Assessing Clinical Decision Making: the Key Features Approach

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1. Why change?

2. What's "**Key Features**" approach?

Basic issues : - **Adequate** &

Final Test Scores

representative sample problems

- **Critical decisions**

- Format *(how)* serves **purpose** *(what)*

Slides available:

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60s → 80s

| Problem solving | Decision making |

- **PMPs**
  Patient Management Problems

- **KFs**
  Key Features

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 Phophokinase, serum
18. Creatinine, serum
19. Drug screening, serum
20. Drug screening, urine

Etc...

Latent image

1.
2.
3.
4.
5.
6.
7.
8. No abnormalities
9.
10.
11.
12.
13.
14.
15.
16.
17.
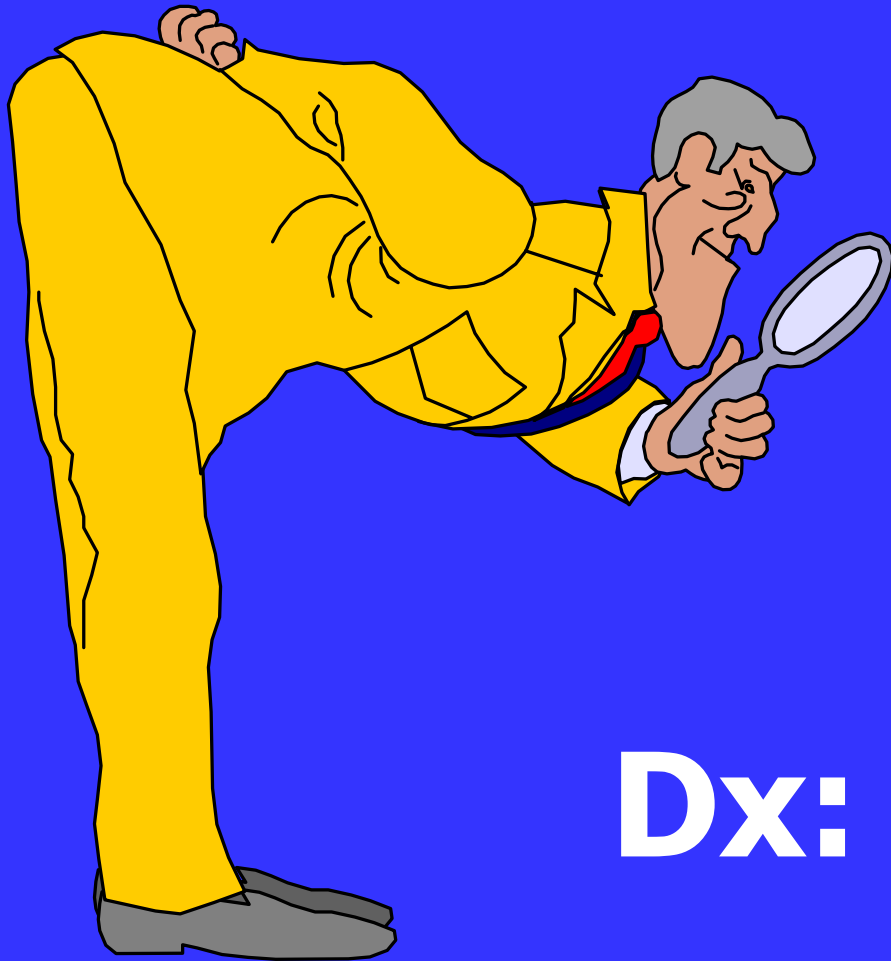18. 1.9   (0.7-1.5 mg/dL)
19. Salicylate: 32mg/dL (20-25 mg/dL)
20.

