
Resident Physician Satisfaction with Spine Care Education: A Progress Report from the Penn Spine Center

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Abstract

Background & Problem Statement: medical education & related research regarding interventional spine care is limited, in spite of repeated calls for increased attention to lower back pain and other spinal disorders. The Penn Spine Center at the University of Pennsylvania was established, in part, to address the need for more focused education of resident physicians concerning a multidisciplinary approach to spine care.

Method: this progress report describes an educational rotation targeted at resident physicians in Physical Medicine & Rehabilitation; and reports on evaluation data provided by 50 rotation participants over a period of six academic years (1997-2003); we provide descriptive data and inter-item correlations (Spearman method); ratings item means were compared using t-tests and/or ANOVA procedures.

Results: 48 of 50 participants reported that the educational objectives of the rotation were achieved; all participants stated that they would recommend the rotation to colleagues; the overall educational value of the rotation was rated highly (9.36 on a 10-point scale); the educational value of interacting with physical therapists was rated significantly lower than other items (7.00; $p < .05$, ANOVA).

Conclusions: although participants rated this educational experience very highly, further research of a more objective nature is needed to demonstrate educational utility.

BACKGROUND

Low back pain and associated spine problems are common in the United States. Lifetime incidence of low back pain is reported to be in the range of 60%-90%, with an annual incidence of five percent¹. Additionally, low back pain is among the top ten reasons for visits to family practice physicians²; is second only to upper respiratory complaints as a cause of lost work time³; and is the most common reason for office visits to orthopedic surgeons, neurosurgeons and occupational medicine physicians⁴. In spite of its prevalence, the diagnosis and clinical management of low back pain is challenging. Compared to more serious spinal disorders and neurologic problems with specific pathologies (e.g., disc prolapse, spinal tumors), patients with chronic low back pain usually present with a more nonspecific constellation of symptoms; the etiology of such pain is, therefore, more difficult to diagnose and resolve⁵. Because of the difficulty of diagnosis, certain diagnostic tools may be viewed as less than beneficial but

used anyway, resulting in increased expenditure of health care dollars. This pattern of diagnostic behavior continues across physician disciplines, even when it is commonly observed that "diagnostic tests often correlate poorly with symptoms and even less well with the level of disability" of the patients involved⁶.

MEDICAL EDUCATION CONCERNING BACK PAIN

Given the relative uncertainties of the clinical applicability of the myriad of diagnostic approaches and the challenging clinical management of these patients, it has been suggested that the education of physicians pertaining to the management of back pain and related disorders should be improved. Numerous calls for better education of medical students and resident physicians are represented in the medical education literature, and include reference to medical schools in the United States⁷, Canada^{8,9}, and European countries^{5,10}. However, there is a paucity of studies

investigating best practice teaching models for low back pain, spine care, and musculoskeletal medicine. Existing studies in graduate medical education are focused on radiographic interpretation¹¹ and patient management^{12,13}; but such studies are not widespread. Specifically for our purposes, we could not identify a single educational research study on the subject of interventional physiatry spine care in the medical education literature.

EDUCATION AT THE PENN SPINE CENTER

In response to the perceived need for improved education regarding the care of patients with back pain and other spinal disorders, the University of Pennsylvania Department of Physical Medicine and Rehabilitation launched a major clinical and educational initiative in 1992 with the establishment of The Penn Spine Center. A primary thrust behind the initiation of the program was to develop a multidisciplinary specialty model of patient care that would provide education across multiple categories of health professions: physical therapists, nurses, medical students, residents, fellows and attending physicians. Other key aspects of the strategy entailed the development of an interventional physiatric clinical fellowship; an emphasis on clinical research; and an emphasis on training academicians who, after completion of the fellowship, could launch similar programs in other academic medical centers across the country.

Since its inception, approximately 250 health professions students from a variety of disciplines have completed rotations in the Penn Spine Center. Another 20 former physiatry residents have completed interventional physiatry fellowships during the 12 months immediately after completion of their PM&R residencies. The educational importance of this collaborative project is underscored by the fact that it was the first interdisciplinary academic spine program in the United States directed by an academic physiatrist (CS). The overall educational emphasis of the Penn Spine Center remains two-fold: to teach the diagnosis and treatment of painful spinal disorders using minimally invasive techniques; and to educate about the judicious use of surgery for spinal disorders.

