Impact of Scribe Intervention on Documentation in an Outpatient Pediatric Primary Care Practice

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ABSTRACT

PURPOSE: The use of the electronic health record (EHR) has led to physician dissatisfaction, physician burnout, and delays in documentation and billing. Medical scribes can mitigate these unintended consequences by reducing documentation workload and increasing efficiency.

OBJECTIVE: To study the effects of medical scribes on time to completion of notes and clinician experience, with a focus on time spent charting during clinic and after-hours. We hypothesized that medical scribes in an outpatient pediatric setting would decrease clinician time spent charting, time to finalize encounter notes, and clinician's perceived documentation time.

METHODS: This 15-month single-center observational study was carried out with 3 study periods: *pre*-scribe, *with*-scribe, and scribe-*withheld*. Time spent in EHR was extracted by our EHR vendor. Participants completed surveys regarding time spent documenting. Six clinicians (5 physicians, 1 nurse practitioner) participated in this study to trial the implementation of medical scribes.

RESULTS: EHR time data were collected for 4329 patient visits (2232 *pre*-scribe, 1888 *with*-scribe, 209 scribe-*withheld* periods). Comparing *pre*-scribe versus *with*-scribe periods, documentation time per patient decreased by 3-minutes 28-seconds per patient (*pre*-scribe IQR: 6, *with*-scribe IQR: 3, $P = .028$); note timeliness decreased from 0.96 days to 0.26 days (*pre*-scribe IQR: 0.22, *with*-scribe IQR: 0.11, $P = .028$); and clinicians' estimates of time spent in the EHR decreased by 1.2 hours per clinic session (*pre*-scribe IQR: 0.5, *with*-scribe IQR: 0.5, $P = .031$).

CONCLUSIONS: Medical scribes in an outpatient pediatric setting result in: 1) decreased time spent charting, 2) reduced time to final sign clinic notes, and 3) decrease in clinician's perceived time spent documenting.

KEYWORDS: burnout; electronic health record; medical scribe; pediatrics

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WHAT'S NEW

Scribe research has been focused on productivity, patient/provider satisfaction, and work-flow in the emergency or subspecialty settings. This study demonstrates a reduction in quantitative electronic health record documentation time and clinician perception of documentation time in the outpatient primary care academic setting.

THE PROPOSED PRIMARY uses of the electronic health record (EHR), as published by the Institute of Medicine in 1997, and reiterated in 2003, are patient care delivery, management, support processes, financial/administrative processes, and patient self-management. The vision for this electronic system aimed to improve patient safety, health care delivery, chronic disease care, and efficiency in our large and cumbersome health care system.[1]

With the advent of the EHR, time spent documenting clinical encounters has changed dramatically for the clinician. Although its overarching goal was to increase efficiency, the multipurpose electronic record has increased the time for documentation and order entry, as stated by the Joint Commission.[2] In addition to creating encounter notes, clinicians spend many hours on electronic prescribing, correspondence via patient portals, computerized physician order entry, and electronic reconciliation of medications and diagnoses.

Physician dissatisfaction and burnout related to the use of EHR has increased enormously since the widespread adoption of electronic records. One study of 6375 US physicians showed that physicians who used EHRs and computerized physician order entry had lower overall job satisfaction, greater frustration with the amount of time spent on clerical tasks, and higher risk for professional burnout than those who did not use EHRs or computerized physician order entry systems.[3] In another study involving 585 primary care residents and faculty, burnout and work-life dissatisfaction were associated with increased time spent on the EHR.[4] The introduction of medical scribes has been shown to lessen clinicians' documentation burden and increase billing revenues in the emergency department[5,6] and to increase physician satisfaction in family medicine clinics.[7] Studies also demonstrate that patients and various subspecialists have positive views on the use of medical scribes.[8,9] A recent study involving 18 primary care internal medicine and family practice physicians also showed that the use of medical scribes decreased the time to chart completion, but did not significantly reduce EHR use outside of clinic hours.[8]

None of these findings, however, have been evaluated in the general pediatric outpatient setting, nor have studies examined the impact of medical scribes on documentation efficiency in pediatric settings. One study from a pediatric gastroenterology group evaluated multiple facets of a scribe intervention, including patient flow, medical note complexity codes associated with work relative value units (wRVUs) and note delinquency.[10] Another recent study examined 1 family medicine doctor and 1 internal medicine doctor with scribes over a 12-week period with regard to the patient and provider experience.[11] There are a variety of differences in primary pediatric care setting as compared with an internal medicine, emergency medicine or subspecialty practice, and the applicability of a scribe program is unknown in this clinic setting. Our group has previously demonstrated that scribes improve the wRVUs in a primary care pediatric setting.[12]

The present study examines the impact of medical scribes on actual and perceived documentation time in an academic pediatric outpatient practice using a 15-month single-center observational study design. We hypothesized that medical scribes in an outpatient pediatric setting would decrease clinician time spent charting, time to finalize encounter notes, and clinician's perceived documentation time.

