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Medical Scribes Have a Variable Impact on Documentation Workflows

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Abstract

Physicians can reduce their documentation time by working with a scribe. However, what scribes document and how their actions affect existing documentation workflows is unclear. This study leverages electronic health record (EHR) audit logs to observe how scribes affected the documentation workflows of seven physicians and their staff across 13,000 outpatient ophthalmology visits. In addition to editing progress notes, scribes routinely edited exam findings and diagnoses. Scribes with clinical training also edited items such as vital signs that a scribe without clinical training did not. Every physician edited patient records later in the day when working with a scribe and those who deferred their editing the most had some of the largest reductions in EHR time. These results suggest that what scribes document, how physicians work with scribes, and scribe impact on documentation time are all highly variable, highlighting the need for evidence-based best practices.

Keywords:
Electronic Health Records; Documentation

Introduction

The rapid adoption of electronic health records (EHRs) has revolutionized healthcare in the United States, increasing medication safety, guideline adherence, and access to patient data [1]. However, the simultaneous regulation of EHRs through laws such as the HITECH Act has also increased *EHR burden* [2,3]. The typical primary care physician may now spend as much time interacting with an EHR as with patients [4,5]. Seeking to reduce their documentation burden, many providers have begun to employ medical scribes.

Medical scribes are clinic staff—often with little prior clinical experience—who enter data into patient records on behalf of a licensed provider such as a physician or nurse practitioner [6]. While quantitative studies have shown that employing scribes can boost clinic efficiency and reduce provider documentation time [7], qualitative studies suggest some ways of working with scribes may be safer or more effective than others [8,9]. However, what scribes document and how they affect existing documentation workflows has not been described in enough detail to suggest which ways of working with scribes may be most effective in reducing physician documentation time [6].

To help fill this gap, this study uses EHR audit logs—detailed records of EHR access—to observe how seven providers and their care teams documented 13,000 outpatient visits, both with and without the help of a medical scribe. By using audit logs to observe EHR use in detail and at scale, this study highlights just how variable scribe impact on documentation workflows can be, even amongst providers in the same specialty.

Methods

This study was designed to test two hypotheses: 1) that working with a scribe affects *what* and *when* physicians document, 2) that there is variation in how physicians adapt their workflows to incorporate scribes. By observing this variation, this study also sought to generate hypotheses about which ways of working with scribes might decrease physician documentation time the most.

Setting

This study was conducted at the Casey Eye Institute of Oregon Health & Science University (OHSU), a large academic medical center in Portland, Oregon. The study was approved by OHSU's Institutional Review Board which granted a waiver of informed consent for analysis of EHR metadata. The institute employs over 50 physicians who conduct more than 100,000 outpatient office visits every year. The institute uses an ophthalmology-specific module of a commercial EHR (Kaleidoscope; Epic Systems, Verona WI) to document patient care. We chose to study scribes in this context because:

1. Ophthalmology is a high-volume specialty where documentation workflows can be *fairly consistent* across patients, enabling easier observation of how working with scribe changes those workflows
2. Ancillary staff (i.e., ophthalmic technicians) already help physicians document outpatient visits, enabling us to observe how scribes affect documentation workflows that were already *collaborative*
3. Some of the scribes had prior clinical training, enabling us to observe *scribes with vs. without clinical training*

Participants

Study participants included seven ophthalmologists, six scribes, and 58 ophthalmic technicians. The seven ophthalmologists each specialized in glaucoma, retina, cornea, or comprehensive eye care. To maintain anonymity, we do not identify each physician's exact sub-specialty (Table 1).

Ophthalmic technicians are ancillary staff with ophthalmology-specific training. They are required to have college-level clinical training or certification in routine ophthalmic imaging and exams. At our study site, they help room patients and typically perform routine exams, including ophthalmology-specific exams (e.g., visual acuity tests). They typically document these exam values, the patient's medical history, and chief complaint, and may use a template to start a free-text note for the provider to later edit and sign.

In contrast to ophthalmic technicians, medical scribes are not required to have specific clinical training—many are pre-medical students seeking experience or non-clinical staff hired from an external scribe company—though existing clinical staff may also act as scribes. At our study site, scribes help physicians document their face-to-face encounter with the patient, which occurs after the technician exam. Of the six scribes in this study, one was a pre-medical student without prior clinical experience and five were ophthalmic technicians. Four providers worked with a shared pool of four clinically-trained scribes, one physician worked with a dedicated clinically-trained scribe, and the two other providers both worked with the same pre-medical scribe (Table 1).

