Original Article

Adequacy of Undergraduate Orthopaedic Education in Makurdi, North central Nigeria

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ABSTRACT

A large number of patients seek help for musculoskeletal conditions. Students and doctors have been noted to have a poor cognitive mastery of the subject area. This study aims to determine the adequacy of orthopedic learning of final year medical students. Freedman and Bernstein's validated basic cognitive examination was administered to final year medical students who had completed their orthopaedic surgery course work and clinical rotations. Overall scores and responses to the individual questions were analyzed using SPSS. The recommended passing score of 73.1 per cent was employed. Forty undergraduate medical students took part in the study. None of the students attained the passing score of 73.1%. The mean score was 21.2%. The students performed best in general orthopaedics with a mean score of 11.4%. They scored 5.3% and 4.6% in anatomy and trauma respectively. The final year undergraduate students had poor knowledge of orthopaedics. Considering the huge burden of musculoskeletal complaints, further studies are needed to assess interventions that will lead to curriculum improvement in the school.

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INTRODUCTION

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Musculoskeletal disorders are common and are among the leading reasons patients seek medical consultation.¹ They represent a large proportion of patients seen in health facilities constituting about 20% of presentations to emergency rooms and 15 to 30% of primary care visits in the United States of America.^{2,3} Most care is offered by doctors whose major musculoskeletal understanding is obtained from undergraduate experience. Freedman and Bernstein⁴ in 1998, studied some medical school graduates on basic topics in musculoskeletal medicine to assess the adequacy of their preparation in the area. A basic competency examination in musculoskeletal medicine was developed and validated. The examination was administered to eighty-five residents who were in their first postgraduate year. Eighty-two (82) per cent of the medical school graduates failed the validated musculoskeletal competency examination which led the authors to conclude that medical school preparation in musculoskeletal medicine was inadequate. Similar studies afterwards have demonstrated deficiencies in the

adequacy of musculoskeletal medicine at different stages of the medical educational process.⁵⁻⁸ Others have shown medical students do not feel adequately prepared in musculoskeletal medicine and lack both clinical confidence and cognitive mastery in the field.^{9,10,11}

Musculoskeletal medicine involves orthopaedic surgery, physical therapy, rheumatology and radiology. In our institution, the various components are taught under orthopaedic surgery except for radiology. The curriculum consists of formal lectures, small group teaching seminars, bedside teaching sessions and participation in clinical activities. Students' clinical postings involve rotations through the orthopaedic units. However, there are no mandatory orthopaedic rotations.

Due to the high prevalence of orthopaedic disorders, it is pertinent that medical students are well-grounded to eventually provide adequate patient care as doctors. This study aims to determine the adequacy of orthopedic learning of final year undergraduate students.

MATERIALS AND METHODS

The Freedman and Bernstein's validated basic cognitive examination⁴, consisting of twenty-five short answer questions, was administered to final year medical students of Benue State University who had completed their orthopaedic and trauma surgery course work and clinical rotations. Approval for the study was obtained from the university hospital Health Research and Ethics Committee. Students who were not interested in participating in the study were excluded. Informed consent was obtained from all the participants. No prior knowledge of this examination was provided to the students. No time limit was given for completion of the examination. Answer sheets were collected promptly and scored anonymously by the authors of the study. The questions were separated into general orthopaedics, trauma and anatomy groups.

Each question was worth one mark, but partial credit was given for questions with multiple answers. The raw scores were multiplied by four to obtain percentage scores. Overall scores and responses to the individual questions were analyzed. The recommended passing score of 73.1 per cent as suggested by Freedman and Bernstein was employed in the study.

Data were analyzed using the software IBM SPSS Statistics for Windows, version 21.0 (Armonk, NY, USA: IBM Corp). Descriptive statistics were employed to display single-variable quantities using means and standard deviations for continuous variables or proportions for categorical variables unless otherwise stated.

RESULTS

Forty undergraduate medical students out of a class of 43 took part in the study. None of the students attained the passing score of 73.1%. The mean score was 21.2%. These ranged from 0.0% for the questions on congenital hip dislocation (Question No. 1) and testing the motor function of the median nerve in the hand (Question No. 12) to 80.0% for those on carpal tunnel syndrome (Question No. 10) sources of cancer metastasis (Question 17). The mean scores for each question are shown in Table 1. The students performed best in general orthopaedics with a mean score of 11.4%. They scored 5.3% and 4.6% in anatomy and trauma respectively.