PMPs: Patient management Problems

- 3-hour, ½-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: ≈ 3 to 10 p

☹ Low reliability (consistency) : ≈ .3

☹ Problem solving = General skill

☹ Unique format (latent image) : cueing

☹ Over-rewarding thoroughness

Thoroughness
predictor of
"**poor**" performance

Elstein, Shulman & Sprafka, 1978

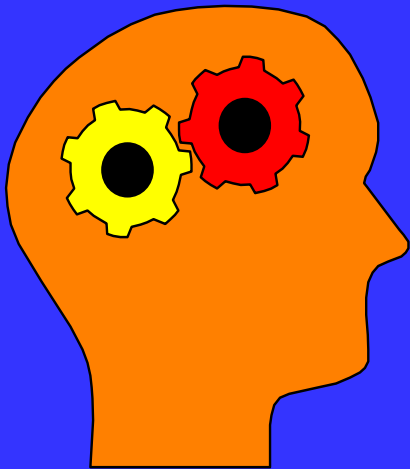When in doubt, collecting more data *(EKG features)*
+ not improve Dx accuracy
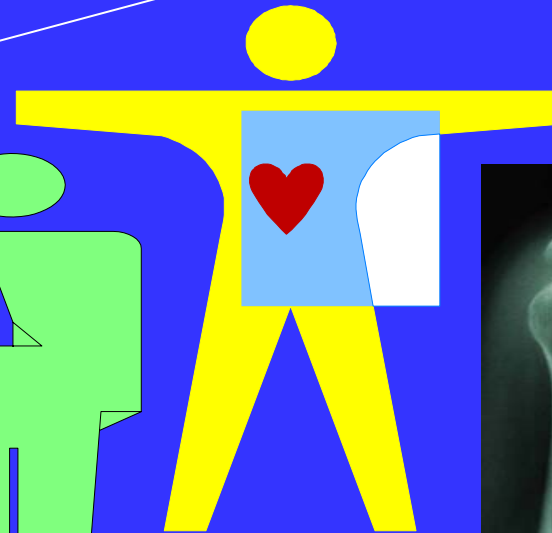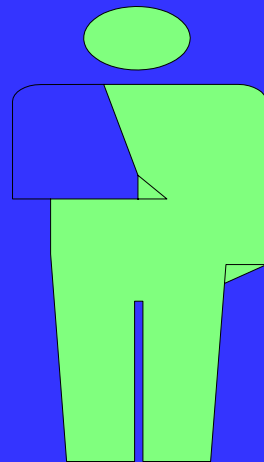+ indicator of uncertainty, Dx error

(Hatala et al, 1998)

PMPs: more THOROUGH, higher scor...

...rewarding wrong behavior

Problem solving in medicine is:

Not a general skill

Specific to each case

Case specificity
Elstein, Shulman & Sprafka, 1978

- Inter - case correlation = .1 - .3

Arthritis $\neq$ Anemia $\neq$ Crohn $\neq$ Eclampsia

- Each case presents unique challenges

Key Features (KFs)

Csqs for assessment:

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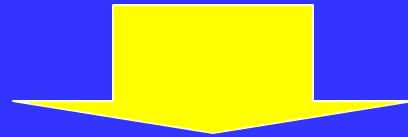- Many short, KF problems

⬆ 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")* o
  critical decisions and actions in the resolution of th
  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

