Time and Note Characteristic Effects of an Electronic Health Record Template for Internal Medicine Resident Notes

Madison B. Calder, MD, Capt, USAF
Matt Hanson, MAS, CST, CPHIMS
Melissa Jost, MS, PMP
Kristen D. Kelley, MD

ABSTRACT

Background Inpatient internal medicine (IM) residents spend most of their time on indirect patient care activities such as clinical documentation.

Objective We developed optimized electronic health record (EHR) templates for IM resident admission and progress notes, with the objective to reduce note-writing time, shorten note length, and decrease the percentage of progress note text that was copy-forwarded from prior notes.

Methods In 2022, a multidisciplinary team created, over an 8-month period, optimized EHR templates for IM resident admission and progress notes. A retrospective analysis was performed to assess differences in resident time spent writing notes, note length in characters, and percentage of progress note text that was copy-forwarded. All 94 residents in the IM residency program had the opportunity to use the novel templates.

Results Following implementation of the novel templates, residents spent on average 3.6 minutes less per progress note compared to pre-intervention (P=.008; 95% CI of the difference: 1.1-6.0 minutes). Notes in the post-intervention period were shorter for admission notes (mean reduction of 1041 characters; P<.001; 95% CI of the difference: 448-1634 characters) and progress notes (mean reduction of 764 characters; P<.001; 95% CI of the difference: 103-1426 characters). Progress notes also saw an average 22% decrease of copy-forwarded text (P<.001, 95% CI of the difference: 18.7%-25.4%).

Conclusions The optimized note templates led to a reduction in resident progress note-writing time, shortened note length, and a lower percentage of copy-forwarded text.

Introduction

Residents spend the majority of their time on indirect patient care activities, including patient care tasks such as note-writing in the electronic health record (EHR).[1,2] As the EHR has been identified as a significant contributor to burnout, it is important for programs to innovate toward efficient note-writing without sacrificing note quality.[3-8] Our objective was to create a novel note template with these goals in mind.

Methods

Setting and Participants

Participants included resident physicians on internal medicine (IM) inpatient services at the University of California (UC) Davis Medical Center during May 2021, May 2022, and July 2022. The IM residency program has 94 residents, 84 traditional IM residents and 10 IM-psychiatry residents. Each IM academic inpatient team is made up of 1 senior IM resident (postgraduate year [PGY] 3) and 2 interns (PGY-1) from IM or another specialty. Interns are responsible for writing all progress notes except on their day off when the senior resident writes the notes. Day shift admission notes are written by interns, while night shift admissions are written by junior residents (PGY-2). Due to limitations in how data were extracted, the number of individual residents included in this study cannot be quantified. UC Davis Medical Center utilizes Epic (Epic Systems Corporation) for the EHR.

Interventions

Phase 1: A local interdisciplinary team consisting of a subset of IM resident and attending physicians, billing and coding representatives, and EHR builders and trainers was formed. All members of the team were employed by UC Davis Medical Center, and the EHR builders had certifications as Epic analysts. Through weekly meetings, optimized templates for admission and progress notes were developed. Feedback from residents across the broader program was incorporated through iterative Plan-Do-Study-Act cycles

DOI: http://dx.doi.org/10.4300/JGME-D-23-00553.1

BOX Post-Intervention (Optimized) Templates: Key Features

- Incorporation of NoteWriter feature (review of systems and physical examination)
- Integration of shared macros for physical examination and review of systems
- Assessment and plan text automatically pulled into current daily progress note from preceding day's progress note
- Progress note subjective section containing pertinent review of systems check boxes
- Automatic inclusion of key laboratory data obtained within preceding 24 hours in organized, easy-to-read, tabulated format
- Automatic inclusion of all radiology or procedural impressions obtained within preceding 24 hours
- Automatic inclusion of any new microbiology data resulted in preceding 72 hours
- Inclusion of additional disposition prompts to promote discharge planning (barriers, anticipated time, and care setting)

over an 8-month period. Key features of the notes can be seen in the BOX.

Phase 2: The optimized templates were made available in January 2022. Educational materials, including informational sheets and short videos, were emailed to all IM residents. Residents were encouraged, though not required, to use optimized templates.

Phase 3: New interns were provided an additional educational intervention, with an in-person live demonstration of the templates during orientation in June 2022.

