**PhD Proposal: Patient Safety Assurance for Digital Health**

**Supervisor:** Ibrahim Habli, Computer Science, University of York

**Co-Supervisors:** Cynthia Iglesias (HYMS/Health Sciences) and Cade McCall (Psychology), University of York

**Background:** Digital Health (DH) technologies have become a critical infrastructure in healthcare [1]. The connected use of information-intensive functions (e.g. electronic health records and ePrescribing) has revolutionised the provision of treatment and care. Recently, the DH landscape has expanded by the use of wearable technologies, health apps and social media, empowering patients to take a more active role in their care [2]. For any technology used in the care pathway, the impact on patient safety is a fundamental concern [3]. DH has the potential to improve patient safety but also introduce new hazards. For example, ePrescribing can reduce medication errors but also increase risks of unsafe shortcuts and alert fatigue. Assessing such patient safety risks intrinsically depends on the clinical and social care settings within which the technology is used [5-6]. DH is typically deployed in dynamic care environments where a high degree of variability is often deemed irreducible [7]. For such complex environments [8], DH risk modelling and analysis is challenging as most hazardous behaviours typically emerge only once the organisational, clinical, human and technology elements interact within different care settings [12].

**Aim and Objectives:** The aim of this PhD project is to develop and evaluate a sociotechnical model, and tool support, for reasoning about the patient safety risks associated with DH, emphasising the need to consider the clinical and technological aspects in an integrated and justifiable manner. This will be achieved by meeting the following objectives:

A. Develop a modelling technique for defining the clinical/care setting and DH functionality and information flows, building on current research at (1) Computer Science on the Epsilon modelling framework [9] and (2) Psychology on Social Cognition [10], particularly considering the impact of variability in clinical practice;

B. Use the technique in (A) as a basis for constructing the safety case for DH interventions, utilising the notion of model weaving [11] for integrating risk analysis, clinical/behavioural models and DH information flows; and

C. Understand how the safety case constructed in (B) can be used for making evidence-based decisions concerning the safe deployment and use of DH in different care settings, considering regulatory requirements and economic constraints.

The PhD research will be developed and evaluated in collaboration with the Clinical Safety Team at NHS Digital. NHS Digital is the national provider of data and IT systems and will provide access to rich information and experiences from different national systems and trusts across the NHS.

The proposed research is inherently interdisciplinary and is on the intersection between at least three different University research themes, namely: Health and Wellbeing, Risk, Evidence and Decision Making and Technologies for the Future, with emphasis on making risk-informed decisions concerning the modelling and safe deployment of novel digital health interventions. The PhD research will build existing collaboration between Computer Science, Psychology and Health Sciences. The primary supervisor will be Ibrahim Habli (CS), supported by co-supervisors from Psychology (Cade McCall) and HYMS/Health Sciences (Cynthia Iglesias). The proposed PhD research will benefit from the results of a Royal Academy of Engineering project on Health IT safety (PI: Ibrahim Habli) and the recently awarded EPSRC project “The Wearable Clinic” (CIs: Ibrahim Habli and Cynthia Iglesias).

This PhD proposal is suitable for self-funding PhD applicants, who have a strong technical background, particularly in programming and modelling, and interest in healthcare and patient safety.

**References**