Assessing Clinical Decision Making: Focusing only on the critical, challenging decisions, the Key Features

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School of Medicine Chiba University, March 2007

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1. Why change?
2. What’s “Key Features” approach?

Basic issues:
- Adequate & representative sample problems
- Critical decisions
- Format (how) serves purpose (what)
Slides available:

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60s  80s

Problem solving  Decision making

PMPs  KFs
Patient Management  Key Features
Problems
PMPs: Patient Management Problems

Christine McGuire
CED-UIC 1960s

- Paper & pencil test
- Clinical scenario (CC) +
- Sections (H&P, Lab. invest., Dx, Managt., F-up)

[L] Options  ||  [R] Latent images – answers
Section C

1. Alanine Aminotransferase (ALT)
2. Alcohol level
3. Aldolase, serum
4. Alkaline phosphatase, serum
5. Amylase, serum
6. Arterial blood gases (ABG)
7. Aspartate Aminotransferase (AST)
8. Brain CT-scan
9. Brain MRI
10. Brain PET-scan
11. Calcium, serum
12. Carotid US-doppler
13. Cerebral angiography
14. Cerebro-spinal fluid examination
15. Complete Blood Count (CBC)
16. C-Reactive Protein
17. Creatine Phosphokinase, serum
18. Creatinine, serum
19. Drug screening, serum
20. Drug screening, urine

Etc...

1. 1.9 (0.7-1.5 mg/dL)
2. No abnormalities
3. Salicylate: 32 mg/dL (20-25 mg/dL)
PMPs: Patient management Problems

- 3-hour, \( \frac{1}{2} \)-day: 10-12 cases

- The more “good” things, the more THOROUGH, the higher the score
1984 : Cambridge Conference

PMPs

Dx: 5 ailments
5 ailments re: PMPs

- Low content validity: \( \approx 3 \) to \( 10 \) pr.
- Low reliability (consistency) : \( \approx .3 \)
- Problem solving = General skill
- Unique format (latent image) : cueing
- Over-rewarding thoroughness
Thoroughness predicts "poor" performance

Elstein, Shulman & Sprafka, 1978
When in doubt, collecting more data *(EKG features)*
- not improve Dx accuracy
- indicator of uncertainty, Dx error

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- **PMPs:** more THOROUGH, higher score
  ...rewarding wrong behavior

_Hatala et al, 1998_
Problem solving in medicine is:

- Not a general skill
- Specific to each case
Case specificity

Elstein, Shulman & Sprafka, 1978

- Inter-case correlation = 0.1 - 0.3

Arthritis ≠ Anemia ≠ Crohn ≠ Eclampsia

- Each case presents unique challenges

Key Features (KFs)
Csqs for assessment:

- Focus on the KFs for wide range of problems
- Many short, KF problems

- Content validity
- Reliability
Object (purpose) assessment

Knowledge recall (describe DT)

Clinical reasoning, problem solving

Clinical decisions, actions (recognize & manage DT)

H&P, Dx, Rx, Investigation, F-up
1986-91
Medical Council of Canada
Qualifying (MD) exam – graduating clerks

5-yr R & D : Q4 Project – Page & Bordage

1992: Replaced PMPs with KF cases

2002: 12-yr review
What is a KF case?

- **A clinical scenario**, with age & clinical situation specified:
  
  *Severe (life-threatening) respiratory distress in an infant …*

- Typically followed by **2 or 3 questions**

- Assessing **only** unique challenges ("key features") or critical decisions and actions in the resolution of the problem (*not underlying knowledge or reasoning*)

- Paper & pencil or OSCE
3 steps

I. Select problems

II. Define KFs

III. Write test material

*(cases & questions)*

& set scoring key
I- Select problems

Adequate & representative number of clinical problems from the domain for graduating students
Objectives for the Qualifying Exam

(3rd ed., 2004, Dauphinee & Mandin)

- 120 primary clinical presentations
- 140 related clinical presentations
- 260 clinical presentations
By alphabetical order

D
- Dysphagia/Difficulty swallowing 26-E
- Dyspnea 27-E
  - Acute dyspnea (minutes to hours) 27-1-E
  - Chronic dyspnea (weeks to months) 27-2-E
  - Pediatric dyspnea Resp. distress 27-3-E

S
- Scrotal Mass
- Scrotal Pain
- Seizures (Epilepsy)
By disciplines

- Primary Care
- Medicine
- Ob-Gyne
- Population, ethics, legal, org.
- Peds
- Psychiatry
- Surgery
Each clinical presentation

- Rationale
- Causal conditions
- Key objectives
- Objectives
- Ethics
- Applied sc. concepts
Ib- How many problems, pts?

