ORIGINAL RESEARCH

Application of Lean Principles to the Comprehensive Geriatric Assessment to Reduce Cycle Time

Junghyun Park, MD[1,2], Eunice Lipinski, MSc[2], Pauline Fisher, RN[2], Amanjot Sidhu, MD[1,2]

[1]Department of Medicine, McMaster University, Hamilton; [2]Hamilton Health Sciences, Hamilton, ON

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ABSTRACT

Background

Prolonged cycle times for new geriatric medicine assessments at the Centre for Healthy Aging have reduced the capacity to see patients. Using a time series design, the aim of the project was to decrease the average cycle time for new patients during one geriatrician's clinic from 114 to 90 minutes by May 1, 2024.

Methods

Lean methodology was used for diagnostics by creating a value stream map of the workflow. This informed change ideas to improve efficiency by implementing a shared note within the electronic health record for information sharing and an assessment guide for targeted cognitive testing. The primary outcome measure was total cycle time. Balancing measures were patient clinic experience scores and counseling time. Process measures included caregiver interview time, pre-clinic intake completion rate, assessment guide use rate, and nursing assessment time.

Results

Total cycle time decreased 19% from 114 minutes (19 patients) to 93 minutes (33 patients). Pre-clinic intake assessment completion rate increased from 60 to 80% and caregiver interview time decreased from 45 to 33 minutes. There was 100% uptake of the assessment guide, and nursing assessment time decreased from 43 to 31 minutes. Counseling time remained stable, and the average clinic experience scores did not decline from the baseline.

Conclusions

This is the first study examining potential methods to improve efficiency of the comprehensive geriatric assessment by using value stream mapping. Spread of change ideas across the centre will be examined next with the goal of increasing capacity using available resources.

Key words: ambulatory care facilities, process assessment, efficiency, quality indicators, time factors, wait time

INTRODUCTION

Background

In 2017, the Canadian Institute for Health Information predicted that the number of adults over the age of 65 will grow by 68% from 6.2 million to 10.4 million in 2037.(1) With this, there is an expected rise in the demand for specialized geriatric services to provide comprehensive clinical care for frail older adults. Providing timely access to care is a crucial proactive step in optimizing their independence and preventing hospitalization. In fact, a 2022 Cochrane review showed that comprehensive geriatric assessments (CGA) in frail community dwelling older adult population can reduce the risk of unplanned hospital admission by 17%.(2) Despite these benefits, there is a growing deficit in the human resources available to provide these services in a timely manner. With an estimated 1.175 geriatrician required per 10,000 population over the age of 65, there is already a deficit of 210 geriatricians in Ontario.(3)

Problem Description

With these limitations, there is a need to first examine whether the current resources are being used as efficiently as possible. Geriatricians generally aim to complete a CGA in 90 minutes, due to the funding model in the Ontario Health Insurance Plan, and to maximize the number of patients seen without diminishing the quality of the assessment. However, the average cycle time at the Centre for Healthy Aging (CHA) is 137 minutes, and can run as long as 217 minutes with an interdisciplinary team consisting of Registered Practical Nurses (RPN), case managers (Occupational Therapists or Registered Nurses), geriatricians, and residents. As a result of the prolonged cycle time, geriatricians are only able to use 75% of their capacity to see new patients in a full standard working day.

Available Knowledge

The contributors to prolonged cycle time in ambulatory care are highly dependent on the specific context. Zhu *et al*. noted that delayed start time for the first appointment due to late arrival of clinic staff (in particular, physicians) contributed to increasing overall patient wait time, as each successive appointment is then impacted as a consequence.[4] Physicians often have several competing interests that may contribute to late starts. Depending on the practice model, geriatricians may be expected to concurrently participate in inpatient or outreach rounds and care for residents in long term care facilities. Other contributors to prolonged cycle time are lack of information readiness[5] to assess patients and poor communication between clinic staff.[6] Finally, much of the visit is highly dependent on the workflow of the most responsible physician, with physicians being found to be the bottleneck in multiple studies.[7-9] Physicians need time to complete an accurate assessment of the patient, and this is hard to modify without decreasing value added time that patients have with the physician.[8] This is likely why academic clinics may be less efficient in the assessment of patients due to the time required to review the resident's assessment, resulting in workflow redundancy.[9]

