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Physician assistants in occupational medicine: how do they compare to occupational physicians?

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Background	Physician assistants (PAs) have been present in occupational and environmental medicine (OEM) in the USA since 1971, yet remarkably little is known about their activity.
Methods	An administrative study of PA activities was undertaken and compared with the activities of physicians in the same occupational medicine setting. Patients were not triaged to either provider and all resources of care were recorded for the visit. An episode of care approach was used for the analysis.
Results	The characteristics of patients seen by each provider were similar in age, gender ratio and severity of injury. Physicians saw a mean of 2.9 patients/h and PAs 2.5, but PAs worked more hours and saw more patients per year than physicians. The average charge per patient visit and total charge for an episode of care were similar. Differences between PAs and physicians were seen in the areas of 'limited duty' duration given to patients and on average PAs prescribed 15 days and physicians 17 days. PAs referred a patient 19.7% of the time, while physicians referred 17.4%. Most of the referrals were to physical therapy. The salary of a physician, based on an hourly rate, was approximately twice as much as a PA.
Conclusion	The use of PAs in OEM may represent a cost-effective advantage from an administrative standpoint. Clearly, more research is necessary in determining the role and utilization of PAs in OEM and how they may improve the delivery of physician services.
Key words	Administration; cost analysis; industrial medicine; management; occupational medicine; physician assistant; USA; utilization.
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Introduction

The concept of occupational and environmental medicine (OEM) has its origins with the first doctor who administered medical attention to patients with a work-related injury or illness. Since that time, the practice of OEM has evolved, keeping pace with the needs of society and the modern day workforce. In the USA, the evolution of medicine has incorporated physician assistants (PAs) to the medical team since 1967 [1]. PAs are a type of medical provider with a unique set of skills and licenced by all 50 states to be able to assess, manage and treat patients, including prescribing of medication. They are delegated these tasks by physicians and the care they provide parallels that of physicians for the most part [2]. Their training is comprehensive, lasting on average 26 months and largely parallels a medical school curriculum, only in a briefer amount of time. There are over 45 000 PAs in clinical practice in the US and Canada. PA students enter an education program with 24 months or more, on average, of health care experience in some medical field such as emergency medicine, pharmacy, respiratory therapy, nursing, or medical

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corpsman [2]. Expansion of the PA concept to England and The Netherlands began in 2002 [3].

In 1999, the American Academy of Physician Assistants identified ~38 000 clinically active PAs and 500 were employed in OEM [4]. While there are PAs in OEM in all 50 states, what they do and how well they do it is unknown. The survey instrument used by the American Academy of Physician Assistants is a broad-based questionnaire to gather information about PAs overall—information about specialties is not detailed.

The introduction of PAs to OEM began with oil and gas production expansion in the 1970s. This industry was in need of health professionals for their growing employee corps. Physicians were in short supply and corporations turned to the growing source of PAs to help fill this void. PAs were employed as early as 1971 on the Alaskan pipeline, a huge enterprise that stretched from the Arctic Ocean to an ice-free port in the southern part of the state [5,6]. Also in the 1970s, PA educators began looking to industrial medical settings as clinical rotation sites for students [7]. The delivery of routine physical examinations for industries and insurance companies by PAs was seen as an economical strategy. The cost of a PA in this service was considerably less than a physician [8]. Industrial studies conducted primarily by PAs instead of physicians have been a trend in certain sectors since the 1980s [9,10].

In spite of the growing literature, very little information exists concerning the role of PAs in the practice of contemporary OEM. The few studies that have been published are both limited in scope and dated in terms of the evolution of OEM PAs. One report estimated that some 500 PAs were providing OEM services directly to the employees of 15 Fortune 500 companies [9]. Elliott [9] reported that 58% of the 124 OEM PAs surveyed in 1983 indicated that they were employed directly by the company and provided medical service at the plant site. Another 15% indicated corporate medical staff positions where they reported directly to the corporate medical director. Overall, the survey respondents estimated that 55% of their time was spent providing direct patient care. Additionally, 27% of respondents indicated they worked in private industrial medicine clinics and were employed by a physician or group of physicians rather than a company. Ramos observed that many were providing essentially primary care services along with other duties [11]. A list of job descriptions of PAs in OEM is cited elsewhere [10].