METHODS

SETTING AND STUDY POPULATION

This study was conducted at a large academic pediatric primary care practice in central Pennsylvania that conducts ~40,000 outpatient visits per year. Of the 19 primary care clinicians (17 physicians and 2 nurse practitioners) working in this practice site, 6 clinicians (5 physicians and 1 nurse practitioner) participated in this study, having agreed to trial the implementation of medical scribes. These participants were surveyed on number of years in practice and any previous experience with scribes. Scribes were contracted through an independent scribe company, received standardized training prior to arrival, had independent log-in capability, and were present in the room and actively documented in the EHR during the clinical encounter. Scribes underwent standard training from the vendor, including a 2-week orientation to medical terminology and documentation for billing and HIPAA/PHI compliance, a minimum 6-day supervisory period with chart review and corrective feedback and clinical performance assessment, followed by periodic reassessment with monthly evaluations and provider-to-scribe satisfaction reporting. Clinicians reviewed, edited, and signed all clinical notes. Scribes previewed the charts prior to the encounter but not prior to the clinic sessions. The documentation labor was divided between the clinician and scribe based on provider preference and was dynamic based on mutual feedback. Questionnaires were distributed to the clinicians after each visit, at the end of each week, and at the end of the study to ascertain their perceptions regarding documentation times.

STUDY DESIGN

This study used a single-center observational study design with 3 study periods: pre-scribe, with-scribe, and scribe-withheld. The EHR documentation time studied for the *pre*-scribe period for each clinician was from March 19, 2017 to June 3, 2017. The *with*-scribe period for each clinician was from March 19, 2018 to June 3, 2018. Data collected during this timeframe then were matched with data from the same time period in 2017 in order to reduce the variations in visit numbers, acuity, seasonal diagnoses, and clinic flow for the study period. The scribe-*withheld* period was 1-week long (at some point between April 19 and June 3, 2018) with scribes being withheld from each clinician after s/he had already worked with a scribe for at least 1 month. This scribe-withhold was conducted to verify that any scribe effects were not due to unrecognized changes in practice patterns or institutional factors since baseline data were gathered in 2017. The week when a given clinician's scribe was with-held was chosen to maximize the number of clinic sessions without a scribe and to provide a representative mix of "well-child" and "sick" clinical encounters. Due the possibility of variance between clinicians, each clinician served as his or her own control. Scribes were not assigned to sessions in which the clinician was working with a pediatric resident. Following written consent, *pre*-scribe questionnaires were distributed to clinicians from August to October 2017, scribe-*witheld* questionnaires from April to June 2018, and *post*-scribe questionnaires from March to June 2018. This study was approved by the Penn State College of Medicine Institutional Review Board.

DATA COLLECTION

EHR TIME DATA

Particular EHR data parameters selected were discussed with the EHR vendor ("Time data analysis" U.S.

Patent number: 10339607), and agreed upon among the study team to examine provider-relevant EHR time as per the aims of the study.[13,14] *Active time* spent in the EHR was extracted by our EHR vendor, and is defined as time when the clinician was logged into the EHR and entering keystrokes or moving the mouse. Pauses of 45 seconds or longer were subtracted from this time so that only active engagement with the EHR was recorded. The main outcome variable was *after-hours time* in the EHR outside of clinic hours, where clinic hours were defined as time during which patient visits were scheduled. *Per patient documentation time* is defined as the average number of hours spent entering information into clinical notes in the EHR per patient (which excludes time spent reviewing lab results or other clinical information, looking at clinic schedules, etc.). *Note timeliness* is defined as the number of days from the time a patient checked into the clinic until the clinic note was final signed. *Total EHR time per patient* is defined as the total time a clinician spent in the EHR (including entering clinical notes, reading and/or responding to patient messages, reading and/or responding to messages from nurses or other clinical staff) divided by the number of patients seen.

