



Research Article

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Making a Case for Musculoskeletal Medicine Curriculum: A Knowledge-assessment Survey of Medical Students and Post Graduates at King Abdulaziz University

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ABSTRACT

Background: *Mastery of musculoskeletal (MSK) examination is an essential skill required in the daily practice of a wide variety of fields, including internal medicine, family medicine, rheumatology, emergency medicine, pediatrics and orthopedic surgery; however, an inadequacy of MSK medicine education has been observed in medical colleges worldwide.*

Objective: *The main aim of this study was to assess the competence of senior medical students and interns in examining the MSK system.*

Design: *This was a cross-sectional survey.*

Setting: *This study was conducted between April 2016 and June 2016 at King Abdulaziz University, Jeddah.*

Participants: *The sample comprised final-year medical students and medical interns.*

Main Outcome Measures: *Score on the Freedman and Bernstein examination and students' levels of confidence in examining the MSK system.*

Results: *A total of 140 respondents (medical interns, 42.1% and sixth year students, 57.9%) completed the survey. The mean GPA of the students was 4 (SD 0.41), and the mean grade was 9.82 (SD 3.83) out of 25. Only two participants scored 70%, representing a passing rate of 1.4%. A strong significant correlation was observed between GPA and exam passing score ($r = .580$; $P\text{-value} = 0.0016$). We also observed a significant association between student level and passing grade. Nearly half of the participants reported that the MSK medicine curriculum needed to be improved.*

Conclusion: *These analyses suggest that undergraduate medical education in MSK is insufficient, as close to 99% of our senior medical students and interns failed to demonstrate competency using the passing grade set by internal medicine residency program directors.*

Limitations: *It would have been beneficial to assess students' MSK examination competency before and after enactments in the MSK curriculum to determine the impact of a new curriculum.*

Keywords: *MSK System – Rheumatology – MSK Module – MSK Medicine- MSK Knowledge – Medicine*

INTRODUCTION

Over the past few years, a huge shift from traditional teaching to problem-based learning (PBL) has been observed in medical colleges worldwide, including those in Saudi Arabia.¹ Such a change successfully filled the gap between the basic years of medical education and the clinical ones. Many advantages have also been associated with this shift, such as students gaining a wide variety of required skills.¹ This shift makes it possible to establish a strong basis on which medical students can continuously build and expand their knowledge; however, this is a continuous

process that should start from the early phase of medical education. Thus, there is still a need to work on areas that can be improved. One of such areas that needs attention is the musculoskeletal (MSK) system, due to inadequacy of MSK medicine education in medical colleges according to different researches done worldwide.²

In 1998, Freedman and Bernstein designed a 25-question questionnaire on basic competency examination in MSK medicine to evaluate students' cognitive excellence in this system. The questionnaire was validated by 124 orthopedic surgery residency program directors who decided 73.1% as passing grade. After several years, the examination was reviewed by 240 internal medicine residency program directors, who set a lower passing score of 70%.³

The Faculty of Medicine at King Abdulaziz University (KAU) provides a six-year program of integrated problem-based learning to undergraduate medical students. Undergraduate medical education requires a total of six years, divided into foundation year, followed by two years of basic science, two years of clinical science, and lastly, an obligatory 12-month internship period. Students get continuous exposure to the MSK in a step-by-step approach, which permits them to focus on basic knowledge integrated with clinical scenarios in different blocks. From the second semester of their second year, students start building basic knowledge on the MSK system. Later on, in the fourth year, during clinical skills module, they learn the basic skills of history taking and examination of MSK system. Finally, during internal medicine and general surgery rotations in the sixth year, they learn how to approach patients with MSK problems.⁴ Moreover, mastery of MSK examination is an essential skill required in the daily practice of a wide variety of fields, including internal medicine, family medicine, rheumatology, emergency medicine, pediatrics and orthopedic surgery. Furthermore, MSK diseases are one of the leading causes of pain, disabilities, and morbidities.⁵ Thus the primary aim of this study was to assess the competence of senior medical students and interns in examining the MSK examination.

METHODOLOGY

Design and ethical statement

This cross-sectional study was conducted between April 2016 and June 2016 on final-year medical students and medical interns of KAU, Jeddah, Saudi Arabia.

Of the 300 students who were invited to participate in the study, 140 responded, representing a response rate of 46.7%. Permission to conduct this study was granted by the Ethics Research Committee of King Abdulaziz University.

