

Title of Project: Sponsored Health IT and Evidence-Based Prescribing among Medical Residents

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Inclusive Dates of Project: 9/30/2014–9/29/2017

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Acknowledgment of Agency Support: Agency for Healthcare Research and Quality (AHRQ)

Grant Award Number: R21HS22927

ABSTRACT

Purpose: SMARxT contains 6 educational video modules that leverage media literacy to improve evidence-based prescribing (EBP). We aimed to assess acceptability and preliminary efficacy of SMARxT among medical trainees.

Scope: EBP may be negatively influenced through pharmaceutical marketing. SMARxT educates around these issues. We recruited 30 medical students from the University of Pittsburgh to develop an initial assessment of SMARxT. After honing questionnaire items, we subsequently tested 91 medical residents before implementation of SMARxT, immediately after implementation, and then 6 months later.

Methods: Knowledge-based items were developed through an iterative process of item pool generation, expert review and response formatting, pilot testing with medical trainees, and evaluation of psychometric properties. The resulting 38-item assessment, covering six domains, was augmented with additional items assessing acceptability of modules and attitudes about covered topics. Residents completed a knowledge pre-test prior to watching videos. The immediate post-test and delayed post-test (6-months) assessed knowledge, acceptability, and clinical attitudes related to SMARxT.

Results: Knowledge scores increased significantly in all six domains before and immediately after implementation. Six-month follow-up scores remained significantly higher than pre-test scores, indicating that knowledge was retained. Assessments of acceptability were favorable, although some participants indicated preference for shorter or faster videos.

Key Words: evidence-based prescribing, media literacy, medical education

PURPOSE

The purpose of this project was to assess the acceptability and preliminary efficacy of a series of educational videos related to evidence-based prescribing. The video series, called “SMARxT” was comprised of 6 videos covering strategies for overcoming EBP challenges such as biases introduced by pharmaceutical marketing and the use of electronic applications to guide clinical decision making (**Table 1**). In the present project, we first developed a knowledge-based assessment framework for each of the 6 videos. This assessment was piloted in a sample of medical students and items were refined. We then leveraged that refined assessment framework to conduct a longitudinal study in a sample of resident physicians. Throughout this process, we also collected data relating to the feasibility, acceptability, and potential impact of the program.

SCOPE

Background. A substantial proportion of the 3 billion prescriptions written annually are not evidence-based,¹⁻⁴ which results in unnecessary morbidity and mortality^{5,6} and contributes to rising healthcare costs.⁷ Although the contributors to non-evidence-based prescribing (non-EBP) in the United States are multifaceted, the multi-billion-dollar marketing of prescription drugs to patients and physicians⁸⁻¹⁰ strongly influences both patient requests for medications¹¹⁻¹⁴ and provider prescribing habits.^{11,14-16} With limits being placed on interactions between physicians and pharmaceutical representatives,¹⁷⁻¹⁹ the pharmaceutical industry is now leveraging the expansion of point-of-care health information technology (HIT) to reach providers.^{20,21} For example, 85% of physicians use a smartphone or medical application (app) to assist with prescribing choices.²² The most commonly used “free” medical apps are funded in large part by pharmaceutical company in-app advertising.²³ These in-app pharmaceutical-sponsored messages may contribute to non-EBP.

Context. In prior work,^{24,25} we examined the impact of pharmaceutical-sponsored messages using HIT through literature reviews; pharmaceutical industry document searches; and our interactions with)

residents, pharmacists, and residency faculty. This work informs our conceptual model linking industry messaging with non-EBP practices via (1) system-level factors, such as formulary options and local culture; (2) physician-level factors such as normative beliefs, time pressures, and habits; and (3) patient-level factors such as knowledge, attitudes, cost, and family experiences. We used these data to conceive of the SMARxT intervention, which uses media literacy—an innovative approach encouraging individuals to analyze and evaluate sponsored messages—to help resident physicians (trainees), a population vulnerable to pharmaceutical-sponsored messaging, to optimize patient communication and EBP decision-making at the point-of-care. Through the following specific aims, we will hone and field test this promising intervention to determine its feasibility, acceptability, and preliminary efficacy. Descriptions of individual SMARxT modules are presented in **Table 1**.

Table 1. Descriptions of SMARxT modules.

