Improving Stress Test Completion With Video Education

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Abstract

Problem: At a local cardiology practice, 20% of stress test appointments were not completed due to instruction nonadherence per log book audit between September 2021 and December 2021. Prior to this project, there was no formal procedure to schedule and educate patients. Canceled cases pose a financial problem in terms of staff wages and wasted isotope. This problem can also lead to a delayed diagnosis for patients putting them at risk for a preventable cardiac event. **Purpose:** To improve workflow and supplement patient instructions with video education to improve stress test completion, instruction adherence, and preparedness of cardiac patients for their nuclear stress test. **Methods:** Staff will give patients being scheduled for a stress test an educational packet that includes written instructions and a QR code to access an educational video. On test day, patients will be asked what type of education they used to prepare. If patients are not able to complete their test due to instruction nonadherence, it will be documented in the patient's electronic chart. This is recorded to distinguish between other reasons for test incompletion. **Results:** 33 patients were scheduled for nuclear stress tests, and 26 were eligible for this project. 23 out of 26 eligible patients were documented to have received an education pamphlet with a QR code, received an explanation on how to access the educational video, and verbalized understanding. 26 out of 26 eligible patients reported the type of education they used to prepare. Nine patients reported using the written instructions only, 16 patients reported using both written and video instructions, and one patient was given their instructions via telephone. 25 out of 26 eligible patients scheduled for a nuclear stress test completed their test at their scheduled visit. **Conclusion:** Findings suggest that implementing video education alongside written instructions is effective at decreasing the rate of canceled tests due to patient non-adherence to the instructions.

Improving Stress Test Completion With Video Education

A local cardiology practice conducts outpatient nuclear stress test services. An ongoing problem at this practice is uncompleted appointments. This has been an issue since the practice opened. Per logbook audit, between September 2021 and December 2021, 20% of stress test appointments were not able to be completed due to patient nonadherence to pre-procedure instructions. Canceled cases pose a financial problem including wasted time for staff, as well as the radioactive isotope that is time-limited and is ordered based on the number of nuclear stress tests scheduled. In addition, this problem can lead to a delayed diagnosis for patients that missed their appointment, as well as those that are waiting on available slots. Unfortunately, this puts patients at risk for preventable cardiac events. Prior to this project, there was no formal procedure to schedule patients.

The literature indicates that missed stress test appointments lead to an increase in morbidity and mortality. McQueenie et al., (2019) state that missed appointments is a significant risk for premature mortality from any cause in patients with long-term conditions. Articles state that increased rates of non-attendance to healthcare appointments remain a problem in terms of increased costs and wasted clinician time. (Morse & Mitchell, 2016). Patients who frequently miss appointments also potentially experience negative attitudes from their providers (Junod Perron et al., 2013; Morse & Mitchell, 2016). The consensus is that interventions should be implemented to help increase attendance for patients, especially those at high risk.

Several root causes were identified regarding nonadherence to pre-procedure instructions. These included patient error, staff practices, processes, and communication. Patient errors include not understanding the importance of following pre-procedure instructions and forgetting or ignoring the instructions. Staff-related causes include not explaining instructions to patients

due to office acuity and time constraints. Furthermore, the instructions themselves are lacking. Instructions are only available in English or Spanish, included on a sheet that contains instructions for other tests, and only given when the stress test is scheduled in person. Ultimately, all these factors point to a knowledge deficit issue.

The purpose of this DNP project was to improve workflow and supplement patient instructions with video education to improve stress test completion, instruction adherence, and preparedness of cardiac patients for their nuclear stress test.

Available Knowledge

Based on the literature review, video education is a viable option to help patients adequately prepare for their procedures. Although all the evidence includes examples of colonoscopy preparation, it is appropriate to translate this practice to other procedures/tests requiring preparation due to the similarities in fasting requirements and medication adjustments. Furthermore, it is unquestionably more difficult to prepare for a colonoscopy than for a nuclear stress test. This is an opportunity to evaluate the effect of video education on the cardiac population as there is a lack of evidence in the literature. The literature includes one Level I randomized control trial and four Level II studies; all were high quality. All studies found that the quality of colonic preparation was significantly higher in the group that was assigned video education (Chen et al., 2021; Hayat et al., 2016; Ho et al., 2019; Jin-Seok Park et al., 2016; Sateesh R Prakash et al., 2013). Bowel preparation was assessed using either the Boston Bowel Preparation Scale (Chen et al., 2021; Ho et al., 2019), Aronchick Scale (Hayat et al., 2016), or the Ottawa Bowel Preparation Quality Scale (Jin-Seok Park et al., 2016; Sateesh R Prakash et al., 2013). All are valid and reliable measures of bowel preparation (Kastenberg et al., 2018; Lai et al., 2009; Rostom & Jolicoeur, 2004). The intervention in the Ho et al. (2019) study continued to

provide verbal and written instructions while implementing and evaluating the effect of video instruction. This further supports the implementation of the intervention for this DNP project.

Rationale

Rosswurm and Larrabee's Model for Change to Evidence-Based Practice (Rosswurm & Larrabee, 1999) was created in 1999. Its purpose was to help guide nurses and other healthcare professionals through a systematic process to change to evidence-based practice. This model supports evidence-based practice changes based on quantitative and qualitative data, clinical expertise, and contextual evidence. This quality improvement framework includes six steps: Assess, Link, Synthesize, Design, Implement and Evaluate, and Integrate and Maintain.

Using this model, the intervention was expected to work because it was developed using the best evidence. Clinical expertise, stakeholder feedback, resources, and practice environment were taken into consideration regarding feasibility, benefit, and risk. See Figure 1 for the model.

Methods

This quality improvement project took place at an outpatient cardiology office, involving patients scheduled for nuclear stress tests at the office. This practice was recently bought by a larger organization, and they were still in a state of transition. The majority of patients scheduled for stress tests were white males, 50-70 years old, presenting with complaints of chest pain, shortness of breath, or an abnormal EKG. A smaller amount of their population consists of patients with established coronary artery disease with a previous myocardial infarction or stent being followed by a cardiologist.

The staff consists of two receptionists, two medical assistants, three nurses, two medical records staff, one nuclear medicine technologist, and two doctors per day. The implementation

and success of this project relied heavily on the front desk staff/receptionists, clinical site representative, and change champions.

Prior to the QI project, nuclear stress tests were ordered for at-risk patients via a paper requisition form, which includes visit reason and orders. The front desk receives the requisition form and schedules the patient for a stress test. The practice gave patients written instructions and the medical assistant called two days before their procedure to remind them of the instructions. Written instructions were on a single sheet of paper. Instructions were also available on the practice's website under patient education. This page also included instructions for other tests performed at the practice. Appointments are tracked through an electronic system. The practice did not have a standardized process for scheduling patients or a system to document that patients were given instructions. In addition, instructions were only available in English and Spanish.

To ensure that no participants were excluded, every patient is given written instructions when scheduled for a nuclear stress test. It is then determined when collecting data if the patient is eligible to be included. Patients that required an interpreter for languages other than English or Spanish were excluded.

