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The Prevalence of Copied Information by Attendings and Residents in Critical Care Progress Notes

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Abstract

Objective—To determine the prevalence and mechanism of copying among ICU physicians using an electronic medical record.

Design—Retrospective cohort study

Setting—Medical intensive care unit of an urban, academic medical center

Participants—2,068 progress notes of 135 patients generated by 62 resident and 11 attending physicians between August 1 and December 31, 2009.

Interventions—None

Measurements and Main Results—82% of all resident and 74% of all attending notes contained ≥20% copied information (p=.001). Although residents authored more copied notes than attendings, residents copied less information between notes than attendings (55% vs. 61%, p<. 001). Following ≥1 day off, residents copied less often from their own prior notes compared to attendings (66% vs. 94%, p < .001). Of the copied information following a day off, there was no difference in the amount of information copied into notes of residents (59%) or attendings (61%, p =.17). In a fixed effects regression model of attending notes, no patient factors were associated with copying. However, the levels of copying among attendings varied from 41% to 82% (p < . 001).

Conclusions—Copying among attendings and residents was common in this ICU-based cohort, with residents copying more frequently and attendings copying more information per note. The

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only factor that was independently associated with attending copying was the attending. Further studies should focus on further elucidating the factors influencing copying in the ICU and the effects of copying on patient outcomes.

Keywords

Electronic Health Records; intensive care units; medical informatics; cohort study

BACKGROUND

Electronic health records have been touted to improve the accessibility, legibility, and completeness of medical documentation while reducing medical errors and mortality rates (1). Electronic clinician-generated progress notes may be more complete and demonstrate more appropriate clinical decisions compared to their paper equivalents (2). For these and other reasons, national implementation of electronic health records is expected to save the US healthcare system $77.8 billion annually (3). Not surprisingly, the Health Information Technology for Economic and Clinical Health Act of 2009 (HITECH) has encouraged the widespread and meaningful use of electronic health records within the next 5 years. Currently however, due in part to the steep cost of such systems, only 1.5% of hospitals currently have a comprehensive system and only 9.1% of hospitals have even a basic system (4).

While there are many advantages to electronic health record implementation, some have expressed concern regarding the development of “e-iatrogenesis”- a term used to describe patient harm resulting from health information technology (5, 6). One way electronic health records may adversely affect patients is by facilitating the copying of patient information between progress notes. Copying of information may impede clinician communication by perpetuating incorrect, unhelpful, or out of date clinical information, and subsequently diminish confidence in the accuracy of information provided (7). A recent study found that nearly 90% of electronic health record-using physicians admitted to copying and 80% planned to continue doing so, making the need for a comprehensive understanding of the pervasiveness of copying essential to ensuring thoughtful widespread electronic health record implementation (8). The concern regarding the increasing prevalence of copying in electronic health record progress notes has even prompted the publication of journal editorials (9, 10).

The intensive care unit is an ideal site to explore the extent of copying because of the high acuity of the patients, the frequent need for expeditious decision-making, the presence of complicated and technologically-advanced treatments, and the necessity for clear communication to facilitate multidisciplinary collaboration (11). Despite this, the characteristics of copying have not been described in the critical care setting. We sought to examine the frequency of copying among physicians in the medical intensive care unit to better understand what modifiable factors may be contributing. We hypothesized that copying would be infrequent in the intensive care unit, particularly in the notes of those patients with the highest severity of illness.

MATERIALS AND METHODS

Design and Setting

We performed a retrospective cohort study involving patients admitted to a 14-bed medical intensive care unit in an urban academic medical center between August 1, and December 31, 2009. Patients were eligible if they had stayed in the intensive care unit for at least 72 consecutive hours. Attending physicians rotated every 12 days with another attending

covering the two days in between. Residents rotated every month and averaged one day off per week. The clinical team consisted of one attending, one critical care fellow, and four to five residents. The institutional review board of MetroHealth Medical Center, Cleveland, Ohio approved the study.

Data Collection

The assessment and plan portions of the progress notes of each patient (the portion of the note that contained the physician's impression regarding the patient's illness and plans for treatment) were extracted from the electronic medical record, EpicCare Inpatient Clinical System (EPIC Systems Corporation, Madison, WI) into a text file. We focused on the assessment and plan portion of the notes as we wanted the portion of the clinical record that most reflected physicians' thoughts regarding each patient's health status and treatment intentions. We were unable to separate the plan portion of the notes from the assessment as many authors had written them as one. All of the progress notes were typed into EpicCare directly by the physician. None of the clinicians dictated their notes.

