

Clinical Management Recommendations

Application of Lean Six Sigma in Dermatology Practice

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ABSTRACT

The Lean Six Sigma (LSS) methodology integrates two quality improvement techniques to enhance efficiency, reduce waste, and improve the quality of processes and products within an organization. While it has found application in various healthcare settings, to the best of our knowledge, there is currently no literature addressing its utilization in a community dermatology clinic. This study aimed to identify efficiency issues within a local dermatology clinic and implement targeted strategies to bolster collaboration, streamline processes, reduce wait times, augment patient volume, and enhance clinical outcomes and the quality of care. Five areas for improvement were identified: the building complex, front office, Electronic Medical Assistant (EMA) system, medical assistants, and general improvements. The executed changes effectively standardized multiple processes, mitigated the potential for errors, and minimized task duration. These findings underscore the efficacy of LSS as a potent tool for enhancing efficiency and reducing waste. Efforts should be directed toward the incorporation of LSS techniques for quality improvement within healthcare systems, both internally and across interconnected entities.

INTRODUCTION

Quality improvement initiatives have become increasingly important in healthcare owing to the growing imperative to develop and execute efficient practices that enhance the quality of patient care, improve clinical outcomes, and optimize operational efficiency. Lean and Six Sigma represent two distinct yet interrelated quality improvement methodologies harnessed to refine efficiency, curtail wastage (including time and resources), and elevate the overall quality of organizational processes and products.

The Lean approach primarily centers on streamlining operations by eliminating extraneous activities, often dubbed as “waste”. This encompasses facets such as overproduction, surplus inventory, defects, unnecessary motion, time wastage, transportation, and overprocessing.¹ By instating Lean techniques, organizations strive to establish a seamless and efficient workflow, culminating in cost and lead time reductions.² Conversely, Six Sigma focuses on pinpointing and rectifying defects, errors, and variations within processes, with the end goal of driving process improvement and variation reduction, thus ultimately augmenting overall performance.¹

By combining Lean and Six Sigma methodologies, organizations can effectively address both efficiency enhancement and quality improvement objectives. The concept of “Lean Six Sigma” (LSS) integrates the principles from both paradigms, which are increasingly applied across various industries, including healthcare. This integration is particularly important because achieving successful operational enhancement outcomes, whether within healthcare or other sectors, demand the incorporation of key elements from both approaches.

This model has found application across diverse healthcare settings, achieving distinct objectives, such as curtailing operating room turnover time in surgery,³ enhancing perioperative efficiency for plastic surgery procedures,⁴ optimizing efficiency in an ophthalmology clinic,⁵ and improving antibiotic administration in pediatric hospital settings.⁶ Nonetheless, to the best of our knowledge, there is an evident lack of literature encompassing its implementation within a community dermatology clinic.

Our study aimed to first identify issues within a local dermatology clinic impeding efficiency and subsequently implement meticulously tailored strategies to foster collaboration, streamline processes, reduce patient wait times, increase the number of patients treated, and improve clinical outcomes and the quality of care.

METHODS

Lean Six Sigma emphasizes the DMAIC approach, a roadmap for process enhancement encompassing five phases: define, measure, analyze, improve, and control (DMAIC). Improvement strategies were executed collaboratively by a team

consisting of dermatologists, physician assistants, medical assistants, and administrative personnel.

The “Define” phase entailed the identification of the focal issue: augmenting process efficiency and workflow within the dermatology clinic (**Figure 1**). In the subsequent “Measure” phase, data was collected from an electronic medical record (EMR) software dashboard to objectively measure and gauge factors such as wait times or other pertinent metrics pertaining to the targeted areas of improvement. The “Analyze” phase centered on five specific areas of improvement: the building complex, front office, Electronic Medical Assistant (EMA) system, medical assistants, and general improvements (**Table 1**). Focused interventions were subsequently executed in these areas during the “Improve” stage, followed by a comparative analysis conducted both pre-implementation and six months post-implementation. To ensure the sustainability of the enhancements made, continuous monitoring extended beyond the preliminary areas of improvement throughout the “Control” phase.

