

A Prescription for Note Bloat: An Effective Progress Note Template

Daniel Kahn, MD^{1*}, Elizabeth Stewart, MD², Mark Duncan, MD¹, Edward Lee, MD¹, Wendy Simon, MD¹, Clement Lee, MD¹, Jodi Friedman, MD¹, Hilary Mosher, MD³, Katherine Harris, MD³, John Bell, MD, MPH⁴, Bradley Sharpe, MD⁵, Neveen El-Farra, MD¹

¹Department of Medicine, David Geffen School of Medicine, University of California, Los Angeles; ²Division of Hospital Medicine, Alameda Health System, Oakland, California; ³Department of Internal Medicine, Carver College of Medicine, Iowa City, Iowa; ⁴Department of Internal Medicine, Division of Hospital Medicine, University of California, San Diego; ⁵Department of Medicine, Division of Hospital Medicine, University of California, San Francisco.

BACKGROUND: United States hospitals have widely adopted electronic health records (EHRs). Despite the potential for EHRs to increase efficiency, there is concern that documentation quality has suffered.

OBJECTIVE: To examine the impact of an educational session bundled with a progress note template on note quality, length, and timeliness.

DESIGN: A multicenter, nonrandomized prospective trial.

SETTING: Four academic hospitals across the United States.

PARTICIPANTS: Intern physicians on inpatient internal medicine rotations at participating hospitals.

INTERVENTION: A task force delivered a lecture on current issues with documentation and suggested that interns use a newly designed best practice progress note template when writing daily progress notes.

MEASUREMENTS: Note quality was rated using a tool designed by the task force comprising a general

impression score, the validated Physician Documentation Quality Instrument, 9-item version (PDQI-9), and a competency questionnaire. Reviewers documented number of lines per note and time signed.

RESULTS: Two hundred preintervention and 199 postintervention notes were collected. Seventy percent of postintervention notes used the template. Significant improvements were seen in the general impression score, all domains of the PDQI-9, and multiple competency items, including documentation of only relevant data, discussion of a discharge plan, and being concise while adequately complete. Notes had approximately 25% fewer lines and were signed on average 1.3 hours earlier in the day.

CONCLUSIONS: The bundled intervention for progress notes significantly improved the quality, decreased the length, and resulted in earlier note completion across 4 academic medical centers. *Journal of Hospital Medicine* 2018;13:378-382. Published online first January 19, 2018. © 2018 Society of Hospital Medicine

The widespread adoption of electronic health records (EHRs) has led to significant progress in the modernization of healthcare delivery. Ease of access has improved clinical efficiency, and digital data have allowed for point-of-care decision support tools ranging from predicting the 30-day risk of readmission to providing up-to-date guidelines for the care of various diseases.^{1,2} Documentation tools such as copy-forward and autopopulation increase the speed of documentation, and typed notes improve legibility and ease of note transmission.^{3,4}

However, all of these benefits come with a potential for harm, particularly with respect to accurate and concise documentation. Many experts have described the perpetuation

of false information leading to errors, copying-forward of inconsistent and outdated information, and the phenomenon of “note bloat” – physician notes that contain multiple pages of nonessential information, often leaving key aspects buried or lost.⁵⁻⁷ Providers seem to recognize the hazards of copy-and-paste functionality yet persist in utilizing it. In 1 survey, more than 70% of attendings and residents felt that copy and paste led to inaccurate and outdated information, yet 80% stated they would still use it.⁸

There is little evidence to guide institutions on ways to improve EHR documentation practices. Recent studies have shown that operative note templates improved documentation and decreased the number of missing components.^{9,10} In the nonoperative setting, 1 small pilot study of pediatric interns demonstrated that a bundled intervention composed of a note template and classroom teaching resulted in improvement in overall note quality and a decrease in “note clutter.”¹¹ In a larger study of pediatric residents, a standardized and simplified note template resulted in a shorter note, although notes were completed later in the day.¹² The present study seeks to build upon these efforts by investigating the effect of didactic teaching and an electronic progress note template on note quality, length, and timeliness across 4 academic internal medicine residency programs.

