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Effect of Medical Scribes on Throughput, Revenue, and Patient and Provider Satisfaction: A Systematic Review and Meta-analysis

Michael Gottlieb, MD*; Joseph Palter, MD; Jennifer Westrick, MSLIS; Gary D. Peksa, PharmD

*Corresponding Author. E-mail: MichaelGottliebMDGmail.com, Twitter: @MGottliebMD.

Study objective: Documentation in the medical record increases clerical burden to clinicians and reduces time available to spend with patients, thereby leading to less efficient care and increased clinician stress. Scribes have been proposed as one approach to reduce this burden on clinicians and improve efficiency. The primary objective of this study is to assess the effect of scribes on throughput, revenue, provider satisfaction, and patient satisfaction in both the emergency department (ED) and non-ED setting.

Methods: PubMed, Scopus, the Cumulative Index of Nursing and Allied Health Literature, Latin American and Caribbean Health Sciences Literature database, Google Scholar, the Cochrane Database of Systematic Reviews, and the Cochrane Central Register of Controlled Trials were searched for studies assessing the effect of scribes versus no scribes on the following outcomes: patients per hour, relative value units (RVUs) per hour, RVUs per encounter, clinic length of stay, time to disposition, ED length of stay, ED length of stay for admitted patients, ED length of stay for discharged patients, provider satisfaction, and patient satisfaction. Data were dual extracted into a predefined work sheet, and quality analysis was performed with the Newcastle-Ottawa Scale or Cochrane Risk of Bias Tool. Subgroup analyses were planned between ED versus non-ED studies.

Results: We identified 39 studies comprising greater than 562,682 patient encounters. Scribes increased patients treated per hour by 0.30 (95% confidence interval [CI] 0.10 to 0.51). Scribes increased RVUs per encounter by 0.14 (95% CI 0.03 to 0.24) and RVUs per hour by 0.55 (0.30 to 0.80). There was no difference in time to disposition (5.74 minutes; 95% CI –2.63 to 14.10 minutes) or ED length of stay (~3.44 minutes; 95% CI –7.68 to 0.81 minutes), although a difference was found in clinic length of stay (5.74 minutes; 95% CI 0.42 to 11.05 minutes). Fourteen of 16 studies reported favorable provider satisfaction with a scribe. Seven of 18 studies reported favorable patient satisfaction with a scribe. No studies reported negative provider or patient satisfaction with scribes.

Conclusion: Overall, we found that scribes improved RVUs per hour, RVUs per encounter, patients per hour, provider satisfaction, and patient satisfaction. However, we did not identify an improvement in ED length of stay. Future studies are needed to determine the cost-benefit effect of scribes and ED volume necessary to support their use. [Ann Emerg Med. 2021;77:180-189.]

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A podcast for this article is available at www.annemergmed.com.

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INTRODUCTION

Background

Documentation and clerical tasks have become a significant component of patient care in the emergency department (ED).1 However, time spent documenting the patient encounter and performing other clerical tasks can reduce the time available to spend with patients, which can lead to less efficient care.2-4 Physicians have also reported lower satisfaction with documentation and computerized physician order entry, which can lead to increased stress and burnout.5-7

To mitigate these challenges, medical scribes have been proposed as an approach to reduce the burden on physicians for mechanical data entry and documentation while increasing efficiency of care. A medical scribe is a nonclinician who assists with documentation in the medical record on behalf of the treating clinician.8 The scribe may also assist with other work flow components (eg, order entry, examination room preparation) in certain settings.

Purported benefits of medical scribe use include improved patient throughput, revenue, provider satisfaction, and patient satisfaction. However, the literature to support this is limited. In 2015, Heaton et al8 performed a systematic review and meta-analysis that
suggested a potential benefit, although the findings were restricted because of the available studies. Since then, there have been a large number of new publications, significantly increasing the available data on this topic and prompting the need for an updated review.