Survey Data

Surveys were developed to assess the clinician experience with and without scribes, and were constructed by 2 of the authors (B.H.L. and B.F.) after a thorough review of the literature and contact with multiple authors of related studies yielded no validated questionnaires on this topic. All surveys questions were checked for face validity by the study team and subsequent pilot testing with clinicians not involved with the study. Clinicians participating in the study were asked to complete 3 different surveys; the first administered immediately following the patient encounter (with or without a scribe), the second at the end of each week of the study period (with or without a scribe), and the third at the end of the entire study period. Question-items specific to clinicians' perception of time spent and anticipation of time to be spent in EHR included 4 free-text response items: a postvisit estimation of time to be spent charting each patient (ie, "I estimate that I still have __ minutes of charting to do on this patient encounter"), a weekly estimation of postshift charting ("The amount of time over the past week that I spent at home working on the EHR was: __ hours."), and both a *pre*-scribe and *with*-scribe estimation of time spent charting after hours across the entire study (ie, "*Before* scribes, how many hours did you spend charting after a 4-hour session shift"; *With* a scribe, how many hours did you spend charting after a 4-hour session shift.").

Statistical Analysis

All variables were summarized prior to any analysis with mean, standard deviations, and medians or frequencies and percentages to examine their distributions. Continuous variables were also assessed with histograms and normal probability plots to further assess their distribution. Outcome variables from the weekly and the postvisit surveys were measured either as time that was not normally distributed or on a 5-point ordinal Likert scale measuring agreement. In order to account for repeated measures related to each clinician and the nonparametric and ordinal nature of the outcome variables, we used Friedman's test to make comparisons between the *pre*-scribe, *with*-scribe, and scribe-*withheld* periods in terms of the median response. For the end-of-study survey, a Wilcoxon Signed Rank test was used to compare the median time *pre*-scribe to the median time *with*-scribe. All analyses were performed using SAS software version 9.4 (SAS Institute, Cary, NC).

Results

We had 6 participating clinicians, including 5 physicians and 1 nurse practitioner. Half (50%) of the participants had brief experiences working with a scribe prior to this pilot study; their time in practice ranged from 4 to 25 years; and 50% were women. Figure delineates the participant flow diagram throughout the study period.

Time Spent in EHR

Data were collected from the EHR for 4329 patient visits (2232 *pre*-scribe, 1888 *with*-scribe, and 209 in the scribe-*withheld* period). All times are summarized in Table 1.

Documentation Time

For each clinician, there was a decrease in average documentation time, from 7 minutes 22 seconds *pre*-scribe to 3 minutes 54 seconds *with*-scribe, which is an average decrease in documentation time of 3 minutes 28 seconds per patient with a P value of .028. An average of 8 patients were seen per clinic session during this study, which would save 27 minutes and 44 seconds per clinic session in documentation time with a scribe. During the scribe-*withheld* period, documentation times returned to *pre*-scribe timings.

Total EHR Time

For each clinician, there was a decrease in total EHR time per patient from the *pre*-scribe to *with*-scribe periods. On average, the 6 clinicians in this study spent 19 minutes in the EHR per patient *pre*-scribe, and 14 minutes *with*-scribe, which is an average decrease of 4 minutes 55 seconds per patient with the scribe intervention with a P value of .046. When the scribes were withheld, the time spent in EHR per patient increased past baseline to approximately 20 minutes per patient.

After-Hours Time

After-hours use of EHR decreased from approximately 40 minutes per day for each clinician *pre*-scribe to approximately 33 minutes *with*-scribe per day, a decrease of 7 minutes with a P value of .249. One clinician did experience a 10-minute increase in after-hours time per day with the scribe intervention, and another clinician a 1 minute increase. These increases in after-hours time are contrasted with the 4 other clinicians, all of whom

