



Impact of a Checklist on Clinic Flow and Patient Visit Times at a Student-Run Free Clinic

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Abstract

Background: While student-run free clinics are a valuable resource to the community, there are limitations leading to challenges with clinic flow. Previous research has identified checklists as a useful intervention in medicine. This project sought to evaluate the efficacy of a checklist on student volunteer accuracy and adherence to clinic flow, and patient visit times.

Methods: From June 2019 to February 2020, volunteers at select clinics received a checklist listing important steps of a patient encounter. The authors sent surveys to volunteers following all clinics and recorded patient visit times. The outcomes measured were: volunteer accuracy (number of steps completed); volunteer adherence (order of steps); perceived helpfulness of the checklist; and patient visit times. The first three outcomes were assessed via self-reported survey data and the last outcome was assessed via collection of time data. Fisher's exact tests to assess statistical significance ($p < 0.05$).

Results: Thirty-eight student volunteers completed surveys, for a response rate of 67.9%. Eighteen (47%) of those who completed surveys were part of the experimental group (received checklist), while the remaining 53% were part of the control group (did not receive checklist). Nine (50%) of 18 volunteers with a checklist spoke to patient navigation and/or lifestyle educators before presenting to an attending, compared to 1 (5%) of 20 volunteers without checklist ($p = 0.0025$). Of the 18 volunteers who received a checklist, 16 (89%) found the checklist helpful. There was no significant difference between mean visit time pre-checklist (74 minutes, $SD = 29.6$) and post-checklist (79 minutes; $SD = 28.3$; $p = 0.46$, $n = 134$).

Conclusion: The checklist improved clinic flow by increasing volunteer accuracy and adherence. The checklist was also perceived to be helpful, and did not increase patient visit times.

Introduction

In 2014, 75.2% of US Association of American Medical Colleges (AAMC) had at least one student-run free clinic (SRFC).¹ SRFCs provide healthcare to underserved populations and give medical students an opportunity to practice their clinical skills.^{2,3} While SRFCs can be a beneficial resource to the community, they have some limitations that may interfere with patient care. These include long wait times, limited hours of operation, and lack of volunteer training.⁴⁻⁶

LionCare is a SRFC located at the Bethesda Mission, a men's shelter, in Harrisburg, Pennsylvania. To volunteer, students fill out an interest form and are assigned a shift through a lottery

system. Due to high demand for volunteer positions, medical student volunteers (MSVs) commonly volunteer only one time, and do not receive orientation prior to their shift. This has resulted in disruptions to clinic flow, as MSVs have been observed to frequently ask for clarification of the next steps of the patient encounter, often slowing the progression of patient visits.

When designing a solution to this issue, we sought an intervention that would improve volunteer accuracy and adherence to clinic flow without increasing patient visit times. We defined volunteer accuracy as the number of steps completed and we defined adherence as completing the steps in the correct order. Additionally, we aimed to develop an intervention that

could be implemented quickly and would not require extra time commitment outside of LionCare.

Checklists are useful interventions for standardizing work processes, creating a check for key components of workflow, and strengthening compliance with guidelines.⁷⁻⁹ Checklists have also been used to improve measures ranging from patient safety to efficiency of patient visits.^{10,11} Despite the identified limitations of SRFCs and the evidence of the value of checklists in the medical setting, there is limited research on the impact of a checklist on volunteer accuracy and visit times at a SRFC. The University of Nebraska conducted a study on the use of checklists at SRFCs.¹² This prior work implemented checklists to improve the use of preventative services. In contrast, we are interested in assessing the impact of a checklist on volunteer accuracy and adherence to clinic flow and patient visit times.

The goal of this work is to assess the impact of a student volunteer checklist at LionCare in regards to 1) volunteer accuracy, 2) volunteer adherence, 3) perceived helpfulness to volunteers, and 4) patient visit times.