Module Title	Video Length	Description
Introduction	9:41	Summaries introducing examples of each SMARxT module topic. Emphasis is on the importance of the topic and implications for quality care.
<u>S</u> implify	11:05	Material related to simplification of treatment plans through the use of lifestyle modifications, time-tested generic medications, and avoiding “me too” drugs or unnecessary adjuncts.
<u>M</u> aster Marketing	17:20	Identification and description of various pharmaceutical marketing techniques used in direct-to-consumer and physician advertising.
<u>A</u> lly	15:46	Modeling of skills for mitigating patient drug requests and creating opportunity for patient education. Emphasis is placed on using requests to deepen and improve the patient-provider relationship instead of putting strain on it.
<u>R</u> ead Critically	13:58	Explication of ways to critically assess potentially biased medical information. This includes not only information directly from industry but also information which may have been influenced, such as articles in medical journals and formulary medications.
<u>T</u> ools	11:23	Discussion of valuable tools (e.g., websites and apps) for supporting evidence-based prescribing. Also emphasized are methods for evaluating the quality of web-based tools which may or may not be biased.

Setting. This research was conducted primarily at the University of Pittsburgh School of Medicine. For recruitment of resident physicians, we partnered with two large residency programs in Pittsburgh, PA and one program in Morgantown, WV.

Participants. Over the course of the study, we obtained electronic informed consent for 30 medical students and 91 resident physicians. This research study was approved by the University of Pittsburgh Institutional Review Board (#PRO14080516). Participants were compensated with pre-paid, reloadable debit cards.

METHODS

Study design. Overall, this study developed an educational assessment framework and leveraged it to measure the acceptability and preliminary efficacy of the SMARxT program.

Developing knowledge-based assessments. In order to test the impact of the video modules on EBP knowledge, we first needed to develop a valid assessment framework. Initially, we developed a pool of approximately 100 multiple choice items, based on content covered within the videos. Each of the items were designed to have five choices and one correct answer. We reviewed and refined the items over several meetings among the project team, reducing the item pool to 62 items (~10 per educational module). Using the web-based Qualtrics survey platform, we embedded these items before and after the associated video modules. We then recruited a sample of 30 medical students from the University of Pittsburgh. Participants received individual program web links that allowed them to complete the program incrementally over the span of 4 weeks. Twenty-one students completed the entire program. Performance characteristics of knowledge-based items were quantitatively assessed based on: percentage of correct answers at baseline (to detect items that were too easy or assessed common knowledge), percent of correct answers at follow-up (to assess items that were too difficult), and pre-to-post change in percentage correct (to ensure that the item

appropriately represented domain knowledge). Items were then refined or removed based on performance characteristics, resulting in a final assessment consisting of 38 items (5–7 per module), to use with our primary sample of resident physicians.

Assessing preliminary efficacy. We used our refined knowledge-based assessment to assess information that resident physicians gained and retained from the SMARxT program. This involved a longitudinal test of the SMARxT program, with (1) a “pre-test” assessment at baseline, (2) a “post-test” assessment directly after program completion, and (3) a “follow-up” assessment approximately 6 months after program completion. We conducted descriptive analyses on individual items (e.g., mean proportion of correct answers at each time point). We then calculated composite scores within each domain to compare performance over time across individual SMARxT modules.

