

A Primary Care Musculoskeletal Clinic for Residents

Success and Sustainability

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Musculoskeletal complaints are common, but are often underemphasized in residency training. We evaluated the experience of residents (12) in 4 sessions of an innovative concentrated ambulatory, community-based musculoskeletal (MS) clinic precepted by general internists with additional training in teaching MS medicine. Compared with the yearlong longitudinal house staff (HS) clinic experience, the mean number of musculoskeletal diagnoses per resident seen in MS clinic was higher (13.9 [standard deviation 4.0] vs 5.4 [standard deviation 4.0]; $P < .01$). Common diagnoses in MS clinic included shoulder, hip, and knee tendonitis/bursitis, and the majority of diagnoses in HS clinic were nonspecific arthralgia (66%). Fifty-two injections were performed in MS clinic over the year, compared with one in HS clinic.

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Over 40 million Americans have musculoskeletal disorders.¹ Musculoskeletal complaints account for 10% to 15% of all visits to primary care physicians, and 70% of all new musculoskeletal injuries are treated by primary care physicians.^{2,3} Although 90% of common nonsurgical orthopedic complaints are thought to be manageable in the primary care setting, the musculoskeletal exam and procedures are often inadequately performed by primary care physicians at all levels of training.^{2,4–7} Previous research has suggested that when primary care physicians are provided additional training in musculoskeletal conditions, their confidence in managing these conditions is increased and referrals are reduced.^{8,9}

A needs assessment of Johns Hopkins Bayview Medical Center residents identified musculoskeletal medicine as a gap in their internal medicine training and reported barriers to training in musculoskeletal medicine including lack of general internal medicine preceptors with sufficient skills in musculoskeletal procedures, and lack of a concentrated musculoskeletal clinic experience. The Accreditation Council on Graduate Medical Education emphasizes that education regarding musculoskeletal and sports injuries should occur in "settings representative of the

environment in which graduates will eventually practice," namely primary care clinics.¹⁰

Thus, our purpose was to establish a primary care musculoskeletal curriculum. The main innovation of this project was that we created a clinical experience that could not have existed previously. The resulting musculoskeletal clinic had a unique combination of 1) a case mix representative of common primary care musculoskeletal disorders, and 2) a group of preceptors specifically trained to have additional expertise in dealing with and teaching about these disorders. We had to overcome several obstacles including providing protected time for additional training for our primary care preceptors to become skilled in teaching musculoskeletal medicine, and also dedicating clinic time and space and establishing a protocol for patients to be triaged into the special musculoskeletal clinic.

In evaluating this curriculum, our goal was to compare the one month musculoskeletal clinic experience with that experienced by residents throughout the year in their hospital-based ambulatory house staff clinic. Our secondary objective was to assess the impact of the curriculum on the productivity of the community-based faculty, as measured by relative value units (RVUs).

METHODS

Focused Needs Assessment

The musculoskeletal curriculum was developed using the 6-step approach developed by Kern et al., starting with a needs assessment.¹¹ We first reviewed the 1999 Bayview Medical House Staff Practice Survey, an end-of-year summary evaluation, and a senior resident exit survey. Residents (34) rated their perceived proficiency in various medical domains at the end of training. Musculoskeletal medicine and gynecology were the lowest rated domains, with a median score of 3 (scale: 0 = lowest, 5 = highest). The perceived importance of musculoskeletal topics to the resident's future careers was high, with a mean score of 4.4 (scale: 0 = lowest, 5 = highest). When asked on the exit survey "are there any specific skills in primary care internal medicine that you will need to know that you do not feel adequately prepared for," several senior residents responded "joint injections, and musculoskeletal issues."

In other open-ended comments on the survey, residents recommended a "musculoskeletal segment in the curriculum." Residents were asked what additional skills training they would like to receive. One reported "formal training in basic procedures an internist might do in an office, such as joint injections." Another suggestion to improve the program was "musculoskeletal, some basic 'ortho,' like a clinic for splints and injections, and also

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'procedure workshops.'" Residents listed barriers to learning more about musculoskeletal medicine including "lack of supplies," and "faculty don't seem to know much more (musculoskeletal) than the residents."

