Physician Assistants Contribution to Emergency Department Productivity

Christopher Brook, MD*
Alexandra Chomut, MD†
Rebecca K. Jeanmonod, MD‡

* Boston Medical Center, Department of Otolaryngology, Boston, Massachusetts
† Floating Hospital for Children at Tufts Medical Center, Boston, Massachusetts
‡ St Luke's Hospital and Health Network, Department of Emergency Medicine, Bethlehem, Pennsylvania

Introduction: The objective of this report is to determine physician assistant (PA) productivity in an academic emergency department (ED) and to determine whether shift length or department census impact productivity.

Methods: A retrospective chart review was conducted at a tertiary ED during June and July of 2007. Productivity was calculated as the mean number of patients seen each hour. Analysis of variance was used to compare the productivity of different length shifts, and linear regression analysis was used to assess the relationship between productivity and department volume.

Results: One hundred sixty PA shifts were included. Shifts ranged from 4 to 13 hours. Mean productivity was 1.16 patients per hour (95% confidence interval [CI] = 1.12–1.20). Physician assistants generated a mean of 2.35 relative value units (RVU) per hour (95% CI = 1.98–2.72). There was no difference in productivity on different shift lengths ($P = 0.73$). There was no correlation between departmental census and productivity, with an R^2 (statistical term for the coefficient of determination) of 0.01.

Conclusion: In the ED, PAs saw 1.16 patients and generated 2.35 RVUs per hour. The length of the shift did not affect productivity. Productivity did not fluctuate significantly with changing departmental volume. [West J Emerg Med. 2012;13(2):181–185.]

INTRODUCTION

Physician assistants (PA) were introduced to the United States workforce in the 1960s and have played an ever-increasing role in medical care since their inception.[1–4] There are more than 79,000 graduates of PA programs in the United States today, and they practice in a wide variety of settings, including primary care, critical care, pediatrics, surgery, and emergency medicine.[5] A large and growing body of literature supports the use of midlevel providers (both PAs and nurse practitioners) as clinicians and that the care they provide does not compromise outcomes in selected patients. Several studies in a variety of settings have shown that using PAs and nurse practitioners instead of physicians does not result in increased morbidity or mortality or adversely affect visit times and cost.[6–10]

Emergency departments (ED) have increasingly used PAs over time with 28% of EDs employing PAs in 1997 compared to 77% of EDs in 2006.[11] A study from 2005 revealed that 1 out of every 8 ED visits are managed by a midlevel provider, and 5% of these have no physician involvement at all.[12] The field of emergency medicine currently attracts 10% of graduates from PA programs as a primary site of work, and over 20% of PAs report spending some time working in EDs.[5] Physician assistants working in EDs have on average higher salaries than PAs working in other settings,[5] and some sites are now offering postgraduate specialty training to PAs in emergency medicine. It is expected, therefore, that PA use in EDs will continue to increase.

In spite of the large numbers of PAs working in EDs, very little is known about their contribution to workflow or

departmental productivity. Research has shown similar prescribing patterns of medications between physicians and PAs in EDs, and 1 study showed similar cost and length of stay in an urgent care setting between PAs working alone and attending physicians.[4,7] This is the first study in the literature that examines PA productivity defined as patients seen per hour and relative value unit (RVU) generated per hour in an academic residency training center.

At the study institution, PAs function in several capacities. They staff a fast track area which is located in the main ED (not a separate site). Patients triaged to the fast track have Emergency Severity Index (ESI) scores of 4 and 5 and are not anticipated to need ancillary studies beyond plain radiographs, urine point-of-care testing, and glucometry. Patients requiring simple laceration repair or splinting of a musculoskeletal injury are preferentially triaged to fast track, while those with complex lacerations, those requiring sedation, and patients with obvious fractures are not. When no patients are waiting in the fast track area, PAs are permitted to see patients with ESI scores of 4 and 5 in triage and manage them there. Additionally, if there are no patients with ESI scores of 4 or 5 waiting, PAs are permitted to float out of fast track and see high-acuity patients waiting in the main ED (this rarely occurs). Finally, on resident conference day, 1 PA staffs fast track, and 1 floats in the main ED. Physician assistants have access to an attending ED physician for consultation at all times but are not required to present their patients to attending physicians, and attendings do not see and examine the majority of PA patients.

Recent research done at this institution suggests that emergency medicine residents are very limited in their capacity to increase productivity in response to changes in ED volume,[13] and therefore, increased patient volume must be compensated for by either the attending physicians' or PAs' adjustment in productivity.

Purpose

We sought to determine the number of patients seen per hour and RVUs generated per hour (productivity) by ED PAs working a variety of different shift lengths and to correlate that number with ED census volume in order to determine whether PAs can respond to variations in patient volume with variations in their productivity.