***Address for correspondence:** Daniel Kahn, MD, Department of Medicine, David Geffen School of Medicine, University of California, Los Angeles, 757 Westwood Plaza #7501, Los Angeles, CA 90095; Telephone: 310-267-9643; Fax: 310-267-3840; E-mail: DaKahn@mednet.ucla.edu

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METHODS

Study Design

This prospective quality improvement study took place across 4 academic institutions: University of California Los Angeles (UCLA), University of California San Francisco (UCSF), University of California San Diego (UCSD), and University of Iowa, all of which use Epic EHR (Epic Corp., Madison, WI). The intervention combined brief educational conferences directed at housestaff and attendings with the implementation of an electronic progress note template. Guided by resident input, a note-writing task force at UCSF and UCLA developed a set of best practice guidelines and an aligned note template for progress notes (supplementary Appendix 1). UCSD and the University of Iowa adopted them at their respective institutions. The template's design minimized autopopulation while encouraging providers to enter relevant data via free text fields (eg, physical exam), prompts (eg, "I have reviewed all the labs from today. Pertinent labs include..."), and drop-down menus (eg, deep vein thrombosis [DVT] prophylaxis: enoxaparin, heparin subcutaneously, etc; supplementary Appendix 2). Additionally, an inpatient checklist was included at the end of the note to serve as a reminder for key inpatient concerns and quality measures, such as Foley catheter days, discharge planning, and code status. Lectures that focused on issues with documentation in the EHR, the best practice guidelines, and a review of the note template with instructions on how to access it were presented to the housestaff. Each institution tailored the lecture to suit their culture. Housestaff were encouraged but not required to use the note template.

Selection and Grading of Progress Notes

Progress notes were eligible for the study if they were written by an intern on an internal medicine teaching service, from a patient with a hospitalization length of at least 3 days with a progress note selected from hospital day 2 or 3, and written while the patient was on the general medicine wards. The preintervention notes were authored from September 2013 to December 2013 and the postintervention notes from April 2014 to June 2014. One note was selected per patient and no more than 3 notes were selected per intern. Each institution selected the first 50 notes chronologically that met these criteria for both the preintervention and the postintervention periods, for a total of 400 notes. The note-grading tool consisted of the following 3 sections to analyze note quality: (1) a general impression of the note (eg, below average, average, above average); (2) the validated Physician Documentation Quality Instrument, 9-item version (PDQI-9) that evaluates notes on 9 domains (up to date, accurate, thorough, useful, organized, comprehensible, succinct, synthesized, internally consistent) on a Likert scale from 1 (not at all) to 5 (extremely); and (3) a note competency questionnaire based on the Accreditation Council for Graduate Medical Education competency note checklist that asked yes or no questions about best practice elements (eg, is there a relevant and focused physical exam).¹²

Graders were internal medicine teaching faculty involved in the study and were assigned to review notes from their respec-

tive sites by directly utilizing the EHR. Although this introduces potential for bias, it was felt that many of the grading elements required the grader to know details of the patient that would not be captured if the note was removed from the context of the EHR. Additionally, graders documented note length (number of lines of text), the time signed by the housestaff, and whether the template was used. Three different graders independently evaluated each note and submitted ratings by using Research Electronic Data Capture.¹³

Statistical Analysis

Means for each item on the grading tool were computed across raters for each progress note. These were summarized by institution as well as by pre- and postintervention. Cumulative logit mixed effects models were used to compare item responses between study conditions. The number of lines per note before and after the note template intervention was compared by using a mixed effects negative binomial regression model. The timestamp on each note, representing the time of day the note was signed, was compared pre- and postintervention by using a linear mixed effects model. All models included random note and rater effects, and fixed institution and intervention period effects, as well as their interaction. Inter-rater reliability of the grading tool was assessed by calculating the intraclass correlation coefficient (ICC) using the estimated variance components. Data obtained from the PDQI-9 portion were analyzed by individual components as well as by sum score combining each component. The sum score was used to generate odds ratios to assess the likelihood that postintervention notes that used the template compared to those that did not would increase PDQI-9 sum scores. Both cumulative and site-specific data were analyzed. *P* values < .05 were considered statistically significant. All analyses were performed using SAS version 9.4 (SAS Institute Inc, Cary, NC).

