

Writing Effective Clinical Decision Making Questions Using the 'Key Feature' Approach

WHAT IS THE 'KEY FEATURE' APPROACH?

The 'Key Feature' (KF) approach is based on case specificity. It encourages that each question be constructed with careful thought to the unique challenge it poses to the learner and that taken together, the questions cover a wide variety of challenges and clinical situations.

WHAT IS THE BASIC STRUCTURE OF KEY FEATURE PROBLEMS?

KF problems have a case scenario, followed by 2-3 questions, each of which tests one or more KFs. Scoring is flexible in order to accommodate the complexity of correct responses required in the resolution of clinical problems.

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October 5, 2021

The concept of creating Clinical Decision Making Questions using the Key Feature approach – as opposed to simply creating multiple choice questions – is based on the work of Page, Bordage and Allen's, "Developing Key-feature problems and examinations to assess clinical decision-making skills" published in *Academic Medicine* in 1995; Anderson & Krathwohl's 2001 *A Taxonomy for learning, teaching, and assessing*; and the Medical Council of Canada's "Guidelines for the development of key feature problems & test cases," published in 2012 and accessed in 2017.

BACKGROUND

This document is a guide to creating Clinical Decision Making Questions for the assessment of medical students using the 'Key Feature' (KF) approach. It will help you conceptualize the types of questions that are most suitable for Key Feature Questions (KFQs) as opposed to Multiple Choice Questions (MCQs) and guide you in creating well-constructed case scenarios and questions.

A student's performance on one question does not necessarily predict how they will perform on subsequent questions. In order to fully assess a student's true clinical ability and ascertain with confidence how a student will act in real life, we need to ensure that we create a broad sampling of questions which together will pose a variety of challenges.

TERMINOLOGY

Key Feature

- A critical or essential step in the resolution of a problem
- A step where learners are most likely to make errors or
- A difficult or challenging aspect of identifying or managing the problem in practice
- Emphasizes the essential elements of each problem, not all aspects
- Constitutes the right answer

Case Scenario: main body of the question

Question: the task

Distractors: the incorrect response options

LEVELS OF LEARNING TARGETED BY KFS

The Revised Bloom's Taxonomy levels being tested are Level III (Applying) and Level IV (Analyzing). These levels rely on having already acquired Level I (Knowledge) and Level II (Comprehension).

Clinical Decision-Making Skills: KFs rely on requisite medical knowledge **but test the ability to *apply* that knowledge** in order to make critical decisions at specific decision points during the assessment or management of a problem.

KF problems test **the application of knowledge** in order to resolve a problem. KF problems do so by guiding our decision to assess either the learners' **Clinical Reasoning** or **Clinical Decision Making**, specifically to:

1. Elicit clinical clues (What history/physical findings would you further elicit?)
2. Formulate diagnostic impressions (what is the diagnosis?)
3. Order investigative or follow-up procedures (What tests would you perform?)
4. Acquire data to monitor a course of action (How would you evaluate response to treatment?)
5. Select a management course (What is the most appropriate treatment?)

TEMPLATE FOR WRITING KEY FEATURE PROBLEMS

1. Choose The Problem, Ensuring It Reflects Learning Objectives

- Ideally, all course objectives will have Key Features with Case scenarios, and questions will be recorded in an examination bank.
- Define the Context
 - Patient Age Group
 - Pregnancy, neonatal and infant (up to 1 year)
 - Pediatrics (1-11 years)
 - Adolescent (12-18 years)
 - Adult (19-64 years)
 - Geriatrics (65 and older)
 - Clinical Situation
 - Undifferentiated complaint
 - Single typical problem
 - Multiple problem or multisystem problem
 - Life-threatening event
 - Preventive care and health promotion
 - Site/Setting
 - Family physician's office
 - Emergency department
 - Inpatient medical ward
 - Outpatient clinic

