

# Medical Council of Canada

---



## GUIDELINES FOR THE DEVELOPMENT OF MULTIPLE-CHOICE QUESTIONS

## TABLE OF CONTENTS

	Page
1. Introduction	3
2. Basic Item-Writing Techniques	4
3. Other Directives Pertaining to Writing Questions for the Medical Council of Canada	7
4. Examples of Well and Poorly-Constructed Multiple-Choice Questions (MCQ)	8
5. Checklist for the Development of Test Items	11
6. Item Classification Specifications	13
7. Sample Lead-In Questions with Examples	14
7.1 History	14
7.2 Physical Examination	16
7.3 Investigation	19
7.4 Diagnosis	22
8. Appendices	26
8.1 Clinical Laboratory Tests - Normal Values	26
8.2 References	27
8.3 Sample Item Development Form	29
8.4 Sample Item Development Template – MCCQE PART I	30
8.5 Sample Item Development Template – MCCQE	31
8.6 Feedback Form	32

## **PREFACE**

As a member of one of the Medical Council of Canada (MCC) Test Committees or as a participant of a workshop, one of the tasks assigned to you will be the development of multiple-choice questions (MCQ) in your general area of expertise. Although this may appear as a relatively easy task at first glance, it is a skill for which we provide general guidelines to create well-constructed, reliable and valid items.

This booklet will help guide you towards good MCQ development by reviewing basic rules pertaining to item development, provide item-writing techniques, provide examples of good and bad questions and explain our classification system.

It is my hope that you will find this guide useful.

Claire Touchie, MD, FRCPC  
Vice-Chair of the MCC Central Examination Committee

## INTRODUCTION

Multiple-choice questions (MCQ) have long been used in the assessment of medical knowledge as they have been shown to be valid and reliable as well as time and cost-effective. Since 2000, the Medical Council of Canada (MCC) Qualifying Examination (QE) Part I has been administered in a computer-adaptive mode which allows candidates to be tested reliably using fewer questions than would be used in a traditional written exam. The computer will test the candidate according to his/her ability by “adapting” to a higher or lower level of difficulty based on the candidates performance on a baseline set of questions. These groups of questions, known as testlets, include questions from different disciplines with different levels of difficulty. Therefore, not every candidate has the same set of questions during his/her examination. In turn, this means the bank of questions available must be larger than a classical examination where each candidate receives the same set of predetermined questions.

Both the MCCQE Part I and the Evaluating Examination (MCCEE) use MCQs as part of their testing. All MCQs are single-best answer (A-type.) These are made up of a stem (usually a clinical scenario) with a lead-in question, followed by five response options (one correct or best answer and four distractors.) Items to be developed should be based on the “Objectives for the Qualifying Examination” which has been provided to you. Each item that you must design should be classified according to the classification scheme of the MCC which is also provided as a separate document.

Your task as a question-writer is to construct a question that will allow the candidate to demonstrate accurately what he/she knows or does not know about the objective that is being tested.

In developing MCQs for the Qualifying Examination or the Evaluating Examination, the following working guideline for developing test items must be used:

**“The Medical Council of Canada Qualifying Examination Part I assesses the competency of candidates after obtaining the MD degree for entry into supervised clinical practice in postgraduate training programs with respect to their knowledge, clinical skills and attitudes as defined by the MCC Objectives.”**

## BASIC ITEM-WRITING TECHNIQUES

### Multiple-choice questions (MCQ) are made up of:

1. The **stem** is usually a clinical scenario of a common or life-threatening patient presentation. It should be clear, unambiguous and include all pertinent information. This information should include the patient's age and gender, clinical setting (ED, office), present complaint and duration, and depending on the nature of the item, other information such as pertinent patient history, physical examination and results of diagnostic testing. This is typically followed by a **lead-in** usually in the form of a question (*e.g.*: Which one of the following is the most likely diagnosis?) The stem of the item can be of any length.
2. The answer consists of five response options including the **correct answer** and **four distractors**. The options should be short.

### Here is an example of how to go about developing an item:

1. **Choose an objective from which the item will be developed.** The objectives are usually based on patient presentations of clinical problems which should have been encountered in the candidates' training.

<b>Presentation:</b> Chest discomfort/pain/angina pectoris
<b>Objective:</b> Differentiate cardiac pain from other types of visceral pain

2. **The item should assess the application of knowledge, not recall of an isolated fact.** The candidate will have to establish a differential diagnosis of the problem to be solved. Asking a question in the context of a clinical situation will make the item appear relevant to the candidate.
3. **The content should be appropriate for the level of difficulty.** For the candidate of the MCCQE Part I or the MCCEE, this is explicitly stated on p.3. If you are writing items for other purposes (clerkship, residency training), the level of difficulty of the item should reflect the level of clinical knowledge expected of the candidate.
4. **The stem of the item must pose a clear question and it should be possible to arrive at an answer with the options covered.** To determine if the question is focused, cover up the options and see if the question is clear and if the examinee can answer based only on the stem.

**NOTE:** Questions where the stem comprises of "Which one of the following is CORRECT/INCORRECT?" or "Each of the following statements are correct EXCEPT?" are strongly discouraged as they are unfocused and often have heterogeneous options.

The following is an example of an appropriate stem and lead-in:

A 58-year-old man presents to the emergency department with sudden onset of left-sided chest pain associated with shortness of breath, palpitations and dizziness. His past history is relevant for a recent diagnosis of a lung carcinoma. Which one of the following historical facts is most useful in establishing the etiology of his diagnosis?
---

5. **All incorrect distractors should be homogeneous with the correct or best answer.** Distractors should fall into the same category as the correct answer (*e.g.*: all diagnoses, tests, treatment, prognoses, and disposition alternatives.) Avoid using "double options" (*e.g.*: do W and X; do Y because of Z) unless the correct answer and all distractors are double options. All distractors should be plausible, grammatically consistent, logically compatible and of relatively the same length as the correct answer.