**Goals of This Investigation**

The primary objective of this study was to evaluate the effect of scribes on throughput, revenue, provider satisfaction, and patient satisfaction. We also planned an a priori subgroup analysis of ED versus non-ED studies.

**MATERIALS AND METHODS**

Our study conforms to the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines for systematic reviews and was performed in accordance with best-practice guidelines.9 This review was registered with PROSPERO. In conjunction with a medical librarian, we conducted a search of PubMed, Scopus, the Cumulative Index of Nursing and Allied Health Literature, the Latin American and Caribbean Health Sciences Literature database, Google Scholar, the Cochrane Database of Systematic Reviews, and the Cochrane Central Register of Controlled Trials to include citations from inception to April 11, 2019. An updated search using the same search terms was performed on March 2, 2020. Details of the search strategy are included in Appendix E1 (available online at [http://www.annemergmed.com](http://www.annemergmed.com)). We also manually searched all conference abstracts for the American College of Emergency Physicians (ACEP), Society for Academic Emergency Medicine, and the Canadian Association of Emergency Physicians. We reviewed the bibliographies of identified studies and review articles for potential missed articles.

Inclusion criteria consisted of all retrospective case-control or cohort, prospective observational, and quasi-randomized or randomized controlled trials comparing scribes with no scribes. Our primary outcome was patients per hour. Secondary outcomes included time to disposition, clinic length of stay, ED length of stay, ED length of stay for admitted patients, ED length of stay for discharged patients, relative value units (RVUs) per hour, RVUs per encounter, provider satisfaction, and patient satisfaction. Subgroup analyses were planned between ED versus non-ED studies. There were no date or age restrictions. We excluded case reports, case series, review articles, and studies that were not available in English or Spanish.

Two investigators (MG, JP) independently assessed studies for eligibility based on the above-mentioned criteria. All abstracts meeting the initial criteria were reviewed as full articles. Studies determined to meet the eligibility criteria on full-text review by both extractors were included in the final data analysis. Any discrepancies were resolved by consensus.

**Data Collection and Processing**

Two investigators (M.G., J.P.) independently extracted data from the included studies. The investigators underwent initial training and extracted data into a predesigned data collection form. The following information was abstracted: last name of the first author, publication year, study title, study country, study years, type of study design (eg, retrospective, prospective, randomized controlled trial), study location (eg, academic, community), type of practice (eg, ED, primary care clinic, specialty clinic), type of providers (eg, attending physicians, resident physicians), total patients in each group, patients per hour in each group, time to disposition in each group, clinic length of stay in each group, ED length of stay in each group, ED length of stay for admitted patients in each group, ED length of stay for discharged patients in each group, RVUs per hour in each group, RVUs per encounter in each group, provider satisfaction in each group, and patient satisfaction in each group. When data were missing or ambiguous, we contacted the authors for clarification. Studies were independently assessed for risk of bias by 2 investigators (M.G., J.P.) using the Newcastle-Ottawa
Scale for retrospective and prospective nonrandomized studies and the Cochrane Collaboration Risk of Bias Tool for randomized controlled trials. Overall study quality was assessed with the Grading of Recommendations, Assessment, Development, and Evaluation criteria. Any discrepancies were resolved by consensus.

**Primary Data Analysis**

Outcome data were pooled for meta-analyses with the generic inverse-variance statistical method with mean differences and associated standard errors as the effect measure. Preferably, estimates of effect were directly extracted from individual studies, and alternatively, confidence intervals (CIs) or $P$ values were used to obtain standard error values. If no individual study variances were reported, then the standard error value was imputed with the average of included studies for the given outcome measure. A random-effects model was used, given the anticipated heterogeneity in study settings and designs. Data were evaluated with 95% CIs. $\chi^2$ and $I^2$ statistics were used to assess statistical heterogeneity of outcomes. A funnel plot was used to assess for publication bias of the primary outcome, as well as Egger’s test for small-study effects. A priori analysis was planned to evaluate studies by subgroup (ED versus non-ED), as well as sensitivity analyses excluding retrospective studies. Statistical analyses were performed with RevMan (version 5.3; Nordic Cochrane Centre, Copenhagen, Denmark), and StataMP (version 13.0; StataCorp, College Station, TX) was used to assess publication bias.

