# Impact of Scribes on Performance Indicators in the Emergency Department

Rajiv Arya, MD, Danielle M. Salovich, Pamela Ohman-Strickland, PhD, and Mark A. Merlin, DO

## Abstract

***Objectives:*** The objective was to quantify the effect of scribes on three measures of emergency physician (EP) productivity in an adult emergency department (ED).

***Methods:*** For this retrospective study, 243 clinical shifts (of either 10 or 12 hours) worked by 13 EPs during an 18-month period were selected for evaluation. Payroll data sheets were examined to determine whether these shifts were covered, uncovered, or partially covered (for less than 4 hours) by a scribe; partially covered shifts were grouped with uncovered shifts for analysis. Covered shifts were compared to uncovered shifts in a clustered design, by physician. Hierarchical linear models were used to study the association between percentage of patients with which a scribe was used during a shift and EP productivity as measured by patients per hour, relative value units (RVUs) per hour, and turnaround time (TAT) to discharge.

***Results:*** RVUs per hour increased by 0.24 units (95% confidence interval [CI] = 0.10 to 0.38, p = 0.0011) for every 10% increment in scribe usage during a shift. The number of patients per hour increased by 0.08 (95% CI = 0.04 to 0.12, p = 0.0024) for every 10% increment of scribe usage during a shift. TAT was not significantly associated with scribe use. These associations did not lose significance after accounting for physician assistant (PA) use.

***Conclusions:*** In this retrospective study, EP use of a scribe was associated with improved overall productivity as measured by patients treated per hour (Pt/hr) and RVU generated per hour by EPs, but not as measured by TAT to discharge.

ACADEMIC EMERGENCY MEDICINE 2010; 17:490–494 © 2010 by the Society for Academic Emergency Medicine

**Keywords: performance indicators, scribes, relative value units**

In emergency departments (EDs), scribes have been touted as an efficient way to increase physician productivity.[1] Scribes are often students working while in school toward an eventual career in the field of medicine. Scribes assist physicians with the clerical aspects of patient care with the intent of improving physician productivity. Their roles are diverse, but may include recording patient histories, documenting details of the physical examination, documenting procedures, following up on lab reports, and assisting with discharges. In a recent editorial, Dr. Richard Bukata stated, ''(The time spent performing) Charting prevents a physician from seeing new patients, the true costs of charting are very high ... scribes can chaperone/assist exams, get labs, make calls and do other tasks to facilitate physician productivity.''[1] Certain physicians attest to the benefits of implementing a scribe program, but there are very limited published data specifically examining physician productivity indicators.[2–5]

Identification of factors that might enhance emergency physician (EP) productivity would be beneficial, as society's demand for emergency services continues to grow. Without published data, many emergency medicine groups have been forced to rely upon anecdotal evidence or promotional material from scribe

From the Department of Emergency Medicine (RA, MAM), the Department of Pediatrics (MAM), and the Department of Medical Education (DMS), University of Medicine and Dentistry of New Jersey–Robert Wood Johnson Medical School, New Brunswick, NJ; and the Department of Biostatistics, University of Medicine and Dentistry of New Jersey–School of Public Health (PO), Piscataway, NJ.

Received April 24, 2009; revisions received June 26, July 23, September 20, October 13, and October 24, 2009; accepted October 27, 2009.

Address for correspondence and reprints: Mark A. Merlin, DO; e-mail: Merlinma@umdnj.edu.Presented at the Society for Academic Emergency Medicine regional meeting in Newark, DE, March 27, 2009, where it won the overall best abstract at the plenary session.

This study received no grants or financial support, and the authors report no conflicts of interest. Dr. Merlin has grant support from the American Heart Association.


ISSN 1069-6563
PII ISSN 1069-6563583

doi: 10.1111/j.1553-2712.2010.00718.x

staffing services to justify a decision to initiate a scribe program.

The hypothesis tested was that use of scribes during an ED shift increases EP productivity, as measured by the endpoints of patients treated per hour (Pt/hr), relative value units generated per hour (RVU/hr), and turnaround time (TAT) to discharge.

## METHODS

### Study Design

This was an observational, nonrandomized, comparative study. The university's institutional review board approved the protocol.

### Study Setting and Population

This study was carried out from July 2006 through December 2007 in the adult ED at a university-based academic medical center, treating 59,000 adult patients per year. The ED is an urban Level 1 trauma center and a tertiary care center for multiple specialties. Only board-certified or board-eligible EPs evaluated and treated patients. Physician assistants (PAs) also see patients in the adult ED, and all patients evaluated by PAs are seen by a physician as well.

Scribes are assigned, when available, to specific areas of our ED, and each scribe provides dedicated service to only one physician during the scribe's work shift. Scribe service is limited to the adult ED; scribes do not work in our fast-track area.