Table 1: Mean scores obtained by students for each question in the study.

Mean Question	Answer	Score %
1. What common problem must all newborns be examined for?	Congenital dislocation of the hip (CDH, dislocation; subluxation also accepted): 1 point	0.0
2. What is compartment syndrome?	Increased pressure in a closed fascial space: 1 point	50.0
3. Acute septic arthritis of the knee may be differentiated from inflammatory arthritis by which laboratory test?	Any analysis of fluid from aspiration (cell count, gram stain, culture): 1 point	31.3
4. A patient dislocated his knee in a car accident. What structure/s is/are at risk for injury and therefore must be evaluated?	Must mention popliteal artery: 1 point	33.8
5. A patient punches his companion in the face and sustains a fracture of the 5th metacarpal and a 3-mm break in skin over the fracture. What is the correct treatment and why?	Irrigation and debridement; risk of infection: ½ point each	13.8
6. A patient comes to the office complaining of low-back pain that wakes him from sleep. What two diagnoses are you concerned about?	Tumour and infection: ½ point each	17.5
7. How is compartment syndrome treated?	Fasciotomy (surgery also accepted): 1 point	70.0
8. A patient lands on his hand and is tender to palpation in the snuff box (the space between the thumb extensor and the adductor tendons). Initial radiographs do not show a fracture. What diagnosis must be considered?	Scaphoid fracture (carpal bone fracture also accepted): 1 point	6.3
9. A 25-year-old male is involved in a motor vehicle accident. His left limb is in a position of flexion at the hip and knee with internal rotation and adduction at the hip. What is the most likely diagnosis?	Hip dislocation: 1 point	25.0
10. What nerve is compressed in carpal tunnel syndrome?	Median nerve: 1 point	80.0
11. A patient has a disc herniation pressing the 5th lumbar nerve root. How is the motor function of the fifth lumbar root tested?	Dorsiflexion of the great toe (toe extensors also accepted): 1 point	1.3
12. How is the motor function of the median nerve tested in the hand?	Any median nerve function (Metacarpophalangeal finger flexion; thumb opposition, flexion or abduction): 1 point	0.0
13. 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 the two possible diagnoses?	Ligament sprain and Salter-Harris 1 fracture (sprain, fracture also accepted): ½ point each	12.5
14. A patient presents with new onset low back pain. Under what conditions are plain radiographs indicated? Please name five (example: history of trauma)	Age > 50 years; neurological deficit; bowel or bladder changes; history of cancer; drug use or steroid use; systemic symptoms (night pain, fever); pediatric population: ½ point each, full credit for 2 correct responses	17.5
15. A patient has a displaced fracture near the fibular neck. What structure is at risk for injury?	Common peroneal nerve (peroneal nerve also accepted): 1 point	32.5
16. A 20-year-old injures his knee while playing football. You see him in the same day and he has a knee effusion. An aspiration shows frank blood. What are the three common diagnoses?	Ligament tear, fracture, peripheral meniscal tear (capsular tear, patellar dislocation also accepted): ½ point each, full credit for 2 correct responses	23.75
17. What are the five common sources of cancer metastasis to the bone?	Breast, prostate, lung, kidney, thyroid: ¼ point each, full credit for four correct responses	80.0

Table 1 Continued: Mean scores obtained by students for each question in the study.

Mean Question	Answer	Score %
18. Name two differences between rheumatoid arthritis and osteoarthritis?	Any two correct statements (e.g., inflammatory vs. degenerative, proximal vs. distal interphalangeal joint, etc.): ½ point each	1.3
19. What malignancy may be present in bone yet typically is not detected on the bone scan?	Myeloma (full credit for haematological malignancies-leukaemia, lymphoma): 1 point	7.5
20. What is the function of the normal anterior cruciate ligament of the knee?	To prevent anterior translation of the tibia on the femur: 1 point	1.3
21. What is the difference between osteoporosis and osteomalacia?	Osteoporosis – decreased bone density; osteomalacia – decreased bone mineralization (any true statement about epidemiology, pathophysiology, e.g., estrogen vs. vitamin D also accepted): 1 point	7.5
22. In elderly patients, displaced fractures of the neck of femur are typically treated by joint replacement, whereas fractures of the trochanter are treated by plate and screws. Why?	Blood supply to femoral head (avascular necrosis, nonunion also accepted): 1 point	16.3
23. What muscle/s is/are involved in lateral epicondylitis?	Wrist extensors (full credit for any wrist extensor – extensor carpi radialis brevis, extensor carpi radialis longus, extensor digitorum communis): 1 point	0.0
24. Rupture of the biceps at the elbow results in weakness of both elbow flexion and?	Supination: 1 point	10.0
25. What muscle(s) control(s) external rotation of the humerus with the arm by the side?	Infraspinatus or teres minor accepted (full credit): 1 point	7.5