Intervention

This project included the creation of a new scheduling process and supplemented written instructions with video education. The impact of video education on patient preparedness for nuclear stress tests was measured. Both the video and written instructions previously existed and were identified by the practice as the educational resources they wanted to use. "Preparing for Your Cardiac Stress Test" (Stress Test Coach, 2020) is available in English and Spanish, while

"What You Should Know About Caffeine Consumption Before Your Stress Test" (Stress Test Coach, 2021) is available in English.

Once the physician ordered the nuclear stress test and the requisition form was received by the front desk, the receptionist scheduled the patient for their test. Staff referred to the scheduling procedure for nuclear stress tests posted at the front desk. With the new process, staff gave patients an instruction pamphlet in their preferred language of English or Spanish. Written instructions were available in English and Spanish. The pamphlet also included an insert with a link and QR code directing patients to the educational video (See Figure 2 for the insert). The front desk receptionist explained to the patient how to access the video using the link via computer or phone or the QR code using their phone. The video is available in English and Spanish. Afterward, staff documented electronically in the scheduler that the patient was given the pamphlet and insert, that it was explained how to access the website, and that the patient verbalized understanding. On the day of testing, patients were asked what type of education they used to prepare. This was documented electronically in the scheduler as a comment. If patients were rescheduled due to instruction nonadherence that was documented electronically in the scheduler as a comment.

Since the responsibility of patients receiving adequate education relied solely on the front desk staff, this created an opportunity for collaboration. The project leader held an in-service for the new scheduling process. Knowing that the person pushing for this change was willing to get involved and do the work helped to achieve buy-in. Simply educating the staff on the new process was also a tactic as change champions were identified and trained as QI facilitators.

Structural changes such as creating a scheduling process facilitated implementation as there was a standard guide to refer to when scheduling patients as well as when training

additional staff. In addition, consistently having pamphlets available and within reach made this intervention easier to implement as there was no extra work entailed. Additional pamphlets were available in PDF and could be printed as needed. Another helpful structural change was the creation of computer desktop sticky notes. The phrases, “Patient was given instruction pamphlet with video education insert and verbalized understanding on how to access the video”, “Patient did not complete scheduled stress test appointment due to instruction nonadherence”, and “Patient used [blank] to prepare for their stress test appointment” were included for quick copy and paste into the chart to decrease the time spent documenting scheduling procedures. This was a simple addition to ensure consistent and standardized documentation.

Measures

The measurements chosen for studying processes and outcomes were the percentage of the time staff documented that they explained how to access the website, the patient received the written instruction pamphlet with QR/link insert during their initial office visit, the patient verbalized understanding, and that the patient was asked which type of education they used to prepare on the day of their test. The outcome was measured as the percentage of patients that were adequately prepared and completed their nuclear stress test.

Chart audits were an appropriate manner to collect data as the process goals mentioned above were documented in the chart by front desk staff. Data was collected weekly for a total of 14 weeks. One previously cited study collected data over 16 weeks and was able to find a significant difference in their intervention group. Data was compared to an equivalent period of time pre-intervention. Collected data was recorded in REDCap. In this case, data was collected on the outcome as either stress test completion or incomplete due to inadequate preparation/instruction nonadherence.

Ethical Considerations

Entered project data was provided via the EMR. Only data for stress test patients was accessible by practice staff and the QI PL for this project. Data was recorded into REDCap, a HIPAA-compliant, password-protected server using a personal laptop with VPN technology by the QI PL directly from the EMR. Data collection was done in a private area using HIPAA privacy practices. There were no paper data records for this project. See Figure 3 for the electronic data collection form. Staff training was conducted in person, in a private area. The design of this QI project was intended to improve patients' stress test preparation in order to decrease test incompletion. The outcomes are not generalizable to other settings/populations because this project was designed to address the patient and staff needs identified by leadership at this specific practice using the resources and workflow available to them. Aggregated project outcomes were communicated to the site to discuss the quality improvement effort. External dissemination with site permission.

Results

During this project, 33 patients were scheduled for nuclear stress tests. Of the total number of patients scheduled, 26 were eligible for this project. One patient required an interpreter, three patients were canceled by the office staff prior to arrival due to the cardiologist being called into the hospital, two called to cancel before their appointment, and one patient had cognitive impairment.

88.5% (n=23) of eligible patients were documented to have received an education pamphlet with a QR code, received an explanation on how to access the educational video, and verbalized understanding. Week one started with a critical complication as the education video was not playing with the provided link. A new educational video insert was created by week two,

and the issue was remedied. Also in week one, three patients were scheduled at a different office and did not receive the instruction pamphlet. Despite this, 100% (n=8) of tests were completed in weeks one and two. See Figure 4 for the documented education run chart.

100% (n=26) of eligible patients reported the type of education they used to prepare, and the nuclear technologist documented those responses. Nine patients reported using the written instructions only, 16 patients reported using both written and video instructions, and one patient had a visual impairment and was given their instructions via telephone (See Figure 5). Among patients that completed their stress test, the most common method of education was both written and video. See Figure 6 for the documented education run chart.

96% (n=25) of eligible patients scheduled for a nuclear stress test completed their test at their scheduled visit. In week four, one patient did not complete their stress test, although the patient arrived adequately prepared. The patient had completed a nuclear stress test recently, but it was not viewable in the EMR. There were two eligible patients scheduled that week, resulting in 50% nuclear stress test completion. See Figure 7 for the completed stress test run chart.

The majority of the outcome data points are directly at 100 percent. The median for each outcome is also 100 because of this. This makes it difficult to identify any runs on the run charts. There also aren't any trends. Shifts in the data were explained above. Although it is anecdotal and not formally recorded, an unexpected benefit that was reported during weekly meetings was an increase in patient satisfaction related to the addition of the educational video.

Discussion

Findings suggest that implementing video education alongside written instructions has been effective at decreasing the rate of canceled tests due to patient non-adherence to the instructions. The outcome goal for this project was met 96% (n=26). This was an improvement

from pre-implementation (20%). Since the results of this project were favorable, the impact on cardiology patients and practices is positive. There is the possibility to improve the workflow, stress test completion, and instruction adherence amongst the cardiology population. Financially, the practice stands to save 94 dollars as that is the price per patient for the isotope.

Based on the literature, video education is a viable option to help patients adequately prepare for their procedures (Chen et al., 2021; Hayat et al., 2016; Ho et al., 2019; Jin-Seok Park et al., 2016; Sateesh R Prakash et al., 2013). The bar graph (Figure 5) shows that the majority of patients used both written and video education. The results of this project partially support the findings in the literature.

Factors that might have limited internal validity include verification of the preferred language and the need for an interpreter. The practice only documents patients' preferred language if they need an interpreter. Meaning that a patient may speak English, but that is not their preferred language. Also, if a patient brings a family member with them to act as their interpreter, they are considered “English-speaking”. Ideally in the future, it would be preferable to be stricter with requirements for an interpreter, by simply confirming and documenting patients’ preferred language.