Survey instrument and procedure

The questionnaire covered two aspects of studying the competency in the MSK system. First, the assessment of students' cognitive and knowledge level of the MSK system using a validated Freedman and Bernstein questionnaire. A pass or fail mark was given to each student; a minimum passing grade of 70% was determined by internal medicine residency program directors.^{2, 3} All the participants had never been exposed to the Freedman and Bernstein examination and were not allowed to consult outside sources. Demographic data (gender, grade point average [GPA], and student level) and data that could influence students' practice and willingness to focus on MSK examination (future interests and time needed to finish the assessment) were included. The other aspect was to assess students' confidence level in their MSK examination skills, which was done by using a self-reported confidence level with a computer-based survey. Additionally, the team measured students' confidence level in examining MSK system and how they identified the differential diagnosis for different body parts, including the upper limbs, lower limbs and back. Further, students were also asked to choose a percentage of daily practice of MSK examination skills and to rate the importance of MSK education in their future medical career. We reported the effect of internship year on MSK examination skills and which part of the MSK curriculum at KAU needed to be improved. Lastly, a Likert-type scale was used to score responses, with "1" = none, "2" = low, "3" = adequate, "4" = high, and "5" = complete.

Statistical analysis

The Statistical Package for Social Sciences (SPSS Inc., IBM, NY, USA) version 21 was used for data analysis. Simple descriptive analyses were used and results expressed as proportions for qualitative data and means with

standard deviations(SD) for quantitative data. Pearson correlation and t-test were used to show statistical significance, which was defined as a P-value < 0.05; all P-values were two-tailed.

RESULTS

A total of 140 respondents (medical interns, 42.1% and sixth year students, 57.9%) completed the survey. Females comprised most of the sample, representing a ratio of 1.7:1. As shown in Figure 1, medical interns and students showed different areas of future interest, with most leaning toward medicine (27.9%), surgery (15.7%), and pediatrics (10.7%) as a career.

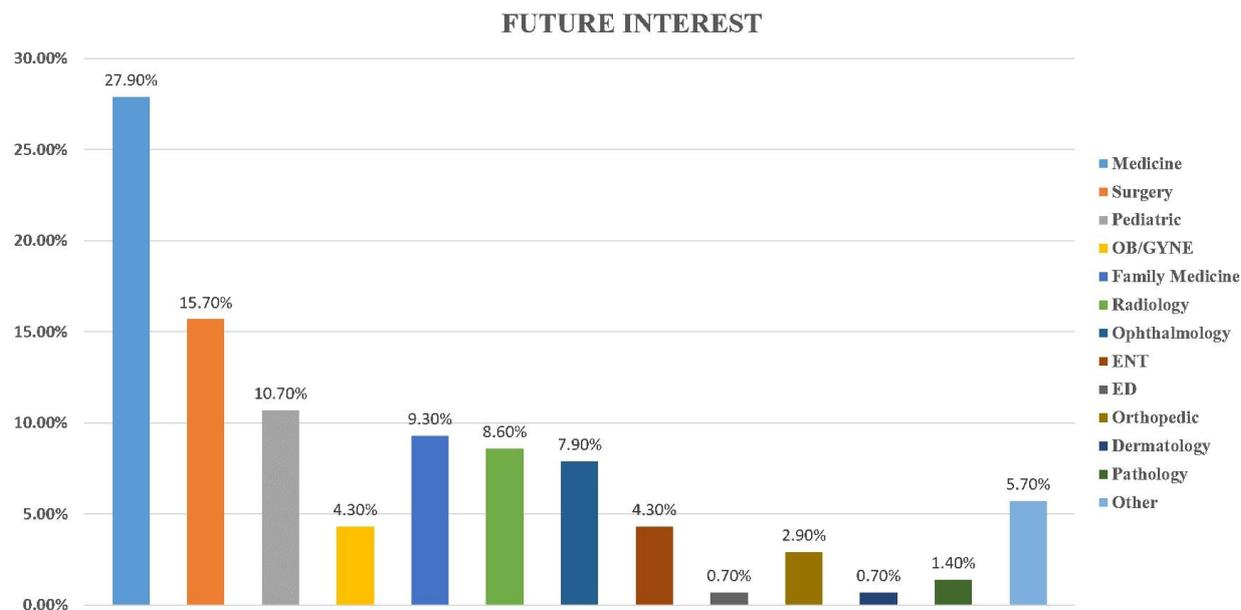


Figure 1: Percentage of future interests among medical interns and students

The mean GPA of the students was 4 (SD 0.41), and the mean grade was 9.82(SD3.83)out of 25. Only two participants (a female student and a male intern) achieved the passing grade of 70%, representing a passing rate of 1.4%. A strong significant correlation was observed between GPA and exam passing score ($r = .580$; P-value = 0.0016). Further, an increase in GPA was correlated with increases in passing score (Figure 2). We also observed a significant association between student level and passing grade. The median exam duration was 0.180, and no relationship existed between exam duration and GPA or passing grade. Table 1 shows the 25 questions of basic competency examination in MSK medicine (with the proportion of correct and wrong answers).