Table 1–Attributes of Study Providers, Scribes, and Visits

Prov.	Scribe Type	Scribe	Non-Scribe Visits	Scribe Visits
1	Pre-Med	1	1902	717
2	Pre-Med	1	172	889
3	Tech	2	1094	109
4	Tech	3-6	639	1501
5	Tech	3-6	770	1189
6	Tech	3-6	1053	1152
7	Tech	3-6	726	1085

Log File Analysis

We collected data on all 22,569 outpatient office visits conducted in 2018 by the seven study providers. To restrict the dataset to typical office visits, we excluded all pre- or post-operative visits as well as visits where a resident or fellow was involved or a technician was not involved, based on the evidence of audit logs. This left 12,998 visits with 8,414 patients for analysis. We collected EHR audit logs for each of these visits, which contain time-stamped data on every high-level action performed in a patient's record (e.g., "Modify chief complaint", "Sign note") as well as who performed that action, from which computer, and whether the action modified the record or was only used to view information. Using previously validated methods, we identified the role of each EHR user as a physician, technician, or scribe [10]. Every encounter had both a technician and physician involved in providing and documenting care, while roughly half of the visits also involved a scribe, who was always different from the technician for the visit even when the scribe was trained as a technician.

To examine how scribes affected documentation workflows, we measured the proportion of scribed and non-scribed visits where providers, technicians, and scribes performed each record-modifying action (e.g., "Modify chief complaint") and compared the proportions of scribed and non-scribed visits using χ^2 tests. To compare when technicians and providers edited the patient chart, we first normalized the time of each record-modifying action relative to the scheduled start of the patient encounter. Since the distribution of these actions across time was non-parametric, we used bootstrapping to compare the median time technicians and providers interacted with the patient record between scribed and non-scribed visits [11].

To examine variation in scribe impact on documentation efficiency by provider, we measured the total time providers, technicians, and scribes spent documenting in the EHR for scribed and non-scribed visits. Documentation time was computed using a previously validated method of counting the number of separate minutes where each user performed an action in the EHR [10]. Documentation time per visit was non-normally distributed, so we compared total EHR times between scribed and non-scribed visits using bootstrapped means.

Results

What Scribes Documented

Figure 1 shows the proportion of visits where providers, technicians, and scribes performed certain actions that modified the patient record. Due to space constraints, the figure only includes actions that scribes performed during at least 10% of scribed visits.

The most frequent scribe action was *pending the progress* note – that is editing and saving a draft of the note for the provider to later edit and sign. The next most frequent action was *saving the patient's exam*, which scribes working with each provider did at >90% of visits. Scribes also *modified the visit diagnosis*, but with some variability. The scribe who worked with Providers 1 and 2 modified the diagnosis at >90% of visits while scribes working with the other five providers did so at 40-60% of visits. Beyond these three actions, there was substantial variation in what scribes working with different providers did to modify the patient record. For example, when working with Provider 1, Scribe 1 regularly modified the patient problem list and information about the patient's next follow-up appointment (i.e., >90% of visits). The same scribe rarely performed these actions while working with Provider 2 (i.e., <20% of visits).

We also observed a difference in the diversity of documentation tasks performed by the scribe working with Providers 1 and 2 and the five other scribes. The former consistently performed the same set of three or five actions each visit and rarely did anything else to modify the record. The scribes working with Providers 3-7 performed a wider range of actions relatively frequently (i.e., >20% of visits) such as updating the patient's vital signs or editing orders.

What Providers and Technicians Documented

While scribes edited the progress note, providers also edited, pended, and signed the same note themselves and continued to do so every visit, whether or not a scribe was present. However, working with scribes reduced how often providers performed other documentation actions. All seven providers were less likely to edit exam information when working with a scribe (χ^2, $p<.001$ for every provider). Providers were also significantly less likely to perform actions such as modifying the visit diagnosis or the patient's problem list when this was something their scribe routinely did (χ^2, $p<.001$ for every provider). This effect was especially pronounced for Providers 1-3 who experienced up to 50% reductions in the proportion of visits where they modified the diagnosis or problem list. Reductions in how often Providers 4-7 performed actions other than pending the note or editing the eye exam were more modest.

Working with scribes also affected what technicians documented. For technicians working with Providers 1 and 2, having the scribe modify information on patient problem lists or follow-ups changed how often those technicians performed these actions (χ^2, $p<.05$). However, the reductions were small (i.e., <10% of visits) as technicians working with these providers rarely performed these actions at non-scribed visits in the first place. This minimal change contrasts with the changes experienced by technicians working with Providers 3-7 who saw more widespread, though generally still modest (i.e., <20% of visits), reductions in how often they performed a wider range of actions such as modifying orders, diagnosis associations, or vital signs. These reductions were largest for technicians working with Provider 3 who, for example, went from reviewing problem lists during 30% of visits without scribes, to 0% of visits with a scribe (χ^2, $p<.001$).