It should be considered that some patients would have arrived prepared regardless of the addition of video education, simply by reading and comprehending the written instructions. This considers literacy level and language barriers. Since video education is only available via the internet, age plays a role, as well as internet accessibility, taking socioeconomic factors into consideration. However, with supplemental video education, patients are not required to be literate to understand the instructions, there is no additional cost to the patient, and it can be

viewed anytime. This aids in avoiding isolating patients with financial constraints or those with stricter time requirements related to work.

Conclusion

This project was an opportunity to evaluate the effect of video education on stress test patient preparedness, as there is a lack of evidence in the literature. All the cited evidence included examples of colonoscopy preparation.

To promote sustainability, the QR code/link to the educational video insert was saved to the desktop/cloud. The new policy/procedure for scheduling patients was created, posted at the front desk, and saved to the desktop/cloud. This allows for quick access in the future for practice staff, and the ability for the insert and scheduling procedure to be easily accessed by other office locations that share the cloud software. This is at no additional cost to the practice, the cloud is free for a certain amount of data.

Given the results, a cost-effective and easy-to-implement intervention that translates to improved quality outcomes for outpatient stress tests was presented. This means a decreased financial loss for the practice and patients related to wasted isotope, staff wages, and appointments. It also means a decrease in delay in diagnosis as tests are able to be completed. For future QI initiatives, all materials are available for dissemination to the other practice locations and beyond.

Special thanks to Dr. Barbara Van de Castle, Dr. Charlotte Nwogwugwu, and Robin Anderson for their continued guidance and support.

References

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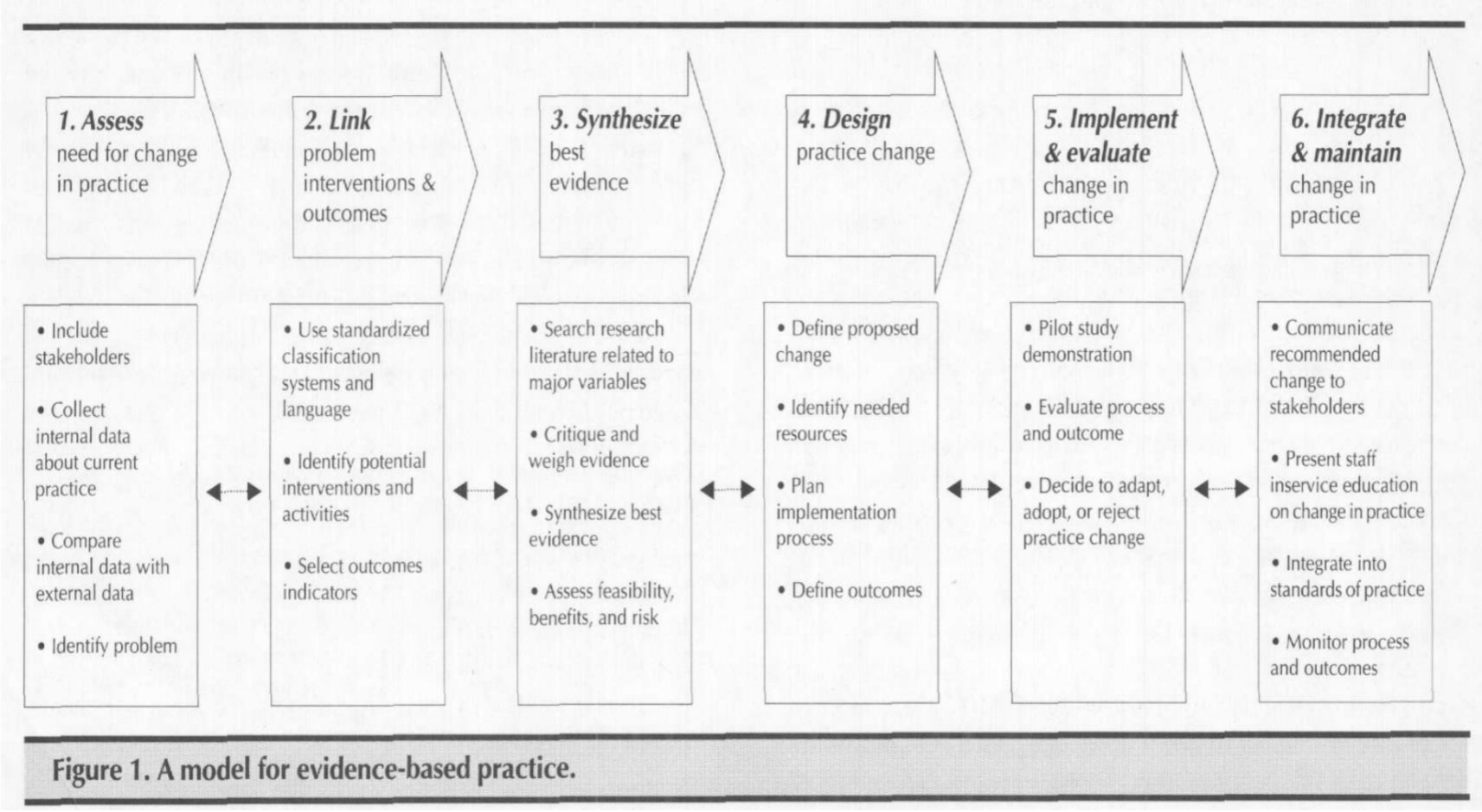
Appendix