Seventy students completed the computer-based survey, which assessed their confidence level in performing MSK examination. Of these, 55.7%, 12.9% and 27.1% reported having a low confidence level in performing an examination of the back, lower extremities, and upper extremities, respectively (Figure 3). Conversely, 28.6% of the participants reported a high confidence level for lower limb examination, 17.1% for examination of the upper limbs, and only 5.7% for spine examination. Approximately 40% of the students reported that patients with MSK problems represented less than 20% of cases they encountered in daily practice, whereas 30% reported that patients with MSK disorders comprised about 20-40% of cases they encountered in daily practice (Figure 4).

In addition, approximately half of the interns and students (51.4%) thought that MSK education was critical to their future career, 38.6% thought it carried moderate importance, and 10% thought it had minor or no importance. Finally, almost half of the participants reported that the MSK medicine curriculum needed to be improved in clinical practice and basic parts.

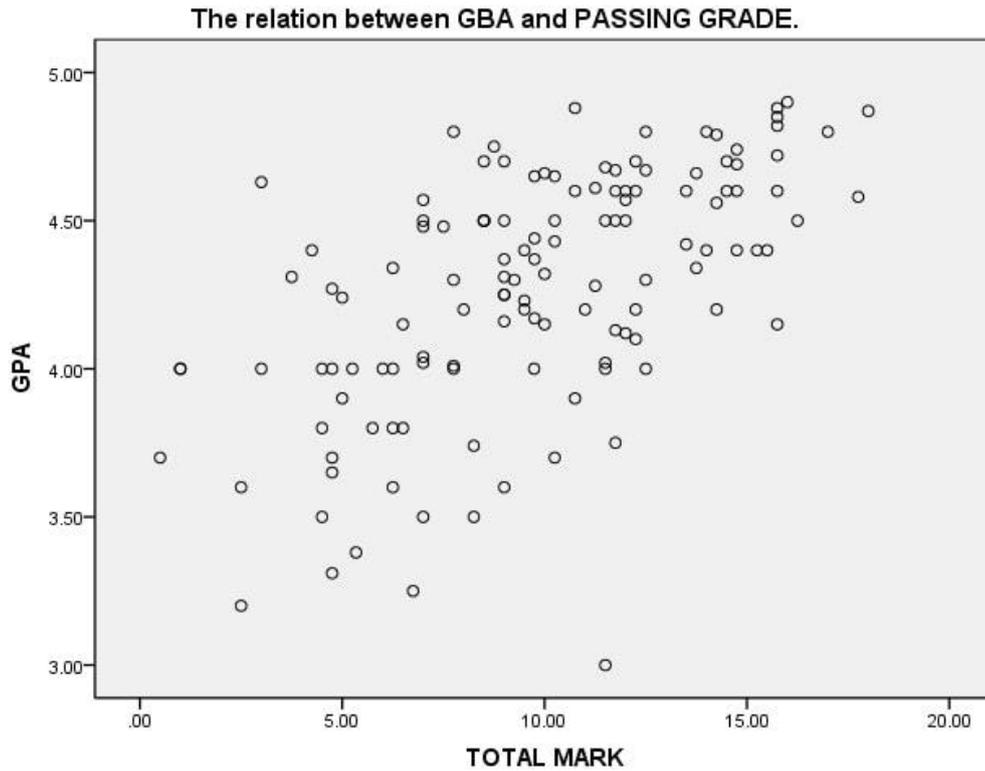


Figure 2: The relation between GBA and the passing Score

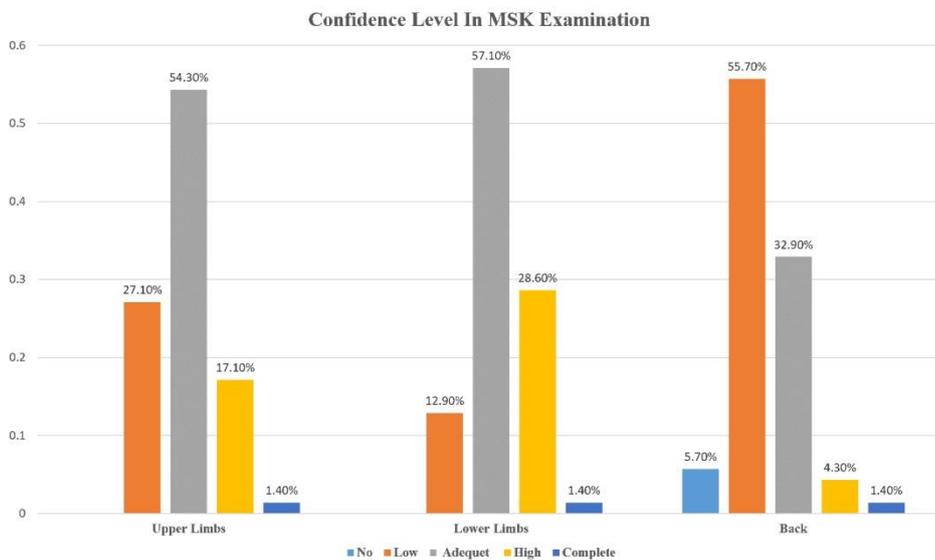


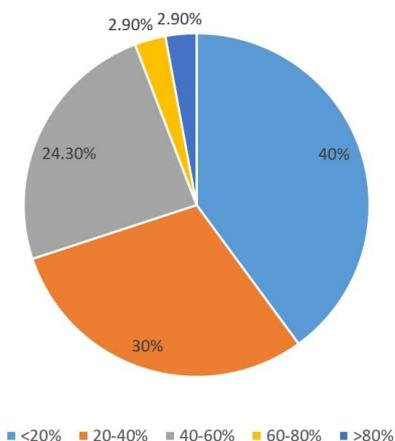
Figure 3: Confidence level in performing MSK Examination

Table 1: Summary of students' responses to questions on the Freedman and Bernstein questionnaire

Questions	Wrong answers	All correct answers	One correct answer	Two correct answers
What common problem must all newborns be examined for?	36.40%	63.60%	-	-
What is compartment syndrome?	24.30%	75.70%	-	-
Acute septic arthritis of the knee may be differentiated from inflammatory arthritis by which laboratory test?	32.10%	67.90%	-	-
A patient dislocates his knee in a car accident. What structure(s)	72.90%	27.10%	-	-

is /are at risk for injury and therefore must be evaluated?				
A patient punches his companion in the face and sustains a fracture of the 5th metacarpal and 3-mm break in the skin over the fracture. What is the correct treatment, and way?	77.90%	8.60%	-	-
A patient comes to the office complaining of low back pain that wakes him up from sleep. What two diagnoses are you concerned about?	65%	2.90%	13.60%	-
How is compartment syndrome treated?	12.90%	87.10%	31.40%	-
