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National Board on Certification & Recertification of Nurse Anesthetists

CCNA RE CERTIFICATION

Alternative Question Formats (AQF) Item Writing Guidelines

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Introduction

Alternative question formats have been included on the National Certification Exam (NCE) since August 2009. This guide has been developed in order to facilitate the process of developing test questions in alternative question formats (AQF). The purpose of this guide is to provide: (1) a description of each alternative item type, as they are presented on the NCE; (2) general guidelines to help item authors, especially nurse anesthesia program faculty, create valid test questions for their own program-level tests; and (3) basic examples of each question format, as well as pitfalls to avoid.

Multiple Correct Response (MCR)

Description

This question format is similar to a multiple choice question (MCQ), consisting of a stem (incomplete statement or question) followed by provided options from which the examinee must select the correct responses. However, in contrast to the MCQ format, which consists of a stem and 4 response options (only one of which is correct), MCRs consist of a stem and 4-8 response options, and more than just one option is a correct response. The question stem will indicate how many responses are correct. The candidate indicates the correct responses using a check box next to each response option. The examinee must select of the correct responses in order to be awarded credit.

Guidelines

1. In general, follow the same guidelines you would follow for constructing a stem for a multiple choice question (MCQ). See pages 3-4 of the MCQ item writer's guidelines, posted in the Resources section of the NBCRNA website. In general, adhere to the following guidelines for constructing item stems:
    - The stem's content should focus on a single theme or problem. Focus is essential to writing clear test items. A lack of focus can contribute to confusion on the part of the examinee.
    - The stem should be economically worded. Avoid unnecessary verbiage.
    - The concept tested in the stem should be consistent with evaluation goals and germane to the entry-level practice.
    - The stem should be grammatically correct, both alone and in conjunction with the responses.
    - The stem should not contain personal pronouns (e.g., what would "you" do if…).
    - The MCR format should essentially eliminate any need for negatively phrased stems (e.g., "which is not" or "all except…").
2. Also, follow the same guidelines you would follow for constructing responses for a multiple choice question (MCQ). See pages 4-5 of the MCQ item writer's guidelines,

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posted in the Resources section of the NBCRNA website. In general, adhere to the following guidelines for constructing response options:

- Response options should be homogenous, or conceptually related to each other, and limited to one topic.
- Response options should flow grammatically with the stem, if the stem is an incomplete statement.
- Parallelism: Responses should be parallel in grammar, sentence structure and length. In other words, the verb tenses and type of nouns, subject-verb-object order, punctuation, number of words and sophistication of language should be similar in each.
- Distractors (incorrect responses) should be objectively incorrect, but plausible.
- Distractors should be attractive alternatives to the correct response without being deceitful or tricky. Distractors should not be so absurd as to be obviously false. The goal is to construct distractors as options which would be attractive to the lower-ability examinee. Possible sources for distractors may be common misconceptions or statements which are partially true, but which are not the best responses to the stem.
- If the stem is an incomplete sentence, responses should begin with a lowercase letter and end with a period. Proper names/nouns, however, should be capitalized in all circumstances.
- If the stem ends in a question mark, the first word of the response options should be capitalized.
- If the responses are numbers, the response options should be placed in numerical order.

3. For MCRs on the NCE, the total number of response options are generally twice the number of correct responses. For example, if there are 3 correct responses to the stem, then 6 total response options should be written. MCR questions should include 4-8 response options.
4. After the stem, indicate the number of correct responses. Specifically, provide the instruction, "**Select two**."

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Examples

1. What are the hemodynamic goals of hypertrophic cardiomyopathy?
   Select two.
   - ☐ A. Decrease contractility
   - ☐ B. Decrease preload
   - ☐ C. Increase afterload
   - ☐ D. Increase heart rate

2. What are potential complications of pulmonary artery catheter insertion?
   Select two.
   - ☐ A. Cardiac perforation
   - ☐ B. Left bundle branch block
   - ☐ C. Mitral valve rupture
   - ☐ D. Pulmonary infarction

3. Characteristics of Eaton-Lambert Syndrome include:
   Select three.
   - ☐ A. positive response to anticholinesterase agents.
   - ☐ B. improved strength with activity.
   - ☐ C. reduced acetylcholine release.
   - ☐ D. destruction of acetylcholine receptors.
   - ☐ E. postjunctional defect.
   - ☐ F. sensitivity to all muscle relaxants.

