Brief Report

A survey to optimize the design of an antimicrobial stewardship smartphone app at an academic medical center

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Mobile medical apps are commonly used by health care professionals and could be used by antimicrobial stewardship programs to enhance adherence to local recommendations. We conducted a survey of health care workers to inform the design of an antimicrobial stewardship smartphone app.

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With the widespread use of smartphones, the use of mobile medical apps (MMAs) has expanded. A study conducted by the Accreditation Council for Graduate Medical Education in 2012 revealed that approximately 86% of physicians were using smartphones, and 64% were using apps.[1] Most physicians and trainees currently have smartphones and use apps.[1] If well-designed and properly used, MMAs can facilitate information seeking, improve clinical decision-making at the point of care, increase adherence to guidelines, and improve patient outcomes.[2,3] A smartphone app could serve antimicrobial stewardship programs by providing a convenient platform for the dissemination of information, such as protocols and guidelines. To date, there are very few MMAs focused on antimicrobial stewardship, and little is known about how best to design such an app. The purpose of this study was to identify the current attitudes and behaviors surrounding MMAs at our institution and to identify the desired in-app content and usability features specifically for an antimicrobial stewardship and infectious diseases MMA.

MATERIALS AND METHODS

Data collection for this study was performed by surveying health care workers at an 865-bed academic tertiary care medical center in Richmond, Virginia, in September, 2015. Approval for the research was obtained from Virginia Commonwealth University's Institutional Review Board. The survey was created by an interdisciplinary team that comprised experts in infectious diseases, antimicrobial stewardship, and survey design and implementation. Questions were drawn from prior studies and the researchers' experience.[4-6] The survey was piloted among a group of health care workers representing different levels of training and professions. Several rounds of revisions were performed prior to administration. The final survey included a total of 18 questions crossing 4 primary categories: general information, determinants of app usage (relevance, perceived need, current use patterns, and attitudes), barriers to using a smartphone app, and desired in-app content and usability features (see appendix 1 for full survey).

Study data were collected and managed using REDCap electronic data capture tools hosted at Virginia Commonwealth University Medical Center. Survey responses were anonymous. A total of 1,664 surveys were disseminated to health care workers via e-mail that contained a hotlink to the REDCap survey. E-mail recipients included house officers across the medical center (including residents and fellows), medical students in their clinical years, physicians, nurse practitioners, and pharmacists and pharmacy residents. The recruitment e-mail was sent on September 1, 2015. The survey was closed on October 5, 2015.

RESULTS

There were a total of 199 responses from 49 medical students (24.7%), 48 attending physicians (24.2%), 27 pharmacists (13.2%), 22 residents (11.1%), 16 nurse practitioners (8.1%), 15 fellows (7.6%),
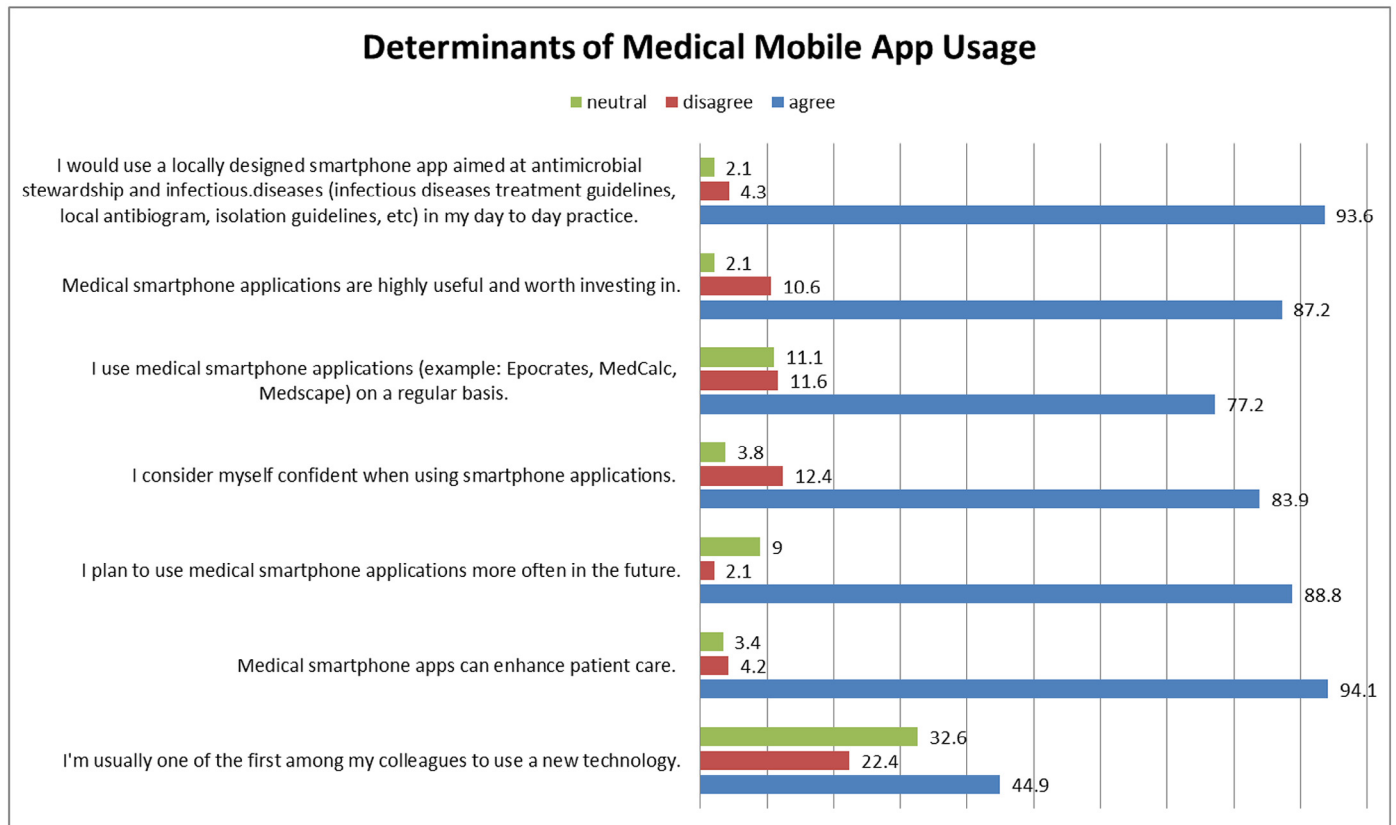
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Fig 1. Determinants of medical mobile app usage.

