



Standardization of Clinic Flow to Improve Patient Experience in a Student-Run Free Clinic

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Abstract

The Saint Louis University Health Resource Center, a student-run free clinic, has seen a rapid expansion in both the number of services supplied by the clinic and the number of patients seen at clinic. While we are excited to serve more patients, the increase in volume has resulted in increased wait times and clinic throughput, the most frequent complaint of patients. To combat these growing concerns, we standardized the route patients take through the services the clinic provides and embedded this flow into a new statusboard that automatically logs the amount of time patients spend with each service and in the clinic overall. This information feeds directly into a process map of the clinic that better visualizes clinic processes. The utilization of a standardized statusboard resulted in a significant 12 minute and 44 second reduction in the median time patients spend in clinic and identified key decision points where bottlenecks occur in clinic flow. It also resulted in a statistically significant improvement in patient satisfaction. Our results demonstrate that standardizing clinic flow via an automated statusboard improves clinic efficiency, reduces throughput time, and can also significantly improve patient satisfaction. The resulting process map can also identify areas needing intervention and opportunities to continue expanding. As we continue to gather data on where clinic patients are spending the most time, we will continue to optimize services to provide the best experience possible for our patients.

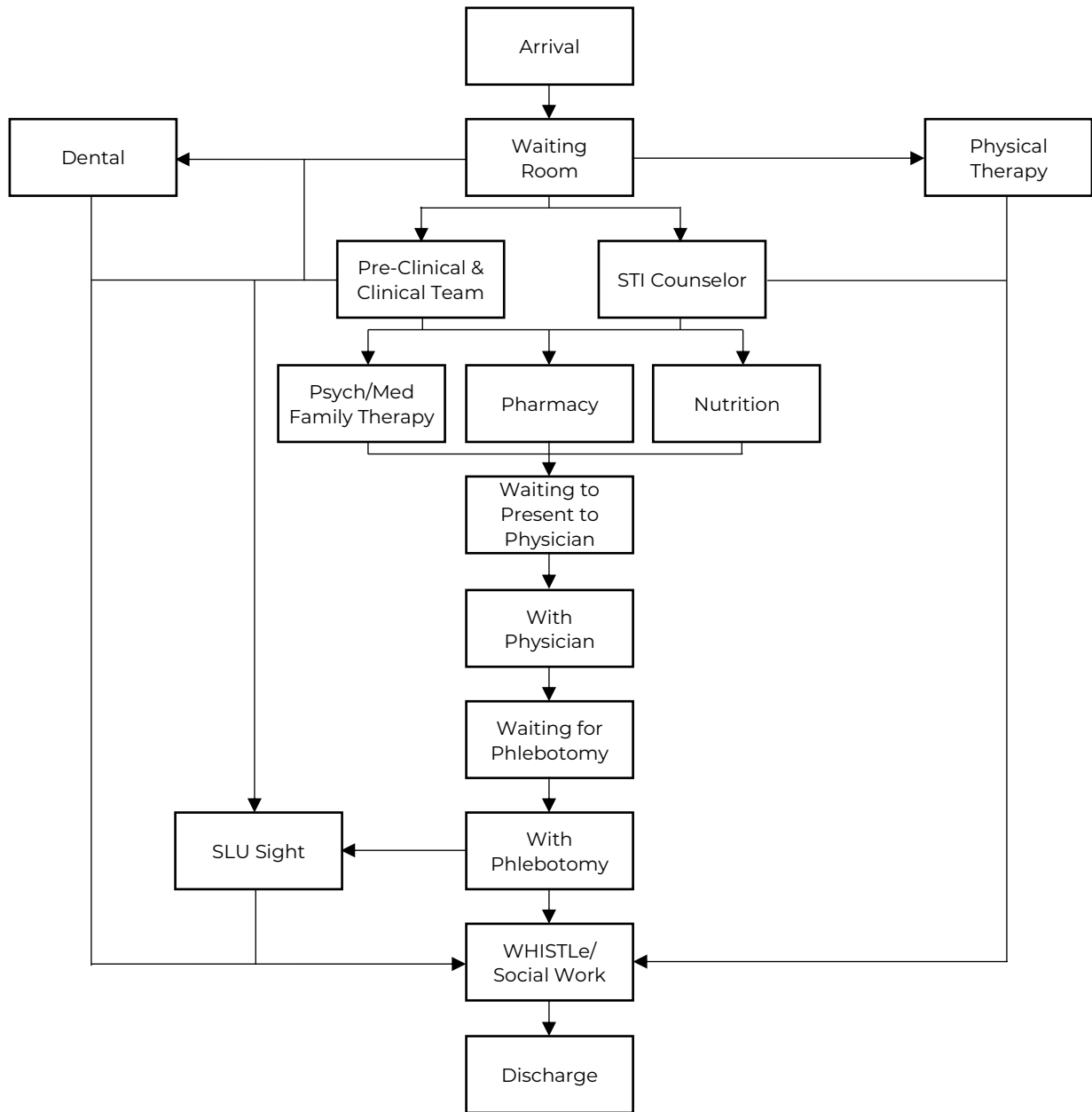
Introduction

The Saint Louis University Health Resource Center (SLU HRC) is a student-run free clinic that has provided healthcare to underserved communities in the North St. Louis area for the past 28 years. North St. Louis is home to significant health disparities, and the HRC strives to attend to these underserved patients' acute problems and connect them with other services throughout the city. The clinic has expanded over the past few years, adding several new services, from social workers to dental screenings, while also seeing an increase in patient volume. This increase in patient load and services has resulted in an anecdotal increase in patient wait and throughput times. Student leadership also noted that our Saturday clinic consistently concluded one to two hours after the scheduled end time, and wait times were

the lowest rated item on our patient feedback surveys. On multiple occasions, patients have left clinic early without receiving the services they needed due to their other commitments.

