

KidneyGuardian AI: An Intelligent Digital Health Promotion Intervention for Preventing Chronic Kidney Disease Among High-Risk Adults in the United Kingdom

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BACKGROUND

Why is CKD a Public Health Concern?

- Chronic Kidney Disease (CKD) is a major global public health challenge, affecting approximately **850 million people worldwide** and contributing significantly to premature mortality and healthcare costs (**KDIGO, 2024**).
- In the United Kingdom, around **3.5 million adults** are estimated to have CKD, with many remaining undiagnosed because symptoms often appear only in advanced stages (**Kidney Research UK, 2023**).
- Diabetes and hypertension are the leading causes of CKD, and delayed diagnosis frequently results in dialysis, kidney transplantation and increased NHS expenditure (**NICE, 2021**).
- Existing interventions include NHS Health Checks, the NHS App, wearable devices and telehealth services. While these technologies improve disease monitoring, they often provide limited personalised risk prediction or behaviour change support (**NHS England, 2023**).

MY DIGITAL HEALTH INTERVENTION

KidneyGuardian AI- What is KidneyGuardian AI?

KidneyGuardian AI is an artificial intelligence-powered mobile health application designed to identify adults at high risk of Chronic Kidney Disease before symptoms develop. The intervention integrates health information from wearable devices, electronic health records and patient-reported lifestyle data to generate personalised kidney health recommendations.

Data monitored

- Blood Pressure
- Blood Glucose
- Daily Water Intake
- Physical Activity
- Diet
- Wearable Device Data
- NHS Electronic Health Records

Key Features

- AI Risk Prediction
- Mobile Health Application
- Smartwatch Integration
- Medication Reminder
- Lifestyle Coaching
- NHS Digital Integration
- Personal Kidney Risk Score
- Personalised Health Alerts



Fig:1- (Kidney Care UK, 2024)

HEALTH PROMOTION VALUES & PRINCIPLES

Ottawa Charter for Health Promotion

- The Ottawa Charter defines health promotion as enabling people to increase control over their health and improve wellbeing (**WHO, 1986**).
- KidneyGuardian AI reflects these principles by empowering individuals through personalised health education, encouraging healthy lifestyle choices and supporting long-term self-management.
- The intervention promotes equity through multilingual support, accessible design and personalised coaching, helping reduce barriers to digital healthcare.
- It also strengthens community action through digital education and shifts healthcare from reactive treatment towards proactive prevention, aligning with modern public health priorities (**WHO, 2021**; **NHS England, 2019**).

DIGITAL HEALTH INEQUALITY

Challenges

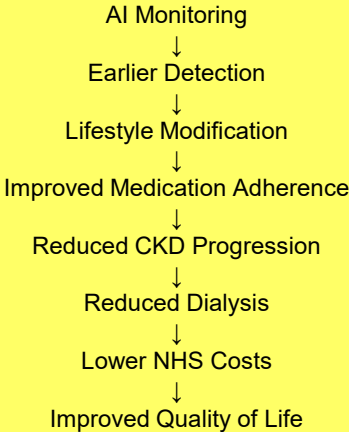
- Older adults with limited digital skills
- Low digital literacy
- Poor internet connectivity
- Language barriers
- Low-income households
- Limited access to smartphones

Proposed Solutions

- Voice-guided navigation
- Large-font accessibility
- Offline functionality
- Multilingual interfaces
- Community digital education
- NHS-approved accessibility standards
- Family or caregiver support options

Digital inclusion strategies are essential to ensure that innovative technologies do not widen existing health inequalities (**WHO, 2021**; **Marmot et al., 2010**).

EXPECTED OUTCOMES



KidneyGuardian AI is expected to promote earlier diagnosis, improve patient engagement and support healthier lifestyle behaviours among high-risk individuals. Increased self-management may delay CKD progression, reduce avoidable hospital admissions and improve quality of life. Wider implementation could also reduce NHS expenditure associated with dialysis and transplantation while helping reduce digital health inequalities through inclusive digital design (**Topol, 2019**; **WHO, 2021**).

BEHAVIOUR CHANGE THEORY

Health Belief Model (HBM)

Perceived Susceptibility

KidneyGuardian AI

Personal Kidney Risk Score

Health Alerts

Lifestyle Advice

Behaviour Change

Reduced CKD Risk

- The Health Belief Model suggests that people are more likely to adopt healthy behaviours when they believe they are personally at risk, understand the seriousness of the disease, recognise the benefits of preventive action and feel confident they can successfully change their behaviour (**Rosenstock, 1974**).

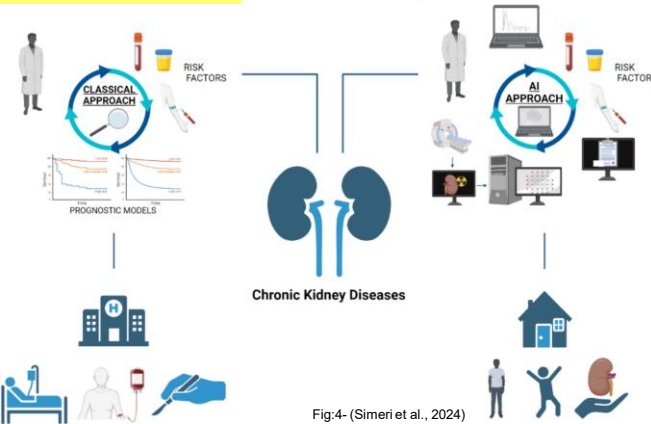


Fig:4- (Simeri et al., 2024)

KidneyGuardian AI supports behaviour change by:

- Increasing perceived susceptibility through personalised CKD risk scores.
- Highlighting disease severity using educational content.
- Demonstrating the benefits of healthy lifestyle behaviours.
- Improving self-efficacy through reminders, goal tracking and positive feedback.
- Providing cues to action through medication reminders and health alerts.

These features encourage long-term engagement and healthier decision-making (**Shen et al., 2018**; **Sarker et al., 2022**).

CONCLUSION

KidneyGuardian AI demonstrates how artificial intelligence, wearable technology and mobile health can transform kidney disease prevention by empowering individuals to take greater control of their health. The intervention aligns with health promotion principles, behaviour change theory and current NHS priorities by focusing on prevention rather than treatment. Future implementation should evaluate usability, cost-effectiveness and long-term clinical outcomes through pilot studies before national adoption. If successfully implemented, KidneyGuardian AI has the potential to improve population health while supporting a more equitable and digitally enabled healthcare system.

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