

Original Publication

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Musculoskeletal Basics: The Shoulder and the Knee Workshop for Primary Care Residents

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Abstract

Introduction: Although musculoskeletal (MSK) complaints are very common in ambulatory clinics, internal medicine residents report low confidence in performing MSK examinations and intra-articular steroid injections. Our goal is to strengthen residents' MSK competence by using visual, auditory, and kinesthetic educational modalities during an academic half-day session. **Methods:** Our intervention was a workshop/academic half-day session that included multimodal educational materials on common shoulder and knee MSK complaints. The intervention featured a PowerPoint presentation highlighting three areas of MSK education: history taking, physical examination, and procedural skills. The curriculum contained a novel interactive charades game in which competitors demonstrated joint exams, an engaging anatomy quiz, and the performance of knee and subacromial bursae injections using interactive models and educational videos. **Results:** The effectiveness of our session was measured using a pre- and postsurvey. In our 2017 resident survey to determine the level of comfort in performing knee and shoulder physical examination and intra-articular injections, the majority of respondents perceived themselves as inadequately trained. After the session, confidence in performing knee and shoulder examinations and in performing knee and subacromial bursae injections increased significantly. In addition, 100% of the residents who attended and evaluated the session either agreed or strongly agreed that the experience improved MSK knowledge and employed effective teaching strategies. **Discussion:** The workshop/academic half-day session positively enhanced residents' perception of their knowledge of MSK medicine and their ability to perform joint injections.

Keywords

Interactive, Shoulder, Musculoskeletal, Knee, Joint Injections

Appendices

- A. Session Outline.doc
- B. Session Presentation.pptx
- C. Interactive Charades Game.docx
- D. Anatomy Quiz.doc
- E. Knee Video and Interactive Model.docx
- F. Shoulder Video and Interactive Model.docx
- G. MSK Pocket Card.docx
- H. Survey Evaluation.doc

All appendices are peer reviewed as integral parts of the Original Publication.

Educational Objectives

By the completion of this curriculum residents will be able to:

1. Gather a focused musculoskeletal history of the knee and shoulder in patients presenting with either knee or shoulder complaints and highlight pertinent findings.
2. Perform the relevant components of the physical examination in patients presenting with either knee or shoulder complaints and correctly interpret the findings.
3. Select the correct medication and dose and use anatomic landmarks to determine the correct needle entry point, needle angulation, and depth of injection to deliver a steroid injection into the intra-articular space of the knee or the subacromial space of the shoulder.

Introduction

Musculoskeletal (MSK) medicine has traditionally been reported as an area of weakness in internal medicine residency education. MSK complaints are some of the most common patient complaints seen and addressed in physician offices.¹ They are additionally among the most disabling and costly conditions suffered by Americans. As the US population continues to age in the next 25 years, MSK impairments will increase because they are most prevalent in the elderly.² Less than 3% of time in medical school curricula is devoted to MSK diseases, although the proportion of MSK conditions in the population is vast.³ In

addition, residency training is heavily weighted towards inpatient training, and thus, exposure to ambulatory complaints and management is limited. Many residents are uncomfortable with MSK physical exam maneuvers, as well as joint injection techniques. Kroop, Chung, Davidson, Horn, Damp, and Dewey studied internal medicine residents at the Vanderbilt University Medical Center to assess confidence in MSK diagnostic and procedural skills in the care of patients with common rheumatologic diseases.⁴ After analysis of self-confidence survey results, they found that the areas of MSK/rheumatology exam, knee injection, subacromial bursae injection, and trochanteric bursa injection were rated much lower than other areas of rheumatologic/MSK patient care, such as history taking and laboratory evaluation. In 2017, Gismervik, Drogset, Granviken, Rø, and Leivseth performed a meta-analysis of physical examination tests of the shoulder designed to aid the assessment of shoulder complaints.⁵ They discovered that of the 180 physical exam tests found in the literature, only certain tests such as the Hawkins test and supraspinatus tests for rotator cuff tears had high diagnostic odds ratios. No single physical exam test was found to be clinically superior; therefore, teaching residents a series of maneuvers with a high pooled diagnostic odds ratio can be beneficial to improving diagnostic skills.