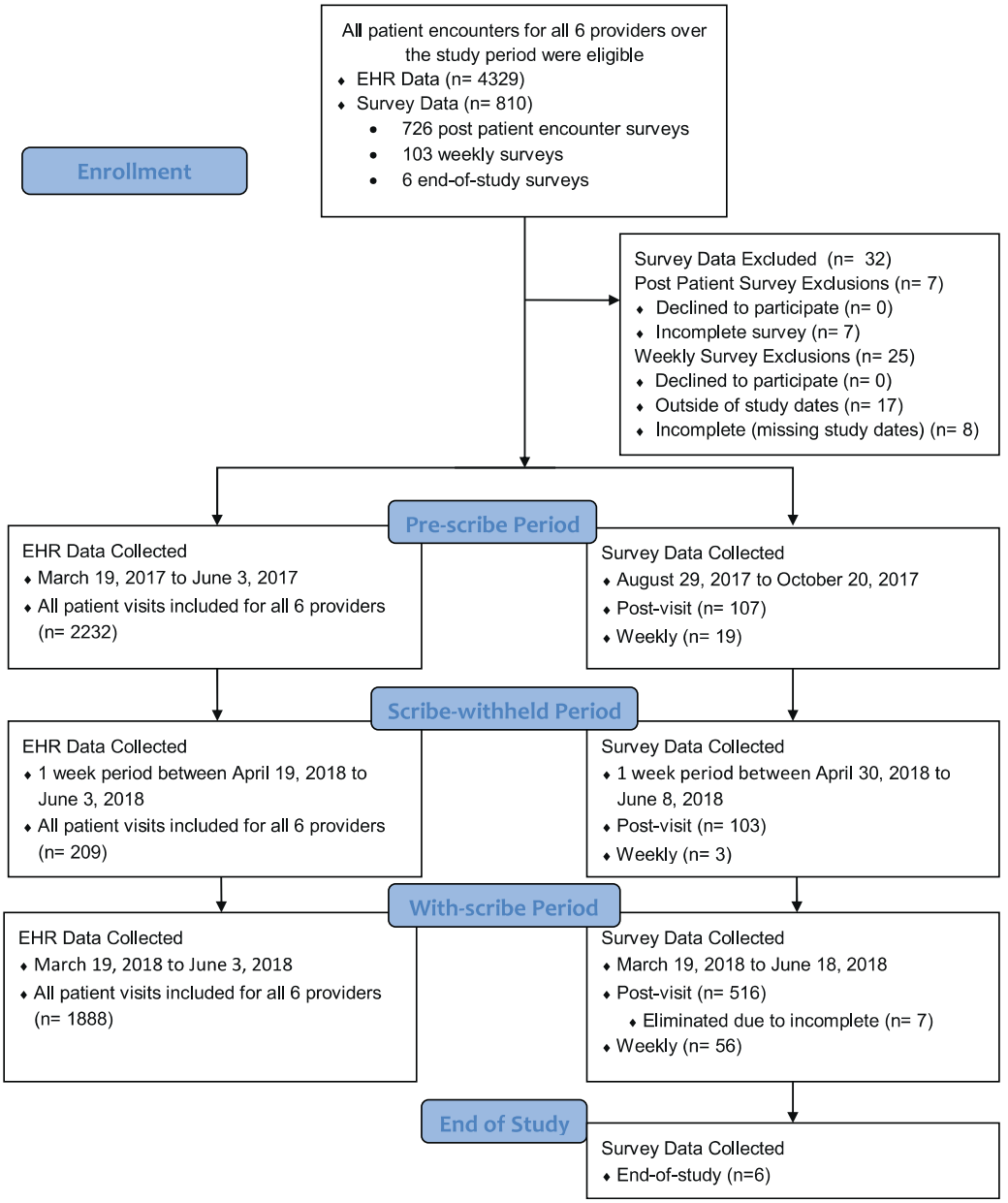

Figure. *Participant flow diagram.*

experienced a decrease in after-hours time. These outliers did affect the average and significance of this variable in our analysis. When scribes were withheld, the *post*-scribe use of the EHR increased past baseline to approximately 51 minutes per day across all providers.

Completion of Note

The timeliness in final-signing notes (from the time of initiation) decreased from 0.96 days *pre*-scribe to 0.26 days *with*-scribe, with a P value of .028. When scribes were withheld, the timeliness to final-sign notes worsened to 0.97 days.

Survey Data

Survey data were collected from clinicians immediately following each of 726 patient encounters (107 *pre*-scribe, 516 *with*-scribe, and 103 in the scribe-*withheld* period, with 7 surveys eliminated from the *with*-scribe period for being incomplete). The response rate was 100%. One hundred thirty-two end-of-week surveys were distributed to clinicians, and 103 were completed (78% response rate). Eight surveys were eliminated due to missing survey dates, and 17 were eliminated because they were outside of date ranges for our study. The remaining 78 end-of-week surveys were analyzed from clinicians (19 *pre*-scribe, 56 *with*-scribe, and 3 in the scribe-*withheld* period). One end-of-study survey was collected from each of the 6 participating clinicians, and all 6 were completed (response rate 100%). All survey data are summarized in Table 2.

