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Spectrum of tablet computer use by medical students and residents at an academic medical center

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Introduction: The value of tablet computer use in medical education is an area of considerable interest, with preliminary investigations showing that the majority of medical trainees feel that tablet computers added value to the curriculum. This study investigated potential differences in tablet computer use between medical students and resident physicians. Materials & Methods: Data collection for this survey was accomplished with an anonymous online questionnaire shared with the medical students and residents at Southern Illinois University School of Medicine (SIU-SOM) in July and August of 2012. Results: There were 76 medical student responses (26% response rate) and 66 resident/fellow responses to this survey (21% response rate). Residents/fellows were more likely to use tablet computers several times daily than medical students (32% vs 20%, $p = 0.035$). The most common reported uses were for accessing medical reference applications (46%), e-Books (45%), and board study (32%). Residents were more likely than students to use a tablet computer to access an electronic medical record (41% vs 21%, $p = 0.010$), review radiology images (27% vs 12%, $p = 0.019$), and enter patient care orders (26% vs 3%, $p < 0.001$). Discussion: This study shows a high prevalence and frequency of tablet computer use among physicians in training at this academic medical center. Most residents and students use tablet computers to access medical references, e-books, and to study for board exams. Residents were more likely to use tablet computers to complete clinical tasks. Conclusions: Tablet computer use among medical students and resident physicians was common in this survey. All learners used tablet computers for point of care references and board study. Resident physicians were more likely to use tablet computers to access the EMR, enter patient care orders, and review radiology studies. This difference is likely due to the differing educational and professional demands placed on resident physicians. Further study is needed better understand how tablet computers and other mobile devices may assist in medical education and patient care.

Spectrum of tablet computer use by medical students and residents at an academic medical center

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Introduction

Tablet computers such as the Apple iPad and Kindle Fire are extraordinarily popular with the general public and physicians. These tablet computers generally have wireless networking capability and the ability to be customized by installing user selected "apps".

Apps are self-contained software applications with a diverse array of purposes ranging from entertainment to medical decision support. Over 1,600,000 apps are available for the Apple iOS platform (the operating system for the iPhone and iPad), with over 34,000 categorized as medical apps (PocketGamer, 2015). Medical apps typically cost less than $5 (Robinson and Burk, 2012), and generally work on smartphones and tablet computers. The essential app for many physicians is their electronic medical record (EMR).

Ease of use and large screens make tablet computers a natural fit for EMR access, computerized physician order entry (CPOE), and radiology image review. As many as one-third of physicians in the United States use tablet computers in clinical settings, with 14-35% using these mobile devices to access an EMR (Robinson & Burk, 2012; Sclafani, Tirrell & Franko, 2013). EMR access via tablet computers can decrease the total time physicians spend logged into workstations while on duty (Hornq et al, 2012), improve the efficiency of inpatient medical care by facilitating earlier order entry (Patel et al, 2012), and appears to be preferred over traditional workstations in a hospital setting (Lehnbom et al, 2014). An observational study showed that tablet computers decrease inpatient data management time while increasing the time physicians spend interacting directly with patients (Fleishmann et al, 2015). These results are supported by systematic reviews that indicate tablet computer use can result in improved documentation, medical decision making, and physician efficiency (Mickan et al, 2013; Mickan et al, 2014). In addition, patients embrace mobile technology and report

tablet computer use by physicians as a positive aspect of their medical care (Strayer et al, 2010). These factors are likely to fuel even greater adoption of tablet computers by physicians.

The value of tablet computer use in medical education is an area of considerable interest, with some medical schools integrating tablet computers into their preclinical curriculum (Dolan, 2011). Preliminary investigations shows that the majority of students at a medical school felt that tablet computers were a positive addition that added value to the preclinical curriculum (George et al, 2013), and another medical school reports improved United States Medical Licensing Exam (USMLE) test scores after integration of tablet computers into the curriculum (Comstock, 2013). Studies of tablet computer use by medical trainees in the United States showed that point of care references (i.e. drug guides), board exam study resources, curricular materials, and EHR data were the most common types of medical resources used by medical students and residents on tablet computers during clinical rotations (Sclafani, Tirrell & Franko, 2013; Robinson & Burk, 2013; Nuss et al, 2014; Archibald et al, 2014).

