

Developing an Automated Text Message Program in the Emergency Department

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ABSTRACT

BACKGROUND: Patients in emergency departments (EDs) often face barriers to care, including complex operations, long waits, and limited communication from care teams. These factors contribute to dissatisfaction and may increase rates of leaving before treatment is complete. Automated text messaging (SMS) may improve transparency by providing real-time updates and answering common patient questions about comfort and visit milestones. This pilot study evaluated the feasibility of implementing a fully automated SMS program and describes key aspects of its design and implementation.

METHODS: SMS content and triggering logic were developed through informal patient interviews and iterative input from a multidisciplinary team, including physicians, nurses, registration staff, and patient experience administrators. Messages were mapped to electronic health record (EHR) events and triggered automatically without staff intervention. Following deployment, a convenience sample of English-speaking, adult patients at a single urban academic ED were offered enrollment over a 15-month period. Enrolled patients received an optional, anonymous post-visit survey. Data on enrollment and survey results were summarized descriptively.

RESULTS: Thirteen automated messages were implemented. Between July 2023 and October 2024, 4,100 of 42,915 eligible patients enrolled (9.6%). Among enrollees, 185 completed the post-visit survey (4.5%). Of respondents, 89.7% reported wanting text messages during their ED visit. The most frequently selected desired topic was “updates on what tests/procedures are still pending” (65.4%).

CONCLUSIONS: A fully automated ED SMS communication program was technically feasible and was viewed favorably by survey respondents. Future work should evaluate strategies to increase enrollment and engagement, assess implementation in other settings, and examine the impact of automated messaging on patient experience.

KEYWORDS: Informatics; Text Messaging; Patient Communication; Emergency Department; Quality Improvement

INTRODUCTION

The emergency department (ED) is the primary site of unplanned acute medical care and a major site for healthcare delivery, providing up to half of all medical care.¹ In 2021, there were nearly 140 million visits to EDs, for an average of nearly 43 visits per 100 people.² Poor patient experience in the ED, however, can reduce quality of care, increase the rate of patients leaving before treatment is complete (LBTC), and even increase the likelihood of lawsuits.³ Nationally, in 2021, approximately 6.5% of encounters ended with patients LBTC, including leaving without being seen (LWBS), elopements, and leaving against medical advice.⁴ Academic medical centers, which are frequently higher volume EDs, have longer average lengths of stay and higher rates of LBTC.⁵ Nationally, LWBS rates have worsened year over year, doubling from 1.1% to 2.1% between 2017 to 2021.⁶ At baseline at the study site, which is a tertiary academic medical center, LWBS rates are higher than the national average and have climbed as high as 11% in 2024.

Conventional wisdom and prior literature have identified care timeliness as a key driver of ED patient experience, making wait time an attractive target of ED process improvement projects.^{7,8} Unfortunately, wait times are constrained by complex external factors such as hospital boarding and crowding, along with ED staffing shortages. It remains urgent to improve patients' experience by creative new means, such as enhancing patient communication and education.

Apart from patient wait times, ED flow models have grown increasingly complicated. Patients often may have unclear expectations for their visit or may not feel prioritized by care providers. Existing sources of transparency, such as patients' electronic health portals, frequently require account creation, credential knowledge, and access to a web browser window. Furthermore, these charts are primarily designed for outpatient contexts and typically present only resulted labs and imaging, while providing limited insight into the active clinical workflow or patient care journey. To date, there has been limited exploration of leveraging technology (specifically automated SMS) in the ED, despite a broad literature base suggesting that SMS can be effective in healthcare settings.⁹⁻¹⁶ These studies in healthcare contexts outside of the ED have demonstrated the potential of text messaging to improve outcomes in healthcare and the perception of SMS

as a reliable form of communication.^{17,18} One major study of SMS automated from the electronic health record (EHR) in the ED also identified a desire by patients for more frequent updates in the ED, along with finding that implementing ED SMS could impact patient satisfaction.¹⁹

We hypothesized that automated text messages linked to EHR workflow events could provide a feasible and intuitive method to communicate with patients without requiring additional staffing or operational resources. In this report, we describe the development and implementation of an automated text message service in a single urban ED at a Level 1 trauma center in New England. We present initial feasibility data, including patient enrollment, along with limited patient-reported acceptability data on interest in messages and preferred message content.