### Study Protocol

Researchers evaluated shifts of 13 EPs working 243 clinical shifts (10 hours during the weekdays, 12 hours on weekends) over 3,562 clinical hours. Payroll data sheets were examined for physician shifts that were uncovered or partially covered for less than 4 hours by a scribe, due to sickness or absence. Physician shifts with full scribe staffing were matched against shifts worked by the same physician during the same shift time period, but without full coverage by a scribe, as detailed below under Measures. The main unit of analysis for this clustered study design was physician work shifts, nested by physician. The main comparison was that of intraphysician productivity data (Pt/hr, RVU/hr, and TAT), compared between shifts with, versus without, full scribe coverage.

*Training and Duties of Scribes.* The scribe facilitates and expedites the throughput of ED patients by creating, transcribing, and completing documentation of the patients' medical record. The scribe communicates all laboratory and x-ray results in a timely manner to the EP.

To apply for the scribe program at our institution, applicants must have 2 years of clerical experience, including familiarity with common software packages. Knowledge of medical terminology and coding is preferred. The scribe training program is 60 hours in length.

In our facility, scribes complete medical documentation as instructed by a physician. They accurately document time of procedures, calls from physicians, and timelines of events. Chart narratives are added by scribes, such as the course of events within the ED.

### Measures

Physician productivity was compared between shifts during which physicians had full availability of a scribe, versus shifts when they did not. Shifts with scribes for less than 4 hours were considered ''without'' scribes. We did not require 0 hours of scribe coverage to qualify a shift as being without a scribe, due to a lack of sufficient numbers of shift that were completely uncovered by a scribe. Data points were collected on all adult (≥21 years) patients within each of the selected shifts.

For each patient, the electronic medical record was examined to determine whether a scribe was used. Each physician shift is designed to have an assigned scribe, but scribe availability falls short of this ideal. During each shift for which scribe services were available, the primary independent variable was the percentage of patient documentation done by a scribe. Another independent variable was the percentage of patients seen by a PA.

Investigators extracted patient-specific time stamps and emergency management (E&M) codes from departmental electronic medical records into Microsoft Access (Microsoft Inc., Redmond, WA). Pt/hr was calculated as the number of patients initially evaluated over the entire shift, divided by the length of the shift. Patients ''turned over'' to an incoming physician at change of shift were not counted toward the receiving physician's Pt/hr.

Dependent variables indicative of physician productivity were: mean Pt/hr (averaged for the full 10 or 12 hours of each shift); RVUs generated per hour, as assigned by a certified medical coder credited to the physician who evaluated the patient initially, regardless of any turnover of care; and TAT (minutes) for discharge, calculated as the difference between the electronically generated arrival and discharge times.

### Data Analysis

Means and standard deviations (SDs) of dependent and independent variables were calculated for each individual physician, as well as across physicians. Intracluster correlations (ICCs) were calculated for each variable, describing the percentage of variation in each variable that could be attributed to differences between physicians. These ICCs, which theoretically could range from 0 to 1.00, quantify the degree of similarity of these measurements within, versus between, physicians.[6] Because these ICCs represent nonnegligible similarities of measures within physicians, statistical models that account for this correlation are warranted.

Because shifts are nested within physicians, a mixed linear model was used to evaluate the mean effect of percentage of patients with scribes (%scribes) on each of the outcomes variables (RVU/hr, Pt/hr, and TAT to discharge). These mixed models have been identified as correctly handling data in which there are unequally sized clusters (number of patients per physician). The initial model included %scribes as a fixed effect and included random intercepts for each physician, thereby allowing shifts to be more similar within physicians

than across physicians. F-tests were used to evaluate the effect of %scribes. Sensitivity analyses examined whether Pt/hr or percentage of patients for whom a PA was assigned (PPA) were confounders for the effect of %scribes. Additionally, we examined whether %scribes was inversely related to PPA. The latter two analyses were used to assess whether use of scribes was associated with decreased use of PAs.

Exploratory analyses examined the potential for variation among physicians in the association between %scribes and the performance indicators through addition of a random component for the slope related to %scribes in the mixed models described above. Wald z-tests of the random component of the %scribes slopes formally tested whether the effect of %scribes varies significantly across physicians. SAS software (SAS for Windows, version 9.1.3, SAS Institute Inc., Cary, NC) was used for all analyses.