- Inter-case corr. = 0.1 - 0.3
- Desired reliability = 0.8
- Spearman-Brown Formula

40 problems
### Age groups

- **Preg., neonat., infant**: 5%* 3
- **Children (Peds)**: 16% 6
- **Adolescents**: 16% 6
- **Adults**: 47% 19
- **Elderly (geriatrics)**: 16% 6

* Health Services Data
Test Committee Process

I- Chair randomly selects problems

II- Assigns a problem to a member to define KFs
   Discussion with committee

III- Member writes test case & quest.
    Discussion with committee
Seizures (epilepsy)

- Rationale
- Causal Conditions
- Key Objectives...
- Objectives
- Ethics
- Applied Sc. Concepts

ER treatment of Status Epilepticus
II- Define KFs

For what clinical situation?

Seizures: - Undifferentiated complaint
- Life-threatening situation
- Prevention…
II-d Clinical situation

- Undifferentiated complaint
- Simple, typical/atypical
- Multiple, multi-system
- Urgent, life-threatening
- Prevention, health promotion
II-e Define KFs

+ Unique challenges, critical decisions or steps in the resolution of the problem

- Most difficult aspect in practice Steps, actions most likely to lead to error
Given man w/ suspected alcohol dependence brought to ER w/ multiple seizures w/o regaining consciousness, graduating medical student should:

KF-1 Generate provisional Dx status epilepticus

KF-2 Secure & maintain cardio-resp. functions

KF-3 Begin initial therapy: NS, vitB, glucose, diaz+phen

KF-4 Elicit Hx re: causes: alc., meds, drugs, diabetes

KF-5 Order imm. exams: lytes, gluc., Ca, ABG, drug, brain CT

Test Committee Process

I- Chair randomly selects **problems**

II- Assigns a problem to a member

   Member select situation & define **KFs**

   Discussion with committee

III- Member writes **test case & quest.**

   Discussion with committee
Validity of KFs

Clerkship directors from across Canada confirmed:

- Existing KFs 92%
- Generating KFs 94%
III- Write test material

a. Prepare **clinical scenario**
   re: problem, situation, KFs

b. Write **test questions**
   re: KFs only

c. Choose **response format**

d. Set **scoring key**
Given a man with suspected alcohol dependence brought to the ER with multiple seizures without regaining consciousness...

- Case scenario includes:
  - CC, some Hx, initial physical
Mr. “X,” a 36-year-old man, is brought to the emergency room in your hospital by ambulance because he fell to 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 jerky movements all over his body for about a minute. He did not recover consciousness after the episode. During the 10-minute ambulance trip, he presented two other similar episodes, without recovering consciousness, and a third episode that you witnessed on arrival.

His temperature is 37.8 C. He looks neglected and is unconscious. No relatives or friends accompanied Mr. “X.”
III-b Test questions → KFs

KF-1 Generate provisional Dx status epilepticus
KF-2 Secure & maintain cardio-resp. fcts
KF-3 Begin initial therapy: NS, vitB, glucose, diaz + phen
KF-4 Elicit Hx re: causes: alc., meds, drugs, diabetes
KF-5 Order imm. exams: lytes, gluc., Ca, ABG, drug, brain CT

Generally 1 question/ KF
Test questions

- **Question 1:** What is (are) your leading working diagnosis(es) at this point in time? You may list up to two.

- **Question 2:** What is your immediate management at this point in time? List as many things as you feel are appropriate.
Test questions

- **Question 3:** Ten minutes after arrival, Mr. “X” is still unconscious. The nurse found a telephone number in his wallet that you decide to call immediately. What questions will you ask the person answering the phone – assuming he/she knows the patient? You may select up to six questions. Select option 35 if you think that it is not appropriate to call at this point in time.

  *KF-4*
...Question 3

1. Abdominal pain
2. Alcohol history
3. Back pain history
4. Benzodiazepine
5. Cancer history
6. Cocaine abuse
7. Coronary bypass history
8. Diabetes history
9. Diarrhea
10. Dizziness
11. Drug allergy
12. Family history
13. Food allergy
14. Headache
15. Hearing disability
16. Heroin abuse
17. Joint pain
18. LSD abuse
19. Lung infection
20. Medication history
21. Muscular disease
22. Nausea
23. Palpitation history
24. Pet in household
25. Previous similar problem
26. Profession
27. Sexual history
28. Smoking history
29. Social integration difficulties
30. Surgery
31. Travel history
32. Viral infection
33. Visual impairment
34. Vomiting
35. Not appropriate to call at this point in time.
Test questions

- **Question 4:** It has been 15 minutes since Mr. X's arrival. What ancillary exams would you order at this point? You may select as many as you feel appropriate. Select option 35 if you think that ancillary exams are not needed at this point in time.

