Racing Against the Clock: Internal Medicine Residents' Time Spent On Electronic Health Records

Lu Chen, MS
Uta Guo, BS
Lijo C. Illipparambil, MS
Matt D. Netherton, BA
Bhairavi Sheshadri, MD
Eric Karu, MD
Stephen J. Peterson, MD
Parag H. Mehta, MD

ABSTRACT

Background Since the late 1980s, resident physicians have spent increasing amounts of time on electronic health record (EHR) data entry and retrieval. Objective longitudinal data measuring time spent on the EHR are lacking.

Objective We sought to quantify the time actually spent using the EHR by all first-year internal medicine residents in a single program (N = 41).

Methods Active EHR usage data were collected from the audit logs for May, July, and October 2014 and January 2015. Per recommendations from our EHR vendor (Cerner Corporation), active EHR usage time was defined as more than 15 keystrokes, or 3 mouse clicks, or 1700 "mouse miles" per minute. Active EHR usage time was tallied for each patient chart viewed each day and termed an *electronic patient record encounter* (EPRE).

Results In 4 months, 41 interns accumulated 18 322 hours of active EHR usage in more than 33 733 EPREs. Each intern spent on average 112 hours per month on 206 EPREs. Interns spent more time in July compared to January (41 minutes versus 30 minutes per EPRE, $P < .001$). Time spent on the EHR in January echoed that of the previous May (30 minutes versus 29 minutes, $P = .40$).

Conclusions First-year residents spent a significant amount of time actively using the EHR, achieving maximal proficiency on or before January of the academic year. Decreased time spent on the EHR may reflect greater familiarity with the EHR, growing EHR efficiencies, or other factors.

Introduction

Adoption of the electronic health record (EHR) has increased dramatically in all practice settings and in residency and fellowship programs in the United States. Compared with physician-owned practices, adoption rates are higher at facilities responsible for training the next generation of physicians, including community teaching settings, academic health centers, and health maintenance organizations.[1]

The amount of time spent on clinical documentation has been increasing since the late 1980s.[2,3] While electronic records are easier to read, significantly more time is spent on the EHR compared with paper charts.[4–6] Recent studies have found that physicians spend more time on electronic documentation than providing direct patient care,[2,7–11] and other studies have reported that clinical computer work constitutes the highest proportion of time spent by physicians.[12–15] The majority of studies were based on subjective reporting by physicians or other observers, limiting their validity. A recent study raised concerns about errors in subjective reporting.[16] Automated tracking logs of screen time on the EHR provide objective data that minimize the error of human reporting.[17]

Kuhn et al[18] and Clynch and Kellett[3] highlighted that increasing time spent on the EHR is due to a transition from its original role as a communication tool with a focus on patient care to a tool focused on regulatory compliance, billing, auditing, and coding. Time has been spent on generating increasingly longer clinical notes in the past 2 decades,[2,18] some of which appear to never be read.[17] Multiple studies have raised concern about the increased time physicians spend on documentation,[2,3,11,13] which consumes between 25% to 60% of resident physicians' time.[2,3,8,11,12,19]

The purpose of our study was to quantify the amount of time first-year residents spend on electronic documentation, using a built-in time tracking program from our EHR, and then to compare this to objectively reported times published in the literature.

DOI: http://dx.doi.org/10.4300/JGME-D-15-00240.1

Methods

Study Design and Data Collection

This retrospective observational study took place in the internal medicine (IM) residency program at a 691-bed, university-affiliated, community teaching hospital. EHR usage data (Cerner Corp, Kansas City, MO) was retrieved from the Department of Information Technology for the months of May, July, and October 2014 and January 2015. Usage time was tracked on the EHR from user log in to log out, and was subdivided into active EHR use and inactive EHR use. Active EHR use was defined as more than 3 mouse clicks (or 15 keystrokes) or 1700 mouse miles (pixels) per minute. Inactive EHR use, defined as any tracked time outside of active EHR use, was excluded from our analysis.

Active EHR usage time was tallied for each patient chart viewed each day and was termed an *electronic patient record encounter* (EPRE). The EHR usage activities within the EPRE included chart reviews, orders, chart documentation, and other activities. Other activities were the times spent outside of the 3 aforementioned categories, including time spent on using EHR-integrated resources, such as communicating with providers via text-paging and cross-checking regulatory, medical, or peer-reviewed resources.