**RESULTS**

A total of 1,088 studies were identified with the search strategy. PubMed identified 315 studies, Scopus discovered 371 studies, the Cumulative Index of Nursing and Allied Health Literature yielded 217 studies, the Latin American and Caribbean Health Sciences Literature database found 33, the Cochrane Database of Systematic Reviews identified 31 studies, and the Cochrane Central Register of Controlled Trials yielded no studies. In addition, the initial 100 studies from Google Scholar were also included as recommended by Bramer et al. On repeated search, an additional 21 studies were identified with Google Scholar. After removal of duplicates, 821 original abstracts were reviewed, with 163 selected for full-text review (Figure 1). No additional articles were identified through bibliographic

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Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-analyses flow diagram.
review. The search of ClinicalTrials.gov found one ongoing study assessing the effect of scribes on productivity and patient satisfaction (NCT04154462).

Thirty-nine studies were included, comprising greater than 562,682 patient encounters (Table E1, available online at http://www.annemergmed.com). Five studies were randomized controlled trials, 15–19 23 studies were prospective nonrandomized studies, 20–42 10 studies were retrospective, 43–52 and 1 study had both prospective and retrospective components. 53 All studies were published between 2010 and 2020. Most studies were conducted in the United States, 15–18,21,23,24,26–30,32–41,43–53 with 4 conducted in Australia 19,22,25,42 and 2 performed in Canada. 20,31 Nineteen studies were conducted in EDs, 17,19,20,22–27,31,36,38,42–46,50,52 10 occurred in specialty clinics, 15,21,30,33,37,40,47–49,51 9 took place in primary care clinics, 16,18,28,29,34,35,39,41,52 5 involved the ED and 1 involved a mix of primary care and specialty clinics. 35 No studies were funded by medical scribe companies and no relevant conflicts of interest were declared by the authors.

Seventeen studies evaluated patients per hour. 17,19,25,27,31,35,36,39,43,44,47,50 Patients treated per hour increased from 1.95 without a scribe to 2.25 with one (mean difference 0.30; 95% CI 0.10 to 0.51) (Table 1, Figure 1). Statistical heterogeneity was high, with $I^2=99%$. Funnel plot evaluation indicated asymmetry (Figure 3), and a post hoc sensitivity analysis determined that removal of 2 studies mitigated the skewness of the plot. Egger’s test for small-study effects indicated that no significant bias existed ($P=$.31). A sensitivity analysis including only prospective studies had similar results (mean difference 0.26; 95% CI 0.04 to 0.49). A subgroup analysis by study location indicated no difference in patients per hour in either the ED setting (2.01 without a scribe versus 2.25

with one; mean difference 0.24; 95% CI –0.00 to 0.49) or non-ED setting (1.73 versus 2.25; mean difference 0.52; 95% CI –0.06 to 1.09) (Table 2).

Ten studies measured RVUs per encounter, 17,21,23,26,33,35,38,39,48,50 whereas 7 evaluated RVUs per hour. 17,21,23,35,36,39,50 Scribes increased RVUs per encounter (2.39 without a scribe versus 2.53 with one; mean difference 0.14; 95% CI 0.03 to 0.24) and RVUs per hour (4.34 without a scribe versus 4.89 with one; mean difference 0.55; 95% CI 0.30 to 0.80) (Figures 4 and 5). Subgroup analyses by study location indicated that RVUs per encounter in non-ED settings showed no benefit, but a benefit was observed in ED settings. RVUs per hour showed benefit in both non-ED and ED settings. When retrospective studies were removed from the analysis, RVUs per encounter no longer demonstrated a difference between groups (mean difference 0.00; 95% CI –0.07 to 0.05), whereas RVUs per hour remained larger in the scribe group (mean difference 0.64; 95% CI 0.24 to 1.05).

