Writing *Clinical* Multi-Choice Questions (MCQs) for Assessment

Getting Started Guide

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**Contents**

[**Starting Activity** 1](#_Toc91962169)

[**Question Writing Formulae** 3](#_Toc91962170)

[**General** 3](#_Toc91962171)

[**Clinical Vignette Stem** 4](#_Toc91962172)

[**Lead-In Question** 4](#_Toc91962173)

[**Option Set** 5](#_Toc91962174)

[**MCQ Technical Item Flaws (see ch 3 of NBME Item-Writing Guide)** 6](#_Toc91962175)

[**Samples of Test Item Stems That Reflect Critical-Thinking** (Su et al, 2009: 225) 7](#_Toc91962176)

[**References and Further Reading** 8](#_Toc91962177)

# **Starting Activity**

Open “Flaws in MCQs that Aid the Testwise Student” (<https://www2.nbme.org/nbme/IWTutorial/eIWW_2/index.html>) and complete before session or in pairs at the beginning of the session.

# **Question Writing Formulae**

1. **Clinical Vignette Stem (30-120 words)**
2. **Lead-In Question**
3. **Option Set**

# **General**

* **Mapped** onto the relevant **module Learning Outcomes**
* Have a **colleague review** each question
* **Language**
  + **Avoid language** that provides **hints for students**
  + Keep **language plain** and **professional relevant** keeping in mind that you shouldn’t disadvantage students with English as a second language
* Writing Guidelines from Tarrant, 2006: 670
  + “The basic format for MCQs is the single best answer. Therefore, ensure that questions have one, and only one, best answer”
  + Avoid complex, or K-type MCQs. K-type MCQs have a range of correct responses and then ask students to select from a number of possible combinations of these responses. Students can often guess the answer by eliminating one incorrect response and all options containing this response or by selecting the responses which appear most frequently in all of the options.
* It can be difficult to use MCQs to evaluate learning objectives that require students to coordinate a number of thinking skills while working on a complex problem
* Where possible **select multiple assessment methods** based on the nature of each learning outcomes of the module rather than rely on one assessment type
* Ensure you spend time with students to
  + **model the thinking** that goes into answering these types of assessment methods and
  + provide some **space in the curriculum to practice** in small groups / pairs­­
* **Strategies for writing MCQs that promote critical thinking (**Morrison, Nibert & Flick, 2006)
  + Design questions that reflect **application** or **analysis cognitive level**.
  + Require students to **apply knowledge of more than 1 concept** to answer the question.
  + Require a **high level of discriminating judgment** by asking students to **choose the best/most appropriate option** from all plausible alternatives.

# **Clinical Vignette Stem**

* Focuses on **important concepts** rather than trivial facts -
  + Age, gender, symptoms, duration, setting
  + Relevant past medical history, examination findings and investigations
  + Avoid ‘bad medicine’ or omitting key information that would be expected
* Can be **answered without looking at the options**
* **Includes relevant facts only** (no additional data, gratuitous or unnecessary information should be provided in the options)
* The problem should appear in the stem – not in the options
* Should not be **not “tricky”** or **overly complex**
* **Try to write your stem as if it were a short answer question –** stem is likely to be longer and options short
* **Avoid**
  + **“use of negatives (**e.g., not, except, incorrect) in the stem as they poorly assess students actual knowledge. If teachers wish to assess contraindications, the questions should be worded clearly to indicate that this is what is being assessed” (Tarrant, 2006: 670).
  + **gratuitous information** – stay focused

# **Lead-In Question**

* **Grammatically** and **logically congruent**
  + These can provide hints for students
* Is **not negatively phrased** (eg, avoid using “except” or “not” in the lead-in)
  + Student can find these types of questions confusing
  + *“this question format often performs worse than positively worded items” (Haladyna and Downing, 1989b quoted by Tarrant et al, 2006)*
* **Avoid absolute** and **personal wording**
  + Avoid “What is the correct…?”
  + Use “What is the most likely…”
  + Avoid “Which… would you choose?”