A single EHR system was used to track inpatient, ambulatory, and emergency care. Active EHR usage time by physicians was mostly recorded at computer stations away from the bedside. Mobile computer stations equipped with EHR were utilized during teaching rounds at patients' approval and attending physicians' discretion. Handheld electronic devices with EHR capabilities were sparsely used during the time of this study.

Subjects

First-year IM residents (N = 41) were identified from the department's roster and comprised the July through January portion of this study. One intern was partially excluded from the analysis due to early completion of training. Data from the previous May included the previous intern class for comparison purposes (n = 36). Interns participated in inpatient, ambulatory, and emergency care. Inpatient care included medicine consulting services and inpatient units staffed primarily by IM residents. This included general medical floors, intensive care units, and step-down units. Ambulatory care included general medicine and subspecialty clinics. Interns were divided into 2 groups based on time spent per EPRE above or below the median time in July. Twenty interns who averaged less time per EPRE were termed *fast providers* (FPs). Remaining interns were termed *average providers* (APs). Incoming interns received formal training on the EHR in early June. With the exception of minor system updates, no other formal training was provided over the duration of the study.

This study was approved as a quality improvement project by the Institutional Review Board at New York Methodist Hospital.

What was known and gap

Residents spend increasing amounts of time on electronic health record (EHR) data entry, but objective longitudinal data are lacking.

What is new

Objective data on EHR usage show that internal medicine interns spend about 5 hours per day on EHR use, and also reveal sizable differences among interns.

Limitations

Single program, observational, retrospective design may limit generalizability.

Bottom line

First-year residents spent a significant amount of time actively using the EHR, and reached maximum efficiency by or before January of the academic year.

Statistical Analysis

Active EHR usage times were displayed as average time (± SD) per physician. Average time for each group of physicians was weighted according to the number of EPREs per individual physician. Comparisons of EHR usage from July 2014, October 2014, and January 2015 were assessed using paired Student *t* tests. All other comparisons were assessed using 2-sample Student *t* tests or analysis of variance when appropriate.

Results

The entire IM intern class was included in this study (41 of 41). The IM interns spent 18 322 hours to review 33 733 EPREs over the span of this study. Each intern spent an average of 40 ± 11 minutes per EPRE in July and 30 ± 5 minutes per EPRE in January ($P < .001$; FIGURE 1). Each IM intern viewed on average 215 EPREs in May, 198 in July, 227 in October, and 220 in January. Each IM intern spent on average 107 hours on the EHR in May, 131 hours in July, 118 hours in October, and 108 hours in January. From July to January, total hours of active EHR use per

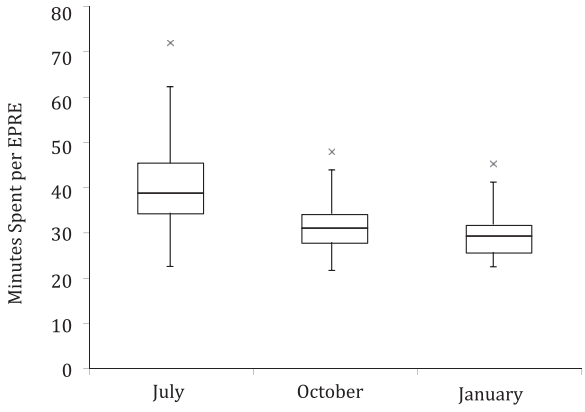

FIGURE 1
Time per Electronic Patient Record Encounter (EPRE) for Interns in July and October 2014 and January 2015

Note: The box and whisker plot represent differences in minutes spent per EPRE by different interns over the span of the study. The outliers are represented by an x.

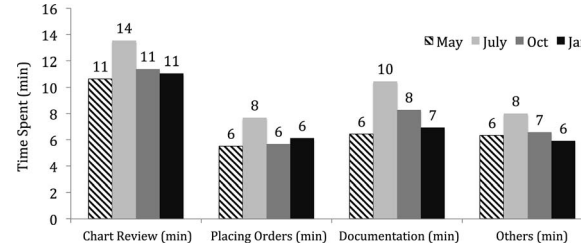

FIGURE 2
Time Spent on the Electronic Health Record by Interns in May, July, and October 2014 and January 2015

Note: Time was rounded to the nearest minute. It should be noted that data from May represent the previous class of interns for comparison purposes.

intern showed a decrease of 23 hours (18%) despite 17 more EPREs in January ($P < .001$). A significant reduction in time was noted in all 4 categories of EHR usage activities (2 minutes in chart review, 2 minutes in orders, 3 minutes in documentation, and 2 minutes in other activities; all $P < .001$; FIGURE 2). January's data echoed that of the previous May in all categories of EHR usage activities (all $P > .05$; TABLE 1).