Time to disposition was measured by 9 studies, 17,20,24,27,38,44,46,50,51 and was similar between groups (184.18 versus 178.44 minutes; mean difference 5.74 minutes; 95% CI –2.63 to 14.10 minutes) (Figure E1, available online at http://www.annemergmed.com). The sensitivity analysis with only prospective studies found similar results (mean difference 3.93 minutes; 95% CI –2.48 to 10.33 minutes). In 7 studies taking place in a clinic setting, 18,29,37,41,48,51,53 length of stay was shortened from 32.06 to 26.32 minutes with a scribe (mean difference 5.74 minutes; 95% CI 0.42 to 11.05 minutes) (Figure E2, available online at http://www.annemergmed.com). However, sensitivity analysis of prospective studies negated the benefit of a scribe (mean difference 1.51 minutes; 95% CI –0.96 to 3.98 minutes).

In an ED setting, total length of stay was reported by 6 studies. 19,23,24,27,38,45 Overall, it did not differ between groups (220.84 versus 224.28 minutes; mean difference –3.44 minutes; 95% CI –7.68 to 0.81 minutes) (Figure E3, available online at http://www.annemergmed.com). Four studies 45,46,50,52 reported ED length of stay for admitted patients and 5 studies 25,43,46,50,52 reported it for discharged patients. Similarly, ED length of stay for admitted patients (362.85 versus 368.55 minutes) and that for discharged patients (244.88 versus 235.48 minutes) were not affected by the presence of a scribe (Figures E4 and E5, available online at http://www.annemergmed.com). Sensitivity analyses of prospective studies yielded similar results for total ED length of stay (mean difference –2.72 minutes; 95% CI –7.19 to 1.76 minutes) and ED length of stay for discharged patients (mean difference 2.25 minutes; 95% CI –13.87 to 18.38 minutes). A sensitivity

### Table 1. Comparison of scribes versus no scribes.

| Outcomes                  | No. of Studies (No. of Patients) | Mean Difference* (95% CI) |
|---------------------------|----------------------------------|--------------------------|
| Patients per hour         | 17 (198,811)                     | 0.30 (0.10 to 0.51)      |
| RVUs per encounter        | 10 (114,550)                     | 0.14 (0.03 to 0.24)      |
| RVUs per hour             | 7 (109,482)                      | 0.55 (0.30 to 0.80)      |
| Time to disposition, min  | 9 (190,903)                      | 5.74 (~2.63 to 14.10)    |
| Clinic LOS, min           | 7 (124,340)                      | 5.74 (0.42 to 11.05)     |
| ED total LOS, min         | 6 (189,426)                      | ~3.44 (~7.68 to 0.81)    |
| ED LOS, admitted, min     | 4 (50,329)                       | ~5.70 (~21.49 to 10.08)  |
| ED LOS, discharged, min   | 5 (110,965)                      | 9.40 (~1.47 to 20.27)    |

LOS, Length of stay.

*Positive values favor the scribe group and negative ones favor the nonscribe group.
analysis was not performed for ED length of stay for admitted patients because only one study was prospective. Provider satisfaction was reported in 16 studies (Table E2, available online at http://www.annemergmed.com). Nine studies compared satisfaction between no scribe and a scribe.15,16,28,30,32–34,39,50 Of these 9 studies, 7 of them15,16,28,32–34,50 reported higher provider satisfaction with a scribe, whereas 2 of 9 studies30,39 reported no

