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Successful interventions to improve efficiency and reduce patient visit duration in a retina practice

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Abstract

Purpose: To reduce the total clinic visit duration among retina providers in an academic ophthalmology department

Methods: All patient encounters across all providers in the department were analyzed to determine baseline clinic visit duration time, defined as the elapsed time between appointment time and checkout. To increase photography capacity, a major bottleneck identified through root cause analysis, four interventions were implemented: training ophthalmic technicians to perform fundus photography in addition to OCTs, relocating photography equipment to be adjacent to exam rooms, procuring three additional Optos widefield retinal photography units, and shifting staff schedules to better align with that of the providers. These interventions were implemented in the clinics of two retina providers.

Results: The average baseline visit duration for all patients across all providers was 87 minutes (19550 patient visits). The prior the average visit duration was 80 minutes for provider 1 (557 patient visits) and 81 minutes for provider 2 (1246 patient visits). In the four weeks after interventions were implemented, the average visit duration decreased to 60 minutes for provider 1 and 57 minutes for provider 2.

Conclusions: A systematic approach and a multi-disciplinary team resulted in targeted, cost-effective interventions that reduced total visit durations.

Summary Statement:

In this quality improvement study, four targeted interventions successfully improved clinic efficiency by reducing the clinic visit durations of two retina providers at an academic

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ophthalmology department. The interventions, aimed at increasing photography capacity, were identified using a systematic approach and multidisciplinary team.

Keywords

Quality Improvement; Clinic efficiency; Photography

Introduction

Ophthalmologists are experiencing increasing demands for their care, in large part due to an expanding aging U.S. population, a growth in the number of insured patients in the United States, and a shift in care from inpatient to outpatient settings.^{1–3} As patient volumes increase, finding ways to reduce patient wait times and improve clinic efficiency will be even more important, especially as ophthalmology appointments are already often prolonged compared to other outpatient visits due to the frequent need for specialized imaging.⁴ Shorter wait times have been shown to significantly improve patient satisfaction in ophthalmology clinics.⁵ Improving workflow would lead to more timely and efficient care, two of the six domains of quality improvement defined by the Institute of Medicine's seminal report "Crossing the Quality Chiasm".⁶ This in turn would have the positive ramifications of reducing financial spending and increasing revenue.⁴

Numerous quality improvement projects focused on enhancing ophthalmology clinic efficiency have been reported in the literature.⁷ Some effective techniques have included developing a data-driven scheduling template based on appointment length, using portable radios in clinic to improve team communications, and having a wider distribution of appointment slots.^{8–10} Increasingly, a number of studies have sought to improve efficiency using Lean Six Sigma, a combination of two overlapping manufacturing industry principles: Lean (a streamlining process that is designed to reduce waste) and Six Sigma (a systematic and rigorous methodology that focuses on reducing process variation and enhancing process control).¹¹ The approach uses a 5-step plan to define, measure, analyze, improve, and control a process (i.e. a patient encounter) that can be optimized. The initial problem (i.e. long clinic wait times or total visit duration) is identified ("define") and then a baseline assessment is gathered ("measure"). These baseline measurements are then examined to identify bottlenecks ("analyze") that specific interventions can then target. After implementation of these interventions ("improve"), a follow-up analysis is run to determine the efficacy of these interventions ("control").⁴

Using Six Sigma approaches in ophthalmology has improved the workflow of emergency room eye examinations, minimized intraoperative and postoperative complications of cataract surgery, increased capacity and reduced patient wait times (even at large, publicly-funded ophthalmology services), and decreased appointment durations while increasing patient-physician interaction time (PMID 28985800, 24422265, 33413381).^{12–14} Within retina practice, Lean Six Sigma methodologies have been used to improve efficiency both in the operating room and in the clinic. These studies include designing a new intravitreal injection center that maximizes quality and reduces waste (PMID 32514665),

or streamlining the process of scleral buckle surgery, standardizing the steps to reduce intraoperative time while maintaining favorable patient outcomes and cost-effectiveness (PMID 32511727). This approach has also been used in outpatient retina clinics, shortening wait times by changing photography workflow, adjusting staffing, and optimizing scheduling.^{4,15}

In this study, we use a comprehensive quality improvement approach, based in part on the aforementioned Lean Six Sigma methodologies, to determine strategies for reducing total visit duration in an academic ophthalmology department. Total visit duration is defined as the time from the patient's scheduled appointment to when they check out of clinic. These strategies were implemented in two retina providers' clinics with the goal of reducing the average visit duration to under 60 minutes.

Methods

A multi-disciplinary team with varying, unique perspectives of the clinic workflow was assembled to conduct this project. The team was comprised of an ophthalmic technician, scheduling assistant, clinic manager, and ophthalmologist.

