I am dying from the treatment of too many physicians.
Alexander the Great


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Diagnostic Errors in Medicine

Rate of diagnostic error is estimated to be about 15% (Elstein, 1995)

Cognitive errors contribute to 74% of these errors (Graber, Franklin, & Gordon, 2005)
- Faulty knowledge
- Faulty data gathering
- Faulty synthesis

⇒ Can teamwork reduce diagnostic errors?
⇒ How does teamwork change the diagnostic process?
Method

Experimental task:
Diagnose six patients with respiratory problems

Experimental conditions:
• alone (n=28 individuals)
• in dyads (n = 30 dyads)

N = 88 medical students (4th semester)

flat- fee of €25

MC-test: medical skills

Plenary presentation of purpose & practice case

Random assignment to experimental condition

Case vignette & patient video

Diagnostic data collection

Choosing a diagnosis

Indicating confidence

Post-test questionnaire

Repeat 6 times
Case vignette & patient video

Diagnostic data collection

Choosing a diagnosis

Indicating confidence

Video of patient with respiratory problems
WEITERFühRENDE DIAGNOSTIK

- RÖNTGEN THORAX
- ARTERIELLE BGA
- SONOGRAPHIE DES THORAX
- TRANSTHORAKALES HERZECO
- CT-THORAX OHNE KONTRASTMITTEL
- CT-THORAX MIT KONTRASTMITTEL

**DIAGNOSE**

![ECG Image](image_url)
Bitte stellen Sie Ihre Diagnose! Wählen Sie genau eine Option aus der folgenden Liste.

Diagnoseoptionen
- akut exazerbierte COPD
- Anaphylaxie
- Aortenaneurysma
- apoplektischer Insult
- Aspiration
- AV-Block III°
- Endokarditis
- Herzinfarkt
- hypertensives Lungenödem
- hypoglykämischer Schock
- intracerebrale Blutung
- Lungenarterienembolie
- Opiatüberdosierung
- paroxysmale supraventrikuläre Tachykardie
- Pneumonie
- Pneumothorax
- Subarachnoidalblutung
- Tachyarrhythmia absoluta bei Vorhofflimmern
- ventrikuläre Tachykardie, instabil
- ventrikuläre Tachykardie, stabil

Weiter
Case vignette & patient video

Diagnostic data collection

Choosing a diagnosis

Indicating confidence

How confident are you that your diagnosis is correct?

1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10

lowest confidence highest confidence
Dependent Variables

Number of correct diagnoses (max. 6)

Measures of information search:
• Number of acquired diagnostic tests (max. 30)
• Relevance of acquired diagnostic tests (based on validation study with 20 experts)
• Duration of diagnoses in experiment and how long tests would have taken in reality

Confidence judgments (1-10)
Results: Diagnostic Errors

Dyads had more correct diagnoses than individuals (4/6 vs. 3/6; \( d = 0.78 \))
Results: Diagnostic Errors

Dyads had more correct diagnoses than individuals
(4/6 vs. 3/6; $d = 0.78$)

Not a statistical artifact due to the higher probability of having a competent individual in a team:
Simulation of nominal dyads
Diagnosis based on „better“ team member – „better“ defined in 3 ways:
• more confident
• higher medical knowledge
• acquired tests more relevant
Result: nominal dyads = individuals < real dyads
Results: Diagnostic Process

Same number of acquired diagnostic tests (approx. 15 out of 30)

Same relevance of acquired diagnostic tests

Dyads slower than individuals in experiment (per diagnosis 4.5 vs. 2.4 min, $\eta_p^2 = .90$)

Dyads‘ acquired tests would be faster in reality than those of individuals (per diagnosis 30 vs. 37 min, $\eta_p^2 = .63$)
Results: Confidence Judgments

Confidence judgments (1-10)
dyads > individuals (7.01 vs. 5.92, $\eta_p^2 = .84$)
if correct > if incorrect ($\eta_p^2 = .28$)
dyads not better calibrated than individuals

When dyads were incorrect, there was a larger difference between the confidence judgments of the two members than when they were correct
⇒ could this be harvested as cue for incorrect diagnoses?
Discussion

Teamwork reduces diagnostic errors without altering the diagnostic process

Not an artefact of the better member

⇒ Collaboration seems to yield better interpretation: it may have helped correct errors, fill knowledge gaps, and counteract reasoning flaws.
⇒ Future studies should examine whether a difference in confidence between members could indicate incorrect diagnoses and thus further reduce diagnostic errors, as results suggest
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Diagnostic performance by medical students working individually or in teams


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