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Short Answer / Calculation

Description

In this question format, examinees are asked to respond by typing in a numerical response, typically a whole number (no decimals) or a number consisting of one or two decimal places. The question will indicate to the examinee the format in which the numerical response should be entered (either a whole number with no decimals, or a number with one or two decimals).

Guidelines

1. Short answer / calculation questions on the NCE currently elicit **numerical responses only**.
2. Be **very** specific about how the answer should be supplied (whole number, number of decimals, measurement units). Include the instructions for formatting the number, after the stem. Closely follow the model provided in the several examples which follow:
    a. **Enter your answer below as a whole number (no decimals) in L/min.**
    b. **Enter your answer below as a whole number (no decimals and no units).**
    c. **Enter your answer below as a number with two decimals in mm Hg.**
    d. **Enter your answer below as a number with one decimal in L.**
    e. **Enter your answer below as a whole number (no decimals) percentage.**
    f. **Enter your answer below as a number with one decimal, in volumes percent.**
3. Indicate, somewhere after the text of the stem, whether a calculator is required to respond to the question.
4. If the correct answer to the calculation question involves rounding, be sure to indicate that the rounding is performed as the final step. In other words, do not round intermediate values. (The instruction to round the answer as the final step of the calculation is provided in the examinee materials.)
5. In general, calculation questions (involving well-known formulas) work better than questions involving ranges of approved values.
6. If the answer to the question is a range of acceptable values, provide all acceptable answers in the item key. For example, if the correct answer to a questions is 20-30 mL, specify all whole number values between 20 and 30 (e.g., 20, 21, 22, 23,…,29, 30). Also, if the answer is a range of possible values, provide two (2) textbook references documenting the correct range.
7. If the answer to the question involves a computation using a formula, provide a rationale or an explanation of how the correct answer is attained in the template, in case the answer is challenged .
8. If possible, consider "cloning" items which involve calculations, by simply changing the factors used to perform the calculation. See the **cloning example** below.
9. Consider whether a particular calculation may have more than one acceptable formula for arriving at an acceptable answer. In this case, all answers reached by any of the acceptable formulae should be documented.

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10. Likewise, be aware that considerable variation may exist in drug dosages which could be considered clinically acceptable, even if one text cites a single dose. The solution to dosage calculation items should be found consistently and discretely among a number of textbooks. Or, dosages vary among texts, the answer key should include all acceptable values. If dosages do indeed vary, then the question should include a text reference for each acceptable value.

Examples

1. Calculate cardiac output given the following hemodynamic parameters: Stroke volume: 60 ml/beat; Blood pressure: 150/70 mmHg; Heart rate: 50 per min

   Enter your answer below as a whole number (no decimals) in L/min.

2. What is the hourly maintenance fluid requirement for an 80-kg male?

   Enter your answer below as a whole number (no decimals) in mL/hour.

Cloning example

3. A patient is 72 inches tall and weighs 200 pounds. Calculate this patient's body mass index (BMI).

   Enter your answer below as a whole number (no decimals and no units.)

Cloned item

4. A patient is 80 inches tall and weighs 250 pounds. Calculate this patient's body mass index (BMI).

   Enter your answer below as a whole number (no decimals and no units.)

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Questions with Graphics

Item writers are permitted, and strongly encouraged, to use graphics as stimuli or supplements for any of the MCQ, MCR, and Short answer / numerical item types. When using graphics, adhere to the following guidelines:

1. Avoid "window-dressing." Do not put a graphic in a question merely for the sake of adding a graphic. If you are including graphics as part of the stem, make sure the graphic is pertinent to answering the question. In other words, it should be necessary to refer to the graphic to answer the question.
2. Item writers have permission to use graphics from any of the following sources:
    a. Photos taken from your own practice. Examples may include:
        i. Actual patients and cases, provided necessary consents have been supplied with your question submission.
        ii. Equipment and instrumentation displays
        iii. Simulation lab
        iv. Cadaver lab
    b. Public domain (Wikimedia, Gray's anatomy)
    c. Textbooks, provided that necessary permissions have been attained for educational use.
    d. Websites, provided proper written permission has been received.
3. Consider the format of the graphic file. Most of the time, jpeg format (*.jpg) of images are easiest to use. In addition to using graphics as part of the question stem, also consider using graphics for response options, given that your testing delivery system has that capability.