# **Option Set**

* **Grammatically** and **logically congruent** 
  + “All options should be grammatically consistent with the stem and should be parallel in style and form. Non-grammatically correct options provide cues to the students who easily eliminate distracters that do not flow grammatically with the stem” (Tarrant et al, 2006: 670).
  + Keep **language plain** and **professional relevant** keeping in mind that you shouldn’t disadvantage students with English as a second language
* Only use the **number of alternatives that are educationally needed**
* **Avoid** 
  + **“Convergence cues** in options where there are **different combinations of multiple components to the answer**. Question writers tend to use the correct answers more frequently across all options and students will identify as correct the answer in which all components appear most frequently” (Tarrant, 2006: 670).
  + **Creation of “filler alternatives”** – Three plausible options is better that three plausible options and one ‘‘filler’’ option
  + “**the use of absolute terms** (e.g., never, always, only, all) as students are taught that there are often no absolute truths in most health science subjects and they can therefore eliminate these distracters” (Tarrant, 2006: 670).
* **Options should** 
  + **all be equally plausible** answers to the question
  + when creating **Single Response MCQs**  you should **not** **have more than one correct answer** or **no correct answer** (5% of MCQs in one study were flawed in this way)
  + “All **options should be similar in length and amount of detail** provided in the option. If one option is longer, includes more detailed information, or it contains more complex language, students can usually correctly assume that this is the correct answer” (Tarrant, 2006: 670).
  + be “in **alphabetical, chronological, or numerical order**” (Tarrant, 2006: 670).
* **Flaws** (such as the following) **provide helpful cues** to students as to the correct option. Avoid
  + **Language, and word repeats** from the stem in the **alternatives**
  + **Logical cues** that provides **hints for students**
  + Use of ‘**all of the above’**
  + **Distractors** that are so close to the correct answer that it is possible to cause confusion when answering

# **MCQ Technical Item Flaws (see ch 3 of NBME Item-Writing Guide)**

**A: Common Flaws that Help the Testwise Student**

1. Grammatical clues
2. Logical clues
3. Absolute terms
4. Word repeats
5. More detailed correct answer
6. Convergence
7. Enemies

**B: Common Flaws that Add Irrelevant Difficulty**

1. Unnecessarily word stem
2. Long, confusing options
3. Options not in logical order
4. Inconsistent order – numeric
5. Overlapping options – semantic
6. Vague frequency terms

# **Samples of Test Item Stems That Reflect Critical-Thinking** (Su et al, 2009: 225)

“To facilitate writing test items that are congruent with the critical thinking learning objectives, faculty developed groups of generic test item stems that are organized according to the identified thinking skills. Faculty then inserted their selected nursing content into the generic test item stems”

|  |  |
| --- | --- |
| **Critical-Thinking Learning Objectives** | **Sample Test Item Stems** |
| Assess client to collect relevant data.   * Identify cues and make inferences * Validate data   Diagnose actual and potential client health needs.   * Cluster data * Draw diagnostic conclusions | 1. \_\_\_\_\_\_ (Describe a client scenario with a medical diagnosis.) When the nurse assesses the client, which is the most relevant data?  2. \_\_\_\_\_\_ (Describe unusual client assessment data.) What additional information does the nurse need to gather in order to validate the assessment data?  3. \_\_\_\_\_\_ (Describe an assessment data cluster.) Which nursing diagnosis (or collaborative problem) is the most reasonable for the nurse to infer?  4. \_\_\_\_\_\_ (Describe an assessment data cluster.) What additional data are needed to support the possible diagnosis of \_\_\_\_\_\_?  5. \_\_\_\_\_\_ (Describe a client scenario.) Which findings (description of a data cluster) would be most indicative of the nursing diagnosis (or collaborative problem) of \_\_\_\_\_\_? |
| Plan care based on identified client health needs   * Set priorities * Predict outcome criteria * Generate solutions (interventions) with risk-benefit analysis | 1. \_\_\_\_\_\_ (Describe a client situation with multiple health needs/problems.) Which client’s need/problem (or nursing action) has the highest priority?  2. \_\_\_\_\_\_ (Describe a client need/problem.) Which is the most appropriate predication of client outcome for the nurse to make?  3. \_\_\_\_\_\_ (Describe a client situation.) To achieve an outcome of \_\_\_\_\_\_, which is the most appropriate/ important nursing action/intervention?  4. \_\_\_\_\_\_ (Describe a client’s question regarding the reason for an intervention.) Which explanation would be most appropriate?  5. \_\_\_\_\_\_ (Describe a planned intervention to a client situation.) Which nursing action is the most important to ensure risk control before implementing this intervention? |
| Implement plan of care   * Test solutions   Evaluate progress toward attainment of outcomes   * Make criterion-based evaluation | 1. \_\_\_\_\_\_ (Describe an intervention in relation to a client problem or need.) Which client data are most relevant as an indicator of the desirable (or undesirable) response?  2. \_\_\_\_\_\_ (Describe an intervention in relation to a client need or problem.) Which condition would justify the nurse discontinuing the intervention?.  3. To evaluate the effects of \_\_\_\_\_\_ (description of a prescribed medication or treatment), which clinical data are most relevant for the nurse to monitor?  4. Which statement made by the client indicates an understanding of the instruction/a need for further teaching regarding \_\_\_\_\_\_ (description of a client education topic)?  5. (Describe undesirable client responses to an intervention.) Which is the first/most appropriate action that the nurse should carry out? |