Differences Among Interns

Differences between fast provider and average provider users are detailed in TABLE 2. The FP interns spent 33 ± 5 minutes per EPRE in July and 28 ± 4 minutes in January. In contrast, AP interns averaged 47 ± 9 minutes per EPRE in July and 32 ± 5 in January. Only 3 interns had increased average time per EPRE from July to January. Those interns were FP users with the lowest average time spent per EPRE in July.

Furthermore, AP users showed a more significant time reduction than FP users (15 minutes versus 5 minutes, $P < .001$). Time reduction was noted in all 4 categories of EHR usage activities in both FP and AP users. A greater magnitude of time reduction was noted in all 4 categories for the AP group (all $P < .001$; TABLE 2), with the most significant reduction occurring in chart review (5 minutes versus 1 minute).

TABLE 1
Time Spent per Patient by Resident Physicians[a]

	Interns (N = 41)			
	May	July	October	January
Total EPRE	8815	8099	9072	8806
Time spent per month, h	104	132	121	110
EPRE per intern	215	198	227	220
Time per EPRE, min	29	40	32	30

Abbreviation: EPRE, electronic patient record encounter.

[a] An EPRE was defined as the total amount of time spent per patient record on a single day. Time spent was rounded to the nearest hour or minute. Total time spent was total hours spent on the electronic health record in a month per physician. The EPRE per physician was the average number of EPREs per physician per month. Time per EPRE was the average minutes spent per EPRE. It should be noted that data from May represent the previous class of interns for comparison purposes.

Discussion

Our study objectively measured interns' EHR use and found that interns spent at least 5 hours a day on the EHR caring for a maximum of 10 patients, confirming prior subjective reports. Interns spent 7 hours a day in July and 5 hours of day in January. This improvement was most likely gained from increased familiarity with using the EHR, comfort with managing different clinical scenarios, and learning from colleagues. The reduced number of EPREs in July was due to a daily patient contact limit set by the program director. Interns spent the most amount of time per EPRE in July. A steady decline in time spent per EPRE was noted as residents became more familiar with the EHR and increased their comfort with patient management. In January, interns spent shorter or comparable time to interns from a different cohort during the previous May. This suggests that interns reached the maximal proficiency level on clinical documentation prior to or around January.

There was a noticeable reduction in both average time spent and SD per EPRE for interns between July and January, especially for average providers. By January, the new interns reached the same time spent

TABLE 2
Time Spent by Interns Stratified by Average Provider Versus Fast Provider[a]

	FPs (n = 20)			APs (n = 21)		
	July	October	January	July	October	January
Total EPRE	**4261**	**4602**	**4350**	**4080**	**4348**	**4205**
Time spent per month, h	117	121	107	143	121	113
EPRE per physician	213	242	229	183	213	212
Time per EPRE, min	33	30	28	47	34	32
Chart review	11	11	10	16	12	12
Placing orders	7	5	6	9	6	6
Documentation	9	8	6	12	9	7
Other activities	7	6	6	9	7	6

Abbreviations: FP, fast provider; AP, average provider; EPRE, electronic patient record encounter.
[a] An EPRE was defined as the total amount of time spent per patient record on a single day. Time spent was rounded to the nearest hour or minute. Total time spent was total hours spent on the electronic health record in a month per physician. The EPRE per physician was the average number of EPREs per physician per month. Time per EPRE was the average minutes spent per EPRE, which was further divided into the 4 subcategories listed.

per EPRE as the previous intern class in May. Compared to July, there is a notable convergence to time spent on the EHR by January (FIGURE 3). This is a novel observation to the best of our knowledge, which begs the question: Did the intern class reach their optimal time spent per EPRE in 7 months or less? Additionally, it should be noted that optimizing the time interns spend on the EHR is a factor that should be addressed without compromising the quality of documentation, along with maximizing the time spent at the bedside and complying with regulatory requirements. These issues must be addressed to further reduce time consumed by clinical documentation.