RESULTS

A total of 200 preintervention and 199 postintervention notes were graded (1 note was erroneously selected twice, leading to 49 postintervention notes from that institution). Seventy percent of postintervention notes used the best practice note template.

The mean general impression score significantly improved from 2.0 to 2.3 (on a 1-3 scale in which 2 is average) after the intervention (*P* < .001). Additionally, note quality significantly improved across each domain of the PDQI-9 (*P* < .001 for all domains, Table 1). The ICC was 0.245 for the general impression score and 0.143 for the PDQI-9 sum score.

Among the competency questionnaire, the most profound improvement was documentation of only "relevant lab values and studies and removal of older data rather than importing all information" (29% preintervention, 63% postintervention, *P* < .001; Table 2). Additionally, significant improvements were seen in notes being "concise yet adequately complete," and in documenting a "relevant and focused physical exam," an "updated problem list," and "mention of a discharge plan" (Table 2). Copying and pasting a note from another physician did not decrease significantly (*P* = .36).

TABLE 1. Comparison of PDQI-9 Mean Scores Between Pre- and Postintervention Progress Notes

Domain	Pre [IQR] n = 200	Post [IQR] n = 199	P value
Up-to-date: The note contains the most recent test results and recommendations.	3.8 [3.3-4.0]	4.1 [3.7-4.7]	<.001
Accurate: The note is true. It is free of incorrect information.	3.8 [3.3-4.3]	4.1 [3.7-4.7]	<.001
Thorough: The note is complete and documents all of the issues of importance to the patient.	3.7 [3.3-4.0]	4.0 [3.4-4.6]	<.001
Useful: The note is extremely relevant, providing valuable information and/or analysis.	3.6 [3.2-4.0]	3.9 [3.3-4.3]	<.001
Organized: The note is well formed and structured in a way that helps the reader understand the patient's clinical course.	3.6 [3.3-4.0]	4.0 [3.7-4.4]	<.001
Comprehensible: The note is clear, without ambiguity or sections that are difficult to understand.	3.7 [3.3-4.0]	4.0 [3.7-4.5]	<.001
Succinct: The note is brief, to the point, and without redundancy.	3.4 [3.0-3.7]	3.8 [3.3-4.3]	<.001
Synthesized: The note reflects the author's understanding of the patient's status and ability to provide a plan of care.	3.6 [3.3-4.0]	3.9 [3.3-4.3]	<.001
Internally consistent: No part of the note ignores or contradicts any other part.	3.7 [3.3-4.0]	4.1 [3.7-4.7]	<.001

NOTE: PDQI-9 is a validated note scoring tool. Abbreviations: IQR, interquartile range; PDQI-9, Physician Documentation Quality Instrument, 9-item version; Post, postintervention; Pre, preintervention.

TABLE 2. Comparison of Percentage of Note Competency Questionnaire "Yes" Responses Between Pre- and Postintervention Progress Notes

Questionnaire Items	Pre n = 200	Post n = 199	P value
Are overnight events mentioned or is there an acknowledgement that there were none?	92%	94%	.36
Are the patient's complaints documented or is there an acknowledgement that there were none?	97%	100%	.41
Is there a relevant and focused physical exam documented?	87%	95%	<.001
Have relevant lab values and studies been documented rather than pasting all the information, and have older studies been removed?	29%	63%	<.001
Have relevant lab values and studies been addressed in the problem-oriented assessment and plan?	79%	88%	<.001
Is there a prioritized and updated problem list?	86%	91%	<.001
Is there a global assessment of whether the patient is clinically the same, improving, or worsening?	35%	46%	.04
Is DVT prophylaxis (or reason why it is not required) documented?	87%	97%	.20
Is code status documented?	90%	94%	.49
Is there mention of a discharge plan, goals of hospitalization, or estimated length of stay?	47%	78%	<.001
Is the author's name listed at the bottom of the note?	99%	99%	.98
Is the note copied and pasted from another physician's note?	14%	5%	.36
Is the note concise yet adequately complete (no excessive copy and paste, no excessive repetition of data, no missing key information, etc)?	61%	81%	<.001

NOTE: Abbreviations: DVT, deep vein thrombosis; Post, postintervention; Pre, Preintervention.