Operationally, throughput is defined as the amount of time patients spend in clinic, from entry to exit, and wait time is defined as the time spent waiting for a provider or service within a healthcare setting. Both are key quality metrics in numerous patient experience surveys used globally.¹ Multiple studies have shown that wait times and throughput times are inversely associated with patient satisfaction.²⁻⁵ One proven method to reduce wait and throughput times is by streamlining clinic flow.⁶ Thus, the primary objective of this quality improvement project was to standardize clinic flow and determine how this change impacted patient satisfaction. This was completed through an internal review of current

Figure 1. Standardized clinic flowchart



Based on an internal review, this flowchart shows the progression that any patient with any chief complaint may experience during their visit at the Health Resource Center. Each box represents an available service that patients may access at the clinic or a transitional stage between services. This encompasses the route a patient would take for any reason they may have for presentation.

STI: sexually transmitted infections; SLU: Saint Louis University; WHISTLe: Wellness Holistic Initiative in St. Louis.

processes to understand how patients naturally flow through the clinic, the development of a standardized clinic flowchart based on this internal review, and the subsequent implementation of a new, standardized statusboard that reflects this flowchart. Our secondary objective was to learn exactly how much time patients are spending with specific services within clinic visits via

the creation of a process map using the data from our statusboard.

Process mapping is the visual representation of workflow that allows an understanding of a process, its inherent properties, and its components (inputs, outputs, limiting factors).^{7,8} It can allow administrators to determine where operations can be made more efficient, how services

can be reorganized to improve clinic flow, and where downtime is available to implement new services. We wanted to incorporate automation within our statusboard to provide an accurate, objective view of clinic function. Our overall goal was to increase patient satisfaction via a transition in clinic priorities to emphasize ongoing, real-time improvement based on our patients' (and other stakeholders') main concerns.

Methods

This project was undertaken as a quality improvement initiative and was approved as non-human subjects research by the SLU Institutional Review Board (IRB); thus, it did not require full IRB review and approval. Data for this study was collected from 1/30/21 to 12/4/21.