Methods

LionCare Clinic: Contextual Information

LionCare operates several times per month, with different clinics operating each week. The specialty clinics include General, Neurology, Psychiatry, Women's Health, Osteopathic Manip-

ulative Treatment (OMT), Cardio-pulmonary, Dermatology, and Orthopedics. Attendings, residents, and MSVs (mostly 1st and 2nd year students) staff LionCare clinics.

MSVs are responsible for ensuring all steps of a patient encounter are completed. Of note, the team structure at all LionCare clinics is organized so that one to two MSVs are paired to one patient. The number of MSVs per patient depends on patient volume, number of MSVs, and number of attendings at a given clinic.

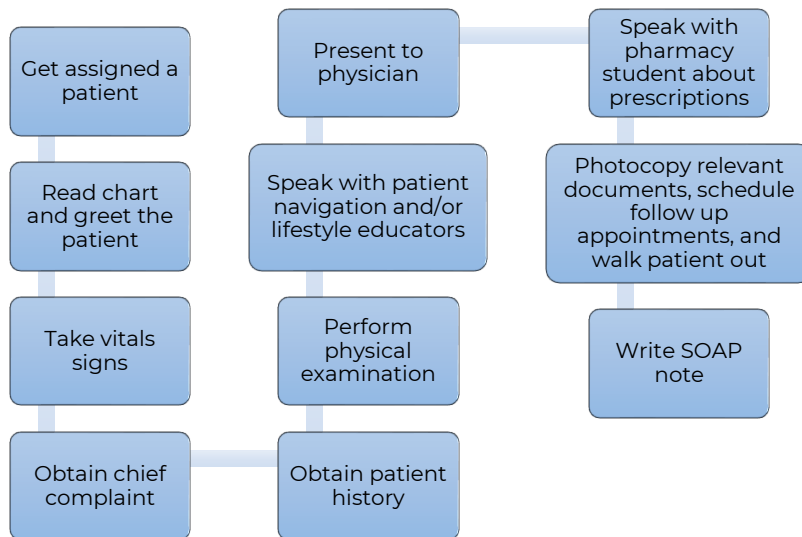
Aside from MSVs, there are other student volunteers at LionCare, including Patient Navigators, Lifestyle Educators, and Pharmacy students. Patient navigators address social determinants of health such as lack of health insurance or food insecurity by connecting patients with resources. Lifestyle educators help educate patients with chronic medical conditions such as diabetes and hypertension. Pharmacy students manage the clinic's medications, ensuring patients leave with the correct prescriptions. Patient navigators, lifestyle educators, and pharmacy students are not located in the same area as the MSVs. MSVs walk down a short hallway to inform these students when a patient is ready to be seen.

Clinic flow is consistent across all LionCare clinics (Figure 1).

Intervention

We created the checklist based on pre-existing clinic flow at LionCare (Figure 1). The order of steps for a patient encounter that had existed

Figure 1. Flow diagram of the order of steps of a visit at LionCare clinic



SOAP: subjective, objective, assessment, plan.

prior to this intervention were not changed. The steps included in the checklist are: 1) Read over chart and meet patient; 2) Take vitals; 3) Obtain chief complaint; 4) Obtain patient history; 5) Perform focused physical exam; 6) Talk to patient navigation/lifestyle educators; 7) Present to physician; 8) Meet with pharmacy regarding prescriptions; 9) Photocopy prescriptions/lab requests and put in chart; 10) Write subjective, objective, assessment, plan (SOAP) note.

We divided MSVs into two groups based on which clinic they volunteered at. MSVs at the General/Neurology clinics were part of the experimental group. Those at all other clinics (Cardiopulmonary, Women's Health, OMT, Psychiatry, Orthopedic, and Dermatology) were part of the control group. We chose the General/Neurology clinics as the experimental groups because they occur at the same time, in the same space. The majority of MSVs in both experimental and control groups were either 1st or 2nd year medical students.

The authors gave MSVs in the experimental group a printed checklist upon arrival to the clinic. MSVs used the checklist for the duration of a single General/Neurology clinic, and returned the checklist at the end of their shift. The control group did not receive a checklist.