Each distractor should be sufficiently applicable so as to be selected by some examinees; therefore, each distractor should be plausible and none should stand out as being obviously incorrect. Common misconceptions and faulty reasoning provide a good source of plausible distractors, as do the mistakes that are often made by the minimally competent candidate. You should be able to provide the line of reasoning that a candidate would use to select any one of the distractors as an answer. If you are unable to provide the line of reasoning then more than likely, the distractor is not plausible.

NEVER use “All of the above” or “None of the above” as distractors.

In the following example, all of the distractors are plausibly associated with left-sided chest pain. The candidate should be able to determine, with the information provided, that the most likely diagnosis is a pulmonary embolism. If the candidate thinks this is most likely a diagnosis of pneumonia or myocardial infarction, the other distractors may seem plausible and thus chosen as their most useful historical fact.

**A 58-year-old man presents to the emergency department with sudden onset of left-sided chest pain associated with shortness of breath, palpitations and dizziness. His past history is relevant for a recent diagnosis of a lung carcinoma. Which one of the following historical facts is most useful in establishing the etiology of his diagnosis?**

1. Daily recurrent fevers.
2. Purulent sputum.
3. History of hypercholesterolemia.
- \*4. Swollen tender lower extremity.
5. Radiation of pain to left arm.

6. **Use the same objective to create other items.** You can use the objective to create more questions concerning the same clinical stem but targeting different aspects such as physical examination, diagnostic tests, establishing a diagnosis, treatment and risk factors. By varying the patient’s age or gender, setting and provided information, you can test a new topic related to the same objective. Producing test questions in this fashion is often referred to as ‘item cloning.’

**A 58-year-old man presents to the emergency department with sudden onset of left-sided chest pain associated with shortness of breath, palpitations and dizziness. His past history is relevant for a recent diagnosis of a lung carcinoma. Which one of the following tests is most likely to confirm his diagnosis?**

1. Electrocardiogram.
2. Chest radiograph.
- \*3. Ventilation-perfusion (V/Q) scan.
4. Echocardiogram.
5. Holter monitoring.

**A 78-year-old man presents to the emergency department with sudden onset of left-sided chest pain radiating to his back. He has a past history of stable angina and peripheral vascular disease. His blood pressure is 80/50 with a heart rate of 120/min. Which one of the following tests is most likely to confirm his diagnosis?**

1. Electrocardiogram.
2. Chest radiograph.
- \*3. Computerized tomography (CT) of the chest.
4. Echocardiogram.
5. Ventilation-perfusion (V/Q) of the lung.

7. **Technical item flaws that provide special benefit to test-wise examinees or that pose irrelevant difficulty must be avoided.** Examples of these are:

- Grammatical cues: one or more distractors do not follow grammatically from the stem
- Logical cues: a subset of the options is collectively exhaustive
- Absolute terms: terms such as “always” or “never” are in some options
- Long correct answer: correct answer is longer, more specific or more complete than other options
- Word repeats: a word or phrase is included in the stem and in the correct answer
- Convergence strategy: the correct answer includes the most elements in common with the other options

## OTHER DIRECTIVES PERTAINING TO WRITING ITEMS FOR THE MEDICAL COUNCIL OF CANADA

- The MCC's Central Examination Committee (CEC) has requested the examination always list drugs by their generic name but that, in the event the test committee members feel that candidates will be unfamiliar with the generic drug name, the trade name be inserted in parentheses.
- The use of acronyms should follow the full spelling of terms; e.g., "magnetic resonance imaging (MRI)"
- The "Clinical Laboratory Tests - Normal Values" (appended) are available as a reference to the candidates either by clicking on the appropriate icon on the computer-based examination or on the cover of all MCC examination booklets. When composing questions, please ensure that any laboratory reference values which are not listed on the "Clinical Laboratory Tests - Normal Values" page are inserted in parentheses following the result recorded in the question. As well, all normal values for pediatric questions must be provided in the question (in parentheses) if they differ from the adult values.
- You are requested to indicate the correct response to your questions. Please indicate the correct response with an asterisk.
- Distractors should be listed in a numerical fashion (e.g. 1 – 5 and not A – E.)
- You must provide a reference for each test item that you write. The reference should include the author's name, title of text, edition, publisher and page number.
- Images to help complement an item are welcomed. They must be digitalized. They must NOT be copyrighted and/or must be accompanied by a patient consent if provided from your personal collection.

## EXAMPLES OF WELL AND POORLY-CONSTRUCTED MULTIPLE-CHOICE QUESTIONS (MCQs)

The following examples will illustrate both well and poorly-constructed questions. Potential problems with the questions will be pointed out to you.

### Example 1

**A 76-year-old man is brought to the Emergency Department by relatives who state that he had collapsed suddenly but regained consciousness within minutes. There was no seizure activity. His electrocardiogram showed a sinus rhythm (76/minute), a right bundle branch block and left anterior fascicular block (left axis deviation.) Which one of the following most likely accounts for this man's loss of consciousness?**

1. Ventricular tachycardia.
2. Type I second degree atrioventricular block (Wenckebach.)
3. Paroxysmal supraventricular tachycardia.
- \*4. Intermittent heart block.
5. Atrial flutter with 2:1 atrioventricular block.

Comments:

- Well-constructed item.
- All necessary information provided.
- Correct answer and distractor are homogeneous and plausible.

### Example 2

**All of the following statements regarding obstructive jaundice are correct EXCEPT?**

1. It is associated with an elevated conjugated bilirubin.
2. It is often associated with impacted gallstones.
- \*3. It is not caused by external compression.
4. Diagnosis may require an ERCP.
5. Laboratory abnormalities usually include an elevated alkaline phosphatase.

Comments:

- No clinical stem.
- Use of the EXCEPT format.
- Cannot hide the options to answer question.
- Use of a negative in an except question is grammatically difficult.
- Use of acronym (ERCP) without writing it out in full.
- Heterogeneity of distractors with etiology, laboratory and diagnostic/therapeutic tests.
- NOTE: the same can be said of questions such as "Which one of the following is TRUE?" or "Which one of the following is FALSE?"