## RESULTS

The sample included shifts from 13 physicians, with the number of shifts per physician ranging from to 4 to 68. Table 1 includes the overall summaries of the independent variables, and Table 2 includes the overall summaries of the outcome variables. Table 3 presents results from the mixed linear models examining the degree of association between percentage of patients over a physician shift seen with a scribe (%scribes) on the three outcome variables. Three models were used to examine the unadjusted and adjusted effects of scribe use. Model 1 only looked at the percentage of scribe utilization (unadjusted). Model 2 looked at percentage of scribe adjusted for percentage of PA (%PA) utilization. Model 3 is similar to Model 2, but additionally adjusts for patients seen per hour. Models 1 and 2 were applied to RVUs/hr and Pt/hr. All models were applied to TAT to discharge.

Percentage of patients with scribes was significant for RVU/hr and for Pt/hr. The RVU/hr increased by 0.18 (95% confidence interval [CI] = 0.04 to 0.32, p = 0.0067) units when the percentage of a shift for which a scribe was utilized increases by 10%. This effect persisted even after adjusting for the percentage of patients during a shift seen with a PA. After controlling for PA use, the RVU/ hr increased by 0.24 (95% CI = 0.10 to 0.38, p = 0.0011) units when %scribe increased by 10%. The number of patients per hour increased by 0.05 per hour (95% CI = 0.01 to 0.09, p = 0.0399) when %scribe use increases by 10%. For constant %PA, Pt/hr increased by 0.08 per hour (95% CI = 0.04 to 0.12, p = 0.0024) when %scribe use increased by 10%. TATs were not significantly affected by use of scribes (Table 3).

Table 1
Descriptives of Independent Variables

| Physician (*n* = 243 shifts) | %Scribes | %PAs | Total No. of Patients |
|---|---|---|---|
| Mean | 30.6 | 63.3 | 25.3 |
| SD | ±16.8 | ±14.1 | ±5.7 |
| ICC* | 0.23 | 0.44 | 0.17 |

Note: 6.1% of patients were seen by physicians with neither scribes nor PAs.
ICC = intracluster correlations; %PAs = percentage of physician assistants; %scribes = percentage of patients with scribes.
*Intraphysician correlation coefficient represents the percent of variation in a variable that can be attributed to physician differences.

Table 2
Descriptives of Performance Indicators

| Physician (*n* = 243 Shifts) | RVUs/hr | TAT to Discharge (Minutes) | Pt/hr |
|---|---|---|---|
| Mean | 6.9 | 256 | 2.5 |
| SD | ±1.7 | ±71.9 | ±0.5 |
| ICC* | 0.22 | 0.14 | 0.09 |

ICC = intracluster correlations; Pt/hr = number of patients treated per hour; RVUs = relative value units; TAT = turnaround time.
*Intraphysician correlation coefficient represents the percent of variation in a variable that can be attributed to physician differences.

## DISCUSSION

To the best of our knowledge, this is the first study to demonstrate improvement in primary endpoints of Pt/hr and RVU/hr with the utilization of scribes in the ED. If a physician in our department changed from 0% to 100% of the patients seen with a scribe, 0.8 additional patients per hour can be evaluated in a 10-hour shift, and 24 (2.4/hr) additional RVUs would be generated. This was obtained after controlling for the effect of PAs on EP productivity.

In our department, there are varying physician practice styles and efficiencies, and there was a variable influence of the effect of scribes on each individual physician's RVUs/hr and Pt/hr. Assigning specific scribes to specific physicians might be expected to augment physician productivity, but this would be difficult to accomplish, because it would be impossible to exactly match physicians' and scribes' schedules. Nonetheless, this study demonstrated overall improvement in EP productivity with use of ED scribes. We did not attempt to study the potentially variable influence of scribes on the productivity of highly productive EPs versus less productive EPs.

As hospitals continue to cut back services to meet increased financial burdens, individual services deserve increased scrutiny as to their cost-effectiveness. The cost of implementing and maintaining a scribe program may be less than the potential increase in revenue (and improved patient throughput) that scribes are likely to generate. Based on the 2008 Medicare RVU reimbursement rate of $38 for one RVU,[7] a scribe being utilized to full capacity, resulting in an additional 2.4 RVUs/hr generated, could result in an additional 91 billed dollars per hour. Scribes at our institution are salaried at approximately $16–$19 per hour, so unless an

Table 3
Results From Mixed Linear Models

| Outcome Variable | Effect Estimate | Model 1 | Model 2 | Model 3 |
|---|---|---|---|---|
| RVUs/hr | %Scribes* | 0.18 (0.04 to 0.32) 0.0067 | 0.24 (0.10 to 0.38) 0.0011 | — |
| | %PAs* | — | 0.20 (0.00 to 0.40) 0.0418 | — |
| | %Scribes† (random slope) | 0.2108 | 0.4447 | |
| Pt/hr | %Scribes* | 0.05 (0.01 to 0.09) 0.0399 | 0.08 (0.04 to 0.12) 0.0024 | — |
| | %PAs* | — | 0.09 (0.03 to 0.15) 0.0056 | — |
| | %Scribes (random slope) | 0.2216 | 0.3082 | — |
| TAT to discharge | %Scribes | 1.1 (−4.6 to 6.8) 0.7118 | 0.4 (−5.3 to 6.1) 0.8815 | 1.4 (−5.1 to 7.9) 0.6694 |
| | Pt/hr | — | 14.3 (−2.4 to 31.0) 0.0918 | 13.5 (−3.4 to 30.4) 0.1179 |
| | %PAs | — | — | 2.6 (−5.8 to 11.0) 0.5487 |
| | %Scribes (random slope) | 0.4512 | 0.4033 | 0.3784 |