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Drag and Drop Questions

Description

These questions involve clicking and dragging objects to corresponding targets, and may take the form of matching or placing objects in order. The drag and drop question format requires the examinee to use the computer's mouse to click on boxes (called "sources"), and while holding down the left mouse button, to drag the source object to a corresponding box (called a "target"). Once the source object is dragged to its appropriate target, the click button is released.

Guidelines

<u>Matching</u>

1. Identify a "theme", or a general concept that ties all of the matchable options (sources and targets) together (e.g., diseases, drug class).
2. Write the stem or "lead-in statement" (e.g. "Match the disease process with its clinical presentation").
3. Limit matching questions to 3-4 matchable options.
4. Matching questions on the NCE currently feature only a 1:1 correspondence between sources and targets. In other words, each source is matched to one and only one target (no unmatched options).
5. Keep the options to single words or short phrases. Limit the matchable options to 7-8 words.
6. Adhere to the following guidelines when organizing sources (right-hand column) and targets (left hand column)
    a. Place wordier matching options in the left-hand column. It is generally easier for examinees to read wordier options if they are placed in the left hand column.
    b. Some matching questions take the form of cause and effects. For example match the symptoms to the disease processes. Place causes (disease processes, in this case) in the left-hand column, and effects (symptoms) in the right hand column.

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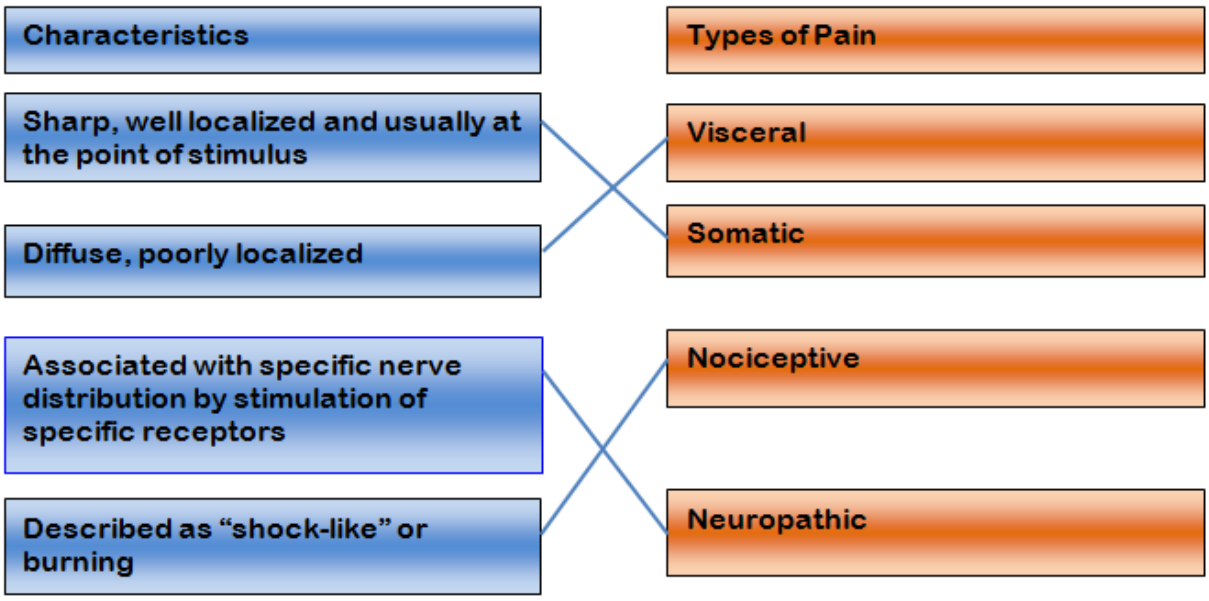
Example
Item Stem: Match the type of pain with its associated characteristics.