Our educational resource is intended to help faculty improve MSK education in three areas: history taking, physical examination, and procedural skills. Traditional educational models for internal medicine residency have included 1-hour didactic learning blocks at noon.⁶ Recently, many internal medicine residency programs have transitioned to an academic half-day model, which is a dedicated 3- to 4-hour weekly teaching period that replaces noon conference. The goals of transitioning to an academic half-day model are to nurture active learning in residents and encourage resident preparation and accountability for learning.⁷

However, many internal medicine residency faculty are more comfortable with didactic teaching, and in some instances, the academic half-day sessions have become a series of two to three didactic lectures. This resource can assist faculty in organizing and delivering an interactive half-day session that can be part of an MSK curriculum. Case-based learning and review of anatomy are still very effective tools when teaching MSK skills. In addition, other studies suggest that an interactive MSK curriculum improves medical knowledge and skills in performing MSK examination and procedures.⁸ Capturing the attention of residents for a 3- to 4-hour session in a digital age,⁸ with multiple distractions such as smartphones, tablets, or laptops, can be challenging. Using more interactive sessions geared toward adult learning theory can be more effective for learner engagement and retention of information. In addition, the development of psychomotor and procedural skills requires opportunities for repetitive practice combined with specific, informational feedback from faculty to immediately correct performance errors. Practice enables learners to refine skills and progress through the phases of motor learning.

In our review of educational resources in *MedEdPORTAL*, we found that most modules teaching MSK were designed for problem-based learning or OSCE curricula for medical students.⁹⁻¹⁰ Another educational resource for MSK education in *MedEdPORTAL* was a self-directed learning module for urgent MSK injuries.¹¹ Although it was geared for more advanced providers, the focus was on urgent injuries that might require acute surgical management rather than common and chronic complaints. In addition, only one program has been published in *MedEdPORTAL* that followed a workshop format, but there, the focus was on detection of early arthritis rather than common MSK complaints, which are more frequently seen in the ambulatory setting.¹² There was also only one resource that focused on hands-on knee injections; however, it required use of a cadaver lab, which can be challenging for a residency program.¹³

Our teaching module is novel in that the focus is on resident education and incorporates interactive teaching on both physical exam and procedural skills. In addition, it can be adapted for any residency program and replicated without extensive additional reading or preparation. It is directed toward the most common MSK complaints encountered in primary care and assists programs in filling an important educational gap.

This curriculum has been implemented in the Wake Forest University School of Medicine internal medicine residency program since 2013. The workshop/academic half-day session occurs every other year as part of a 2-year ambulatory education curriculum directed towards second- and third-year residents.

Methods

The presented curriculum included multimodal educational materials: a didactic PowerPoint presentation, games such as charades, simulation using interactive models, and links to multimedia online resources.

The intended audience for this curriculum was internal medicine residents at a community or academic medical center. It would be appropriate for family medicine residents as well. The material was appropriate for all levels of training and did not require any additional prerequisites. This resource was delivered by one or two clinicians (chief resident, educational liaison, program director) and did not require prior training in MSK conditions. Faculty members required 1.5 hours to review materials and prepare logistics for the session.

The session was divided into seven segments containing both didactic and experiential learning activities. The session outline (Appendix A) gives a general overview of how the session was conducted. The total session time was approximately 2 hours and 50 minutes. The session began with a PowerPoint lecture that discussed basic anatomy, common pathology, and medical management of knee and shoulder complaints (Appendix B).

To reinforce concepts taught in the lecture, the learners transitioned to an interactive charades game (Appendix C). This was a novel, game-based activity that created a friendly competition to name the MSK maneuver being demonstrated. During this activity, learners practiced physical exam maneuvers in pairs or groups and identified what each physical exam maneuver tested. The cards included in Appendix C show pictures of the exam maneuver and a written description.

The next activity was an engaging and fun instructional method that involved an anatomy quiz, which provided sample pictures to create a gross anatomy practical for the residents (Appendix D). In addition, residents were asked to label the structure, discuss the function of the structure, and identify which physical exam maneuver could detect pathology of the structure. An answer key is included in Appendix D with structure identification and a completed grid.

Residents then watched an online video of the knee exam and knee injection techniques (Appendix E). The video was followed by a simulation exercise using an interactive knee model. Directions on how to perform knee injection are included in Appendix E. Residents then practiced injection techniques and received coaching and guidance from the facilitator.

A similar activity was repeated for the shoulder where residents viewed expert instructional videos, followed by a practice session using an interactive shoulder model (Appendix F). The session concluded with key lessons learned, and residents were provided with a pocket card (Appendix G) with best practices to aid them in continuing to perform injections on their own patients.