The visit duration for all patient encounters across all providers at this academic ophthalmology department was determined for a period of 17 weeks from January 2019 to April 2019. The weekly averages were calculated and then averaged again to determine baseline values for the entire ophthalmology department, each subspecialty, and each individual provider. Defined as the elapsed time between the appointment time and checkout, visit duration was calculated through time stamps in the electronic health record. Any patient that was more than 15 minutes late to their scheduled appointment time was excluded from the analysis. In addition, waiting time before the scheduled appointment time or after the visit was complete (i.e. waiting for transportation to and from the clinic) was not considered in this analysis, as is the standard practice.⁴

A process map outlining patient clinic flow and delineating phases of care was created. Root cause analysis for long visit duration was performed and a cause-and-effect fishbone diagram identifying factors contributing to visit duration was designed. These factors were listed in a survey sent to faculty and clinic staff, who were asked to rate the top 3 factors leading to increased visit duration. Interventions that targeted these key drivers were designed.

The retina service had the highest clinical volume and thus was targeted for intervention. Two retina providers participated in the project, which ultimately focused on reducing congestion in photography. To accomplish this, three new Optos widefield retinal photography units were purchased with the goal of decentralizing usage by moving devices outside of the photography suite. Ophthalmic technicians were trained to perform Optos imaging in exam lanes, bypassing the need for patients to go to the photography suite. Average visit duration was recorded for one month after the intervention was instituted.

Results

Baseline Assessment:

The baseline visit duration for all patients across all providers, averaged each week over a period of 17 weeks, was 87 minutes (range 78–96). The total number of patient visits was 19,994 and the mean weekly volume of patients that were analyzed was 1150 (range 776–1345). For the two retina specialists who participated in this study, the average baseline visit duration for provider 1 was 84 minutes (range 60 to 105) with a total of 557 patient encounters, and 81 minutes (range 63–97) with a total of 1246 patients for provider 2. From a multiple-choice survey administered in July 2019 to 100 consecutive retina patients, the majority (70%) expressed the expectation that their visit be limited to 1 hour. This formed the basis for our quality improvement goal of a target visit duration of 60 minutes.

Root Cause Analysis:

A cause and effect (fishbone) diagram was created to identify factors contributing to a longer visit duration (Fig. 1). The diagram included 6 general categories: methods (i.e. appointment scheduling), materials (i.e. levels of instruments and supplies), people (i.e. staff or providers), environment (i.e. room availability), machines (i.e. capacity of photography machines), and factors outside of our control (i.e. patients needing unexpected treatment/procedures during the appointment). Based on analysis of the process map outlining clinic workflow, the fishbone diagram was drafted and then iteratively refined following direct observation by the team of the two retina providers' clinics. The factors highlighted in the fishbone diagram were listed in a survey sent to all clinic providers and staff, who were asked to rate which factors were most responsible for prolonged visit duration. Limitation in photography capacity was identified as the #1 factor contributing to delays.

Analysis of the process map detailing clinic workflow also identified a bottleneck in the photography suite (Fig. 2). In the retina clinic, patients are first screened by technicians who check visual acuity and intraocular pressure, dilate the eyes, and perform optical coherence tomography (OCT) imaging if necessary. The patients then wait in a separate lobby for the ophthalmic photographers, who obtain additional requested imaging such as Optos imaging and fluorescein angiography. Following this, the patients return to the main waiting area once more before being brought back to the exam room to be seen by a provider. The time spent waiting for ophthalmic photography, the handoffs between technicians and photographers, and the additional waiting time in the main lobby were identified as areas of inefficiency.

Interventions and Effect:

Several photography-related interventions were considered to shorten overall visit duration. These included hiring additional photographers and purchasing more photography equipment, both of which would directly increase photography capacity. Due to budgetary and human resource priorities at our institution, purchasing more photography equipment had several advantages over hiring additional staff. From a cost perspective, the equipment are a 1 time fixed expense that can generate increased revenue and thereby recoup the purchase cost over time. At a purchase cost of \$100,000 per Optos device, a breakeven

point is reached after 2,000 tests considering a medicare allowable rate of approximately \$50 per test. This is achieved in less than 1 year by using an Optos device at least 8 times per workday, which is readily exceeded by our high volume retina practice. In addition, at our institution, there is an annual capital budget allocation for new equipment. Compared to the several layers of approval required to hire new staff, applying for new equipment is relatively straightforward, and in our case readily granted. Another approach focused on addressing existing inefficiencies in the workflow to indirectly increase capacity. A combination of these two approaches was ultimately chosen.