After completing a shift, MSVs in both the experimental and control groups received an email with a link to an anonymous survey in REDCap, the electronic data capture tools hosted at Pennsylvania State University (Penn State) College of Medicine and Penn State Health Milton S. Hershey Medical Center for all data collection. REDCap is a secure, web-based application designed to support data capture for research. The survey included the same steps of a patient encounter as listed on the checklist, and asked students to indicate the order each step was completed. The survey also included questions about volunteer demographics and perceived helpfulness of the checklist. Using sample size calculations, with 30% improvement in volunteer accuracy/adherence being considered clinically significant, this work aimed to recruit a total of 76 survey responses.

The authors of this work were present during the General/Neurology clinics and recorded patient visit times from June of 2019 until February of 2020, post-implementation of the checklist. Patient visit time was defined as the time from the MSV greeting the patient to the patient checking out of the clinic.

Measures and Analysis

Outcome 1 and 2- Assessing medical student volunteer accuracy and volunteer adherence

We assessed volunteer accuracy by the number of tasks completed and the completion of 2 specific tasks: talking to patient navigation/lifestyle educators and meeting with pharmacy students. We chose these 2 tasks as they were identified by previous LionCare coordinators, patient navigators, lifestyle educators, and pharmacy students as commonly missed steps that are key in providing comprehensive care. These 2 steps, along with the other steps in the checklist, are expected to be completed for every patient encounter.

We assessed volunteer adherence by the order in which steps were completed. The primary outcome for correct order analysis was talking to patient navigation/lifestyle educators before presenting to the attending. Adherence to the sequence of these steps is essential to clinic flow as it can minimize the amount of time patients are in the exam room alone. Other steps of the patient encounter were rarely done out of order (e.g. obtaining a history before presenting to the attending), and therefore were not considered when assessing volunteer adherence.

We obtained the data for these analyses from the self-reported REDCap surveys. We used GraphPad Prism software (Version 8.1.2) to analyze results and Fisher's exact tests to assess statistical significance ($p < 0.05$).

Outcome 3- Perceived helpfulness of the checklist

Perceived helpfulness of the checklist was measured via self-reported REDCap survey responses. All volunteers were asked if they found the checklist to be helpful.

Outcome 4- Impact of checklist on patient visit times

In order to analyze the impact of the checklist on patient visit times, we obtained a database of patient visit times from General/Neurology clinics from April 2018 through March 2019.¹³ We chose to use this historic data, rather than compare visit times across clinics, as visit times could vary significantly across each specialty clinic. Certain clinics have increased complexity of patient concerns, often requiring more extensive physical examinations (Women's Health) or procedures (Dermatology), increasing the length of a visit.

No checklist was used to facilitate MSV patient

encounters at the General/Neurology clinics from April 2018 through March 2019. This data was compared to our newly collected data post implementation of the checklist at the General/Neurology clinics from June 2019 to February 2020. The definition of patient visit time was consistent between the historical database and our data. There were no other ongoing interventions that changed from April 2018 to February 2020 that could have impacted visit times. We used GraphPad Prism software to analyze results and Fisher’s exact tests to assess statistical significance ($p < 0.05$).

Ethical Considerations

Implied consent was obtained from all medical students prior to volunteering at LionCare and prior to starting the survey. The Institutional Re-

