EMI questions and Formative Assessment

Pete Smith
1st BDS Teaching Lead
EMI

- A MCQ variant
- Extended Matching Items
  - Title
  - Lead-in
  - 2-5 Question Stems
  - >7 Options (10-15)
- To test reasoning in Clinical Education
  - Alternative to free response questions
  - Assess diagnostic ability \((Case \& Swanson; 1993)\)
Aspirin inhibits which of the following enzymes?

a) COX-2.
b) DNA polymerase.
c) ATPase.
d) Angiotensin converting enzyme.
Diagnosis of Abdominal Pain
For each patient, select the most likely diagnosis.

1) A 25-year-old woman has sudden onset of persistent right lower abdominal pain that is increasing in severity. She has nausea without vomiting. She had a normal bowel movement just before onset of pain. Examination shows exquisite deep tenderness to palpation in right lower abdomen with guarding but no rebound; bowel sounds are present. Pelvic examination shows a 7-cm, exquisitely tender right-sided mass. Hematocrit is 32%. Leukocyte count is 18,000/mm3. Serum amylase activity is within normal limits. Test of the stool for occult blood is negative.

2) An 84-year-old man in a nursing home has increasing poorly localized lower abdominal pain recurring every 3-4 hours over the past 3 days. He has no nausea or vomiting; the last bowel movement was not recorded. Examination shows a soft abdomen with a palpable, slightly tender, lower left abdominal mass. Hematocrit is 28%. Leukocyte count is 10,000/mm3. Serum amylase activity is within normal limits. Test of the stool for occult blood is positive.

   a) Abdominal aneurysm
   b) Appendicitis
   c) Bowel obstruction
   d) Cholecystitis
   e) Colon cancer
   f) Constipation
   g) Diverticulitis
   h) Ectopic pregnancy — ruptured
   i) Endometriosis
   j) Hernia
   k) Kidney stone
   l) Mesenteric adenitis
   m) Mesenteric artery thrombosis
   n) Ovarian cyst — ruptured
   o) Pancreatitis
   p) Pelvic inflammatory disease
   q) Peptic ulcer disease
   r) Perforated peptic ulcer
   s) Pyelonephritis
   t) Torsion
Severe asthma

For each of the statements chose the most appropriate option.

A 25 year old woman has presented for routine elective work she is a known asthmatic and a lifelong non-smoker. Upon arrival it is clear to the receptionist that the patient is very breathless; her husband says she has been like this much of the day. Her condition worsens quite quickly.

1) What clinical feature from the list of options is most compatible with “acute severe asthma”?

2) The same patient described above clearly needs medical attention. The dentist dials 999 for an ambulance. What first choice drug(s) should be started by the dentist while awaiting the ambulance?

3) The lady seems to improve within the hour after admission, and is sent to the wards. What is the most appropriate way to monitor this patient’s progress after admission?

- a) Chest pain
- b) Pallor
- c) Stridor
- d) Wheeze
- e) Purulent sputum
- f) Non-productive cough
- g) Cannot complete sentences in one breath
- h) Oral chlorpheniramine (a histamine H1 antagonist)
- i) IV adrenaline
- j) Inhaled salbutamol (plus O2 if available)
- k) Inhaled sodium cromoglycate
- l) Inhaled beclomethasone
- m) Intravenous hydrocortisone
- n) Intravenous hydrocortisone plus intravenous ceftriaxone
- o) Intravenous hydrocortisone plus diazepam
- p) Intramuscular adrenaline plus intravenous hydrocortisone
- q) Oral montelukast (a leukotriene antagonist)
- r) Repeat chest radiograph after 24 hours
- s) Clinical assessment by an experienced nurse plus serial measurement of peak expiratory flow rate
- t) Clinical assessment by an experienced nurse plus serial measurement of forced vital capacity
- u) Serial monitoring of venous blood gases
- v) Serial blood pressure monitoring
- w) Oral doxapram (a respiratory stimulant)
- x) Transfer to the ITU for mechanical ventilation
- y) Chest physiotherapy

Heterogeneous Option List
3 MCQ Questions
Not alphabetised
Patients with uncontrolled (insulin-dependent) diabetes are prone to periodontal disease

1) Increased levels of what molecules in the blood correlate with the severity of periodontal disease?

