

## Research Article

# Beyond UpToDate and Patient Updates: Surgery Residents Using Their Phones for a Novel Text Messaging Education Tool

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## Abstract

**Background:** There is currently limited data on the feasibility and utility of text messaging as a tool in surgical resident education. The objective of this study was to determine the perceived added value of a text message-based curriculum amongst surgery residents, to determine the ideal delivery methods and content of a text message-based curriculum, and to understand the practical challenges of maintaining a text message-based curriculum.

**Methods:** The text messaging tool was trialed over the course of 4 weeks in September 2020. Two messages were delivered per week on Monday and Friday at varying times in the afternoon. One message was delivered in a question/answer format (with an answer sent 5min after the question) and the second message in a statement format. After completion of the pilot text message curriculum, post-intervention surveys were distributed to all enrolled residents to assess feasibility, acceptability and perceived utility of this educational tool.

**Results:** More junior than senior residents completed the post-intervention survey. 15 of 29 (52%) respondents moderately or strongly agreed that they learned from the text messages they received from our pilot curriculum. The large remainder (38%) expressed neutrality. 38% respondents moderately agreed and 24% strongly agreed that the text messages from our pilot curriculum would improve their ABSITE score. The remainder (35%) expressed neutrality. 16 of 29 respondents (55%) moderately or strongly agreed that they enjoyed receiving the text messages. The remaining respondents (45%) felt neutral.

**Conclusions:** A text-messaging educational tool for general surgery residents proves beneficial with minimal financial and time investment by the program. A tool tailored to the specific educational activities of a general surgery residency has high perceived utility and acceptability. This high-yield text message-based education tool is an enhancement to our existing general surgery resident curriculum and can benefit trainees of other institutions when uniquely tailored to their programs.

## Introduction

Millennials are fast becoming the surgeons of tomorrow, raised and educated in an evolving system permeated by advancements in technology. Text messaging has become the preferred method to share patient data [1,2], and increasingly, some hospitals are providing their trainees with smartphones. Smartphones provided by the employer not only facilitate communication between providers while safeguarding patient's confidentiality but also place clinical resources at clinicians' fingertips-whether it is UpToDate to look up an unfamiliar disease or a hospital app for the latest local antibiogram. This millennial cohort of students and residents are adept at using their various electronic devices in lieu of traditional textbooks. Thus, cellphones can be used beyond the function of communication and access to clinically useful resources-they can be used as an interactive educational tool. This has a heightened application in the setting of a pandemic, colored by quarantine and social distancing, which

has forced an abrupt adaptation to shift educational activities to the virtual or online format [3].

The volume of foundational material that residents must become versed in is enormous, in addition to chasing new literature and ever-changing guidelines. Since the initiation of restricted duty hours, didactic time has decreased [4]. For surgery residents, the restriction also limits opportunities for experiential learning through a lower volume of operative cases. New and innovative methods for exposing surgical residents to the necessary material are needed. Utilizing a smart phone-specifically through text messaging-as an educational tool may better cater to the learning preferences of modern residents. Texting allows the delivery of small bites of easily digestible information in a convenient, familiar, fast-paced and low-cost format [3].

The use of educational text messaging has been implemented and studied with a positive response in several specialties, including pediatrics, obstetrics/gynecology, cardiology and family medicine [4-7]. For example, the Text4Peds text message program for pediatric and internal medicine residents was well-received: all respondents agreed that messages were relevant to their education and a majority found them useful for board preparation [5]. Although text messages have begun to be implemented by some board review platforms in surgery-such as the TrueLearn ABSITE preparation resource-there is currently limited data on the feasibility and utility of text messaging as a tool in surgical resident education. A single-institution study examined the experience of medical students and residents on a surgery rotation with a text messaging tool related to observed patient cases and found a generally positive response by trainees [8]. We

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aimed to determine the perceived added value of a text message-based curriculum amongst surgery residents, to determine the ideal delivery methods and content of a text message-based curriculum, and to understand the practical challenges of maintaining a text message-based curriculum. The ultimate goal of this work was to enhance surgery resident education in our program with the use of a uniquely-designed text messaging platform.

