



Combining methods in the study of diagnosis

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Difficult diagnoses in Family Medicine

- ✦ Predictors of diagnostic accuracy
- ✦ Factors explored:
 - ✦ Information gathering
 - ✦ Length of clinical practice ('experience')

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Methods

- ✦ Hypothetical, detailed patient scenarios
- ✦ Representative of diagnostic challenges in primary care
- ✦ 'Process tracing' techniques
 - ✦ Active Information Search (AIS)
 - ✦ Stimulated recall

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Diagnostic challenges in primary care

- ✦ Published analyses of UK closed malpractice claims
- ✦ Medical conditions & presentations associated with perceived difficulty and diagnostic error
 - ✦ Systematic literature review
 - ✦ Semi-structured interviews with family physicians

Kostopoulou, Munro, Delaney, Family Practice (2008)

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Determinants of diagnostic difficulty

- ✦ Ease of generating a plausible alternative
- ✦ Likelihood of questioning the plausible alternative
- ✦ Ease of generating the correct diagnosis
 - ✦ Typicality
 - ✦ Prevalence
 - ✦ Familiarity

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7 common symptom presentations

Toddler with fever presenting 3 consecutive times
68 y/o man, smoker, presenting with dyspnoea
30 y/o woman presenting with 3-month abdominal pain
60 y/o man, presenting with intermittent chest pain
76 y/o COPD patient with increasing episodes of dyspnoea
69 y/o woman with persistent headaches
52 y/o man, on antidepressants, with fatigue

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Clinical features included

- Features with diagnostic value ('critical')
 - LR+ >1.5 or LR- <0.67
 - Modelled shifts in belief for the diagnoses (online survey of 'experts')
- Features with no or unknown diagnostic value ('non-critical')

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Diagnosable

- 5 cases: diagnosis by investigation
- 1 case: diagnosis by criteria
- 1 case: diagnosis uncertain but best management could be defined

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Participants

- 21 residents in Family Medicine
- 21 physicians with 1-3 years in Family Medicine
- 42 physicians with ≥10 years in Family Medicine
 - 21 Trainers
 - 21 Non-trainers
 } Matched for years of experience

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Patient Description

NAME: Mabel Evans AGE: 76 years old ETHNICITY: Caucasian
 HEIGHT: 1.60m WEIGHT: 62kg (BMI 24.2, measured last year)
 SMOKING STATUS: Smoked 20 cigarettes per day from age 15, gave up last year (80 pack years)
 LAST BP: 120/67, 6 weeks ago
 PAST MEDICAL HISTORY: COPD 1998, Hypertension 1996
 MEDICATION: Combivent inhaler (via spacer) 2 puffs qds, bendroflumethazide 2.5 mg od
 LAST CONSULTATION: 6 weeks ago, for exacerbation of COPD. Attended 3 times in previous 6 months for this reason.
 APPEARANCE: On entering the room, you notice that her lips look blue.

I've come to see you about my breathing again, doctor. This is the 4th time in the past 6 months that I'm flared up and I'm getting worried about it. I came out of the blue about 3 days ago. My breathing is now awful. I get out of breath doing the slightest thing, even getting ready to come to the surgery had me all out of puff today. I've been wheezy too, much worse than usual.

Time Elapsed: 10:13:39 You have Patients waiting

Patient Description

NAME: Mabel Evans AGE: 76 years old ETHNICITY: Caucasian
 HEIGHT: 1.60m WEIGHT: 59kg (BMI 24.2, measured last year)
 SMOKING STATUS: Smoked 20 cigarettes per day from age 15, gave up last year (80 pack years)
 LAST BP: 120/67, 6 weeks ago
 PAST MEDICAL HISTORY: COPD 1998, Hypertension 1996
 MEDICATION: Combivent inhaler (via spacer) 2 puffs qds, bendroflumethazide 2.5 mg od
 LAST CONSULTATION: 6 weeks ago, for exacerbation of COPD. Attended 3 times in previous 6 months for this reason.
 APPEARANCE: On entering the room, you notice that her lips look blue.