We also held a focus group of 20 residents during a noon conference in December 1999. Specific themes derived from qualitative analysis of comments included: 1) gap between knowledge and skills (residents felt they had some knowledge but were lacking most procedural and diagnostic skills related to musculoskeletal medicine), 2) unbalanced emphasis in training on rarer conditions, 3) lack of exposure to adequate patient population, and 4) desire to train with primary care physicians. Despite a currently available, highly rated rotation in rheumatology, and another optional rotation with orthopedics, residents felt the orthopedics cases (fractures, pre- and postoperative care) and rheumatology cases (rheumatoid arthritis, vasculitis, lupus, etc.) did not mirror the epidemiology of disorders (back pain, tendonitis, plantar fasciitis, etc.) seen in primary care.

To further triangulate data, we asked 23 residents to complete a barriers to training in musculoskeletal medicine

assessment, and 22 responded. The most significant barrier perceived was "lack of teachers trained in musculoskeletal medicine," with (38%) of residents identifying this as a serious barrier.

Curriculum Objectives and Training of Preceptors

The goals of the primary care musculoskeletal curriculum were to 1) prepare residents to competently evaluate and manage common ambulatory musculoskeletal complaints and 2) provide residents knowledge and skills practice in common outpatient musculoskeletal injections. Based on our needs assessment, a concentrated clinic experience directed by a group of primary care preceptors, a series of small group case-based discussions of musculoskeletal problems with practice of the musculoskeletal physical exam, and a reference syllabus were implemented. Teaching was organized around a set of specific educational objectives (Table 1).

Prior to implementing our clinic, three community-based general internal medicine preceptors were given

Table Summary of Specific Knowledge and Skill Objectives for the Musculoskeletal Curriculum

Learner Objectives	
For all conditions	<ol style="list-style-type: none"> 1. Demonstrate physical exam techniques relevant to diagnoses. 2. List the indications for X-ray, other radiologic imaging, and for surgical referral when indicated. 3. Write a concise, appropriate physical therapy referral as indicated for the patient's diagnosis. 4. Identify appropriate materials needed and perform appropriate aspiration and corticosteroid injections with appropriate technique.
Knowledge: knee	<ol style="list-style-type: none"> 1. List the elements of the history that differentiate between meniscal and ligamentous tears from simple knee strain, and those that distinguish between various pain syndromes of the knee including patello-femoral syndrome, knee strain, a Baker's cyst, and anserine bursitis. 2. List the key treatments for knee strain, patello-femoral syndrome, meniscal tear, ligament tear, anserine bursitis, and osteoarthritis.
Skill: knee	<ol style="list-style-type: none"> 1. Demonstrate key maneuvers in the physical exam to distinguish between various pain syndromes of the knee including patello-femoral syndrome, anserine bursitis, and knee strain, and to distinguish meniscal from ligamentous tears and from knee strain. 2. Demonstrate intra-articular aspiration/injection, prepatellar bursa aspiration, and injection of the anserine bursa.
Knowledge: shoulder	<ol style="list-style-type: none"> 1. Describe the distinguishing features of rotator cuff tendonitis, subacromial impingement, frozen shoulder, rotator cuff tear, subscapular bursitis, glenohumeral osteoarthritis, and biceps tendonitis. 2. Describe principles of treatment, including heat, exercise, NSAID, and corticosteroid injections.
Skill: shoulder	<ol style="list-style-type: none"> 1. Perform range of motion evaluation and identify any deviation from normal. 2. Perform the arc of elevation maneuver and show how it is used to diagnose shoulder pain. 3. Demonstrate the proper performance of range of motion and strengthening exercises. 4. Perform corticosteroid injection, using proper technique.
Knowledge: hip	<ol style="list-style-type: none"> 1. List the elements of the history that distinguish between various pain syndromes of the hip including osteoarthritis, trochanteric bursitis, iliopectineal bursitis, and ischial bursitis. 2. List the key treatments for osteoarthritis, trochanteric bursitis, iliopectineal bursitis, and ischial bursitis.
Skill: hip	<ol style="list-style-type: none"> 1. Demonstrate key maneuvers in the physical exam to distinguish hip osteoarthritis, trochanteric bursitis, iliopectineal bursitis, and ischial bursitis.
Knowledge: elbow	<ol style="list-style-type: none"> 1. Describe the typical features of lateral epicondylitis, including lateral location of pain, reproduction of pain by resisted dorsiflexion of the wrist, lack of synovitis, and normal range of motion, and describe the symptoms, signs, and most common causes of olecranon bursitis. 2. Describe the typical features of medial epicondylitis, including medial location of pain, reproduction of pain by resisting wrist flexion and radial deviation, decreased grip strength, and normal range of motion. 3. Describe treatment for epicondylitis, including analgesics, exercises, and injections.
Skill: elbow	<ol style="list-style-type: none"> 1. Demonstrate proper performance of exercises and demonstrate use of elbow strap.
Skill: plantar fasciitis	<ol style="list-style-type: none"> 1. Describe treatment, including shoe inserts, NSAID, exercises, and injections. 2. Demonstrate how to perform exercises and demonstrate proper injection technique.