Figure 1

Rosswurm & Larrabee Model for Change to Evidence-Based Practice



**(Rosswurm & Larrabee, 1999)*

Figure 2
QR Code Insert English and Spanish Versions

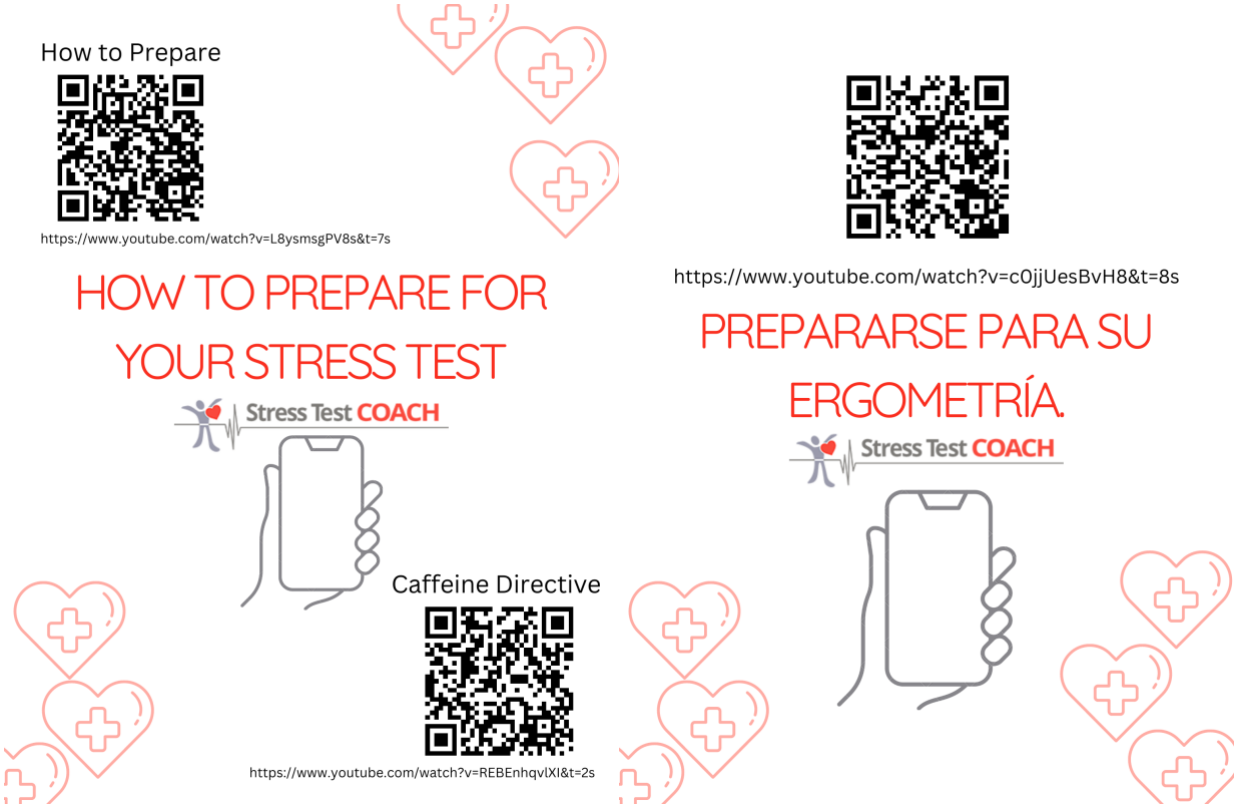
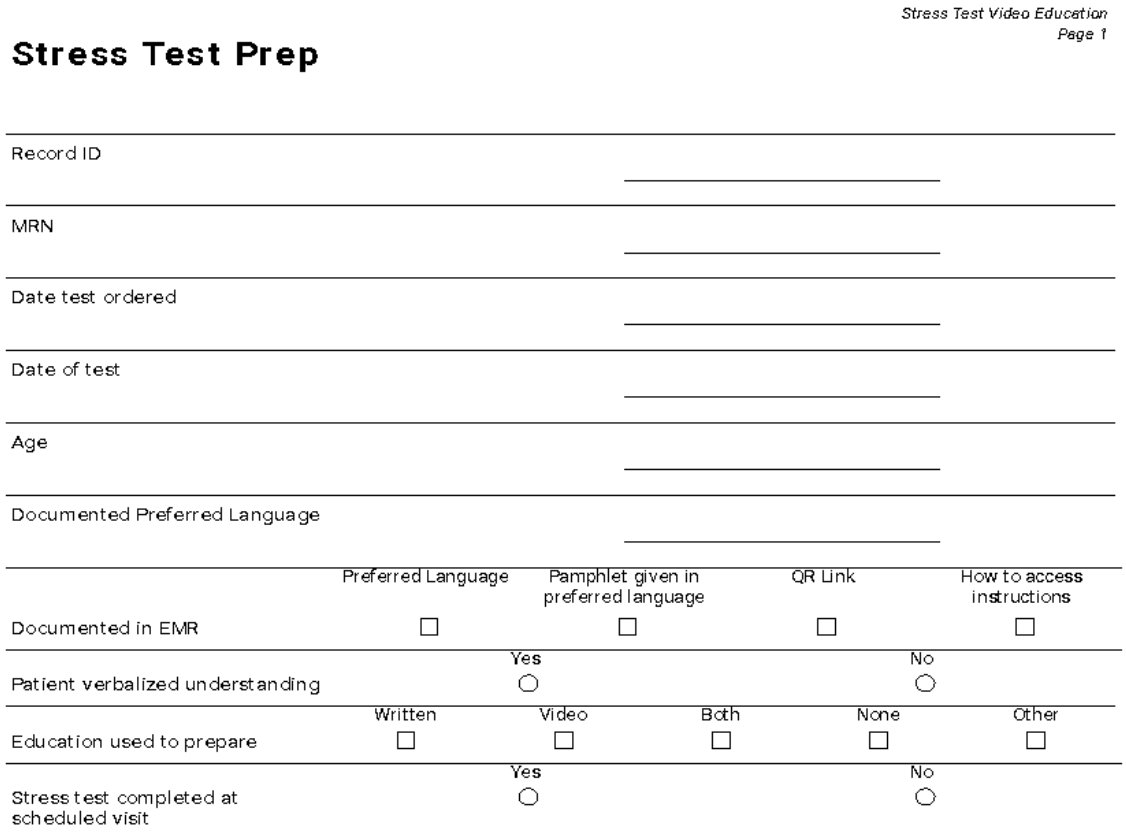


Figure 3

Stress Test Prep Data Collection Tool



Stress Test Video Education
Page 1

Stress Test Prep

Record ID _____

MRN _____

Date test ordered _____

Date of test _____

Age _____

Documented Preferred Language _____

	Preferred Language	Pamphlet given in preferred language	QR Link	How to access instructions
Documented in EMR	☐	☐	☐	☐