EpicCare offers two ways to copy notes. The first, called "copy and paste function" involves highlighting the desired text, selecting "Copy" from the "Edit" pull-down menu, and then moving to the new progress note and selecting "Paste" from the same "Edit" menu. This allows any text from any note to be copied. The second method of copying, called "copy forward", involves opening a new, blank progress note and pushing the "Copy Text" button. This allows the entire last note created by the author to be copied into that author's new progress note. We attempted to differentiate the two forms of copying by identifying the source of the copied information and calculating the proportion of information copied. If the copied proportion was high and the source of the copied information was the same physician's last note, the "copy forward" method was most likely used. If the source of the copied information was another physician's note the "copy and paste function" was likely employed.

The text file generated from the progress note was uploaded into CopyFind, a GNU General Pubic Use License program developed by Louis Bloomfield (12) and used in similar studies evaluating medical copying (13). CopyFind was created to help identify plagiarism in education. CopyFind performed pair-wise comparisons of all progress notes of each patient and searched for identical matching word sequences. When a physician took time off, we compared the note written on their return to the note written by another physician on the day prior as well as the note written by the same physician prior to leaving. CopyFind has user-modifiable settings for identifying copied segments. We set it to identify matching phrases of more than 4 words and 20 total characters and to only report copying of ≥20%. We chose ≥20% to reduce the false positives of copying due to long phrases that are commonly employed in the medical intensive care unit such as "acute respiratory distress syndrome" (Figure 1). CopyFind then created a Hypertext Markup Language (HTML) file revealing each pair of documents side by side with the matching words and phases underlined (Figures 1 and 2).

Detailed patient information was obtained from the electronic record and included baseline demographics, admission diagnoses, primary insurance, severity of illness, and lengths of stay. Patients were followed for the entirety of their ICU stay. Patient deaths during the hospitalization were determined using the electronic record. Physician demographics were obtained through interview.

Statistical Analysis

For each patient, we determined the proportion of resident and attending progress notes containing ≥20% copied information. Patients were the unit of analysis. The *t* test was used to compare the mean copying proportion between attending and resident physicians and the mean copying proportion between notes on consecutive days compared to days following a physician hiatus. We then constructed a linear mixed model for repeated observations over time by patient and clustering of patients within physicians (intraclass correlation coefficient = .31). The effects of physicians on the primary response variable in this model (percent of copied information in attending notes) was assessed in several ways. In the initial model, physicians were included as a fixed categorical effect using dummy variables. For this model we generated the least square mean effects by physicians and tested pairwise differences with Tukey adjustment for multiple comparisons. In a second model, characteristics of attending physicians (gender, race, and years since fellowship) were included and assessed individually without an indicator for physicians. In addition, we constructed a model with characteristics of the interaction of demographics (race and gender) between patient and attending (i.e. both patients and attending the same or different gender or race). Only the final model was included in the results as the findings did not change. Similar models for resident physicians could not be constructed due to the large number of residents enrolled in the study.

Patient characteristics were determined *a priori* and included age, sex, race, ethnicity, insurance status, primary admission diagnosis, Acute physiology and Chronic Health Evaluation II (APACHE II) score at ICU admission and again 72 hours later, Sequential Organ Failure Assessment (SOFA) score at ICU admission and again 72 hours later, days of mechanical ventilation, and days in the ICU. The SOFA score at admission and 72 hours later were used in final models in place of APACHE II as it has been demonstrated to be a good indicator of prognosis (14) and no difference in the two was noted during model fitting. The unit of analysis for the regressions was the patient. Analyses were performed using SAS v.9.2 (Cary, NC). All *p* values represent 2-side hypothesis tests, and the significance level was .05.

RESULTS

Patient characteristics are found in Table 1. One hundred thirty five patients were admitted to the medical intensive care unit and had stays of longer than 3 days. The average age was 57 ± 16 years, 44% were men, and 16% of patients died during their hospitalization.

Physician characteristics and information regarding their progress notes are found in Table 2. Seventy-three physicians (62 residents and 11 attendings) cared for the 135 enrolled patients. Each patient had an average of 5 physicians caring for them during their intensive care unit stay. Patients stayed in the intensive care unit for an average of 7 ± 5 days and generated an average of 16 notes (8 by residents and 8 by attendings). Over the entire cohort, 2,068 notes (1047 resident and 1021 attending) were generated.

