Effectiveness of an Interprofessional and Multidisciplinary Musculoskeletal Training Program

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ABSTRACT

Background Musculoskeletal (MSK) problems are common, and a recent US Bone and Joint Initiative calls for new models of education and professional collaboration. Evidence of feasibility and acceptability of innovative methods are needed.

Objective We assessed if an experimental immersion interdisciplinary MSK curriculum would be acceptable to residents from different specialties, be feasible within existing rotations, and be effective in strengthening clinical skills.

Methods Through funding from the Veterans Affairs Office of Academic Affiliations and the Office of Specialty Care, we developed a Center of Excellence in MSK Care and Education. A core element is the monthly MSK Education Week, which teaches skills and provides opportunities to apply these in clinical settings. Participants include internal medicine, physical medicine and rehabilitation, and orthopaedic surgery residents, as well as students and residents from other health professions programs. All were assigned to the MSK week in lieu of other clinical experiences. Faculty encompassed primary care, rheumatology, endocrinology, orthopaedics, and physical medicine and rehabilitation. Assessments include surveys and a 2-station objective structured clinical examination (OSCE).

Results Since 2012, a total of 176 trainees have participated. Percentage of trainees reporting ability to evaluate and manage MSK complaints increased (9% to 87% for shoulder; 18% to 86% for knee), and confidence performing MSK injections increased from 10% to 70%. Competency in evaluation of shoulder and knee pain was confirmed by OSCEs.

Conclusions The MSK week program was accepted by residents from the 3 specialties, with learners reporting improved ability to perform shoulder and knee examinations, as demonstrated by OSCEs.

Introduction

Musculoskeletal (MSK) problems are common, and in 2006, codes for MSK diseases were the most frequently selected conditions for primary care office visits in the United States.¹⁻³ Despite this prevalence, MSK education is inadequate across the continuum of medical education in the United States and throughout the world.⁴⁻¹¹ The 2011 US Bone and Joint Initiative Summit called for improved MSK education and emphasized the need to demonstrate competence in performing MSK physical examinations.¹²

Although recent reports emphasize innovative MSK education at the undergraduate level, less is known about interdisciplinary, multilevel structured MSK training experiences in graduate medical education.^{13,14} The purpose of this study was to determine whether an experimental interdisciplinary immersion MSK curriculum would be acceptable to residents

from internal medicine (IM), orthopaedic surgery, physical medicine and rehabilitation (PM&R), and other specialties; feasible within existing rotations; and effective in strengthening clinical skills.

Methods

In 2011, the George E. Wahlen Department of Veterans Affairs (VA) Medical Center in Salt Lake City, an affiliate of the University of Utah Health Sciences Center, established a Center of Excellence (COE) in MSK care and education, with initial support from the Veterans Health Administration Office of Academic Affiliations and the Office of Specialty Care. The goal of the COE is to train students and trainees of medical, nursing, and allied health professions to provide patient-centered care to patients with MSK diseases while learning and working in an interdisciplinary and interprofessional health care system.

Setting and Participants

Curriculum development was informed by Kern's systematic approach.¹⁵ The target group was IM

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Editor's Note: The online version of this article contains knee and shoulder examination checklists and demonstration videos.

residents, anticipating that the program would be adaptable to other trainees. In the first year, our cohort was a convenience sample of IM, PM&R, and orthopaedic surgery residents, a physical therapy resident, a senior medical student, and several physician assistants and advance practice nursing students, all of whom had been assigned to VA clinic rotations. The MSK Education Week replaced what would otherwise have been traditional clinical experiences. After the first year, we scheduled all postgraduate year (PGY) 1 categorical IM residents to participate during their required ambulatory rotation.

Intervention

In development, we drew from Kolb's theory of learning cycles, in which abstract conceptualization is followed by active experimentation, followed in turn by concrete experiences, and completed with reflective observation.¹⁶ Our planning was informed by systematic reviews supporting the use of small groups, peer learning, and simulation, and by published projections of potential cost-effectiveness of a course to train primary care providers to perform joint injections, and the initial experience of the program that followed.^{10,11,17–20} The schedule for the MSK

What was known and gap

Interdisciplinary models of care are needed in a range of clinical areas, including musculoskeletal (MSK) care.