METHODOLOGY

A specific resident rotation in interventional spine care was established to provide an elective for physiatry (rehabilitation medicine) residents from across the United States who requested an in depth training experience in

various aspects of care for patients with spinal disorders. We report on an exploratory project concerning an elective experience in interventional spine care for resident physicians. The rotation was designed to maximize residents' learning from and exposure to a variety of patients experiencing back pain and other types of spinal disorders. The formal educational objectives of the rotation were as follows:

- To provide residents with hands-on exposure to history-taking and diagnostic assessment of patients experiencing chronic back pain and/or other spinal disorders
- To reinforce the fundamental tenets of the musculoskeletal examination
- To maximize residents' understanding of proper interpretation of radiographic studies
- To expose residents to a clinical care approach specifically based on the involvement of a multidisciplinary care team consisting of physicians from other specialties and rehabilitation therapists
- To maximize residents' understanding of how to formulate a diagnostic and/or therapeutic algorithm for patients with spinal disorders
- To describe the process of revising the initial algorithm to ensure high quality and efficient medical treatment
- To expose residents to indications for and techniques of various interventional spine injection procedures and minimally invasive spine surgery
- To describe and explain the indications and timing of surgical intervention for spinal disorders

Formal educational experiences incorporated into the rotation in a systematic fashion included general outpatient clinics (5 days per week); injection clinics (3-5 days per week); weekly case conferences and research conferences; consultations in The Penn Spine Center with physicians from other specialties; and focused interactive sessions on a case by case basis with physical therapists concerning recommended therapy regimens for spine patients. Residents were also expected to work closely with faculty and/or

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clinical fellows on the production of a scholarly paper on some aspect of spine care or a related topic.

In collaboration with their home institutions, participants were scheduled for rotations after making application to the Director of the Spine Center and completing an internal interview process. The length of the rotations varied from 5 to 30 days, and averaged 14.3 days. They were asked to provide end of rotation feedback on their educational experiences using a ratings form containing eighteen items (see Table One).

Figure 1

Table 1

Item Means & Distributions: Educational Feedback by Rotations in Spine Care Center
University of Pennsylvania Department of PM&R
Academic Year 1997-2003

Rating Scale for Items 1-14		Rating Scale for Item 15		Rating Scale for Items 16-18	
10 = Excellent		4 = Greatly		1 = Yes	
7 = Good		3 = Moderately		2 = No	
5 = Average		2 = Slightly			
3 = Poor		1 = None			
1 = Unsatisfactory					

Item #	# of Ratings	Item Scale	Mean	St Dev	Item
1	50	1 to 10	9.36	0.91	Rate the overall patient population in terms of educational value.
2	50	1 to 10	9.42	0.94	Rate your overall experience with this elective rotation.
3	48	1 to 10	9.04	1.15	Rate the degree to which educational objectives were met.
4	48	1 to 10	9.04	1.00	Rate the quality of teaching provided for history taking.
5	50	1 to 10	9.32	0.97	Rate the quality of teaching provided for assessment of spinal disorders.
6	50	1 to 10	9.12	1.11	Rate the quality of teaching provided for radiographic interpretation.
7	48	1 to 10	8.70	1.25	Rate the quality of teaching provided for physical examinations.
8	50	1 to 10	9.26	1.04	Rate the quality of teaching provided for formulation of a diagnosis & therapeutic plan.
9	47	1 to 10	8.38	1.04	Rate the quality of teaching provided for spinal injection procedures.
10	26	1 to 10	9.82	1.04	Rate the educational value of contact with:
11	19	1 to 10	9.81	1.01	Rate the educational value of contact with orthopedic spinal surgeons.
12	23	1 to 10	9.17	1.00	Rate the educational value of contact with basic radiology.
13	13	1 to 10	7.00*	2.38	Rate the educational value of contact with physical therapists.
14	14	1 to 10	8.00	2.20	Rate the educational value of contact with other health attendings in the Spine Center.

Figure 2

*Item mean significantly lower @ p<.05

Item #	# of Ratings	Yes	No	Item
16	50	48	2	Were the objectives of this rotation defined at the beginning?
17	50	48	2	Were these objectives met?
18	50	50	0	Would you recommend this rotation to other PM&R residents?

Items 1-14 asked participants to rate their experiences on a ten-point rating scale where 1=Unsatisfactory, 3=Poor, 5=Average, 7=Good, and 10=Excellent. Item 15 (degree of change in interpretation of radiographic studies) asked for ratings based on a four-point rating scale where 1=None, 2=Slightly, 3=Moderately and 4=Greatly. Items 16-18 were rated dichotomously, i.e., using “yes” or “no” responses. All ratings items emphasized the quality of teaching and the perceived educational value of the experience as self-reported by rotating resident physicians.