Each cell includes an effect estimate (95% CI) and a p-value. Cells for random slope for %scribes includes only a p-value.
RVUs = relative value units; %PAs = percentage of physician assistants; Pt/hr = number of patients treated per hour; %scribes = percentage of patients with scribes; TAT = turnaround time.
*The effect estimates for %scribes may be interpreted as the increase in the outcome attributable to a 10% increase in number of patients with which a scribe was used; for Pt/hr, the increase in the outcome attributable to an increase of one patient per hour; for % PAs, the increase in the outcome attributable to a 10% increase in number of patients seen by a PA.
†p-value given for testing whether the association between %scribes and outcome varies among physicians, with p-value based on z-test of the variance component for random slope for %scribes.

institution collects less than 30% of their billed revenue, scribes may be expected to improve the financial ''bottom line.'' A complete cost analysis should of course take into consideration the fixed costs of training, as well as the variable costs of salary and nonsalary benefits.

## LIMITATIONS

This study is a single institutional evaluation of scribes. Further research needs to be conducted to explore if our findings can be generalized to other institutions with various academic and nonacademic models. Our method of deploying and utilizing scribes may differ from the methods of others, and this may change the effect of scribes on physician productivity at different sites. Also, facilities that do not have such a high percentage of patients seen by PAs (nearly two-thirds in our sample) may find different results.

Two of the outcome variables (RVU/hr and Pt/hr) are highly interrelated. Our specific model controlled for the impact of PAs in our department. These data support the assertion that PAs provide not only patient evaluations, but also assist with other operational issues. Furthermore, the retrospective nature of the study limits the ability to determine causality.

Most shifts that lacked scribe coverage occurred on nights and over weekends. However, day shifts, during which scribe coverage was more common, tended to be the busiest shifts in terms of patient volume. The benefit of scribes may be influenced by such circadian variation.

We were unable to control for some variables. We selected physician shifts with and without scribes that were the same time of day. We chose to utilize less than 4 hours as a cutoff for ''no scribe available,'' since several ''uncovered'' shifts occurred because scribes were present less than one-third of the 12-hour weekend shift. When scribes were utilized between 0 and 4 hours, the impact of complete lack of a scribe is likely to be understated. If we had a sufficient number of shifts for analysis during which scribes were completely unavailable to work, it is possible that our estimate of the impact of scribes upon physician productivity measures would have been numerically greater.

It is also possible that certain scribes have variable performance indicators when paired with different physicians, due to nonquantifiable influences of interpersonal interactions between scribes and physicians. In addition, we did not evaluate years of experience of each scribe as a variable. Whether physicians benefit from scribes could also be a question of utility, as well as the extent that physicians maximized scribes as a resource during their shifts. No control for the influence of specific PAs was attempted, and it is acknowledged that this could have changed the RVUs/hr or Pt/hr generated by the physicians.

## CONCLUSIONS

This retrospective data analysis suggests that at our institution, ED scribes are associated with an increase of 2.4 billed relative value units per hour, which is primarily gained from the additional 0.8 patients per hour who are seen, but not with changes in turnaround time to discharge.

## References

1. Scheck A. The era of the scribe: lightening the EP's load. Emerg Med News. 2004; 26:1–6.
2. Allred RJ. Improved emergency department patient flow: five years of experience with a scribe system. Ann Emerg Med. 1983; 12:162–3.

3. Witt RC, Haedther DR. Nurse-scribe system saves time in the ED. J Emerg Nurs. 1975; 1:23–4.
4. Hixson JR. Scribe system works like a charm in Sarasota ED. Emerg Dep News. 1981; 2:4.
5. Scheck A. The next big thing: medical scribes. Emerg Med News. 2009; 2:13–16.
6. Preisser JS, Reboussin BA, Song EY, Wolfsen M. The importance and role of intracluster correlations in planning cluter trials. Epidemiology. 2007; 18:552–60.
7. Medical Reimbursement Systems, Inc. 2009 Physician Reimbursement. Available at: http://www.mrsiinc.com/PDFs/2009%20MRSI%20PHYSICIAN%20UPDATE.pdf.Accessed Jan 29, 2010.