*KF-5*
Questions – KFs matrix

<table>
<thead>
<tr>
<th></th>
<th>KF1</th>
<th>KF2</th>
<th>KF3</th>
<th>KF4</th>
<th>KF5</th>
</tr>
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<tbody>
<tr>
<td>Q1</td>
<td>□</td>
<td></td>
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<tr>
<td>Q2</td>
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<td></td>
<td></td>
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<td>□</td>
<td>□</td>
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</tbody>
</table>
III-c  Response format

- Write-in (WI): short answer
- Short menu (SM): 15 - 35 options
- Long menu (LM): booklet

Which is best?
After initial management of this patient, what will you do?

<table>
<thead>
<tr>
<th>Action</th>
<th>WI</th>
<th>SM</th>
</tr>
</thead>
<tbody>
<tr>
<td>GI consultation</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Wash hands</td>
<td>3</td>
<td>76</td>
</tr>
<tr>
<td>Notify h. authorities</td>
<td>25</td>
<td>63</td>
</tr>
<tr>
<td>Stop work</td>
<td>4</td>
<td>82</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Performance on Open Response (WI) vs. Selected Response Items (SM)
WI vs. SM

- Nbr responses: WI < SM (-14%; cueing)
- Difficulty: WI > SM (-18pts; 54 – 72)
- Variance: WI > SM
- Discrimination: WI > SM
- Marginal cand.: WI > SM

SM: H&P, Lab. & Investigation
WI: Dx & Rx, Management
III-d Scoring (points)

- Dichotomous: 0 / 1
- Partial credit (fraction):
  - Equal weights (3 resp.: .33 each)
  - Differential w. (.50 +.33 +.33)
Scoring: Partial credit

KF - 3 Begin initial therapy

1. NS .25 .17
2. Vit B .25 .17
3. Glucose .25 .17
4. Diaz+Phen .25 .50

Not mentioning above
Scoring

- **Problems**: (unit of measurement) - *item independence*
  
  Average KF scores (*KFs equal weight*)
  
  e.g., \( \frac{1 + .5 + .84 + .5 + .58}{5} = 0.70 \)

- **Test as a whole**: 
  
  Average problem scores (equal weight)
  
  e.g., \( \frac{.67 + .75...}{32} = .78 = 78\% \)

- **Passing score**: 
  
  Content (criterion) - based approach
  
  *(modified Angoff; 30 min./pr)*
Reliability

Consistency, reproducibility

- PMPs: ½-day  ≈ .3 - .5
- KF exams (1/2-day; 32-36 cases) : ~.65 - .71
- Spearman Brown Formula:
  .80  →  45-50 cases = 1 day
**Qs/ case**

- **Reliability went down with single-q. cases**

- Generalizability study; maximize reliability with **2 - 3 q. / case**

  1 question/ case, not enough

  >3 redundant, wasting testing time

*Norman et al, 2006*

* EBM: Evidence based medicine
KFs : Case specificity

“...problem-solving skills are specific to the case or problem encountered... and are contingent on the effective manipulation of those few elements of the problem that are critical to its successful resolution... the problem’s key features.”

Why KFs?

- **High fidelity** test of applied knowledge
- Focus on case-specific decisions: **KFs**
- **Broader sampling:** adequate & representative
  …**better reliability & validity**
- Simple & focused **scoring** : only re: KFs
- Varied **formats** fit purpose (**avoid cueing**)
- Defensible pass-fail **decisions**
- Best predictor of future complaints
Dissemination

- Medical schools across **Canada**
- 1991 Collège des Médecins du **Québec** (SOI)
- 1993 College Physicians & Surgeons of **Pakistan**
- 1995 Amer. College of Physicians (MKSAP)
- 1996 Amer. C. Colon & Rectal Surgeons (CARSEP)
  - 9 cases – 30 KFs; $Crb\alpha = .95 \text{ overall} \quad .93 \text{ CRS}$
- 1997 Royal **Australian** College General Practice
- **Swiss** National Examination Board
- 2002 Hatala & Norman, clerkships ($k=15; Crb\alpha = .49$)
Domo arigato!

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