RESULTS

During the initial analysis, several logistical areas of improvement were identified. Patients frequently encountered delays and confusion during their clinic visits, stemming from challenges in locating the office due to inadequate signage and directions. Furthermore, patients often expressed a lack of awareness regarding parking options and underestimated travel time, culminating in tardiness for appointments. To address these challenges, directions and instruction were provided to every new patient, encouraging them to allocate an additional 10-15 minutes for travel. To address same day

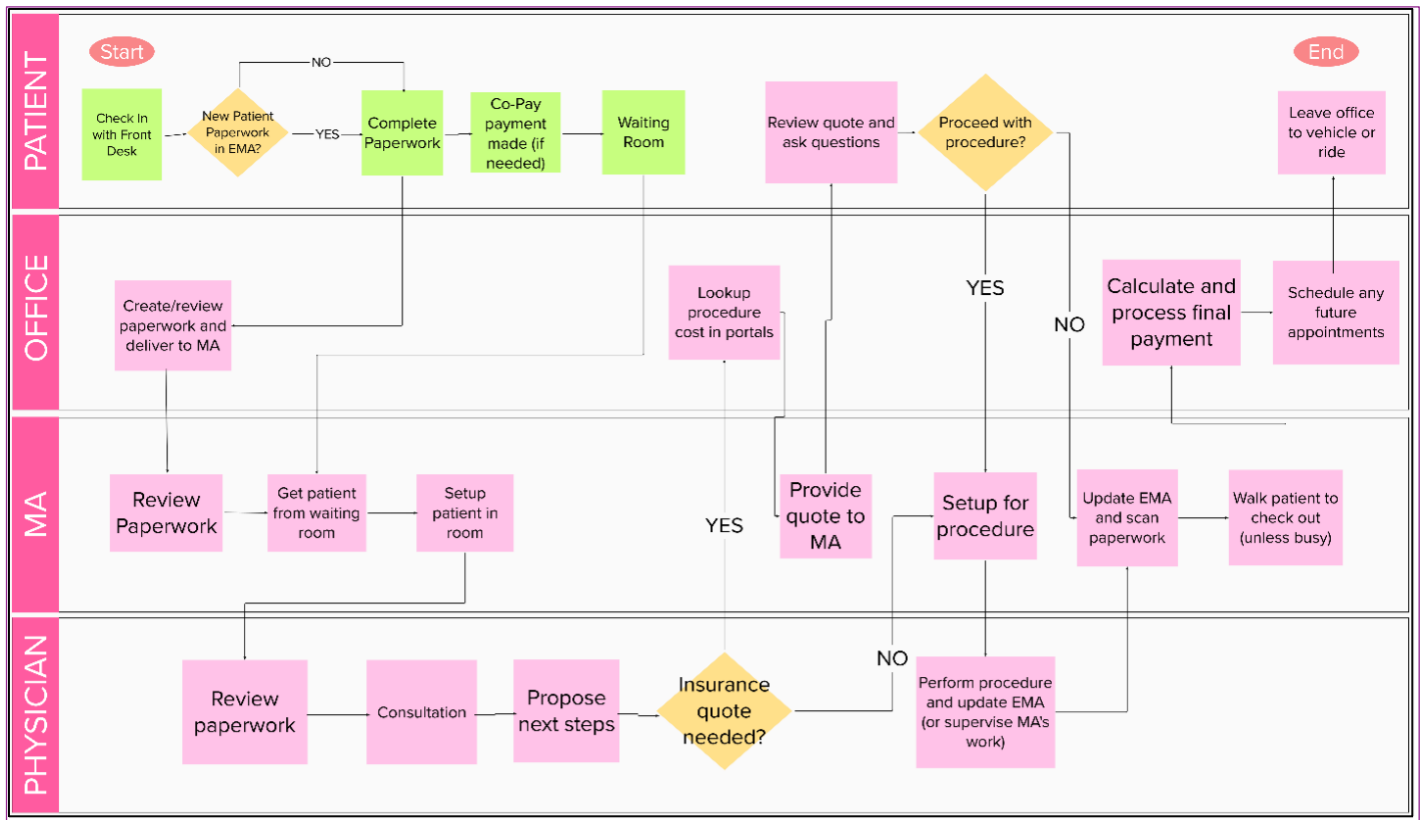


Figure 1. Swimlane diagram of general dermatology patient flow

Table 1. Summary of improvement areas and targeted interventions utilizing Lean Six Sigma methodology.