The assessment and plan portion of the progress notes were on average 92 words longer for residents compared to attendings (208 ± 99 vs. 116 ± 61, $p < .001$, Table 3). Copying was found in 82% of all resident notes and 74% of all attending notes. Residents copied less information between notes than attendings (55 ± 23% vs. 61 ± 21%, $p < .001$). The source of copying following at least one day off varied between residents and attendings. Residents were less likely to copy information from their own notes from prior to the day off than attendings were (66% vs. 94%, $p < .001$). However, whether information was obtained from their own notes prior to a day off or from a colleague's note on the day prior, both residents and attendings copied the same amount of information (59% vs. 61%, p = .17 and 52% vs.

49%, p = .48). Less than 20% of information was copied from attendings' notes to residents' notes and <20% of information was copied from residents' notes to attendings' notes. Similarly, we found <20% of information was copied from critical care physicians' notes into consultants' (residents' or attendings') notes.

There was significant variation in the average amount of copying among both attendings and residents. In a regression model adjusting for the clustered effect of patients by physicians, there was significant variation in mean copying amongst attendings ranging from 41% to 82% (Figure 3) However, no patient factors were associated with copying, including ICU length of stay (p = .34), patient age (p = .23), patient gender (p = .61), patient race/ethnicity (p = .94), patient insurance (p = .48), patient SOFA score at admission (p = .36), change in SOFA score after 72 hours (p = .66), admission diagnosis (p = .38), and days on mechanical ventilation (p = .44, Table 4). . There was no significant association between attending gender, race/ethnicity, or years following fellowship and mean copying. There was also no effect of racial concordance between provider and patient on copying.

DISCUSSION

In this cohort study conducted in the medical intensive care unit of an urban, academic medical center, copying of information in the assessment and plan portion of daily progress notes was prevalent among both resident and attending physicians. While residents copied more frequently than attendings, attendings copied more information between notes compared to residents. The majority of attending copying was from their own prior notes, both on consecutive days and following a day off. Attending physician was the only variable associated with copying.

Our finding of 74% copying among attendings, and 82% among all physicians in the medical intensive care unit is comparable to the prevalence of copying found in prior studies conducted outside of the medical intensive care unit. A study from the Utah VA hospital found an overall prevalence of 20% copying of patient notes (7). However, when they examined 60 patient records more closely, they found that 43 (72%) had at least one copied note. In another VA study, over 167,076 notes were analyzed for 1,479 patients (13, 15). Using the Copyfind software used in this study, the authors found 90,702 instances when "pairs of documents contained identical forty-word sentences." This amounts to a copy rate of 54%. The copy rates were greatest in the physical exam (25% of patient records), but the assessment portion of notes was fourth most common. Over the 7.5 years of analyzed data, the copy rates significantly increased with 2 notes with copied text in 1995 and 867 in 2001.

When interviewed, many physicians have acknowledged copying frequently in their electronic notes. In one study conducted at two academic medical centers, 90% of 253 physicians reported copying when writing progress notes (8). The majority (70%) reported copying almost always or most of the time when writing their notes. Residents were three times more likely to report high copying rates compared to attendings. Interestingly, the majority of the physicians who reported copying did so using the "copy and paste function". In this study, however, attending physicians were more likely to copy from their own notes than the notes of colleagues, suggesting use of the "copy forward" method. Intensivists in this study may have exhibited a lack of trust in the information found in the notes of colleagues, who were generally covering patients over the weekend, and therefore less often chose to copy information from their colleagues' notes.

The fact that copying prevalence in this intensive care unit-based study was not appreciably different from that of studies involving the notes of patients with lower severity of illness suggests that despite the need for intensive monitoring and therapies, physicians may not

feel obligated to convey new or changing information from day to day. Alternatively, the intensive care unit environment may make physicians feel more compelled to reduce their workload. Electronic health records have been demonstrated to slow the speed at which clinicians carry out clinical documentation and ordering processes (16). The addition a "copy forward" button to the electronic health record may provide physicians with an easy means to reduce workload. Another explanation for the high rate of copying in the intensive care unit may be a change in the perception of the utility of the medical record. Some authors have suggested that the primary purpose of writing progress notes has shifted from the transfer of knowledge to documentation for billing (11). As a result, physicians may be less invested in spending the time and effort necessary to convey new information and may prefer copying of existing information as a means to quickly completing an onerous task. We found no patient characteristics that were associated with copying among attendings. We also found that there was great variability in attending copying. These findings suggest that copying occurs at the whim of the intensivist regardless of the patient.