### Example 3

**An 86-year-old woman fell at the local nursing home and sustained an intertrochanteric fracture of her left hip. On clinical examination, you would expect to find her left leg**

1. Shortened, abducted and internally rotated.
2. Lengthened, abducted and internally rotated.
3. Shortened, adducted and externally rotated.
- \*4. Shortened, abducted and externally rotated.
5. Lengthened, abducted and externally rotated.

Comments:

- You would not be able to answer this item correctly if the options were covered.
- Although distractors are homogeneous, candidates can use the convergence strategy. That is shortened, abducted and externally rotated are the most commonly used variables of all the distractors and therefore may be the most logical answer to someone who has little content knowledge.
- A better way to construct this item would be to put the clinical findings in the stem and to ask what type of fracture the patient presents with.

#### Example 4

**A 24-year-old female presents to a walk-in clinic with fever, flank pain, frequency and dysuria. The urinalysis (urine microscopy) shows 1+ proteinuria, 25 white blood cells per high power field and a few granular casts. Which one of the following investigations is the next best step?**

1. Intravenous pyelography.
2. Intravenous antibiotics.
3. Creatinine clearance.
- \*4. Midstream urine culture.
5. Oral analgesia.

Comments:

- Well-constructed stem.
- Lead-in question asks for investigations therefore distractors 2 and 5 can be eliminated as they are treatments; this is an example of a logical cue.
- Could change the lead-in question to “Which one of the following is the next best step?” where either treatments or investigations may be correct.

#### Example 5

**A 45-year-old woman presents with sudden loss of consciousness. On exam, her vitals are normal, she is not pale and she is not diaphoretic. Which one of the following is more typical of “fainting” as a conversion symptom than of a syncopal attack due to orthostatic hypotension?**

1. Bradycardia.
2. Muscle twitching.
- \*3. Absence of pallor and sweating.
4. Urinary incontinence.
5. Rapid recovery.

Comments:

- Stem contains elements that are directly related to the correct answer. Both lack of pallor and sweating (diaphoresis) are mentioned in the stem which leads to the correct answer. This is an example of word repeats.
- The clinical information is actually not necessary as the lead-in question contains all the information necessary.

The following examples demonstrate how to make an item easier or harder:

#### Example 6

**A 62-year-old man presents with a few days' history of peripheral edema and decreased urine output. On examination, his blood pressure is 195/90 with 3+ pitting edema of his lower extremities. His creatinine is 230 mmol/L and urinalysis shows 2+ leukocyte esterase with 3+ proteinuria. Which one of the following is the most likely diagnosis?**

1. Urinary tract infection.
2. Urolithiasis.
- \*3. Nephrotic syndrome.
4. Hepatorenal syndrome.
5. Congestive heart failure.

#### Example 7

**A 62-year-old man presents with a few days' history of peripheral edema and decreased urine output. On examination, his blood pressure is 195/90 with 3+ pitting edema of his lower extremities. His creatinine is 230 mmol/L and urinalysis shows 2+ leukocyte esterase with 3+ proteinuria. Which one of the following is the most likely diagnosis?**

1. Hypertensive nephropathy.
2. Chronic pyelonephritis.
- \*3. Nephrotic syndrome.
4. IgA nephropathy.
5. Allergic interstitial nephritis.

Comments:

- By using the same stem you can make an item easier or more difficult by varying the distractors. Be careful to remember who your audience is (in the case of the MCC exam, candidates obtaining their MD and entering supervised practice.)

## CHECKLIST FOR THE DEVELOPMENT OF TEST ITEMS

### Guidelines for Item Structure

- Follow four basic steps for the development of test items:
  1. Start with the clinical presentation and the objective/key feature.
  2. Write the stem of the item.
  3. Formulate the correct or best answer.
  4. Develop four distractors (for a total of five possible answers.)
- The problem to be solved should be clearly defined in the stem. Candidates should not have to look at the options to determine what the item is requesting.
- If the incomplete-sentence format is used for the stem, the options should flow directly and grammatically from the stem.

### Guidelines for Item Stems

- The stem should be written in a clear and concise manner. If a clinical vignette is used, include information which is relevant to the case at hand. The stem must include a lead-in that states the task required of the candidate (e.g.: make a diagnosis, order a test.)
- The question format for the lead-in should be the preferred format. If the incomplete-sentence format is to be used at all, use it for very short stems.
- A well-constructed stem should contain all the necessary content for a competent student to answer the item without having to read any of the options. A good test of this rule is to hide all the options and trying to answer the item question posed in the stem.
- Avoid using the negative form unless there is some merit from a clinical perspective to be measuring some negative aspects.
- Give clear directions as to what the candidate should be doing in order to identify the correct answer. The stem should clearly introduce what is expected of the candidate.
- Avoid “tricky” and overly complex items.

### Guidelines for Correct or Best Answers

- The correct answer should be clearly the only correct one or better than the distractors. If the *best* answer is sought, this should be clearly stated in the stem.
- Avoid making the correct answer clearly longer than the other options. If it is longer than the other options, try varying the length across all options.
- Avoid clues to the correct answer:
  - using textbook wording in the correct answer and not in the distractors
  - using specific determiners such as *always, never*, etc.
  - the correct answer contains the exact wording of an important concept mentioned in the stem
  - there is no link between the stem and some of the options
  - there is lack of parallelism among the options (grammatical, structural, vocabulary, technical jargon)

## **Guidelines for Distractors**

- Distractors should be consistent with the stem.
- Distractors should be plausible; distractors should be developed with the acceptably competent student/clinician in mind. The distractors should include content which is reflective of common misconceptions or errors which are not acceptable. If the correct answer is of the *best*-type, can competent students make a case for one or several distractors? If so, reformulate those distractors. Can the question be answered by someone who does not know the correct answer?
- Acceptable distractors:
  - are homogeneous in content (e.g., all are diagnoses or all are therapies)
  - are incorrect or definitely inferior to the correct answer
  - do not contain any hints to the correct answer
  - would seem plausible and attractive to the uninformed
  - are similar to the correct answer in construction and length
  - are not mutually exclusive to each other or to information in the stem
- Examples of irrelevant difficulty would include:
  - options are long, complicated or double
  - numerical data is not stated consistently
  - terms in the options are vague (e.g., rarely, usually)
  - language in the options is not parallel
  - options are in a non-logical order
  - "None of the above" is used as an option

## **General Guidelines**

- Keep options homogeneous in content and structure.
- Use as many functional distractors as possible.
- Avoid the use of humor as this can potentially distract students.
- Avoid the use of "*All of the above*" and "*None of the above*" as options.
- Avoid overlapping content in the correct answer and distractors.