Category	Issue/ Problem	Impact	Magnitude (L/M/H)	Potential Solutions	Implemented	Additional Comments
General	Friday afternoon free time doesn't allow time for improving, only catch-up. Two of the meetings are staff and social media meetings.	Ideas don't get implemented as quickly, can lead to frustration or busy work	M	<ul style="list-style-type: none"> Include time in staff meeting to discuss and share recent improvements Set expectation that 1 hour per week should be spent on improvement Reduce other tasks to free up 1 hour per week 	Yes	Hired additional PA and MA to increase workflow
Building Complex	Lack of signage inside the courtyard	Takes patients longer to find the office, can	H	Add signs or arrows to help visitors find different businesses,	No	Unable to add signage in parking garage or courtyard

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		lead to frustration		especially coming out of elevator		per building rules
	Signage in parking garage says Level 1, 2 and 3, but elevator says G, 2 and 3	Confusing for patients to know which button to press	L	<ul style="list-style-type: none"> Contact building management to see if sticker can be placed in elevator next to G (1st Level) Change signage in parking garage to call offices "Ground level" instead of 1st level 	No	
EMA System	Two-step process to create face sheets (print face sheets, then re-print with insurance section at bottom)	Takes extra time to prepare for each day (would save a minute or two for each prep day)	M	See if EMA can include additional custom information (insurance info) at the bottom of the face sheet	No	Insufficient time to make changes
	New patient screen requires scrolling down to mark state as Texas	Adds a few seconds to each new patient entry	L	See if EMA has a default state selection for new patients	No	
	Extra clicks to select Mon/Tues/Wed (general) or Thu/Fri (cosmetic) for checking schedule availability	Adds 1 second each time patient needs to schedule appt	L	See if EMA can add grouped day selection (Mon/Tues/Wed or Thu/Fri)	No	
Front Office	Patients don't know about parking options and don't plan for traffic	Take longer to get to appointment, increased frustration	H	<ul style="list-style-type: none"> Provide instructions to every new patient about where to go, how to find office, etc. For early or late appointments, encourage them to plan for 10-15 mins longer than expected to arrive 	Yes	Implemented but only measured reactively; outdoor construction made implementation difficult

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<p>Some new patients complain they don't get the new patient email forms (mainly don't check their emails)</p>	<p>Adds 5-10 mins to wait time, and about 5 mins for data entry</p>	<p>M</p>	<ul style="list-style-type: none"> · Review Patient Portal features · Give paperwork to MA after entering name and address, finish entering details later (to reduce patient waiting time) 	<p>Yes</p>	
<p>Takes time to check the face sheet and determine which folder is which</p>	<p>Small delays add up through the day, higher risk of grabbing wrong paperwork</p>	<p>M</p>	<ul style="list-style-type: none"> · Color code folders or sticky notes based on new patients, cosmetic, MA only, checkup, etc. · See if font size can be increased for key items on face sheet (name, ID, etc.) 	<p>No</p>	<p>Not executed due to challenges in overseeing color-coded folders or notes for categorizing new patients, cosmetic procedures, MA-only tasks, and checkups</p>
<p>Lots of patients don't want to schedule another appt (3+ months in advance)</p>	<p>Lost revenue and more costly to attract and setup new patients</p>	<p>H</p>	<ul style="list-style-type: none"> · Follow-up with patients that haven't scheduled after 3 months (all patients, not just cancer patients) · Highly encourage patients to book a time and cancel later · See if EMA has a way to auto-email patients who are supposed to reschedule 	<p>Yes</p>	<p>Encouraged patients to book appointments before departure. However, it was difficult since patients lack advance access to their schedules or have others managing their appointments.</p>
<p>Anecdotal evidence of customer satisfaction</p>	<p>May not be aware of negative experiences or problems</p>	<p>H</p>	<ul style="list-style-type: none"> · Review patient feedback online on regular basis · Solicit feedback right away (ideally before they leave while there is still time to fix, or explain how to share feedback privately or anonymously) 	<p>No</p>	<p>Regular patient feedback review hindered due to existing workload of staff</p>