Ordering

1. Write the stem or "lead-in statement." Be specific about how the objects should be ordered, (e.g. "Order the following objects by their specific mass, from least to greatest.").
2. Place objects to be ordered in the right-hand column. The left-hand column objects should read, "First," "Second," "Third," and "Fourth."
3. Limit the objects to 3-4 objects to be sorted.
4. Ordering questions on the NCE currently feature only a 1:1 correspondence between sources and targets. In other words, each source is matched to one and only one target (no unmatched options).
5. Keep the text options to single words or short phrases. Limit the matchable options to 7-8 words.

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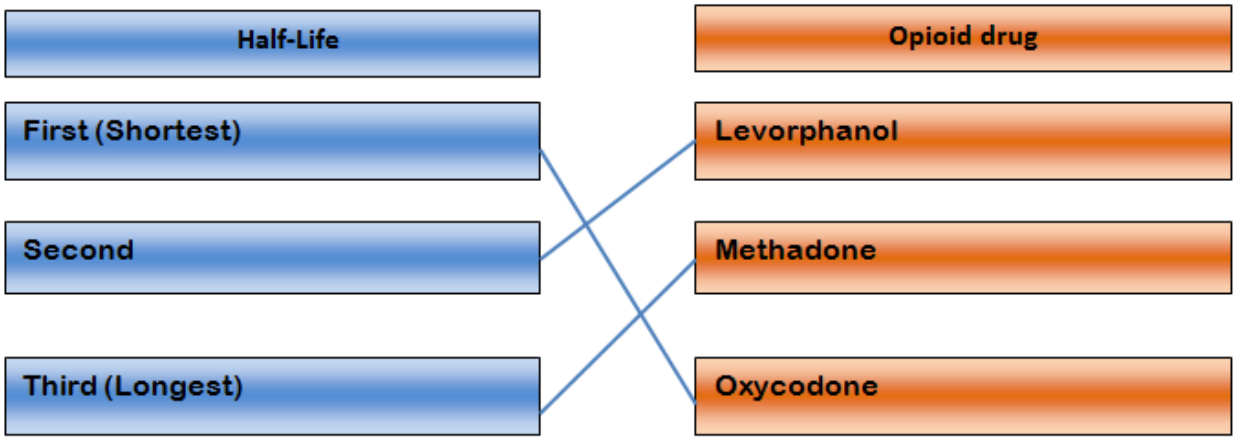
Example

Item Stem: Place the opioid drugs in order of the duration of their half-lives, from **shortest to longest**.



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Hotspot

Description

In this question format, the examinee is presented with an image or a figure. The examinee indicates the answer by using the mouse to click on a region of a presented image or figure. When a region is selected, a marker (e.g., "X") indicates the precise location of the click. Examinees can typically change their answer (before going to the next question) by moving the "X" simply by clicking on another region in the image, or by clicking on the marker and dragging it to a new position. This functionality may differ across testing delivery platforms. To receive credit on a hotspot question, the examinee's "X" marker must be inside the region of the image determined as correct by subject matter experts.

Guidelines

1. All hotspot items are graphics-based. Please see guidelines 1-2 for Questions with Graphics (Page 7).
2. First select the graphic you will use as the basis of the question. Once the graphic is selected, construct the stem to instruct the examinee which structure or element they should click on. Example: In the image below, click on needle insertion point for an epidural.
3. Note: Hotspot items on the NCE currently feature only 1 correct region. The current exam driver cannot score a hotspot question with 2 or more correct regions.
4. The correct region can be indicated by using basic shapes (rectangles, circles, ovals). However, correct regions can also be complex – such as a curvilinear object
5. Ensure that a single keyed area encompasses the entire range of correct responses without including incorrect areas. In the example below, if the question asked for identification of the faucial pillars, the keyed figure on the left would exclude correct responses on the opposite side of the figure. However, the key in the figure on the right incorrectly includes portions of the soft palate.