## ITEM CLASSIFICATION SPECIFICATIONS

Item classification specifications are broken down into 9 parts. In turn, each part of the specifications is assigned a number which identifies a specific area of interest. This provides information to help in the construction of the examination and helps to determine what items may be lacking in the question bank.

The following list provides the key to the item specification designations. Please refer to the document “Classification Reference” for more details about the classification system. Construct your questions so they adhere to the specifications that have been provided to you in your assignment.

- A. PRESENTING SIGNS AND SYMPTOMS
- B. DIAGNOSIS
- D. DISCIPLINE (MCCEE only)
- E. LIFE SPAN PERIOD
- F. CONTEXT A (MCCQE Part I only)
- G. CONTEXT B (MCCQE Part I only)
- \*I. TASK
- K. KEY WORDS AND PHRASES (MCCQE Part I only)
- L. MASTERY (MCCEE only)

\* NOTE: The method of classifying the ‘task’ is different for both MCCQE Part I and MCCEE MCQs respectively. For further information, please refer to the above-mentioned “Classification Reference” document.

## SAMPLE LEAD-IN QUESTIONS WITH EXAMPLES

Examples of the type of stem formats that are typical of questions in each area, followed by an example question that was constructed from a given item specification, are provided below.

### History

#### Most Relevant Symptoms

Stem format suggestions:

1. Which one of the following additional symptoms would you consider most contributory to the diagnosis?
2. A patient presents with... Which one of the following symptoms would support the diagnosis?
3. Which one of the following symptoms would be most helpful in establishing a diagnosis?
4. Which one of the following would be the most appropriate initial question to ask the patient?

**A 58-year-old man presents to the emergency department with sudden onset of left-sided chest pain associated with shortness of breath, palpitations and dizziness. His past history is relevant for a recent diagnosis of a lung carcinoma. Which one of the following historical facts is most useful in establishing the etiology of his diagnosis?**

1. Daily recurrent fevers.
2. Purulent sputum.
3. History of hypercholesterolemia.
- \*4. Swollen tender lower extremity.
5. Radiation of pain to left arm.

A.	Presenting Signs and Symptoms:	A14	Chest Discomfort/Pain/Angina Pectoris
B.	Diagnosis:	BI82	Other venous embolism and thrombosis
D.	Discipline:	D028	Medicine (MCCEE)
E.	Life Span Period:	E06	Adult: 18-69 years
F.	Context A:	F02	Ongoing problems
G.	Context B:	G02	Typical problem
I.	Task:	I01	Obtain history (MCCQE Part I)
		CT001	Data-gathering (MCCEE)
K.	Key Words and Phrases:		Chest pain
L.	Mastery:		Yes (MCCEE)

## Cause and Risk Factors

Stem format suggestions:

1. Which one of the following factors is most likely responsible for/ to predispose to (causes?)
2. The risk for... is increased in patients with/who...?
3. Which one of the following diseases is associated with exposure to...?
4. In this patient/disease which one of the following risk etiological factors should be inquired about?
5. The development of... is primarily the result of...?

**A 63-year-old previously healthy female presents to your office with a 1 cm lesion in her right breast. No lymphadenopathy is palpable. Which one of the following is most likely to predispose her to a malignant lesion?**

1. 40 pack per year smoking history.
- \*2. Use of hormone replacement therapy.
3. Late onset of menarche.
4. Caucasian race.
5. 2 ounces of alcohol daily.

- |    |                                |       |                                   |
|----|--------------------------------|-------|-----------------------------------|
| A. | Presenting Signs and Symptoms: | A10-1 | Breast lump/screening             |
| B. | Diagnosis:                     | BC50  | Malignant neoplasms of the breast |
| D. | Discipline:                    | D028  | Medicine (MCCEE)                  |
| E. | Life Span Period:              | E06   | Adult: 18-69 years                |
| F. | Context A:                     | F02   | Ongoing problems                  |
| G. | Context B:                     | G02   | Typical problem                   |
| I. | Task:                          | I01   | Obtain history (MCCQE Part I)     |
|    |                                | CT001 | Data-gathering (MCCEE)            |
| K. | Key Words and Phrases:         |       | Breast cancer                     |
| L. | Mastery:                       |       | No (MCCEE)                        |

## Physical Examination

### Most Relevant Signs

Stem format suggestions:

1. Which one of the following signs is most indicative/in favor of...?
2. On physical examination, special attention should be directed toward which one of the following?
3. ...is the most characteristic classic finding of which one of the following?
4. Which one of the following signs is most helpful in establishing a diagnosis in this patient?

**An 18-year-old woman presents with primary amenorrhea. On examination, which one of the following findings best supports the diagnosis of Turner syndrome?**

1. Hypertension.
2. Hirsutism.
- \*3. Short stature.
4. Epicanthal folds.
5. Normal external genitalia.

A.	Presenting Signs and Symptoms:	A56-1	Amenorrhea/Oligomenorrhea
B.	Diagnosis:	Q96	Turner syndrome
D.	Discipline:	D028	Medicine (MCCEE)
E.	Life Span Period:	E06	Adult: 18-69 years
F.	Context A:	F02	Ongoing problems
G.	Context B:	G02	Typical problem
I.	Task:	I02	Obtain physical signs (MCCQE Part I)
		CT001	Data-gathering (MCCEE)
K.	Key Words and Phrases:		Turner syndrome
L.	Mastery:		No (MCCEE)

## Expected Signs Or Appropriate Examination

Stem format suggestions:

1. Which one of the following signs is most likely to be found on physical examination?
2. Which one of the following should be most particularly looked for?
3. Physical examination of... would most likely disclose which one of the following?