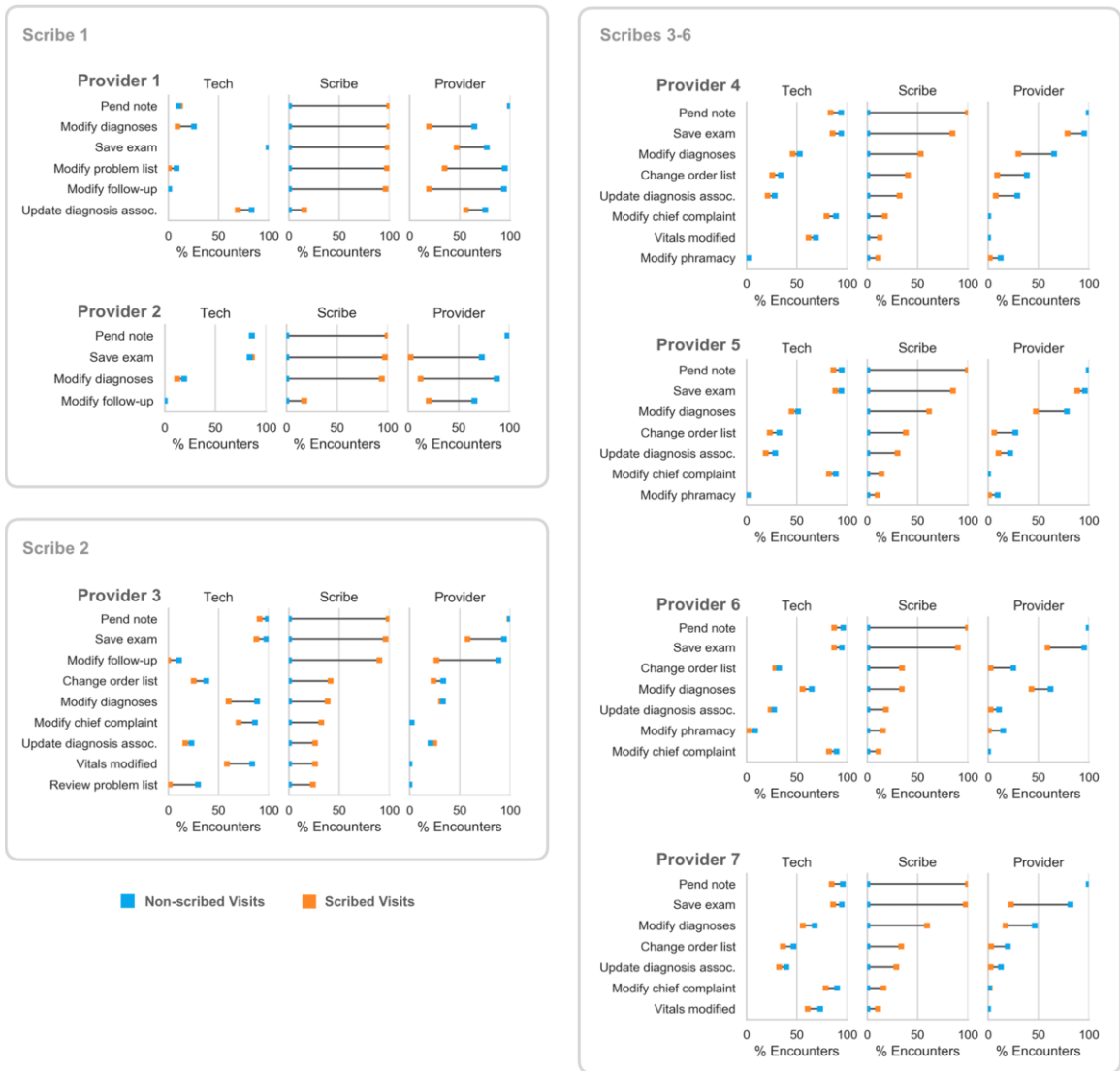

Figure 1 – Proportion of scribed and non-scribed visits where providers, technicians, and scribes performed select actions