NSAID, non-steroidal anti-inflammatory drug.

protected time to enhance their skills in musculoskeletal medicine. These preceptors 1) participated in joint injection workshops at two national Society of General Internal Medicine meetings, 2) attended continuing medical education courses sponsored by the American College of Rheumatology, and 3) rotated through specialty sports medicine orthopedic clinics.

The Musculoskeletal Clinic

The setting of our primary care musculoskeletal clinic was Johns Hopkins at Merritt Park. The community-based clinic is housed in a shopping mall in the Dundalk area of Baltimore. Residents were already familiar with the clinic population and attendings, as they frequently rotated through the clinic to learn basic ambulatory care in addition to their experience in the hospital-based ambulatory house staff clinic. Patients represent a lower middle-class population, with median household income of \$39,000 based on U.S. Census 2000. The clinical experience was implemented during the resident ambulatory block month. Residents were given primary responsibility to interview, examine, and evaluate the patients, and present their findings to the preceptors. The preceptors would then supervise the residents performing any procedures that were needed. The policy of the primary care preceptors was to have all the procedures done by the residents, unless the resident was specifically uncomfortable (a few times at the beginning of the rotations). Thus, the majority of procedures were completed by the residents, under the close supervision and guidance of the preceptors.

A significant challenge was to have an adequate number of patients with musculoskeletal problems scheduled into the musculoskeletal clinic. To expedite scheduling, a special protocol was developed for secretarial staff to triage patients with new musculoskeletal complaints into the concentrated once-weekly musculoskeletal clinic. Front office staff were trained to identify specific patient musculoskeletal complaints (knee pain, foot pain, shoulder pain, etc.). Patients were given the choice of waiting to be seen in their primary care provider's regular clinic or present to the musculoskeletal clinic.

The Longitudinal House Staff Clinic: The Comparison Experience

The yearlong house staff clinic is located on the campus of Johns Hopkins Bayview Hospital and represents a separate patient population from the same area of Baltimore. Because the house staff clinic provides care to the underserved, patients' household income is likely to be lower.