Most studies have taken a unified approach in addressing prolonged cycle time by using Lean methodology, derived from the Toyota Production System, to minimize "waste" or activities that do not add value from the patient's perspective. A systematic review in 2020 demonstrated that this method is effective in reducing patient wait time and length of stay.[10] The most valuable tool was value stream mapping to understand patient flow and potential areas of optimization to reduce waste. Once non-value-added time is identified, change ideas target elimination or minimization of these steps to produce a more efficient process.

Technology is increasingly used as a change idea to minimize non-value-added time. Scribe tools powered by artificial intelligence have reduced the time required to document visits.[11] In geriatric medicine, frailty can now be measured on personal computers[12] and smartphone applications[13] to streamline CGAs.

Aim

The project's aim was to decrease mean cycle time for new patients during Tuesday morning clinics for one geriatrician from 114 to 90 minutes by May 1, 2024. This study used a time series design and was completed between August 1, 2023 and May 1, 2024. Change ideas that produce the desired change would then be considered for spread amongst the other geriatricians at CHA to further increase the capacity to see more patients.

METHODS

Context

The CHA is an outpatient geriatric medicine clinic located at St. Peter's Hospital in Hamilton and is part of Hamilton Health Sciences—a large tertiary academic institution. Patients are accompanied by a caregiver to provide collateral information, as most referrals concern cognitive impairment. At times, case managers assigned to the patient have a variable practice of performing an intake assessment prior to the clinic visit, where collateral history is collected over the phone prior to the visit. Upon arrival to clinic, patients complete physical and cognitive testing with the RPN while either the case manager or physician interviews the caregiver. Following this, the physician assesses the patient and then the team gathers to provide counselling with the caregiver present. An After Visit Summary (AVS) is provided to the patient at the end of the assessment with a summary of the discussion. In terms of documentation, the collateral history would be documented similarly in two separate notes by the case manager and the geriatrician.

Diagnostics

Lean principles to Define, Measure, Analyze, Improve and Control (DMAIC) provided the framework for the project (see Table S1 in the supplemental material). A flow chart of the usual workflow was made by the quality improvement committee. The committee decided to test out change ideas in one geriatrician's clinic first to keep get the scale of the project small, and to use results of the project to influence buy-in from the other geriatricians within CHA.

A time study was performed by the principal investigator for 10 new patient assessments (two by each of the five clinic geriatricians) to evaluate the workflow of the clinic as a whole in July 2023. Patients and caregivers were given a voluntary survey to rate their clinic experience on a 5-point Likert Scale and additional comments in free text for qualitative analysis (Appendix S1 in the supplemental material). Out of 44 surveys collected from July to August 2023, average scores were 4.6 or higher (5 being the most positive). Sixty-eight per cent of the survey respondents provided qualitative feedback, and thematic analysis revealed three key themes: clear communication, patient-centred care, and team performance, with 50% of the comments centred on the time spent counselling (Table S2 in the supplemental material). With this data and input from our patient advisor, value stream mapping from the patient's perspective was completed (Figure 1). Certain steps were felt to be either value added or non-value added depending on the patient. For example, if the patient scored poorly on the Standardized Mini Mental Exam, there would be limited utility in obtaining a Montreal Cognitive Assessment. Based on the committee's analysis, the main contributors to prolonged cycle time were potentially unnecessary testing during the RPN assessment, prolonged time required to interview the caregiver, and time required for case review.

