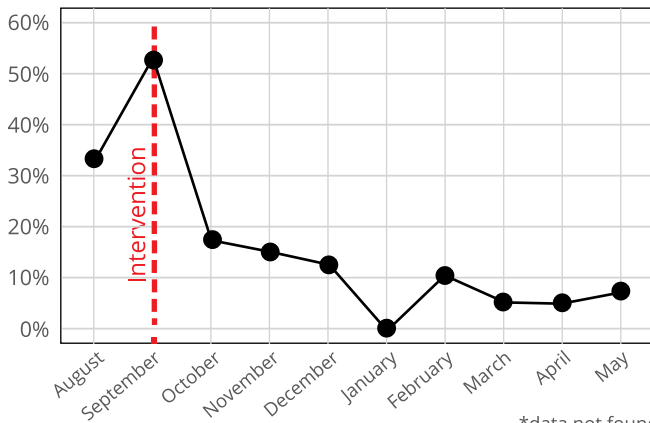
The data for this quality improvement project was accessible to only allow applicable investigators. The study's activities did not prevent or hinder the delivery of care to patients, nor did they impose greater than minimal risks or burdens on them. The potential loss of confidentiality was minimized by storing data on password-protected computers secured within the residency offices. Data usage followed the Health Information Privacy and Accountability Act (HIPAA) guidelines and only de-identifiable CPT codes were stored and analyzed. For descriptive statistical analysis, wait time goals and total OMT were reported using frequencies and percentages. The comparison of pre-intervention and post-intervention data was performed using the chi-square test. The p-value for the significance for these was set at 0.05.

RESULTS

The months after Lean management initiation revealed a significantly lower percentage of days failing the wait time goal in comparison to months before the intervention ($X^2 = 19.95$, $p = 0.00001$). A trend of the percentage of days each month with failed wait time goal is shown in Figure 1. The average percentage of failed days decreased from 43.1% to 10.4% with the intervention. The trend line demonstrates how the application of Lean management in October 2018 immediately led to a sharp decrease in the percentage of failures. Subsequent months of Lean management showed a continued declination of the failure rate.

FIGURE 1:

The percentage of days each month with failed patient visit wait time goal.



The graph illustrates changes before and after the initiation of Lean management. The red line denotes the timing of intervention (implementation of the “5-s” of Efficiency method).

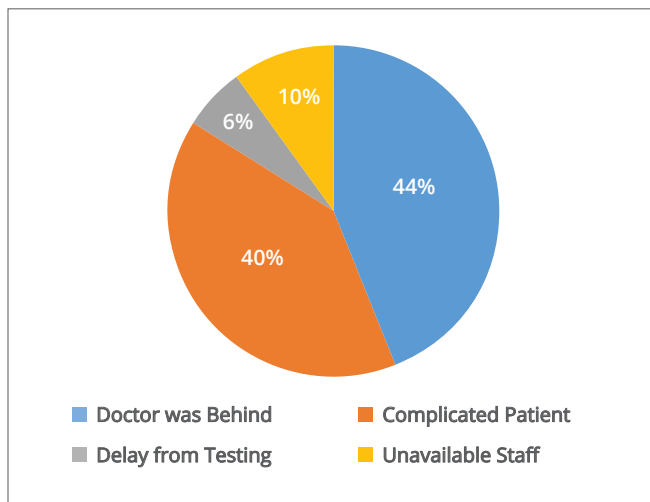
*Indicates missing data for January (statistical analyses did not include this month).

Reasons for Failing Wait Time Goals

As indicated in Figure 2, the most common reasons reported for failed wait time goals were doctor/medical student behind (44%) and complicated patient (40%), while less common reasons were unavailable staff (10%) and delay from testing (6%).

FIGURE 2:

Reported reasons for not meeting patient visit wait time goal. N = 68.



Proportion of OMT Used

Enacting Lean management from October 18 to May 19 resulted in a significantly greater percentage of billed OMT CPT codes (6.8% vs 5.3%), ($X^2 = 4.53, p = 0.03$). Table 4 displays the effect Lean management had on the proportion of OMT CPT codes billed by physicians in the clinic. The percentage of the variety of codes used did not significantly differ ($X^2 = 3.00, p = 0.39$). Table 5 demonstrates the comparison of different levels of OMT CPT Codes billed before and after initiation of Lean management. The enactment of Lean management did show a trend of the increasing percentage of higher-level OMT codes billed, though not statistically significant (6% vs. 2% and 0.2% vs. 0% for the CPT codes of 5–6 body regions and 7–8 body regions, respectively).