There are limitations of this study. We examined progress notes involving patients of a medical intensive care unit in a single hospital. The results may not be generalizable to other settings. The study was conducted during a time of year when the medical intensive care unit census is generally low. However, it is difficult to envision how an increased physician workload would be associated with less copying. Physicians in this study used EpicCare and while it is one of the most utilized electronic health records in the country, other electronic health records may be used differently. We did not directly observe the physicians in this study writing notes nor did we interview them to better understand their behavior. We chose to report a copying rate of greater than 20% to minimize the risk of false positives. In doing so, the reported copying prevalence was likely artificially low. However, with over 75% of the examined notes having some form of copying, even this prevalence is quite elevated.

Data continues to emerge demonstrating benefits to using electronic health records. In the ambulatory setting, diabetes care is significantly better at facilities using electronic compared to paper records (17). In inpatient settings, electronic records with physician order entry have been demonstrated to reduce medical errors and mortality (18, 19). They have also been shown to reduce time spent for daily activities, reduce costs and are positively regarded by nurses and clinicians (20–23). However, with the relative ease of copying information into progress notes, the possibility of inaccurate of diluted information exists in which true patient assessments and treatment plans may be missed and adverse patient outcomes may result (11). Copying may also lead to less independent thought thereby hampering the development of alternative diagnoses and treatments (9). This is of particular concern in training the next generation of doctors. As we transition to electronic health records we need to continue to focus on their strengths while being careful not to embrace their limitations.

Acknowledgments

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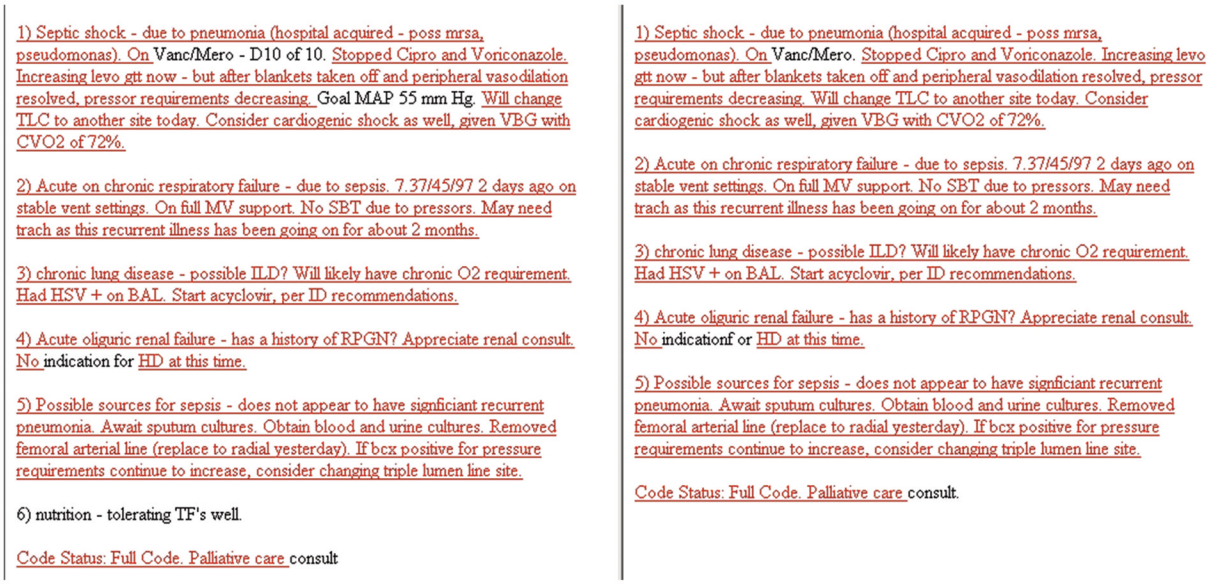

1) Septic shock - due to pneumonia (hospital acquired - poss mrsa, pseudomonas). On Vanc/Mero - D10 of 10. Stopped Cipro and Voriconazole. Increasing levo gtt now - but after blankets taken off and peripheral vasodilation resolved, pressor requirements decreasing. Goal MAP 55 mm Hg. Will change TLC to another site today. Consider cardiogenic shock as well, given VBG with CVO2 of 72%.