9 pharmacy residents (4.9%), and 12 interns (6.1%). A total of 22 different medical and surgical specialties were represented. Out of the 199 respondents, 55.1% (109/198) were women. Most respondents were ages 20-29 (94/198, 47.5%), with <10% being >50 years of age.

All respondents owned a smartphone, with 81.2% (160/197) owning iPhones, 18.3% (36/197) having an Android-based platform, and 0.5% (1/197) having Windows phones (2 missing responses). Eighty-seven percent (163/186) reported using at least 1 medical smartphone app daily, and 14.5% (27/186) reported using ≥3 daily.

When asked whether they currently own a medical smartphone app to assist with clinical questions related to infectious disease, 48.4% (90/186) answered yes. Respondents were also asked to what extent they agreed with various statements related to current app usage and general attitudes about MMAs. The overall attitude was favorable toward perceived need, value, and future adoption of MMAs (Fig 1).

The top 5 barriers to app usage were poor usability (eg, difficult to find what you are looking for, difficulty navigating within the app) (134/183, 73.2%), cost of the app (116/183, 63.4%), out of date information (75/183, 41%), complexity of the app (71/183, 38.8%), and staying connected to WiFi (65/183, 35.5%). The top 5 most important content areas were antimicrobial drug dosing (168/181, 92.8%), infectious diseases treatment protocols (156/181, 86.2%), local hospital antibiogram (134/181, 74%), antibiotic use data for individual patient care units (105/181, 58%), and diagnostic testing (100/181, 55.2%) (Fig 2).

Respondents were given a list and asked to choose the top 3 usability features most important to their day to day work. The top 3 choices were algorithms (139/179, 77.7%), summary tables (116/179, 64.8%), and organization of content (109/179, 61.2%). The most common free text responses to this question included a modern and simple visual design, ability to search by categories, a well-organized menu of options after opening the app, a text highlighting feature or ability to bookmark commonly used information, built-in tools (drug dosing calculator), and ability to personalize the app to the user's organizational preferences and easy and automatic updating.

DISCUSSION

The results of the survey demonstrate that smartphone usage among a wide variety of medical and surgical specialties was essentially ubiquitous. The uptake of MMA usage was found to be quite high, with nearly 90% of respondents using at least 1 MMA on a daily basis and >40% using ≥2 apps daily. This indicates a rise when compared with a study by the Accreditation Council for Graduate Medical Education in 2012, which found that 56% of overall respondents were using MMAs in their clinical practice.[1] Importantly, the study found that there is a high degree of interest in a locally designed smartphone app aimed at antimicrobial stewardship and infectious diseases, with nearly 94% of respondents indicating they would use an MMA in their day to day practice. Most health care workers at our institution believe MMAs can enhance patient care, are worth investing in, and are likely to be adopted more frequently in the future.

A notable limitation to the study is the low response rate. Because of the inability to isolate particular medical professionals via e-mail, LISTSERV functions were required, resulting in bulk e-mails. It is possible that only those highly interested in technology responded.

When designing an MMA, stewardship programs should be aware of important potential barriers to usage, including poor usability, cost of the app, and inclusion of out of date information. If resources allow, making the app free to all health care workers at their institution would be ideal. Content should be tailored to local needs.