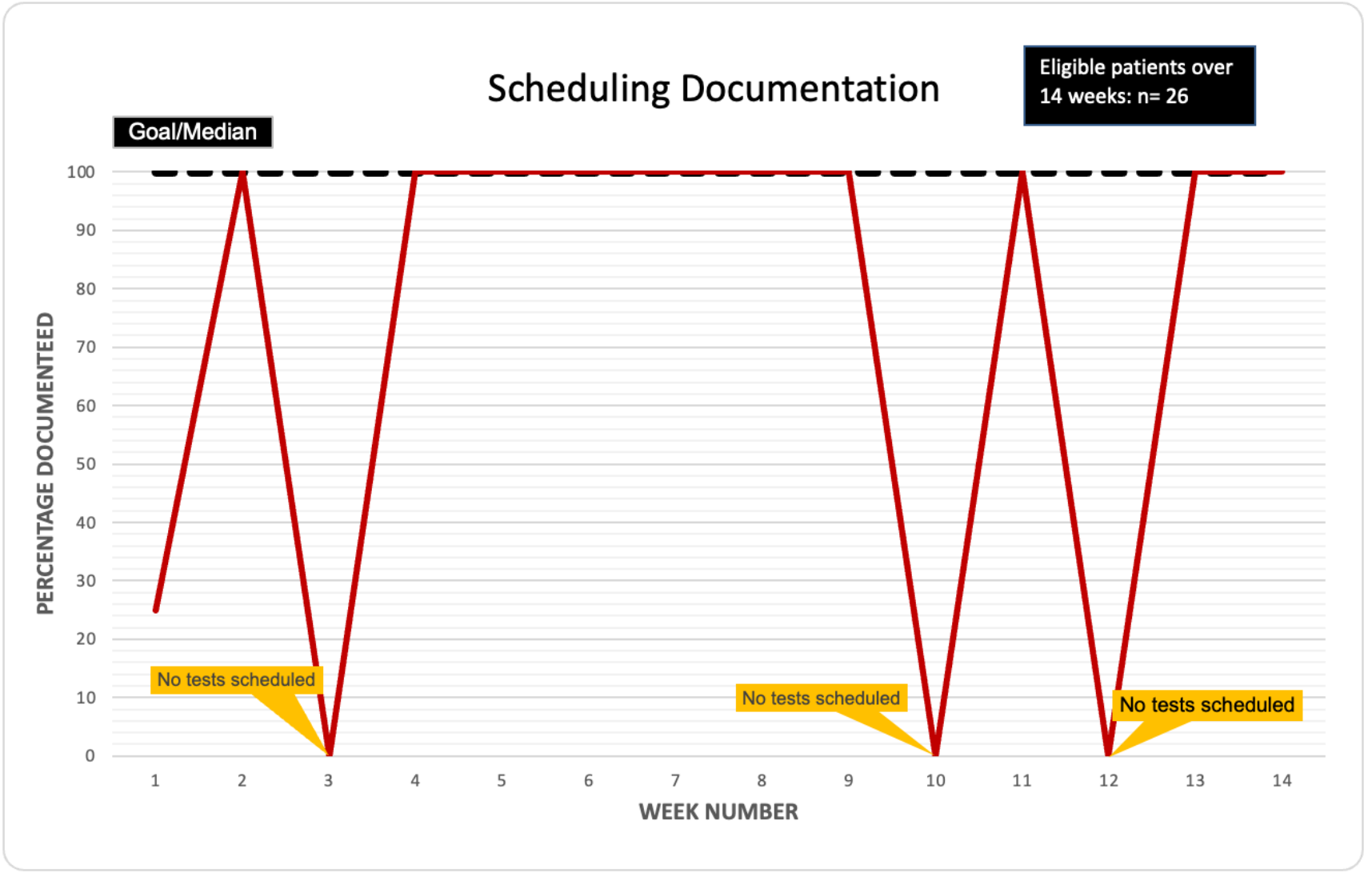
	Yes	No
Patient verbalized understanding	○	○

	Written	Video	Both	None	Other
Education used to prepare	☐	☐	☐	☐	☐

	Yes	No
Stress test completed at scheduled visit	○	○

Figure 4

EMR Documentation Run Chart



Note. Patients were not scheduled for Week 3.

Figure 5
Education Preparation Type Graph

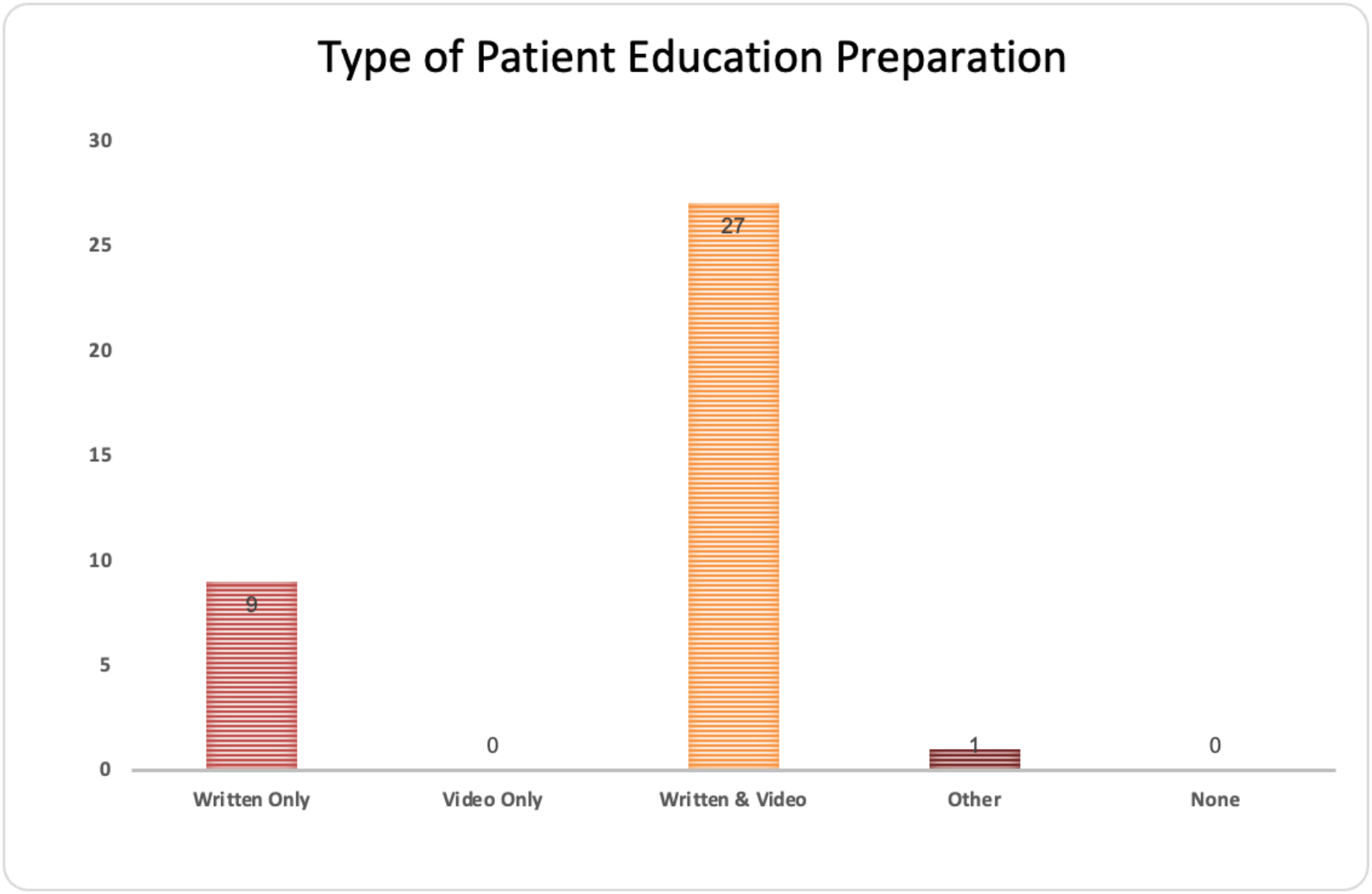
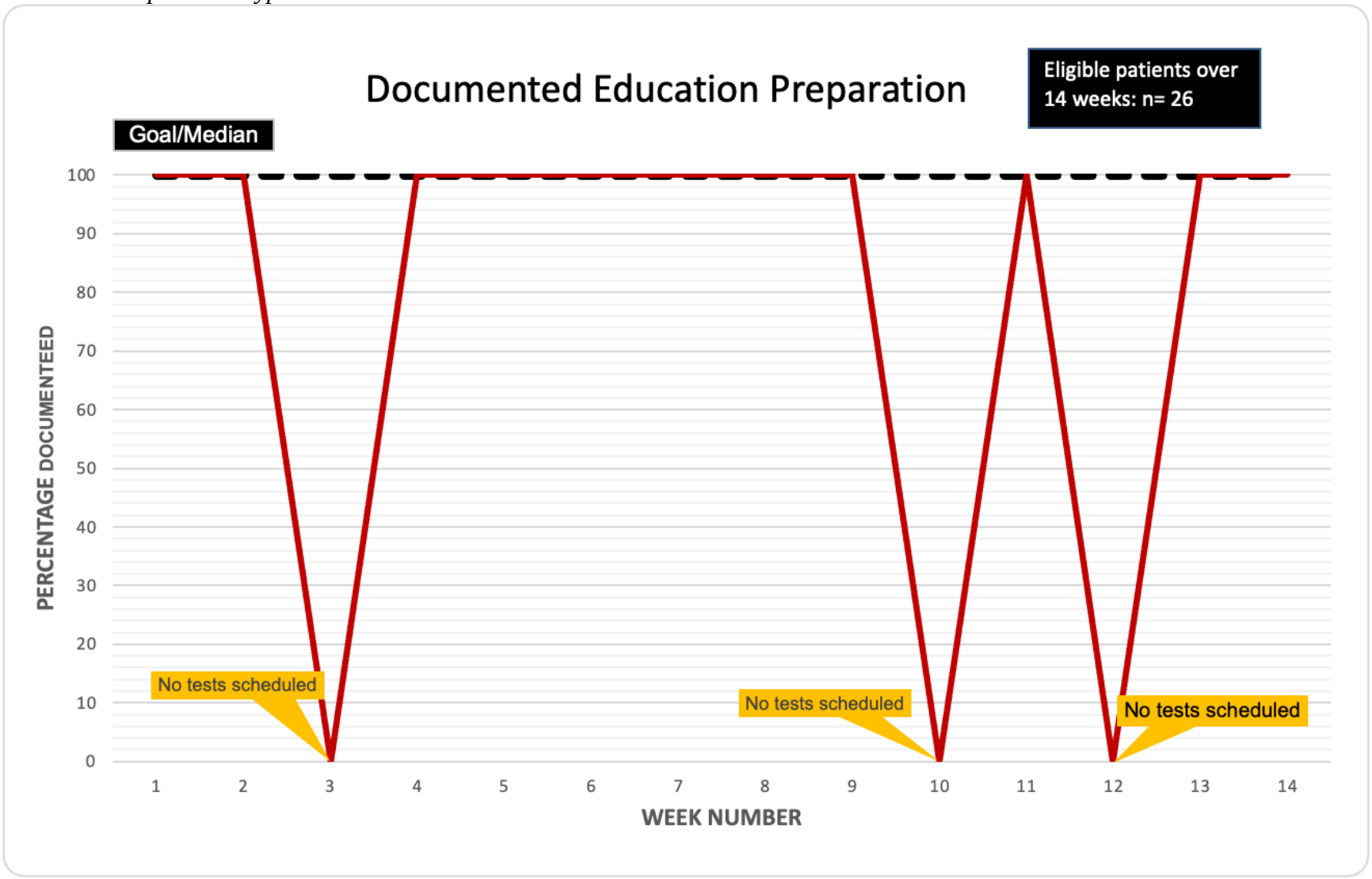


