

Structural Knowledge and Clinical Skill

R. Brent Stansfield, Ph. D.
Department of Medical Education
University of Michigan
Ann Arbor, MI

George Bergus, M. D.
Internal Medicine
University of Iowa Hospitals and Clinics
Iowa City, IA

How do clinicians diagnose?

Diagnostic reasoning requires a map of symptoms

Symptoms related to the same disorder should cluster together
When a patient has many of these symptoms, the clinician should consider that disorder more likely
Clinicians should update the likelihoods of disorders upon uncovering more symptoms

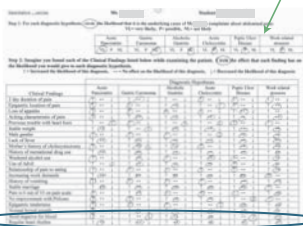
Methods

n = 35
40 M3s and R1s participated
5 discarded for missing data

each saw standardized patient
part of clerkship exam
clinical and communication performance were graded
patient complained of abdominal pain

immediately after, completed the questionnaire

Part 1: rate likelihood patient has each of 6 disorders
Part 2: revise likelihood in light of each of 22 clinical findings



analyze likelihoods:
frequencies of likelihood ratings by disorder
factor analysis of likelihood judgements:
principal components analysis
varimax rotate 3 factors (eigenvalues > 1.0)

draw a clinical judgement "map"

for each pair of clinical findings
count the number of rating points difference
average across disorders
multidimensional scaling analysis
2 dimensional fit
fit all participants' data together



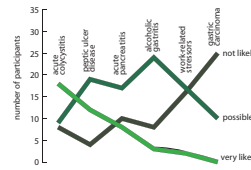
how do the findings relate to the disorders?

for each symptom:
compute the average likelihood adjustment for each disorder
multiply each average by the symptom's dimension 1 and 2 position
if a symptom makes a disorder more likely, the disorder is pulled closer to it
if a symptom makes a disorder less likely, the disorder is pushed away from it

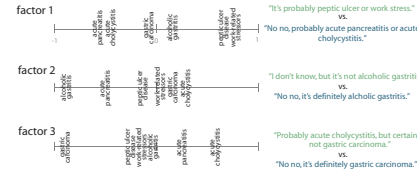
for each disorder:
sum those multiples for each dimension
treat those sums as coordinate vectors

Clinicians have different diagnoses:

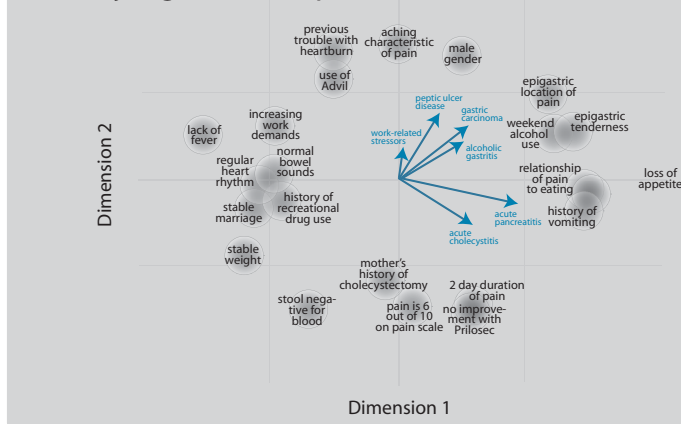
Some agreement about the likelihood of the 6 disorders:



Factor analysis finds meaningful differences:



Clinical judgement map:



Conclusions

M4s and residents use a coherent intuition to update the likelihoods of diagnoses in light of symptoms

"Clinical judgement map" is easily interpretable:
clustering ("loss of appetite", "relationship of pain to eating", "history of vomiting" are all very close together) makes sense

dimension 1 = severity or abnormality of symptoms
all disorder vectors point rightward: away from normality
dimension 2 = chronicity or environment-relatedness

Judging a disorder as unlikely is related to being less sensitive to the symptoms that suggest that disorder

For instance:
Clinicians who felt work-related stressors was an unlikely diagnosis did not rate "increasing work demands" or "use of Advil" as making that disorder more likely.

Simple pen-and-paper task yields coherent qualitative information about clinical judgements

Use of inferential statistical techniques (factor analysis and multidimensional scaling) allow qualitative descriptions of quantitative data.

Future directions

"Peptic Ulcer Disease" was considered stress-related at the time; it is now considered a bacterial infection

How would the clinical judgement map differ in a replication now?

How stable are these findings across cases? Across variations within this case?

All else being equal, would the age, attitude, dress or manner, race, or attractiveness of the simulated patient change the students' clinical judgements? Would such changes reflect valid clinical decisions?