Collecting Baseline Clinic Times, Services Accessed, and Patient Satisfaction

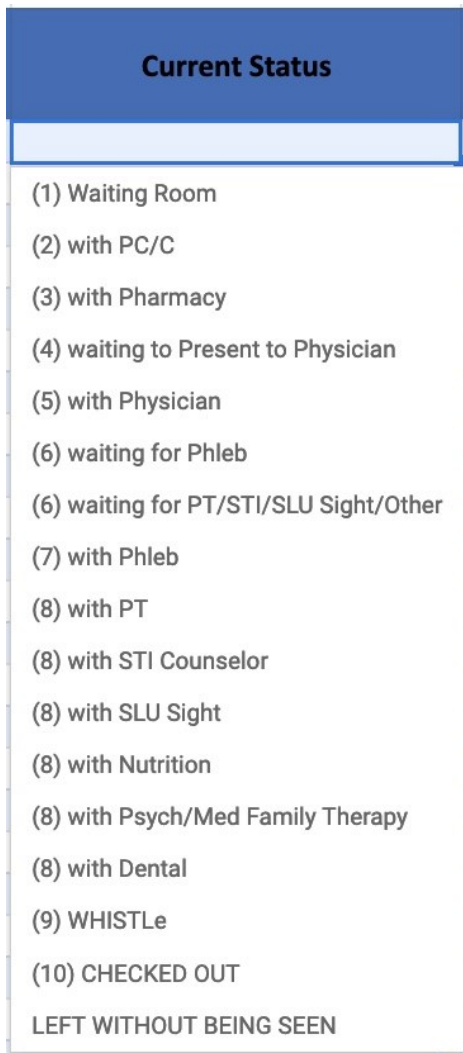
Before creating a new statusboard, we collected preliminary information on each of the services our patients received and how long they spent within our clinic overall using our old statusboard (1/30/21 to 6/26/21). This was completed by training our front desk volunteers to manually record the time that patients arrived at clinic, the services that the patient visited while within our clinic, the total number of services accessed, and the time that the patient checked out of the clinic on a spreadsheet in Google Sheets. At the end of each clinic, patient identifiers were removed from the data. This information summarized, on average, how long patients spend in our clinic as a function of the average number of services they accessed during their visit. At the end of their clinic visit, patients were asked to complete an anonymous, eight question satisfaction survey in English regarding their visit. One statement that patients responded to on a Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree) is "The amount of time I waited today was reasonable," and their responses were collected for baseline analysis. All survey data has been anonymous since creation of the survey in 2017; demographic identifiers such as name, date of birth, ethnicity, and gender were not collected.

Statusboard and Process Map

An internal review of the processes of each of the services available within the clinic was performed to map the flow that patients generally take through the clinic (with regards to their specific chief complaint) and to identify any inefficiencies in this process. The data from this review was used to construct a standardized flowchart that depicts how we believe patients should move through clinic (Figure 1) to limit confusion among services. This flowchart allowed us to visualize our clinic flow while we built our statusboard.

Given that the previous statusboard was on Google Sheets and Google Drive serves as the central database for all clinic information and documentation at the HRC, we decided to design a new statusboard that would automatically record times in Google Sheets. Using Google Sheets also allowed multiple clinic staff to access the statusboard at the same time. Automation of the statusboard was achieved through JavaScript functionality within Google Sheets. Statusboards are individual Google Documents (one spreadsheet per clinic). With the objective of easy readability and simplicity (i.e. to decrease the size of the statusboard), each spreadsheet contains multiple tabs such that each clinic volunteer only sees information pertinent to their duties. Thus, the statusboard has three main tabs—one for front desk volunteers who intake patients (Figure 2), one for the rest of the clinic (Figure 3), and one for administrative records that contains information entered in the first two tabs plus extra entries that timestamp patients' start and finish times with different services (Figure 4). As front desk volunteers edit cells/columns in their tab of the statusboard (Figure 2), the columns marked in green on the main clinic statusboard (Figure 3) populate automatically. Volunteers (undergraduate, medical, and allied health students) were trained extensively on how to use the new statusboard. This included a detailed email and standard operating procedure on statusboard construction, function, and purpose, small Tips and Tricks handouts at every computer, and one of the study authors present at every clinic to answer questions. The standardized flowchart model of clinic flow that was created (Figure 1)

Figure 5. Current status drop-down as seen on main clinic tab of statusboard



This column can only be edited on the Main Tab of the statusboard. This column is directly mirrored to the Administrative Tab of the statusboard for records. Updating this column of the statusboard in a timely manner is imperative to the accurate recording of timestamps in the administrative tab so that analyses can be conducted on the most accurate patient time data. Volunteers in the clinic were extensively trained on the importance of the timely updating of this column to clinic flow and knowledge of the patient's position/status within clinic processes.

PC/C: Pre-clinical/clinical; PT: physical therapy; STI: sexually transmitted infection; SLU: St. Louis University; WHISTLe: Wellness Holistic Initiative in St. Louis.

services accessed per clinic increased from 26 to 35.

The weekly average amount of time patients spent in clinic was graphed against the average time spent in clinic before the statusboard

intervention as a run chart in Figure 7. The run chart shows 2 significant shifts (6 or more consecutive data points above or below the pre-intervention average) between 07/03/2021 and 09/11/2021 and between 09/25/2021 and 11/06/2021.⁶ With regards to our secondary objective, our process map (Figure 6) demonstrates the median amount of time that patients spent with each available service within our clinic from 07/03/2021 to 12/04/2021. It was discovered that at decision points (diamonds in the process map), patients experienced excessive delays which are key drivers for increased patient wait time, total clinic throughput, and decreased patient satisfaction.