When Providers and Technicians Documented

Working with scribes affected not only *what* providers and technicians documented, but also *when* they documented. All providers documented significantly later in the day when working with a scribe (Bootstrap, $p<.001$ for all providers). These shifts in median editing time ranged from just 6 minutes later for Provider 4 to over four hours later for Provider 2 (Table 2). The shift in editing time even varied between providers working with the same scribe (Figure 2). Technicians likewise tended to shift when they documented to earlier in the appointment when working with a scribe, though these shifts were generally smaller than those experienced by providers. The technicians working with Providers 2 and 3 did not shift their work significantly earlier (Bootstrap, $p>.05$), while technicians working with the other five providers shifted their median documentation time from 2 to 15 minutes earlier (Bootstrap, $p<.05$) (Table 2)

Variation in Documentation Efficiency

Figure 3 shows the mean total time technicians and providers spent documenting for both scribed and non-scribed visits. Technicians working with Providers 1 and 2 actually saw their documentation time go up when working with a scribe, though this change was only significant for technicians working with Provider 1 (Bootstrap, $p<.001$). Technicians working with the five other providers all saw their documentation time go down when working with a scribe ($p<.05$). All providers saw their documentation time go down when working with a scribe ($p<.001$), with mean decreases ranging from 4.3 minutes per visit for Provider 2 to just 1.5 minutes for Provider 7.

Discussion

This research provides three key contributions: 1) quantitative evidence on what scribes document, 2) quantitative evidence on how working with scribes affected what and when providers

and other members of the care team document, and 3) hypotheses about what factors may influence scribe impact.

Table 2 – Shift in median time when providers and technicians performed record-modifying actions when working with a scribe, relative to the start of the patient encounter

Prov	Prov Shift (min)	95% CI (min)	Tech Shift (min)	95% CI (min)
1	20.1	[17.2, 24.0] ***	-14.9	[-17.1, -12.6] **
2	268.3	[255.1, 282.3] ***	-0.7	[-3.3, 1.9]
3	83.9	[46.0, 123.1] ***	-2.3	[-5.4, 0.6]
4	6.2	[3.8, 8.3] ***	-3.5	[-4.9, -2.1] ***
5	10.0	[6.2 to 13.7] ***	-1.7	[-3.4, -0.1] *
6	20.1	[15.5, 25.2] ***	-1.9	[-3.3, -0.7] **
7	6.7	[3.1, 10.7] ***	-3.7	[-5.6, -2.1] ***

*p<.05, **p<.01, ***p<.001, Confidence intervals and significance levels were generated through 1000-fold bootstrapping

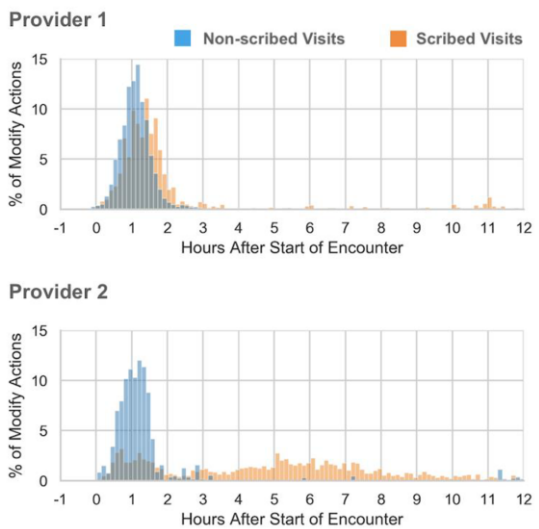

Figure 2– Histogram of when two providers working with the same scribe edited patient records during scribed and non-scribed visits

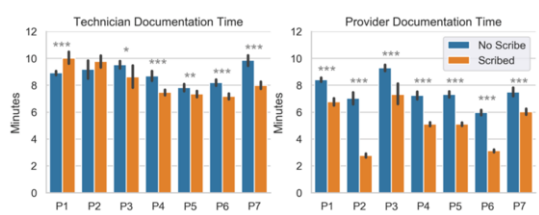

*Figure 3 – Mean technician and provider documentation time per visit for visits with and without scribes. Error bars show bootstrapped 95% confidence intervals. Significant differences marked as: *=<.05, **=<.01, ***<.001*

Scribes consistently edited the visit progress note, exam findings, and visit diagnoses. This pattern fits the notion that scribes primarily capture information related to the physician's face-to-face encounter with a patient, when exam findings and diagnoses are often discussed. However, we also observed that some scribes regularly documented other aspects of care. For example, the clinically-trained scribes working with Providers 3-7 sometimes updated orders and vital signs. By contrast, the scribe without prior clinical training working with Providers 1 and 2 performed a more limited but consistent set of actions. This difference in what scribes edited may simply reflect individual differences between scribes or providers. Yet, it may also reflect a more systematic difference due to the increased clinical knowledge and experience of Scribes 2-6. Prior work has highlighted that scribes may perform activities beyond documenting the physician encounter [9]. However, the variation in what scribes documented based on their clinical training is a novel observation, in part because few studies have included clinically-trained scribes [7,9].

