Innovations in Assessment – Assessing the Possibilities

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Overview

• A spectrum of innovations
• Alternative item types
• Managing ongoing change
A Spectrum of Innovation

Offering Advantages at Various Points in the Test Development Cycle
A Wide Variety of Innovations

• Design and development of item and tests
  • Auto-item generation
  • Assessment engineering

• Items and tasks used within the test
  • Use of the internet during secure online testing
  • Game-based assessments
  • Computer-based simulations

• Item selection during the test
  • Adaptive testing

• Delivery of the test
  • Online proctoring
An Item/Task Constraint-Continuum

Alternative Item Types

Innovations of Low to Medium Complexity
# Video – Overview

<table>
<thead>
<tr>
<th>Item Type</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| **Video** | present *dynamic* visual content, e.g.  
• physical movement  
• communication, ethics, diagnosis  
• scenario reenactment  
Can expand test content into new regions | Potential issues related to examinees with hearing disabilities (for videos with sound) or visual disabilities (no text reader alternatives)  
technical considerations, due to potentially large file sizes |
A 2-week-old newborn is brought to the physician for a routine examination. His mother is concerned that his development may be delayed because he startles easily, which causes his arms and legs to shake briefly. He was born at term following a cesarean delivery due to late decelerations. Pregnancy was otherwise uncomplicated. He is at the 25th percentile for height, weight, and head circumference. His temperature is 37.2°C (99°F), pulse is 140/min, and respirations are 52/min. To view the examination, click on the “Play Media” button. Which of the following is the most appropriate next step in management?

A. Reassurance  
B. MRI of the brain  
C. EEG  
D. Electromyography  
E. Lumbar puncture
## Drag & Drop – Overview

<table>
<thead>
<tr>
<th>Item Type</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drag-and-Drop</td>
<td>can be used for: matching, prioritizing, or sequencing</td>
<td>can require too much knowledge/time for a single score point</td>
</tr>
<tr>
<td></td>
<td>for some content, may provide more direct measurement than MC</td>
<td>potentially complex interface</td>
</tr>
</tbody>
</table>
Match the symptoms listed on the left to the preferred treatments listed on the right in the **rank-order** approach for managing the adult patient with asthma.

*Drag each element in the left column to its matching element in the right column.*

1. **Step 1: mild intermittent**
2. **Step 2: mild persistent**
3. **Step 3: moderate persistent**
4. **Step 4: severe persistent**

A. Low-to-medium dose inhaled corticosteroids and long-acting inhaled beta2-agonists
B. Low-dose inhaled corticosteroids or leukotriene
C. High-dose inhaled corticosteroids and long-acting inhaled beta2-agonist
D. No daily medications; short-acting bronchodilator as needed; systemic corticosteroids for severe exacerbations

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## Multiple Response – Overview

<table>
<thead>
<tr>
<th>Item Type</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple Response</td>
<td>ideal for content where multiple keys are common</td>
<td>can require too much knowledge/time for a single score point</td>
</tr>
<tr>
<td></td>
<td>can be less complex than MC versions of same item (e.g., Type K)</td>
<td>examinees may confuse MR with MC and provide only a single key</td>
</tr>
</tbody>
</table>
An adult nurse practitioner is examining a 32-year-old patient who reports having “heartburn.” The patient recently underwent an esophagogastroduodenoscopy and was diagnosed with Barrett esophagus. The nurse practitioner recommends:

Select **FOUR** options.

- 1. a proton pump inhibitor.
- 2. antacids.
- 3. H2 antagonists.
- 4. surveillance endoscopy every 10 years
- 5. the patient avoid foods high in proteins and cholesterol.
- 6. weight reduction.

# Short Answer – Overview

<table>
<thead>
<tr>
<th>Item Type</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short Answer</strong></td>
<td>efficient</td>
<td>tends to measure knowledge level</td>
</tr>
<tr>
<td></td>
<td>measures recall rather than recognition</td>
<td>difficult to write stems that are clear, yet avoid cluing</td>
</tr>
<tr>
<td></td>
<td>cueing and guessing are almost eliminated</td>
<td>difficult to ensure automatically scorable response</td>
</tr>
</tbody>
</table>
What is the hourly maintenance fluid rate for an 11 pound infant?