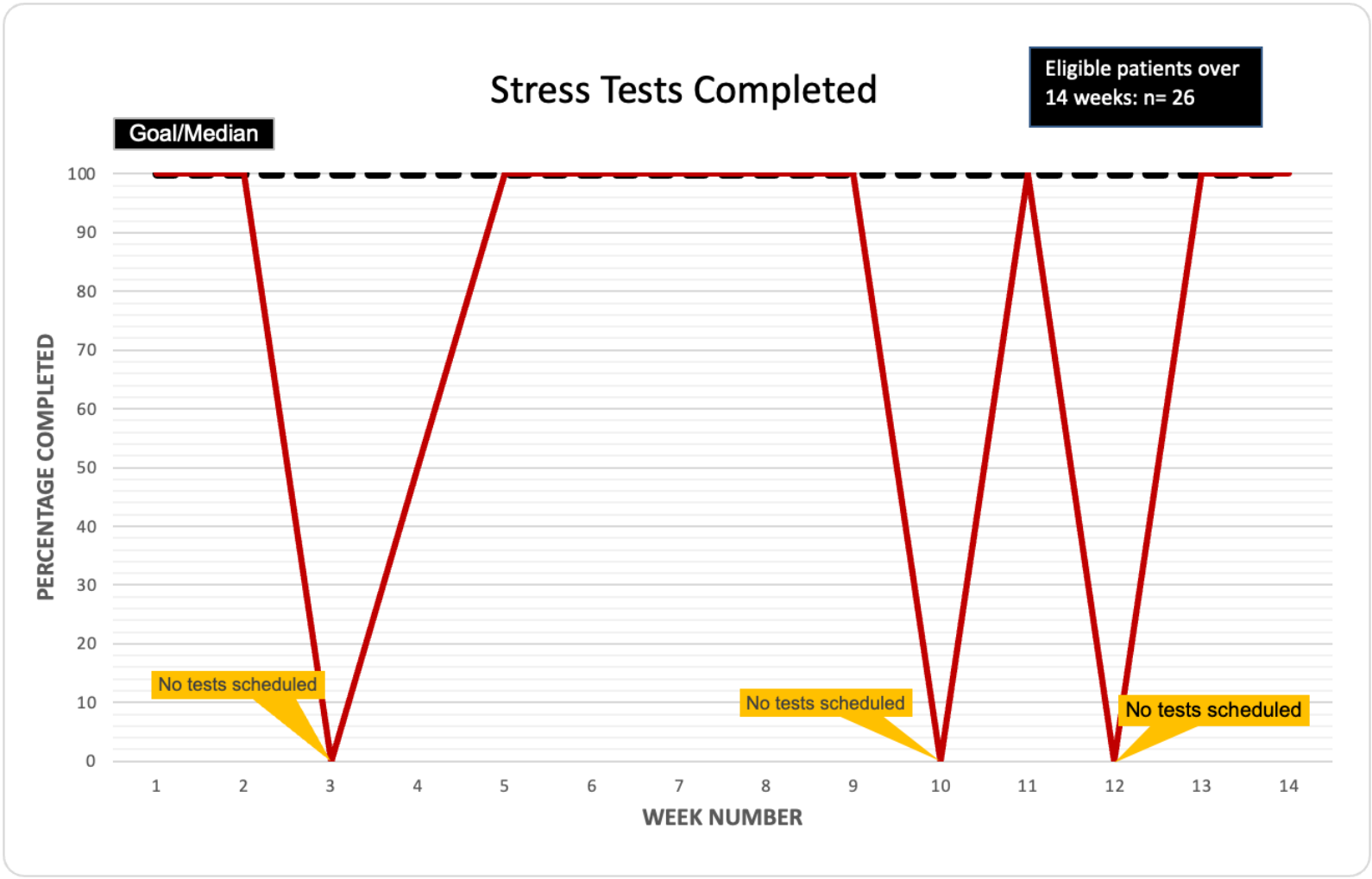
Figure 6

Education Preparation Type Documentation Run Chart



Note. Patients were not scheduled for Week 3.