**A 72-year-old bachelor presents to the office complaining of facial pain, swelling, nausea and shaking chills for 24 hours. He looks unwell and has a red, raised, confluent eruption over one cheek and the bridge of the nose. Which one of the following are you most likely to find on physical examination?**

- \*1. Sharp demarcation of the margins.
2. Pustules at the base of hair follicles.
3. Mucosal lesions in the mouth.
4. Vesicles in the ipsilateral ear.
5. Bilateral tonsillar exudates.

A.	Presenting Signs and Symptoms:	A107-2 Fever of unknown origin A92-2 Urticaria/Angiodema/Anaphylaxis
B.	Diagnosis:	L03 Cellulitis
D.	Discipline:	D028 Medicine (MCCEE)
E.	Life Span Period:	E07 Older adult 70+ years
F.	Context A:	F01 Acute problems
G.	Context B:	G02 Typical problem
I.	Task:	I05 Interpret data/make a diagnosis (MCCQE Part I) CT001 Data-gathering (MCCEE)
K.	Key Words and Phrases:	Erysipelas, cellulitis
L.	Mastery:	No (MCCEE)

## Interpretation of Clinical Signs

Stem format suggestions:

1. Which one of the following statements best explains this sign?
2. These signs are most suggestive of...?
3. One must expect to find this sign in...?
4. Which one of the following (disease) is most likely responsible for these findings?

**A 74-year-old man complains of progressive onset of muscle weakness, especially in the thigh muscles, and stiffness in his shoulders. He complains of difficulty rising from a chair and combing his hair. Which one of the following findings will most likely help in establishing a diagnosis?**

1. Elevated serum creatine kinase.
- \*2. Elevated erythrocyte sedimentation rate.
3. Elevated serum calcium.
4. Positive acetylcholine-receptor antibody.
5. Evidence of muscle damage on electromyogram.

A.	Presenting Signs and Symptoms:	A117	Weakness/Paralysis/Paresis/Loss of Motion
B.	Diagnosis:	M35	Other systemic involvement of connective tissue
D.	Discipline:	D028	Medicine (MCCEE)
E.	Life Span Period:	E07	Older adult 70+ years
F.	Context A:	F02	Ongoing problems
G.	Context B:	G02	Typical problem
I.	Task:	I03 CT001	Obtain laboratory data (MCCQE Part I) Data-gathering (MCCEE)
K.	Key Words and Phrases:		Polymyalgia rheumatica
L.	Mastery:	No	(MCCEE)

## Investigation

### Appropriate Investigation

Stem format suggestions:

1. Which one of the following diagnostic studies/examinations is most indicated at this time?
2. The best initial diagnostic step is to order...?
3. Which one of the following tests is most likely to confirm the diagnosis of...?
4. The diagnosis of... is best supported by which one of the following?
5. Which one of the following findings is most characteristic of...?

**A 32-year-old unemployed man who abuses alcohol who underwent a mastoidectomy as a youngster presents with headaches, nausea, vomiting, drowsiness and confusion. He does not have a fever but his right eardrum is not visualized and there appears to be some discharge there. There is slight neck stiffness as well. Which one of the following investigations is the most appropriate at this time?**

1. Lumbar puncture.
2. Electroencephalogram.
3. Skull x-ray.
- \*4. Computed tomography scan of head.
5. Blood culture.

- A. Presenting Signs and Symptoms: A58-1 Coma
- B. Diagnosis: G06 Intracranial and intraspinal abscess and granuloma
- D. Discipline: D028 Medicine (MCCEE)
- E. Life Span Period: E06 Adult: 18-69 years
- F. Context A: F01 Acute problems
- G. Context B: G02 Typical problem
- I. Task: I03 Obtain laboratory data (MCCQE Part I)  
CT001 Data-gathering (MCCEE)
- K. Key Words and Phrases: Cerebral abscess, diagnosis
- L. Mastery: Yes (MCCEE)

## Interpretation Of Results

Stem format suggestions:

1. These findings are most consistent with the diagnosis of...?
2. Which one of the following results/findings is most consistent with the diagnosis of...?
3. Which one of the following results is most likely to be found in this case?

**An 84-year-old woman presents with a history of confusion and constipation. Laboratory investigations reveal a serum calcium of 2.9 mmol/L, a creatinine of 146 mmol/L and a hemoglobin of 108. These findings are most suggestive of a diagnosis of:**

1. Hyperparathyroidism.
2. Chronic renal failure.
- \*3. Multiple myeloma.
4. Vitamin D intoxication.
5. Renal cell carcinoma.

A.	Presenting Signs and Symptoms:	A58-2	Delirium/Confusion
B.	Diagnosis:	BC90	Multiple myeloma
D.	Discipline:	D028	Medicine (MCCEE)
E.	Life Span Period:	E07	Older adult 70+ years
F.	Context A:	F02	Ongoing problems
G.	Context B:	G02	Typical problem
I.	Task:	I05 CT002	Interpret data/make a diagnosis (MCCQE Part I) Data interpretation (MCCEE)
K.	Key Words and Phrases:		Hypercalcemia, renal failure
L.	Mastery:		Yes (MCCEE)

## Common Screening Tests

Stem format suggestions:

1. Which one of the following tests is most useful for the screening of...?
2. The most cost-effective screening test in this case is which one of the following?
3. Which one of the following tests is most likely to lead to a diagnosis?
4. Which one of the following tests will help to establish the etiology of...?

**A 32-year-old woman presents with a two-week history of diarrhea associated with heat intolerance, sweating and restlessness. Physical examination reveals a blood pressure of 150/60 mm Hg and a pulse of 106/minute. She has a fine tremor of her outstretched arms. Her thyroid is diffusely enlarged, firm and tender. Which one of the following tests will help to establish the etiology of her thyrotoxicosis?**

1. Antithyroid antibodies.
2. Sensitive thyroid-stimulating hormone assay.
3. Free triiodothyronine (T<sub>3</sub>.)
- \*4. Radioactive iodine uptake.
5. Erythrocyte sedimentation rate.