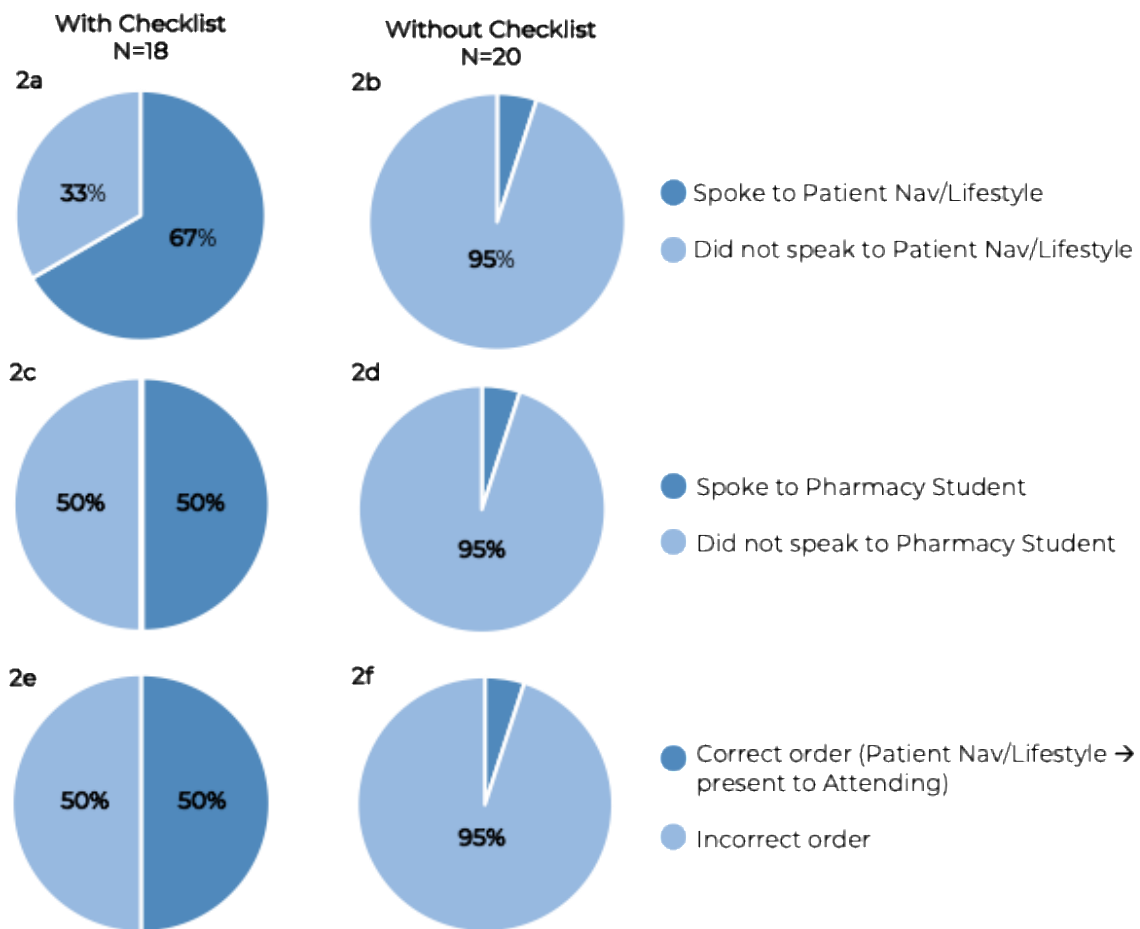
view Board office at Penn State College of Medicine approved this research.

Results

Volunteer Accuracy and Adherence

MSVs completed 38 surveys, for a response rate of 67.9%. After emailing the survey link, the average length of time to respond was 16 hours (one data point was excluded due to an error in data recording). Sixty-one percent of those who received the checklist were first time volunteers. On average, students with the checklist completed 8.6 out of 10 tasks ($SD=1.10$), while students without the checklist completed 6.5 out of 10 tasks ($SD= 1.28$, $p < 0.0001$). Sixty-seven percent ($n=12$) of the MSVs with a checklist spoke to patient navigation/ lifestyle educators, compared to

Figure 2. Impact of checklist on student volunteer order of visit steps



2a,2b: MSVs with checklist were more likely to speak to patient navigation and/or lifestyle educators compared to MSVs without checklist ($p < 0.0001$) **2c,2d:** MSVs with checklist were more likely to speak to pharmacy student compared to MSVs without checklist ($p=0.0025$). **2e,2f:** MSVs with checklist were more likely to patient navigation/lifestyle educators before presenting to attending compared to MSVs without checklist ($p=0.0025$).