METHODS

Study Setting and Design

This study evaluated a pilot implementation of an automated ED text-messaging program with prospectively collected operational and patient survey data that were then analyzed with descriptive methods. The study took place at a busy, urban, academic ED with ~89,000 annual patient visits and a baseline rate of LWBS of 10.7% prior to the launch of the project (Rhode Island Hospital, Providence, RI). The ED contains a split-flow model with multiple care areas targeted toward different estimated levels of patient acuity.

Patient Enrollment and Inclusion

Adult patients were offered enrollment in the text messaging program by ED registration staff on arrival to the ambulatory waiting area. As the pilot program was only offered in English, staff were instructed to offer enrollment only to patients with a listed preferred language of English. Patients were enrolled during all shifts. Enrollment was entirely voluntary, and ED staff were encouraged but not required to offer enrollment.

Intervention Development and Deployment

First, one author (M.B.) performed qualitative interviews with ED patients to identify the communication gaps that could potentially be addressed by text messages. Ten patients across a range of acuity levels were interviewed. These early interviews suggested that patients who were higher acuity often could not benefit from text messages, either secondary to clinical condition or secondary to a lower level of technical literacy. In our ED, these higher acuity patients skewed older, consistent with prior literature, and either did not have phones or did not feel comfortable using them.^{20,21} Additionally, as a byproduct of their acuity, these patients tended to have more frequent touchpoints with clinical staff and were less likely to have questions about their care.

For patients who were triaged as lower acuity, however,

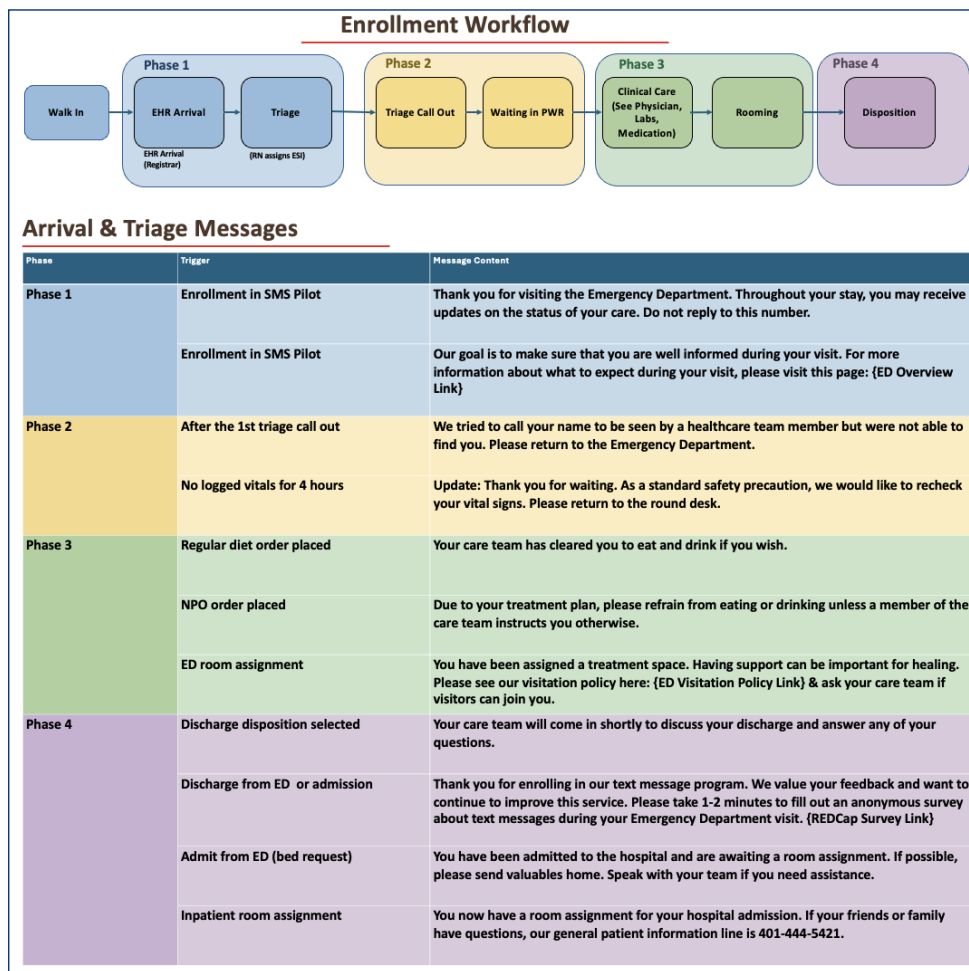
interviews suggested that a meaningful source of frustration was a lack of care transparency. These patients faced longer wait times, had their phones with them, and felt comfortable using them. Patient feedback coalesced around thematic areas of confusion, including uncertainty around why some patients were called into rooms before others, lack of clarity of what steps remained in their care journey, and limited familiarity with or recollection of systems such as the MyChart patient portal (Epic Systems, Verona, Wisconsin) that would allow them to see their test results. Patients who participated in these early interviews indicated an interest in being enrolled in such a service. As a final step before initiating development of the SMS service, cell phone signal penetration was assessed throughout the ED, both using provider devices and through patient interviews.