What is new

A weeklong immersive, multidisciplinary MSK experience for internal medicine, physical medicine and rehabilitation, and orthopaedic surgery residents, and learners from other health professions.

Limitations

Single site visit reduces generalizability; there is a lack of a comparison group or long-term measurement of outcomes.

Bottom line

The MSK Education Week was accepted by residents and improved performance of shoulder and knee examinations, as demonstrated by the objective structured clinical examination.

Education Week, including requirements for faculty participation, is shown in FIGURE 1.

Shoulder and Knee Curriculum: Physical examination of the shoulder is presented, including demonstrating a systematic approach (provided as online supplemental material). Participants receive a checklist outlining the method (provided as online supplemental material) and practice this examination under faculty supervision, using the checklist as a memory aid.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Course Orientation ^a	Back Pain ^a <i>-Didactic-</i>	Gout ^b <i>-Didactic-</i>	Orthopaedic Injection Clinic ^e <i>-or-</i> Physical Medicine & Rehabilitation Clinic ^f	Multidisciplinary Musculoskeletal Clinic ^{a,c,f}
Introduction to Rheumatic Disease ^b <i>-Didactic-</i>	Physical Examination of the Knee ^{a or c} <i>-Didactic-</i>	Rheumatology 101: Serologies and RA ^b <i>-Didactic-</i>		
Physical Examination of the Shoulder ^{a or c} <i>-Didactic-</i>	Physical Examination of the Knee ^{a,c} <i>-Group Practice-</i>	Arthrocentesis ^{a,c,e} <i>-Didactic and Group Practice-</i>		
Physical Examination of the Shoulder ^{a,c} <i>-Group Practice-</i>	Approach to Knee Pain ^{a or c} <i>-Didactic-</i>			
Approach to Shoulder Pain ^{a or c} <i>-Didactic-</i>				
Lunch	Lunch	Lunch	Lunch	Lunch
Bone Health I: Osteoporosis Risk Factors and Evaluation ^d <i>-Didactic-</i>	Bone Health II: Osteoporosis Treatment and Hypogonadism ^d <i>-Didactic-</i>	General Rheumatology Clinic	Primary Care Musculoskeletal Injection Clinic ^{a,c}	Rheumatoid Arthritis Clinic ^b
	Shoulder Cases ^{a,c} <i>-Group Practice-</i>			OSCE ^{a,c}

FIGURE 1

Schedule for the MSK Education Week

Note: Specific faculty participating in each specific event are identified by footnote; the general rheumatology clinic on Wednesday afternoon does not involve course faculty. Each week involves an average of 6 to 8 participants.

Abbreviations: MSK, musculoskeletal; RA, rheumatoid arthritis; OSCE, objective structured clinical examination.

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TABLE 1

Participants in the Musculoskeletal Education Week Over a 3-Year Period

Postgraduates	N			Total (%)
	2012–2013	2013–2014	2014–2015	
Internal medicine				
PGY-1	6	31	33	70 (40)
PGY-2	1	2	...	3 (2)
PGY-3	7	1	...	8 (4.5)
PM&R				
Preliminary PGY-1	...	1	3	4 (2)
PGY-3	1	4	3	8 (4.5)
Orthopaedics (PGY-1)	1	4	2	7 (4)
Geriatrics (PGY-4)	...	1	...	1 (0.5)
Rheumatology (PGY-4)	...	2	1	3 (2)
Neurology (preliminary PGY-1)	...	1	...	1 (0.5)
Occupational medicine	...	1	5	6 (3)
Physical therapy residents	1	...	4	5 (3)
Pharmacy residents	...	...	5	5 (3)
Students				
Physician assistant	3	10	12	25 (14)
Advance practice nursing	2	9	7	18 (10)
Medicine (MS 4)	1	4	7	12 (7)
Total per year	23	71	82	176 (100)
Average participants per month (range)	6 (2–8)	6 (3–11)	8 (4–17)	

Abbreviations: PGY, postgraduate year; PM&R, physical medicine and rehabilitation; MS 4, medical student, fourth year.