Data Collection

Twelve residents participated in the month-long musculoskeletal clinic between June 2000 and May 2001. For comparison, the experience in the house staff practice over

the same year for these residents and the rest of the cohort of second- and third-year residents (26) was assessed. We requested and obtained Institutional Review Board exemption to use anonymized patient data aggregated at the resident level to evaluate the curriculum. Diagnostic and procedure codes were collected from billing records at each session of the musculoskeletal curriculum and retrospectively for house staff clinic at the end of the year. Diagnoses were classified according to the International Classification of Diseases.¹² Procedures were classified according to Current Procedural Terminology (CPT) codes, 4th revision, developed by the American Medical Association (<http://www.ama-assn.org/ama/pub/category/3113.html>). The frequencies of these diagnoses and procedures were assessed using administrative and billing records collected during the evaluation period. End-of-rotation satisfaction surveys were collected by the residency training program.

Productivity of Faculty

Because our community-based teachers were required to demonstrate clinical productivity, we collected data to calculate the RVUs¹³ based on the procedure codes and level of service generated during the musculoskeletal clinic sessions. RVUs were calculated for two example months, January and August, for one provider. The mean RVUs per half-day musculoskeletal clinic were compared with average RVUs of 7.2 previously reported for the three community-based faculty's half-day clinic sessions.

Analysis

We compared the two separate clinical experiences over the course of the year (June 2000 to May 2001). Thus, the 1-month, once-weekly, community-based musculoskeletal clinic was compared with the yearlong longitudinal hospital-based house staff clinic. Because the musculoskeletal diagnoses in house staff clinic were uncommon, we choose to use the entire cohort of second- and third-year residents (26) for comparison. This maximizes our ability to pick up small numbers of diagnoses. Because our target for analysis was the clinical experience, and these two experiences were essentially unique, we considered the experience of each resident in each clinic as independent. Thus, for the most conservative estimate, we compared the experiences of all 26 residents in house staff practice with that of the subset also participating in musculoskeletal clinic (12), using unpaired, nonparametric tests (Mann-Whitney).

RESULTS

A total of 184 patients were seen by the 12 residents in musculoskeletal clinic over the year (2000 to 2001). Our success in scheduling patients increased slightly over the year. The mean number of patients per clinic session in the first 6 months was 4.7 (standard deviation [SD], 0.889), compared with 4.9 (SD, 1.0) in the second 6 months.

Table 2. Frequency of Musculoskeletal Diagnoses Encountered in Musculoskeletal Clinic and House Staff Clinic

	Musculoskeletal Experience					House Staff Clinic Experience			
	ICD-9 Code	Total		Mean (SD)	Range	Total	Median	Mean (SD)	Range
				per Resident for 1-Month Experience N = 12			per Resident for 1-Year Experience N = 26	per Resident for 1-Year Experience N = 26	
Degenerative arthritis [‡]	715.09	36	3	3 (1.3)	1 to 5	0	0	0	
Back pain-lumbago*	724.2	29	3	2.4 (1.3)	0 to 5	38	1	1.4 (1.8)	0 to 6
Shoulder tendonitis/bursitis [†]	726.10	28	2.5	2.3 (1.7)	0 to 6	5	0	0.2 (0.4)	0 to 1
Hip bursitis/tendonitis [†]	726.5	23	1.5	1.9 (2.4)	0 to 9	2	0	0.1 (0.3)	0 to 1
Knee tendonitis/bursitis [†]	726.69	21	1.5	1.8 (1.6)	0 to 5	0	0	0	-
Bursitis/tendonitis, NOS [‡]	726.90	19	1	1.6 (1.7)	0 to 6	0	0	0	
Carpal tunnel [†]	364.0	3	0	0.3 (0.7)	0 to 2	0	0	0	
Plantar fasciitis	728.71	3	0	0.3 (0.7)	0 to 2	3	0	0.1 (0.43)	0 to 1
Arthralgia, NOS [‡]	729.1, 791.4	3	0	0.3 (0.45)	0 to 1	93	3	3.5 (2.7)	0 to 10
Total diagnoses[†]		165	13	13.9 (5.1)	6 to 24	141	4	5.4 (4)	1 to 16

* Mann-Whitney $P < .05$.

[†] Mann-Whitney $P < .001$.