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	Takes multiple steps to create templated email for new patient forms (copy from Word template)	Small benefit, will save a few seconds each time	L	<ul style="list-style-type: none"> · Check if Outlook has easy-to-access templates that can be created · Review Patient Portal features 	No	Could not implement templated emails since office manager handles front-end tasks
	Patients are canceling same-day or not showing up	Lost revenue and missed opportunity for patients to be seen earlier	H	<ul style="list-style-type: none"> · Review past data to see if charging patients makes a difference · If charging makes a difference, consider re-implementing program · Look at most common times when cancellations occur (around Holidays, Mondays, early morning or late afternoon) and add 1-2 time slots into schedule to account for it 	Yes	Cancellation fee (\$25) instituted with first-time waivers
	Staff don't get feedback on clinic performance (total visits, cancelations, wait times, problems, etc.)	Staff motivation and performance can increase when they have insights into how they are doing each day, and have a chance to bring up problems	H	<ul style="list-style-type: none"> · Consider formalizing the short meeting at beginning and end of shift (daily huddle) · Discuss yesterday's results and plan for today · Bring up any issues or errors that occurred 	Yes	Daily huddle to discuss previous day's results, plan for the day, and address issues/errors. Continued monthly staff meetings.
	Patient must re-write all information for update forms	Takes a long time, increases waiting time	M	<ul style="list-style-type: none"> · See if EMA can print out most recent patient information and have patient confirm instead of filling out blank form 	No	

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	Use of verbal cues to know if patients are frustrated in waiting room	Patient satisfaction , potential negative reviews	H	· See if EMA can alert you when patient is checked-in, but not seen by MA yet (after 10 or 15 mins), then communicate with patient about expected wait time	Yes	MAs monitor patient wait times for timely check-ins
	New and update patient form does not ask for same gender categories as EMA (form says birth gender, EMA can be marked “identifies as”)	Judgment call on gender identity and preference	L	Modify patient forms to match EMA	Yes	Direct form changes to match EMA were not made, but more portal usage allowed for updates.
Medical Assistants	Patient waiting too long in room without being seen	Patient satisfaction , potential negative reviews	H	Timer that reset every time the door opens, so you know how long it’s been since last contact. Not sure if that exists, or if this is a current issue or not.	Yes	MAs monitor patient wait times for timely check-ins
	Lack of procedures or documentation used for most procedures, based on memory	Potential to make mistakes, do steps out of order, or forget steps	M	Create flow sheets or checklist for all procedures, not just biologic (more complex processes)	No	Transitioning away from flow sheets; information is entered directly into EMR
	Potential for collision rounding corners	Patient or staff injury	M	· Install mirror on wall or ceiling to make it easier to see if someone is coming	No	Aesthetic concerns and no prior reported issues prevent implementation
	Supply area for making kits seems congested and lacking space	Potential to drop supplies, more reaching and bending to throw stuff away	M	· Move other items out of area (like MVE tank) that don’t have to be there · Put trash can and MVE tank on wheels to move them around more easily	Yes	Rearranged the area to optimize space

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	Patients, doctor, and MA walk back and forth to waiting room, bypassing other unused rooms	Takes time for walking that causes small delays, which can add up over weeks and months. But would have to compare to time spent going back and forth to Rooms 1-3 to see if overall time is saved	L	Utilize Room 0 for patients (not just overflow or acne treatments)	Yes	Room 0 is now being used.
	Rare and infrequent procedures have run low or run out of supplies in the past	Requires last-minute ordering and expediting, with potential to delay procedure	M	Implement more trigger/reorder systems (2 bin system) for rare and infrequent items (balance inventory of running out and having too much)	No	Every Friday, the MA conducts a thorough review and restocks supplies, with plans to enhance this practice.

Abbreviations: EMR (electronic medical record), MA (medical assistant), L (low), M (medium), H (high), PA (physician assistant)

cancellations or no-shows, a fee was instituted to discourage these occurrences.