5% (n=1) of the MSVs without checklist (Figure 2a-2b, $p < 0.001$). Fifty percent (n=9) of the MSVs with a checklist spoke to a pharmacy student, compared to 5% (n=1) of the MSVs without a checklist (Figure 2c-2d, $p = 0.0025$). Nine of eighteen (50%) of the MSVs with a checklist spoke to patient navigation/ lifestyle educators before presenting to an attending, compared to 1 of 20 (5%) MSVs without checklist (Figure 2e-2f, $p = 0.0025$).

Perceived Helpfulness to Volunteers

Of the survey responders who received a checklist, 89% (n=16) reported they found the checklist to be helpful.

Patient Visit Times

This analysis includes a total of 134 patient encounters from the General/Neurology clinics. Seventy-nine patient encounters occurred prior to checklist implementation, while 55 occurred after checklist implementation. In the pre-checklist group, patient visit times ranged from 25 to 222 minutes. In the post-checklist group, patient visit times ranged from 26 to 153 minutes. There was no significant difference between mean visit time in the pre-checklist group (74 minutes; $SD = 29.6$), compared to the post-checklist imple-

mentation group (78 minutes; $SD = 28.3$; $p = 0.46$; Figure 3).

Analyses excluding outliers in the data continued to yield no significant difference in visit time in the pre-checklist vs post-checklist groups.

Discussion

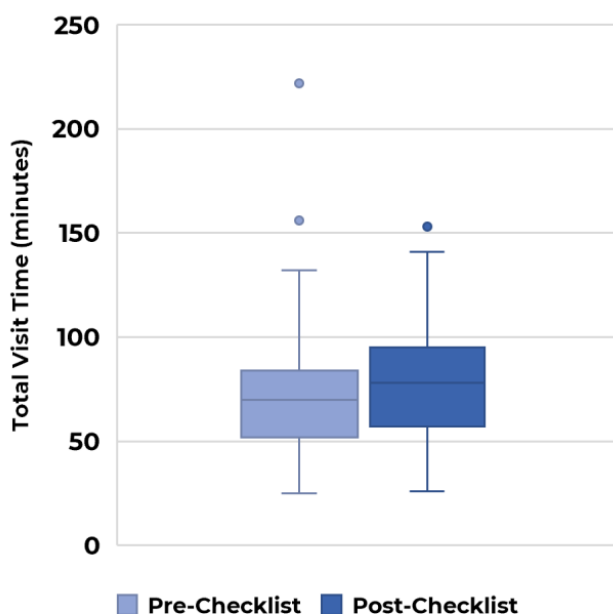
Volunteer Accuracy, Volunteer Adherence, and Clinic Flow

The results of this study suggest that the checklist may be helpful in reminding MSVs to complete more steps of the patient encounter. There were no other ongoing interventions occurring at the time of data collection that would have impacted our results. MSVs with the checklist completed a greater number of tasks compared to MSVs without the checklist and were more likely to talk to patient navigation/lifestyle educators and pharmacy students compared to MSVs without the checklist. Thus, MSVs with a checklist had increased accuracy in their approach to the patient encounter. Improved accuracy, specifically talking to patient navigation and/or lifestyle educators, is essential to patient care at LionCare. Patient navigators help address barriers affecting a patient’s care, lifestyle educators help manage chronic conditions, and pharmacy students ensure that patients leave with necessary medications.

Although on average MSVs with the checklist completed more steps than those without a checklist, they still did not complete 100% of the steps. We believe this could be due to the fact that the majority of MSVs are first time volunteers who are unfamiliar with the clinic’s layout. They may have to orient themselves to find where patient navigators/lifestyle educators sit, or learn how to schedule follow up appointments. Therefore, their unfamiliarity could have impacted accuracy despite the implementation of the checklist.