ECG shows a heart rate of 98 beats per minute, right axis deviation and p-pulmonale.

Time Elapsed: 10:00:10 You have Patients waiting

Recorded

- Information requests in sequence
- Time
- Diagnoses & management decisions
- Diagnostic accuracy: correct diagnosis included in the final list of differential diagnoses
- Appropriateness of management (based on clinical guidelines)

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Results

PATIENT CASE	CORRECT DIAGNOSES
Pyrexial child	25% (21/84)
Dyspnoea 1	27% (23/84)
Abdominal pain	41% (34/84)
Chest pain	44% (37/84)
Dyspnoea 2	46% (39/84)
Headache	52% (44/84)
Fatigue	57% (48/84)

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What about experience?

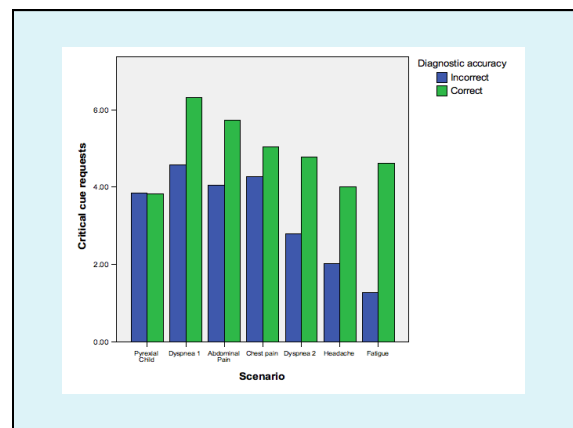
EXPERIENCE	CORRECT DIAGNOSES
GP registrars	35% (52/147)
1-3 years	43% (63/147)
≥10 years	45% (131/294)

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What predicted diagnostic accuracy?

- Logistic regression
 - interaction (number of requests for critical information x scenario) ($p < .0001$)
 - experience ($p = .06$)

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SCENARIO	ODDS RATIO	95% CI
Headache	7.5	3.2 - 17.7
Fatigue	3.3	1.9 - 5.9
Dyspnoea 1	2.7	1.7 - 4.3
Abdominal pain	2.6	1.6 - 4.1
Dyspnoea 2	2.3	1.6 - 3.3
Chest pain	1.3	1.0 - 1.7

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In summary

- Gathering diagnostic information predicted diagnostic accuracy. Gathering a lot of information did not.
- It is not asking a lot of questions, it is asking the right ones.
- So what determines if the right questions will be asked?

Kostopoulou et al. Medical Decision Making (2008)

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A detailed look into reasons for misdiagnosis

- ✦ No feedback
- ✦ ‘Stimulated recall’ for last 3 scenarios
- ✦ Went over earlier requests for information, step by step
 - ✦ This is what you asked for earlier. Why?
 - ✦ This is the answer that you received. What did it tell you?

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Findings

- ✦ The most frequent reason for missing a diagnosis in most scenarios was not considering it as a possibility.
- ✦ In the absence of a single diagnosis that explained all the symptoms, clinicians sought multiple, co-existing explanations.

Kostopoulou, Devereaux-Walsh, Delaney, Medical Decision Making (2009)

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An exception to the rule

NAME: Roger Knox AGE: 60 years old
 ETHNICITY: Caucasian
 HEIGHT: 1.79m WEIGHT: 77kg (BMI 24, measured in 2007)
 SMOKING STATUS: Gave up smoking 7 years ago
 LAST BP: 132/86, taken 2 years ago
 PAST MEDICAL HISTORY: Osteoarthritis of the knee 2005
 MEDICATION: None
 LAST CONSULTATION: For knee pain 4 months ago.
 APPEARANCE: As he enters the room you notice that he does not look ill.

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Roger says:

“I’ve been getting this pain in my chest recently and my wife got a bit concerned. It’s right here over the breastbone, in the middle of my chest. It’s been 7 days now - I was helping my daughter move house, and as I was lifting the washing machine I felt it come on, like a dull sort of aching sensation. I thought I’d pulled a muscle in my chest or something.”