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

[Blank] mL/hour
A 55-year-old woman was diagnosed with *Clostridium difficile* colitis following a course of antibiotics for pyelonephritis. Symptoms resolved entirely after treatment with a 14-day course of metronidazole. Ten days after completing the antibiotic course, the patient reports a two-day history of abdominal pain and diarrhea. She has not had fever or blood in her stools, but reports seven bowel movements during the past 24 hours.

Temperature is 37.1°C (98.7°F), pulse rate is 85 per minute, respiration rate is 14 per minute, and blood pressure is 105/62 mm Hg. The abdomen is soft, and examination reveals mild diffuse tenderness; bowel sounds are decreased. No peritoneal signs are detected. Leukocyte count is 13,000/μL, serum albumin is 3.2 g/dL, and stool assay for *Clostridium difficile* toxin is positive.

**What should you prescribe now?**

- **SULFATRAP®**
  - CIPROFLOXACIN HCL ORAL SUSPENSION
  - CIPROFLOXACIN ORAL SOLUTION
  - CIPROFLOXACIN ORAL TABLETS
  - CIPROFLOXACIN ORAL CAPSULES
  - CIPROFLOXACIN ORAL DISCUS

- **No prescription**
Audio – Overview

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Audio</td>
<td>present audible content - e.g., heart, lungs</td>
<td>need to provide alternatives for candidates with hearing disabilities</td>
</tr>
<tr>
<td></td>
<td>can expand test content into new regions</td>
<td></td>
</tr>
</tbody>
</table>
A 14-year-old boy is brought to the physician for an examination prior to participation on a basketball team. He has a history of recurrent otitis media since infancy. He underwent tonsillectomy 7 years ago for snoring associated with obstructive sleep apnea. Growth and development are appropriate for age. To view the cardiac examination, click on the "Play Media" button. Which of the following is the most appropriate next step in management?

A. Approve basketball participation
B. Chest x-ray
C. Exercise stress test
D. ECG
E. Echocardiography
Example of an Audio Player within an Item, when there is no visual.
## Hot Spot – Overview

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</tr>
</thead>
<tbody>
<tr>
<td>Hot Spot</td>
<td>good for measuring visual content</td>
<td>if images are poorly sized or ambiguous, examinees may be confused</td>
</tr>
<tr>
<td></td>
<td>some images provide more, or more realistic, “distractors”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>responding on image may provide better fidelity</td>
<td>can be written to measure knowledge level</td>
</tr>
<tr>
<td>Non-discrete images</td>
<td>“non-discrete” images can support measurement that labeling would not</td>
<td>“non-discrete” images may need additional scoring rules that are consistent and transparent</td>
</tr>
</tbody>
</table>
4. 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.
5. In the lead II electrocardiogram tracing below, click on the area which would indicate that the patient has had a myocardial infarction in the past.

The nurse is caring for a 4-month-old infant who is in a crib.

Click on all of the potential safety hazard(s) in the picture below.
Managing *Ongoing* Change

Considering Continuous Innovation
Likelihood of Future Innovations

• Continual changes in the environment are likely
  • Medicine
  • Technology
  • Measurement

• These changes may:
  • offer new and better assessment options
  • require the use of some innovations, to maintain fidelity
Agile Strategies for Continuous Innovation

• *Agile* methods support a “little bets” approach
  • An innovation is pursued in a series of quick iterations
  • Over time, expertise is developed
  • Final design decisions are made with deeper understanding
An Agile Approach to Prioritizing Potential Innovations

- Have stakeholders rate all potential innovations:
  - Complexity (-)
  - Cost and risk (-)
  - Opportunity (+)
  - Value (+)

- Combine ratings and plot them
  - Bubble chart
Value Bubbles Plotted By Complexity vs. Risk

Summary
Summary

• A spectrum of innovations exists
  • These possibilities include alternative approaches, from item writing through test delivery

• Alternative item types
  • Have different levels of constraint
  • Present different advantages and challenges

• We may be entering an era of ongoing change
  • The first set of innovations ABP implements may be followed by others
  • Agile methods can help you manage the process