A patient lands on his hand and is tender to palpation in the "snuff box" (the space between the thumb extensor and abductor tendons). Initial radiographs do not show a fracture. What diagnosis must be considered?	41.40%	58.60%	-	-
A 25-year-old male is involved in a motor-vehicle accident. His left limb is in a position of flexion at the knee and hip, with internal rotation and adduction of the hip. What is the most likely diagnosis?	27.90%	71.40%	-	-
What nerve is compressed in carpal tunnel syndrome?	7.90%	92.10%	-	-
A patient has a disk herniation pressing on the 5th lumbar nerve root. How is motor function of the 5th lumbar nerve root tested?	90.70%	9.30%	-	-
How is the motor function of the median nerve tested in the hand?	61.40%	37.10%	1.40%	-
A 12-year-old boy severely twists his ankle. Radiographs show only soft-tissue swelling. He is tender at the distal aspect of the fibula. What are two possible diagnoses?	46.40%	15%	38.60%	-
A patient presents with new-onset low-back pain. Under what conditions are plain radiographs indicated?	54.30%	45%	0.70%	-
A patient has a displaced fracture near the fibular neck. What structure is at risk for injury?	75%	25%	-	-
A 20-year-old injured his knee while playing football. You see him on the same day, and he has a knee effusion. An aspiration shows frank blood. What are the three most common diagnoses?	71.40%	10.70%	17.10%	0.70%
What are the five most common sources of cancer metastatic to bone?	5.00%	16.40%	27.90%	41.40%
Name two differences between rheumatoid arthritis and osteoarthritis.	42.10%	36.40%	21.40%	-
Which malignancy may present in bone yet typically is not detected with a bone scan?	90.70%	9.30%	-	-
What is the function of the normal anterior cruciate ligament at the knee?	85.70%	14.30%	-	-
What is the difference between osteoporosis and osteocalcin?	81.40%	18.60%	-	-
In elderly patients, displaced fractures of the femoral neck are typically treated with joint replacement, whereas fractures near the trochanter are treated with plates and screws. Why?	58.60%	41.40%	-	-
What muscle(s) is/ are involved in lateral epicondylitis (tennis elbow)?	90.00%	10.00%	-	-
Rupture of the biceps at the elbow results in weakness of both elbow flexion and ____?	85.70%	14.30%	-	-
What muscle(s) control(s) external rotation of the humerus with the arm at the side?	82.10%	17.90%	-	-

