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Enhancing Orthopaedic Education through Multiple-Choice Questions (MCQs): A Case for Integrating Active Recall and Self-Assessment Using MCQ Texts

Amaechi Chinedu Nwachukwu[1*], Chinyerem Cynthia Nwachukwu[2]

[1*]Department of Surgery, Chukwuemeka Odumegwu Ojukwu University, Awka, Anambra State, Nigeria.

[2]Department of Community Medicine, Chukwuemeka Odumegwu Ojukwu University, Awka, Anambra State, Nigeria.

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Abstract: **Orthopaedic education requires both depth of knowledge and critical clinical reasoning. Despite the wealth of clinical exposure, structured formative assessments are often underutilised. This article explores the value of using multiple-choice questions (MCQs) as a strategy to enhance undergraduate and postgraduate orthopaedic training. Drawing from an author's publication, Orthopaedic Bullet (Orthopaedics), this paper outlines the educational rationale, cognitive science underpinnings, and practical implementation of MCQ-based learning. The study proposes that such resources not only reinforce knowledge retention through active recall but also expose learners to a broader curriculum scope often overlooked in conventional clinical training.**

Keywords: **Orthopaedic Training; Multiple Choice Questions (MCQs); Critical Reasoning; Active Recall.**

1. INTRODUCTION

The complexity of orthopaedic surgery and musculoskeletal medicine requires a comprehensive understanding of anatomy, biomechanics, pathology, and surgical principles. Although traditional teaching methods rely heavily on ward-based and operative experiences, there is a growing recognition of the need for structured, curriculum-aligned supplementary resources. [1,11, 14, 38]

MCQs, widely used in summative examinations, are underutilised in formative learning. This paper argues for their role not merely as assessment tools but as instruments of learning. The author's publication, *Orthopaedic Bullet*, compiles carefully curated MCQs covering a wide breadth of orthopaedic knowledge, each accompanied by evidence-based explanations. This format facilitates repeated retrieval practice, active learning, and deeper engagement with the material. [1,38,39,40,41]

Rationale for MCQs in Orthopaedic Education

Cognitive Science Foundations:

Retrieval practice, that is, actively recalling facts, enhances memory retention more than passive review.

Spaced repetition and interleaved practice — both of which are supported by MCQ formats — are known to improve long-term retention and transfer of knowledge.

Curricular Breadth and Depth:

Clinical training is often influenced by case availability and consultant subspecialties, leading to gaps in topic exposure.

MCQ-based study tools can ensure comprehensive exposure to all curriculum domains, including trauma, oncology, paediatrics, spine, and sports injuries.

Immediate Feedback and Clarification:

MCQs accompanied by explanations, as used in *Orthopaedic Bullet*, provide instant clarification and reinforce conceptual understanding.

Several MCQ texts are compilations of questions designed for both undergraduate and postgraduate orthopaedic education. Some are designed so that each question is followed by an answer and a concise, referenced explanation, aiding in both test preparation and conceptual clarity. The questions were developed with an emphasis on:

Clinical Relevance: Focusing on conditions and decision-making scenarios that trainees are likely to encounter.

Curricular Alignment: Mapping to national and international orthopaedic training syllabi.

Learning over Assessment: Prioritising educational value over mere scoring.

This resource exemplifies how MCQs can bridge the gap between didactic teaching and clinical experience, and between passive learning and active engagement.

Implementation Strategies

Self-Directed Learning Modules: Incorporating MCQ banks into student-led study groups or flipped classroom models.

Curriculum-Embedded MCQ Sessions: Introducing weekly topic-based MCQ seminars with facilitated discussion.

Digital Integration: Making MCQ content available through apps or learning management systems to support spaced learning.

The questions below buttress the usefulness and effectiveness of MCQs in aiding active recall of clinical facts:

1) Which musculoskeletal test is used to detect cruciate ligament instability?

a) Thomas' test

b) Trendelenburg's test

c) McMurray's test

d) Lachman's test

Answer: (d)

Explanation: The various clinical tests employed to detect potential abnormalities of the musculoskeletal system include Amare Thomas' test, which assesses hip flexion deformity; Trendelenburg's test for hip instability; McMurray's test for a torn meniscus in the knee; Lachman's test for cruciate ligament instability.

2) What is the main value of estimating pain severity in orthopaedics?

a) To assess the patient's emotional state

b) To determine the specific cause of pain

c) To assess the progress of the disorder or response to treatment

d) To prescribe appropriate pain medication

Answer: c) Estimating pain severity helps in assessing the progress of the disorder or the response to treatment.