[‡] Statistical test not performed, rate in HS clinic = 0.

ICD-9, International Classification of Diseases, 9th revision; SD, standard deviation; NOS, not otherwise specified.

Because of vacations and other scheduling issues, the mean number of musculoskeletal clinic sessions per resident (12) was 3.5 (range, 2 to 4). The mean number of clinic sessions per resident (26) in hospital-based house staff clinic was 48 over the 1-year experience.

Musculoskeletal Diagnoses

Residents saw a mean of 13.9 (SD, 5.1) diagnoses per month experience, compared with a mean of 5.4 (SD, 4) musculoskeletal diagnoses seen in the ambulatory house staff clinic over the 1-year experience (Table 2). The most common diagnoses in musculoskeletal clinic were knee pain, back pain, shoulder pain, and hip pain. The most common diagnosis in house staff clinic was nonspecific arthralgia, and most other diagnoses were rarely recorded.

Procedures

Most residents performed 4 or more procedures during their month rotation. The most common procedures were

injection of steroids into the knee joint, subacromial space, and trochanteric bursa (Table 3). After reviewing billing codes for office procedures from house staff clinic, only 3 procedures (2 arthrocenteses and 1 joint injection) were performed by the 26 residents during house staff clinic during the year from June 2000 through May 2001.

Productivity

The mean RVUs per musculoskeletal session for the two example months of January and August were 5.55 and 6.0, respectively. The overall mean RVUs for all sessions for the July 2000 to June 2001 year for each of these three preceptors was unchanged from the previous year.

Ratings by Residents

Overall, satisfaction with the musculoskeletal clinic was 4.3 (on a scale of 1 = poor, 5 = superb), exceeding the average for other block rotations (4.1; range, 3.2-5.0). These ratings have continued in the subsequent years the

Table 3. Frequency of Musculoskeletal Procedures Performed in the Community-based Musculoskeletal Clinic

	CPT Code	Total	Mean (SD) per Resident for 1-Month Experience (N = 12)	Range
Wrist, elbow, ankle injection	20600	6	0.5 (0.67)	0 to 2
Shoulder, hip, knee injection	20610	40	3.3 (1.7)	0 to 6
Tendon, ganglion, trigger point injection	20550	3	0.25 (0.62)	0 to 2
Finger, toe injection	20606	3	0.25 (0.45)	0 to 1
Total procedures		52	4.3 (1.7)	1 to 7

curriculum has been sustained. Comments by residents from the 3 years of musculoskeletal clinic have included "Please increase the number of half days of MS clinic—it is an outstanding rotation with great teaching and we don't get much exposure to rheum and joint exam and injections on inpatient rotations. It seemed like there were plenty of patients and it won't be a problem to fill slots for another half day" and "Excellent preceptors, great intro to doing MS exam" and "Excellent, the best of the subspecialty clinics patients, appropriate focused, excellent teaching, [and] excellent teaching aids."

DISCUSSION

We were successful in developing, implementing, and sustaining an innovative concentrated clinical experience in musculoskeletal medicine. The number of specific musculoskeletal diagnoses seen in the 1-month (average of 3.5 sessions) musculoskeletal clinic experience was considerably higher than the 1-year experience in house staff clinic. Nonspecific diagnoses such as arthralgia were frequently coded in house staff clinic. The most striking improvement in resident experience was in procedural training. Almost no procedures were performed in house staff clinic during the study period. Although we have performed a statistical analysis, these differences can be seen even without these tests of statistical significance.

The major innovation of this curriculum is that we were able to create a match between a case mix representative of primary care musculoskeletal medicine and a group of preceptors with motivation and additional training in musculoskeletal medicine to guide the experience. We chose to implement the curriculum in a community-based setting because of the 1) availability of patients, 2) availability of providers, and 3) generalizability of the setting to primary care practice. We overcame a significant barrier: a lack of concentration of patients with specific musculoskeletal complaints. The physicians and staff of the community-based clinic were able to work together to block off a specific half-day dedicated to the special clinic, and then design a triage protocol for front office secretarial personnel to use to fill the clinic with patients with appropriate complaints. We also had significant support from institutional leaders to begin planning the curriculum a year in advance, and to allow the three preceptors to have significant protected time to undergo further training to enhance their own ability to train the residents in musculoskeletal medicine.