Figure 7
Outcome Goal Run Chart



Note. Patients were not scheduled for Week 3.

Evidence Review Tables

Citation: Anthony, N., Molokwu, J., Alozie, O., & Magallanes, D. (2019). Implementation of a Text Message to Improve Adherence to Clinic and Social Service Appointments. *Journal of the International Association of Providers of AIDS Care, 18,* 1–5. https://doi.org/10.1177/2325958219870166					**Level: II** **Quality: B**
Purpose/Hypothesis	**Design**	**Sample**	**Intervention**	**Outcomes**	**Results**
The purpose of this study was to assess the effectiveness of a text-based reminder system compared with usual care in improving the attendance to clinic and social work appointments.	Quasi-Experimental study Two study arms, looking at two periods, six months before initiation of text messages and six months after initiation of text messages.	**Sampling Technique:** Convenience **Eligible Participants:** Current patients of the clinic. **Setting:** Ryan White-funded HIV clinic in El Paso, Texas. **Excluded:** Patients without a mobile number, those that did not sign consent. **Accepted:** 331 patients. **Control:** 173 participants. **Intervention:** 158 participants. **Power analysis:** No data.	**Control:** No reminder text message sent. **Intervention:** Reminder text message sent. **Treatment Fidelity:** The clinic social worker and medical assistant sent a preformatted text message in the patient's preferred language to patients three days before their appointments.	**Dependent variable:** No show rate **Measurement**: Rates of clinic attendance were reported using percentages of patients who attended or did not attend their clinic appointment. These percentages were compared using chi-squared statistics**.**	**Statistical Results:** There was a significantly reduced no-show rate of 17.7% with a statistically significant increase in clinic adherence of 7.15% (P-value = .05) compared to the preintervention results of 24.8% **Conclusion:** The researchers were able to conclude that using an inexpensive online text messaging system significantly decreased no-show rates in a primarily younger, low-income, and uninsured population.

		Group Homogeneity: There were no significant differences in demographics between groups based on NS p values in Table 1.			

Citation: Anyaegbu, C. T. (2021). SMS reminders: Reducing DNA at a community mental health depot clinic. *Journal of Community Nursing*, *35*(1), 50–55.					**Level: II** **Quality: C**
Purpose/Hypothesis	**Design**	**Sample**	**Intervention**	**Outcomes**	**Results**
The purpose of this study was to determine both pre and post-intervention rates of did not attend [appointment] (DNA).	Quasi-Experimental study. Two study arms, with an eight-week period for baseline data collection followed by an eight-week intervention period.	**Sampling Technique:** Convenience **Eligible Participants:** Current patients of the clinic, age 18 to 65, prescribed a depot antipsychotic injection for at least eight weeks before the evaluation.	**Control:** No reminder text message. **Intervention:** Reminder text message sent. **Treatment Fidelity:** A standard text message was sent via a secure and confidential internet-based service used by the NHS. The SMS	**Dependent variable:** Difference in DNA rate. **Measure:** Attendance/ non-attendance data was collected and recorded weekly during both arms of the study.	**Level of measurement:** A t-test was used to assess whether the mean difference between the text reminder vs control group based on the number of appointments was statistically significant. **Analysis:** The DNA rate in the text reminder group post-intervention was 15.3%, while the control group had a 27.6% post

		Setting: Community Mental Health Clinic in East London, UK. **Excluded:** Patients that received their injection at home. **Accepted:** 76 participants met inclusion criteria. **Control:** 38 participants (those without a mobile phone). **Intervention:** 38 participants (those with a mobile phone). **Power analysis:** None. **Group Homogeneity:** No data.	reminders were sent between 0730 and 0800 am on the day of the appointment.		DNA rate. This represents a 12.2% difference, which the t-test found to be statistically significant with $p<0.0001$, $t= 4.8404$; 95% confidence interval. **Conclusion:** There were significant reductions in nonattendance following the implementation of SMS reminders.

Citation: Junod Perron, N., Dao, M. D., Righini, N. C., Humair, J.-P., Broers, B., Narring, F., Haller, D. M., & Gaspoz, J.-M. (2013). Text-messaging versus telephone reminders to reduce missed appointments in an academic primary care clinic: A randomized controlled trial. *BMC Health Services Research*, *13*(1), 125–125. https://doi.org/10.1186/1472-6963-13-125					**Level: I** **Quality: A**
Purpose/Hypothesis	**Design**	**Sample**	**Intervention**	**Outcomes**	**Results**
Hypothesis: That text-message reminders would be as effective as telephone reminders in an academic primary care clinic	Randomized controlled non-inferiority trial.	**Sampling Technique:** Simple random sampling **Eligible Participants:** Cell phone number available, had a scheduled appointment.	**Control:** Telephone call reminder. **Intervention:** Text message reminder. **Treatment Fidelity:** Text reminders were sent	**Dependent Variable:** Rate of unexplained missed appointments.	**Level of Measurement**: Comparison of patient and health care providers' baseline characteristics between groups by means of Chi-square tests for categorical variables and

		Setting: The academic primary care division of the Geneva University Hospital. **Excluded:** Patients that wished to be excluded that informed the receptionist. **Accepted:** 6450 were eligible for randomization. **Control:** 3165 participants, four excluded for not receiving the allocated intervention, 65 excluded for canceling the appointment before the intervention took place. **Intervention:** 3285 participants, 539 excluded for not receiving the allocated intervention, 29 excluded for canceling the appointment before the intervention took place. **Power analysis:** 3151 consultations in each arm of the study to meet power of 0.80 and .05 alpha. **Group Homogeneity:** There were no significant differences in demographics and health professional status between groups based on NS p values in Table 1.	through a secured web platform. Text message reminders 24 hours before the appointment. Telephone reminders were offered in French, Spanish, English, or Italian. A message was left if there was no answer after two attempts.	**Measure:** The rate of unexplained missed appointments was collected and recorded monthly during both arms of the study.	Student's t-test for continuous variables. **Analysis:** The rate of missed appointments was similar in the text-message group (11.7%, 95% CI: 10.6-12.8) and in the telephone group (10.2%, 95% CI: 9.2-11.3 p = 0.07). However, only text message reminders were cost-effective. **Conclusion:** Text-message reminders are equivalent to telephone reminders in reducing the proportion of missed appointments in an academic primary care clinic and are more cost-effective.