2. Write Key Features to Test the Objective

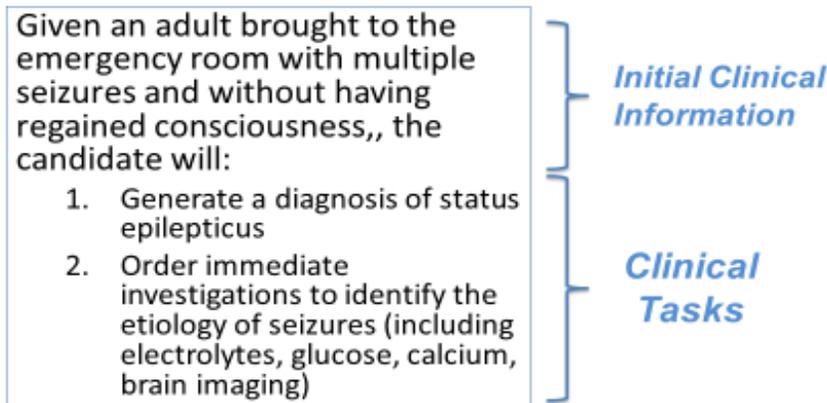
The KF should be **as specific as possible** and should test a critical step in the resolution of a problem

- a step where the weaker student may falter
- key features link to the MCC Physician Activities (Assessment, Management, Communication, Professional Behaviours)

Elements and Characteristics of Key Features

1. Initial clinical information that casts the problem, patient's age, and clinical situation
 - E.g. "Given an adult patient presenting with _____, the candidate will..."
 - Clinical information can consist of signs/symptoms, diagnoses, test results
2. Clinical Task
 - E.g. **Order** ____, **include** ____ in the differential diagnosis, elicit risk factors, etc.
3. Key features must be specific clinical **actions**
 - Avoid items like "manage appropriately," "understand" or "know"
 - Use action words like "include", "order," "diagnose" "ask" "examine" "recommend" "counsel"

Example of Key Features



3. Write Case Scenario

Write a case scenario to test KFs based on your own clinical experience. Make it realistic. Include data that will be required in order to answer the ensuing questions. Case scenarios will be brief when key features are associated with history taking/physical examination, and longer when key features are associated with investigations and management.

4. Write Questions to Test Key Features for the Case Scenario

Each question tests one KF. Experience has shown that two to three KFs can be tested by one case scenario, i.e. two to three questions. – a single question can test up to 2 KFs.

5. Set the Scoring Key

- Correct responses must directly match KF
- Each KF score totals “1”
- If more than one correct response is required to fulfill the key feature, ensure equal weighting of scores; weighted scores should add up to “1”
- Avoid differential weighting - does not improve reliability of scores

6. Draft the Answer Key

- Anticipate all correct and incorrect options for answer
- Include acceptable synonyms Ex: essential hypertension – will accept primary hypertension; will not accept pulmonary hypertension

QUESTION FORMATS

There are two question types:

- **Short Menu (SM):** best for testing History, Physical Examination, and Investigations
- **Write-In (WI):** best for testing Diagnosis and Management

SHORT MENU

Provide option list

- a) Include answer(s) that correspond to the key feature(s) being assessed.
- b) Include answers (distractors) using a ratio of between 2-5 distractors per correct answer. These answers can include reasonable choices, but these choices do not resolve the key feature being assessed. Ask yourself, ***‘What would a weaker candidate choose?’***
- c) For each incorrect answer, ensure you create logical options for subsequent questions. ***Create logical trails moving forward from each incorrect answer.***
- d) Avoid cueing to correct answers by a) listing answers alphabetically and b) preserving a homogenous style (content, length, language) across all answers
- e) Specify the number of options the learner may select: “Choose up to 4.”