To establish a baseline for the target clinic, cycle times were tracked from August 15 to November 7, 2023, using a combination of data extracted from the electronic health record (EHR) and manual data collection. Total cycle time was calculated from the scheduled appointment start time and the AVS print time. The mean total cycle time was 113.8 minutes for 19 new patient assessments during this period. Intake

assessments by case managers prior to the clinic visit were done for 41% of the patients. Time logs were manually collected to determine caregiver interview time, RPN assessment time, case review time, and counselling time, with the average time being 44.2 minutes, 44.4 minutes, 9 minutes, and 26.5 minutes, respectively. The time required to review cases was found to be significantly shorter for this clinic (9 minutes) compared to what was previously observed for the CHA as a whole (27 minutes), likely due to differences in practice patterns.

Interventions

We hypothesized that increasing the completion rate of pre-clinic intake assessments prior to the clinic visit would decrease the amount of time required to interview the caregiver and reduce patient wait time. Given the volume of information required to complete a CGA, the preliminary assessment would streamline the questions asked during the physician interview. To increase the completion rate, a shared note (between the case manager and geriatrician) functionality within the EHR was proposed to maintain or reduce the work required by case managers and reduce duplication of work. Having the documented note available for the geriatrician prior to the clinic would also reduce the amount of time required for case review and document after the visit.

The next intervention was a new assessment guide to promote targeted cognitive testing and resource stewardship. Much of the variability in value added and non-value-added aspects of the assessment was due to the type of cognitive testing performed. Our patient advisor suggested that targeted testing may be more patient-centred, as testing can cause significant stress for the patient. Cognitive testing also had the greatest impact on the total amount of time required to complete the patient assessment. The assessment guide encouraged communication between RPNs and geriatricians to determine the most appropriate cognitive test. If the geriatrician was not available, the assessment guide included a flow sheet providing guidance on choosing the most appropriate test. From an equity perspective, the Snellgrove Maze task was added as an alternative to the Trail Making Test for patients

