Training in the Era of EHR: Examining the Experience of Medical Student Documentation in the Ambulatory Care Setting [version 1]

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Abstract
This article was migrated. The article was marked as recommended.

Purpose: Documenting clinical encounters in the electronic health record has become an important component of medical student training. Reflecting this trend, recent rule changes by the Centers for Medicare and Medicaid services now permit billing for medical student notes. We sought to investigate the educational value of student note-writing following implementation of these changes.

Methods: We surveyed medical students at a private research university who participated in longitudinal ambulatory care experiences. Survey questions assessed the incorporation of student note-writing into clinic workflow, as well as the benefits and disadvantages of note-writing.

Results: Thirty-six students completed the survey. A majority of students perceived benefits in regards to residency preparedness, engagement with the clinical team, and clinical reasoning ability as a result of writing notes in clinic. While some students reported seeing fewer patients as a result of note-writing, most felt that use of the electronic health record did not negatively impact patient interaction. Barriers cited included a lack of knowledge regarding billing requirements and preceptor apprehension toward student note-writing.

Conclusion: The results of this study indicate that student note-writing continues to be a valuable part of medical training following recent billing changes. Our results also identify areas for improvement, including clarifying billing requirements and assuaging preceptor apprehension.
concerns.

**Keywords**
medical student, documentation, electronic health record

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Introduction

Documentation in the electronic health record (EHR) has become a prominent part of outpatient physician practice, with recent studies suggesting that physicians spend over one-half of their workday interacting with the EHR (Arndt et al., 2017; Young et al., 2018). As a result, the Association of American Medical Colleges lists the ability to document a clinical encounter among its Core Entrustable Professional Activities for Entering Residency, and the American Medical Association has similarly adopted policies encouraging EHR training in medical school and residency. In 2018, the Centers for Medicare and Medicaid Services revised their claims processing manual to allow medical student notes to be used for billing purposes, provided the information is verified and attested to by a supervising physician. With this seismic shift in the role of the medical student, we sought to investigate the educational impact of student EHR use in the ambulatory care setting. Specifically, we aimed to examine 1) how student note-writing is incorporated into clinic workflow, 2) benefits derived from student use of the EHR, and 3) potential areas for improvement in regards to the documentation experience.

Methods

We conducted a survey of medical students at the Duke University School of Medicine (DuSoM) in Durham, North Carolina (USA) who participated in a longitudinal ambulatory care experience during the 2018-2019 academic year, the first year in which DuSoM implemented billing for student notes. Students at Duke have 3 opportunities to participate in longitudinal ambulatory care experiences: Primary Care Leadership Track (PCLT), Longitudinal Integrated Clerkship (LIC), and Continuity Clinic (CC). PCLT and LIC are ambulatory care-focused clerkship tracks which serve as an alternative to the traditional 2nd year clerkship training; students in these programs spend 7-8 months of the year rotating through various primary care and subspecialty clinics. CC is an opportunity for 3rd year (research year) medical students to spend one half-day per week with a preceptor of their choice for 8-9 months. In September of 2019, a total of 91 students were emailed an invitation to complete a 19-question survey designed by the authors, which included Likert scale and free-response questions. Survey data was collected and managed using REDCap electronic data capture tools hosted at DuSoM (Harris et al., 2009). This study was granted exempt status by the DuSoM IRB.

Results/Analysis

36 students completed the survey (40% response rate). 56% of respondents worked in primary care clinics with the remainder in subspecialty clinics. A majority of students saw 3-4 patients per half-day (69%) and wrote 3-4 notes (72%) (Figure 1A-B). Almost all (92%) students reported that their notes were used for billing. Major uses of the EHR in the patient room included documenting the HPI (47%) and reviewing pertinent labs (69%) and imaging (47%) (Figure 1C). Most students received direct feedback from their preceptor on the same day (42%) or during the following clinic session (42%). Many students also received indirect feedback by reviewing preceptor attestations (64%) (Figure 1D).