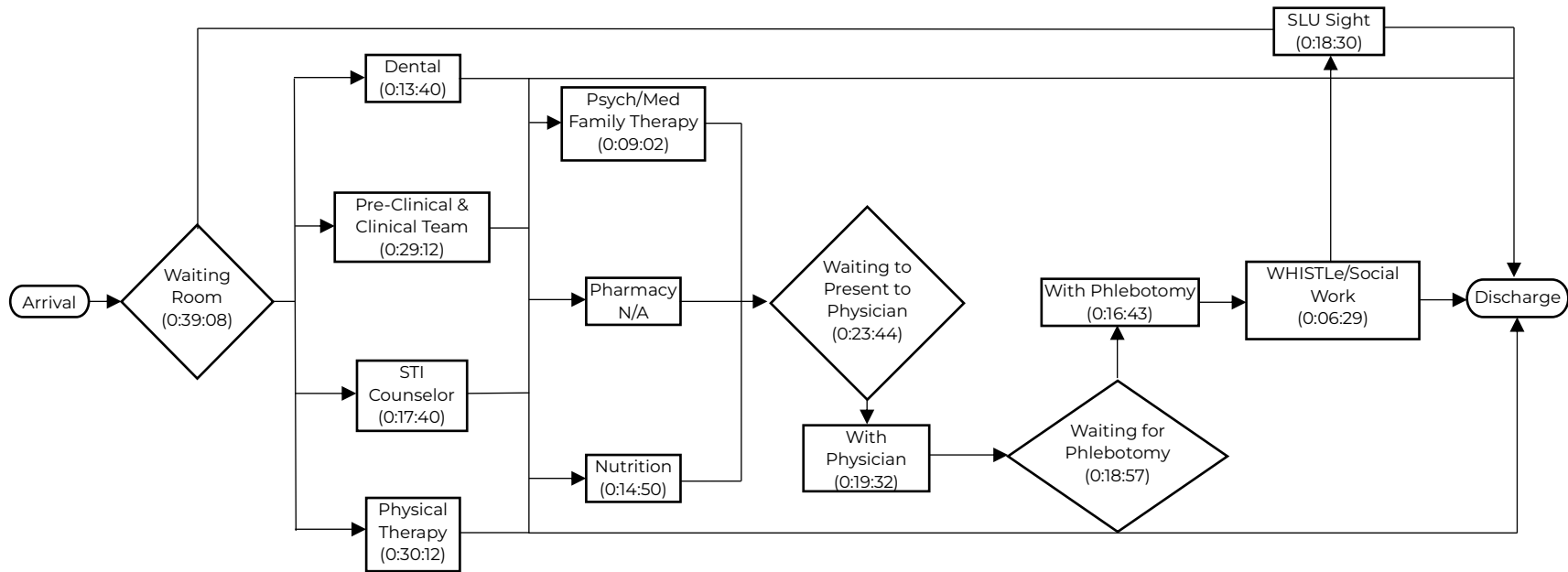
Upon analysis of Likert responses to the statement “The amount of time I waited today was reasonable” where a score of 1 indicates strongly disagree and a score of 5 indicates strongly agree, the average score was 4.45 (SD 1.05) after the implementation of the standardized statusboard (n = 260) as compared to an average score of 4.09 (SD 1.18) before this intervention (n = 1375 since survey inception in 2017), P < 0.001.

Discussion

After outlining and streamlining clinic flow and creating a new statusboard, we were able to shorten patient visits by nearly 15 minutes on average, despite an increase in the number of services that patients were using and the number of patients that were seen per clinic. During the same period, we also saw a statistically significant improvement in patient satisfaction.⁹⁻¹¹

Process maps have been shown in the literature to increase patient satisfaction times; however, we hope that ours can be part of an iterative process to continue optimizing clinic flow.¹²⁻¹⁵ As previously mentioned, our clinic was being forced to stay open later to accommodate patients who were being seen, but after our intervention, all 23 recorded Saturday clinics in this study finished on time. We also recognize that certain services that patients access make take more time than others. With this quantitative tool to guide us, we are more easily able to “diagnose” why certain areas in clinic are increasing patient wait times. For example, if a bottleneck is forming with phlebotomy, our statusboard and generated process

