Diagnosis is a core aspect of several medical subdisciplines and is an important area of study from a psychological perspective for a few reasons. Firstly, accurate medical diagnosis is crucial to safe, high quality patient care and is a core part of a doctor’s job. Secondly, from a psychological standpoint, it allows for an extension of previous research on decision making to an ecologically valid, real-world setting. Finally, past work has been grounded in the incidence of errors. A report from the US Institute of Medicine1 concluded that most patients will experience a diagnostic error within their lifetime. Bhise et al.2 found that up to 55% of spinal epidural patients experienced diagnostic error. An Australian study found that 20% of adverse events were due to delayed diagnosis3. Around 32% of clinical errors have been found to be caused by the clinician’s failure to weigh up competing diagnoses4. Even using the most conservative of these estimates, the scale of the diagnostic error is substantial and manifests in differences to treatment of patients: diagnostic errors have been found to lead to longer hospital stays and even increased patient mortality5. There has been limited work, however, looking into the causes of diagnostic errors.

My PhD in Experimental Psychology at the University of Oxford aimed to improve our understanding of the cognitive mechanisms of diagnoses. I especially studied the relationship between confidence and information seeking during diagnoses. Overconfidence has been found to be associated with inadequate patient management and lower clinical effort6. Hence, I aimed to understand how the process of seeking information during diagnostic decisions influences the confidence that participants (who in my studies were final year medical students) had in their decision. I used a mixture of textual patient vignettes and virtual reality paradigms, in which participants could freely seek information before recording the diagnostic hypotheses they were considering and the confidence they have in their diagnoses. I found that the amount of information seeking (i.e. physical examinations, testing) was associated with increases in confidence, even if some information was not supportive of their decision. This association was also found in the opposite direction, such that higher initial confidence then resulted in more tests being requested for patients. In a study where participants verbalised their thought process out loud as they were making diagnoses, I found that participants used different reasoning strategies for generating diagnostic hypotheses and then seeking information to support or rule out these hypotheses. These strategies then resulted in differing associations with confidence: participants who used a more systematic, thorough strategy (i.e. not wanting to miss diagnostic possibilities) increased their confidence with more information, whilst participants whose strategy was based on honing in on a single diagnosis instead increased their confidence by considering more diagnoses early on (i.e. from the patient’s medical history and presenting complaint). Diagnostic accuracy, however, was associated with selectivity in information seeking.

Taken together, these findings have implications for future work in both medicine and psychology, particularly around medical education. Design of educational and cognitive interventions should hence focus on prompting appropriate information seeking, as well as prompting uses of different reasoning strategies based on the properties of the patient case (such as how much diagnostic uncertainty there is associated with the patient). Whilst this work has revealed interesting results, there is still follow-up work that can be done to further elucidate how interventions can prompt accurate diagnostic decisions with appropriate levels of confidence. In addition, there is still needed work on understanding how clinicians deal with uncertainty in their clinical practice6. This follow-up work is what I intend to pursue during my research fellowship.

The strands of my planned research are as follows:

**Strand 1 - Normative Diagnostic Strategies:** whilst my work has uncovered differences in how medical students approach diagnoses (despite being educated at the same university), it does not delve into how doctors view medical decisions broadly. This strand will aim at understand how clinicians think they should make decisions from a normative perspective. To understand this, I will develop a survey to distribute to clinicians, whilst also collecting information about their experience and speciality. This survey (*Experiment 1*) will ask clinicians whether they use more structured/analytical decision strategies in their practice or rely primarily on intuition, as well as understanding the primary types of decisions they face during their practice (e.g. diagnosis, admitting/discharging patients, administering medication etc.)

**Strand 2 – Exposure to Uncertainty:** this strand will use experimental methods that build on the paradigm I developed during my PhD to investigate how the diagnostic decisional process develops with more information. Specifically, I will build on this paradigm by considering two aspects of real medical decisions (and indeed, other non-medical decisions): ambiguity and informational cost. For the former, information, such as test results may sometimes be neutral (and could be interpreted in multiple ways) or inconclusive. For the latter, different pieces of information/tests have different costs in terms of either money or time. In healthcare specifically, clinicians may require a test result to proceed but may be unable to obtain it for a while due to a myriad of reasons (e.g. the testing equipment is already in use, staff is not available etc.). This strand will hence consist of two studies, one with ambiguous information (*Experiment 2a*) and one with informational cost (in terms of time) (*Experiment 2b*). My hypotheses are that clinicians who see more ambiguous information reduce their confidence and seek more information as a result, and that clinicians with lower confidence will be less willing to request costly information.

**Strand 3 – Timing Prompts of Uncertainty:** this strand will build on previous work7,8 looking at the optimal time during a diagnostic decision to ‘prompt’ uncertainty. These will take the form of a cognitive intervention taken from existing literature: guided reflection to consider alternative diagnoses9 (such that participants are asked if they think they missed any possibilities). Participants will either be instructed to do this throughout at the start of the task, will be prompted early on during a decision or prompted later on (*Experiment 3a*). Another study will then frame the cognitive intervention/prompt as advice coming from a LLM (*Experiment 3b*), which is important to look at given AI’s ever-increasing implementation and usage within healthcare. My hypotheses are that clinicians with higher confidence will be less susceptible to prompts of uncertainty when provided later.

During my PhD, I have developed research collaborations in Oxford with medical professionals who can assist with ensuring the ecological validity of my experimental designs. I also intend to work with a wide range of collaborators in my network who can assist with the practical aspects of my research, including design of experiment materials, participant recruitment and engagement of stakeholders within the medical community.

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