The project strategy included four components. First, three new Optos cameras with widefield capabilities were procured. Second, all technicians working with the two retina providers were trained to perform wide-field fundus photographs on Optos cameras, in addition to OCT which they already performed independently. Since these were the two imaging modalities that the majority of patients required, having the technicians perform these photographs eliminated the need for most patients to be routed to photography. In addition, two Optos devices were relocated from the photography suite (which was located at one end of the clinic) to areas adjacent to exam rooms. Not only did this relocation circumvent the problem of limited physical space for more equipment in the photography suite, but it also reduced patient movement. Finally, technicians and photographers shifted their schedules from five eight-hour days to four ten-hour days. By matching staff and physician schedules, providers were able to maintain continuity among their cell units throughout the day. .

The effect of these interventions were pronounced. In the 17 weeks prior to the implementation of these interventions, the average visit duration across 557 patient visits was 84 minutes (range 60–105) for provider 1 and 81 minutes across 1246 patient visits (range 63–97) for provider 2. In the 4 weeks following implementation, the average visit duration decreased to 60 minutes (120 patient visits) for provider 1 and 57 minutes (253 patient visits) for provider 2. This represented a 25% and 30% decrease in average visit duration for providers 1 and 2, respectively. (Fig. 3)

Discussion

This study demonstrated the efficacy of using a quality improvement approach to reduce the duration of patient visits in an ophthalmology clinic. The stepwise process involved establishing baseline metrics, creating a process map outlining phases of care for patients, performing a comprehensive root cause analysis for prolonged visit duration, determining which factors to prioritize based on provider feedback, implementing targeted solutions, and measuring the results of this implementation.

A team-based approach was crucial to the successful implementation of these interventions. As primary drivers of the project, ophthalmic technicians, patient schedulers, and clinical manager provided important perspectives on the patient experience in our clinic, aspects of which are not seen and experienced by busy clinical providers. The team members were essential to designing the cause and effect diagram, identifying key drivers, deciding which interventions to test, and implementing the interventions. Effective change required

buy-in from the technicians as they became responsible for Optos imaging. The benefits of utilizing a multidisciplinary team-based approach for quality improvement projects has been well-established in the literature.^{16–18}

This study has shown that improving clinic efficiency can be accomplished by reducing bottlenecks in clinic workflow. Reallocation of resources, including reorganizing equipment and training clinic personnel for new responsibilities, is a more cost effective solution than only focusing on capital purchases or hiring additional personnel. Optimizing usage of existing personnel, physical space, or other resources has been shown to be an integral part of delivering high-value healthcare.¹⁹ Furthermore, these interventions can be widely implemented even in clinics that fewer resources.

Aside from reducing their visit duration, the interventions in this study had numerous other benefits for patients. Perhaps more importantly, these interventions provided preemptive safety measures by decreasing the risk of falls, especially important given the large numbers of elderly or low-vision patients that ophthalmologists care for. By relocating the imaging devices closer to the exam lanes, patients avoided the long walk to the photography suite and minimized movement between different clinic rooms. Continuity of care was also improved by limiting the number of patient handoffs, which in turn reduced idle time during transitions in phases of care.

Reduced visit duration is also beneficial for providers in improving patient satisfaction, as one of the most common patient complaints pertains to longer wait times and limited time with providers. In fact, studies using Press-Ganey scores have shown that when patients spend a long time waiting to see providers (either in the waiting room or the exam room), they are not only less satisfied with their care but also have less confidence in the provider and perceive the quality of care received to be lower.²⁰ Reducing visit duration by increasing clinic efficiency allows providers to see their patients sooner and increase the percentage of the visit that is spent face to face with the provider.

Study limitations include a smaller sample size, as the interventions were implemented in only two retina physicians' clinics. However, the results and the relative ease of implementation show it can be applied to other providers' clinics, with similar results expected. In addition, the Lean Six Sigma approach was not always carried out to the fullest extent. For instance, more detailed information of the length of time spent in various phases of care could not be obtained due to limitations in how the time stamps were recorded in the electronic health record. There may have been delays in checking in or checking out due to a bottleneck at scheduling, or prolonged waiting in the lobby pre-screening or post-photography. Existing time stamps did not correlate with these phases of care and the only reliable time stamps was the check-in and check-out times. Nevertheless, from prior quality improvement projects conducted in our department, we are confident that the main bottleneck involves photography. Re-coding time stamps to be more specific to our ophthalmology clinic would aid future quality improvement efforts to reduce visit duration.

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CAUSES FOR PROLONGED VISIT DURATION

Fig. 1. Cause and effect (fishbone) diagram.

Root cause analysis was performed with a fishbone diagram to identify factors that prolong visit duration.

Fig. 2. Process map of clinic workflow.

This map details the general stages patients go through during their visit. A bottleneck in patient flow occurs in photography.

Fig. 3. Average visit durations for two retina providers.

This scatterplot shows weekly average visit duration time for two retina providers with a running average (blue horizontal line) and a intervention target (green horizontal line). After implementation of these interventions (indicated by the yellow arrow), the weekly average visit duration was reduced to 60 minutes for provider 1 and 57 minutes for provider 2.