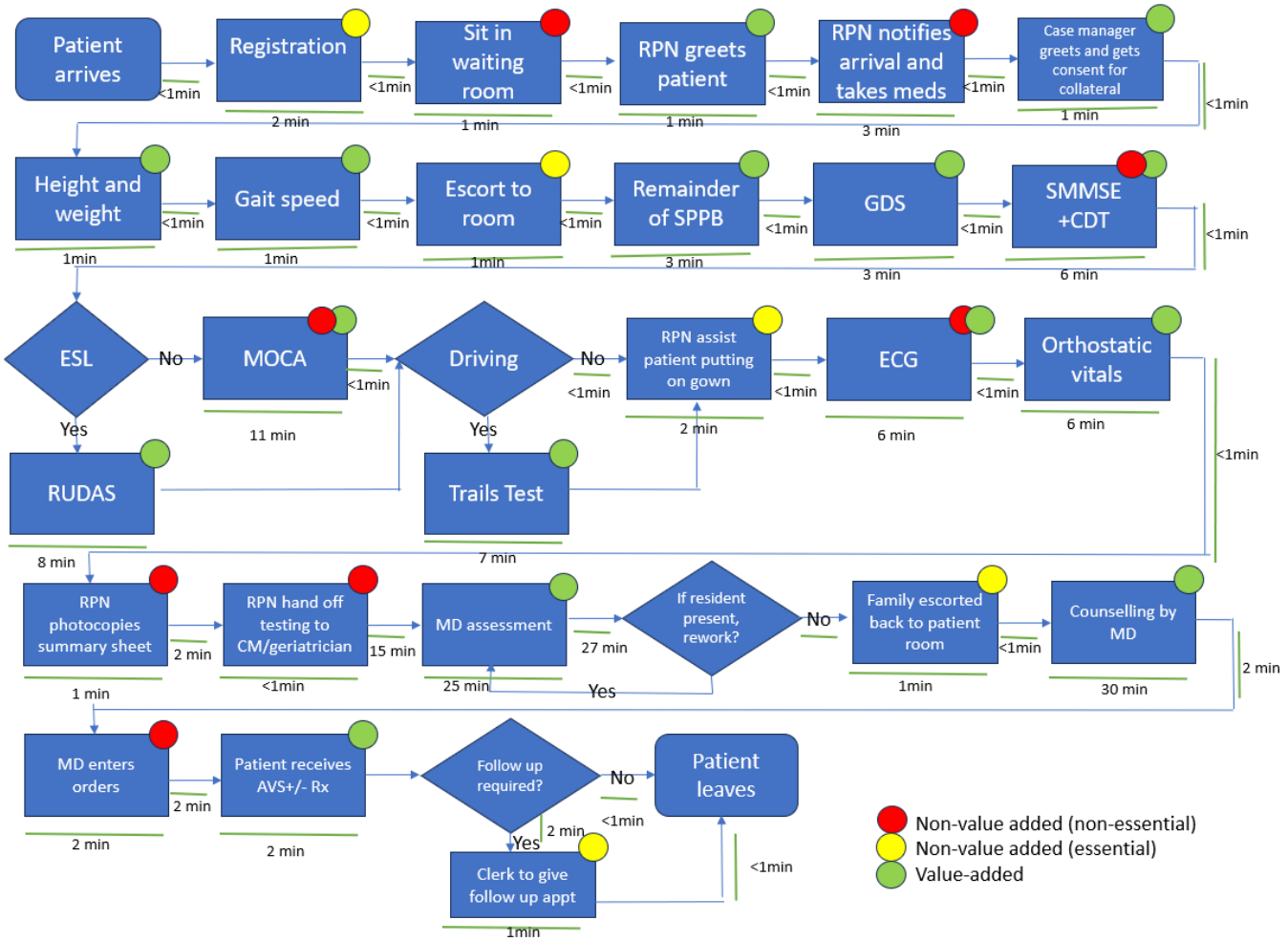

FIGURE 1. Value stream map of new patient assessments at CHA

SPPB = Short Physical Performance Battery; GDS = Geriatric Depression Scale; SMMSE = Standardized Mini-Mental State Examination; CDT = clock drawing test; ESL = English as a second language; RUDAS = Rowland Universal Dementia Assessment Scale; ECG = electrocardiogram; CM = case manager; MD = medical doctor; AVS = after visit summary; Rx = prescription.

who may not be familiar with the Roman alphabet due to limited English proficiency.

Measures

The outcome measure was the total cycle time for new patient assessments in minutes, extracted from the EHR using appointment time and AVS print time. If the patient arrived more than 15 minutes after the scheduled appointment time, the check-in time was used instead of the appointment time. An adjustment was not made if the patient arrived early as it is difficult to determine when exactly the assessment started. Total cycle times for all other physicians were also measured to provide context of the setting.

To track fidelity to change ideas, the following process measures were used: caregiver interview time in minutes, monthly intake assessment completion rate, RPN assessment time in minutes, and assessment guide use rate. To control for potential bias, time related processes during the clinic were manually tracked by a volunteer who externally observed the visit using a time log. Intake completion and assessment guide use rate was manually recorded. Balancing measures included counselling time in minutes and patient experience scores on a 5-point Likert Scale (Supplement 2 in the supplemental material).

Analysis

All time-related measures were analyzed using statistical process control (SPC) XBarR charts generated from QI Macros—primary outcome measure of total cycle time, caregiver interview time, RPN assessment time, and counselling time. SPC charts were used because it can more reliably distinguish between common cause variation from special cause variation when there are enough data points. The balancing measure of patient clinic experience scores were also displayed on an XBarR chart. A run chart was used to show the monthly completion rate of intake assessments and compliance to the assessment guide due to limited data points. Institute for Healthcare Improvement rules were used for interpretation of variation in data.

Ethical Considerations

The study was reviewed by the Hamilton Integrated Research Ethics Board and deemed that approval was not required in accordance with the requirements for Tri-Council Policy Statement. No personal health information was collected.