This study explores differences in tablet computer use between medical students and resident physicians at the same institution in hopes of providing insight into how these devices influence medical care and education. The working hypothesis was that tablet computer use and medical app use would substantially differ between medical students and resident physicians.

Materials & Methods

Data collection for this survey was accomplished with an online questionnaire shared with the medical students and residents at Southern Illinois University School of Medicine (SIU-SOM) in July and August of 2012. The SIU-SOM is located in Springfield, Illinois and had an enrollment of 298 medical students and 314 residents and fellows at the time of this survey. Satellite training sites in Carbondale, Decatur, and Quincy, Illinois were also included.

This anonymous survey was approved by the Springfield Committee for Research Involving Human Subjects (SCRIHS), the local institutional review board. Chi-squared tests were used to examine associations between respondent characteristics, and p values less than 0.05 were considered statistically significant. SPSS version 17.0 was used for data analysis.

An inactive copy of the survey instrument can be accessed at: http://goo.gl/wn5QU

SIU-SOM does not require or issue tablet computers to students or residents. The training hospitals at SIU-SOM and the faculty outpatient practice have electronic medical records that are accessible via tablet computers.

Results

There were 76 medical student responses (26% response rate) and 66 resident/fellow responses to this survey (21% response rate). Slightly over 50% of respondents used a tablet computer, with the Apple iPad being the most popular type of tablet computer used (Table 1). Tablet computer use of one or more times daily was reported by 40% of respondents (Table 2). Residents/fellows were more likely to use tablet computers several times daily than medical students (32% vs 20%, p = 0.035)

Respondents were asked about how they use tablet computers (Figure 1). The most common reported uses were for accessing medical reference applications (46%), e-Books (45%), and board study (32%). Residents were more likely than students to use a tablet computer to access an electronic medical record (41% vs 21%, $p = 0.010$), review radiology images (27% vs 12%, $p = 0.019$), and enter patient care orders (26% vs 3%, $p < 0.001$).

Discussion

This study shows a high prevalence and frequency of tablet computer use, primarily in the form of iPads, among physicians in training at this academic medical center. Most residents and students use tablet computers to access medical references, e-books, and to study for board exams. The high frequency of e-book and other educational material use on tablet computers suggest that this may be an important avenue for medical educators to investigate.

Residents were more likely to use tablet computers for direct patient care such as accessing an EMR, reviewing radiographs, and CPOE. This suggests that computers become integrated into the workflow of residents at SIU-SOM, which is not unexpected given reports of improved resident efficiency and increased time in direct patient care with tablet computer use (Hornq et al, 2012; Patel et al, 2012). This also is likely a reflection of the transition of mobile computing needs from that of a student to that of a practitioner.

As a single center study, the results of this survey may not be generalizable. Local factors, such as the availability of EMR access via a tablet computer, are likely to have had significant effects on the patterns of tablet computer use in this study. Additionally, this survey may have selection bias given the

voluntary nature of this survey. Despite these limitations, this survey shows widespread adoption and daily clinical use of tablet computers in an academic medical center by medical students and residents.

Conclusions

Tablet computer use among medical students and resident physicians was common in this survey. All learners used tablet computers for point of care references and board study. Resident physicians were more likely to use tablet computers to access the EMR, enter patient care orders, and review radiology studies. This difference is likely due to the differing educational and professional demands placed on resident physicians. Further study is needed better understand how tablet computers and other mobile devices may assist in medical education and patient care.