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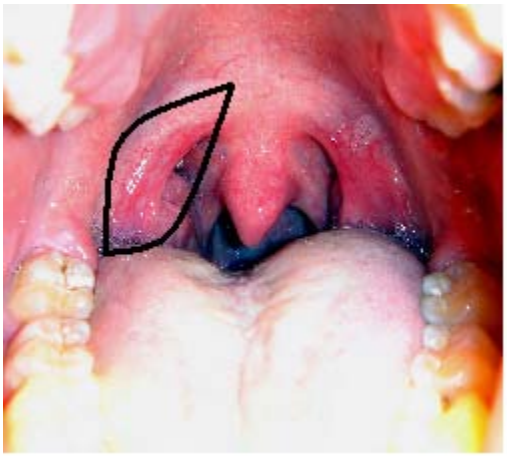

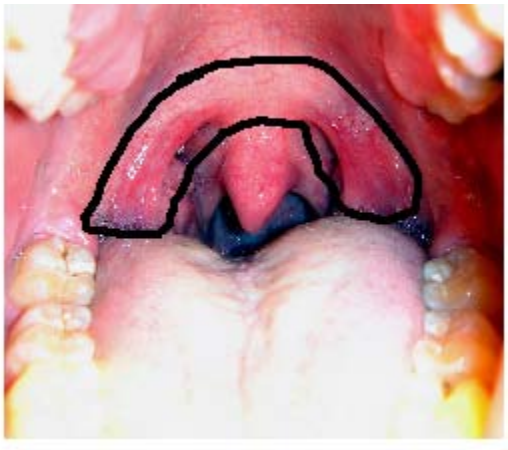

6. The hotspot question format is best suited to questions where a *diverse response-space* is desired. Ideally, the question is posed, and the graphic is presented in such a way as to elicit many (or even infinite) potential places to click, not just 3-4 possible places. By contrast, if a hotspot question is formulated in a way to allow only 3-4 possible click-points, then it may just as well be set up as a multiple choice question (MCQ), with the four points labeled A, B, C, D, etc.. The item writer gets more "bang for the buck" if there are many possible options to click in the presented graphic. See the examples below.
7. With hotspot questions, it is easy to get into the rut of basic anatomy / identification questions. Try to incorporate more critical thinking into these questions. For example, instead of :

"In this diagram of the heart, click on the SA node",

Try this:

In this diagram of the heart, click on the part of the heart which generates the sinus rhythm.

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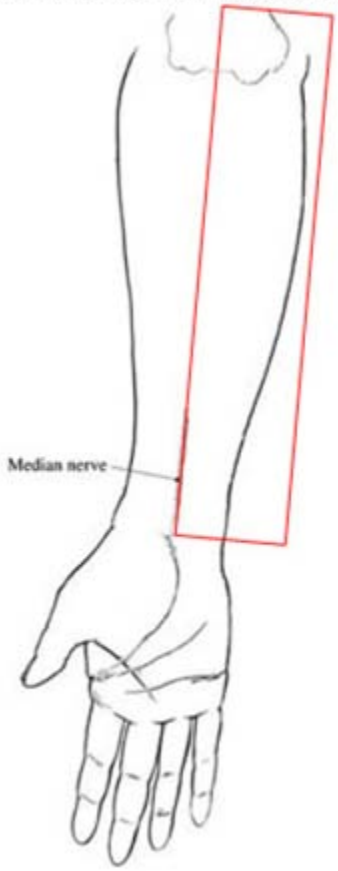
Examples

Example 1. Correct region - simple shape

In the figure below, click on the area of the arm where peripheral nerve stimulator electrodes should be placed to demonstrate thumb twitch via the adductor pollicis muscle.