3)What term describes the sudden inability to complete a particular movement due to a mechanical block?

a) Stiffness

b) Weakness

c) Locking

d) Instability

Answer: c) Locking refers to the sudden inability to complete a particular movement, often due to a mechanical block like a torn meniscus.

4) According to WHO criteria, what T-score indicates osteoporosis?

a) <-1.0

b) <-1.5

c) <-2.0

d) <-2.5

Answer: d) According to WHO criteria, a T-score of <-2.5 indicates osteoporosis. Explanation: WHO defines osteoporosis as a T-score of -2.5 standard deviations or more below the mean bone mineral density of young, healthy adults.

5) Which blood test is commonly used to monitor the progress and activity of rheumatoid arthritis?

a) Erythrocyte sedimentation rate (ESR)

b) C-reactive protein (CRP)

c) Rheumatoid factor

d) Gamma-globulins

Answer: b) C-reactive protein (CRP) is commonly used to monitor the progress and activity of rheumatoid arthritis. Explanation: CRP is an acute phase protein that increases in response to inflammation, making it useful for monitoring disease activity in rheumatoid arthritis.

6) In which condition might synovial fluid analysis be the only way to distinguish between different causes?

a) Osteoarthritis

b) Rheumatoid arthritis

c) Septic arthritis

d) Gout

Answer: d) In gout, synovial fluid analysis might be the only way to distinguish between different causes. Explanation: Synovial fluid analysis can identify characteristic crystals, such as urate crystals in gout, which helps differentiate between various arthritic conditions.

7) What is the main advantage of closed bone biopsy over open biopsy?

a) Lower risk of infection

b) Higher diagnostic accuracy

c) Smaller incision size

d) Reduced tissue trauma

Answer: c) The main advantage of closed bone biopsy over open biopsy is a smaller incision size. Explanation: Closed biopsy involves less tissue disruption and smaller incisions, leading to faster recovery and reduced risk of complications compared to open biopsy.

8) Which joint is most accessible for diagnostic arthroscopy?

a) Hip

b) Shoulder

c) Ankle

d) Elbow

Answer: b) The shoulder joint is most accessible for diagnostic arthroscopy. Explanation: Arthroscopy is commonly performed in the shoulder joint due to its accessibility and ability to diagnose various pathologies, including rotator cuff tears and labral injuries.

9) What is a common complication of diagnostic arthroscopy?

a) Joint dislocation

b) Osteoarthritis

c) Haemarthrosis

d) Tendon rupture

Answer: c) Haemarthrosis is a common complication of diagnostic arthroscopy. Explanation: Haemarthrosis, or bleeding into the joint space, is a frequent complication following arthroscopy and may require drainage or intervention to manage..

10) How can microorganisms reach musculoskeletal tissues?

a) Direct introduction through the skin

b) Inhalation from contaminated air

c) Ingestion of contaminated food

d) Through sexual contact

Answer: a) Direct introduction through the skin

Explanation: Microorganisms can reach musculoskeletal tissues through direct introduction via skin wounds such as pinpricks, injections, stab wounds, lacerations, fractures, or surgical operations.

11) Which of the following is not a possible result of an infection in musculoskeletal tissues?

a) Pyogenic osteomyelitis

b) Septic arthritis

c) Chronic gastritis

d) Tuberculosis of bone or joint

Answer: c) Chronic gastritis

Explanation: Infections in musculoskeletal tissues can lead to various conditions such as pyogenic osteomyelitis, septic arthritis, and tuberculosis of bone or joint, but not chronic gastritis, which is related to the stomach.

12) What are the classical signs of inflammation?

a) Redness, swelling, numbness, fever, loss of appetite

b) Redness, swelling, heat, pain, loss of function

c) Itching, rash, cough, fatigue, headache

d) Numbness, tingling, weakness, dizziness, blurred vision

Answer

d) Coccidioidomycosis

Correct Answer: c) Histoplasmosis

Explanation: Histoplasmosis is characterized by influenza-like symptoms and often affects individuals on immunosuppressive therapy

13) What term encompasses diseases causing chronic pain, stiffness, and swelling around joints and tendons, often accompanied by extra-articular features?

a) Musculoskeletal disorders

b) Autoimmune disorders

c) Inflammatory rheumatic disorders

d) Degenerative joint diseases

Correct Answer: c) Inflammatory rheumatic disorders

Explanation: Inflammatory rheumatic disorders encompass diseases causing chronic pain, stiffness, and swelling around joints and tendons, often accompanied by extra-articular features.