Avoid

- Grammatical errors
- Logical cues
- Discrepancies in the length of answers
- Words that repeat stem words
- Convergence (repeating items in different answers)
- Medical jargon

WRITE-IN (WI) QUESTION WRITING

- Ask a direct and specific question that has an unambiguous correct answer(s). Each question must include a response limit
- “List only one” when there is a single definitive answer
- “List up to ____” to take into account other reasonable responses

PUTTING IT ALL TOGETHER

The following two samples are adapted from the 2012 MCC Guidelines for the Development of Key Feature Problems and Test Cases.

CLINICAL PROBLEM # 1

Clinical problem: Seizures
MCC objective: Seizures/Epilepsy
Age group: Adult (19-64 years)
Clinical situation: Single typical problem; Life-threatening event
Site/Setting: Emergency department

Key Feature #1

Given an adult brought to the emergency room with multiple seizures and without having regained consciousness, the candidate will:

1. generate a provisional diagnosis of status epilepticus.

Key Feature #2

Given an adult brought to the emergency room with multiple seizures and without having regained consciousness, the candidate will:

2. order immediate investigations to identify potentially treatable causes of the seizures (including electrolytes, glucose, calcium, and CT or MRI of the brain).

	Key Feature #1	Key Feature #2
Question #1	X	
Question #2		X

Case Scenario

A 36-year-old-man is brought to the emergency room by ambulance because he fell onto a sidewalk unconscious while waiting for the bus. A witness immediately called an ambulance and reported to the ambulance crew that before falling to the ground, he seemed confused, agitated, and was arguing with some invisible person. After falling, he began to twitch for a short while, his face became blue, and then he began to have generalized jerky movements for about a minute. He did not recover consciousness after the episode. During the 10-minute ambulance trip, he had two other similar episodes, without recovering consciousness, and a third episode that you witnessed on arrival in the emergency room. His temperature is 37.7 °C. He looks neglected and is unconscious. No relatives or friends accompanied the patient.

Question #1 (Testing KF #1)/Format: WI

What is (are) your leading working diagnosis(es) at this point in time? List up to two.

Scoring Key

- 1 Status epilepticus (both elements required)
- 0 Listing more than two responses

Not acceptable: epilepsy, seizure, withdrawal seizure, alcohol withdrawal

Comments

To obtain a mark, the student must state this answer. Other answers may be correct, but are not scored. When writing the scoring key and determining acceptable synonyms and unacceptable answers, it is worth asking, ***“What might a weaker student answer that would miss the critical step required to diagnose and treat this patient?”*** We are looking for the student who fails to recognize status epilepticus, treat immediately, and investigate reversible causes. For example, one may answer “Alcohol withdrawal”. This is a plausible differential diagnosis, but not scored because it does not answer the KF, the critical step that must not be missed. It is also not penalized, unless the number of answers provided exceeds the set limit, in this case two.

Question #2 (Testing KF #2)/Format: SM

It has now been 15 minutes since the patient’s arrival. What investigations, if any, would you order at this point? Select up to eight or option (x) if no investigations are required.

- a) Alcohol level
- b) Amylase, serum
- c) Brain Computed Tomography (CT)
- d) Calcium, serum
- e) Carotid ultrasound
- f) Cerebral angiography
- g) Cerebrospinal fluid examination
- h) Complete blood count (CBC)
- i) C-reactive protein
- j) Creatine Kinase, serum
- k) Creatinine, serum
- l) Electroencephalographic recording
- m) Electrolytes, serum
- n) Glucose, serum
- o) Lactate dehydrogenase, serum
- p) Liver enzymes (ALT, AST)
- q) Lyme disease serology
- r) Protein electrophoresis
- s) Syphilis serology
- t) Thyroid stimulating hormone
- u) Toxicology screen, urine
- v) T4
- w) Urea, serum
- x) No investigations are needed

Scoring Key

Score	Criteria
0.25	c) Brain Computed Tomography (CT)
0.25	d) Calcium, serum
0.25	m) Electrolytes, serum
0.25	n) Glucose, serum

Comments

While other investigations are also appropriate (CBC, CK, Creatinine, liver enzymes), they are not scored because they do not answer the KF. Missing the essential steps is what distinguishes the successful student from the unsuccessful student. Asking for UP TO EIGHT answers allows the student to also answer the other appropriate choices that do not answer the KF, though no points are awarded.