Impact on Provider and Technician Workflow

Working with scribes impacted both *what* and *when* physicians and technicians documented. All seven providers edited exam findings and visit diagnoses less often when their scribes edited this information. Technicians similarly documented some items less frequently when scribes edited them instead. More dramatic was scribe impact on *when* technicians and providers documented. Technicians working with five of the seven providers documented earlier when working with scribes, while all seven providers documented later when working with scribes. For some teams, these shifts may reflect "making room" for scribes in a documentation workflow so they can edit the record after technicians and before physicians. However, the large shifts in when some providers edited the record may reflect a more fundamental reorganization of documentation workflows. For example, providers such as Provider 2 may have shifted from sequentially documenting after each patient visit to batch editing patient records at the end of the day.

Variation in Documentation Efficiency

Documentation efficiency varied as well. Technicians working with Providers 1 and 2 saw their average documentation time go up when working with the pre-medical scribe, though this increase was only significant for technicians working with Provider 1. By contrast, technicians working with the five other providers who employed clinically-trained scribes all saw their documentation time decrease. This may again reflect individual differences, or a more systematic difference in how well scribes with and without prior medical training can integrate into existing documentation workflows. And while all physicians saw their documentation time decrease while working with a scribe, some saw more dramatic reductions in documentation time than others. Those providers with the greatest reduction in documentation time appear to be among those who documented latest in the day when working with scribes (e.g., Providers 2 and 6). However, additional data on more physician-scribe pairs are needed to test this hypothesis.

Implications for Training and Design

There is currently a robust debate about how scribes should be trained, what they should be allowed to do, and how they might be employed to most effectively reduce provider's EHR burden [12–15]. While some argue that scribes—especially those with clinical training—could have a wider scope of practice to help reduce provider burnout [15], others raise concerns that employing scribes risks patient safety, especially if scribes without clinical training are allowed to place orders [13]. There is also concern that EHR features designed for physicians, such a drug-drug interaction alerts, will be presented to scribes who may not be able to judge their relevance or severity.

This study finds evidence suggesting scribes' clinical training may impact not only what they document, but also the work of other team members. In particular, scribes lacking prior medical training may in some cases increase the workload of other

clinical staff, even as they decrease physician workload. If supported by additional studies, this finding suggests care teams might benefit from training scribes on a wider range of clinical tasks, employing scribes with prior clinical experience, or finding ways to better integrate them into the clinic workflow. The observed variance in what scribes documented also suggests that EHR interfaces may need to consider how best to present information to scribes with and without prior clinical training who may have different scopes of practice.

There has also been increasing recognition that providers may benefit from training on how best to work with scribes [8,9], though best practices are still emerging [12,14]. This study suggests that *when* providers document (e.g., after every encounter versus at the end of the day) may influence physician documentation time. Future work is needed to test this hypothesis, however, differences in when and how long providers spent documenting with scribes—even providers working with the same scribe (Figure 2)—suggest more attention should be paid to physician-level factors.

Limitations

This study has several limitations which future work could address. First, it included only seven providers and six scribes. More data are needed to test hypotheses about the impacts of scribe clinical experience and physician workflow on documentation efficiency. This research was also conducted in a single outpatient department where technicians already assisted with documentation. The primary finding, that scribe impact varies, likely still holds true in other contexts, but it may manifest differently. This study also included only one scribe without prior clinical training, so differences between that scribe and the five scribes with clinical training may primarily reflect individual differences. Finally this study only examined scribe impact on record editing, though scribes likely also affect how providers review the patient record.

Conclusions

Through a detailed analysis of EHR audit logs, this study provides some of the first quantitative evidence on what scribes document and how employing scribes affects existing documentation workflows. We find scribes document aspects of care beyond the progress note and physical exam, including modifying diagnoses and orders. We also find that working with scribes led physicians and other clinic staff to shift when they edited the record. Yet, what scribes documented, how providers adapted their workflows to incorporate scribes, and scribes' impact on physician documentation time were all highly variable. This variation highlights the need for evidence-based best practices. Larger studies across more specialties might determine if factors such as scribes' clinical training and when physicians' edit the record are driving variance in scribe actions and physician documentation time. More evidence is also needed on how scribes affect chart review, data quality, and the quality of care. However, this study demonstrates how examining documentation workflows in detail can begin to illuminate best practices for how physicians, scribes, and other clinical staff can work together to document patient care.

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