A total of fifty residents (forty-four male and six female)

participated in the project, representing twenty-five residency programs in twelve states. Data collection took place over six academic years (1997-1998 through 2002-2003); all responses to surveys were anonymous. Data from rating scales were treated as interval level data. Data analyses included descriptive statistics; percentage responses in selected categories; Spearman correlational analyses, which measured associations between ratings items; and comparison of item means across groups of trainees and academic years, using independent t-test and/or analysis of variance (ANOVA) procedures.

RESULTS

All fifty residents who completed the rotation provided a post-rotation evaluation/feedback form, which was generally completed on the last day of the rotation. Forty-eight of fifty participants reported that educational objectives were well defined and achieved. All participants answered “yes” to the question “would you recommend this rotation to your colleagues?”

All item means and other results are also displayed in Table One. For items 1-14, item means ranged from a high of 9.42 (overall educational experience) to a low of 7.00 (interaction with physical therapists). The actual number of ratings per item ranged from fifty to thirteen; completed ratings dropped for items ten through fourteen. The educational value of the overall patient population was rated highly (9.36). Three quality of teaching items were also rated highly: assessment of spinal disorders (9.32), development of a diagnosis and therapeutic treatment plan (9.26), and radiographic interpretation (9.12). On a single ratings item (educational value of contact with physical therapy) the mean rating was significantly different from other item means (p=.05, ANOVA procedure). No significant differences were found on any of these fourteen items based on academic year.

On item 15, which used the four-point rating scale, the mean rating across all raters was 3.38. Based on ratings of this item, eighty-six percent (86%) of residents felt that their ability to interpret radiographic studies had increased either “moderately” or “greatly”. Again, there was no difference on this item based on academic year.

Regarding the three dichotomous items (“yes” or “no” responses), all but two of the fifty participants said “yes” when asked if the rotation objectives were well defined at the beginning of the rotation; all but two stated that these objectives had been met; and all residents stated that they

would recommend the rotation to other residents in physical medicine and rehabilitation.

Inter-item correlations ranged from .96 to -.14. Focusing on items pertaining to educational aspects of the rotation (see Table Two), we found strong positive associations between residents' overall educational experience and five items pertaining to quality of teaching, including the overall educational value of patients seen ($p=.05$); the degree to which educational objectives were met ($p=.01$); the educational value of contact with orthopedic spinal surgery and bone radiology; and the degree to which interpretation of radiographic studies had changed ($p=.05$). The degree to which educational objectives were met was also positively correlated with four items: the educational value of patients seen ($p=.05$); overall educational experience ($p=.01$); teaching of history taking ($p=.05$) and the degree to which interpretation of radiographic studies had changed ($p=.05$). No significant negative correlations were found on any ratings item; nor were there any significant item correlations based on academic year.

Figure 3

Table 2

Selected Inter-Item Correlations - Educational Feedback by Rotators in Spine Care Center
University of Pennsylvania Department of PM&R
Academic Years 1997-2003

Item #	Overall Educational Experience	Degree Objectives Met
Resident Gender	-.074	.305*
Academic Year	-.047	-.099
Educational Value Patients	.304*	.354*
Overall Educational Experience	1.00	.448**
Degree Objectives Met	.448**	1.00
Teaching History Taking	-.011	.323*
Teaching Assessment of Spinal Disorders	-.179	-.105
Teaching Radiographic Interpretation	-.173	.006
Teaching Clinical Exam	-.094	-.024
Teaching Diagnosis & Therap Plan	-.132	-.146
Teaching Injection Procedures	.166	.093
Educational Value of Conferences	.271	.304
Educational Value of Contact w Orthopedics	.540*	.241
Educational Value of Contact w Bone Radiology	.433*	.385
Educational Value of Contact w Phys Therapy	-.079	.284
Educational Value of Contact w Physiatrists	.494	-.379
Degree Radiographic Interpretation Changed	.396**	.637*

* $p=.05$, Spearman Rho coefficient

** $p=.01$, Spearman Rho coefficient

DISCUSSION

This article reports program evaluation data on educational outcomes regarding a resident rotation in interventional physiatry, the first such evaluative study of this nature within the field of Physical Medicine & Rehabilitation in the