RESULTS

From August 2023, cycle time and associated outcomes of 53 new patient assessments were measured (two patients per week). The primary outcome of total cycle time decreased 19% from 114 minutes to 93 minutes with demonstration of sustainability over 17 weeks, reflected with the shift in the control limits (Figure 2). There was special cause variation noted within the baseline measurement period (Aug 15–Nov 7) that was due to the variable presence of resident learners in clinic (Aug 29–Oct 3). However, there was sustained decrease in average cycle time after the implementation of change initiatives despite ongoing variable resident presence (Nov 14, Nov 28, Jan 16–March 26, April 29–30)—reflective of usual clinical practice in an academic setting.

There was good fidelity to the shared note change idea. Shared notes were completed 100% of the time, and intake assessment completion rate increased from 60 to 80% (Figure S1 in the supplemental material) and caregiver interview time decreased from 45 minutes to 33 minutes with decreased variability (Figure 3). Although the overall intake completion rate increased after the implementation of shared note, there was a decline noted January to March as case managers were short staffed. There was 100% uptake of assessment guide use rate and RPN assessment cycle time also decreased from 43 minutes to 31 minutes with less variability (Figure 4).

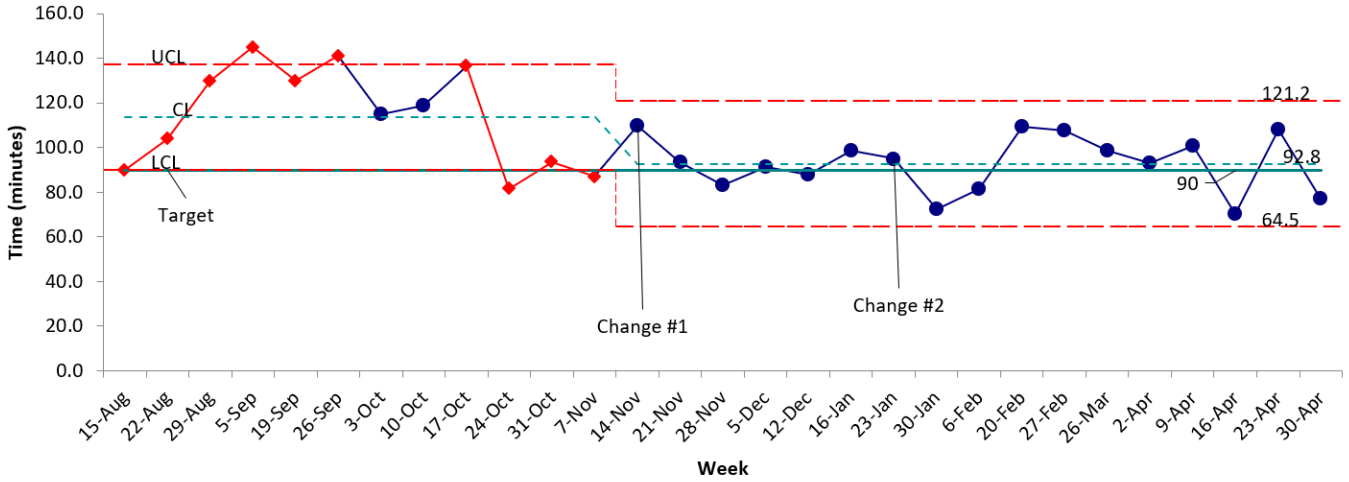

FIGURE 2. Statistical process control (SPC) X-Bar R chart for new patient cycle time; red data points indicate special cause variation; special cause variation was noted consistently after change #1 so the centre line was shifted to demonstrate the sustained change

UCL = upper control limit; CL = centre line; LCL = lower control limit; green solid line = target.

Counselling time remained stable (Figure 5), and average clinic experience scores did not decline from the baseline (Figure S2 in the supplemental material).