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Cardiac diagnosis	Musculoskeletal diagnosis
1. Male, 60, ex-smoker	More common than cardiac
2. Chest pain relieved by rest	Onset of pain during lifting
3. Worsening chest pain	Patient thinks that he pulled a muscle
4. Father had MI at 65	Tenderness over the intercostal muscles
5. Chest pain radiates to right arm	
6. Pain on gardening	Pain on gardening?

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Results –information elicited & decision made

- ✦ 54% (45/84) managed for musculoskeletal – the musculoskeletal group (MG)
- ✦ 46% (39/84) managed for cardiac – the cardiac group (CG)
- ✦ Cardiac group: elicited more information ($p < 0.01$), spent more time ($p < 0.01$)

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Information elicited

Critical Cues	CG	MG	p
Resting ECG	82%	37%	0.0001
Pain relieved by rest	74%	38%	0.001
Family history of IHD	62%	31%	0.005
Palpate chest	64%	89%	0.007

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Stimulated recall data

Diagnostic cues	Linked to cardiac		No information gained	
	CG	MG	CG	MG
Pain relieved by rest	80%	23%	20%	69%
Worsening chest pain	90%	17%	10%	67%
Pain on gardening	74%	9%	26%	50%

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Pain on gardening (ambiguous)

"It's definitely worse when I'm working in the garden."

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Musculoskeletal group

Physician 9: Working in the garden... is kind of work at rest ... It's not taking heart rate to a point where he could be getting ischaemic type pain. So that's what it was, actually moving his arms about, thus making his musculoskeletal pain worse.

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Cardiac group

Physician 79: That to me said, because it's exertional chest pain, I have to put cardiac pain a bit higher on my list.

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Pain stops with rest (diagnostic)

"If I take a rest then it usually goes away."

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Musculoskeletal group



Physician 16: Yeah, garden. I never got the feeling he was working terribly hard... *'Does it stop you?'* If a pain is bad enough it will stop you doing something.

Researcher: And he says, *'if I take a rest then it usually goes away.'*

Physician 16: It puts back the cardiovascular a little bit, but it didn't stop him altogether. If he got really good-going cardiac pain, he wouldn't go on doing anything more.

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Worsening pain (diagnostic)



"When it started, it was just lasting for a few minutes, but the past couple of days, it's been worse and going on for longer."

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Musculoskeletal group



Physician 57: It is getting worse. But again, because he's been doing things, lifting washing machine and gardening, he is aggravating it. It looks more like a muscular problem.

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Cardiac group



Physician 53: This is not consistent with a pulled muscle. A pulled muscle would tend to get better or stay static, and the fact it is getting worse is more worrying.

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Main findings



- ✦ Systematic differences in
 - ✦ information elicitation (amount & type)
 - ✦ information interpretation
- ✦ depending on the final diagnosis
- ✦ Confidence in diagnosis – no differences

Kostopoulou, Mousoulis, Delaney, *Judgment and Decision Making* (2009)

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Doctors 'see' patients, not cues



- ✦ Ambiguous information is 'pulled' to support leading diagnosis (unsurprising)
- ✦ 'Clear-cut' information with diagnostic value can also be 'pulled'.
- ✦ On-line construction of mental model
- ✦ Clinical information is interpreted not independently and in isolation but within the mental model of the situation.

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Post-decisional justification?



- ✦ Reducing cognitive dissonance
- ✦ Consolidating decision (Diff Con Theory, Svenson, 1992, 2003)

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Pre-decisional distortion?



- ✦ The interpretation of new information is biased to support a prior belief
- ✦ Psychological necessity to form & maintain coherent judgments
 - ✦ Multiple, conflicting pieces of probabilistic information
 - ✦ suppress inconsistencies & bolster consistencies
- ✦ Consumer decision making (Russo & colleagues)
- ✦ Legal decision making (Dan Simon & colleagues)

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