Results

The curriculum has been implemented every 2 years since 2013. Approval was obtained through the Institutional Review Board at Wake Forest University Baptist Health to survey residents regarding their experience with the curriculum. In March 2015, we conducted an anonymous online survey of the internal medicine residents to assess their perceived knowledge of MSK. Forty-eight residents completed the online survey (response rate: 49%), a group predominantly composed of upper level residents (40% House Officer III [HOIII] and 38% HOII). While the majority of the respondents qualified their ability to examine the knee and shoulder as adequate to excellent (92% and 89%, respectively), over half rated their ability to perform knee and subacromial bursae injections as less than adequate (51% and 62%, respectively). Thirty-

one percent (15 out of 48) rated their overall MSK education as less than adequate, 54% (26 out of 48) as adequate, and 14% (seven out of 48) rated training as good to excellent. The majority of the residents (41 out of 48, or 85%) perceived that MSK education was important to their future medical career (average to critical importance).

The curriculum was delivered again in February 2017. We conducted an anonymous presession survey and an immediate postsession survey of perceived knowledge of MSK and comfort with injection techniques (Appendix H). In addition, we collected a postsession evaluation of the content and delivery of the workshop/academic half-day session (also in Appendix H).

Twenty-five of 36 residents completed the survey (response rate: 69%), and 20 of 36 residents completed the session evaluation (response rate: 56%). The participants were upper level residents (64% HOIII and 36% HOII). During the presurvey, the majority of the respondents qualified their ability to examine the knee and shoulder as poor to adequate (70% and 75%, respectively). At the completion of the session, residents qualified their ability to examine the knee and shoulder as good or excellent (82% and 77%, respectively). Prior to the session, the majority of the residents rated their ability to perform knee and subacromial bursa injections as poor (50% and 67%, respectively). Postsession, the majority of the residents rated their ability to perform knee and subacromial bursa injections as good to excellent (55% and 59%, respectively). Overall, the residents prior to the session rated their knowledge of MSK medicine as less than adequate (46%) and adequate (50%). Postsession residents rated their knowledge of MSK medicine as adequate (50%) and good (50%). A smaller subset of the respondents evaluated the educational sessions. Of the residents who attended and evaluated the academic half-day session, 100% agreed or strongly agreed that the experience improved MSK knowledge and employed effective teaching strategies. In addition, 100% agreed or strongly agreed that it was useful for board preparation and was delivered effectively in the allotted time. See the Table for full results.

Comments from the residents included the following:

- “I liked the interaction and active learning.”
- “Excellent conference with very applicable teaching point.”
- “Very helpful and engaging.”
- “Very interactive, good review, and great attention to detail!”

Table. Survey Results

Item	2015 % Perceived Confidence in Ability (N = 48)	2017 % Perceived Confidence in Ability (N = 25)	
		Presession	Postsession
Ability to examine the knee	92 (adequate to excellent)	70 (poor to adequate)	82 (good to excellent)
Ability to examine the shoulder	89 (adequate to excellent)	75 (poor to adequate)	77 (good to excellent)
Ability to perform knee injections	51 (less than adequate)	50 (poor)	55 (good to excellent)
Ability to perform subacromial bursa injections	62 (less than adequate)	67 (poor)	59 (good to excellent)
Adequacy of overall musculoskeletal education	54 (less than adequate)	46 (less than adequate)	50 (good)

Discussion

MSK medicine was considered an important knowledge gap by internal medicine residents who responded to this survey, particularly in the area of procedural skills. Our workshop/academic half-day session enhanced the residents’ perception of their knowledge of MSK medicine and procedures. In addition, it appeared to positively impact the educational curriculum.

We have successfully implemented the curriculum for 4 years. We learned from the first session that it is important to have two facilitators to deliver the curriculum and provide adequate individual attention to the residents. Facilitators are able to circulate around the room to provide individualized coaching of physical exam maneuvers and injection techniques. The second time the curriculum was delivered, we utilized the strategy of creating workstations with some of the interactive activities such as the gross anatomy quiz

and the interactive knee/shoulder models. With these stations, the larger group was able to rotate through different activities, maximizing time, space, and engagement. We were limited by having only one shoulder and one knee model. Having additional models would facilitate residents having more time for practice. Other enhancements to the session could include the flipped classroom technique of having residents read articles and watch videos prior to the session.

Our feedback has been consistently positive. Residents have commented that the session is interactive and informative and have requested additional sessions.