The cycle time for CHA as a whole decreased from an average of 137 minutes to 128 minutes due to special cause variation noted with two physician's clinics (Physician E and F) in Figure S3 in the supplemental material. Although the process and balancing measures were only tracked for Physician F's clinic due to limited capacity for manual data collection, the change ideas were implemented at the same time in Physician E's clinic to demonstrate feasibility and reliability of the change ideas with another physician. Change ideas were not implemented in the remainder of the clinics to keep the scale of the project small.

DISCUSSION

Summary

This is the first study examining potential methods to improve efficiency of the CGA—a resource intensive assessment required to accurately assess frail older adults. One of the major strengths of the study was the incorporation of patient and caregiver perspectives in driving diagnostics and change ideas. This in turn prevented the potential negative impact of change ideas on patient clinic experience. In addition, there was a clear association between the change ideas and outcome that was observed—improved completion of pre-work prior to clinic reduced the time required to complete assessments in clinic and targeted testing reduced redundancy of multiple

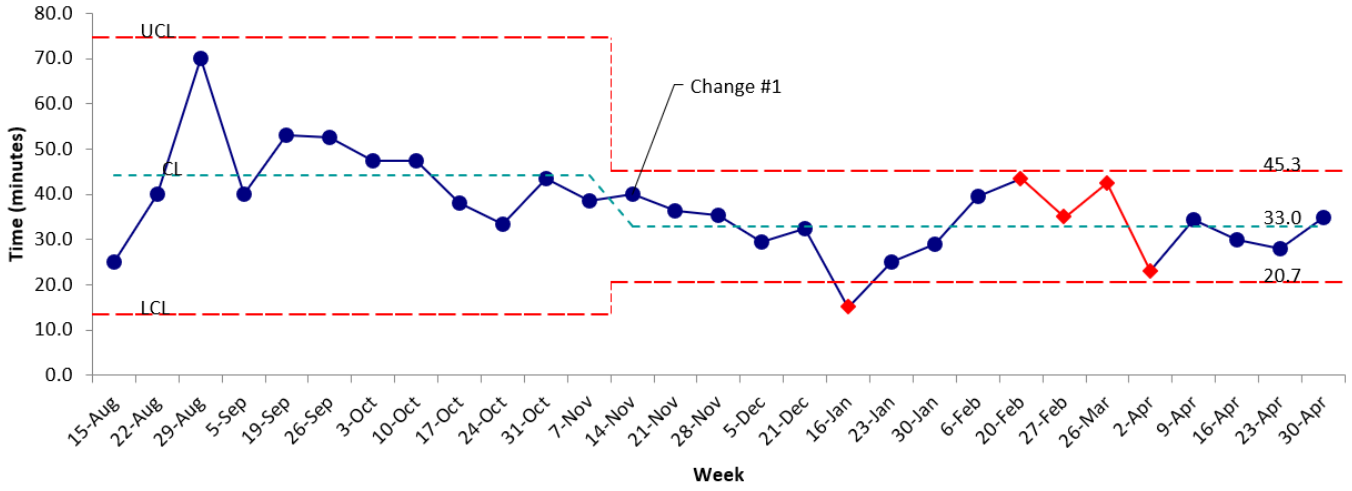

FIGURE 3. Statistical process control (SPC) X-Bar R chart for caregiver interview time; caregiver interview time was the process measure for change #1, so only the time of initiation of change #1 is displayed; special cause variation was noted consistently after change #1 so the centre line was shifted to demonstrate the sustained change.
UCL = upper control limit; CL = centre line; LCL = lower control limit.