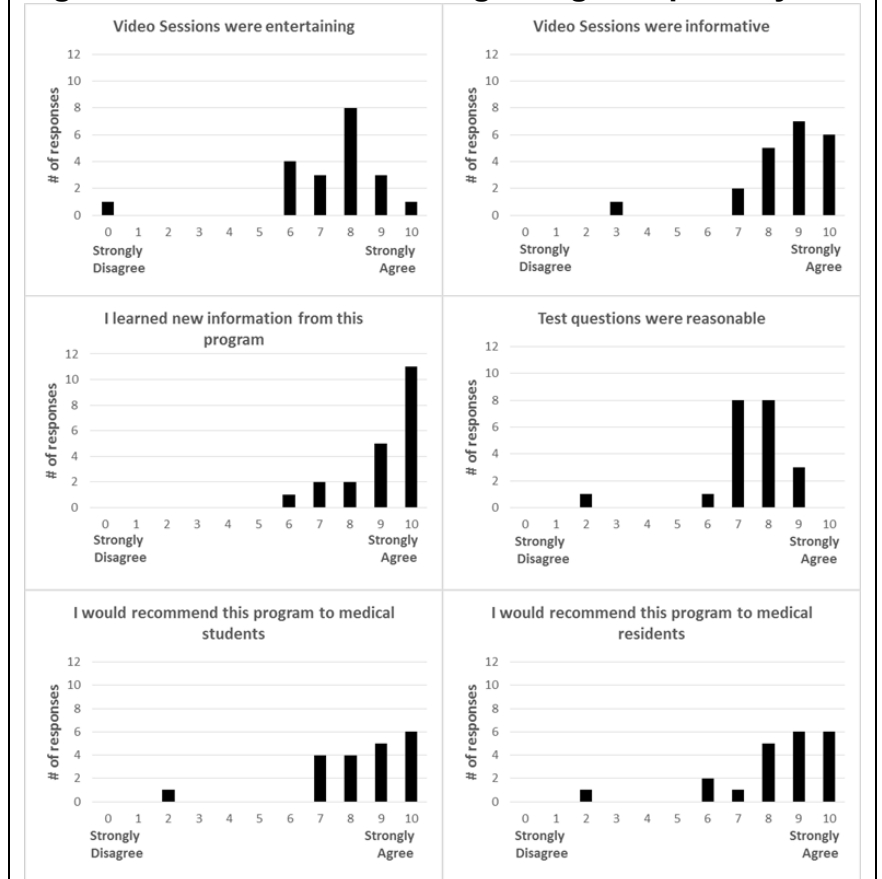
Assessing acceptability. Both the medical students and the residents were presented with evaluative items and open-ended questions to elicit feedback about the SMARxT program. These items were used to obtain quantitative and qualitative indicators of program acceptability. Particular items are included in **Figure 1**. Each of these items was rated on an 11-point Likert scale (0 = Strongly disagree; 10 = Strongly Agree). Open-ended responses were examined using thematic analysis.

Limitations. For assessing preliminary efficacy, the scope was limited to assessing knowledge retention related to the video content. Therefore, we are unable to infer the videos impact on potential outcomes such as prescribing practices. For assessing acceptability, the open-ended responses may also reflect other aspects of program structure. For example, medical students were presented with 62 knowledge assessment items and resident physicians were presented with 38 items. As such, their pre-test and post-test procedures were more burdensome for students, which could influence their perspectives on acceptability.

RESULTS

Acceptability. Both the students and resident physicians rated the program favorably overall. For example, in the student sample, the quantitative acceptability items were generally rated highly (**Figure 1**). Favorable open-ended responses covered themes of *Educational*, *Simple-to-Use*, and *Entertaining*. Feedback in these categories indicated that the videos were well accepted, covered novel topics, and could be helpful for medical

Figure 1. Student feedback regarding acceptability.



student training. Students also provided constructive criticism around themes of *Video Speed*, *Video Length*, and *Confusing Questions*. There was sometimes conflicting feedback between categories of *Simple-to-Use* and *Video Length*, where students indicated that the videos were “fairly short and easy to understand” versus “too long and hard to pay attention throughout the entire time.” Several students also noted that it would have been preferable to play the videos at 1.5x or 2x speed, which might also have mitigated some concerns about video length. These types of favorable and constructive feedback were largely echoed in the resident physician sample. Students particularly noted concerns about knowledge-based assessment questions being confusing or not appropriate. This feedback helped to inform our revisions to the knowledge assessment items prior to testing preliminary efficacy with resident physicians.

Preliminary efficacy. Of 91

resident physicians who provided informed consent 88 (97%) completed pre-test and post-test procedures. Two tailed t-tests indicated that knowledge score increases were statistically significant ($p < 0.001$) across all SMARxT modules (**Table 2**). A total of 51 individuals completed

Module	Possible Range	Mean (SD) score		
		Pre-test ($n=88$)	Post-test ($n=88$)	Follow-up ($n=51$)
Introduction	0–6	2.39 (1.45)	4.08 (1.54)	3.81 (1.70)
Simplify	0–6	1.32 (1.12)	3.51 (1.60)	2.13 (1.22)
Master Marketing	0–7	1.63 (1.21)	2.38 (1.72)	2.73 (1.34)
Ally	0–7	1.89 (1.25)	4.58 (1.85)	4.04 (2.11)
Read Critically	0–7	2.43 (1.30)	4.11 (1.56)	3.56 (1.85)
Tools	0–5	1.23 (0.88)	2.34 (1.23)	2.67 (1.08)

follow-up assessments approximately 6 months after the post-test. Knowledge scores declined slightly from post-test, but remained significantly higher ($p < 0.001$) than pre-test scores for all SMARxT modules (**Table 2**).