TABLE 4:

Summary of the proportion of different OMT CPT codes used before and after enacting Lean management.

| TIME PERIOD | COUNT OF TOTAL VISIT CPT CODES | COUNT OF OMT CPT CODES | % OMT BILLED |
|---------------------------|--------------------------------|------------------------|--------------|
| August 18 to September 18 | 1,552 | 83 | 5.3% |
| October 18 to May 19 | 6,347 | 434 | 6.8% |

TABLE 5:

Summary of the proportion of OMT CPT codes billed before and after application.

| OMT CPT CODE | TOTAL NUMBER OF BILLED CODES BEFORE LEAN MANAGEMENT | TOTAL NUMBER OF BILLED CODES DURING LEAN MANAGEMENT (AUGUST 2018 – MAY 2019) |
|-------------------------|---|--|
| 98925: 1–2 Body Regions | 60 (72%) | 293 (68%) |
| 98926: 3–4 Body Regions | 21 (25%) | 112 (26%) |
| 98927: 5–6 Body Regions | 2 (2%) | 28 (6%) |
| 98928: 7–8 Body Regions | 0 (0%) | 1 (0.2%) |

DISCUSSION

Training to become an independent practicing physician in the context of a three-year residency program requires enhanced knowledge in a variety of areas. The Family Medicine Review Committee (RC) of the ACGME creates the standards for family medicine residents to achieve in a three-year program. Attaining numbers of patient encounters are a requirement. These number requirements ensure that family medicine residents are exposed to various cases that prepare them for practice. From a program standpoint, it emphasizes the importance of teaching residents efficiency in caring for their patients' panel. This efficiency prepares a resident for the real-world capacity to ensure that, along with

the patient's acute needs, the ideals of patient satisfaction, quality and access to care can be addressed. Reports have shown that hospitals or clinics can use Lean management in effective ways to improve efficiency in practice and decrease wait time.^{2,3,5}

Our study exhibits the successes of Lean management in the ambulatory resident clinic setting. The percentage of average visits with prolonged wait times significantly reduced over the short period of implementation using the 5 "S" efficiency method. In the industry world, a 5 "S" tool is used to implement Lean in the workplace. It provides strategies for workers to ensure a clean, organized and efficient environment. These 'S's stand for (as translated from Japanese): Sort (eliminate what is not necessary), Set in order (organize), Shine (clean workspaces), Standardize (schedule maintenance) and Sustain (establish a habit.)³ Recognizing there were many aspects of this memory tool that health care could adapt, the faculty compiled their own tips for efficiency for residents into a similar 5 "S" memory guide. The 5 "S" were taught to residents to follow many of the steps outlined in the Japanese model. Faculty emphasized the 5 "S" of Efficiency in their oversight of residents during the study period to ultimately contribute to the findings.

Similar findings of Lean's effects have been exhibited in other non-family medicine programs.^{4,5} Other studies have shown that putting into play Lean management strategies has shown to reduce the patient wait times, time in a queue and increase satisfaction.¹⁻⁶ While the studies may be limited, other residency programs have also shown similar results and have led to increased involvement of residents in other quality initiatives.⁸ The thought is that the success of Lean is attributed to the ability to identify the issues needing immediate assistance and provide suggestions for improvement in real time.⁵

Throughout an academic year (July through June), it is expected that resident trainees continue to develop skills and improve their performance with time management. For this reason, the results of this study could potentially be questioned in their significance, as the findings attributed to Lean could be solely related to this progression alone in residents. However, the abrupt reduction in wait time that was seen in this study over a one month period from September 2018 to October 2018 would speak against progression alone as the causative factor for the improvement seen in this study.