Outcomes Measured

We performed a retrospective analysis of all admission and progress notes completed by residents on the inpatient IM services in May 2021 (pre-intervention) and May 2022 (post-intervention). The primary variable of interest was average resident time spent writing and editing notes. Secondary variables included note length in characters and the percentage of progress note text that was copy-forwarded from prior notes. We additionally assessed the proportion of total notes that were written using the novel templates before (May 2022) and after (July 2022) the new intern July 2022 educational intervention.

Analysis

Data were extracted from the EHR using native reporting tools that are available to all Epic customers with a Cogito (Epic's analytic module) license. Admission and progress notes written within the designated dates with a note status of "Cosigned" or "Attested" were included. Medical student notes and incomplete notes were excluded from analysis. Time data were obtained using time stamps for individual notes. Analysis was performed using Microsoft Excel. For continuous variables, the difference in means was assessed by using Student's *t* test, and 95% CIs of the difference are reported. For binary outcomes, odds ratios (ORs) and 95% CI of the OR were calculated.

The UC Davis Institutional Review Board (IRB) characterized this study as a quality improvement initiative, and thus it was exempt from IRB review.

Results

There were 261 admission notes and 1149 progress notes in the pre-intervention sample (May 2021). The post-intervention sample (May 2022) included 258 admission notes and 1271 progress notes. The sample following the new intern educational intervention (July 2022) contained 248 history and physicals and 1149 progress notes.

Compared to the pre-intervention sample, residents spent on average 3.6 minutes less time writing and editing progress notes in the post-intervention sample, with average time decreasing from 34.4 to 30.8 minutes (P=.008, 95% CI of the difference: 1.1-6.0 minutes). For admission notes, residents spent on average 113.3 minutes writing and editing in the pre-intervention sample, compared to 110 minutes in the post-intervention sample (P=.48; 95% CI of the difference: -15.9–22.6 minutes). Pre-intervention admission notes averaged 12 479 characters, compared to post-intervention admission notes that averaged 11 438 characters (mean reduction of 1041 characters; P<.001; 95% CI of the difference: 448-1634 characters). Post-intervention progress notes were on average shorter at 8411 characters, compared to 9175 characters in the pre-intervention group (mean reduction of 764 characters; P<.001, 95% CI of the difference: 103-1426 characters). Additionally, progress notes in the post-intervention group contained on average 32.7% of copy-forwarded text from prior notes, compared to 54.7% of the text in the pre-intervention period (P<.001, 95% CI of the difference: 18.7%-25.4%). Finally, we found that following the additional intern educational intervention increased optimized template usage from 85.6% to 94.0% for admission notes, yielding an OR of 2.7 (95% CI of OR: 1.4-5.2) and from 49.8% to 69.2% for progress notes, yielding an OR of 2.3 (95% CI of OR: 1.9-2.7).

Discussion

We utilized a multidisciplinary approach to create optimized EHR note templates, with the goal of promoting resident efficiency to reduce time spent on documentation. Our findings add to a growing

body of literature regarding effects of implementation of standardized note templates on characteristics of resident notes, including time spent writing and length.[9,10] Based on our experience, similar projects could be completed over an approximate 3-month period.

We found an average reduction in time spent writing and editing progress notes by 3.6 minutes in the post-intervention period. There was no difference in average time spent writing and editing admission notes between the 2 periods. This is possibly because admission notes place a greater emphasis on data interpretation and clinical reasoning, and these areas of note-writing were not targeted by the novel templates. Furthermore, our admission note sample size was limited.

Post-intervention period notes were also significantly shorter and contained a lower percentage of copy-forwarded text from prior notes. "Note bloat" is a well-known phenomenon where notes grow longer, often containing nonrelevant information. Additionally, the practice of copy-forwarding text from prior notes risks including outdated or incorrect information. Both note bloat and copy-forwarding can be detrimental to note quality.[11-13] By reducing note length and percentage of the note copied forward, our templates minimize risk of potential harm, and likely improve the readability of these notes.

Our study has several limitations and areas for future investigation. We did not directly investigate the impact of the optimized templates on total resident work hours or resilience to burnout. Additionally, we could not perform subgroup analysis based on resident level of training and specific residency program. Finally, while we included billing and coding representatives in the creation of the templates, we did not assess the effect of templates on reimbursement metrics in this study.

