The Role of Artificial Intelligence in Managing and Preventing Complications Related to Type 2 Diabetes

Author: Cypo Hiels

Affiliation: Glasgow Caledonian University

Programme: MSc Advanced Practice (Diabetes Care Pathway)

**Abstract**

This dissertation explores the transformative potential of artificial intelligence (AI) in the prevention and management of complications associated with Type 2 Diabetes Mellitus (T2DM). With global T2DM prevalence rising at an alarming rate, there is a growing imperative for scalable, innovative interventions that can deliver personalised, proactive, and cost-effective care. This study employs a structured literature review to evaluate AI-driven tools such as predictive analytics, clinical decision support systems (CDSS), and AI-powered digital self-management platforms. Key outcomes of interest include HbA1c control, complication prevention, patient engagement, and clinical workflow optimisation. The study also critically reflects on the ethical, regulatory, and practical barriers to AI adoption within the UK’s healthcare framework, particularly the NHS, and considers the implications for nursing practice and multidisciplinary diabetes care.

Keywords: Artificial intelligence, Type 2 Diabetes Mellitus, HbA1c, predictive analytics, digital health, self-management, diabetic complications, clinical decision support, NHS, nursing innovation

**Background and Rationale**

T2DM represents one of the most urgent public health challenges of the 21st century, accounting for over 90% of all diabetes cases globally. Despite the availability of modern pharmacological therapies and clinical guidelines, many individuals face challenges in sustaining glycaemic control and adhering to long-term care plans. Complications such as cardiovascular disease, diabetic retinopathy, nephropathy, and neuropathy contribute significantly to morbidity, mortality, and healthcare costs.

AI technologies offer a promising avenue to augment conventional care models by enabling predictive, data-driven, and person-centred care. These tools can detect clinical deterioration, anticipate complication risks, automate decision pathways, and enhance patient self-efficacy through personalised feedback. However, the successful integration of AI into mainstream healthcare requires careful consideration of technical feasibility, clinical utility, ethical governance, and user acceptability.

As a registered nurse with hands-on experience in diabetes education and chronic disease management, I have witnessed both the resilience of patients and the systemic limitations of reactive models of care. This project stems from a commitment to exploring how AI can empower both healthcare professionals and patients in achieving sustainable, high-quality diabetes management.

**Aims and Objectives**

**Aim:**

To critically evaluate the application of AI technologies in preventing complications and improving the management of T2DM, with a particular focus on clinical outcomes, patient-centred care, and real-world implementation in UK healthcare settings.

**Objectives:**

1. To identify and categorise current AI interventions utilised in T2DM care.

2. To assess the clinical effectiveness of these interventions in improving glycaemic control (e.g. HbA1c), reducing complication risks, and supporting decision-making.

3. To examine how AI tools enhance self-management, patient engagement, and adherence to treatment plans.

4. To explore the ethical, legal, and practical challenges of implementing AI within UK clinical practice, including implications for nursing roles and interprofessional collaboration.

**Methodology**

A structured literature review will be undertaken by PRISMA guidelines. Electronic databases including PubMed, Scopus, CINAHL, IEEE Xplore, and Cochrane Library will be systematically searched using a combination of MeSH terms and Boolean operators relevant to AI, T2DM, and digital health.

**Inclusion criteria:**

- Studies involving adults diagnosed with Type 2 Diabetes Mellitus

- Interventions incorporating AI applications (e.g. machine learning, predictive modelling, digital decision support, remote monitoring)

- Quantitative and qualitative studies reporting clinical, behavioural, or implementation outcomes

- Peer-reviewed articles published in English between 2014 and 2024

**Exclusion criteria:**

- Studies focusing exclusively on Type 1 or gestational diabetes

- Commentary articles, editorials, or non-peer-reviewed sources

- Interventions without a discernible AI component

A thematic synthesis approach will be used for data analysis, grouping findings into key domains such as clinical effectiveness, patient experience, usability, and ethical considerations. The quality appraisal will be guided by appropriate tools (e.g. CASP, Joanna Briggs Institute checklists) depending on the study design.

**Expected Outcomes and Contribution**

This study will generate a comprehensive overview of AI’s current and potential contributions to T2DM care, identifying technologies with demonstrated clinical value and mapping barriers to real-world adoption. The findings will highlight the opportunities for AI to complement and enhance nursing practice, support self-management, and alleviate resource pressures within the NHS.

By integrating clinical insight with emerging technological evidence, this dissertation aims to inform future innovations in digital diabetes services particularly those that align with personalised, community-based, and nurse-led care. In doing so, it contributes to the broader discourse on digital transformation in chronic disease management and provides actionable insights for educators, practitioners, and policymakers shaping the future of diabetes care.