Since the early descriptions of PAs in OEM, many changes have occurred which have enhanced and modified the delivery of health care. Organizations are undertaking cost-effective and administrative strategies that are designed to improve the efficiency of their operation. Although PAs would probably not be employed in various OEM settings if they were not cost-effective, no systematic analysis or comparative role study has been undertaken to date.

Accordingly, a study of OEM PAs in one occupational medicine organization was developed to better understand some of the similarities and differences in provider roles. We asked one fundamental question: how do PAs and physicians in this organization compare in their management of OEM patients?

Method

This is primarily an administrative data study and not medical outcomes research. Types of patients seen and visit dispositions between two types of providers were compared. The information sources were the billing and other internal administrative datasets from a large employer of PAs and physicians in OEM. Statistical analyses were conducted and the 95% confidence intervals around the means and proportions were computed using SAS (Statistical Analysis System), a statistical software package used in the biomedical sciences. Differences between the numbers of observations for each group of clinicians were investigated using analysis of variance. Chi-square analyses determined differences in proportion of treatment mentioned by type of provider and other variables.

Setting

The setting was the Dallas–Fort Worth (DFW) Texas region of Concentra Managed Care. Concentra is a for-profit health care organization that specializes in occupational and industrial health care and injury treatment services. It is the largest OEM corporation in North America and employs 8800 people in 32 states and Canada. One aspect of this service is to manage the disability costs associated with workers' compensation injuries. In 1999 the organization served ~130 000 different employers and processed >5 million patient encounters.

The Concentra presence in the DFW area includes 36 health care providers specializing in family practice, OEM, general surgery, emergency medicine and physiatry. Providers are defined as allopathic and osteopathic physicians (MD/DOs) and PAs. In 1999, there were ~84 000 visits at 16 proprietary medical offices. A broad range of services included injury management, employment related physical examinations, pre-placement substance abuse testing, regulated examinations (i.e. respirator mask fittings), job-specific return-to-work evaluations and information management. Specialized 'on-site' occupational health care and consulting services were also performed.

Patients are referred from their employers to Concentra, where they are assigned an appointment time and location. Urgent cases are seen on the same day. Referrals

and return visit dates are assigned at the time of the visit. There is no triage and patients are assigned to the next available provider. Protocols are system wide and not specific for a type of provider. A supervising physician is administratively assigned to a PA for the day, as required by Texas medical licensing statute.

Data sources

The data for this study include three sources: employee administrative files maintained by the Department of Human Resources; patient encounter files; and billing records. For each encounter or patient visit, the provider of record enters the information about the patient on forms and in networked computers. Data input employees further abstract the patient encounter forms and add administrative data for billing purposes. These data are warehoused on a mainframe computer at the national headquarters in Dallas, Texas.

The patient encounter database contains a case or episode of injury information for an individual. Each visit can include a wide range of information for the encounter. Important fields for this analysis include patient demographics, date of injury, unique case record number used for managing the encounter, number of visits, treatment, referrals, medications prescribed, other resources and the provider of record. This information is then linked with the provider such as specialty, type, date of hire, hours worked and other characteristics.

The activity of physicians and PAs in OEM was examined using episode of care methodology. An episode of care began on the date the employee sought care from Concentra and ended when the case was closed to further care. A diagnostic code (or codes) was entered at the first encounter. All activity was linked to the patient and the first encounter date. The diagnostic code could change, but the date of the encounter and patient did not. Because the intent of the study was to compare total care by two types of providers if care was divided between two OEM providers, or more than one diagnosis recorded, that episode was eliminated from the analysis.

There were 168 000 patient visits to eight DFW Concentra Managed Care medical offices in 1999. For this study, the activities of interest were injuries, which constitute 94% of all doctor and PA provided services at Concentra Managed Care.

Results

When this study was conducted in 1999, the DFW region of Concentra employed 36 providers specializing in OEM (Table 1). Two-thirds (24) were physicians and the other third (12) were PAs. No nurse practitioners were employed in this region at the time of this study. The average age of the physician was 50 years and that of a PA was 45 years. The mean annual salary was $143 056 for a physician and $74 208 for a PA. Benefits were not calculated in the salary structure. The mean total hours worked for the physician was 1662.2 annually and 1871.3 for the PA. Annual hours included part-time and overtime employment.