METHODS

A retrospective chart review was conducted of all the patients seen in the ED at a 70,000-volume tertiary care center in the months of June and July of 2007. Productivity data were collected by review of the computerized timeline available for all patients seen in the ED, which creates a record of patient registration and caregiver assignment to the patient. The hour of care initiation was determined from the time recorded by the ED tracker (EM Track) when a PA signed up for a patient. The PA was considered the primary provider if they initiated patient care and provided documentation on the patient. If more than 1

PA or resident signed up for the patient, the computerized medical record was accessed to determine which provider dictated the chart. All PAs were eligible to work the full complement of shift lengths, as all PAs rotate through the schedule in an equitable fashion, with no PAs restricted to short shifts or shifts at certain times of day. Eight PAs participated in the study.

Productivity was defined as patients seen during a given shift divided by the total hours that a PA saw patients that shift. Relative value unit data were collected from a separate database, and a total was calculated for all of the PA shifts worked and was compared against the total hours worked by PAs during those months, giving a mean RVU per hour for each of the PAs (to use as a reference standard). Productivity by shift length was compared using an analysis of variance (ANOVA) statistical test. Productivity by day of the week was also calculated and compared using ANOVA.

Hourly productivity for each shift was calculated so that patterns of patient care could be compared between different shifts lengths. At the study institution, PAs are responsible for following up on variances from prior shifts, such as imaging studies that are read differently by radiology and ED personnel, and therefore do not always start their shifts at the same time. This leads to differences in shift lengths and shift start times. The start of a shift was determined to be the hour in which a PA initiated care on their first patient, and shift end was determined from their preset schedule.

ED volume was calculated to determine if there was a correlation between PA productivity and the volume of patients seen in the ED. Daily volume was calculated as the number of patients registered between 0700 and 2359 each day; 0700 was chosen because that is the hour that ED residents working the day shift start their shifts, and it was hypothesized that their work load might affect PA productivity. This was also thought to be a reasonable time, as PA coverage begins at 0900, and we wanted our volume calculations to adequately represent the volume in the department, which often lags behind actual time of registration, as patients are moved from the waiting room through triage and into their rooms. Volume was not analyzed for the early morning hours because all PA shifts at our institution end by midnight, and none of the other providers working before 0700 overlap with PAs. Hourly volume, defined as patients registered per hour, was also calculated for each day of the study period. Linear regression analysis was used to determine the relationship between productivity overall and daily departmental census, as well as to determine the relationship between productivity and hourly volume. Microsoft Excel (Redmond, Washington) was used for statistical calculations.

No financial or other incentives were in place to encourage PA productivity or efficiency during the study period.

The institutional review board reviewed this study and found it to be exempt.

RESULTS

During the study period of June and July 2007, there were 160 PA shifts, including lengths of 4 hours (n = 2), 5 hours (n = 2), 7 hours (n = 1), 8 hours (n = 8), 9 hours (n = 5), 10 hours (n = 9), 11 hours (n = 58), 12 hours (n = 70), and 13 hours (n = 5). The mean productivity of all shifts was 1.16 patients per hour (95% confidence interval [CI] = 1.12–1.20). The productivity of different shift lengths was as follows: 1.25 patients per hour for 4-hour shifts, 1.3 patients per hour for 5-hour shifts, 0.714 patients per hour on 7-hour shifts, 1.14 patients per hour (95% CI = 0.91–1.37) on 8-hour shifts, 1.20 patients per hour (95% CI = 0.75–1.65) on 9-hour shifts, 1.13 patients per hour (95% CI = 0.90–1.36) on 10-hour shifts, 1.17 patients per hour (95% CI = 1.11–1.23) on 11-hour shifts, 1.16 patients per hour (95% CI = 1.11–1.21) on 12-hour shifts, and 1.17 patients per hour (95% CI = 1.00–1.34) on 13-hour shifts. By ANOVA calculation, there was no statistical difference between productivity of different shift lengths ($P = 0.73$).

ANOVA yielded no statistical difference between hourly productivity on different shift lengths (ie productivity in the third hour of any shift length was not statistically different), except the 11-hour shift, which had significantly lower productivity in the 11th hour than productivity in the 11th hour of the 12- and 13-hour shifts ($P = 0.0001$), and the 5-hour shift, which had significantly lower productivity in its last hour than other shifts in their fifth hour ($P = 0.01$). Productivity in terms of mean RVUs per hour during the study period was calculated as 2.35 RVUs per hour (95% CI = 1.98–2.72).