Medical Council of Canada

- **Objectives for the Qualifying Exam**
(3 rd 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.
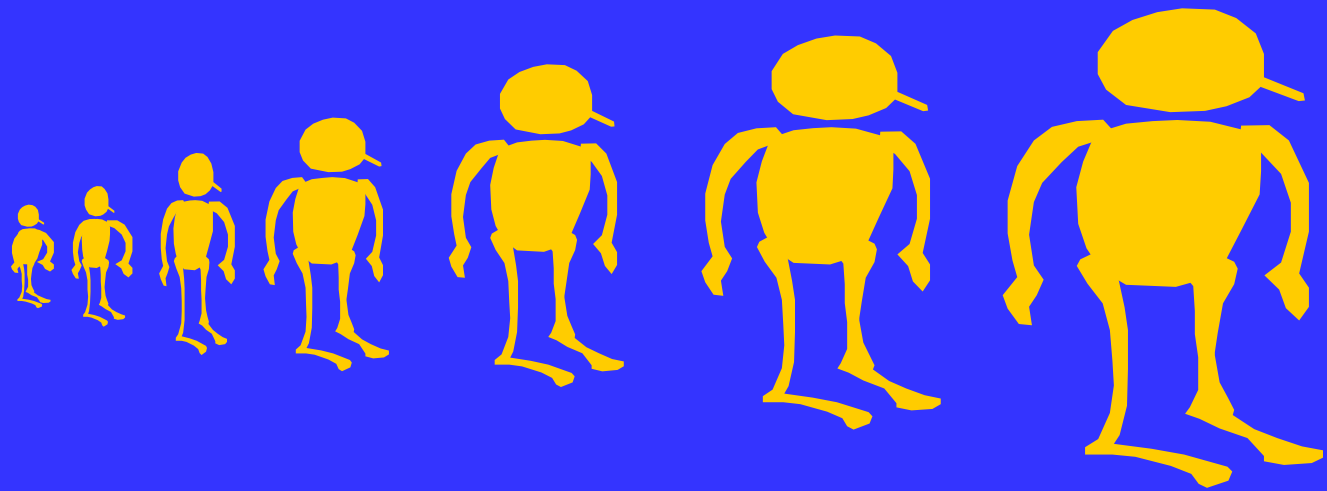- Peds
- Psychiatry
- Surgery

Each clinical presentation

- Rationale
- Causal conditions
- Key objectives
- Objectives
- Ethics
- Applied sc. concepts

Ib- How many problems, pts?

- Inter-case corr. = .1 - .3
- Desired reliability = 0.8
- *Spearman-Brown Formula*

40 problems

c- In what proportion? Blueprint

Age groups

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

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* Health Services Data   **40**

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
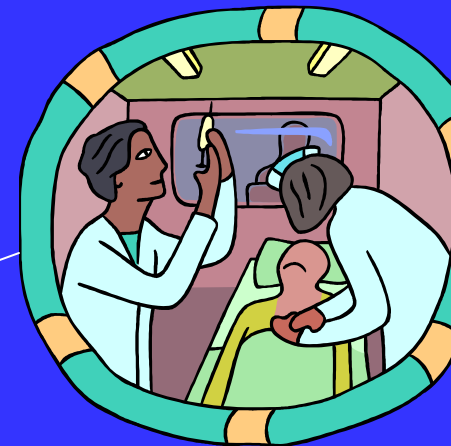- Applied Sc. Concepts

ER treatment of

Status Epilepticus

II- Define KFs

For what **clinical situation**?

Seizures: - Undifferentiated complain

- Life-threatening situation

- Prevention...

II-d Clinical situation

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

29

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. 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

Nendaz & Bordage, 1997, 2003

Test Committee Process

I- Chair randomly selects **problems**

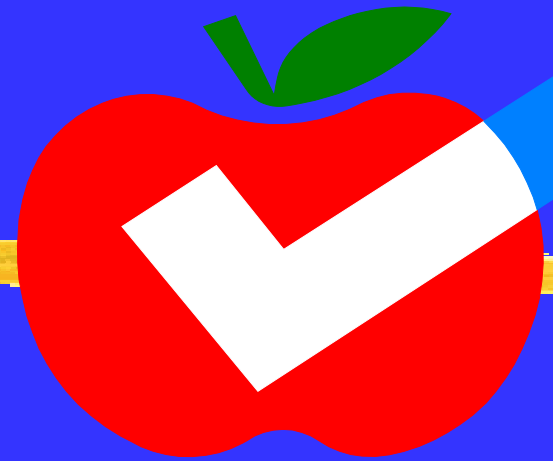**II**- Assigns a problem to a member
   Member select situation & define **KFs**
   Discussion with committee

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**

KFs dictate case scenario

Given man w/ suspected alcohol dependence brought to ER w/ multiple seizures w/o 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. *KF-1*

- **Question 2:** What is your immediate management at this point in time? List as many things as you feel are appropriate. *KF-2 & 3*

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.