A greater number of MSVs with a checklist spoke to patient navigation after the history and physical but before presenting to a physician, completing these steps in the correct order. Having MSVs speak to patient navigation before presenting to the attending allows patient navigators to talk to patients while MSVs are presenting to a physician outside of the room. Volunteer adherence to clinic flow prevents patient wait time from increasing, as patients do not have to prolong their visit waiting to speak to patient navigation.

Figure 3. Impact of a checklist on patient visit times



Box plots show median time and quartile ranges, with outliers indicated by individual points. Total patient visit times before and after checklist implementation.

Other studies have shown that using checklists at clinics can be a feasible way to address challenges, such as rates of delivery of preventative services or medical errors, and subsequently improve upon these specific measures.¹⁰⁻¹² Our findings are consistent with these studies in that implementing a checklist served to be an effective way to impact clinic flow by improving volunteer accuracy and adherence.

Perceived Helpfulness of Checklist

A majority of MSVs who received the checklist found it to be helpful. The checklist served to guide MSVs who had not previously volunteered, suggesting that it helped increase the level of MSV comfort.

Patient Visit Times

Implementing a checklist did not increase patient visit times. Total patient visit time was not impacted by having MSVs complete more tasks with the checklist, such as the photocopying relevant documents (prescriptions and lab requests). Therefore, the checklist both improved volunteer accuracy and adherence, and did not increase the length of patients' time in the clinic.

Limitations

One limitation of this study is possible self-reported bias, given the use of self-reported survey responses in our analysis. Surveys were emailed to MSVs within 24 hours of the end of all clinics. Volunteers may not have accurately remembered the order of tasks completed, or could have overestimated or underestimated the number of tasks completed. Also, we were unable to verify the self-reported information, as completion of all steps of the patient encounter (e.g. talking to patient navigation) were not documented in patient charts by clinic coordinators. However, given that on average, MSVs took only 16 hours to complete the survey, we believe it is likely that responders would accurately remember the steps of their clinical encounters.

A second limitation is the small sample size of 38 survey responses and 134 patients for the visit time analysis. Sample size calculations indicate that our analysis was underpowered, as we had a goal of reaching 76 survey responses. We did not achieve 76 responses due to lack of survey completion, as well as, the inability to distribute the intended number of surveys. A lack of expected MSV attendance to clinics and cancellations of clinics secondary to poor patient turnout resulted

in the total number of MSVs during our study period being lower than expected, which is what our initial sample size calculation was based on. While this is a limitation of this work, we still found significant differences between the control and experimental groups. Further analysis with a larger sample size would be valuable to confirm our findings.

Furthermore, another limitation is that sometimes two MSVs saw one patient. It is possible that some of the survey data is non-independent if two survey responses were referencing the same patient encounter. However, this is equally likely to have happened in both the control and experimental group. Additionally, given our response rate of 67.9%, it is possible that for the patient encounters including two MSVs, only one MSV completed the survey. Although we would change this for future interventions, for the reasons stated, we believe our findings still hold.

Future Interventions

One future intervention to improve MSV pre-arrival preparation is to have volunteers watch an orientation video in addition to using the checklist.

Future interventions could also focus on ensuring more MSVs talk to patient navigation after the history and physical and before presenting to attendings. This could be done by calling volunteer attention to this step by verbally mentioning it when handing out the checklist.

Additionally, it may be valuable to obtain more concrete feedback to refine the checklist. The current survey asked, "Is there anything you think should be added to the checklist?". Participants answered with "No" and "N/A." We could improve this question by asking if there is a checklist component that should be added or removed. Also, 2 of the 18 MSVs who received a checklist indicated that they did not find it to be helpful. It could be beneficial to ask future survey respondents why the checklist was not helpful.

Applicability to other SRFCs

Every SRFC has a unique organization and workflow. However, many SRFCs have MSVs who play a vital role in running clinic.^{1,3,6} For this reason, the results of this study may apply to other SRFCs that use similar models. A checklist modified to the clinic flow of another SRFC may lead to improved volunteer accuracy.

Disclosures

The authors have no conflicts of interest to disclose.

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