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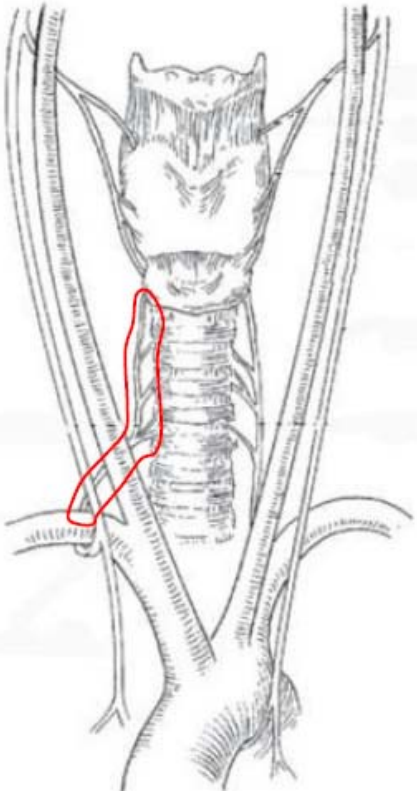
Example 2. Correct region - complex shape

In the figure below, click on the nerve that may be compressed during mediastinoscopy.



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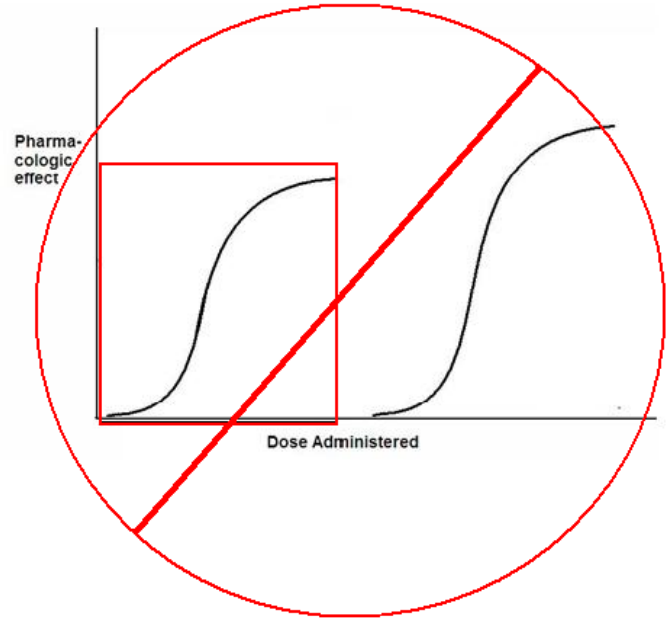
Example 3. Creating hotspot items in order to elicit many possible responses.

DO NOT: Formulate the question and the graphic in a way to allow for only a limited number of plausible points to click. The example below really only allows for two plausible points to click. This could just as well be formulated as a multiple choice question:

The dose-response curves of two drugs are shown below. Click on the curve which represents the drug with the higher potency.



NO!

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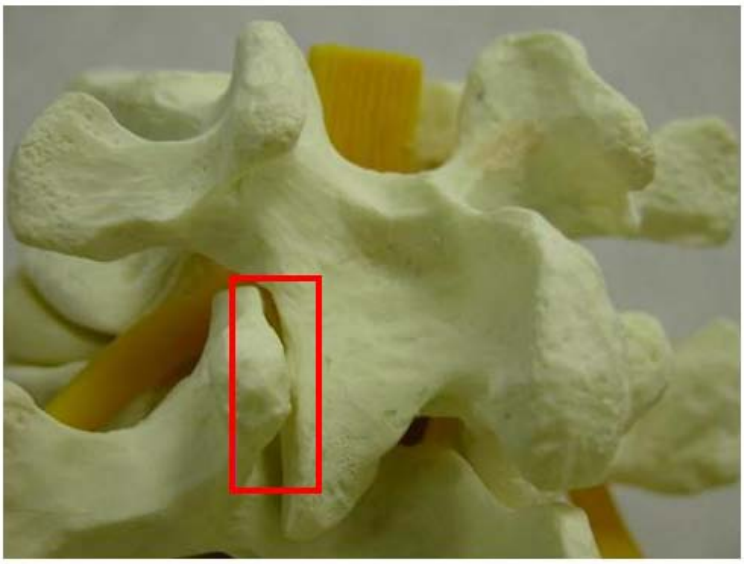
DO: Formulate the question and the graphic in a way to allow for many plausible points to click. Any point in the image below is a plausible point to click on, allowing for a more diverse response space.

In the oblique view of a spinal segment below, click on the area of needle insertion for the performance of a left inferior facet injection.



YES!

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