A.	Presenting Signs and Symptoms:	A63	Neck mass/Goiter/Thyroid Disease
B.	Diagnosis:	E05	Acute pericarditis
D.	Discipline:	D028	Medicine (MCCEE)
E.	Life Span Period:	E06	Adult: 18-69 years
F.	Context A:	F01	Acute problems
G.	Context B:	G02	Typical problems
I.	Task:	I05 CT001	Obtain laboratory data (MCCQE Part I) Data-gathering (MCCEE)
K.	Key Words and Phrases:		Thyrotoxicosis, etiology
L.	Mastery:	No	(MCCEE)

## Diagnosis

### Most Likely Diagnosis

Stem format suggestions:

1. Which one of the following diagnoses is the most likely?
2. The most likely underlying cause is...?
3. The differential diagnosis should consider which one of the following?

**A 65-year-old man who had been making an apparently satisfactory recovery from a myocardial infarction six days previously suddenly develops pulmonary edema. There is a regular tachycardia of 120/minute, a parasternal heave, a pansystolic murmur over the precordium and a S3 gallop. Blood pressure is 100/60 mm Hg. Which one of the following is the most likely diagnosis?**

1. Post-infarct pericarditis.
2. Another myocardial infarction.
- \*3. Ruptured papillary muscle.
4. Cardiac tamponade.
5. Ventricular aneurysm.

A.	Presenting Signs and Symptoms:	A27	Dyspnea
B.	Diagnosis:	I23	Certain current complications following acute myocardial infarction
D.	Discipline:	D028	Medicine (MCCEE)
E.	Life Span Period:	E06	Adult: 18-69 years
F.	Context A:	F01	Acute problems
G.	Context B:	G02	Typical problem
I.	Task:	I05	Interpret data/make a diagnosis (MCCQE Part I)
		CT002	Data interpretation (MCCEE)
K.	Key Words and Phrases:		Myocardial infarction, complications
L.	Mastery:		No (MCCEE)

Severity, Prognosis, Location Of Disease

Stem format suggestions:

1. Which one of the following is most likely the primary site of...?
2. The stage of the... in this case is...?
3. Which one of the following findings/tests is most useful in establishing the stage/severity/prognosis of...?
4. Which one of the following findings/signs/test results suggests a favorable/unfavorable prognosis?

**A 72-year-old man presents to your office for evaluation prior to colon carcinoma resection. Which one of the following historical facts is associated with an increased risk of cardiovascular death in this gentleman?**

1. Bronchial asthma.
2. Atrial fibrillation.
- \*3. Myocardial infarction less than three months ago.
4. Stable angina.
5. Previous coronary artery bypass surgery.

- |    |                                |       |   |
|----|--------------------------------|-------|---|
| A. | Presenting Signs and Symptoms: | A74-3 | Pre-operative medical evaluation                                    |
| B. | Diagnosis:                     | BI23  | Certain current complications following acute myocardial infarction |
| D. | Discipline:                    | D028  | Medicine (MCCEE)  |
| E. | Life Span Period:              | E07   | Older adult 70+ years   |
| F. | Context A:                     | F04   | Principle or circumstance   |
| G. | Context B:                     | G01   | Undifferentiated complaint  |
| I. | Task:                          | I11   | Prognosis/Complications/Outcomes (MCCQE Part I)                     |
|    |                                | CT006 | Prevention/Education (MCCEE)  |
| K. | Key Words and Phrases:         |       | Cardiovascular death and non-cardiac surgery                        |
| L. | Mastery:                       |       | No (MCCEE)  |

## Counseling, Education

Stem format suggestions:

1. Which one of the following instructions/recommendations should be given to the patient?
2. Which one of the following recommendations is the most appropriate?
3. Which one of the following pieces of information should be provided to...?
4. This patient should be instructed to avoid which one of the following?

**A 19-year-old woman has been taking insulin for one year. She is monitoring her blood glucose regularly in an appropriate manner and most values are within the recommended range. However, she reports two or three symptomatic episodes of hypoglycemia within the past week. Which one of the following is important for you to advise her about?**

- \*1. No driving until she has resolved her episodes of hypoglycemia.
2. Glucagon should be given at the hospital only.
3. She should stop exercising.
4. She should increase her caloric intake at snack time.
5. Relatives are not dependable in treating hypoglycemia.

- |    |                                |       |  |
|----|--------------------------------|-------|--|
| A. | Presenting Signs and Symptoms: | A37-2 | Hypoglycemia                                   |
| B. | Diagnosis:                     | E10   | Insulin-dependent diabetes mellitus            |
| D. | Discipline:                    | D028  | Medicine (MCCEE)                               |
| E. | Life Span Period:              | E06   | Adult: 18-69 years                             |
| F. | Context A:                     | F02   | Ongoing problems                               |
| G. | Context B:                     | G02   | Typical problem                                |
| I. | Task:                          | I08   | Management education/counseling (MCCQE Part I) |
|    |                                | CT005 | Counseling (MCCEE)                             |
| K. | Key Words and Phrases:         |       | Hypoglycemia, management                       |
| L. | Mastery:                       |       | No (MCCEE)                                     |

## Side Effects, Contraindications

Stem format suggestions:

1. Which one of the following adverse effects/side effects/complications is most likely to develop in this patient/in a patient treated with...?
2. Which one of the following findings contraindicates the use of...?
3. Which one of the following is contraindicated in...?

**A 70-year-old man treated for Parkinson disease presents with a six-month history of heartburn and occasional morning vomiting. Your work-up reveals a severe gastro-esophageal reflux with moderate esophagitis. Which one of the following medications would be contraindicated?**

1. Ranitidine.
2. Calcium carbonate (TUMS.)
- \*3. Metoclopramide.
4. Sucralfate.
5. Omeprazole.

A.	Presenting Signs and Symptoms:	A3-2	Abdominal pain, acute
B.	Diagnosis:	K21	Gastro-esophageal reflux disease
D.	Discipline:	D028	Medicine (MCCEE)
E.	Life Span Period:	E07	Older adult 70+ years
F.	Context A:	F02	Ongoing problems
G.	Context B:	G02	Typical problem
I.	Task:	I07 CT004	Management drug therapy (MCCQE Part I) Drug therapy (MCCEE)
K.	Key Words and Phrases:		Gastro-esophageal reflux with moderate esophagitis, contraindications
L.	Mastery:	No	(MCCEE)

## APPENDICES

### Clinical Laboratory Tests - Normal Values

This table lists reference values for the most common laboratory tests and is intended for interpretation of the results as they are provided in the examination. Note that all values are provided in SI units. All values apply to adults. Many important laboratory reference values are not listed here because of the less frequent use of these tests. Such values are inserted in parentheses following the result recorded in the examination questions.