Conclusions

The use of optimized EHR templates decreases resident note-writing time for progress notes, while also improving other quality metrics, including reducing note character length and the amount of copy-forward text.

References

1. Chaiyachati KH, Shea JA, Asch DA, et al. Assessment of inpatient time allocation among first-year internal medicine residents using time-motion observations. *JAMA Intern Med*. 2019;179(6):760-767. doi:10.1001/jamainternmed.2019.0095
2. Mamykina L, Vawdrey DK, Hripcsak G. How do residents spend their shift time? A time and motion study with a particular focus on the use of computers. *Acad Med*. 2016;91(6):827-832. doi:10.1097/ACM.0000000000001148
3. West CP, Dyrbye LN, Shanafelt TD. Physician burnout: contributors, consequences and solutions. *J Intern Med*. 2018;283(6):516-529. doi:10.1111/joim.12752
4. Gopal R, Glasheen JJ, Miyoshi TJ, Prochazka AV. Burnout and internal medicine resident work-hour restrictions. *Arch Intern Med*. 2005;165(22):2595-2600. doi:10.1001/archinte.165.22.2595
5. Shanafelt TD, Dyrbye LN, Sinsky C, et al. Relationship between clerical burden and characteristics of the electronic environment with physician burnout and professional satisfaction. *Mayo Clin Proc*. 2016;91(7):836-848. doi:10.1016/j.mayocp.2016.05.007
6. Gardner R, Cooper E, Haskell J, et al. Physician stress and burnout: the impact of health information technology. *J Am Med Inform Assoc*. 2019;26(2):106-114. doi:10.1093/jamia/ocy145
7. Tajirian T, Stergiopoulos V, Strudwick G, et al. The influence of electronic health record use on physician burnout: cross-sectional survey. *J Med Internet Res*. 2020;22(7):e19274. doi:10.2196/19274
8. 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. doi:10.1001/archinternmed.2009.534
9. Aylor M, Campbell EM, Winter C, Phillipi CA. Resident notes in an electronic health record. *Clin Pediatr (Phila)*. 2017;56(3):257-262. doi:10.1177/0009922816658651
10. Epstein JA, Cofrancesco J Jr, Beach MC, et al. Effect of outpatient note templates on note quality: NOTE (Notation Optimization through Template Engineering) randomized clinical trial. *J Gen Intern Med*. 2021;36(3):580-584. doi:10.1007/s11606-020-06188-0
11. Hilliard RW, Haskell J, Gardner RL. Are specific elements of electronic health record use associated with clinician burnout more than others? *J Am Med Inform Assoc*. 2020;27(9):1401-1410. doi:10.1093/jamia/ocaa092
12. O'Donnell HC, Kaushal R, Barrón Y, Callahan MA, Adelman RD, Siegler EL. Physicians' attitudes towards copy and pasting in electronic note writing. *J Gen Intern Med*. 2009;24(1):63-68. doi:10.1007/s11606-008-0843-2
13. Rule A, Bedrick S, Chiang MF, Hribar MR. Length and redundancy of outpatient progress notes across a decade at an academic medical center. *JAMA Netw Open*. 2021;4(7):e2115334. doi:10.1001/jamanetworkopen.2021.15334

Madison B. Calder, MD, Capt, USAF, is a PGY-3 Internal Medicine Resident, Department of Internal Medicine, UC Davis Health, Sacramento, California, USA; **Matt Hanson, MAS, CST, CPHIMS,** is a Clinical Application Analyst, Innovation Technology, UC Davis Health, Sacramento, California, USA; **Melissa Jost, MS, PMP,** is Director of Clinical Informatics, UC Davis Health, Sacramento,

California, USA; and **Kristen D. Kelley, MD,** is Assistant Clinical Professor, Department of Internal Medicine, UC Davis Health, Sacramento, California, USA.

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

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

This work was previously presented as an abstract at the ACP National Meeting, San Diego, California, USA, April 27, 2023, and Northern California Regional ACP Meeting, Stanford, California, USA, October 15, 2022.

Corresponding author: Kristen D. Kelley, MD, UC Davis Health, Sacramento, California, USA, kdkel@ucdavis.edu