In terms of perceived benefits, nearly all respondents reported feeling more prepared for residency (94% strongly or slightly agree) and more integrated into the clinic workflow (92%) as a result of writing notes (Figure 2A-B). 94% of students also felt their clinical reasoning skills were improved (Figure 2C). One student explained, “writing notes in the clinic setting where there are time constraints, I learned to write more quickly and effectively.” Another described how note-writing “helped to consolidate my thinking and assessment of patients in a comprehensive, organized fashion.”

Regarding potential disadvantages, the majority of respondents did not feel that note-writing detracted from patient interactions (67% slightly or strongly disagree), though some felt it reduced the number of patients seen (44% slightly or strongly agree) (Figure 2D-E). Most students did not feel note-writing to be a significant time burden outside of clinic (64% slightly or strongly disagree) (Figure 2F). Other difficulties reported included lack of familiarity with billing requirements and preceptor apprehension toward student note-writing.

Discussion

As medical student notes now become utilized for billing, one potential concern is that the business aspects of note-writing might overshadow the educational benefits. Encouragingly, at our institution, the student response to EHR use in the outpatient setting following these billing changes has been overwhelmingly positive, with a vast majority of students perceiving benefits in regards to residency preparedness, engagement with the clinical team, and clinical reasoning ability. Although we did not investigate the specific aspects of student documentation that correlate with these benefits, it stands to reason that by encouraging students to clearly and concisely articulate patient histories, assessments, and plans, students learn to improve their communication and medical decision-making ability. As preceptors are now mandated to review student notes prior to attesting, the frequency of feedback has also likely increased, further enhancing the learning experience. Finally, because student notes are now being used for billing, as opposed to serving as redundant documentation, students may feel more valued as a member on the medical team.
Reassuringly, and in contrast to older studies (Rouf, Chumley and Dobbie, 2008), most students did not feel that use of the EHR adversely affected their interactions with patients, which may reflect increasing familiarity with and acceptance of the EHR by students and physicians alike. While some students reported seeing fewer patients as a result of note-writing, the learning derived from each patient may well have been greater. A notable minority of students also reported spending significant amounts of time outside clinic completing notes; as such, preceptors should take care in ensuring that note-writing does not become an undue burden on students. Finally, several students reported a lack of knowledge concerning billing requirements, underscoring a need for additional formalized training; at DuSoM, current training consists of viewing a brief 30-minute video tutorial.

Further study is needed to determine whether preceptors share similarly positive views. A prior nationwide survey of clerkship directors found more neutral opinions toward student EHR use (Hammoud et al., 2012), with some raising concerns regarding the “copy and paste” nature of notes, which might stifle students’ ability to think for themselves; such practices are known to be widespread among students and physicians (Heiman et al., 2014). Indeed, in our study, several students reported preceptor apprehension toward student note-writing. Identifying and remediying the specific concerns of these preceptors should be a priority moving forward.
Conclusion
In this survey of medical students at a major tertiary care center in the United States, we demonstrate that documentation in the EHR remains an important aspect of medical student education following the implementation of billing for medical student notes. Students reported improvements in residency preparedness, clinical reasoning, and integration into the clinical team as a result of note-writing, without adverse effects on patient interaction. Areas for improvement include clarifying billing requirements and overcoming preceptor apprehension toward student note-writing, and future research should focus on how best to optimize training and implementation, with input from all stakeholders.

Take Home Messages
- Medical student note-writing was well-received by students, with perceived benefits in regards to residency preparedness, integration into the clinical workflow, and clinical reasoning ability.
- Medical students did not feel that note-writing adversely affected patient interactions.
- Areas for improvement include clarifying billing requirements and overcoming preceptor apprehension toward student note-writing.
- Future research should investigate preceptor attitudes toward student note-writing.

Notes On Contributors
Charlton Tsai, Julia Bellantoni, and Omar Martinez-Uribe are medical students at the Duke University School of Medicine (Durham, NC, USA).

Bruce Peyser, MD is a Professor of Medicine in the Division of General Internal Medicine at the Duke University School of Medicine (Durham, NC, USA). He also leads the school’s Primary Care Leadership Track.

Appendices
Original Survey Text
This 5-minute survey seeks to examine the experience of medical student clinical documentation in a Longitudinal Integrated Clerkship curriculum. All answers will remain anonymous. Please respond to the survey questions in regards to your experience at the longitudinal clinic where you were most engaged in note writing during the academic year 2018-2019.