2) What is the cause of the above products?

3) What macrophage function is marked decreased in diabetes?

4) What medium can be used to monitor diabetic control in patients with periodontal disease?

5) What pathological change may lead to poor tissue perfusion of the periodontal tissues in diabetic patients?

a) albumin molecules
b) advanced glycation endproducts
c) haemoglobin subunits
d) gingival crevicular fluid
e) glycosaminoglycans
f) vascular thickening
g) parotid saliva protein
h) phagocytosis
i) low density lipoproteins
j) vasodilatation
k) submandibular saliva
l) cell division
m) the longstanding use of insulin
n) transient hypoglycaemia
o) elevated levels of salivary glucose
p) long-standing hyperglycaemia
q) periodontal attachment loss
r) chemotaxis
Components of the digestive system

Identify the part of the digestive system which best matches the following descriptions.

1) Responsible for synthesizing digestive enzymes
2) Stores and metabolises nutrients, destroys toxins and produces bile
3) Involved in the inhibitory phase of the intestinal reflex to produce cholecystokinin
4) Contains surface mucous cells, neck cells and parietal cells
5) Contains both voluntary and smooth muscle

a) Colon  
b) Duodenum  
c) Gall bladder  
d) Ileum  
e) Liver  
f) Oesophagus  
g) Oral cavity  
h) Pancreas  
i) Stomach

Conforms to EMI format
Tests only basic knowledge

Weak EMI (by Pete Smith)
Diabetic diseases
Identify the diabetic disease which best matches the following descriptions.

1) A condition categorised by the autoimmune destruction of pancreatic beta cells.

2) A condition in which target cells in the body become less sensitive to insulin due to the down regulation of insulin receptors.

3) A condition resulting in polydipsia and polyuria due to a lack of vasopressin production or abnormal collecting duct function.

4) A form of monogenic diabetes. Potential gene mutations include GCK, HNF1A AND HNF4A.

5) A life-threatening metabolic state, predominantly found in those with Type 1 Diabetes; resulting from a profound lack of insulin, leading to excess conversion of fatty acids to ketone bodies and the development of metabolic acidosis.

   a) alcohol-related diabetes mellitus
   b) diabetic ketoacidosis
   c) diabetes insipidus
   d) diabetes mellitus type I
   e) diabetes mellitus type II
   f) gestational diabetes mellitus
   g) malnutrition-related diabetes mellitus
   h) maturity onset diabetes of the young
   i) prediabetes

Written by a group of 8 1st BDS students October 2013
Treatments for Indigestion

Identify the treatment which best fits each of the following descriptions

- A CaCo$_3$ based palliative treatment for acid reflux
- A histamine H$_2$-receptor antagonist based treatment for acid reflux
- A histamine H$_2$-receptor antagonist based treatment for peptic ulcer disease
- A homeopathic “treatment” for acid reflux
- Medication for relief of pain associated with indigestion

1. Aspirin
2. Kaolin & Morphine
3. Milk
4. Natrum Carbonicum 100C
5. Paracetamol
6. Prussic acid
7. Rennie
8. Rituxan
9. Zantac

1st BDS, early in Semester 1
Treatments for Indigestion

Identify the treatment which best fits each of the following descriptions:

1. A CaCO₃ based palliative treatment for acid reflux
2. A histamine H₂-receptor antagonist based treatment for acid reflux
3. A histamine H₂-receptor antagonist based treatment for peptic ulcer disease
4. A homeopathic “treatment” for acid reflux
5. Medication for relief of pain associated with indigestion

A warm-up simple knowledge-testing question
Treatments for Indigestion

Identify the treatment which best fits each of the following descriptions

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- A histamine H$_2$-receptor antagonist based treatment for acid reflux
- A histamine H$_2$-receptor antagonist based treatment for peptic ulcer disease
- A homeopathic “treatment” for acid reflux
- Medication for relief of pain associated with indigestion