There are many other important potential KF and subsequent questions for this Case Scenario. For example, a KF could ask the student how to treat this patient. Course committees could practice in groups writing additional Key Features and Questions and review each other's work to ensure the process is understood.

SUMMARY - STEPS FOR WRITING KF QUESTIONS

Step 1: Choose the learning objective for which you want to write a KF question

Step 2: Define the context: Select the Patient Group, Clinical Situation, and Site or Setting

Step 3: Ask: What are the critical steps in the resolution of this problem for patients of this age group presenting in this way?

Step 4: Write the KF

Step 5: Write a case to test the KF. The case must be realistic. Think of a real patient from your practice. Include all relevant information that will be required to answer the question(s) that follow. Leave out extraneous information.

Step 6: Write questions for the case. *HINT: If the question asked can be answered without referencing the stem, it is not testing clinical decision making and may be better-suited for MCQ.*

Step 7: Set the Scoring Key

Step 8: Draft the Answer Key

Step 8: Check for pitfalls

Step 9: Edit with a partner

Step 10: Write new cases often to replenish the database, ensure relevancy, and protect against obsolescence of clinical data and responses.

It is not easy to write good CDMs

An examination blueprint is essential to ensure course objectives are represented fairly. It is good practice to have a spectrum of question difficulty on each examination. Avoid too many questions that are either too simple or too challenging. Working in partners or small groups will help detect and correct faulty construction.

New questions should be piloted and student performance statistics reviewed before finalizing in the question bank. Questions with poor statistics (either too easy, too hard, or poor discrimination) should be returned to the exam committee for revision. Questions for each exam sitting should be reviewed to ensure they are not out of date, and that they represent an appropriate sampling of the course objectives.

SUMMARY

WHAT MAKES A KF GOOD?

- ✓ A good KF assesses one clearly identified concept.
- ✓ Emphasis is on typical presentations of clinical problems.
- ✓ KF should contain initial clinical information, a clinical task, and if necessary, a qualifier may be added.
- ✓ Considers pitfalls in clinical reasoning.

WHAT MAKES A CASE SCENARIO GOOD?

- ✓ A good case is clinically realistic.
- ✓ All relevant information required to answer the question(s) is included.
- ✓ Once KFs is established, write different questions for each case.

WHAT MAKES A QUESTION GOOD?

- ✓ A good question is short
- ✓ Provides specific instructions (i.e., “select up to x”, “only one”, or “as many as appropriate”)
- ✓ Is specific to the case
- ✓ Tests one KF
- ✓ Focuses on a critical or challenging step
- ✓ Uses words like “AVOID” or “CONTRAINDICATION”

COMMON PITFALLS TO AVOID IN DEVELOPING KF QUESTIONS

- Question should not be able to stand alone. (You are not testing clinical decision making if it can.)
- Have I avoided:
 - An obscure problem? Too broad a problem?
 - Medical jargon? Wordy question?
 - Trick items?
 - Controversial or debatable answers?
 - Absolute words such as “EXCEPT”, “ALL”, “NEVER”, “ALWAYS”, “COMPLETELY” or “NONE”?

REFERENCES

1. Page G, Bordage G, and Allen T. “Developing Key-feature problems and examinations to assess clinical decision-making skills.” *Academic Medicine* 70:194-201 (1995).
2. Anderson & Krathwohl *et al.* A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom’s Taxonomy of Educational Objectives.(2001)
3. Medical Council of Canada. “Guidelines for the development of key feature problems & test cases.” August 2012 (v3). <http://mcc.ca/media/CDM-Guidelines.pdf>.