Three of four institutions documented the number of lines per note and the time the note was signed by the intern. Mean number of lines per note decreased by 25% (361 lines preintervention, 265 lines postintervention, $P < .001$). Mean time signed was approximately 1 hour and 15 minutes earlier in the day (3:27 PM preintervention and 2:10 PM postintervention, $P < .001$).

Site-specific data revealed variation between sites. Template use was 92% at UCSF, 90% at UCLA, 79% at Iowa, and

21% at UCSD. The mean general impression score significantly improved at UCSF, UCLA, and UCSD, but not at Iowa. The PDQI-9 score improved across all domains at UCSF and UCLA, 2 domains at UCSD, and 0 domains at Iowa. Documentation of pertinent labs and studies significantly improved at UCSF, UCLA, and Iowa, but not UCSD. Note length decreased at UCSF and UCLA, but not at UCSD. Notes were signed earlier at UCLA and UCSD, but not at UCSF.

When comparing postintervention notes based on template use, notes that used the template were significantly more likely to receive a higher mean impression score (odds ratio [OR] 11.95, $P < .001$), higher PDQI-9 sum score (OR 3.05, $P < .001$), be approximately 25% shorter (326 lines vs 239 lines, $P < .001$), and be completed approximately 1 hour and 20 minutes earlier (3:07 PM vs 1:45 PM, $P < .001$) than nontemplated notes from that same period. Additionally, at each institution, templated notes were more likely than nontemplated notes to receive a higher PDQI-9 sum score (OR at UCSF 6.81, $P < .05$; OR at UCLA 17.95, $P < .001$; OR at UCSD 10.99, $P < .001$; OR at Iowa 4.01, $P < .05$).

DISCUSSION

A bundled intervention consisting of educational lectures and a best practice progress note template significantly improved the quality, decreased the length, and resulted in earlier completion of inpatient progress notes. These findings are consistent with a prior study that demonstrated that a bundled note template intervention improved total note score and reduced note clutter.¹¹ We saw a broad improvement in progress notes across all 9 domains of the PDQI-9, which corresponded with an improved general impression score. We also found statistically significant improvements in 7 of the 13 categories of the competency questionnaire.

Arguably the greatest impact of the intervention was shortening the documentation of labs and studies. Autopopulation can lead to the appearance of a comprehensive note; however, key data are often lost in a sea of numbers and imaging reports.^{6,14} Using simple prompts followed by free text such as, "I have reviewed all the labs from today. Pertinent labs include..." reduced autopopulation and reminded housestaff to identify only the key information that affected patient care for that day, resulting in a more streamlined, clear, and high-yield note.

The time spent documenting care is an important consideration for physician workflow and for uptake of any note intervention.¹⁴⁻¹⁸ One study from 2016 revealed that internal medicine housestaff spend more than half of an average shift using the computer, with 52% of that time spent on documentation.¹⁷ Although functions such as autopopulation and copy-forward were created as efficiency tools, we hypothesize that they may actually prolong note writing time by leading to disorganized, distended notes that are difficult to use the following day. There was concern that limiting these "efficiency functions" might discourage housestaff from using the progress note template. It was encouraging to find that postintervention notes were signed 1.3 hours earlier in the day. This study did not measure the impact of shorter notes and earlier completion time, but in theory, this could allow interns to spend more time in direct patient care and to be at lower risk of duty hour violations.¹⁹ Furthermore, while the clinical impact of this is unknown, it is possible that timely note completion may improve patient care by making notes available earlier for consultants and other members of the care team.