Many patients who had appointments expressed reluctance to schedule follow-up visits several months in advance, resulting in diminished revenue and difficulties with attracting and assimilating new patients. The staff was prompted to proactively reach out to patients who had not scheduled their next appointment after three months and strongly encourage them to make an appointment and reassure them of the option to cancel later if needed. The consideration of configuring the EMA system to send automatic reminder emails for rescheduling was also put forth. However, it is worth noting that this solution was not always feasible for patients who did not have their schedules in advance or had someone else managing their schedule.

Patient wait times also served as a source of improvement. The efficiency of the patient check-in process for the initial consultation was found to be suboptimal. Some new patients reported not receiving the requisite new patient email forms, resulting in an additional 10-15 minutes of waiting time for manual data entry. To mitigate patient waiting time, the proposed solution involved providing the paperwork to the medical assistant after entering the patient's name and address, allowing subsequent data input into the EMR system at a later point. Furthermore, certain patients expressed dissatisfaction while waiting to be seen, citing extended waiting periods. This not only increased the potential for negative reviews but also impacted overall patient satisfaction. To address this, the medical assistants actively monitored patient waiting times to prevent prolonged waits. This proactive approach heightened assistants' awareness of the waiting room dynamics, enabling them to quickly identify and rectify bottlenecks, such as inefficient triage or room turnovers,

that led to patient delays. Active monitoring of wait times thus allowed for faster patient processing and a more efficient overall system.

Additionally, the team tasked with handling patient dissatisfaction lacked feedback on their clinical performance. Recognizing the significance of this aspect in fostering staff motivation and performance, a daily morning huddle was introduced. This enabled the discussion of the previous day's outcomes, addressing any emerging issues or errors, and outlining plans for the day ahead. These measures aimed to enhance staff engagement, operational efficiency, and patient satisfaction.

Underutilization of patient rooms emerged as another source of improvement, and therefore, one room previously designated for overflow and acne treatments was repurposed for general patient use. A congested supply area where kits were assembled presented challenges, including limited space, disorganization, and an increased risk of supply mishandling and staff injuries. To alleviate these concerns, unnecessary items were either removed or rearranged, optimizing room organization to ensure efficiency and easy accessibility.

In terms of overarching clinical improvements, it was observed that free time on Friday afternoons was primarily devoted to completing unfinished tasks, rather than optimizing clinic workflow. This delayed the implementation of LSS ideas. In response to this issue, an additional physician assistant and medical assistant were hired. This initiative aimed to strengthen workflow and expedite the implementation of improvement initiatives.

DISCUSSION

By implementing targeted interventions using the Lean Six Sigma methodology, the objective was to eliminate unnecessary steps and refine clinical workflow. This approach minimized time wastage, enhanced efficiency across multiple facets of the clinic, bolstered staff productivity, and ultimately improved patient satisfaction.

Notably, several challenges were identified, yet potential solutions remained unfeasible for implementation. For instance, the incorporation of additional signage within the parking garage, courtyard, and elevator to expedite patient navigation to the clinic proved unattainable due to the need for alterations in building management rules. This issue surpassed the scope of the internal clinic's influence.

Improving the collection of anecdotal evidence regarding customer satisfaction emerged as an important issue to address, as it allowed for early detection of negative experiences or problems. Suggestions were made to regularly review patient feedback online or solicit feedback during clinic visits. Unfortunately, these proposals could not be implemented due to the existing workload of the staff.

Additionally, concerns regarding potential collisions when rounding corners in the clinic prompted a proposal for the installation of mirrors on the walls or ceiling to enhance visibility and prevent accidents. However, apprehensions over the negative aesthetic impact on the office space hindered this solution's implementation, especially since no accidents had yet occurred. Consequently, this matter was deferred.

Occasional shortages of supplies for infrequent procedures necessitated last-minute ordering and expedited deliveries and risked procedure delays. A proposal to

introduce additional triggers or a reorder system for infrequently used items, such as a two-bin system, was made. Temporarily, this issue was addressed by increasing the frequency of supply checks by medical assistants, with the intention of implementing the proposed change in the future.

