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OBSERVATIONS

The Association Between Confidence and Accuracy Among Users of a Mobile Web Platform for Medical Education

Background: Recent literature suggests that physicians' diagnostic confidence tends to exceed accuracy, with confidence being relatively inflexible regardless of case difficulty (1). Overconfidence could lead to physicians not asking for help when they need it. Underconfidence may expose patients to defensive medicine. Those who lack confidence may misrepresent their actual level of knowledge, resulting in missed opportunities for professional development (2). Research suggests that female medical students perform as well as their male peers but report less confidence in their abilities and are actually perceived to be less confident (3). The future of medical education may involve training students to better align confidence and accuracy. One strategy may include providing students with immediate, actionable performance feedback through technology-enabled education platforms (4). Osmosis is a mobile Web platform designed to help medical students learn by answering questions related to their curricula. Its database includes information from more than 14 000 users. We developed a user-facing "Calibration Index" to show students their propensity for under- or overconfidence when answering questions.

Objective: To measure medical students' confidence in their answers, compare confidence with accuracy, and examine differences between men and women.

Methods: To answer a question in the platform, a user must first select 1 of 3 confidence ratings: "I'm sure," "Feeling lucky," or "No clue." We analyzed the responses of 1021 users who answered more than 50 random multiple-choice and true-or-false questions. An automated software package (SexMachine, version 0.1.1, based on Gender.c, version 1.2) that evaluates data on how frequently a name correlates with male or female gender in the United States was used to determine a user's sex from his or her first name. Users with ambiguous name–sex pairings were omitted. The final list was checked to confirm reasonable assignment. Users were assumed to be predominantly medical students in their preclinical years because the platform is designed for and marketed to this audience. Results are presented as the means of user-level response averages and compared with Mann–Whitney U tests using the Bonferroni adjustment (Stata, version 12.0, StataCorp).

Table. Correlation Between Confidence and Accuracy in Men and Women

Confidence Rating	Confidence for All Questions Answered, %			Accuracy by Confidence Level, %		
	Men	Women	*P* Value*	Men	Women	*P* Value*
"I'm sure"	44.4	39.5	>0.001	78.3	80.5	>0.002
"Feeling lucky"	42.0	44.4	0.180	49.8	53.5	>0.001
"No clue"	13.6	16.1	0.27	32.0	32.0	1

* From Mann–Whitney U tests with Bonferroni adjustment.

Findings: The study included 617 men and 404 women. Women's answers were more accurate than men's (61.4% vs. 60.3% correct; $P = 0.040$); however, they were less confident than men. For example, women selected "I'm sure" significantly less often than men (39.5% vs. 44.4% of responses) (**Table**). Average accuracy for questions rated as "I'm sure" and "Feeling lucky" was higher in women (80.5% vs. 78.3% of "I'm sure" responses were correct; 53.5% vs. 49.8% of "Feeling lucky" responses were correct). The average number of questions answered by female and male users did not differ (647 vs. 579; $P = 0.40$). When results were stratified into quartiles based on the number of questions answered, differences by sex remained.

Discussion: The data suggest that, despite performing at the same level or higher, women lacked confidence relative to men. To understand the meaning and magnitude of this observed effect, it will be important to relate question-answering behavior to actual behavior on the wards. One limitation is that sex was determined from first name. Also, we could not verify that users were medical students or stratify results according to school and academic year. Notwithstanding these limitations, the data are a reminder that less confidence might not indicate a lack of knowledge and that confidence should not be mistaken for correctness.

Insights gained from understanding the relationship between confidence and accuracy in medical trainees may ultimately prove valuable in reducing diagnostic errors caused by overconfidence and sex disparities caused by lack of confidence. Going forward, new educational interventions like the Calibration Index may help future physicians align confidence with accuracy to improve patient care and promote career advancement (5).

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Progress and Challenges in Electronic Health Record Adoption: Findings From a National Survey of Physicians

Background: The United States is modernizing the information technology infrastructure of its health care system. The provisions of the American Recovery and Reinvestment Act that are known as the Health Information Technology for Economic and Clinical Health (HITECH) Act provide substantial economic incentives for physicians to implement and use electronic health records (EHRs) (1, 2). Since the passage of the HITECH Act, studies have consistently found EHR use increasing steadily among office-based physicians (3, 4). However, recent studies report that a substantial proportion of physicians are unsure about or are not planning to participate in the program (5). Understanding which physicians may opt out will be necessary to achieve the goals of the HITECH Act and implement broader changes.

Methods: We surveyed a sample of 3437 U.S. physicians selected to represent all primary care physicians and certain specialist physicians who were likely to care for a given patient over an extended time. We collected data in 2 waves. Wave 1 took place between October 2011 and March 2012, and wave 2 took place between May and July 2013. Detailed information about the survey methods is available from the authors on request. In this observation, we describe data from physicians who responded to both rounds of the survey (44% overall response rate). Our primary goal was to measure associations between the stage of EHR adoption and practice characteristics.

Findings: In 2011, 44% of physicians had an EHR that met basic criteria (early adopters). Between 2011 and 2013, an additional 19% adopted a basic EHR (new adopters). In 2013, 20% were in the process of implementing an EHR or had implemented one without some functions required for a basic EHR (partial implementers), 8% were planning to adopt an EHR in the next 2 years (planners), and 9% were not planning to adopt an EHR (persistent nonadopters).

On average, persistent nonadopters were older than other physicians. The mean number of physicians employed in the main practice location of persistent nonadopters was 2.3 compared with 33.4 among early adopters and 15.1 among new adopters. Persistent nonadopters were significantly more likely to be employed in independent solo or 2-physician practices than early and new adopters, who were significantly more likely to be employed by a hospital or medical school, group or staff-model HMO, or network owned by a hospital or other type of health care organization.

Methods of compensation varied by stage of implementation. Most persistent nonadopters reported fee-for-service as their primary compensation, whereas early and new adopters were more likely to report salary adjusted for performance. Persistent nonadopters seemed less likely to participate in incentive programs focused on improving the quality and continuity of care and were significantly less likely than early and new adopters to receive or have the potential to receive additional payments for managing patients with chronic conditions or complex needs.

Discussion: Persistent nonadopters in small, isolated practices may be facing a unique set of challenges that limits their ability to adopt an EHR. Failure to address the needs of these physicians has implications beyond adoption because new models of health care delivery require the use of an EHR. Physicians who choose not to make the change to EHRs may find themselves further isolated if these new models become widespread, but they may move toward adoption as the penalty phase of the meaningful use program draws closer. If so, they are likely to require extensive support in selecting, implementing, and using these systems.

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