DISCUSSION

It is important to ensure that all graduating doctors possess the necessary knowledge and skillset to diagnose and treat musculoskeletal disorders. Deficiencies in musculoskeletal education at different levels of the medical education process were noted decades ago leading to suggestions of reforms.¹² Evaluating the adequacy of musculoskeletal learning at undergraduate level will help as a guide in curriculum review to improve knowledge and skill acquisition of doctors.

In this study, we evaluated the knowledge in musculoskeletal medicine of final year medical students who had completed their rotations using the Freedman and Bernstein questionnaire. None of the students attained the pass mark of 73.1%. Poor performances following administration of the Freedman and Bernstein's validated cognitive

musculoskeletal examination to medical students have been reported in previous studies.^{5,6,7} Following Freedman and Bernstein's landmark study that demonstrated the inadequacy of musculoskeletal knowledge among medical school graduates, different schools have reformed their undergraduate musculoskeletal medicine curricula. However, students and doctors at different levels continue to show poor cognitive knowledge in musculoskeletal education.

Increasing musculoskeletal lecture time has been considered as a modality to improve musculoskeletal knowledge among medical students. Weiss et al. administered a validated musculoskeletal cognitive examination to four hundred and five medical students before and after a new module to determine the impact of the module on their competency.¹³ While the mean examination score was below the recommended

passing score, the scores were significantly higher for the pre-module group than the post-module group despite the latter having more lecture and laboratory time. This led the authors to suggest that increasing musculoskeletal lecture time may not improve medical students' knowledge of musculoskeletal medicine. A similar finding was obtained by Day *et al.*¹⁴

Routine clinical clerkships do not automatically provide a conducive learning environment for medical students.¹⁵ This may be because many of such clinical teaching activities are passive, low-level cognitive actions.¹⁶ Studies on structured educational interventions have been carried out to investigate time-dependent effects of assisted learning in addition to a standard musculoskeletal curriculum. Perrig *et al.*¹⁶ conducted a controlled study of 48 medical students studying musculoskeletal physical examination. All the students underwent the regular clerkship programme. The intervention group received 6 lessons each of 1 hour-long interactive small group examination skills teaching in addition to the regular clinical clerkship. It was noted that the students in the intervention group not only improved their skills immediately after the teaching but also maintained these acquired skills several months afterwards. In contrast, the controls, who only carried out regular clerkship activities, such as hospital placements, could not improve their examination skills. Improvement in musculoskeletal cognition and or examination skills have been obtained by other studies^{17,18,19} Interactive small-group musculoskeletal teachings with a hands-on examination of real patients, with detailed feedback involving specialists, peers and patients may be incorporated into the curriculum to improve cognition and competence. Equally, students who had taken elective postings in musculoskeletal medicine have been noted to do better on the Freedman and Bernstein's validated cognitive musculoskeletal examination; which has been attributed to exposure to and interest.^{4,7,13}

CONCLUSION

The final year undergraduate students had poor knowledge of orthopaedics. Cognitive mastery was best in general orthopaedics but worst in trauma surgery.

Recommendation

Considering the huge burden of musculoskeletal complaints, further studies are needed to assess interventions that will lead to curriculum improvement in the school

Limitations

Freedman and Bernstein's questionnaire does not include common musculoskeletal conditions within the study area like chronic osteomyelitis, tuberculous spondylitis, talipes equinovarus and traditional bone setters' limb gangrene. The students had trauma and orthopaedic surgery rotations at different times. This may result in an inability of some students to recall content well and maybe a limitation to attaining high scores. These factors may have acted as limitation factors and contributed to the poor scores obtained.

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