Problems were also identified with patient documentation and the EMA system that resulted in prolonged waiting times before consultation with a dermatologist. These issues included a two-step face sheet creation process involving insurance details, lengthy scrolling for selecting the state of residence (e.g., Texas), and additional clicks for choosing the appropriate appointment day, all of which added extra time for each patient. To optimize efficiency and diminish daily task times, proposals were made: including supplementary custom information (such as insurance details) at the bottom of the EMA system's face sheet, implementing default state selections for new patients, and introducing grouped day selections for simplified scheduling.

Due to the six-month follow-up period, there was insufficient time for the clinic to incorporate some recommended changes. In the front office, extra time was expended searching for specific folders while checking face sheets, which contributed to minor delays and the possibility of retrieving incorrect paperwork. Proposed solutions, such as enlarged fonts and color-coded folders or sticky notes based on appointment category, could not be implemented due to the complexities of overseeing the color coding and categorization process for all folders. Requiring patients to rewrite all their information on update forms prolonged wait times. The suggestion to use the EMA system to print the most recent patient information was recommended, allowing patients to simply confirm accuracy rather

than completing a new form each time. However, time constraints hindered the integration of this recommendation. Another EMA-related concern was the reliance on memory for documenting most procedures, which introduced the potential for errors or omissions. A flow sheet or checklist was proposed to standardize this process. However, as the EMR system already contained the necessary information, the clinic opted to move away from creating flow sheets.

Overall, the dermatologist of the clinic involved in this study expressed contentment and a sense of enjoyment in his participation with the process. The initial consultation provided great insight for areas of improvement in his clinic. The primary hindrance to implementing many of these changes lay in the lack of sufficient time, particularly for suggestions requiring adjustments to the EMR system or coordination with management. He noted that the most challenging aspect of introducing the LSS methodology to the dermatology practice was determining how to proceed with the proposed changes. It required extensive time and deliberation for the dermatologist and office manager to integrate these changes into their daily practice and commit to them. Ensuring consistent adherence to the changes posed difficulties, as it is easy to revert to previous habits that worked for the clinic, rather than consistently integrate new changes into their daily routine. While morning huddles were successfully adopted and valued, consistent adherence to additional measures (such as proactive patient callbacks and wait time monitoring) was hindered by a tendency to revert to familiar habits. This resistance was compounded by the complexity of training staff for new roles that added to their existing duties, potentially making these recommended changes burdensome and

challenging to maintain over time. He suggested that a timeframe of 1-2 months was likely suitable for implementing some recommended changes, while more substantial changes would require 6-12 months for proper execution. Enhancing the benefits of the LSS methodology could involve preliminary staff training before introducing changes and implementing a self-check-in tablet for patients to expedite the check-in process and complete necessary paperwork without waiting for staff members. In his experience, addressing the following areas could be beneficial in improving the study's design: categorizing each issue as low, medium, or high magnitude and prioritizing high magnitude problems first, rather than all recommendations simultaneously; permitting a lengthier implementation period with more frequent follow-ups to monitor the progress of changes; appointing 2-3 individuals to oversee assessments and review implemented changes with weekly team discussions; providing periodic staff retraining to ensure sustained adherence to recommended changes; and increase the number of providers to facilitate the division of tasks more effectively.

CONCLUSION

The Lean Six Sigma methodology focuses on eliminating resource wastage, optimizing efficiency, and diminishing process variability. Using this model, the implementations undertaken at the dermatology clinic achieved this goal by streamlining administrative processes, mitigating potential documentation and logistical errors, increasing the number of patients treated, and curtailing waiting room durations and task execution times. Future initiatives directed towards reducing the time from patient check-in to initial consultation

may involve coordinated efforts among healthcare providers, front desk personnel, medical assistants, and other administrative staff. Efforts should be made to further utilize Lean Six Sigma tools for quality improvement in processes within and across healthcare systems.

Overall, the outcomes of this study highlight the capacity of the Lean Six Sigma methodology to improve healthcare delivery through coordinated and targeted interventions. These findings provide invaluable strategies that can not only be applied to individual practitioner offices but also translated to benefit larger medical practices.

Conflict of Interest Disclosures: None

Funding: None

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