| Study or Subgroup | Mean Difference | SE | Weight | Mean Difference | IV, Random, 95% CI | Mean Difference | IV, Random, 95% CI |
|-------------------|----------------|----|--------|----------------|-------------------|----------------|-------------------|
| Emergency Department |                |    |        |                |                   |                |                   |
| Bastani 2011       | 0.27 0.07      | 5.7%|        | 0.27 [0.13, 0.41] |                   |                |                   |
| Chin 2012          | 0.04 0.37      | 3.4%|        | 0.04 [-0.69, 0.77] |                   |                |                   |
| Marshall 2012      | 0.38 0.1       | 5.5%|        | 0.38 [0.18, 0.58] |                   |                |                   |
| Walker 2014        | 0.32 0.08      | 5.6%|        | 0.32 [0.16, 0.48] |                   |                |                   |
| Hess 2015          | 0.1 0.13       | 5.4%|        | 0.10 [-0.15, 0.35] |                   |                |                   |
| Heaton (Pediatric) 2016 | 0.04 0.07 | 5.7%|        | 0.04 [-0.10, 0.18] |                   |                |                   |
| Walker 2016        | 0.11 0.06      | 5.7%|        | 0.11 [-0.01, 0.23] |                   |                |                   |
| Heaton (Adult) 2017B | 0.13 0.07     | 5.7%|        | 0.13 [-0.01, 0.27] |                   |                |                   |
| Heaton (Pediatric) 2017B | 0.16 0.07   | 5.7%|        | 0.16 [0.02, 0.30]  |                   |                |                   |
| Fiedler 2018       | 0.1 0.05       | 5.8%|        | 0.10 [0.00, 0.20]  |                   |                |                   |
| Graves 2018        | 0.32 0.03      | 5.8%|        | 0.32 [0.26, 0.38]  |                   |                |                   |
| Addesso 2019       | 0.24 0.06      | 5.7%|        | 0.24 [0.12, 0.36]  |                   |                |                   |
| Shuabi 2019        | 0.9 0.01       | 5.8%|        | 0.90 [0.88, 0.92]  |                   |                |                   |
| Walker 2019        | 0.18 0.05      | 5.8%|        | 0.18 [0.08, 0.28]  |                   |                |                   |
| Subtotal (95% CI)  |                |    |        | 77.2%          | 0.24 [-0.00, 0.49]|                   |                   |

Heterogeneity: TAU^2 = 0.21; CHI^2 = 1272.94, df = 13 (P < 0.00001); I^2 = 99%
Test for overall effect: Z = 1.94 (P = 0.05)

Non Emergency Department

| Study or Subgroup | Mean Difference | SE | Weight | Mean Difference | IV, Random, 95% CI |
|-------------------|----------------|----|--------|----------------|-------------------|
| Bank 2013         | 1.3 0.04       | 5.8%|        | 1.30 [1.22, 1.38] |                   |
| Bank 2015         | 0.22 0.01      | 5.8%|        | 0.22 [0.20, 0.24] |                   |
| Zalman 2018       | 0.16 0.05      | 5.8%|        | 0.16 [0.06, 0.26] |                   |
| Heckman 2019      | 0.38 0.12      | 5.4%|        | 0.38 [0.14, 0.62] |                   |
| Subtotal (95% CI) |                |    |        | 22.8%          | 0.52 [-0.06, 1.09]|                   |

Heterogeneity: TAU^2 = 0.34; CHI^2 = 692.70, df = 3 (P < 0.00001); I^2 = 100%
Test for overall effect: Z = 1.76 (P = 0.08)

Total (95% CI) 100.0% 0.30 [0.10, 0.51]

Heterogeneity: TAU^2 = 0.19; CHI^2 = 3144.70, df = 17 (P < 0.00001); I^2 = 99%
Test for overall effect: Z = 2.90 (P = 0.004)
Test for subgroup differences: CHI^2 = 0.74; df = 1 (P = 0.39); I^2 = 0%

Figure 2. Forest diagram of patients per hour.