1. Aspirin 8%
2. Kaolin & Morphine 0%
3. Milk 2%
4. Natrum Carbonicum 100C 6%
5. Paracetamol 2%
6. Prussic acid 4%
7. Rennie 0%
8. Rituxan 39%
9. Zantac 39%

A slightly more obscure knowledge testing question
Treatments for Indigestion
Identify the treatment which best fits each of the following descriptions

1. A CaCo$_3$ based palliative treatment for acid reflux
   - Aspirin

2. A histamine H$_2$-receptor antagonist based treatment for acid reflux
   - Milk

3. A histamine H$_2$-receptor antagonist based treatment for peptic ulcer disease
   - Natrum Carbonicum 100C

4. A homeopathic “treatment” for acid reflux
   - Paracetamol

5. Medication for relief of pain associated with indigestion
   - Prussic acid

   - Rennie 68%

   - Rituxan

   - Zantac 39%

Making the point
Treatments for Indigestion
Identify the treatment which best fits each of the following descriptions

1. A CaCo₃ based palliative treatment for acid reflux
2. A histamine H₂-receptor antagonist based treatment for acid reflux
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A knowledge/understanding/reasoning question
Treatments for Indigestion
Identify the treatment which best fits each of the following descriptions

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- A histamine H₂-receptor antagonist based treatment for peptic ulcer disease
- A homeopathic “treatment” for acid reflux
- Medication for relief of pain associated with indigestion

1. Aspirin
2. Kaolin & Morphine
3. Milk
4. Paracetamol
5. Prussic acid
6. Rennie
7. Rituxan
8. Zantac

Test understanding

Having seen the answer to Q2 and if they understand the underlying processes, then they can figure out the answer to Q3.
Treatments for Indigestion
Identify the treatment which best fits each of the following descriptions

- A CaCo\textsubscript{3} based palliative treatment for acid reflux
- A histamine H\textsubscript{2}-receptor antagonist based treatment for acid reflux
- A histamine H\textsubscript{2}-receptor antagonist based treatment for peptic ulcer disease
- A homeopathic “treatment” for acid reflux
- Medication for relief of pain associated with indigestion

A setup question

<table>
<thead>
<tr>
<th></th>
<th>Treatment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>1</td>
<td>Aspirin</td>
<td>0%</td>
</tr>
<tr>
<td>2</td>
<td>Kaolin &amp; Morphine</td>
<td>2%</td>
</tr>
<tr>
<td>3</td>
<td>Milk</td>
<td>93%</td>
</tr>
<tr>
<td>4</td>
<td>Natrum Carbonicum 100C</td>
<td>3%</td>
</tr>
<tr>
<td>5</td>
<td>Paracetamol</td>
<td>0%</td>
</tr>
<tr>
<td>6</td>
<td>Prussic acid</td>
<td>0%</td>
</tr>
<tr>
<td>7</td>
<td>Rennie</td>
<td>0%</td>
</tr>
<tr>
<td>8</td>
<td>Rituxan</td>
<td>2%</td>
</tr>
<tr>
<td>9</td>
<td>Zantac</td>
<td>0%</td>
</tr>
</tbody>
</table>
Treatments for Indigestion
Identify the treatment which best fits each of the following descriptions

1. A CaCo$_3$ based palliative treatment for acid reflux
   - Aspirin

2. A histamine H$_2$-receptor antagonist based treatment for acid reflux
   - Natrum Carbonicum Sodium Carbonate

3. A histamine H$_2$-receptor antagonist based treatment for peptic ulcer disease
   - Natrum Carbonicum 100C 3%
   - Not testing the obvious

4. A homeopathic “treatment” for acid reflux
   - Do you know what homeopathy is?
   - 100C = 1/100 dilution repeated 100 times
   - 100C = $10^{-200}$ dilution

5. Medication for relief of pain associated with indigestion

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Treatments for Indigestion
Identify the treatment which best fits each of the following descriptions