1. What type of clinic did you work in?
   - Primary care
   - Specialty (please specify)
2. How long did you work in the clinic?
   - 1-3 months
   - 4-6 months
   - 7+ months
3. About how many patients did you see during a half-day clinic?
   - 1-2 patients per half day
   - 3-4 patients per half day
   - 4-5 patients per half day
   - >5 patients per half day
4. About how many notes did you write during a half-day clinic?
   - 1-2 notes per half day
   - 3-4 notes per half day
   - 4-5 notes per half day
   - >5 notes per half day
5. Did the provider utilize your note for billing?
   - Yes
   - No
6. Did you prechart or preload your notes before clinic?
   - Yes
   - No
7. How did you use the chart while in the patient room? (select all that apply)
   - Write the HPI
   - Review lab results with patient
   - Review imaging with patient
   - Other (please specify)

8. When did you complete your notes?
   - While in clinic
   - After clinic
   - Sometimes in clinic, sometimes after

9. How did you receive feedback on your notes? (select all that apply)
   - Preceptor reviewed your note with you that day
   - Preceptor reviewed your note during next clinic session
   - Preceptor signed note with edits; student reviewed on own time
   - I did not receive feedback on notes
   - Other (please specify)

10. I felt well prepared/trained to write notes during my longitudinal clinic.
    - Strongly agree
    - Slightly agree
    - Neither agree nor disagree
    - Slightly disagree
    - Strongly disagree

11. I felt more integrated into the medical team and my clinic’s workflow by writing notes.
    - Strongly agree
    - Slightly agree
    - Neither agree nor disagree
    - Slightly disagree
    - Strongly disagree

12. Note writing has improved my clinical reasoning skills.
    - Strongly agree
    - Slightly agree
    - Neither agree nor disagree
    - Slightly disagree
    - Strongly disagree

13. I feel more prepared for residency by writing notes in clinic.
    - Strongly agree
    - Slightly agree
    - Neither agree nor disagree
    - Slightly disagree
    - Strongly disagree

14. How else has note writing benefited your learning experience? (Free Response)

15. I see fewer patients in clinic when I am expected to write notes.
    - Strongly agree
    - Slightly agree
    - Neither agree nor disagree
    - Slightly disagree
    - Strongly disagree

16. Note writing requires spending significant periods of time outside of clinic preparing or finishing notes.
    - Strongly agree
    - Slightly agree
    - Neither agree nor disagree
    - Slightly disagree
    - Strongly disagree

17. Note writing during a clinic visit negatively impacts the way I interact with the patient.
    - Strongly agree
    - Slightly agree
- Neither agree nor disagree
- Slightly disagree
- Strongly disagree

18. What other disadvantages have you found in note writing? (Free Response)
19. What suggestions do you have for improving the medical student note writing experience? (What has worked well? What could be different?) (Free Response)

**Declarations**
The author has declared that there are no conflicts of interest.

**Ethics Statement**
This study was considered by the Duke University School of Medicine IRB on July 18, 2019 and deemed exempt under Category 2 (research that only includes interactions involving survey procedures AND the information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained directly or through identifiers linked to the subjects).

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All figures were created by the authors using the Graphpad program; there are no associated copyright licenses.

**Bibliography/References**

Arndt, B. G., Beasley, J. W., Watkinson, M. D., Temte, J. L., et al. (2017) Tethered to the EHR: Primary Care Physician Workload Assessment Using EHR Event Log Data and Time-Motion Observations. *The Annals of Family Medicine. 15*(5), pp. 419–426. [Reference Source](#)

Hammoud, M. M., Margo, K., Christner, J. G., Fisher, J., et al. (2012) Opportunities and Challenges in Integrating Electronic Health Records Into Undergraduate Medical Education: A National Survey of Clerkship Directors. *Teaching and Learning in Medicine. 24*(3), pp. 219–224. [Reference Source](#)

Harris, P. A., Taylor, R., Thielke, R., Payne, J., et al. (2009) Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics. 42*(2), pp. 377–381. [Reference Source](#)