2) Acute on chronic respiratory failure - due to sepsis. 7.37/45/97 2 days ago on stable vent settings. On full MV support. No SBT due to pressors. May need trach as this recurrent illness has been going on for about 2 months.

3) chronic lung disease - possible ILD? Will likely have chronic O2 requirement. Had HSV + on BAL. Start acyclovir, per ID recommendations.

4) Acute oliguric renal failure - has a history of RPGN? Appreciate renal consult. No indication for HD at this time.

5) Possible sources for sepsis - does not appear to have signficiant recurrent pneumonia. Await sputum cultures. Obtain blood and urine cultures. Removed femoral arterial line (replace to radial yesterday). If bcx positive for pressure requirements continue to increase, consider changing triple lumen line site.

6) nutrition - tolerating TF's well.

Code Status: Full Code. Palliative care consult

1) Septic shock - due to pneumonia (hospital acquired - poss mrsa, pseudomonas). On Vanc/Mero. Stopped Cipro and Voriconazole. Increasing levo gtt now - but after blankets taken off and peripheral vasodilation resolved, pressor requirements decreasing. Will change TLC to another site today. Consider cardiogenic shock as well, given VBG with CVO2 of 72%.

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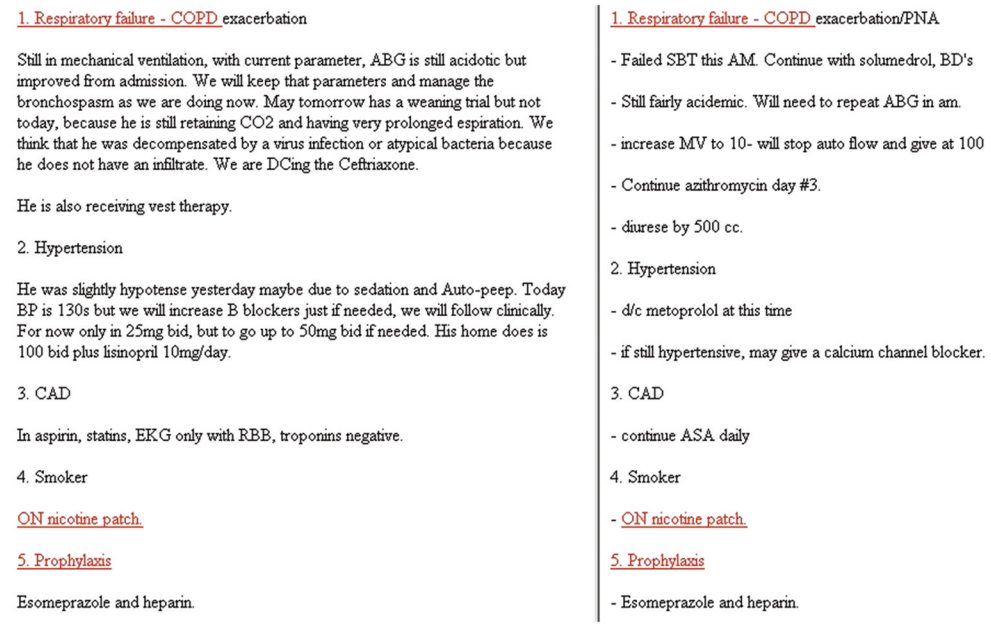
Code Status: Full Code. Palliative care consult.

Figure 1.

Example of low copying proportion (11%) among two consecutive daily progress notes authored by one resident physician. The copied portions of text were underlined by the CopyFind software program.



1. Respiratory failure - COPD exacerbation

Still in mechanical ventilation, with current parameter, ABG is still acidotic but improved from admission. We will keep that parameters and manage the bronchospasm as we are doing now. May tomorrow has a weaning trial but not today, because he is still retaining CO2 and having very prolonged espiration. We think that he was decompensated by a virus infection or atypical bacteria because he does not have an infiltrate. We are DCing the Ceftriaxone.

He is also receiving vest therapy.