Figure 3. Funnel plot of studies assessing patients per hour.
difference. Seven studies reported provider satisfaction specifically with scribes without a comparator, and all results were supportive of scribes.

Patient satisfaction was reported in 18 studies, and all studies compared satisfaction between no scribe and a scribe (Table E3, available online at http://www.annemergmed.com). Seven studies reported favorable patient satisfaction with a scribe, and the remaining studies indicated a scribe presence made no difference in patient satisfaction.

Studies were deemed to be good quality overall. Of 11 retrospective studies evaluated by the Newcastle-Ottawa Scale, 1 study did not have proper selection of controls and 1 study did not have adequate representativeness of cases and had an inadequate nonresponse rate (Table E4, available online at http://www.annemergmed.com). Eleven of 23 prospective studies received all 9 points with the Newcastle-Ottawa Scale, 1 study did not have adequate representativeness of cases and had an inadequate nonresponse rate (Table E4, available online at http://www.annemergmed.com). One prospective study did not adequately select the nonexposed cohort. All retrospective studies and 10 prospective studies lost 1 point for comparability of cases and controls because of insufficient matching or controlling for confounders. According to the Cochrane Risk of Bias Tool, 3 randomized controlled trials were deemed to be of good quality, whereas 2 studies were rated of fair quality (Table E6, available online at http://www.annemergmed.com). One study was given high risk of bias because of inadequate random-sequence generation and unclear risk of bias for allocation concealment. The study by Mishra et al had unclear blinding of participants and personnel. When assessed with the Grading of Recommendations, Assessment, Development, and Evaluation criteria, findings were deemed very low for certainty (Table E7, available online at http://www.annemergmed.com).

**LIMITATIONS**

It is important to consider several limitations in regard to this study. First, our assessment of a funnel plot indicated publication bias may be present. This may reflect an absence of published negative-result studies and may bias the results toward a positive finding. Furthermore, funnel plot analysis identified a study outlier associated with a large positive finding as measured by mean difference. A sensitivity analysis with removal of the identified study mitigated the asymmetry of the plot, and a sensitivity analysis was performed with removal of the study for each outcome, without a change in findings. Next, there was significant heterogeneity between studies in regard to study design, practice environment, and provider experience. To address this, we used random-effect modeling and performed subgroup analyses between ED and non-ED settings to better understand the influence of scribes on each setting. Additionally, the providers varied, with some studies including only attending physicians, whereas others included residents, nurse practitioners, and physician assistants. The effect may be more pronounced among certain subgroups, and further studies are needed to assess this. Moreover, provider and patient satisfaction scores differed between studies, limiting the ability to combine these assessments. Future studies should better assess the effect on satisfaction, as well as physician stress and burnout, using validated tools. Because most studies were conducted in the United States, we were unable to perform subgroup analyses by country. Future research should determine the effect of scribes in different countries, in which the documentation burden may differ. Finally, although we performed a comprehensive search using 7 search databases, it is possible that some studies were missed. However, we also performed bibliographic searching to identify potential missed studies, so it is unlikely that any significant studies were missed.

**DISCUSSION**

To the best of our knowledge, this systematic review and meta-analysis is the largest review to date on this topic. We found that the addition of scribes significantly increased the RVUs per hour and encounter, as well as the total number of patients treated per hour. Scribes also decreased the length of stay among clinics but did not influence length of stay or time to disposition in the ED setting.

There are 2 previous systematic reviews evaluating the role of scribes. Shultz and Holmstrom analyzed this in 2014 and identified 5 studies on this topic. Although the results suggested a possible benefit, the findings were limited by the few studies available. Heaton et al conducted an updated review in 2015 and identified 17 studies, although the majority were abstracts with only 6 peer-reviewed publications. They found no difference in length of stay or RVUs, but found a small difference in
Figure 4. Forest diagram of RVUs per encounter.