Heiman, H. L., Rasminsky, S., Bierman, J. A., Evans, D. B., et al. (2014) Medical students’ observations, practices, and attitudes regarding electronic health record documentation. *Teaching and Learning in Medicine. 26*(1), pp. 49–55. [Reference Source](#)

Rouf, E., Chumley, H. S. and Dobbie, A. E. (2008) Electronic health records in outpatient clinics: Perspectives of third year medical students. *BMC Medical Education. 8*(1), p. 13. [Reference Source](#)

Young, R., Burge, S., Kumar, K., Wilson, J., et al. (2018) A Time-Motion Study of Primary Care Physicians’ Work in the Electronic Health Record Era. *Family Medicine. 50*(2), pp. 91–99. [Reference Source](#)
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Migrated Content

**Version 1**

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Keith Wilson
Dalhousie University

This review has been migrated. The reviewer awarded 4 stars out of 5

The authors present a succinct study on the impact of student EHR use in a clinical setting. The results of this survey showed a positive perception from students. Interestingly, students felt that they were more prepared for residency and that its use expanded their clinical reasoning skills. Additionally, the authors highlighted that students felt more integrated with the team and that this may be driven by their utility (rather than simply providing redundant documentation) – this can be helpful for preceptors to know: that the documenting process can be more than just a required task. It would have been helpful to the reader to have some examples of what students described in the last two free-text questions (disadvantages and suggestions). Although the sample size was small, the conclusions of this study are likely representative of a broader student experience. It might be interesting to take some of what was found to another level: does the use of EHR actually impact clinical reasoning skills? Additionally, exploration of student reasons behind these answers (perhaps using a qualitative lens) would be very helpful in informing future research. The present study will be of interest to any educator or clinician who is using electronic record systems with students.

**Competing Interests:** No conflicts of interest were disclosed.

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Deb Halder

This review has been migrated. The reviewer awarded 4 stars out of 5

Note on Title, Abstract and References
The title is suggestive and it is all inclusive on what it aims to research and who the targets are. The abstract has tended to make an informative summary on the total design, results as well as the directions of study. The references used for the purpose of this research paper is recent, suitable, and symmetrical to the aims and objectives of the paper. Notes on Introduction and Method
The introductory part of this paper is well-written with the highlight of all necessary tools inserted. Introduction has been able to explain the problem, the objectives of the research, the research questions as well as the hypothesis. But, the method seems to be not in details. It could not explain sampling procedure, data analysis and presentation technique. Without the detail explanation of the procedure, the result cannot be retested by other parties and cannot be proved likewise. Results and Discussion
Results have been presented on ratio scale and the discussion has been on descriptive analytics. The result is details in interpretation though it was not indicated how the findings would be presented. Findings in the discussion part has been proved with reasonable citations. But, the discussion has been found as descriptive rather than analytic and critical evaluation which are the core of discussion.

Conclusion and Appendix
An academic research paper should follow third person point of view to retain neutrality and it is more likely adoptable for the construction of conclusion which this paper violates. Conclusion should guide on universal thought or aspect on the researched issues. What was surveyed and found is dealt in previously. Conclusion aims at summing at the general thought with the help of findings and references derived from the paper. The inclusion of the appendix is intelligent task for the authors; it also needs to deal with how it is constructed and validated. There prevail lots of intervening variables in case of emailed generated responses as it cannot ensure who really respond to the questions, what their age limits are etc. The paper has not guided how those limitations were settled.

Competing Interests: No conflicts of interest were disclosed.

Reviewer Report 28 March 2020

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Trudie Roberts
Leeds Institute of Medical Education

This review has been migrated. The reviewer awarded 4 stars out of 5

As EHR become the norm it is important that medical students get experience in this area. So this paper is
a useful contribution. It is good to note that students felt this experience would prepare them for residency and not surprising that preceptors were more apprehensive. Interesting that because preceptors had to review the student entries the perhaps unintended (positive) consequence was that the students got more feedback. As a UK physician to understand that one could bill for medical student entries in the EHR was a learning point for me.

**Competing Interests:** No conflicts of interest were disclosed.