There were 29 676 first encounters and 51 088 follow-up visits available for analysis where one provider managed an episode of care for all visits. How each group of providers managed patients is displayed in Table 2. The average number of days of 'limited activity' assigned to the patient (as a form of injury management) by all providers was 16.8, with PAs averaging 15.6 and physicians 17.4 ($P = 0.015$). Referring a patient to an outside provider (e.g. ENT surgeon) was rated as a probability with an average likelihood of 18.2% of all visits. Physicians were less likely (17.4%) than a PA to refer (19.7%; $P = 0.0001$). An overall average of 2.8 patients/h was maintained in 1999: physicians averaged 2.9 and PAs 2.5 ($P = 0.008$). The average charge per visit was $296.72. The average total charge per episode was $594.33. While visit charges for PAs were less than physician charges, on average the difference was negligible and did not reach statistical significance.

Providers used a three-point scale, the Injury Severity Scale, at the time of encounter to assess the severity of the patient's complaint. Selected criteria categorized the patient's condition as mild, moderate, or severe. The mean severity scale for both providers was 1.93.

Most of the patients were male (average 73.1%). While the difference (72.5 and 74.3% for physicians and PAs, respectively, $P = 0.007$) reached statistical significance, the clinical difference was considered irrelevant.

The probability of patients being likely to keep their appointments was assessed. The overall average was 79%, with 81% for PAs and 76% for physicians ($P = 0.002$).

Finally, a comparison regarding types of referrals made by each provider was conducted (Table 3). No statistical

Table 1. Occupational and environmental providers by labor characteristics (1999)

	No.	Age (average)	Gender	Mean salary ($)	Average no. of visits per hour	No. of hours worked	Average hours worked per provider
Physicians	24	50	18 M:6 F	143 056	2.9	39 892	1662.2
Physician assistants	12	45	7 M:5 F	74 208	2.5	22 455.5	1871.3

Table 2. Comparison of PAs and physicians by outcomes of episodes of care

	PA average	Physician average	Overall average	*P*	SD	95% CI
1. Average number of days of limited activity assigned	15.6	17.4	16.8	0.015	48.2	16.1–17.5
2. Likely to refer a patient to an outside provider	19.7%	17.4%	18.2%	0.0001	38.6%	17.6–18.7%
3. Average number of patient visits per hour	2.5	2.9	2.8	0.008	1.9	2.8–2.8
4. Average charge per visit	$284.77	$302.53	$296.72	n.s.	$159.76	$294.50–298.93
5. Average total charges for episode of care	$565.98	$608.13	$594.33	n.s.	$751.46	$583.91–604.75
6. Average severity score of problems treated (mild = 1; moderate = 2; severe = 3)	1.92	1.93	1.93	n.s.	0.33	1.93–1.94
7. Percentage of male patients	74.3%	72.5%	73.1%	0.007	44.3%	72.5–73.2%
8. Average age of patients (years)	35.3	35.5	35.5	n.s.	11.2	35.3–35.7
9. Probability patients likely to keep their appointment	81%	76%	79%	0.0024	1.04	78.0–80.9

difference emerged between physicians and PAs where the referrals were directed.

Table 3. Percentage distribution of referrals by type of provider (1999)

Referral type	Physician	PA
Physical therapy	84.0	88.0
Orthopedics	4.6	3.0
General surgery	2.1	2.3
Other	9.3	6.7
Total	100	100

Discussion

In this particular OEM setting, some administrative differences emerged between the two providers. PAs work proportionally more hours on average than physicians and their salary is approximately half of a physician's salary. This salary difference is consistent with nationally observed PA and physician salaries in primary care [12].

Characteristics of patients are important variables when comparing provider activities. In this study, no significant differences emerged. The average age of patients was similar between the two providers and the percentage of males differed by only 2.2%. The injury severity scale scores were identical. However, a three-point interval scale was not considered sensitive to analysis and has not been validated. An interesting observation was that patients seen by PAs were more likely to keep their return appointments than patients seen by physicians. One interpretation of this finding might be a measure of compliance and could represent satisfaction with care or some other attribute of either the physician or PA. Patients who do not keep their appointments also represent unrecompensed time.