Figure 6. Process map at the SLU Health Resource Center



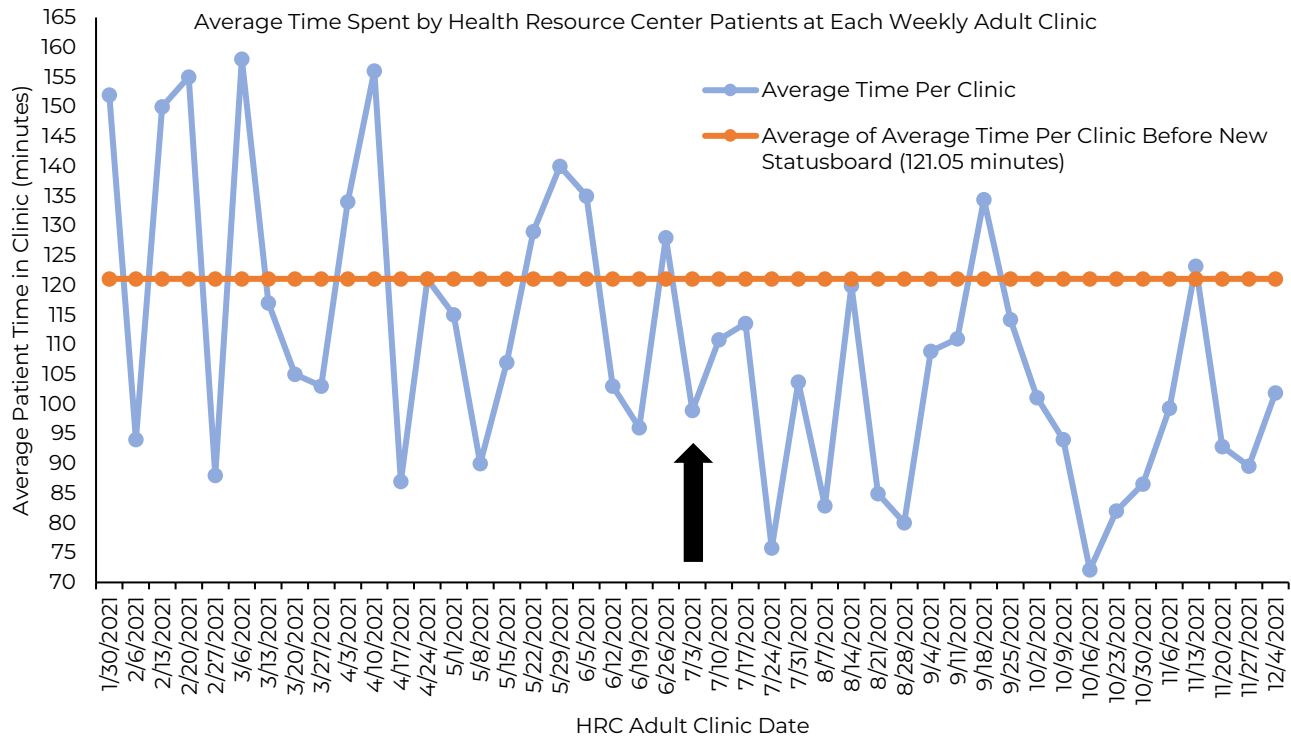
Based on data collected from our implemented statusboard, this process map displays the median amount of time patients spent at each available service within our clinic. Pharmacy volunteers were not available to volunteer at the Health Resource Center in 2021, thus no data was collected on this service. SLU: Saint Louis University; STI: Sexually Transmitted Infections; WHISTLe: Wellness Holistic Initiative in St. Louis.

Table 1. Pre-intervention and post-intervention metrics

| Metric | Pre-statusboard implementation | Post-statusboard implementation | Decrease in patient time spent in clinic |
|--|--------------------------------|---------------------------------|--|
| Average patient time spent in clinic (H:M:S) | 1:55:42 | 1:40:35 | 0:15:07 |
| Median patient time spent in clinic | 1:52:00 | 1:39:16 | 0:12:44 |
| Total # of patient data analyzed (n) | 189.00 | 317.00 | - |
| Median # of services accessed per clinic | 26.00 | 35.00 | - |
| Median # of patients seen per clinic | 12.00 | 15.00 | - |

This table shows the total number of patients observed and the time change in measured metrics (hours, minutes, and seconds) before and after the implementation of the standardized statusboard.