Figure 5. Forest diagram of RVU per hour.
patients per hour. Our study adds to this by including 32 new studies, as well as 3 additional articles that were abstracts at the previous review. We also excluded 7 studies that were originally included by Heaton et al because they did not assess any of the aforementioned study outcomes. As a result of this, we were able to identify a difference in RVUs per hour and encounter, as well as better understand the effect of scribes on throughput times, provider satisfaction, and patient satisfaction.

One significant finding was the increase in RVUs per hour with the addition of scribes. Subgroup analyses found this to be consistent in both the ED and clinic settings. With a dedicated focus on the charting itself, it is likely that the scribes can improve billing by ensuring that providers meet all criteria to achieve a level of charting for appropriate reimbursement. This is evidenced by the increase in RVUs per encounter, particularly in the ED setting. However, scribes were also associated with an increase in patients per hour, thereby multiplying the effect on RVUs for each hour worked.

Scribes had no effect on ED length of stay for admitted or discharged patients. The factors involved in ED length of stay can be complex and involve many additional factors, such as consultations, laboratory testing, imaging, and medical interventions. As such, the addition of scribes is likely insufficient to effect change in this area. However, a difference in length of stay was identified among clinics. This is likely due to the limited number of additional factors involved in the completion of a clinic visit, thereby more directly demonstrating the benefit of scribes.

We also identified improved provider satisfaction in the majority of studies. Although we were unable to perform a meta-analysis on these data because of differences in the scales used, this is supportive of an additional benefit beyond the metrics listed earlier. This is consistent with a qualitative study by Cowan et al, which found that medical scribes improved enjoyment at work and decreased stress levels. This improved satisfaction, in the form of less clinical burden and greater time spent with patients, may also help to combat some of the burnout issues faced in medicine.

Finally, we identified a potential benefit in regard to patient satisfaction. Nearly half of the studies noted an increase in satisfaction, whereas none reported a decrease. This may be due to more time spent talking with the patient as opposed to charting or a consequence of the increased satisfaction from providers. Although the effect of patient satisfaction on health outcomes remains controversial, there does appear to be an association between improved patient satisfaction and better health care outcomes for patients. Additionally, patients who are more satisfied with care may be more likely to return to the same ED and health care system, thereby improving continuity of care.

Our review did not specifically assess for the costs associated with scribes, which should include both the cost associated with training and the continued costs associated with an established scribe program. Additionally, we did not assess for harms associated with scribe use (eg, patient safety, scribe exposure to airborne diseases). Future studies should assess the potential cost-benefit ratios, as well as any potential harms associated with scribe use.

In summary, we found that scribes improved RVUs per hour, RVUs per encounter, patients per hour, clinic length of stay, provider satisfaction, and patient satisfaction. However, we did not identify an improvement in ED length of stay. Future studies should better assess the effect of scribes on patient and provider satisfaction, as well as the cost-benefit ratio for scribes and the ED volume necessary to support this. Additionally, it would be important to better assess the effect of scribes on resident education and how this may affect training in regard to charting skills and efficiency.

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Author affiliations: From the Department of Emergency Medicine, Rush University Medical Center, Chicago, IL (Gottlieb, Peksa); the Department of Emergency Medicine, John H. Stroger, Jr. Hospital of Cook County, Chicago, IL (Palter); and the Library of Rush University Medical Center, Rush University, Chicago, IL (Westrick).

Author contributions: All authors were responsible for study concept and design. MG and GDP were responsible for the data analysis. MG and JP were responsible for study selection, data extraction, and quality analysis. All authors drafted the article and made critical revisions. MG takes responsibility for the paper as a whole.

All authors attest to meeting the four ICMJE.org authorship criteria: (1) Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND (2) Drafting the work or revising it critically for important intellectual content; AND (3) Final approval of the version to be published; AND (4) Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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“Elderly Female With Syncope” by Byrne, Czuczman, and Hwang, July 2011, Volume 58, #1, pp. 105, 115.