- A CaCO₃ based palliative treatment for acid reflux
- A histamine H₂-receptor antagonist based treatment for acid reflux
- A histamine H₂-receptor antagonist based treatment for peptic ulcer disease
- A homeopathic “treatment” for acid reflux
- Medication for relief of pain associated with indigestion

A “duh” question

1. Aspirin 15%
2. Kaolin & Morphine 10%
3. Milk 0%
4. Natrum Carbonicum 100C 0%
5. Paracetamol 72%
6. Prussic acid 0%
7. Rennie 3%
8. Rituxan 0%
9. Zantac 0%
Treatments for Indigestion

Identify the treatment which best fits each of the following descriptions

- A CaCO₃ based palliative treatment for acid reflux
  1. Aspirin

- A histamine H₂-receptor antagonist based treatment for acid reflux
  2. Kaolin & Morphine
  3. Milk

- A histamine H₂-receptor antagonist based treatment for peptic ulcer disease
  4. Natrum Carbonicum 100C
  5. Paracetamol
  6. Prussic acid

- A homeopathic “treatment” for acid reflux
  7. Rennie 3%

- Medication for relief of pain associated with indigestion
  8. Rituxan

Duh!

Test reasoning
Are you thinking about your answer?
Treatments for Indigestion
Identify the treatment which best fits each of the following descriptions

1. Bad
2. Poor
3. Fair
4. Good
5. Excellent
6. Not a Learning Objective

Group feedback on the questions – compared directly to a previous self-assessment of accomplishment
Alcohol - safe drinking limits
Choose the range closest to the appropriate value of the following

- The recommended weekly limit for women
- The recommended weekly limit for men
- The % of men in the UK who drink more per week than the recommended maximum.
- The minimum number of units consumed per week that constitute "dangerous" drinking in a man.
- The number of units consumed per day by an alcoholic who drinks two bottles of vodka a day. 1 bottle of vodka = 1000 ml @ 40% alcohol

Formative works both ways! Any drinking is dangerous.
Alcohol - safe drinking limits

Choose the range closest to the appropriate value of the following

- The recommended weekly limit for women
  - 1 0-9 7%
  - 2 10-19 0%
  - 3 20-29 2%
  - 4 30-39 0%
  - 5 40-49 7%
  - 6 50-59 4%
  - 7 60-69 20%
  - 8 70-79 5%
  - 9 80-89 55%

- The recommended weekly limit for men
- The % of men in the UK who drink more per week than the recommended maximum.
- The minimum number of units consumed per week that constitute "dangerous" drinking in a man.
- The number of units consumed per day by an alcoholic who drinks two bottles of vodka a day. 1 bottle of vodka = 1000 ml @ 40% alcohol

‘A’ level maths but little functional numeracy....
Epidemiology

Using data provided in the scenario, estimate the following:

Each year, from a total of 40 million children born in sub-Saharan Africa, an estimated 200,000 have sickle cell anaemia and of these, 90% die in their first year before the disease is diagnosed. In a study of 1000 children with sickle cell disease admitted to a hospital in Kenya, the researchers found 60 to have bacteremia. Only 10 children of an equivalent group of non-sufferers were found to have bacteremia.

1. What is the incidence rate of sickle cell disease per 1000 person years?
2. What is the mortality rate per 1000 in children in their first year?
3. What is the prevalence of sickle cell disease in neonates?
4. If the birthrate is 40 per 1000, what is the total population of sub-Saharan Africa (in billions)?
5. In comparison to a non-sufferer, estimate the odds ratio of a child with sickle cell disease having bacteremia.