Next, the evaluation and management of shoulder pain are discussed, including appropriate use of imaging. Faculty then simulate cases; participants solicit history, perform the focused physical examination, provide a differential diagnosis, and propose a plan.

This sequence is repeated on the second day, with sessions for the knee (provided as online supplemental material).

Osteoporosis Curriculum: Discussions of risk factors, screening recommendations, definitions, diagnosis, and treatment options for osteopenia and osteoporosis are facilitated by an endocrinologist with expertise in bone health.

Arthrocentesis/Joint Injection Curriculum: We teach the “No-Touch” technique described by Wittich et al,²¹ focusing on injections of the subacromial space of the shoulder and the suprapatellar pouch of the knee. Anatomy and external landmarks identifying portals for safe and effective aspiration and injection are discussed at length. Indications, contraindications, and complications of these procedures are emphasized. Informed consent, patient positioning, sterilization of the injection site, technique of aspiration and injection, and postprocedural care

are presented by an orthopaedic surgeon. Participants practice using knee and shoulder arthrocentesis simulators (Limbs & Things Ltd, Savannah, GA).

Rheumatology Curriculum: Case-based discussions review gout, osteoarthritis, rheumatoid arthritis, acute monoarthritis, and spondyloarthropathies, as well as interpretation of serologies and acute phase reactants.

Clinical Experiences: The latter portion of the week involves supervised experiences with patients in outpatient settings: (1) an orthopedic injection clinic; (2) a PM&R clinic; (3) a primary care MSK clinic; (4) 2 rheumatology clinics; and (5) an interdisciplinary MSK clinic.

Self-Assessments

Beginning in the second year, self-assessments were incorporated. These were developed by faculty (M.J.B., A.M.B., M.P.G., J.M.B., G.W.C.) and did not undergo validity testing. Before the course, participants used Likert scales anchored at 5 points (1, strongly disagree, to 5, strongly agree), rating proficiency relative to course goals. On the final day of the program, the same dimensions are used to self-rate postcourse proficiency and retrospectively rate pre-

TABLE 2

Precourse and Postcourse (Including Retrospective Precourse) Self-Assessment Ratings