Although increased familiarity reduced time spent on clinical documentation, a significant portion of an intern's day is still consumed by clinical computer work. Our data correlate well with national survey data, showing that IM residents spent more than 4 hours per day on clinical documentation.[2] Furthermore, a nationwide survey revealed that residents' perceptions of the time devoted to documentation were generally negative; residents felt that clinical documentation took time away from education, patient care, and more importantly, motivation to provide high-quality care.[10] This has been linked to reduced resident satisfaction and increased burnout.[10,20–22] Therefore, to address resident satisfaction and thus improve motivation to provide patient-centered quality care, reducing the time residents spend on clinical documentation should be a priority.

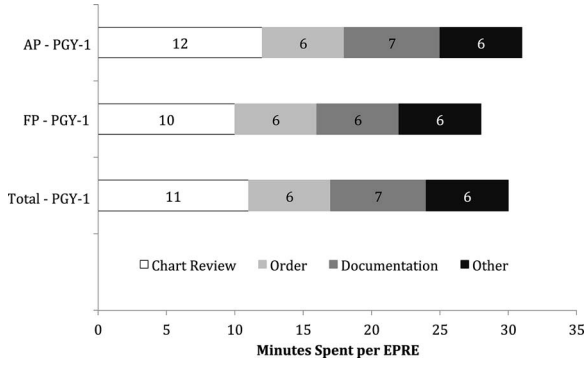

FIGURE 3
Comparison of Time Spent on the Electronic Health Record by Resident Physicians in January 2015

Abbreviations: AP, average provider; PGY, postgraduate year; FP, fast provider; EPRE, electronic patient record encounter.

Note: Time was rounded to the nearest minute.

Limitations of our study include its single center, observational, and retrospective format. Although computer-generated logs provide objective data on time spent on the EHR, further studies are needed to explore the impact on quality of care, patients' satisfaction, and experience. Finally, the quality of clinical documentations is an important issue as well, and the amount of time spent on clinical documentation does not imply the quality of documentation.

Conclusion

Internal medicine interns spent a significant amount of time actively using the EHR, achieving maximal proficiency on or before January 2015. Decreased time spent on the EHR may reflect greater familiarity

with the EHR, built-in EHR efficiencies, or other factors.