40

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

	KF1	KF2	KF3	KF4	KF5
Q1	■				
Q2		■	■		
Q3				■	
Q4					■

III-c Response format

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

Which is best ?

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

	WI	SM
GI consultation	1	12
Wash hands	3	**76**
Notify h. authorities	25	**63**
Stop work	4	**82**
…		
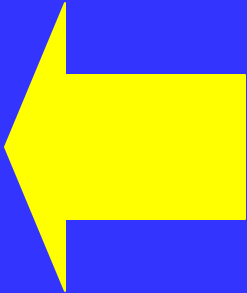
Performance on Open Response (WI) vs. Selected Response Items (SM)
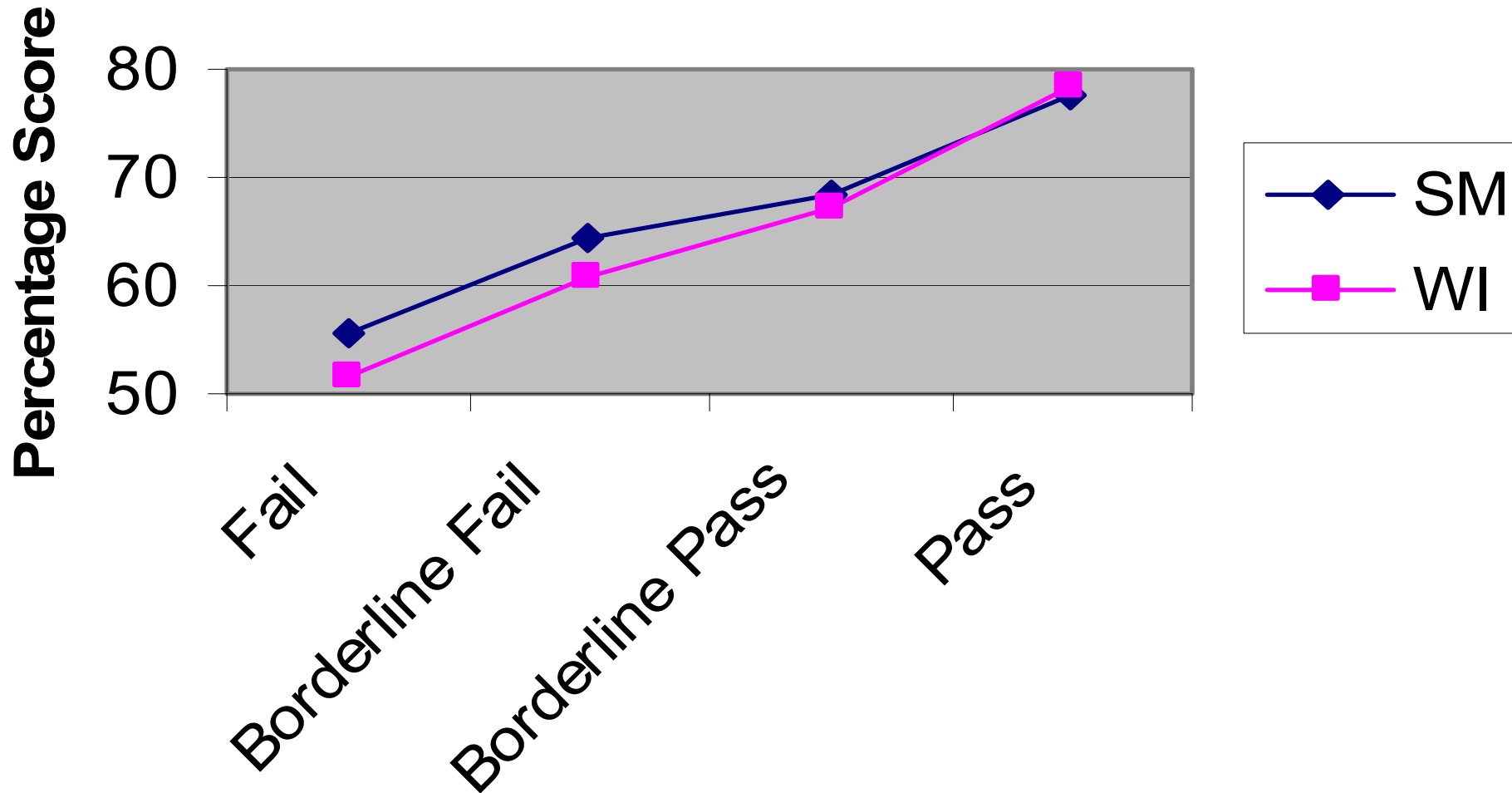
WI vs. SM