## Materials and Methods

### Participants and program description

This study was a pilot, prospective study on general surgery residents carried out in September 2020. The study group consisted of residents at a single general surgery residency program-Columbia University Irving Medical Center (CUIMC). All clinical general surgery residents, Post-Graduate Year (PGY)-1 through 5, including both categorical and preliminary, were enrolled (N=42). Non-clinical residents on their research year(s) were excluded. All clinical general surgery residents were enrolled with their personal cell phone number and received messages during a 4-week period. One week before the intervention began; all residents were informed *via* email of the project and alerted to expect educational text messages. The text message platform used for this study was CallMultiplier. The message delivery fee for this group size was \$12.99 per month. These charges were funded by the Department of Surgery at Columbia University Irving Medical Center. There was no extra cost for the residents to receive text messages from the text message platform, as these text messages were covered by their personal cell phone plans. The study was approved by the CUIMC Institutional Review Board.

### Curriculum design

The curriculum was designed and the text message content was selected by the authors. The pre-survey probed residents' views based on prior experience with educational texts. Results of the pre-survey were used to help guide the design of the residency-specific text message platform, including content and frequency of dissemination. The text messaging tool was trialed over the course of 4 weeks in September 2020. Two messages were delivered per week on Monday and Friday at varying times in the afternoon. One message was delivered in a question/answer format (with an answer sent 5 min after the question) and the second message in a statement format. Text message content was derived from two areas: 1) board-review topic from the prior week's educational conference based on the Surgical Council on Resident Education (SCORE) curriculum and 2) landmark surgical literature reviewed during the program's weekly Journal Club session. Text messages were limited to 160 characters by platform used. Messages were scripted by a senior surgery resident and reviewed by an attending. All of the utilized text messages are listed in Table 1.

### Analysis

After completion of the pilot text message curriculum, post-intervention surveys were distributed to all enrolled residents to assess feasibility, acceptability and perceived utility of this educational tool. Residents were asked, again as in the pre-survey, for their views regarding content and timing of the program. In addition to questions framed in a Likert scale, the survey included space for qualitative comments. Qualitative comments from the post-survey were categorized by the authors as positive or negative, as done in a prior pediatrics study [5]. The surveys were voluntary and anonymous. Descriptive statistics were used.

## Results

### Participants

Forty-two general surgery residents were enrolled in the text message-based curriculum. The pre-survey was administered in December 2019 to the previous academic year, thus encompassing a slightly different cohort of residents including 2020 graduating seniors and excluding the new interns of the incoming 2020 class (N= 40). Of these residents, 21 (53%) of the residents completed the pre-survey. More junior residents completed the survey than senior residents, with the following distribution of respondents: 24% PGY-1, 24% PGY-2, 24% PGY-3, and 19% PGY-4, and 10% PGY-5. Fourteen of the 21 or 64% of pre-survey respondents indicated they had received text messages from surgical education platforms before. Responses indicated all prior educational text message exposure was from the TrueLearn platform. Half of the respondents indicated they would be strongly or very strongly interested in receiving educational text messages.

Of the 8 text messages sent during the 4-week study period, all messages were delivered successfully to all of the participants. Of the 42 residents who received the text messages, 29 (69%) of the residents completed the post-survey. Again, more junior than senior residents responded, with the distribution as follows: 28% PGY-1, 24% PGY-2, 21% PGY-3, 14% PGY-4, and 14% PGY-5 residents.