14) Which disease is the most common cause of chronic inflammatory joint disease, characterized by symmetrical polyarthritis, morning stiffness, and elevation of ESR?

a) Osteoarthritis

b) Rheumatoid arthritis

c) Gout

d) Psoriatic arthritis

Correct Answer: b) Rheumatoid arthritis

Explanation: Rheumatoid arthritis is the most common cause of chronic inflammatory joint disease, characterized by symmetrical polyarthritis, morning stiffness, and elevation of ESR.

15) What is the peak incidence age range for rheumatoid arthritis?

a) First decade of life

b) Second decade of life

c) Fourth or fifth decades of life

d) Seventh or eighth decades of life

Correct Answer: c) Fourth or fifth decades of life

Explanation: Rheumatoid arthritis typically peaks in incidence during the fourth or fifth decades of life.

16) What is the main pathological feature of rheumatoid arthritis in joints and tendon sheaths?

a) Granuloma formation

b) Proliferation of synoviocytes

c) Formation of rheumatoid nodules

d) Deposition of urate crystals

Correct Answer: b) Proliferation of synoviocytes

Explanation: Rheumatoid arthritis is characterized by the proliferation of synoviocytes in joints and tendon sheaths.

17) Which human leukocyte antigen (HLA) allele is strongly associated with rheumatoid arthritis?

a) HLA-B27

b) HLA-DQ2

c) HLA-DR4

d) HLA-DP1

Correct Answer: c) HLA-DR4

Explanation: HLA-DR4 is strongly associated with rheumatoid arthritis.

18) What autoantibody is highly specific for rheumatoid arthritis?

a) Antinuclear antibody (ANA)

b) Rheumatoid factor (RF)

c) Anti-double stranded DNA (anti-dsDNA)

d) Anti-cyclic citrullinated peptide (anti-CCP)

Correct Answer: d) Anti-cyclic citrullinated peptide (anti-CCP)

Explanation: Anti-cyclic citrullinated peptide (anti-CCP) antibodies are highly specific for rheumatoid arthritis.

19) Which stage of rheumatoid arthritis pathology is characterized by persistent inflammation leading to joint and tendon destruction?

a) Stage 1 - Pre-clinical

b) Stage 2 - Synovitis

c) Stage 3 - Destruction

d) Stage 4 - Deformity

Correct Answer: c) Stage 3 - Destruction

Explanation: Stage 3 of rheumatoid arthritis pathology is characterized by persistent inflammation leading to joint and tendon destruction.

2. DISCUSSION

Multiple Choice Questions (MCQs) serve as a valuable tool in assessing comprehension and application of core principles in orthopaedics. Their utility extends beyond rote memorisation, offering a structured framework to test clinical reasoning, diagnostic acumen, and familiarity with evidence-based guidelines.[1]

In Chapter One: Diagnosis in Orthopaedics, the MCQs cover fundamental orthopaedic diagnostic techniques, such as the identification of cruciate ligament instability using Lachman's test. This question highlights the importance of selecting specific clinical tests that target individual anatomical structures. By contrasting it with other distractors such as Thomas' test (hip flexion deformity), Trendelenburg's test (hip abductor weakness), and McMurray's test (meniscal tears), learners are required to differentiate between overlapping but distinct physical examination manoeuvres. Such questions enhance diagnostic precision, an essential skill in musculoskeletal assessment.[1,2,3,4,7,8]

Further, questions assessing pain severity estimation underscore its functional relevance, notably in monitoring treatment efficacy or disease progression. By choosing the correct answer—that pain severity helps assess the progress of the disorder or response to treatment—the learner demonstrates an understanding of pain as not only a symptom but also a clinical metric for therapeutic effectiveness.[17]

Another question, addressing locking as a mechanical limitation in joint movement, serves to delineate terminologies often confused in clinical practice, such as stiffness, weakness, and instability. Recognizing mechanical locking as indicative of intra-articular derangement (e.g., torn meniscus) reinforces the importance of correlating symptoms with likely structural causes.

In the latter part of the section (items 95–100), the MCQs delve into more nuanced diagnostic strategies and complications. For example, knowing that a T-score < -2.5 indicates osteoporosis aligns with globally accepted diagnostic standards [24]. Similarly, the choice of C-reactive protein (CRP) over ESR or rheumatoid factor for monitoring rheumatoid arthritis reflects updated clinical practice, given CRP's sensitivity and rapid responsiveness to inflammatory changes [34].