The daily number of patients registered in the ED (0700–2359), ranged from 133 patients to 198 patients (mean = 160 ± 14.8), whereas anywhere from 0 to 22 patients were registered on an hourly basis (mean = 9.4 ± 3.9). Linear regression analysis examining shift productivity related to daily volume showed an R^2 (statistical term for the coefficient of determination) of 0.01. Linear regression analysis of productivity per hour plotted against volume per hour yielded an R^2 of 0.02.

DISCUSSION

Overall, our PAs saw a mean of 1.16 patients per hour across all shift lengths. This number did not seem to vary with departmental census in any appreciable way, which may speak to the PAs being maximized in terms of ability to move through more cases, since they are already working as hard and as fast as they can. Alternatively, this phenomenon may speak to departmental gridlock, when patients are in fact waiting to be seen but cannot find a physical space within the department due to inpatient holds or other patients undergoing extensive workups, and so sit in the waiting room where the PA cannot gain access to them. Those patients could potentially not make their way into the ED until after the PA shifts are over, as they are typically lower-acuity cases and can afford to wait. They would then be seen overnight by residents or perhaps would choose to leave without being seen. Previous research at this

institution has demonstrated essentially no relationship between departmental volume and resident productivity on a day-to-day basis with R^2 values ranging between 0.08 and 0.20, depending on level of training,[13] so it is unclear which provider group is able to adjust their productivity to compensate for volume fluctuations. Given a system with a finite number of beds, PAs, attendings, and residents, one would assume that if the PAs and residents cannot adjust their productivity with increasing patient volume, attendings must be able to adjust their productivity, but further research is needed to determine if this is the case.

Our PA productivity of 1.16 patients per hour compares well with the productivity (as patients per hour) of emergency medicine residents during the later years of their training, which ranges from 1.19 to 1.41 in different studies.[13–15] At the study institution, data show that senior-level residents see 1.25 patients per hour, while second-year residents see 1.13.[13] Although the number of patients seen by PAs is similar to that of residents, it is important to recognize that their roles in the ED are very different. Residents do not act independently. Their patients must be seen by an attending physician, and they need to gain appropriate education while in the ED. As residents become experienced and accomplished, they do receive graduated responsibility, but every June brings about a new change of resident classes and a starting over of the educational process. In this way, residents have the potential to use more limited resources (in this case, the attending physician) than a PA might on a busy shift.

Our data on RVUs showed that PAs billed 2.35 RVUs per hour during the study period. This figure is lower than that in a study by Pershad et al, who looked at RVUs per hour in a pediatric ED and found that pediatric emergency medicine physicians saw 4.36 RVUs per hour, and pediatricians and nurse practitioners saw 3.08 RVUs per hour.[16] Another study showed emergency medicine resident productivity in RVUs to range from 2.51 as first-year residents to 3.61 as third-year residents.[17] It is unclear if this discrepancy in RVU data is based on the lower acuity of the patients seen by PAs or if it is an issue with incomplete documentation. Relative value unit determination is highly dependent on completeness of documentation, and PAs may not document as well as residents, whose charts are generally carefully reviewed by their attendings. This data also fails to reflect the other components of the PA workload, such as reviewing radiology and lab variances and calling or writing to follow-up patients. These jobs are of critical importance to sound patient care in any ED, but do not itemize out in traditional billing schemes.

LIMITATIONS

There are several limitations to our study. Calculations for ED volume were based on total numbers of patients registered in the department per day (0700–2359), and on patients registered per hour. By not including patients registered before 0700, some early fluctuations that impacted PA productivity at

the start of their shifts may have been missed. Similarly, by measuring hourly volume as patients registered per hour, it was not possible to determine if that was the volume of patients actually seen during that hour. Although the time the patient was placed in their room could have been used, it was felt that this number was less reliable due to the fact that there is a substantial lag where patients often sit in the waiting room after they are placed in a room in the computer.

Data were only collected from a very specific time period during the year (June and July of 2007). It is possible that there is significant variation in productivity and patterns of care during the year. Specifically, PAs may see more patients during the summer months when new ED residents are starting to work and learn the system and more experienced residents learn to handle new positions and duties. On the other hand, inexperienced physicians may require more help and have difficulty moving patients through the ED, slowing down their fellow providers. It would be beneficial to compare these data to data collected during other times of the year when resident inexperience was less of an issue.

This study did not look at the number of procedures accomplished by PAs during their productive hours. It is possible that PAs, who see a selected group of lower-acuity patients, have increased or decreased hourly productivity because they spend a different amount of time on procedures, such as suturing, than emergency medicine residents or attending physicians. Theoretically this should be reflected in the RVU data, although this relies on proper documentation. Additionally, no data were analyzed on PA productivity based on the number of consecutive or cumulative days worked, so we did not account for fatigue. This would be an interesting analysis and may provide further information regarding PA productivity and staffing patterns that would best support optimal productivity and enhance patient flow. Additionally, our study was not adequately powered to parse out the strengths or weaknesses of individual providers, and all PA data were analyzed as a whole with no attempt made to compare PAs of differing skill or seniority.