One limitation to our curriculum is that it occurs only one half-day for residents in either their second or third year of training. After the seminar, many residents are eager to perform procedures or practice skills learned; however, not all teaching faculty have the same level of expertise in MSK knowledge or procedural supervision. Future opportunities are to expand our curriculum to our entire faculty in order to provide consistency throughout the residents' clinical experiences. In addition, if we are able to access more models or incorporate standardized patients, an OSCE could be beneficial as a second session to assess retention of the material. Another limitation of our study is that our evaluation measures perception change rather than behavior change; therefore, a 6-month postsession survey may be beneficial in the future. An important next step to strengthen future presentations would be using a rating tool¹⁴ to measure learner proficiency in performing intra-articular knee or subacromial space injections. This would be a more tangible way to measure the learning objectives and is recommended to future users of this educational intervention. Another opportunity would be to develop a workshop/academic half-day session geared towards interns with an annual MSK refresher course during upper level years.

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All identifiable persons in this resource have granted their permission.

Ethical Approval:

Wake Forest University Health Sciences Institutional Review Board approved this study.

References

1. Schappert SM, Rechtsteiner EA. Ambulatory medical care utilization estimates for 2007. *Vital Health Stat 13*. 2011;13(169):1-38.
2. United States Bone and Joint Initiative. *The Burden of Musculoskeletal Diseases in the United States: Prevalence, Societal and Economic Cost*. 3rd ed. Rosemont, IL: United States Bone and Joint Initiative; 2014.
3. Freedman KB, Bernstein J. The adequacy of medical school education in musculoskeletal medicine. *J Bone Joint Surg Am*. 1998;80(10):1421-1427. <https://doi.org/10.2106/00004623-199810000-00003>
4. Kroop SF, Chung CP, Davidson MA, Horn L, Damp JB, Dewey C. Rheumatologic skills development: what are the needs of internal medicine residents? *Clin Rheumatol*. 2016;35(8):2109-2115. <https://doi.org/10.1007/s10067-015-3150-4>
5. Gismervik SØ, Drogset JO, Granviken F, Rø M, Leivseth G. Physical examination tests of the shoulder: a systematic review and meta-analysis of diagnostic test performance. *BMC Musculoskelet Disord*. 2017;18(1):41. <https://doi.org/10.1186/s12891-017-1400-0>

6. Ha D, Faulx M, Isada C, et al. Transitioning from a noon conference to an academic half-day curriculum model: effect on medical knowledge acquisition and learning satisfaction. *J Grad Med Educ*. 2014;6(1):93-99. <https://doi.org/10.4300/JGME-D-13-00185.1>
7. Batalden MK, Warm EJ, Logio LS. Beyond a curricular design of convenience: replacing the noon conference with an academic half day in three internal medicine residency programs. *Acad Med*. 2013;88(5):644-651. <https://doi.org/10.1097/ACM.0b013e31828b09f4>
8. Kiwalkar S, Olorunfemi O. Teaching musculoskeletal examination to internal medicine residents in digital age [abstract]. *Arthritis Rheumatol*. 2017;69(suppl 10).
9. Akins R, Patrick Strong, shoulder pain. *MedEdPORTAL*. 2012;8:9113. https://doi.org/10.15766/mep_2374-8265.9113
10. Akins R, Pema K. Sam Rodilla, knee pain. *MedEdPORTAL*. 2012;8:9078. https://doi.org/10.15766/mep_2374-8265.9078
11. Miller AN. Evaluation of common musculoskeletal injuries in the urgent setting. *MedEdPORTAL*. 2016;12:10514. https://doi.org/10.15766/mep_2374-8265.10514
12. Almoallim H, Kalantan D, Shabrawishi M, et al. Basic skills in musculoskeletal examination: hands-on training workshop. *MedEdPORTAL*. 2013;9:9398. https://doi.org/10.15766/mep_2374-8265.9398
13. Keim Janssen S, VanderMeulen SP, Brown D. Hands-on lightly embalmed cadaver lab for teaching knee aspiration/injection. *MedEdPORTAL*. 2012;8:9187. https://doi.org/10.15766/mep_2374-8265.9187
14. Walzak A, Bacchus M, Schaefer JP, et al. Diagnosing technical competence in six bedside procedures: comparing checklists and a global rating scale in the assessment of resident performance. *Acad Med*. 2015;90(8):1100-1108. <https://doi.org/10.1097/ACM.0000000000000704>

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