Figure 7. Run Chart



The run chart displays the average time spent by patients at each clinic (blue line) compared to the average of the average time spent by patients before standardized statusboard implementation (orange line). This value was calculated by finding the mean of the total patient times of all patients during a particular clinic date. Using that mean, we generated a statistic for the average patient throughput across all clinics before the implementation of this standardized statusboard. The black arrow indicates the first clinic at which the intervention was implemented.

HRC: Health Resource Center.

map would enable us to objectively see this, thus allowing us to take steps toward adding another phlebotomist to help reduce the burden on the one currently volunteering. This tool will allow us to conduct an iterative process—making changes that address problematic/inefficient areas and evaluating the impact of our changes in real-time. One clinic has imposed time limits on specific phases of their clinic flow (i.e. initial history taking) which have resulted in a decrease in clinic throughput from 94.2 to 74.1 minutes.¹⁶ While significant, this implementation is static. Conversely, our project is only the first attempt of several iterations to address concerns regarding patient flow.

The boost in efficiency due to the introduction of the statusboard also has important implications beyond patient satisfaction. Research has also shown that patient wait times are not only correlated to patient satisfaction, but also patient

impression of the quality of patient care, the likelihood of repeat visits, participation in their own care, and health outcomes.^{11,18} Similar to other free clinics, many of our patients are low-income and uninsured. Any touchpoint they have with the healthcare system is extremely important to both treat their acute issues while also connecting them with more sustainable care. By reducing their wait times in our clinic, we hope to increase the likelihood that they continue to follow up, whether with our clinic or a potential primary care physician. We also hope that other clinics can use our project to effectively connect marginalized patients with the healthcare they deserve.

There were several important considerations when building the statusboard. Initially, we considered displaying a running stopwatch for every service, a strategy employed by other clinics. However, we chose not to include this feature, as

we feared it might encourage volunteers to rush their service, decreasing the quality of care our patients receive. Our volunteers voiced concerns about potentially forgetting specific steps in their protocol or receiving external pressure from their colleagues about the speed of their services. Consequently, we instead chose to broadcast the entire time a patient was staying in clinic overall, increasing awareness of how long a patient had been in clinic without putting pressure on any single service. The time spent with a particular service was instead in the administrative tab of the statusboard, hidden from volunteers.

There are a few limitations to this study. Arrival/exit times before the new statusboard relied on volunteers entering when patients arrived and when they left clinic. Unsurprisingly, throughput before the implementation of the new statusboard had a higher standard error than afterwards, as measurements were more prone to human error. After switching to the new statusboard that automatically recorded times when volunteers changed a patient's status, we saw the variability of times decrease; however, we also did not record which services were accessed by patients prior to the intervention. While our patient population did not change during this study, it is possible that patients were accessing a different set of services before and after the intervention. The statusboard required several additional trainings for volunteers, as well as in-clinic monitoring by leadership before we were certain that the new statusboard was being used correctly. While we initially planned to improve trainings to increase the accuracy of our measures, our clinic is currently undergoing a restructuring, and clinic operations have been temporarily paused.

We also present several strengths. We saw a decrease in the total amount of time patients spent in clinic through our initial process map, a key goal of this project. One contributor to this decrease may have been the color indicators that changed from green to yellow to red as patients spent more time in clinic. This resulted in fewer patients left waiting in clinic, as there was a continuous reminder that these patients needed attention. Further, our statusboard displayed a simplified, easy-to-read view—different users only saw what was pertinent to them, and volunteers

were only responsible for changing one column. All other functions were automated, from displaying what services a patient needed to recording the time that they left. By having volunteers only focus on one column, we were also able to indirectly increase communication across the clinic—a vision screener sitting in an entirely different room within clinic was able to see that a patient was waiting for a different service (i.e. phlebotomy), allowing them to screen this patient and return them to their room before being seen by another service.

Both the statusboard and process map had significant impacts on reducing patient times and have provided clinic with a blueprint for improving services in the immediate future. As we continue to gather data on where patients are spending their time in clinic, we plan to use our process map to optimize clinical flow, learning why certain areas operate as bottlenecks, and how we can relieve those delays with the ultimate goal of increasing patient satisfaction with our clinic.

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Disclosures

This project was undertaken as a quality improvement initiative and was approved as non-human subjects research by the SLU Institutional Review Board (IRB), thus not requiring full IRB review and approval. The authors have no conflicts of interest to disclose.

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