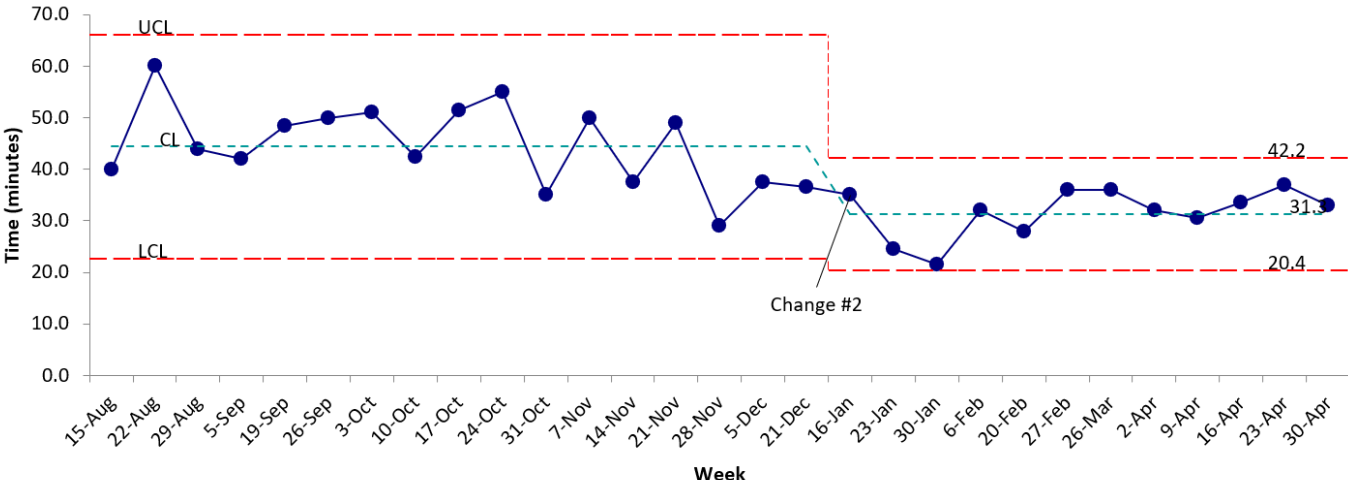

FIGURE 4. Statistical process control (SPC) X-Bar R chart for RPN assessment cycle time; RPN assessment time was the process measure for change #2, so only the time of initiation of change #2 is displayed; special cause variation was noted consistently after change #2 so the centre line was shifted to demonstrate the sustained change.
UCL = upper control limit; CL = centre line; LCL = lower control limit.

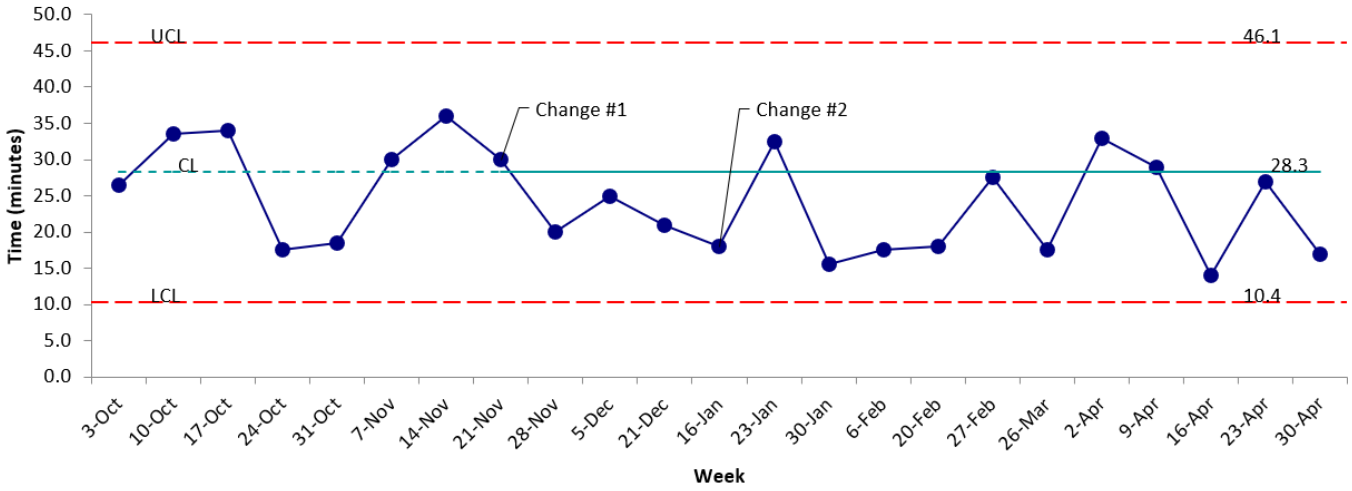

FIGURE 5. Statistical process control (SPC) X-Bar R chart for counseling time
UCL = upper control limit' CL = centre line; LCL = lower control limit.