- 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 → **2** .17

Vit B .25 .17

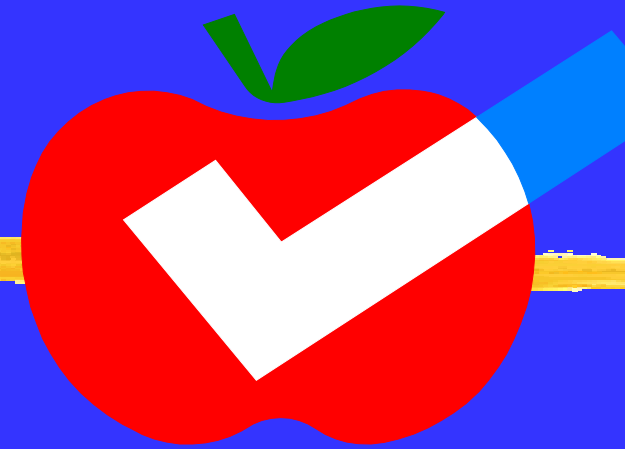Glucose .25 .17

Diaz+Phen .25 .50 ← **3**

0 Not mentioning above

Scoring

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

- **Test as a whole:**
  Average problem scores (equal weight)
  e.g., (.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:
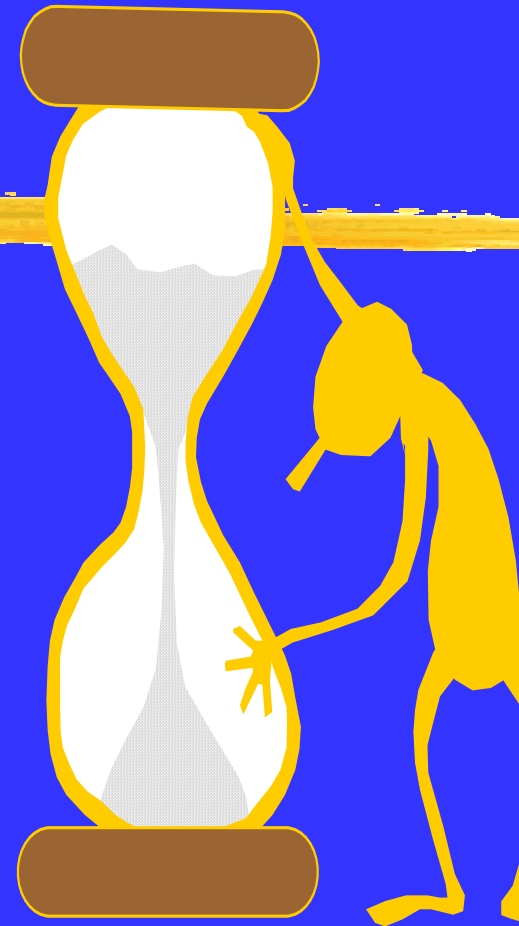
  .80 ➔ 45-50 cases = 1 day

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**

References*

Sirven, JI & Waterhouse, E.
  Management of status epilepticus.
  <u>Am Fam Physician</u> 2003;68:469-76

_____

* 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**.*

Page & Bordage, Ac.Med., 1995

Why KFs?