2. Hypertension

He was slightly hypotense yesterday maybe due to sedation and Auto-peep. Today BP is 130s but we will increase B blockers just if needed, we will follow clinically. For now only in 25mg bid, but to go up to 50mg bid if needed. His home does is 100 bid plus lisinopril 10mg/day.

3. CAD

In aspirin, statins, EKG only with RBB, troponins negative.

4. Smoker

ON nicotine patch.

5. Prophylaxis

Esomeprazole and heparin.

1. Respiratory failure - COPD exacerbation/PNA

- Failed SBT this AM. Continue with solumedrol, BD's

- Still fairly acidemic. Will need to repeat ABG in am.

- increase MV to 10- will stop auto flow and give at 100

- Continue azithromycin day #3.

- diurese by 500 cc.

2. Hypertension

- d/c metoprolol at this time

- if still hypertensive, may give a calcium channel blocker.

3. CAD

- continue ASA daily

4. Smoker

- ON nicotine patch.

5. Prophylaxis

- Esomeprazole and heparin.

Figure 2.

Example of high copying proportion (90%) among two consecutive daily progress notes authored by one attending physician. The copied portions of text were underlined by the CopyFind software program.

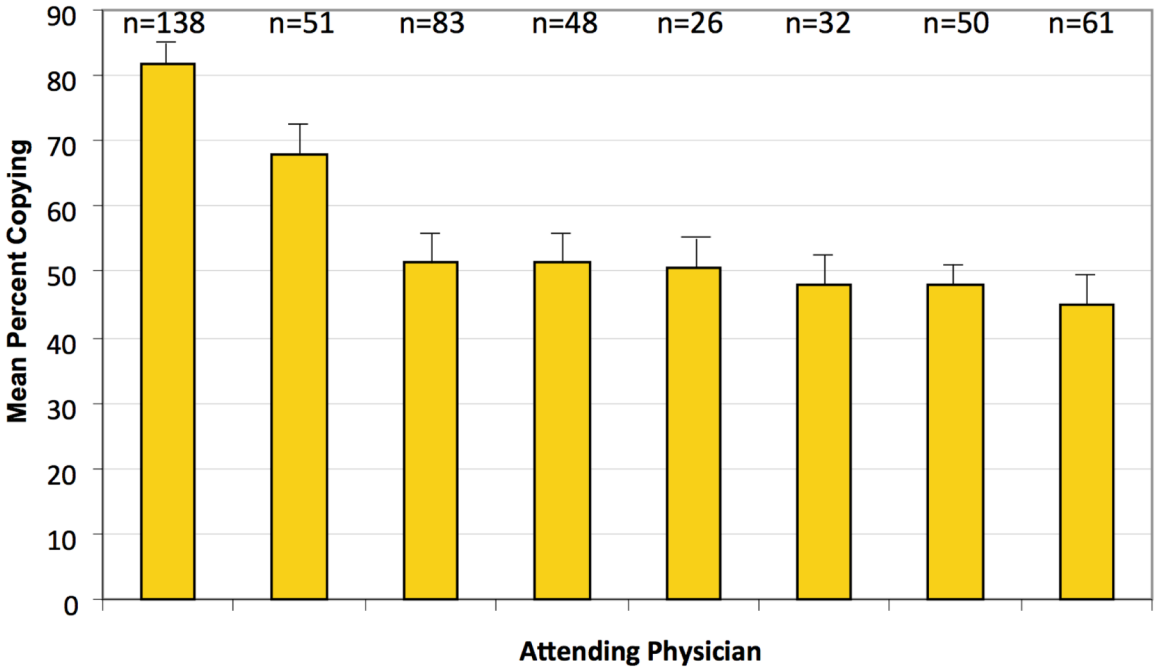


Figure 3. Adjusted mean percent copying by attending

Bars represent adjusted mean levels with standard error bars. The number of patients evaluated by each physician is listed above each bar. Three attending physicians with a small number of observations not displayed. Overall effect of attendings ($p<0.001$); pairwise differences between the first attending and all other attendings was significant ($p<0.05$); pairwise differences between attending two and all other attendings was significant ($p<0.05$); pairwise differences between the third and last attendings was significant ($p<0.05$).