The amount of revenue a provider generates is reflected in the billing charges. In this setting, all OEM visits were billable, therefore a higher rate of return visits to see the PA may be viewed as beneficial to the organization, especially since the charges were fixed regardless of provider. The average charge for an unscheduled (injury) visit was $296.72 (1999 dollars). An episode of care (two visits for 93% of all visits) was $594.33 on average. The differences in average charges generated by each group of provider for a visit or an episode did not reach statistical significance.

The management of patients revealed a few differences between providers. When light duty or limited work activity was assigned to an industrial medicine patient, PAs prescribed less time (15.6 days) than physicians (17.4 days). The implications of these findings are beyond the scope of this paper, since treatment based on diagnosis was not part of this study. However, since patients were undifferentiated (not triaged) to one type of provider over another, it implies there may be differences in care between providers.

Another area of interest in this study is the referral rate. The average referral rate of 18.2% is 2.5 times as high as the national rate in adult primary care [13,14]. This finding may reflect that not all of OEM is primary care; the need to use allied health (e.g. physical therapy) and select specialists (e.g. orthopedics) for industrial patient management may be higher than primary care.

While barriers to referral can limit the cost-effectiveness of PAs [15], the referral rate of almost 20% by PAs in this study suggests referral barriers were not an issue. When the referrals were systematically analyzed, most of the referrals were to physical therapy (PT) for both providers. Some evidence suggests that a referral to PT can accelerate recovery from an acute care mode and return him or her to work more quickly [16]. Patients seen by PAs for an episode of care were assigned shorter periods of limited activity on average, but at a higher PT referral rate than the patients of physicians, suggesting there may be differences in how the patients are managed.

This was an administrative study designed to be useful to managers of health providers and not an econometric study. As such, there are some limitations to this type of

work from a labor cost-effectiveness standpoint. As with many studies of this type, it was a retrospective study using secondary data for analysis. Data collected and intended for one purpose may have unknown biases that skew the data in one direction or another. If PA care is comparable to a physician's care in OEM, then a prospective study that matches patients for age, gender, type of injury, diagnosis, severity, time of visit and resources used needs to be undertaken to substantiate that belief.

Another limitation with this study is the unknown interaction between the PA and physician. Technically, the role of the PA in relation to the physician is one of delegated responsibility. How the PA provides care can theoretically be enhanced or inhibited by the physician's supervisory influence. This team role is identified as one issue in the provision of patient care and needs to be assessed from an overall productivity standpoint [17].

It is difficult to generalize these findings to OEM PAs in other settings, since so little is known about OEM PAs. Concentra is the largest OEM company in North America, unique in its size, and there is no other company that comes close. It may have an economy of scale that makes comparisons difficult. However, the method it employs to process patient needs and its use of PAs is consistent with other managed care firms and probably reflects contemporary organizational practices [18]. While each of the states differ somewhat in permissive legislation concerning how PAs may perform their delegated roles, the incorporation of employees in managed care settings tends to dampen these differences and allows PAs and other employees to function fairly efficiently. For example, PAs in Texas, at the time of this study, could not prescribe narcotic analgesics. However, policies within the organization permitted PAs to phone in a controlled substance in the supervising physician's name thus avoiding interruptions in workflow.

Conclusion

This small study offers some insight into the activity of PAs in OEM, at least in the USA. In this particular setting, where OEM is the exclusive focus of medical care, it appears that PAs are providing a service that is comparable to physician services from an administrative viewpoint. Their productivity to compensation ratio suggests they may be economical members of the health care team from a labor standpoint. However, some of their cost-effectiveness may be negated by a higher referral rate than the physicians. This observation requires further analysis to see if the benefit of a PA in the provider mix is retained.

While it is probably safe to say that PAs would not be employed in OEM if they were not cost-effective, far more needs to be understood about PA delivered services from an economic perspective. Clearly, little is known about what OEM PAs do, where they work and how they benefit their employers. Understanding how they are utilized precludes any organizational evaluations that would improve patient and employer services. It is hoped this study helps to establish a foundation for additional research on how OEM services can be effectively and efficiently delivered.

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