Mahmud, N., Doshi, S. D., Coniglio, M. S., Clermont, M., Bernard, D., Reitz, C., Khungar, V., Asch, D. A., & Mehta, S. J. (2019). An Automated Text Message Navigation Program Improves the Show Rate for Outpatient Colonoscopy. *Health Education & Behavior, 46*(6), 942–946. https://doi.org/10.1177/1090198119869964					**Level: II** **Quality: C**
Purpose/Hypothesis	**Design**	**Sample**	**Intervention**	**Outcomes**	**Results**
Researchers hypothesized that a bidirectional messaging approach informed by principles of behavioral science might foster improved engagement and improve outpatient colonoscopy show rates.	Prospective cohort study	**Sampling Technique:** Convenience **Eligible participants:** Patients 18 to 75 years who were scheduled for outpatient colonoscopy within 2 months of initial contact. **Setting:** Urban academic endoscopy center in Philadelphia, PA. **Excluded:** Patients on diabetic medications. **Accepted:** 71 patients **Control:** 50 patients **Intervention:** 21 patients **Power Analysis:** Power calculations to enable detection of a ~30% difference in the primary outcome. No further data. **Group homogeneity:** There were no significant differences in demographics or comorbidities between groups based on NS p values on Table 2.	**Control:** Written instructions and a phone reminder in the week prior to colonoscopy (usual care). **Intervention:** 10 bidirectional, automated, timed text reminders with a link to instructions and location of the endoscopy center. **Treatment Fidelity:** A series of nine instructional and reminder messages sent in the week prior to the procedure. Messages included a link to the bowel preparation instructions and location of the endoscopy center. Patients could text questions to be answered by gastroenterology staff within 24 hours.	**Dependent Variable:** Appointment adherence, bowel preparation quality, and colonoscopy completion. **Measure:** For each patient, rate of appointment adherence (show, no-show, cancelation), bowel preparation quality (excellent, good, fair, poor), and colonoscopy completion (cecum reached) were obtained from the EMR.	**Statistical Results:** Intervention patients were significantly more likely to show for colonoscopy (90% vs. 62% show rate; p = .049). Among those who showed, there were no significant differences in preparation quality or completeness between arms (p = .12 and p = .43, respectively). **Conclusion:** Patients enrolled in a bidirectional, automated text message navigation program had significantly higher colonoscopy attendance rates as compared with patients receiving usual care.

Nayor, J., Feng, A., Qazi, T., Hurwitz, S., & Saltzman, J. R. (2019). Impact of Automated Time-released Reminders on Patient Preparedness for Colonoscopy. *Journal of Clinical Gastroenterology*, *53*(10), e456–e462. https://doi.org/10.1097/MCG.0000000000001211					**Level: V** **Quality: B**
Purpose/Hypothesis	**Design**	**Sample**	**Intervention**	**Outcomes**	**Results**
To evaluate the effect of an automated time-released colonoscopy reminder program on preparation quality and the rates of canceled procedures.	Quality Improvement Program	**Sampling Technique:** Convenience **Eligible participants:** All patients scheduled for a colonoscopy by a gastroenterologist. **Setting:** Brigham and Women's Hospital (main hospital or ambulatory endoscopy center) in Boston, MA. **Excluded:** Colonoscopy performed by a non-gastroenterologist. Those with missing mobile phone numbers, email, or preparation type. **Accepted:** 1941 patients. **Control:** 426 patients. **Intervention:** 1497 patients; 18 opted out during the program. **Power Analysis:** None. **Group homogeneity:** No data.	**Control:** Did not receive automated reminders. **Intervention:** Electronic automated reminders via text or email. **Treatment Fidelity:** A series of automated reminders were sent to patients via text or email starting the day after colonoscopy booking. A link with additional content and instructional videos was included. Reminders were sent at specific times based on the time of procedure.	**Dependent Variable:** Quality of bowel preparation and canceled procedures. **Measure:** Rate of adequate bowel preparation and rate of canceled procedures, from March through June 2017 compared with the baseline cohort (March through June 2016).	**Statistical analysis**: Compared with the baseline cohort, the rate of adequate bowel preparation increased from 88.5% to 96.2% (P<0.0001). The rate of canceled procedures decreased from 6.1% to 4.3% (P=0.02). **Conclusions**: This study showed that automated text message and email reminders for colonoscopy preparations significantly increased the rate of adequate colonoscopy preparations and decreased the rate of canceled colonoscopies.

Citation: Steiner, J. F., Shainline, M. R., Bishop, M. C., Stan Xu, & Xu, S. (2016). Reducing Missed Primary Care Appointments in a Learning Health System: Two Randomized Trials and Validation of a Predictive Model. *Medical Care*, *54*(7), 689–696. https://doi.org/10.1097/MLR.0000000000000543					**Level: I** **Quality: A**
Purpose/Hypothesis	**Design**	**Sample**	**Intervention**	**Outcomes**	**Results**
To describe collaborative efforts to reduce missed appointments through an interactive voice response and text message (IVR-T) intervention, and to develop and validate a prediction model to identify individuals at high risk of missing appointments.	Randomized trial at a Kaiser Permanente Colorado index clinic and replication clinic.	**Sampling Technique:** Simple random **Eligible Participants:** Patients that had a primary care appointment scheduled. **Setting:** Kaiser Permanente Colorado **Excluded:** Scheduled telephone visits and visits for office procedures, members who requested no contacts by phone or text message, pediatric or OB-GYN appointments, repeat appointments. **Accepted:** **IC:** 8804 appointments **RC:** **Control:** **IC:** 4462 appts **RC:** 3814 appts **Intervention:** **IC:** 4342 appts **RC:** 3683 appts **Power analysis:** No data.	**Control:** No reminder. **Intervention:** IVR call or text reminder. **Treatment Fidelity:** One day before a scheduled visit, patients randomized to the intervention arm received a single English-language IVR call to their landline or a text message if a cellular phone was identified as the primary means of contact.	**Dependent Variable:** Rate of missed appointments **Measure:** Proportion of missed appointments; demographic, clinical, and appointment-specific predictors of missed appointments.	**Statistical Analysis:** Patients receiving IVR-T had a lower rate of missed appointments than those receiving no reminder at the IC (6.5% vs. 7.5%, relative risk=0.85, 95% confidence interval, 0.72-1.00) and RC (8.2% vs. 10.5%, relative risk=0.76, 95% confidence interval, 0.65-0.89). A 10-variable prediction model for missed appointments demonstrated excellent discrimination (C-statistic 0.90 at IC, 0.89 at RC) and calibration (P=0.99 for Osius and McCullagh tests). Patients in the 3 lowest-risk quartiles missed 0.4% and 0.4% of appointments at the IC and RC, respectively, whereas patients in the highest-risk quartile missed 24.1% and 28.9% of appointments, respectively. **Conclusions**: A single IVR-T text or call reduced missed appointments, whereas a locally validated prediction model accurately identified patients at high risk of missing appointments.

		Group Homogeneity: There were no significant differences in demographics, comorbidities, insurance type, time between scheduling appointment and date of appointment, emergency department visits, or previous number of missed appointments between groups based on NS p values in Table 1.			