### Utility and acceptability

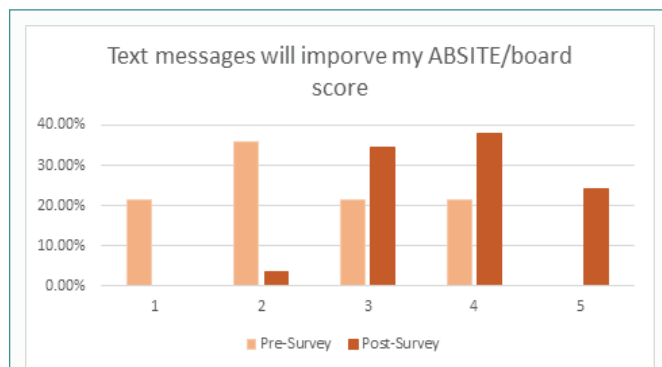
Perception of learning and preparation for the American Board of Surgery In-Training Examination (ABSITE) were used as indicators of utility. Perception of text message utility among pre- and post- survey respondents can be found in Figure 1. Only 14 of the 22 residents who completed the pre-survey responded to questions on this topic, as these questions were based on having previous exposure to another educational text message platform. In the pre-survey, only 4 of 14 (29%) respondents moderately or strongly agreed that they learned from the text messages they had previously received from another platform, as seen in Figure 2. The majority of the respondents (43%, 6 of 14) expressed neutrality.

In the post-survey, 15 of 29 (52%) respondents moderately or strongly agreed that they learned from the text messages they received from our pilot curriculum. The large remainder (38%) expressed neutrality. In the pre-survey, 3 respondents (21%) moderately agreed and none strongly agreed that the text messages they had been previously receiving would improve their ABSITE score. In the post-survey, 38% respondents moderately agreed and 24% strongly agreed that the text messages from our pilot curriculum would improve their ABSITE score. The remainder (35%) expressed neutrality. Only one respondent (PGY-1 preliminary resident) disagreed that the text messages would improve his/her score, while the majority of respondents (57%) moderately or strongly disagreed in the pre-survey.

In addition to perception of learning and board preparation, the enjoyment of text messages was used as an indicator of acceptability. In the post-survey, 16 of 29 respondents (55%) moderately or strongly agreed that they enjoyed receiving the text messages. The remaining respondents (45%) felt neutral. Further, the respondents were asked about qualitative comments about the pilot tool, which are shown in Table 2. Five of the 7 qualitative responses were positive and 2 were suggestions for improvement. There were no negative qualitative comments.

**Table 1:** Text message format and content.

Week	Format	Content Source	Content
1	Q/A	Conference	“What is the wound classification and the associated risk of surgical site infection during a cholecystectomy with significant bile spillage?” “Answer: contaminated, risk of SSI is about 6%-15%”
1	Statement	Journal club paper	The ACDC trial showed lower morbidity (12% vs. 34%), along with lower length of stay and costs, in the immediate group (<24 hr) versus delayed group for lap chole.
2	Q/A	Conference	“What is the most common location of an accessory spleen?” “Answer: It is the splenic hilum, followed by the splenic vascular pedicle, greater omentum, and tail of pancreas. About 20% of people have accessory spleens.”
2	Statement	Journal club paper	“CRASH-3 showed that TXA within 3 hrs of injury in patients with mild/moderate TBI reduces risk of head injury-related death and doesn't increase adverse events.”
3	Statement	Conference	“The Milan criteria are used to assess patients with HCC for liver transplant: 1 tumor <5 cm, 3 tumors <3 cm, no vascular invasion and no extrahepatic disease.”
3	Q/A	Journal club paper	“Should defects be closed in laparoscopic ventral hernia repair?” “A retrospective review of 783 pts with 2 cm-8 cm defects showed decreased incidence of surgical site events, seromas and recurrences in the defect closure group.”
4	Statement	Conference	“For esophageal adenocarcinoma, T1a tumors invade the muscularis mucosa & can be treated w/EMR, while T1b invade the submucosa & are treated w/esophagectomy.”
4	Q/A	Journal club paper	“Perioperative recovery is faster and patients use fewer analgesics after laparoscopic versus open colectomy for colon cancer. What about recurrence rates?” “The landmark 'COST trial,' a multi-center noninferiority trial, showed similar rates of recurrent cancer after laparoscopically-assisted and open colectomy.”