Finally, these data were drawn from a single academic institution and may not be able to be generalized to other institutions. In community settings without residents, PAs may see a broader range of patients and have different productivity characteristics. At this institution, length of stay for patients in the ED is 3 hours for discharged patients and 7.5 hours for admitted patients, which has implications for patient turnover and accessibility to new patients for our PAs during their shifts.

Although it is beyond the scope of this paper, it is also important to recognize that questions of PA use should always address educational objectives of residents at teaching institutions as well as those of the PAs themselves. Physician assistants generally receive only on-the-job training with few PAs choosing to engage in postgraduate subspecialty training. Therefore, it is important to recognize that young or

inexperienced PAs may lack adequate training in system management to efficiently manage numerous patients and document appropriately. Residents may be deprived of the bread and butter of emergency medicine in the form of abscess drainages and laceration repairs by these cases getting preferentially picked up by PAs. As always, one must balance service requirements with educational objectives when deciding on a staffing model.

CONCLUSION

ED physician assistants at this institution see 1.16 patients per hour, and generate 2.35 RVUs per hour. Productivity is not impacted by shift length or changes in volume in the ED. If specific days of the week or times of the day are known statistically to have higher volume, those times should be staffed with a larger number of PAs to absorb the extra patients.

Address for Correspondence: Rebecca K. Jeanmonod, MD, St Luke's Hospital and Health Network, Department of Emergency Medicine, 2504 Old Harrow Ct, Bethlehem, PA 18055. E-mail: rebeccajeanmonod@yahoo.com.

REFERENCES

1. Hooker RS. Physician assistants and nurse practitioners: the United States experience. *Med J Aust.* 2006;185:4–7.
2. Pedersen DM, Chappell B, Elison G, et al. The productivity of PAs, APRNs, and physicians in Utah. *JAAPA.* 2008;21:42–44.
3. Hooker RS, McCaig L. Emergency department uses of physician assistants and nurse practitioners: a national survey. *Am J Emerg Med.* 1996;14:245–249.
4. Hooker RS, Cipher DJ, Cawley JF, et al. Emergency medicine services: interprofessional care trends. *J Interprof Care.* 2008;22:167–178.
5. Hooker RS. A cost analysis of physician assistants in primary care. *JAAPA.* 2002;15:39–42, 45, 48 passim.
6. Grzybicki DM, Sullivan PJ, Oppy JM, et al. The economic benefit for family/general medicine practices employing physician assistants. *Am J Manag Care.* 2002;8:613–620.
7. Arnopolin SL, Smithline HA. Patient care by physician assistants and by physicians in an emergency department. *JAAPA.* 2000;13:39–40, 49–50, 53–54 passim.
8. Sakr M, Angus J, Perrin J, et al. Care of minor injuries by emergency nurse practitioners or junior doctors: a randomised controlled trial. *Lancet.* 1999;354:1321–1326.

9. Oswanski MF, Sharma OP, Raj SS. Comparative review of use of physician assistants in a level I trauma center. *Am Surg*. 2004;70:272–279.

10. Singer AJ, Hollander JE, Cassara G, et al. Level of training, wound care practices, and infection rates. *Am J Emerg Med*. 1995;13:265–268.

11. Menchine MD, Wiechmann W, Rudkin S. Trends in midlevel provider utilization in the emergency departments from 1997 to 2006. *Acad Emerg Med*. 2009;16:963–969.

12. Ginde AA, Espinola JA, Sullivan AF, et al. Use of midlevel providers in US EDs, 1993 to 2005: implications for the workforce. *Am J Emerg Med*. 2010;28:90–94.

13. Jeanmonod R, Brook C, Winther M, et al. Resident productivity as a function of emergency department volume, shift time day, and cumulative time in the emergency department. *Am J Emerg Med*. 2009; 27:313–319.

14. DeBehnke D, Obrien S, Leschke R. Emergency medicine resident work productivity in an academic emergency department. *Acad Emerg Med*. 2000;7:90–92.

15. Deveau JP, Lorenz JE, Hughes MJ. Emergency medicine work productivity and procedural accomplishment. *J Amer Osteo Assoc*. 2003;103:291–296.

16. Pershad J, Whitley M, Herman M. Visit-level acuity and resource-based relative value unit utilization in a pediatric emergency department. *Pediatr Emerg Care*. 2006;22:423–425.

17. Brennan DF, Silvestri S, Sun JY, et al. Progression of emergency medicine resident productivity. *Acad Emerg Med*. 2007;14:790–794.