In addition to recruitment and logistic concerns, financial sustainability is an additional challenge to teaching in the community-based setting.^{14,15} Because of the high number of procedures indicated for patients triaged to the musculoskeletal clinic, the revenue generating power of this clinic per patient was higher than that estimated for the average clinic visit. But, because of the intensity of the teaching experience, fewer patients were seen. Thus, the estimated RVUs were lower than the established 7.2 for the faculty practices. However, the one half-day per week

of musculoskeletal medicine teaching did not impact the overall productivity of the three community-based faculty, compared with the previous year.

Unfortunately, looking month-by-month during the yearlong house staff practice, there was no trend toward increased musculoskeletal diagnoses or procedures. Thus, the additional skills the residents had obtained did not seem to cross over to the house staff practice. However, our analysis was not designed to specifically evaluate this longitudinal change, and the limited number of patients with musculoskeletal complaints in house staff clinic limits our ability to assess the resident's further use of their skills.

Because our musculoskeletal clinic was evaluated at only one community-based site staffed by three motivated preceptors with additional training in musculoskeletal medicine, our results are not strictly generalizable. Our statistical analysis is limited because of the small number of residents and our assumption of independence of experiences. Also, we do not have a gold standard assessment of diagnoses to compare with our administrative data. The fact that the rate of specific diagnoses and procedures in house staff clinic was very low, and did not change as residents were trained in musculoskeletal clinic during the same year, supports the assumption of independence. Because procedures are potentially underdocumented, especially in house staff practice, our dependence upon billing records for data collection is a limitation of this study. Using direct observation, standardized patients, or other methods, future research should evaluate change in resident skills after participating in a targeted experience such as our musculoskeletal clinic.

The clinic was designed to provide an educational experience for residents and a service to patients. Although we might speculate that the additional expertise of the clinic preceptors may have improved the care that patients received, we were not able to prospectively evaluate clinical outcomes of these patients. We might also speculate that outcomes would be improved because of the higher volume of specific musculoskeletal complaints seen by these preceptors. Our current analysis was focused on the training experience of the residents, but future research should include recruitment of patients for a prospective outcomes assessment.

The practice of medicine is becoming more outpatient focused, requiring training programs to attempt to recruit outpatient, volunteer community-based teachers to provide experiences for students and residents in internal medicine.¹⁶ Our report is the first to evaluate the comparative success of the training experience in a concentrated, community-based musculoskeletal clinic to that in a general hospital-based house staff clinic, and also to evaluate the financial viability of the community-based musculoskeletal teaching clinic. We achieved a well-received, financially sustainable clinical experience that significantly added to the training experience.

The musculoskeletal curriculum, currently sustained after its third year of implementation, continues to rank

well above average on resident satisfaction surveys of clinical precepting, compared with other block rotations. Despite logistic challenges, our curriculum has demonstrated the feasibility of a concentrated community-based primary care musculoskeletal medicine experience. We might speculate that this curriculum could be implemented in other settings, if significant institutional support from the educational, clinical, and financial leaders were obtained prior to start-up. The major barriers (lack of a concentrated patient population, and lack of trained preceptors) were addressed in the planning phase of the curriculum. The curriculum would not have been possible at our institution without the flexibility of the practice to allow the triage protocol that created the patient concentration or the protected time from clinical work for the preceptors to develop additional skills. We hope this pilot study provides information to faculty development leaders in internal medicine. Future research should prospectively assess the impact of concentrated clinical experiences on continued diagnostic and procedural competence of the trainees.

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