To integrate interview findings into clinical workflows, a simplified process map of the ED operational workflow for the target, lower-acuity patient population was produced [Figure 1]. Leveraging initial patient feedback as well as provider clinical experience, a set of intervention points for sending SMS were determined and preliminary text content was written as a launching point for discussion.

Following this, a multidisciplinary working group of stakeholders was convened. This included staff from patient registration, nursing management, patient experience administrators, information technology (IT), and physicians. Early conversations focused on which team was best suited to enroll patients into the SMS program and at what point in the care workflow. Many EDs, including the study site, have transitioned to 'bedside' ED registration to improve patient flow, but this created a point of friction with the SMS program. The team determined SMS would be most useful at the point of arrival and would have less impact if the program only activated at the time of full registration, often hours after arrival. We modified an existing patient arrival workflow by asking staff to enroll patients at the time of arrival before the full registration process. Registration staff were trained and provided with supportive documentation to enable successful enrollment of patients for the pilot.

The group developed and prioritized a suite of SMS messages [Figure 1]. The design of each message included both the text language as well as the operational events, such as provider orders, that would serve as programmatic triggers. The language and trigger of each message was vetted by the multidisciplinary working group to minimize risk of unintended operational consequences, legal risks, or patient misunderstanding. All operational messages were designed to be fully automated, requiring no change to any staff workflows. Given the security profile of SMS, all text messages were written without any inclusion of protected health information (PHI), including names, test results, or room numbers. Given the limited scope of the pilot, all messages were written in English, with the expectation that pending pilot assessment, messages would be translated. Members of

Figure 1. This figure illustrates a simplified patient arrival and SMS program enrollment workflow, along with the specific messages received by patients. Each text message has been assigned a numerical identifier which marks where in the workflow the message is sent. The message content excludes a message header identifying the ED as the sender of the messages.



EHR, Electronic Health Record. ESI, Emergency Severity Index. NPO, nothing by mouth. PWR, public waiting room.

both IT and clinical informatics worked to translate these documented message requirements into a technical design that was implementable from within the electronic health record (EHR). Messages were then grouped into tranches that were scheduled to be iteratively released to reduce the risk of EHR system failures or operational disruptions. These messages were paired with the production of infographics and FAQs' materials that were uploaded to the hospital website, to provide patient-facing context and explanations of both ED operations and the text message pilot.

Patient Survey Collection

Enrolled patients who received at least one message after the initial introductory text were invited to provide voluntary, anonymous feedback through a survey, which was also delivered via text message. Survey data were collected and managed using REDCap electronic data capture tools hosted

at the study site.^{22,23} Survey topics included soliciting general positive or negative interest in ED text messages, questions about preferred message content, and areas for unstructured qualitative feedback. Patients who reported either a positive or negative interest in receiving text messages as part of ED visits were further asked to provide categorical feedback explaining their responses. A copy of the survey questions can be seen in **Supplemental Table S1**.

[Editor's note: Email corresponding authors for supplemental table, figure.]

RESULTS

Patients Enrolled

From July 2023 through October 2024 (15 months), just over 4,100 patients were enrolled in the program [Figure 2] out of 42,915 eligible patients (9.6%, **Supplemental Figure S1**).