High fidelity test of applied knowledge

Focus on case-specific decisions: **KFs**

Broader sampling:
adequate & representative
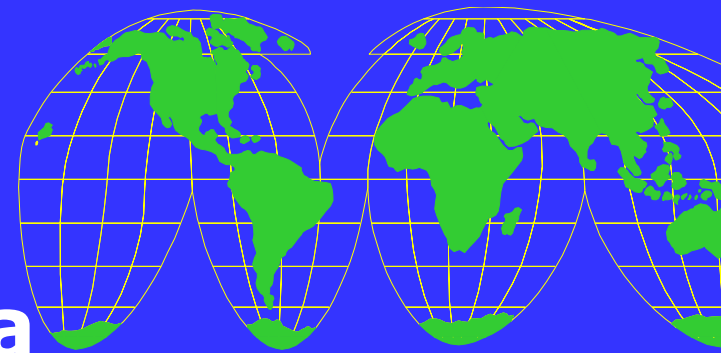 ...*better reliability & validity*

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; *Crbα=.95 overall .93 CRS*
- 1997 Royal **Australian** College General Practice
- **Swiss** National Examination Board
- 2002 Hatala & Norman, clerkships *(k=15; Crbα=.49*

Muchas gracias !

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References

- Page, G. & Bordage, G. The Medical Council of Canada's Key Feature Project: A More Valid Written Examination of Clinical Decision-making Skills. Ac. Med., 1995, 70: 104-110.

- Page, G., Bordage, G. & Allen, T. Developing Key-Feature Problems and Examinations to Assess Clinical Decision-making Skills. Ac. Med., 1995, 70: 194-201

- Bordage, G. & Page, G.   An Alternative to PMPs: The "Key Features" Concept. Further Developments in Assessing Clinical Competence, 2nd Ottawa Conference, 1987, 59-75.

- Ali, S.K. & Bordage, G. Validity of Key Features for a Family Medicine Pilot Exam at the College of Physicians and Surgeons Pakistan. J. Coll. Phys. Surg. Pakistan, 1995, 5(6):256-60

Brailovsky, C., Bordage, G., Page, G. Generalizability of Clinical Decision-Making Skills Tested on a National Qualifying Exam, 8th Ottawa Conference, Philadelphia, 1998

Dauphinee et al. Examination Results of the Licentiate of the Medical Council of Canada (LMCC): Trends, Issues, and Future Considerations. 8th Ottawa Conference, Philadelphia, 1998

Jones, A et al.   Teaching and Learning in a Clinical Presentation Curriculum: Positive Feedback and Outcomes. 8th Ottawa Conference, Philadelphia, 1998

MacRury, K., Froggart, G.M. & Gare, D.G.   The Key Features Format for the Assessment of Clinical Reasoning of Undergraduate Clerks
8th Ottawa Conference, Philadelphia, 1998

Schuwirth, L. et al.   Validation of Key-Feature Assessment Using Think-aloud Protocols 8th Ottawa Conference, Philadelphia, 1998

Page, G., Farmer, L, Spike, N & McDonald E.   The Use of Sho
Answer Questions in the KF Problems on the Royal Australian
College of Gen. Pract. Fellowship Exam. 9th Ottawa Conferenc
Cape Town. 2000

Page, G., Boulais, A-P, Blackmore, D. & Dauphinee, D.
Justifying the Use of Short Answer Questions in the KF
Problems of the MCCC's Qualifying Exam. 9th Ottawa
Conference, Cape Town. 2000

Schuwirth, L. Key-feature approach case-based testing, PhD
Dissertation, Maastricht, 1998

Hatala R, Norman GR. Adapting the key feature examination
for a clinical clerkship. Med.Edu. 36: 160-165, 2002

NORMAN, G., BORDAGE, G., PAGE, G. & KEANE, D. How Specific
Case Specificity? Medical Education 2006;40:618-23.