The inclusion of questions on synovial fluid analysis, closed versus open bone biopsy, and diagnostic arthroscopy further tests applied knowledge in procedural decision-making. For instance, recognising the shoulder as the most accessible joint for arthroscopy and haemarthrosis as a common complication trains students to anticipate procedural outcomes. It also reinforces the principle that understanding the risks and benefits of diagnostic interventions is key to effective patient management.

For Bone Infections, the MCQs continue to provide value by challenging students to understand the routes of infection, clinical consequences, and key inflammatory signs. Knowing that microorganisms can enter through direct skin breaches reflects practical clinical exposure, especially in trauma or post-operative care. Distinguishing between bone-related infections and unrelated conditions such as chronic gastritis tests a learner's ability to categorize diseases accurately. Similarly, identifying the classical signs of inflammation—redness, swelling, heat, pain, and loss of function—anchors diagnostic skill in clinical fundamentals that cut across all medical specialties.[11,14, 31-35]

Additionally, the recognition of histoplasmosis as a relevant musculoskeletal concern in immunocompromised individuals connects orthopaedics with systemic medicine, particularly infectious diseases.[10,15,18]

Across both chapters, the carefully constructed MCQs do more than just test factual knowledge. They encourage critical thinking, application of clinical reasoning, and reinforce integration of basic science with clinical practice. They also reflect a curriculum grounded in locally and globally relevant orthopaedic literature, as evidenced by extensive citations from works by Nwachukwu et al. [7,8,11,12,14,16], Apley [13], Rockwood [9], and Campbell's Operative Orthopaedics [10]. These references lend credibility and contextual relevance, especially in highlighting unique local findings such as the use of autologous fibular strut grafts or triple antibiotic prophylaxis in knee surgery in Nigeria.

The study of inflammatory arthritis and rheumatic disorders encompasses a wide spectrum of autoimmune and musculoskeletal diseases that significantly impair quality of life through chronic pain, joint dysfunction, and systemic complications. In clinical education, the effective use of Multiple-Choice Questions (MCQs) can illuminate the complexity and nuances of these conditions while reinforcing foundational and advanced concepts in rheumatology.[11,14,37].

Inflammatory rheumatic disorders, a term that broadly encompasses diseases distinguished by chronic inflammation in and around joints and tendons, often accompanied by extra-articular manifestations such as fatigue, fever, organ involvement, and serological abnormalities. Unlike degenerative joint diseases, these disorders are immunologically mediated, often progressive, and require long-term multidisciplinary management.

Among these conditions, rheumatoid arthritis stands as the most prevalent chronic inflammatory joint disease. RA typically presents as symmetrical polyarthritis involving the small joints of the hands and feet. Patients often report morning stiffness lasting more than an hour, a hallmark of inflammatory joint pathology. This condition not only causes joint damage but also increases cardiovascular and metabolic risks, highlighting its systemic nature. The diagnosis is often supported by elevated inflammatory markers, especially ESR and CRP, in combination with clinical findings and serological markers. (4,11)

The peak incidence of RA lies within the fourth to fifth decades of life, although it may also occur earlier, particularly in women, or later in life, where it may take on an atypical course. Understanding the age distribution is critical for early diagnosis, as prompt initiation of disease-modifying therapy can prevent irreversible joint damage.

A key pathophysiological hallmark of RA is the proliferation of synoviocytes [1,2,3,4,11,22] within the joint capsule and tendon sheaths. This uncontrolled synovial cell growth leads to pannus formation, cartilage destruction, and erosion of bone—ultimately contributing to joint deformity and functional decline. As the disease progresses, the pathologic process transitions from early synovitis to [10], where persistent inflammation erodes joint structures, often necessitating surgical intervention or joint replacement.

The utility of these MCQs lies in their ability to scaffold learning across cognitive domains. The synthesis of all the questions builds upon the learner's diagnostic capabilities by integrating immunological, clinical, genetic, and pathological knowledge. These MCQs collectively foster critical thinking, ensuring that students and practitioners alike can not only recall key facts but also apply them in complex clinical scenarios.(40, 41)

3. CONCLUSION

These MCQs demonstrate high efficacy as an educational tool. They are well-aligned with core orthopaedic principles, structured to encourage clinical reasoning, and provide a platform for evaluating both knowledge recall and applied decision-making. When properly designed, MCQ, like those analysed here, offer a reliable and efficient means of formative and summative assessment in orthopaedic training.

Conflict of Interest: There is no conflict of interest in this article.

Statement of informed consent

Informed consent and permissions were obtained from all individuals necessary for this article.

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