In the *post-visit* surveys, clinicians' estimates of how many minutes of charting still had to be completed was significantly greater for patients seen during the *pre*-scribe

Table 1. Average Time Spent in EHR for all Clinicians

	Pre-Scribe(n = 2232) Median Times	*With*-Scribe(n = 1888) Median Times	*P* Value (*Pre*-Scribe Vs *With*-Scribe)*
Documentation time per patient			
(h:min:s)	0:07:22	0:03:54	.028
(IQR)	(0:06:00)	(0:03:00)	
EHR time per patient			
(h:min:s)	0:19:06	0:14:11	.046
(IQR)	(0:03:06)	(0:04:12)	
After-hours per day			
(h:min:s)	0:40:36	0:33:05	.249
(IQR)	(0:08:35)	(0:19:31)	
Note timeliness			
(days)	0.96	0.26	.028
(IQR)	(0.22)	(0.11)	

EHR indicates electronic health record and IQR, interquartile range.
*Friedman's test or Wilcoxon signed rank test.

Table 2. Clinician Estimates of Time Spent in EHR

	Pre-Scribe Median Times	*With*-Scribe Median Times	Scribe-*Withheld* Median Times	*P* Value (*Pre*-Scribe Vs *With*-Scribe)*
Postvisit survey: provider estimate of remaining documentation time per visit				
(h:min)	00:05	00:01	00:05	<.001
(IQR)	(00:00)	(00:01)	(00:04)	
(n)	(n = 107)	(n = 509)	(n = 103)	
Weekly survey: provider estimate at home EHR time per week				
(h:min)	03:30	01:00	01:00	<.001
(IQR)	(01:48)	(02:00)	(01:00)	
(n)	(n = 19)	(n = 56)	(n = 3)	
End of study survey: at home EHR time estimate per clinic session				
(h:min)	01:30	00:15	N/A	.031
(IQR)	(00:30)	(00:30)		
(n)	(n = 6)	(n = 6)		

EHR indicates electronic health record and IQR, interquartile range.
*Friedman's test or Wilcoxon signed rank test,

period, compared to *with*-scribe period ($P < .001$), and the same was true for the scribe-*withheld* period versus the *with*-scribe period ($P < .001$; Table 1). In the *weekly* surveys, clinicians also estimated that they spent less time at home working in the EHR *with*-scribe versus pre-scribe ($P < .001$).

Finally, in the *end-of-study surveys*, clinicians similarly reported that working with a scribe markedly decreased the (estimated) median time spent charting after a 4-hour clinic session *pre*-scribe from a median of 1.5 hours to 0.3 hours *with*-scribe, with a *P* value of .031.

DISCUSSION

This study supports our study hypothesis that a scribe intervention decreases actual time spent in the EHR outside of clinic hours and overall, as well as clinician perception of time spent in the EHR. In both quantitative measurement and qualitative estimates, average documentation times improved for our pediatric providers. Providers estimated 1 hour and 30 minutes per clinic session of at home documentation time without a scribe (*pre-scribe*), and 15 minutes per clinic session with a scribe. In reality, per EHR data collected, 40 minutes per day of after-hours documentation occurred *pre-scribe*, and 33 minutes with a scribe. This discrepancy in perception versus reality may speak to the impact of scribes on provider satisfaction[15] and morale.[16] Although there are published studies in emergency medicine,[5,17–19] internal medicine,[8,11,20] family practice,[7,8,20] and some adult and 1 pediatric subspecialty,[9,10] this is the first to report qualitative and quantitative outcomes of a scribe intervention in an outpatient general pediatric practice.