cognitive tests, ultimately reducing cycle time. The reduction in cycle time in this study was in line with the range of results in literature[5-8,10]—especially given the degree of detail required in assessing frail older adults with multi-complexity and the coordination required between multiple clinic staff. Finally, there has been informal observation of improved staff morale and empowerment with the centre's first quality improvement project. The shift in culture resulted in dedication to ongoing quality improvement with the introduction of a quality improvement board within the clinic space.

Limitations

The major limitation of our study is the variation in individual geriatrician work flow and practice patterns that may impact the success of the spread of change ideas on a larger scale. The intervention clinic for this study already started out with the lowest cycle time within the centre, and had significant differences compared to the other providers in the time required to review cases with residents (9 minutes vs. 27 minutes)—likely due to the practice of observing the resident while history and physical examination was completed. As such, if the spread of change ideas to the other clinics do not result in significant change in cycle time, case review time variability is likely to be the culprit—requiring further in-depth root cause analysis and data collection. However, one other geriatrician (Physician E) did show success in reducing cycle time with the implementation of the change ideas, which provides some promise in the scalability of the project despite differences in practice patterns.

Collected time related data also only occurred during the clinic visit and it provides a limited view on the amount of time required for the intake assessment, chart review, and documentation. Due to the plan to scale up the project to the entire clinic, it would not have been feasible to ask case managers and physicians to track the time required for each task. However, we plan to collect qualitative data on the perceived change in workload by conducting interviews with the clinic staff as a proxy measure. While literature does note the potentially powerful impact of ambient scribe technology on reducing documentation time,[11] the goal of the project was to create efficiencies using available resources—acknowledging that the adoption of these technologies may take time to become more widespread.

Regarding the change ideas, although the quality of the shared note would have been a meaningful balancing measure, it would be difficult to evaluate as there is no particular gold standard. There is also potential that the assessment guide may result in less cognitive testing than required for clinical decision-making, and this will be assessed when the change idea is scaled up to the entire CHA. Beyond the CHA, application of the change ideas may be limited based on the clinic resources available to support geriatricians. Nevertheless, it highlights the value of efficient and coordinated interdisciplinary work in streamlining the assessment of complex geriatric patients.

CONCLUSION

Value stream mapping of an outpatient geriatric clinic informed targeted change ideas to reduce cycle time without negatively impacting patient clinic experience. The next step of the project will assess the impact of the spread of change ideas across the CHA with quantitative analysis of total cycle time data and qualitative interviews of clinic staff on their perspective of the implementation of change ideas. Ongoing improvement work will refine the change ideas to suit the needs of the centre as a whole and, if successful in reducing overall cycle time, may lead to increased capacity to see more patients.

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CONFLICT OF INTEREST DISCLOSURES

We have read and understood the *Canadian Geriatrics Journal*'s policy on conflicts of interest disclosure and declare that we have none.

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Correspondence to: Junghyun Park, MD, Department of Medicine, Faculty of Health Sciences, 1200 Main St. West, Hamilton, ON L8N 3Z5
E-mail: Junghyun.park@medportal.ca

SUPPLEMENTAL MATERIALS

Supplemental material linked to the online version of the paper (https://doi.org/10.5770/cgj.28.850):

- **Table S1**: "Lean" Principles
- **Appendix S1**: Patient/Caregiver Survey;
- **Table S2**: Key Themes from Survey
- **Figure S1**: Results of shared notes
- **Figure S2**: Clinic experience
- **Figure S3**: Cycle time for the Centre