

patients' experience, that feedback changes physicians' performance, and people will inevitably use the Internet to voice opinions, so why not capture this information in a useful form.³ Arguments against using this data include the selection bias by those leaving reviews, the lack of meaningful data on technical quality of health care, and straining of physician-patient relationships.^{2,5} Although our results do not counter all of these arguments against, they suggest that discretionary patient ratings, obtained through a Web site, may be a more useful tool than previously considered for both patients and health care workers. If patients are making choices based on this information, they can be reassured that the ratings are not entirely misleading and may be providing relevant information about health care quality. In his book *The Wisdom of Crowds*, James Surowiecki⁷ argues that a diverse collection of "independently deciding individuals" is likely to make better predictions and decisions than single individuals or even experts. At least to an extent, the self-selecting crowd of patients appears to be wise.

The use of Web-based patient ratings has become common in other industries such as hotels and restaurants, and consumers value these rankings in making choices. We believe that the information provided by these Web sites, although flawed, represents a potentially important development in the measurement of health care quality.

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Impact of Mobile Tablet Computers on Internal Medicine Resident Efficiency

Internal medicine residents' increased workload compounded by limited work hours creates work compression and competition between service responsibilities and educational goals.¹ Moreover, residents report spending the bulk of their time in indirect patient care, such as updating medical charts, documentation, and ordering tests, at the expense of direct patient care or education.² Unfortunately, the implementation of electronic health records actually increases time in indirect care and the need for available computer workstations to advance care. These trends, coupled with the growing information needs for patient care,^{3,4} have led to more time spent locating a computer or

working on the computer at the expense of time at the bedside⁵ or at conference.

We sought to implement and evaluate the deployment of personal mobile computers on resident workflow efficiency and patient care.

Methods. A total of 115 internal medicine residents were given Apple iPads (Cupertino, California) and instructions on how to access to the medical record (Epic; Verona, Wisconsin) via Citrix client, publications, and paging systems via shortcuts to the Web address on the home screen in October 2010. Residents were surveyed in the month prior to and 4 months after deployment of personal mobile computing devices to assess the potential impact on their workflow and efficiency.

In addition, data from the electronic health record were examined to ascertain the time frame of all patient care orders placed in the first 24 hours of a new patient's admission to the general medicine service from January to March of 2011. These data were compared with the time frame for orders during patient admission in the same 3-month period in 2010 (prior to distribution of iPads) to assess any change in ordering efficiency with personal mobile computing. This time period was used since it was after residents had 3 months to learn how to use the iPad and fully integrate it into their workflow. The rate of patient orders per admission by admission hour was compared for both groups using 2 sample tests of proportion with statistical significance defined as $P = .05$.

This study was deemed to be institutional review board exempt.

Results. Nearly all residents (114 of 115 [99%]) completed the postimplementation survey. The postsurvey demonstrated that almost 90% of residents (100) were using their iPad for clinical responsibilities at work, with almost 75% of these residents (72) using their iPad every day. More than three-quarters of residents (78%) noted that they were more efficient on the wards, with a self-reported time savings of about an hour a day. Furthermore, more than half (56%) felt that they could attend more conferences by using their iPads. Sixty-eight percent of all housestaff reported that patient care delays were averted with the iPad. Interestingly, interns were more likely than residents to report that the iPad improved their efficiency on the wards (89% of interns vs 71% of residents; $P = .03$).

From January to March of 2010 and 2011, there were 631 and 675 general medicine admissions, which generated 16 770 and 17 414 total orders placed in the first 24 hours of admission, respectively. There was no difference ($P = .58$) in the number of orders per admission in 2010 before iPads (27 orders per admission) and 2011 after iPads (26 orders per admission).

Interestingly, timing of orders with respect to time of patient admission did change after iPad deployment (**Figure**). Specifically, 5% more orders were placed prior to postcall attending rounds, which are scheduled at 7 AM. Likewise, there were 8% more orders placed prior to the time at which postcall teams are scheduled to leave the hospital. This results in a statistically significant increase in the proportion of orders placed prior to postcall attending rounds (33% precall vs 38% postcall;