In addition to these results on patient wait times, OMT use significantly increased the overall percentage of visits after the intervention. It was theorized that having more time in the context of a visit will allow more time to implement OMT seamlessly into visits. While earlier studies indicate that "time constraints" have led to fewer DOs in practice actively using their skills in practice,⁷ more recent information suggests continued high interest in alternative medicine in young learners.⁹ It should be noted that other factors could have influenced the change in OMT used in practice in this study. Throughout the study, the program was implementing a new curriculum for OMT and osteopathic principles and practice while seeking OR status. This could encourage residents to think more osteopathically in their total treatment plan and increase consideration for OMT use. On the other hand, faculty have

emphasized the importance for residents to think holistically in treatment plans as part of their case discussions well before implementing this study or the new curriculum. Analysis of data beyond the study period may help to determine the factor this new curriculum has on implementing more OMT in the clinic moving forward.

Strengths of the study include the novelty of this topic, the attempt to model the intervention on real-world industry successes and the innovative method to study the use of OMT. Weaknesses include the missing data from January, the change in methods throughout the course of Lean (a process that is inherent to Lean itself) and other variables mentioned above, including resident progression and the program's focus on achieving OR status. There may have also been the effect of bias in the study as faculty patient visit data was included throughout. However, because faculty visits were included in both the pre-intervention and post-intervention groups, the effect was likely minimal. Finally, it might have been insightful to single out each 5 "S" to determine individually its impact on the results or how to wait time translated to patient satisfaction scores. However, this information was not available for retrospective review.

Because the current study was performed on residents in training, it was difficult to extrapolate this out to others. Nevertheless, the authors hope that this study might encourage young and experienced physicians alike to trial Lean processes, improve efficiency and help free up more time for OMT. Busy DOs in practice could implement a few of the 5 "S's" with minimal effort and potentially see quick results, as suggested by our study. Future studies might follow residents into private practice to determine if the 5 "S" method continues to affect patient wait time reduction and enhanced OMT use. Studies might also look further into the impact of each 5 "S" on outcomes and the overall effect of 5 "S" on patient satisfaction.

CONCLUSION

This study is rather timely. As family medicine residency programs work to achieve osteopathic recognition, programs will have to find methods to engage residents to ensure the continual practice of osteopathic treatment skills. Our study suggests that the use of Lean may help provide the additional time residents in training needed to improve patients' satisfaction (by decreasing wait times) and use OMT more seamlessly. Challenges in the implementation of Lean included creating buy-in among staff and residents, the time commitment to implementation and the ongoing challenge of creating a standard of work to ensure future success. Nonetheless, the study indicates a method that may help osteopathic programs focus on efficiency and increase OMT use throughout the training.

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CALENDAR OF EVENTS

MARCH 7-8, 2021

DO Day on Capitol Hill
American Osteopathic Association
Virtual
osteopathic.org

MARCH 10, 2021

ACOFP Congress of Delegates
American College of Osteopathic
Family Physicians
Virtual
acofp.org

MARCH 11-14, 2021

ACOFP 58th Annual Convention
& Scientific Seminars
American College of Osteopathic
Family Physicians
Virtual
acofp.org/acofp21

APRIL 15-18, 2021

VOMA 2021 Spring Virtual CME
Conference
Virginia Osteopathic Medical
Association
Virtual
voma-net.org

APRIL 23-25, 2021

Ohio Osteopathic Virtual Symposium
Ohio Osteopathic Association
Virtual
ohioacofp.org

MAY 21-22, 2021

IOA '21 Virtual Live Annual Spring Update
Indiana Osteopathic Association
Virtual
inosteo.org

APRIL 28 - MAY 1, 2021

POMA's Virtual 113th Annual Clinical
Assembly & Scientific Seminar
Pennsylvania Osteopathic Medical
Association
Virtual
poma.org

JUNE 11-13, 2021

KOMA Annual Conference
Kentucky Chapter of ACOFP
koma.org

JUNE 11-13, 2021

MOA 110th Annual Convention
Maine Osteopathic Association
mainedo.org

JUNE 9-13, 2021

TOMA/TX-ACOFP Annual Convention
Texas State Chapter of ACOFP
txacofp.org

JUNE 26-27, 2021

Summer CME
Missouri Society of the ACOFP
msacofp.org

JULY 16-18, 2021

Direct Primary Care Summit
American Academy of Family Physicians,
in partnership with ACOFP
dpcsummit.org

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