We found that adding an "inpatient checklist" to the prog-

ress note template facilitated a review of key inpatient concerns and quality measures. Although we did not specifically compare before-and-after documentation of all of the components of the checklist, there appeared to be improvement in the domains measured. Notably, there was a 31% increase ($P < .001$) in the percentage of notes documenting the "discharge plan, goals of hospitalization, or estimated length of stay." In the surgical literature, studies have demonstrated that incorporating checklists improves patient safety, the delivery of care, and potentially shortens the length of stay.²⁰⁻²² Future studies should explore the impact of adding a checklist to the daily progress note, as there may be potential to improve both process and outcome measures.

Institution-specific data provided insightful results. UCSD encountered low template use among their interns; however, they still had evidence of improvement in note quality, though not at the same level of UCLA and UCSF. Some barriers to uptake identified were as follows: (1) interns were accustomed to import labs and studies into their note to use as their rounding report, and (2) the intervention took place late in the year when interns had developed a functional writing system that they were reluctant to change. The University of Iowa did not show significant improvement in their note quality despite a relatively high template uptake. Both of these outcomes raise the possibility that in addition to the template, there were other factors at play. Perhaps because UCSF and UCLA created the best practice guidelines and template, it was a better fit for their culture and they had more institutional buy-in. Or because the educational lectures were similar, but not standardized across institutions, some lectures may have been more effective than others. However, when evaluating the postintervention notes at UCSD and Iowa, templated notes were found to be much more likely to score higher on the PDQI-9 than nontemplated notes, which serves as evidence of the efficacy of the note template.

Some of the strengths of this study include the relatively large sample size spanning 4 institutions and the use of 3 different assessment tools for grading progress note quality (general impression score, PDQI-9, and competency note questionnaire). An additional strength is our unique finding suggesting that note writing may be more efficient by removing, rather than adding, "efficiency functions." There were several limitations of this study. Pre- and postintervention notes were examined at different points in the same academic year, thus certain domains may have improved as interns progressed in clinical skill and comfort with documentation, independent of our intervention.²¹ However, our analysis of postintervention notes across the same time period revealed that use of the template was strongly associated with higher quality, shorter notes and earlier completion time arguing that the effect seen was not merely intern experience. The poor interrater reliability is also a limitation. Although the PDQI-9 was previously validated, future use of the grading tool may require more rater training for calibration or more objective wording.²³ The study was not blinded, and thus, bias may have falsely elevated postintervention scores; however, we attempted to minimize bias by incor-

porating a more objective yes/no competency questionnaire and by having each note scored by 3 graders. Other studies have attempted to address this form of bias by printing out notes and blinding the graders. This design, however, isolates the note from all other data in the medical record, making it difficult to assess domains such as accuracy and completeness. Our inclusion of objective outcomes such as note length and time of note completion help to mitigate some of the bias.

Future research can expand on the results of this study by introducing similar progress note interventions at other institutions and/or in nonacademic environments to validate the results and expand generalizability. Longer term follow-up would be useful to determine if these effects are transient or long lasting. Similarly, it would be interesting to determine if such results are sustained even after new interns start suggesting that institutional culture can be changed. Investigators could focus on similar projects to improve other notes that are particularly at a high risk for propagating false information, such as the History and Physical or Discharge Summary. Future research should also focus on outcomes data, including whether a more efficient note can allow housestaff to spend more time with patients, decrease patient length of stay, reduce clinical errors, and improve educational time for trainees. Lastly, we

should determine if interventions such as this can mitigate the widespread frustrations with electronic documentation that are associated with physician and provider burnout.^{15,24} One would hope that the technology could be harnessed to improve provider productivity and be effectively integrated into comprehensive patient care.

Our research makes progress toward recommendations made by the American College of Physicians “to improve accuracy of information recorded and the value of information,” and develop automated tools that “enhance documentation quality without facilitating improper behaviors.”¹⁹ Institutions should consider developing internal best practices for clinical documentation and building structured note templates.¹⁹ Our research would suggest that, combined with a small educational intervention, such templates can make progress notes more accurate and succinct, make note writing more efficient, and be harnessed to improve quality metrics.

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