	Mean Precourse Ratings		Mean Postcourse Ratings (n = 135) (range, SD)
	Prospective (n = 153) (range, SD)	Retrospective (n = 135) (range, SD)	
Shoulder pain			
I can examine and diagnose shoulder pain without MRI.	2.7 (1–5, 0.99)	2.3 (1–5, 0.96)	4.5 (3–5, 0.58)
I can evaluate patients effectively.	2.6 (1–5, 0.90)	2.3 (1–5, 0.93)	4.5 (3–5, 0.56)
I can develop an appropriate plan.	2.7 (1–4, 0.89)	2.2 (1–4, 0.88)	4.3 (2–5, 0.65)
I understand when to order imaging.	2.8 (1–5, 0.89)	2.3 (1–5, 0.89)	4.4 (3–5, 0.55)
I understand when to refer.	2.8 (1–5, 0.96)	2.3 (1–5, 0.91)	4.4 (3–5, 0.59)
Knee pain			
I can examine and diagnose knee pain without MRI.	3.2 (1–5, 0.93)	2.6 (1–4, 0.94)	4.4 (2–5, 0.66)
I can evaluate patients effectively.	3.1 (1–5, 0.96)	2.7 (1–5, 0.97)	4.5 (3–5, 0.57)
I can develop an appropriate plan.	3.0 (1–5, 0.93)	2.6 (1–5, 0.94)	4.3 (2–5, 0.62)
I understand when to order imaging.	3.2 (1–5, 0.92)	2.5 (1–5, 1.01)	4.4 (2–5, 0.62)
I understand when to refer.	3.1 (1–5, 0.98)	2.5 (1–5, 0.95)	4.4 (3–5, 0.58)
Back pain			
I can identify patients with low back pain for whom MRI is appropriate.	3.4 (1–5, 0.94)	2.9 (1–5, 0.97)	4.1 (2–5, 0.73)
I can develop a reasonable management plan.	3.3 (1–5, 0.88)	2.8 (1–4, 0.90)	4.0 (2–5, 0.69)
I understand when to refer.	3.2 (1–5, 0.93)	2.8 (1–5, 0.98)	4.1 (2–5, 0.75)
Gout			
I can perform an appropriate evaluation of patients with gout.	3.2 (1–5, 0.98)	2.9 (1–5, 1.08)	4.2 (1–5, 0.79)
I can develop an appropriate management plan.	3.2 (1–5, 1.03)	2.7 (1–5, 1.10)	4.2 (2–5, 0.72)
I understand when to refer patients with gout to specialists.	2.8 (1–5, 1.04)	2.6 (1–5, 1.01)	4.1 (1–5, 0.85)
Joint aspirations and injections			
I understand the indications for aspiration.	3.1 (1–5, 1.07)	2.6 (1–5, 1.05)	4.4 (3–5, 0.60)
I can perform intraarticular knee injection.	2.5 (1–5, 1.24)	2.2 (1–5, 1.19)	4.2 (1–5, 0.87)
I understand the indications for injection of the subacromial space.	2.5 (1–5, 0.94)	2.2 (1–5, 1.04)	4.3 (2–5, 0.69)
I can perform a successful subacromial space injection.	2.2 (1–5, 1.07)	2.0 (1–5, 1.07)	4.1 (1–5, 0.99)
I can interpret the results of synovial fluid analysis to distinguish inflammatory from noninflammatory diseases.	3.4 (1–5, 1.16)	2.9 (1–5, 1.29)	4.1 (1–5, 0.99)
Osteopenia/osteoporosis			
I can perform a comprehensive risk assessment on patients for osteopenia/osteoporosis.	2.8 (1–5, 0.87)	2.3 (1–5, 0.85)	4.0 (2–5, 0.69)
I am able to use published guidelines to determine the need for DXA.	2.9 (1–5, 0.96)	2.4 (1–5, 0.94)	4.0 (2–5, 0.69)
I am able to use the FRAX screening tool for the evaluation and management of osteopenia.	2.8 (1–5, 1.03)	2.3 (1–5, 1.08)	4.0 (1–5, 0.86)

TABLE 2

Precourse and Postcourse (Including Retrospective Precourse) Self-Assessment Ratings (continued)

	Mean Precourse Ratings		Mean Postcourse Ratings (n = 135) (range, SD)
	Prospective (n = 153) (range, SD)	Retrospective (n = 135) (range, SD)	
I am comfortable diagnosing patients with osteopenia/osteoporosis.	2.9 (1–5, 0.95)	2.6 (1–5, 1.04)	4.1 (1–5, 0.76)
I can develop a management plan for the treatment of osteopenia/osteoporosis.	2.9 (1–5, 0.83)	2.4 (1–5, 0.93)	4.1 (2–5, 0.73)
I am comfortable discussing the mechanism of action and adverse effects of bisphosphonates.	2.9 (1–5, 0.90)	2.5 (1–5, 1.01)	4.1 (2–5, 0.76)

Abbreviations: MRI, magnetic resonance imaging; DXA, dual-energy x-ray absorptiometry; FRAX, fracture risk assessment tool.

Note: Scale is as follows: 1, strongly disagree; 2, disagree; 3, neutral; 4, agree; 5, strongly agree.

course proficiency—in effect, capturing information that trainees “didn’t know they didn’t know.”^{22–24} The domains of the instruments map to course goals (1) to evaluate and manage common MSK conditions; (2) to develop skills of joint aspiration and injection; and (3) to screen patients for osteopenia and osteoporosis. Responses specific to knee, shoulder, and arthrocentesis were pooled for each of these categories, and averaged responses were dichotomized.