Discussion. Overall, the SMARxT program demonstrated high levels of acceptability as well as preliminary efficacy, as measured by knowledge retention. While acceptability was high, participants noted several areas that might be improved on. In particular, many of the medical students recommended that the videos have an option to play at faster speeds. Similarly, resident physicians generally indicated that the videos could have been shorter and that more interactive content (as opposed to assessment questions) would have helped with engagement. As such, the SMARxT program seems to be a possible candidate for classroom implementation, where more interactivity would naturally occur. As a self-paced implementation tool, including additional features like higher speed playback or interactive web content may further enhance program acceptability. Throughout the study, many of the participants needed individualized prompts to move forward. This required substantial efforts from our research team emailing and calling participants. Despite these efforts, only about 58% of residents who completed the initial program also completed the follow-up.

However, the follow-up was a component of the assessment framework and not the SMARxT) program itself, so we would not consider this a program-related deficit. The low follow-up rate may simply indicate that the compensation for follow-up (\$25) was not sufficient for physicians who are busy in residency programs. Other logistic factors such as recruiting from remote clinics (where the study team had no physical presence) and participants leaving residency prior to follow-up, may also have influenced follow-up. As we prepare to report our results in forthcoming manuscripts, we will further account for factors that influenced participation and retention. While the present results (**Table 2**) indicate high preliminary efficacy, additional considerations and analytical approaches are likely to clarify these results further. Additionally, continued data analysis is needed for open-ended feedback that related to attitudes about pharmaceutical companies, electronic devices for looking up prescription information, and other topics covered in the videos. Participants also provided open ended feedback about how the SMARxT program related to or may have impacted their practice. These data will be valuable to understand themes that were particularly salient to participants, and to gain understandings of practical impacts of the SMARxT program.

Conclusions. The SMARxT program demonstrated high levels of acceptability as well as preliminary efficacy, as measured by knowledge retention. Additional considerations were provided to further improve feasibility and acceptability of implementation. Further analysis of the qualitative may help to elucidate the program's potential impact on clinical practice.

Significance. There are several challenges to evidence-based prescribing, and many of these topics are covered in SMARxT educational program. Our research indicated high levels of acceptability as well as preliminary efficacy for this program. As such, the program will highly feasible to implement in medical training environments. Because it is web based, it can be completed independently, as self-paced educational modules. However, it would also be appropriate for implementation in classroom-type environments. Throughout the study, we were able to refine the knowledge assessment to a

reasonable subset of items to assess knowledge related to the SMARxT modules. Having well-validated, multiple choice items such as these is helpful in scenarios where SMARxT may be used in educational settings (e.g., course exams, continuing education modules). While it was beyond the scope of our study, it would be valuable to conduct in-depth research into how the program impacts evidence based prescribing practices in clinical settings.

LIST OF PUBLICATIONS AND PRODUCTS

Corbin B, Colditz JB, Raithel A, Switzer GE, Sidani JE, Klatt P, Primack BA. The SMARxT media literacy program: a pilot study to improve evidence-based prescribing among medical residents. 37th Annual Meeting and Scientific Sessions of the Society of Behavioral Medicine. 2013 April 1; Washington, DC.

Corbin B, Colditz JB, Switzer GE, Sidani JE, Klatt PM, Schaffer T, Primack BA. The SMARxT media literacy program: a pilot study to improve evidence-based prescribing among medical students. Manuscript under review.

Colditz JB, Shensa A, Sidani JE, Woods MS, Kennedy A, Schaffer TC, Corbelli JA, Primack BA. Acceptability and preliminary efficacy of a media literacy program for evidence based prescribing among medical trainees. Manuscript in production.

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