#### BLOOD

##### COAGULATION (HEMOSTASIS)

Bleeding time (Ivy)	< 9 minutes
International Normalized Ratio (INR)	0.9-1.2
Partial thromboplastin time (PTT)	28-38 seconds
Prothrombin time (PT)	10-13 seconds

##### HEMOGRAM

Hematocrit (Hct)	
Female	0.370-0.460
Male	0.420-0.520
Hemoglobin (Hb)	
Female	123-157 g/L
Male	140-174 g/L
Mean corpuscular volume (MCV)	80-100 fL
Mean corpuscular hemoglobin (MCH)	27-34 pg
Platelet count	130-400 X 10 <sup>9</sup> /L
Red blood cells (RBC)	
Female	4.0-5.2 X 10 <sup>12</sup> /L
Male	4.4-5.7 X 10 <sup>12</sup> /L
Red cell distribution width (RDW)	11.5-14.5%
Reticulocyte count	20-84 X 10 <sup>9</sup> /L
Sedimentation rate (Westergren)	
Female	< 10 mm/hour
Male	< 6 mm/hour
White blood cells & differential	
White blood cell count (WBC)	4-10 X 10 <sup>9</sup> /L
Segmented neutrophils	2-7 X 10 <sup>9</sup> /L
Band neutrophils	< 0.7 X 10 <sup>9</sup> /L
Basophils	< 0.10 X 10 <sup>9</sup> /L
Eosinophils	< 0.45 X 10 <sup>9</sup> /L
Lymphocytes	1.5-3.4 X 10 <sup>9</sup> /L
Monocytes	0.14-0.86 X 10 <sup>9</sup> /L

##### CHEMICAL CONSTITUENTS

Albumin (serum)	35-50 g/L
Alkaline phosphatase (serum)	35-100 U/L
Aminotransferase (transaminase) (serum)	
Alanine (ALT; SGPT)	3-36 U/L
Aspartate (AST; SGOT)	0-35 U/L
Gamma glutamyl transferase	
Female	10-30 U/L
Male	10-35 U/L
Amylase (serum)	< 160 U/L
Bicarbonate (HCO <sub>3</sub> ) (serum)	24-30 mmol/L
Bilirubin (serum)	
Direct (conjugated)	< 7 µmol/L
Total	< 26 µmol/L
Calcium (serum)	
Total	2.18-2.58 mmol/L
Ionized	1.05-1.30 mmol/L

Chloride (serum)	98-106 mmol/L
Cholesterol (serum)	< 5.2 mmol/L
Low density lipoprotein (LDL)	< 3.37 mmol/L
High density lipoprotein (HDL)	> 0.9 mmol/L
Cortisol	160-810 nmol/L
Creatine kinase (CK) (serum)	5-130 U/L
Creatinine (serum)	
Female	50-90 µmol/L
Male	70-120 µmol/L
Ferritin	10-250 µg/L
Folic (Folate)	7-36 nmol/L
Glucose fasting (serum)	3.3-5.8 mmol/L
Hemoglobin A <sub>1c</sub>	4-6%
Iron (serum)	11-32 µmol/L
Lactate dehydrogenase (LDH) (serum)	95-195 U/L
Lipase (serum)	< 160 U/L
Magnesium (serum)	0.75-0.95 mmol/L
Osmolality (serum)	280-300 mmol/kg
Oxygen saturation (arterial blood) (S <sub>a</sub> O <sub>2</sub> )	96-100%
P <sub>a</sub> CO <sub>2</sub> (arterial blood)	35-45 mm Hg
P <sub>a</sub> O <sub>2</sub> (arterial blood)	85-105 mm Hg
pH	7.35-7.45
Phosphorus (inorganic)(serum)	0.8-1.5 mmol/L
Potassium (serum)	3.5-5.0 mmol/L
PSA (Prostate Specific Antigen)	0-4 µg/L
Protein (serum)	
Total	60-80 g/L
Albumin	35-50 g/L
Sodium (serum)	135-145 mmol/L
Thyroid-stimulating hormone (sensitive)	0.4-5.0 mU/L
TIBC (Total Iron Binding Capacity)	45-82 µmol/L
Transaminase - see Aminotransferase	
Triglycerides (serum)	< 2.20 mmol/L
Troponin T (TnT)	< 0.10 µg/l
Urea nitrogen (BUN) (serum)	2.5-8.0 mmol/L
Uric acid (serum)	180-420 µmol/L
Vitamin B <sub>12</sub>	74-516 pmol/L

##### **CEREBROSPINAL FLUID**

Cell count	< 4 x 10 <sup>6</sup> /L
Glucose	2-4 mmol/L
Proteins (total)	0.20-0.45 g/L

##### **URINE**

Calcium	< 7.3 mmol/day
Chloride	110-250 mmol/day
Creatinine	6.2-17.7 mmol/day
Osmolality	100-1200 mOsm/Kg
Potassium	25-120 mmol/day
Protein	< 0.15 g/day
Sodium	25-260 mmol/day

