Information Seeking and Confidence in Medical Decision Making

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For my paatis and my thathas

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Having a PhD thesis completed is a weird position to be in. On one hand, this is very much a new beginning in my career and my professional life. On the other hand, reaching this stage feels like the culmination of many years of work and life experiences. I still have a lot to learn, which is very humbling. But getting to the end of something like this really forces me to take stock of where I am at and where I want to be at in future. I'm grateful to have experienced this kind of personal growth over the course of this DPhil, and will take it with me going forward. I would like to thank Wolfson College for providing financial support, as well as personal support for my time here at Oxford.

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Abstract

Medical decisions are often made within high-pressure situations, with their outcomes having a major impact on patients. There has been limited work aiming to understand the cognitive mechanisms of medical diagnoses, and the potential drivers of both diagnostic error and overconfidence. This thesis explores the role of confidence during diagnoses, and its contribution to both the information that clinicians seek and the hypotheses that clinicians consider during the diagnostic decision process. The research presented in this thesis adopts several methodologies that increase in naturalism with each successive study, including interactive patient vignettes, a think-aloud protocol, virtual reality and ethnography based on observations within real medical settings. Our first line of research investigates the interplay between information seeking and both confidence and accuracy during medical diagnoses. To this end, we found that confidence was associated with the amount of information sought, but accuracy was associated with an efficiency in information seeking, which meant seeking the right information for each patient. Our second line of research involved detecting different reasoning strategies that medical students use during diagnoses. We found that medical students used a range of reasoning strategies that could not simply be explained by their individually preferred decision making style, the type of patient case being diagnosed or even the students' educational background. The third key avenue of research involved investigating whether medical students use an approach of broadening or narrowing their diagnostic hypotheses as they receive information. We find evidence of an initial broadening of diagnoses, which can then become a narrowing of diagnoses as medical students seek hypothesis-driven tests and observe a patient's reaction to treatment (also increasing their diagnostic confidence). Collectively, this thesis shows how important confidence is as a marker during medical diagnoses, as it signals to other clinicians both the information known about a patient and how much a clinician's thinking has evolved with respect to the diagnoses being considered for the patient. This thesis has implications for medical education on how diagnostic reasoning is taught and whether there can be several 'good' approaches to making diagnoses. This thesis also has implications for cognitive psychology, both methodologically (for the richness of data from think-aloud and simulation-based tasks) and theoretically (for how information seeking may reflect differences in reasoning strategies and the consideration of multiple hypotheses at a time).

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List of Abbreviations

ABCDE . . . . Airway Breathing Circulation Disability Exposure (assessment tool)

AD . . . . . Aortic Dissection

AICU . . . . . Adult Intensive Care Unit

AUC . . . . . Area Under the Curve

CI . . . . . Confidence Interval

CRP . . . . . C-Reactive Protein blood Test

DKA . . . . . Diabetic Ketoacidosis

ECG . . . . . Electrocardiogram

ED . . . . . Emergency Department

EPR . . . . . Electronic Patient Record

FBC . . . . . Full Blood Count

GBS . . . . . Guillain-Barré Syndrome

GI . . . . . Gastrointestinal

GLM . . . . . Generalised Logistic Regression

HD . . . . . Hypothetico-Deductive Reasoning

LOOCV . . . . Leave One Out Cross-Validation

M . . . . . Mean

MDiff . . . . . Mean Difference

MRC . . . . . Medical Research Council

MRI . . . . . Magnetic Resonance Imaging

MTB . . . . . Miliary Tuberculosis

NHS . . . . . National Health Service

OMS . . . . . Oxford Medical Simulation

OSF . . . . . Open Science Framework

OUH . . . . . Oxford University Hospitals (NHS Trust)

PE . . . . . Pulmonary Embolism

PR . . . . . Pattern Recognition

PRISMA . . . Preferred Reporting Items for Systematic Reviews and Meta-Analyses

ROC . . . . . Receiver Operating Characteristic

SBAR . . . . . Situation Background Assessment Recommendation (handover framework)

SD . . . . . Standard Deviation

SI . . . . . Scheme-Inductive Reasoning

TA . . . . . Temporal Arteritis

TTP . . . . . Thrombotic Thrombocytopenic Purpura

UC . . . . . Ulcerative Colitis

U&E . . . . . Urea & Electrolytes

VBG . . . . . Venous Blood Gas

VR . . . . . Virtual Reality