Percentage of daily practice deals with MSK problem

**Figure4: Percentage of MSK problem encountered in daily practice**

DISCUSSION

We found that most students in this study failed the examination, with only two students achieving a passing grade. Although there have been efforts to reform the MSK curriculum in Saudi medical schools,⁶ our students' poor performance on MSK examination suggests that more should be done to improve education about MSK disorders at the undergraduate level. Poor student performance on basic MSK competency has also been reported by other authors. When compared with our study, students achieved better passing rates in prior studies.^{7, 8} Skelley et al.,⁸ for example, reported passing rates of 31.8% and 24.7% in third and fourth year medical students, respectively, which is much higher than the 1.4% in our study. On the other hand, Nottidge et al.⁹ reported that all students in their study failed the Freedman and Bernstein basic musculoskeletal competency examination; the authors used a passing score of 73.1%.

We observed a significant correlation between GPA and exam passing score, which, to the best of our knowledge, has not been previously investigated. Further, we found a significant association between student level and passing grade. Although Day et al.⁷ also found an association between student level and performance on the Freedman and Bernstein examination, it was not significant. In their study, they reported a slightly higher performance among fourth year students compared with entry-level residents (mean score of 62.0 [13.4] for fourth year students versus 59.6 [12.0] for residents).

Similar to our report, other authors reported low levels of confidence in MSK examination among medical students.¹⁰ However, the authors sampled students during their training and did not specifically compare findings between students in the pre-clinical year and those in the clinical year. Although we believe that measures of confidence do not determine students' competencies and should therefore not be interpreted as such, it is possible that students who complete medical school with a low level of confidence in examining the MSK might prematurely refer patients with MSK disorders or order unnecessary paraclinical examinations. These possibilities could lead to poor management of patients with MSK disorders and consequently increase health care costs.

Despite an increase in the prevalence of MSK disorders globally,^{11, 12} these disorders have typically been perceived as "less important" than other conditions such as heart diseases, human immunodeficiency virus/AIDS, and cancer.¹³ In the current study, half of the interns and students surveyed thought that MSK education was critical to their future career and a similar proportion reported that the MSK curriculum needed to be improved. In addition, close to one third and one quarter of respondents reported 20-40% and 40-60% of MSK disorders, respectively in daily practice; however, it is not clear whether the discrepancy between the magnitude of MSK conditions and students' competency in MSK examinations due to educational deficiencies at the undergraduate level or due to students' attitudes toward MSK examination.

A limitation of this study is its cross-sectional design and the inherent weaknesses associated with such a design. Second, the original study by Freedman and Bernstein was conducted on postgraduate students and may not necessarily translate to undergraduate students, as was the case in this study. Third, it would have been beneficial to assess students' MSK examination competency before and after enactments in the MSK curriculum to determine the impact of a new curriculum. We therefore suggest that future studies should include a long follow-up to determine whether a change in the MSK curriculum results in adequate competencies among undergraduate medical students.

CONCLUSION

These analyses suggest that undergraduate medical education in MSK is insufficient, as close to 99% of our senior medical students and interns failed to demonstrate competency using the passing grade set by internal medicine residency program directors. In addition, our study presents students' and interns' attitudes toward MSK medicine and the MSK curriculum. With the increasing burden of MSK disorders in our society, it is necessary to place more focus on MSK medicine and the time dedicated to this system in the undergraduate MSK curriculum to increase students' preparedness to deal with such conditions when they graduate from medical school.

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