Target the poor numeracy......
Components of the digestive system
Identify the histological images of the GI tract

1. Anal canal 0%
2. Appendix 0%
3. Colon 20%
4. Gall bladder 0%
5. Jejunum 13%
6. Liver 2%
7. Oesophagus 25%
8. Pancreas 27%
9. Stomach 13%

Target the distain for histology......
Alternative / Complementary Therapies

Identify the following therapies from their description

1. A therapy based on theory of the presence of the four elements (fire, water, earth and air) in the human body.
2. A therapy that attempts to treat patients with heavily diluted preparations which are claimed to cause effects similar to the symptoms presented.
3. A therapy that emphasizes diagnosis, treatment and prevention of mechanical disorders of the musculoskeletal system.
4. A therapy that focuses on natural remedies and the body’s vital ability to heal and maintain itself.
5. A therapy that involves inserting and manipulating filiform needles into various points on the body to relieve pain.
Alternative / Complementary Therapies
When did they start? Choose from the following dates....

- Aromatherapy
  - Before 2000BC: 13%
  - 1999BC - 1000BC: 9%
  - 999BC - 0AD: 2%
  - 1AD - 500AD: 4%
  - 501AD - 1000AD: 15%
  - 1001AD - 1500AD: 6%
  - 1501 - 1750: 17%
  - 1751 - 1900: 21%
  - 1901 - 2010: 13%

A way of challenging preconceptions

... and stimulating cognition

Aromathérapie: Les Huiles Essentielles, Hormones Végétales by René-Maurice Gattefossé 1937

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Assessment of Risk
Choose the value that most closely matches the risk in each case

- The percentage chance of a non-smoker developing lung cancer by age 75
  - 1: <1%
  - 2: 5%
  - 3: 15%
  - 4: 30%
  - 5: 40%
  - 6: 50%
  - 7: 65%
  - 8: 85%
  - 9: 100%

- The percentage chance of a smoker who quits at age 50 developing lung cancer by age 75
  - 1: 28%
  - 2: 21%
  - 3: 16%
  - 4: 10%
  - 5: 16%
  - 6: 6%
  - 7: 3%

- The percentage of lung cancer patients who survive 1 year following diagnosis
- The percentage of lung cancers thought to be smoking related

Keep challenging the preconceptions. Make them think!
Adverse Effects

Identify the adverse effect associated with each of the following drugs

- Clonidine hydrochloride: (prevention of recurrent migraine)
- Ephedrine hydrochloride: (reversible airways obstruction)
- Amiloride hydrochloride (oedema)
- Hyoscine hydrobromide (motion sickness)
- Phenelzine (antidepressant, Monoamine-oxidase inhibitor)

1. angioedema 9%
2. dry mouth 47%
3. hypertension 4%
4. muscular hypotonia 14%
5. renal failure 6%
6. respiratory depression 10%
7. seizures 10%
EMI

• Formatively and Summatively
• Test
  • Basic knowledge
  • Understanding
  • Reasoning

Sometimes all three in the same question!
EMI

• Formatively
• Immediate feedback on self-assessment
• Direct learning
  • Identify weaknesses and omissions
  • Identify the boundary of knowledge/understanding
  • Challenge preconceptions and stimulate cognition
  • Reinforce key points

Use formative assessment to show what you think is important
EMI

• Formatively
• Assessment for Learning

"Assessment for learning is any assessment for which the first priority in its design and practice is to serve the purpose of promoting students’ learning."

“It thus differs from assessment designed primarily to serve the purposes of accountability, or of ranking, or of certifying competence.”

Students have a “Hidden Curriculum”

Use formative Assessment for Learning

To keep students on our curriculum
**Writing EMI questions**

**The assassination of JFK**

John Fitzgerald Kennedy, the 35th President of the United States, was assassinated on Friday, November 22, 1963, in Dealey Plaza, Dallas, Texas. Kennedy was fatally shot by a sniper while traveling with his wife Jacqueline and the Texas Governor. A ten-month investigation in 1963–64 by the Warren Commission concluded that Kennedy was assassinated by a single individual, acting alone.

Identify the individual who best fits each of the following descriptions.

<table>
<thead>
<tr>
<th>Abraham Zapruder</th>
<th>Clint Hill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earl Warren</td>
<td>J.D. Tippit</td>
</tr>
<tr>
<td>Jack Ruby</td>
<td>John Connally</td>
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