## References

- Albanese, M.A., "Type K and other complex multiple-choice items: An Analysis of research and item properties," *Educational Measurement: Issues and Practice*, 12, (1993), pp. 28-33
- Albanese, M.A., Kent, T.H., Whitney, D.R., *A comparison of difficulty, reliability, and validity of complex multiple choice, multiple responses and multiple true-false items*, Report #95 (Iowa City: University of Iowa, Learning Resources Unit, College of Medicine and Evaluation and Examination Service, 1977)
- Albanese, M.A., Kent, T.H., Whitney, D.R., "Clueing in multiple-choice test items with combinations of correct responses," *Journal of Medical Education*, 1979, pp. 948-950
- Berk, R.A., *A guide to criterion-referenced test construction* (Baltimore: John Hopkins, 1984)
- Case, S., Downing, S., "Performance of various multiple-choice item types on medical specialty examinations: Type A, B, C, K, and X," proceedings from the *Twenty-Eighth Annual Conference on Research in Medical Education* (Washington, DC: Association of American Medical Colleges, 1989) pp. 167-172
- Crocker, L., Algina, J., *Introduction to classical and modern test theory* (Montreal: Harcourt Brace Jovanovich College Publishers, 1986)
- Dawson-Saunders, B., Nungester, R., Downing, S., "A comparison of single best answer multiple-choice items (A-type) and complex multiple-choice items (K-type)," proceedings from the *Twenty-Eighth Annual Conference on Research in Medical Education* (Washington, DC: Association of American Medical Colleges, 1989) pp.161-166
- Ebel, R.L., "Blind guessing on objective achievement tests," *Journal of Educational Measurement*, vol. 5, (1968) pp. 321-325
- Green, K., "Effects of item characteristics on multiple-choice item difficulty," *Educational and Psychological Measurement*, vol. 44 (1984) pp. 551-561
- Gross, L.J., "Logical versus empirical guidelines for writing test items," *Evaluation in the Health Professions*, vol. 17 (1994) pp. 123-126
- Haladyna, T.M., *Developing and validating Multiple-Choice Test Items* (Hillsdale: Lawrence Erlbaum, 1994)
- Haladyna, T.M., Downing, S.M., "Validity of a taxonomy of multiple-choice item-writing rules," *Applied Measurement in Education*, vol. 2, no. 1 (1989) pp. 51-78
- Harasym, P.H., Price, P.G., Brant, R., Violato, C., Lorscheider, F.L., "Evaluation of negation in stems of multiple-choice items," *Evaluation in the Health Professions*, vol. 15 (1992) pp. 198-221
- Harasym, P.H., Norris, D.A., Lorscheider, F.L., "Evaluating student multiple-choice responses: Effects of coded and free formats," *Evaluation and the Health Professions*, vol. 3 (1980) pp. 63-84
- Huntley, R.M., Plake, B.S., "An investigation of multiple-response-option items: Item performance and processing demands," paper presented at the meeting of the *National Council on Measurement in Education*, (New Orleans, April 1984)
- Kolstad, R., Briggs, L.D., Bryant, B.B., Kolstad, R.A., "Complex multiple-choice items fail to measure achievement," *Journal of Research and Development in Education*, vol. 17 (1983) pp. 7-11
- Kolstad, R., Wagner, M.J., Kolstad, R.A., Miller, E.G., "The failure of distractors on complex multiple-choice items to prevent guessing," *Educational Research Quarterly*, vol. 8 (1983) pp. 44-50

- Oosterhof, A.C., Coats, P.K., "Comparison of difficulties and reliability of quantitative word problems in completion and multiple-choice item formats," *Applied Psychological Measurement*, vol. 8 (1984) pp. 287-294
- Osterlind, S.J., "Constructing test items" (Boston: Kluwer, 1998)
- Parker, C.S., Somers, J.E., "A comparison of the difficulty and reliability of Type K and one-best-response formats," paper presented at the meeting of the *Iowa Evaluation and Research Association*, (Des Moines, November 1983)
- Rossi, J.S., McCrady, B.S., Paolino, T.J., "A and B but not C: Discriminating power of grouped alternatives," *Psychological Reports*, vol. 42 (1978) p. 1346
- Tripp, A., Tollefson, N., "Are complex multiple-choice options more difficult and discriminating than conventional multiple-choice options?" *Journal of Nursing Education*, vol. 24 (1985) pp. 92-98.
- Weiten, W., "Violation of selected item construction principles in educational measurement," *Journal of Experimental Education*, vol. 52 (1984) pp. 174-178
- Case, S. M., Swanson, D. B., "Constructing Written Test Questions for the Basic and Clinical Examiners," *National Board of Examiners* (Philadelphia, 2002)
- Downing, S. M., "Assessment of Knowledge with Written Test Forms," *International Handbook of Research in Medical Education* (2002) pp. 647-672

Sample Item Development Form

**CLINICAL PRESENTATION:** Category: Dysphagia

**MCC OBJECTIVE:**

- Determine whether symptomatology is intermittent or progressive and weight loss (late sign) a problem, any neurologic symptom or aspiration
- Determine the presence of coughing, choking, drooling or regurgitation

**AUTHOR:** Dr. \_\_\_\_\_

**A 40-year-old patient presents to your office complaining of heartburn and some difficulty in swallowing. These symptoms have been present for several years, but have worsened during the last six months. Which one of the following findings would you consider the most suggestive of reflux esophagitis?**

- \*1. Regurgitations when lying down.
2. Progressive dysphagia.
3. Gastrointestinal bleeding.
4. Morning hoarseness (laryngitis.)
5. Recurrent pulmonary infections.

**(Please note the correct response should be indicated by an asterisk.)**

**REFERENCE:** Sabiston, *Textbook of Surgery*, 14th Ed., Saunders, p. 708

**MCC CLASSIFICATION:**

**A – Dysphagia**

**B - K21**

**D - D030**

**E - E08**

**F - F02**

**G - G02**

**I - I05**

**CT002**

**K - Heartburn; dysphagia; reflux esophagitis**

**L – L02**

**CLINICAL PRESENTATION:** Category: \_\_\_\_\_

**MCC OBJECTIVE:** \_\_\_\_\_

**AUTHOR:** Dr. \_\_\_\_\_

**Stem:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Response Options:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

**(Please note the correct response should be indicated by an asterisk.)**

**REFERENCE:** \_\_\_\_\_

**MCC CLASSIFICATION:**

A - \_\_\_\_\_

G - \_\_\_\_\_

B - \_\_\_\_\_

I - \_\_\_\_\_

E - \_\_\_\_\_

K - \_\_\_\_\_

F - \_\_\_\_\_

L - \_\_\_\_\_