Patient Survey Results

Of the 4100 patients enrolled in the program, 186 patients consented to their feedback on the service being used, although only 185 provided feedback through the survey (4.5%). Of

Figure 2. Monthly counts of patient enrollment in the text-messaging pilot from July 2023 through October 2024

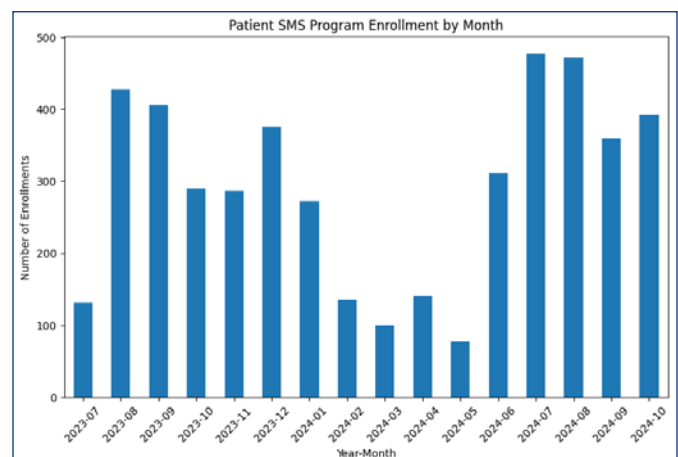


Figure 3. Anonymous survey results from patients who expressed a disinterest in receiving text messages. Patients were able to select one or more reasons. Counts are shown from each pre-defined category.

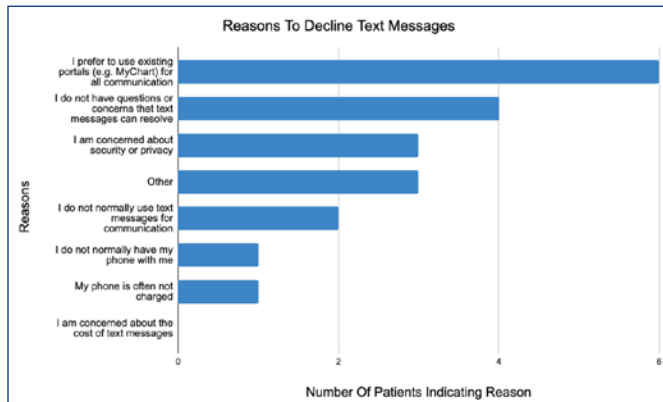


Figure 4. Anonymous survey results regarding patient text message content preferences. Patients were offered a list of potential text message content and were able to select as many text messages as they would find valuable. Counts of each category are shown.

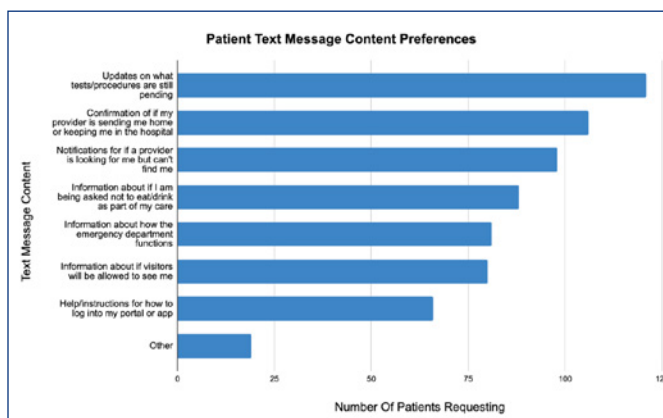


Table 1. Qualitative Feedback From Survey Respondents

This table shows a sample of verbatim, positive and negative, feedback about the initial SMS program. Responses unrelated to the SMS program or that include a single word, are not shown.

"Your text messages are more consistent than the nurse I had."
"I think it's a great thing to have to inform patients on the level of care that you're offering and sometimes you can get crazy in here so the more information you can give the patients to better thank you for everything."
"Very informative and on time...texting is a great idea."
"Every text I received in the ED was either too late or I was told was irrelevant by staff. It seems little more than a confusing waste of money. It does not even effectively serve the purpose of keeping the patient placated until services can be offered, if anything it has the opposite effect."

This table shows a sample of verbatim, positive and negative, feedback about the initial SMS program. Responses unrelated to the SMS program or that include a single word, are not shown.

the 185, 166 (89.7%) said they would want to receive informational text messages as part of an ED visit. Nineteen patients indicated they would not want to receive messages [Figure 3].

For those patients who expressed interest in receiving SMS, Figure 4 displays what message content they felt was most valuable.

There were 33 (17.8%) of survey respondents who provided further unstructured feedback, with a sample of both positive and negative sentiment responses shown in Table 1.