FIGURE 2
Percentage of Responses (n = 135) Indicating Confidence Before and After MSK Week

Abbreviation: MSK, musculoskeletal.

Objective Structured Clinical Examination

Added in the second year, the objective structured clinical examination (OSCE) involves 2 stations—the shoulder and the knee. The OSCE and the self-assessments were completed on the last day of the course. Validity evidence of these has been reported; interrater agreement was 87% ($k = 0.61$) and 97% ($k = 0.88$) for the knee and shoulder, respectively.²⁵

This project was reviewed by the Institutional Review Board of the University of Utah and was classified as exempt.

Results

The course was implemented in July 2012. Over the 3-year period to date, we have seen increasing numbers of participants, as well as a growing diversity of the training programs that learners represent (TABLE 1). We found improvement in participants' confidence in evaluating and managing common MSK conditions, and competence in performing and interpreting shoulder and knee physical examinations was confirmed by the OSCE. Self-assessment ratings are shown in TABLE 2, with 153 precourse and 135 postcourse surveys collected (response rates of 100% and 88%, respectively). FIGURE 2 shows percentages of responses indicating agreement with items relating to the evaluation and management of shoulder and knee complaints, and FIGURE 3 shows the distributions of OSCE scores.

FIGURE 3
Distribution of OSCE Scores (Percentage of Items Performed) for 153 Participants

Abbreviation: OSCE, objective structured clinical examination.

Discussion

Our interprofessional, multidisciplinary curriculum for MSK care for residents and senior medical and health professions students has been used for more than 3 years, and is now sustained without external funding.

The most innovative aspect of our curriculum is the multispecialty character of the trainee cohort and the interdisciplinary faculty. Although we cannot directly

measure the impact of these, our participant cohort has both increased and grown more diverse. When the scheduling of IM residents became systematized, other disciplines may have been able to schedule their trainees to best fit their programs.

The IM residency is the largest at the institution, and it is not surprising that IM residents are the majority of participants. At the same time, there is strong interest from other program directors in having their trainees participate. The MSK experience is now required for all first-year “preliminary” neurology and PM&R residents.

Our study confirms earlier work that used a monthly program of two 1-hour workshops, supervised practice with joint injection simulators, and structured experiences in an MSK injection clinic to train 27 IM residents (PGY-2 and PGY-3) in physical examination skills and knee and shoulder injections.⁸ Similar to their results, we found that participants’ confidence increased after the course, which was confirmed with OSCEs. Our methods differed in that, although we included joint injections as a key component of the course, we emphasized the performance and interpretation of the physical examination through supervised peer-practice sessions and evaluated clinical reasoning and medical decision-making skills in the OSCEs. We also demonstrated sustainability, and the increase in participation rates over a 3-year period indicates feasibility and a durable interest across a range of training programs. An ideal model for MSK education in postgraduate settings would combine these approaches, using an intensive foundational program early in training, followed by focused “booster” experiences to reinforce and expand skills in subsequent years.

We acknowledge several limitations. First, this innovation was implemented at a single site, thus reducing generalizability. Second, our intervention lacked a comparison group, and third, learning outcomes were measured at the conclusion of the course, and we do not know the durability of these skills or whether competence in the OSCE predicts proficiency in patient care. Finally, our self-assessment survey lacks validity evidence.

Next steps include examining experiences with implementation of this curriculum at other sites and comparing cost-effectiveness to other educational strategies. For our program, the next development phase involves 2 elements: (1) expanding outcome measures to include written knowledge assessments, and (2) evaluating durability of skills by OSCE 1 year later.

Conclusion

The MSK Education Week is a multidisciplinary initiative developed within a primary care rotation for

IM residents. It is well received by residents and other learners from a range of specialties and health professions training programs. As confirmed by OSCEs, there is a self-reported increase in ability to evaluate and manage shoulder and knee pain and increased competence in performing shoulder and knee examinations.

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