United States. We relied exclusively on feedback data provided by fifty physiatry residents who underwent an elective rotation at The Penn Spine Center over six academic years. Based on self-report by participants, we find empirical support for the teaching efforts of The Penn Spine Center faculty in formulating a positive rotation experience with educational value. Specifically, participants in the rotation reported that their educational experiences enhanced their knowledge of back pain and other spinal disorders, as well as their clinical skills in such areas as patient assessment, clinical examination, interpretation of radiographic studies, and formulation of a diagnostic and therapeutic plan of care for patients. Additionally, residents benefited from exposure to spinal injection procedures, as well as from opportunities to interact with members of a care team from other disciplines such as orthopedic surgery, bone radiology and physical therapy. Finally, the large majority of residents who completed the rotation felt that their ability to interpret radiographic studies had improved, and all residents stated that they would recommend the experience to their resident colleagues in physiatry. And, these positive educational benefits were consistently reported across all six academic years.

PM&R residents who rotated through The Penn Spine Center were pleased with the educational value of the patient population cared for; believed strongly that the educational objectives were well defined at the outset of the rotation and had been met; and gave good ratings to the quality of teaching in designated topics. The patterns of inter-item correlations are logical and support the notion that an elective rotation like the one described herein must be carefully designed. For example, our finding of positive associations between overall educational experience and the clear explanation and attainment of educational objectives lends support to an organized and systematic approach to clinical education. Further, the structured approach used in our rotation also resulted in a high degree of satisfaction with the rotation and positive feedback from learners about the quality of teaching. We are optimistic that our visiting residents did, in fact, learn a great deal about such things as radiographic interpretation, taking appropriate histories from patients with spinal disorders, and how professionals in various medical specialties can work together for the benefit of patients.

Residents were less enthused about participating in case and/or research conferences, perhaps because these

experiences took them away from time spent in clinical care. And, PM&R residents were the least positive about interaction with physical therapists. We are somewhat puzzled by this finding, as we had anticipated that more frequent and focused interaction with physical therapists who specialize in spine care would lead to increased appreciation on the part of PM&R residents for the important contributions made by therapists to patient care. Perhaps one explanation is that many, if not most, of the residents had already worked with therapists in their home programs and believed this interaction to be redundant to previous learning experiences with therapists. Another possible explanation is that the residents did not have the ability to formulate and pose insightful questions to knowledgeable and experienced therapists. In combination with a relative passivity of the physical therapists, this could have resulted in a diminished dialogue between the two groups. We are in the process of undertaking further research to identify the root issue(s) with this finding, so that resident educational experiences with therapists are maximized during the rotation.

There are several important limitations to our data that must be highlighted:

- Reliance on self-reported data; this subjectivity means that our results reflect not an objective study per se, but rather a progress report based on educational feedback from rotation participants.
- Small sample size in combination with comparative analyses of item means can contribute to Type II error and to general difficulty in interpretation of results; and, the reduced number of resident ratings of certain items on the feedback form further weakens our ability to interpret the data.
- We made no attempt (again, due primarily to the small overall sample size) to compare the experiences of rotating residents based on the length of time they spent in the Spine Center. Some rotations were longer than others, depending on the schedule time allotted by the home institution and resident preference. Obviously, resident perceptions could have been heavily impacted by the duration of their experiences.
- We did not measure gains in knowledge or clinical skills by use of a written or oral examination, a

clinical performance assessment, or other more objective means. Such measurements could have supplemented resident reporting of results, and shed important light on whether residents actually learned what they reported learning.

- Although inter-item correlations were statistically significant in regard to nine variables, the overall strength of those correlations did not approach the .70 level; this could be interpreted as somewhat less than “clinically significant” in the sense that relatively low correlations do not engender confidence in the results.

CONCLUSION

A structured clinical rotation in interventional spine care for resident physicians, as described herein, is perceived by participants as an effective means of enhancing their education regarding low back pain and other spinal disorders. Self-reported evaluation data by participants indicate that enhanced learning in specific areas focusing on diagnosis, treatment planning and multidisciplinary care will be favorably received by PM&R residents and, by inference, other physicians. These educational efforts are consistent with the prevailing view that additional clinical education focusing on care of patients with spinal disorders is sorely needed. Future research will include a pre- and post-test measurement of resident knowledge and/or ratings of actual clinical performance by attending faculty or senior fellows. And, our research will also focus on understanding how a variety of teaching methods impact individual student learning, and on whether rotations such as the one described herein actually increase the measurable knowledge and clinical skills of physicians who care for patients with low back pain.

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