DISCUSSION

Primary Findings

This project demonstrated the technical feasibility of leveraging automated, EHR-triggered SMS technology in a high-volume tertiary ED. It summarized initial patient survey data, noting high acceptability of the technology for respondents, and gathered additional information about the types of information respondents wish to receive via automated messages. It provides a framework and project management approach to develop similar services in other hospital settings.

Comparison with Prior Literature

Our study adds to existing literature in several key ways. First, to the authors' knowledge, it represents the first surveyed feedback offered by patients on an ED SMS program. Secondly, we introduced several innovative messages directed at specific patient demands, such as informing them of their current dietary status and giving them a visual overview of a complex, split-flow ED visit. Finally, this report offers multiple granular details on the design and launch of a program that may be of interest to peer institutions considering implementing SMS. The survey response rate of 4.5% of enrolled patients was comparable to other digital health surveys, showing single digit response rates from 1.2–8.1%.²⁴⁻²⁶

Lessons Learned

This pilot was not without initial challenges. An initial launch of the program included a technical bug that required a temporary shutdown in the service while the bug was resolved. Separately, front-line registration staff indicated that during times of peak ED crowding, patients declined the service more frequently due to general frustration with crowding and wait times. Driven by this patient feedback, other demands on registration staff time, and the novelty of the service, some members of the registration staff were less likely to offer patients the SMS service than others. Limitations in reporting during the early phase of launch made it difficult to detect this silent 'buyout' by registration staff, which occurred early in 2024. It became critical to measure if patients were being disproportionately enrolled during

certain shifts or by staff members to target staff education and devise further operational improvements. Analytics for the SMS program were not easy to develop due to the design of the module within the EHR. Once reporting was available, it became a potent tool for driving further change management, program development, and increasing enrollment. Finally, this program was launched in the middle of multiple organizational changes, including an operational overhaul of the ED, turnover of IS staff, and updates to the EHR infrastructure itself. Key to the success of the program was developing both messages and a roll-out plan and timeline that was robust to delays and operational changes, which required prioritizing and developing logical tranches of new message releases.

Limitations

This pilot study had multiple limitations. The study utilized a convenience sample approach in which enrollment was offered at the discretion of ED staff. Therefore, the study does not capture information on patients who were either not offered messages or who may have declined an offer to receive ED text messages. There may be significant differences in these populations that could bias the results. The overall enrollment rate of 9.6% was low, and the study was not designed to determine what proportion of this enrollment was due to poor registration staff compliance in offering messages versus the level of patient demand for messages. There is not sufficient literature to determine what would be an optimal or target-enrollment rate for ED patients. Some patients will inevitably have less access to digital health technologies due to inequities in mobile phone ownership, mobile plans, and whether technology is charged or present with the patient. Second, the voluntary survey component had a 4.5% response rate, introducing the possibility of non-response bias. Survey responses, therefore, should be interpreted as exploratory feedback rather than representative of the full ED population. Next, the pilot was designed primarily to assess the technical and operational feasibility of messaging rather than its impact on clinical operations or overall patient experience. Therefore, the study can draw no conclusions on the impact of the program on LBTC, LWBS or patient experience scores. The design of the study included only English-speaking patients presenting to the ambulatory waiting area, and patient demographic data and language data were not collected. Therefore, generalizability at this time is limited and the equity of program uptake cannot be measured.

Future Directions

Our future directions intend to address these gaps through a multi-pronged strategy. First, we intend to translate the messages into non-English languages routinely spoken by our patient population (Spanish, Portuguese). Secondly, as we transition from pilot to larger scale deployment, we plan

to reconvene the multidisciplinary group that helped with its design to revisit what operational changes may result in increased patient participation, better staff compliance in offering messages to patient, and a better understanding of what new messages may prove most valuable. With consistent staff uptake in offering enrollment, it may be more possible to identify what percentage of ED patients truly wish to receive automated messages. Finally, we aim to conduct a more rigorous evaluation of the impact of SMS both directly on patient satisfaction, as well as on operational metrics such as “left without being seen” rates.

CONCLUSIONS

This manuscript serves as a proof of concept for the use of text messages in the ED and offers some initial validation signals. Our team intends to expand the offering to other EDs inside of the hospital network to better understand the impact of setting on program success. Other institutions should consider implementing and studying text-based communication programs to improve the ED patient experience.

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