**Figure 1:** Perception of ABSITE prep among pre- and post-survey respondents (1=strongly disagree, 5=strongly agree).**Figure 2:** Perceived learning among pre- and post-survey respondents (1=strongly disagree, 5=strongly agree).

### Frequency and format

Respondents were asked to evaluate the design of the pilot educational text message tool in the post-survey. A majority of the post-survey respondents (62%) indicated that the frequency of text messages (2 days per week) provided by our pilot curriculum was ideal. A majority of the post-survey respondents (57%) also preferred the format of text messages provided by our pilot curriculum (a mixture of both question/answer format and summary statements), while 29% preferred just question/answer format. The majority (82%)

**Table 2:** Qualitative feedback from post-survey.

Positive qualitative comments	Improvement qualitative comments
Love it!!!!	Would prefer interactive-true/false or simple multiple choice, get texted the question and don't receive the answer until you respond
Love the review questions!	Maybe leaving a bit more time in between Q&A? Sometimes would like to think about it but just so busy that the answer comes and I see both texts at once
Please do more of this it was great	
Great resource	
Really appreciate this initiative.	
Keep up the fantastic work!	

of post-survey respondents selected the content presented by our pilot educational tool (weekly educational lecture content and landmark surgical literature) as their preferred content. Yet, the majority (70%) also selected “random facts” and “practical knowledge,” as preferred content.

### Future direction

A majority of post-survey respondents (79%) moderately or strongly agreed that the text message-based curriculum should be continued throughout the rest of the academic year. The remaining respondents (21%) expressed neutrality, with no respondents disagreeing that the tool should not be used for the rest of the academic year. A little over half of the post-survey respondents (54%) moderately or strongly agreed that an interactive format, with ability to respond to the text messages, would have been preferred.

### Discussion

Among the very limited published data on text-messaging educational tools in surgery, our study presents the curriculum design and evaluation of utility and satisfaction of a text-message educational tool uniquely tailored to surgical residents. Text messaging has been shown to be a feasible educational tool among various medical specialties, including internal medicine, cardiology, and pediatrics [3-7]. The “prevalence, acceptance, and low cost of text messaging make it particularly inviting as a potentially high-yield learning tool in medical education” [3]. Our study confirmed the feasibility of texts as an education tool: 100% of the text messages were delivered

successfully at a relatively low-cost of \$12.99/month, which equates to \$3.71/resident per year. The “ease, asynchronous nature, and fast-paced style of text messaging” is likely the attractive aspect to the millennial resident trainee [5].

Text messaging has been studied among surgical residents, mostly pertaining to communication regarding patient care [1] and improving feedback [9], but analyses on texting as an educational tool are limited. A single-institution study out of the Louisiana State University examined text-messaging as an education tool aimed at surgery trainees, published in 2019. This initiative, termed “academic epinephrine,” was headed by an attending surgeon, with text content focused on information pertaining to patient cases observed by medical students and resident trainees on call or on rounds. Survey results showed the majority of participants found the material relevant, helpful and a desirable tool to be used in other rotations [8].

Although well-received, the format of using cases from rounds or on-call time does not generalize the content to the entire residency and limits the tool to those on a particular rotation. Case-based texts were found to be useful among other specialties, such as a group text platform using WhatsApp to augment learning among Cardiology fellows in a group text-case-based format [4]. Other texting platforms, not using a case-based format, have been more generalizable to an entire residency. The Text4Peds initiative used a statement format with topics derived from most commonly missed questions on in-service exams [5].