Clinician burnout is a growing problem in the United States, and a significant contributor to this is the time and effort spent engaging with the EHR. The stress associated with documentation can interfere with a clinicians' ability to engage with patients and families, physically, emotionally, and intellectually.[21] Primary care pediatrics relies heavily on a robust doctor-patient/parent relationship to provide education and reassurance, to accurately assess behavior and development, and to establish the trust that is needed to serve as a credible resource for both patients and parents. Fulfilling these expectations requires that

pediatricians have their eyes and ears on their patients and their families, and not a computer screen. With the current COVID-19 pandemic restrictions on numbers of people involved in a live encounter as well as social distancing requirements, the use of virtual scribes needs to be studied in the outpatient visit setting.[22] Virtual visits from the convenience of a patient's home can also lend itself to virtual or telescribe involvement.[23,24]

As shown in our group's previously published work,[12] in our clinic, the average number of patients seen over the study period was 8 patients per clinic session, factoring in no-shows and cancellations. The all-payer blended payment is $80.90 per wRVU. The mean wRVU per visit increased 7.68% from the *pre-scribe* period (1.49) to the *with-scribe* period (1.60, $P < .001$). This increase results in an additional 0.11 wRVUs per visit and an average all-payer increase of $8.90 per visit. With 8 visits per session and 2 sessions per day, this results in an increased average payment of $142.40 per day per provider. Nationally, the average salary for a medical scribe is $12.41 per hour in 2020, estimated to range from $15.51 to $15.91 per hour with benefits, or between $124 and $128 per day. As previously shown by our group, the scribe cost was defrayed by the increase in wRVU per visit without adding any additional patients to a provider's schedule and without any concerted attempt to use scribes to optimize billing.[12]

Our study demonstrates that documentation time per patient was reduced for each clinician with a scribe intervention. The average amount of time spent on after-hours documentation was also reduced. Time to complete the encounter note was also significantly reduced, enabling all providers to close the visit note on the same day as the encounter. Despite the requirement to proofread, edit and final-sign the scribe note, there was a significant reduction in time to final-sign the note as compared with writing his/her own note. In our study, it is notable that clinician self-assessments of documentation time with a scribe were markedly decreased, on a per patient basis, a weekly basis, and in retrospect at the end of the study period. Burnout and stress in clinicians have been found to be related to use of health information technology,[25,26] and even incremental decreases in perceived documentation time with scribe implementation should be emphasized. The implications of this for continuity of care, patient safety, and timely billing should be both obvious and compelling, as delays in documentation create a plethora of problems for colleagues providing cross-coverage, for clinical decision-making, and for third-party reimbursement of services provided.

LIMITATIONS

Study data were gathered from just 6 clinicians in 1 academic pediatric practice. These clinicians were selected for their willingness to work with scribes and be a part of this study. Scribes were not randomized to any provider or clinic sessions, which limits the view of different scribes across random providers. We do recognize the evolution of a scribe/provider relationship, and the synergy that develops. Our group's published study on wRVU changes with scribes demonstrate further increases in wRVU/visit in the last 3 weeks of this study, which may be attributed to this evolving relationship and feedback from the provider with subsequent scribe performance improvement.[12] We acknowledge that there is a ramp-up period when scribes and providers are learning to work together, which was not incorporated into this evaluation.

No a priori effect size was calculated prior to this study. All encounters with a scribe during the study period were included in the analysis, and all completed surveys from providers were included. Qualitative analysis of interviews conducted with providers at the end of the study are planned for the future. We recognize the danger of relying on medical scribes if the physician population is less diligent or dedicated. In implementing any innovation, we need to be mindful of unintended consequences. We received no reports of these in our pilot study or in a literature search.

Efforts were made to account for changes in visit types and patient volume, and also by controlling for time of year when collecting active EHR time data (ie, by using the same dates across 2 years for the pre- and post-scribe data). There was no such control for seasonal variation when collecting survey data, which could limit generalizability of the findings. Additionally, the internal control period (scribe-*withheld)* was limited to 1 week, with resultant limited control visits (n = 209). The reasons for the increase in after-hours time per day with the scribe intervention in 2 of the clinicians (by 10 minutes in 1 clinician, and by 1 minute in another clinician) is unclear, but may relate to increased scrutiny and attention to detail when editing scribe notes. Re-evaluation of these clinicians' EHR times at a later date, after continued experience and comfort with scribe documentation, would be helpful to elucidate these outliers. Other studies have demonstrated different impacts on different providers with regard to productivity, which may be due to individual variances between scribe capabilities or provider feedback, which may have also impacted our study group.[27] Finally, potential bias was introduced by 2 of the participants having helped design the survey tools. However, all data collection, data entry, and cleaning of data were performed by research assistants with no involvement of study investigators.

CONCLUSIONS

This study suggests that medical scribes in an outpatient primary care pediatric setting can significantly decrease clinicians' documentation burden, shorten the time-frame for final signing of notes in the EHR, and reduce the amount of time clinicians must spend after-hours completing their work.

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