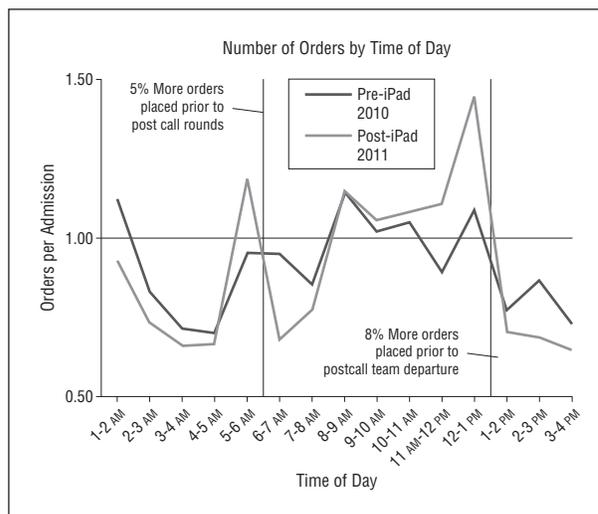


Figure. The ordering patterns from January through March of 2010 (pre-iPad) and 2011 (post-iPad). Patterns were analyzed and plotted by the number of orders placed per general medicine admission (y-axis) in hourly increments (x-axis) for the first 24 hours of admission. The total number of orders per patient in the 3-month period was not statistically different (26.6 orders in 2010 vs 25.8 in 2011). After iPad implementation in 2011 by attending rounds at 7 AM, 38% of the orders were placed (6618 orders before 7 AM out of 17 414 total orders in 24 hours) vs 33% in 2010 (5598 orders before 7 AM out of 16 770 total orders in 24 hours). At the time of postcall team departure at 1 PM, with iPads in 2011, 64% of orders (11 085 orders before 1 PM out of 17 414 total orders in 24 hours) were placed vs 56% of orders in 2010 (9416 orders before 1 PM out of 16 770 total orders in 24 hours). Both differences are statistically significant ($P < .001$).

$P < .001$) and before departure of postcall team (56% precall vs 64% postcall; $P < .001$). In addition, there were also more orders placed in the first 2 hours of admission (odds ratio, 1.06; 95% CI, 1.00-1.12; $P = .04$) in 2011 (with iPads) vs 2010 (without iPads).

Comment. The implementation of personal mobile computing via iPads was associated with improvements in both perceived and actual resident efficiency. Resident perception of improvement in workflow efficiency seems to be consistent with data demonstrating that orders were placed earlier in a patient's admission. Furthermore, more orders were entered before the postcall team had to leave the hospital. In addition to enhancing efficiency of residents, the iPads may have facilitated greater continuity of patient care since the primary service was able to advance care for the patients they admitted and will follow before they execute a handoff.

As a single-institution study, the results may not be generalizable. Furthermore, the origin of orders, whether placed on iPads vs desktop computers, was not discernable in this analysis. However, the number of computer workstations was unchanged in the study period. Despite these limitations, it seems that personal mobile computing can help improve perceived and actual resident efficiency in an era of increasing work compression.

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EDITOR'S NOTE

Mobile Tablets: Benefits to Residents and Patients

I liked this Research Letter because I believe that mobile tablets may provide a number of useful benefits to the inpatient medicine service. As reported by the authors, the tablets seemed to increase the efficiency of residents, thereby potentially allowing for more time with patients and at educational conferences. Besides saving time by eliminating the search for open computers in physician medical charting areas, tablets can encourage residents to do more of their order writing and charting while sitting at the patient bedside. Order writing and charting can be incorporated into the physician-patient encounter, as when a resident discusses with a patient what tests he or she will have that day as the tests are ordered. Although there can be no substitute for focused attention to patients, being by the bedside using a tablet seems to me better than being in

a distant charting room. I also believe tablets may increase patient confidentiality by eliminating the possibility of common room computers being left signed on with patient data accessible when residents leave the room to respond to an inquiry or obtain a needed piece of information.

As the price of tablets declines and the power of information management and decision support grows, I believe that the value of tablets on the inpatient service will only increase—perhaps in ways we cannot currently even imagine.

Mitchell H. Katz, MD

RESEARCH LETTERS

Smoking Cessation, Weight Gain, and Risk of Type 2 Diabetes Mellitus Among Postmenopausal Women

Cigarette smoking is associated with an increased risk of type 2 diabetes mellitus.¹ However, smoking cessation is often accompanied by weight gain, which may explain the increased risk of diabetes that has been observed in several studies.²⁻⁶ Two studies with data on weight came to different conclusions about whether the increased risk of diabetes after smoking cessation is primarily attributable to postcessation weight gain.^{3,4} We used data from the Women's Health Initiative,⁷ a large prospective study with detailed information on smoking status, weight changes, and potential confounders, to assess the relationship between smoking cessation, weight gain, and subsequent diabetes risk. We examined diabetes risk by smoking status, including new quitters who smoked at baseline but no longer smoked at the 3-year follow-up visit.

A total of 115 092 women without known diabetes were followed up from year 3 to diabetes diagnosis, date of death, loss to follow-up, or September 30, 2010, whichever occurred first. The definition of incident diabetes was a positive answer to questions regarding "newly prescribed treatment for diabetes with pills or insulin shots" or using "diet and/or exercise for diabetes" on any of the semiannual or annual follow-up questionnaires. Self-reported diabetes in the Women's Health Initiative has been validated by medication inventories and laboratory data as a reliable indicator of diagnosed diabetes.⁸ A total of 11 056 incident diabetes cases occurred during an average of 8½ years after the 3-year follow-up visit.

The main exposure included never smokers at both baseline and 3-year follow-up visit, former smokers at both baseline and follow-up visit, continuing smokers at both baseline and follow-up visit, and new quitters who smoked at baseline but were abstinent at the follow-up visit. A small proportion of women (0.6%) whose smoking status changed from never or former smokers at baseline to current smokers in year 3 were excluded. Weight was measured at both baseline and year 3 in 107 471 women, 10 380 of whom developed diabetes.

Cox proportional hazards regression models were used to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) of diabetes risk by smoking status overall