Table 1

Patient Characteristics

	Patients (N = 135)
Age, mean (SD), y	57 (16)
Sex, no. of men (%)	59 (44%)
Race and Ethnicity, no. (%)	
White, Not Hispanic	87 (65%)
Black, Not Hispanic	33 (24%)
Hispanic	12 (9%)
Other	3 (2%)
Insurance, no. (%)	
Uninsured	12 (10%)
Medicaid	49 (36%)
Medicare	60 (44%)
Private	13 (10%)
Primary admission category, no (%)	
Acute respiratory failure	80 (59%)
Cardiovascular	5 (4%)
Gastrointestinal Hemorrhage	56 (4%)
Metabolic	5 (4%)
Neurologic	27 (20%)
Sepsis	12 (9%)
APACHE II on ICU admit, mean (SD)	20 (8)
APACHE II 72 hours following ICU admit, mean (SD)	16 (8)
SOFA on ICU admit, mean (SD)	8 (3)
SOFA 72 hours following ICU admit, mean (SD)	7 (3)
Mechanical ventilation, mean days (SD)	7 (5)
ICU length of stay, mean days (SD)	7 (5)
Hospital length of stay, mean days (SD)	14 (9)
In-hospital death, no (%)	22 (16%)

APACHE, Acute Physiology and Chronic Health Evaluation

ICU, intensive care unit

SOFA, Sequential Organ Failure Assessment

Table 2

Characteristics of the physicians and their progress notes

	Number (%)
Physicians, no. (%)	73
Residents	62 (85%)
Attendings	11 (15%)
Progress notes written, no. (%)	2,068
Resident notes	1047 (51%)
Attending notes	1021 (49%)
Notes per patient, mean (SD)	15 (9)
Resident notes	8 (4)
Attending notes	8 (4)
Physicians per patient, mean (SD)	5 (2)
Residents	2 (1)
Attendings	2 (1)

Table 3

Prevalence of progress note copying by ICU physicians

	Resident (773 Notes)	Attending (773 Notes)	*p**
Word count, mean (SD)	208 (99)	116 (61)	<0.001
Percent of notes with ≥20% copying	82%	74%	0.001
Percent of information copied per note**, mean (SD)	55% (23%)	61% (21%)	<0.001
Following ≥ 1 day off:			
Percent of information copied from same author's note**, mean (SD)	59% (21%)	61% (21%)	0.17
Percent of information copied from colleague's note**, mean (SD)	52% (24%)	49% (22%)	0.48

*p-value based on mixed models with patient admissions considered a random effect to account for within-patient clustering of observations

**among notes with at least 20% copying

Table 4

Patient characteristics independently-associated with increasing proportion of attending copying using multivariate regression

Patient Characteristic	Regression Coefficient	p	95% CI
Age	.08	.23	−.05 – .21
Women	−.91	.61	−4.4 – 2.6
Race and Ethnicity (White = referent)			
Black	−1.3	.58	−6.1 – 3.4
Hispanic	−.41	.9	−7.1 – 6.2
Other	1.5	.82	−12 – 15
Insurance Status (Uninsured = referent)			
Medicaid	−1.5	.66	−8.2 – 5.2
Medicare	−3.3	.33	−10 – 3.4
Private	.91	.83	−7.4 – 9.2
Admission category (Sepsis = referent)			
Acute Respiratory Failure	.08	.98	−6.1 – 6.3
Cardiovascular	6.4	.25	−4.6 – 17
Gastrointestinal Hemorrhage	−.51	.92	−11 – 9.9
Metabolic	4.7	.33	−4.8 – 14
Neurologic	−3.2	.36	−9.8 – 3.6
SOFA on ICU admit	.28	.35	−.32 – .9
SOFA change 72 hours following ICU admit	.14	.66	−.49 – .78
Duration of mechanical ventilation	−.16	.43	−.57 – .24
ICU length of stay	.49	.34	−.55 – 1.5
Attending Physicians			
Attending 1	−10	.06	−20 – .39
Attending 2	−3.3	.4	−11 – 4.4
Attending 3	30	<.001	25 – 35
Attending 4	16	<.001	9.1 – 24
Attending 5	.13	.97	−7.2 – 7.5
Attending 6	−.94	.83	−9.6 – 7.7
Attending 7	−3.4	.31	−10 – 3.2
Attending 8	−6.5	.04	−13 – −.29
Attending-Patient racial concordance	−1.3	.57	−6.0 – 3.3

Includes attendings who wrote notes on greater than 25 enrolled patients.

SOFA, Sequential Organ Failure Assessment

ICU, intensive care unit