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151 Table 1. Tablet computer use by physicians in training

	Medical Students	Residents/Fellows
Total respondents	76	66
Use a tablet computer	39 (51%)	33 (50%)
Use an iPad	35 (46%)	27 (41%)
Use an Android Tablet	4 (5%)	6 (9%)

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156 Table 2. Frequency of medical app use by physicians in training

	Medical Students	Residents/Fellows
Total respondents	76	66
Use medical apps	35 (46%)	33 (50%)
Several times daily	15 (20%)	21 (32%)
Daily	10 (13%)	11 (17%)
Weekly	10 (13%)	1 (2%)
Monthly	0 (0%)	0 (0%)
Never	41 (54%)	33 (50%)

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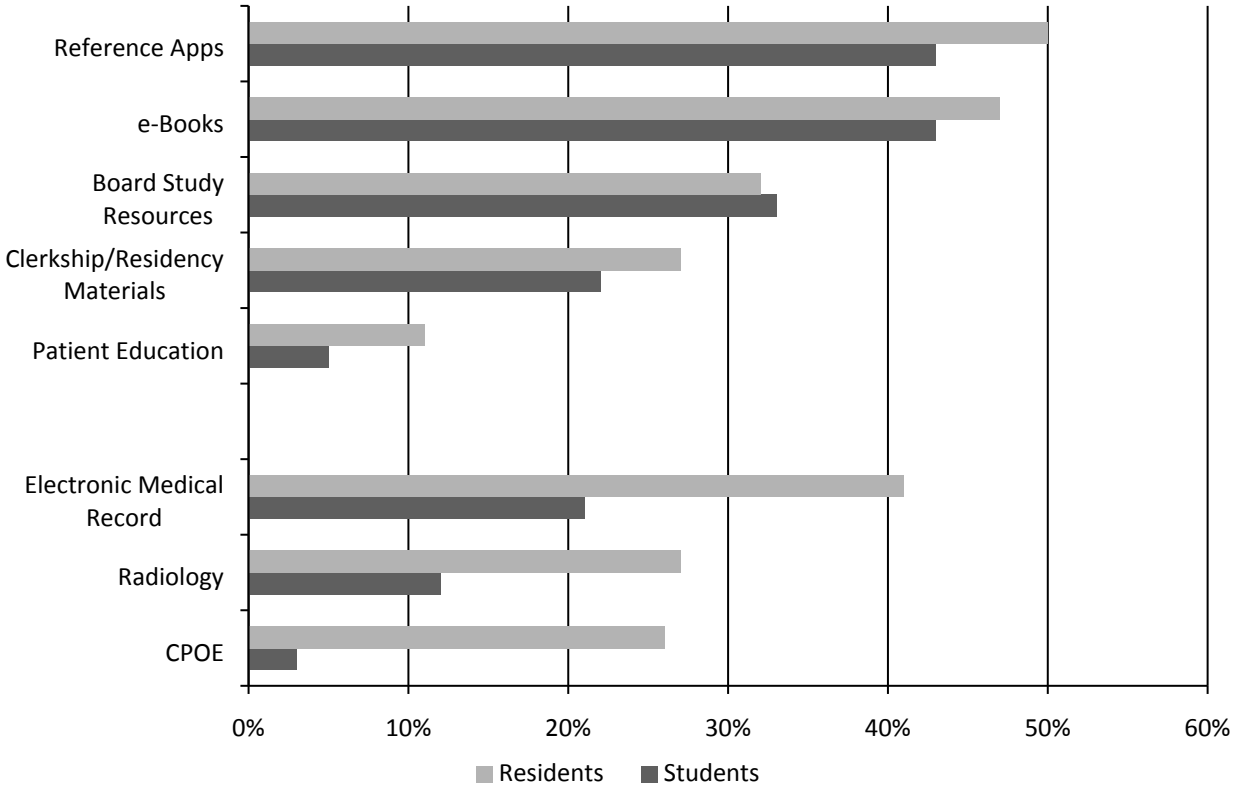
160 Figure 1. Tablet computers use by stage of medical education



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