References

1. Kokkonen EW, Davis SA, Lin HC, Dabade TS, Feldman SR, Fleischer AB Jr. Use of electronic medical records differs by specialty and office settings. *J Am Med Inform Assoc*. 2013;20(e1):e33–e38.
2. Oxentenko AS, West CP, Popkave C, Weinberger SE, Kolars JC. Time spent on clinical documentation: a survey of internal medicine residents and program directors. *Arch Intern Med*. 2010;170(4):377–380.
3. Clynch N, Kellett J. Medical documentation: part of the solution, or part of the problem? A narrative review of the literature on the time spent on and value of medical documentation. *Int J Med Inform*. 2015;84(4):221–228.
4. Victores AJ, Coggins K, Takashima M. Electronic health records and resident workflow: a time-motion study of otolaryngology residents. *Laryngoscope*. 2015;125(3):594–598.
5. Wormer BA, Colavita PD, Yokeley WT, Bradley JF 3rd, Williams KB, Walters AL, et al. Impact of implementing an electronic health record on surgical resident work flow, duty hours, and operative experience. *Am Surg*. 2015;81(2):172–177.
6. Chiang MF, Read-Brown S, Tu DC, Choi D, Sanders DS, Hwang TS, et al. Evaluation of electronic health record implementation in ophthalmology at an academic medical center (an American Ophthalmological Society thesis). *Trans Am Ophthalmol Soc*. 2013;111:70–92.
7. Westbrook JI, Ampt A, Kearney L, Rob MI. All in a day's work: an observational study to quantify how and with whom doctors on hospital wards spend their time. *Med J Aust*. 2008;188(9):506–509.
8. Block L, Habicht R, Wu AW, Desai SV, Wang K, Silva KN, et al. In the wake of the 2003 and 2011 duty hours regulations, how do internal medicine interns spend their time? *J Gen Intern Med*. 2013;28(8):1042–1047.
9. Arabadzhiyska PN, Baysari MT, Walter S, Day RO, Westbrook JI. Shedding light on junior doctors' work practices after hours. *Intern Med J*. 2013;43(12):1321–1326.
10. Christino MA, Matson AP, Fischer SA, Reinert SE, Digiovanni CW, Fadale PD. Paperwork versus patient care: a nationwide survey of residents' perceptions of clinical documentation requirements and patient care. *J Grad Med Educ*. 2013;5(4):600–604.
11. Oxentenko AS, Manohar CU, McCoy CP, Bighorse WK, McDonald FS, Kolars JC, et al. Internal medicine residents' computer use in the inpatient setting. *J Grad Med Educ*. 2012;4(4):529–532.
12. Fletcher KE, Visotcky AM, Slagle JM, Tarima S, Weinger MB, Schapira MM. The composition of intern work while on call. *J Gen Intern Med*. 2012;27(11):1432–1437.
13. Tipping MD, Forth VE, O'Leary KJ, Malkenson DM, Magill DB, Englert K, et al. Where did the day go? A time-motion study of hospitalists. *J Hosp Med*. 2010;5(6):323–328.
14. Füchtbauer LM, Nørgaard B, Mogensen CB. Emergency department physicians spend only 25% of their working time on direct patient care. *Dan Med J*. 2013;60(1):A4558.
15. Hollingsworth JC, Chisholm CD, Giles BK, Cordell WH, Nelson DR. How do physicians and nurses spend their time in the emergency department? *Ann Emerg Med*. 1998;31(1):87–91.
16. Gilleland M, Komis K, Chawla S, Fernandez S, Fishman M, Adams M. Resident duty hours in the outpatient electronic health record era: inaccuracies and implications. *J Grad Med Educ*. 2014;6(1):151–154.
17. Hripcsak G, Vawdrey DK, Fred MR, Bostwick SB. Use of electronic clinical documentation: time spent and team interactions. *J Am Med Inform Assoc*. 2011;18(2):112–117.
18. Kuhn T, Basch P, Barr M, Yackel T; Medical Informatics Committee of the American College of Physicians. Clinical documentation in the 21st century: executive summary of a policy position paper from the American College of Physicians. *Ann Intern Med*. 2015;162(4):301–303.
19. Ammenwerth E, Spötl HP. The time needed for clinical documentation versus direct patient care. A work-sampling analysis of physicians' activities. *Methods Inf Med*. 2009;48(1):84–91.
20. Hickson GB, Federspiel CF, Pichert JW, Miller CS, Gauld-Jaeger J, Bost P. Patient complaints and malpractice risk. *JAMA*. 2002;287(22):2951–2957.
21. Levinson W, Roter DL, Mullooly JP, Dull VT, Frankel RM. Physician-patient communication. The relationship with malpractice claims among primary care physicians and surgeons. *JAMA*. 1997;277(7):553–559.
22. Forster HP, Schwartz J, DeRenzo E. Reducing legal risk by practicing patient-centered medicine. *Arch Intern Med*. 2002;162(11):1217–1219.

Lu Chen, MS, is a Medical Student, Department of Medicine, New York Methodist Hospital, and St. Georges University School of Medicine, Grenada, West Indies; **Uta Guo, BS,** is a Medical Student, St. Georges University School of Medicine; **Lijo C. Illipparambil, MS,** is a Medical Student, St. Georges University School of Medicine; **Matt D. Netherton, BA,** is Business Operations Analyst, Department of Information Technology, New York Methodist Hospital; **Bhairavi Sheshadri, MD,** is a Resident Physician, Department of Medicine, New York Methodist Hospital; **Eric Karu, MD,** is a Fellow, Department of Information Technology, New York Methodist Hospital; **Stephen J. Peterson, MD,** is Chairman, Department of Medicine, New York Methodist Hospital; and **Parag H. Mehta, MD,** is Senior Vice Chairman, Department of Medicine, and Chief Medical Information Officer, New York Methodist Hospital.

Funding: The authors report no external funding source for this study.

Conflict of interest: The authors declare they have no competing interests.

A minor portion of this work was accepted as an abstract for the New York Chapter of American College of Physicians Annual Scientific Meeting, West Harrison, New York, February 6, 2015.

The authors would like to thank all the physicians, physicians in training, and staff members at New York Methodist Hospital, departments of Internal Medicine and Information Technology, for their help and support of this project.

Corresponding author: Parag H. Mehta, MD, New York Methodist Hospital/Weill Cornell Medical College, 506 Sixth Street, Brooklyn, NY 11215, 718.780.5246, fax 718.780.3259, phm9018@nyp.org

Received May 31, 2015; revisions received July 30, 2015, and August 19, 2015; accepted August 24, 2015.