Our text-message pilot tool utilized a unique format, aimed at relevance to our institution’s surgical residents. The text messages in our curriculum were created to reflect and reinforce two sets of categories: 1) concepts learned in weekly resident education conference and 2) landmark surgical literature discussed during journal club. The content was formatted in alternating statement *vs.* question/answer format and was delivered twice weekly. The majority of residents demonstrated satisfaction of both the format and frequency in our curriculum.

The text-message curriculum was generally perceived to be useful for learning among general surgery residents. The difference in perceived learning and ABSITE preparation between pre- and post-survey responses demonstrated increased utility of our pilot tool compared to respondents’ pre-intervention experience with other text messaging program(s). Pre-survey data showed that of residents who had prior exposure to educational text messages, 29% of respondents moderately or strongly agreed that they learned from the text messages and 21% moderately agreed that the text messages would improve their ABSITE score. The majority of respondents (57%) moderately or strongly disagreed that these texts would improve their ABSITE score. In contrast, 52% of the post-survey respondents moderately or strongly agreed that they learned from the text messages they received from our pilot curriculum. Furthermore, 62% respondents moderately or strongly agreed that the text messages from our pilot curriculum would improve their ABSITE score.

We postulate that the uniquely designed curriculum, tailored to supplement the specific structure of this single-institution general surgery residency, accounts for the higher-rated perceived usefulness of our program compared to prior experience. Utilizing recently reviewed conference and journal club topics ensured re-enforcement of relevant educational material. Indeed, the overwhelming majority (82%) of post-survey respondents selected the content presented by

our pilot educational tool (weekly educational lecture content and landmark surgical literature) as their preferred content.

In addition to perceived usefulness, the curriculum was demonstrated to be acceptable by general surgery residents. In the post-survey, 16 of 29 respondents (55%) moderately or strongly agreed that they enjoyed receiving the text messages. The remaining respondents (45%, 13 of 29) felt neutral. Qualitative comments indicated satisfaction and enthusiasm: “Love the review questions” and “Please do more of this it was great”.

One suggested change brought forth in the survey results was for increased interaction. A little over half of the post-survey respondents (15 of 28) moderately or strongly agreed that an interactive format with ability to respond to the text messages would have been preferred. This presents a challenge with the CallMultiplier platform used in this study, as notifications of responses to texts are only visible on the website by the sender requiring active surveillance online for responses. This requires additional time by a dedicated moderator to monitor and respond to resident responses, which all may arrive at a variety of different time intervals. Although it is important to consider potentially using a more interactive format, such as a 2-way texting program [3], and such interaction considered more favorable by our respondents, this would be at the expense of feasibility in our curriculum design.

The present study on our unique text-message tool has some limitations. The study was a small, prospective, pilot study utilizing descriptive analyses and no statistical analyses of significance. The aim was to examine feasibility, utility and satisfaction at a single program of general surgery residents. There is potential for sampling and nonresponse bias as the post-survey response rate was 69%. The cohorts of pre-survey and post-survey residents differed slightly, as they were administered in different academic years due to the COVID-19 pandemic halting the study for several months. The timing of the surveys, particularly in relation to ABSITE dates, may have affected the results as well.

Further opportunity for study in this area would assess quantitative effects of text messaging on weekly conference quiz scores or correlation with ABSITE scores. There is also potential to broaden the scope of the tool to include interaction and real-time assessment of knowledge through a two-way messaging platform.

## Conclusions

A text-messaging educational tool for general surgery residents proves beneficial with minimal financial and time investment by the program. A tool tailored to the specific educational activities of a general surgery residency has high perceived utility and acceptability. It is low-cost and easily administered through third-party texting platforms. Sourcing the material from parallel resident education conferences and landmark surgical literature while delivering the content in a mixture of question/answer and statement format is preferred. Lastly junior residents likely benefit the most as they demonstrated more engagement with higher response rate in both pre- and post-intervention surveys. This high-yield text message-based education tool is an enhancement to our existing general surgery resident curriculum and can benefit trainees of other institutions when uniquely tailored to their programs.

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