# **References and Further Reading**

Billings, D. M., & Halstead, J. A. (2013). Teaching in nursing: A guide for faculty. Elsevier Health Sciences.

Chaudhary, N., Bhatia, B.D., Mahato, S.K. and Agrawal, K.K., (2014) Multiple Choice Questions-Part II (Classification, Item Preparation, Analysis and Banking). *Journal of Universal College of Medical Sciences*, *2*(3), pp.54-59. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.816.8122&rep=rep1&type=pdf>

Cohen, A., & Wollack, J. (2000). Handbook on test development: Helpful tips for creating reliable and valid classroom tests. Madison, WI: University of Wisconsin, Center for Placement Testing. Retrieved 13 October, 2003 from <http://testing.wisc.edu/Handbook%20on%20Test%20Construction.pdf>

Dewey, R. A. (1998). Writing multiple choice items which require comprehension.

Kehoe, J. (1995) Writing multiple-choice test items. Practical Assessment, Research & Evaluation, 4(9). Retrieved July 29, 2008 from [http://PAREonline.net/getvn.asp?v=4&n=9](http://pareonline.net/getvn.asp?v=4&n=9)

McDonald, M. (2014). The nurse educator's guide to assessing learning outcomes. Jones & Bartlett Publishers.

Morrison S, Nibert A, Flick J. (2006) Critical Thinking and Test Item Writing. 2nd ed. Houston, TX: Health Education System.

**NBME (2021) NBME Item-Writing Guide: Constructing Written Test Questions for the Health Sciences, NBME.** [**https://www.nbme.org/services/nbme-workshops-consultancy**](https://www.nbme.org/services/nbme-workshops-consultancy)

Nedeau-Cayo, R., Laughlin, D., Rus, L., & Hall, J. (2013). Assessment of item-writing flaws in multiple-choice questions. Journal for nurses in professional development, 29(2), 52-57. <https://nursing.ceconnection.com/ovidfiles/01709760-201303000-00002.pdf>

Nitko, A. J. (2001). Educational assessment of students. (3rd Ed.). Columbus, OH: Merrill Prentice Hall.

Owen, S. & Freeman, R. (1987). What's wrong with three option multiple items? In Educational & Psychological Measurement (47), 513-22.

**Su, W.M., Osisek, P.J., Montgomery, C. and Pellar, S., (2009) Designing multiple-choice test items at higher cognitive levels. *Nurse Educator*, *34*(5), pp.223-227.** [**https://www.nursingcenter.com/wkhlrp/Handlers/articleContent.pdf?key=pdf\_00006223-200909000-00015**](https://www.nursingcenter.com/wkhlrp/Handlers/articleContent.pdf?key=pdf_00006223-200909000-00015)

**Tarrant, M., Knierim, A., Hayes, S. K., & Ware, J. (2006). The frequency of item writing flaws in multiple-choice questions used in high stakes nursing assessments. Nurse education in practice, 6(6), 354-363.** [**https://www.sciencedirect.com/science/article/abs/pii/S0260691706001067**](https://www.sciencedirect.com/science/article/abs/pii/S0260691706001067)

Zimmaro D. (2004). Writing Good Multiple-Choice Exams, Measurement and Evaluation Center: University of Texas, Austin