

Exploring the Viability of an AI Speech-Based Diagnostic Tool in Parkinson's Disease

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Introduction

Parkinson's Disease (PD) affects one in every 37 people in the United Kingdom, yet clinicians continue to lack objective, early detection tools that are fully integrated into clinical care pathways (Parkinson's UK, 2022). Timely identification of deterioration is critical for enabling prompt intervention and maintaining quality of life (Rajan et al., 2020). Despite the rapid advancement of artificial intelligence (AI) and digital health, diagnostic tools are often designed without the meaningful involvement of frontline clinicians or people with Parkinson's (PwPD), limiting adoption and sustainability (Smith & Caplan, 2018).

This study explored the design and implementation requirements for a speech-based AI tool to support the early identification of PD deterioration. By gathering the insights of community health professionals across disciplines, the research aimed to define the practical, ethical, and organisational factors required for successful integration into existing community care pathways.

Methods

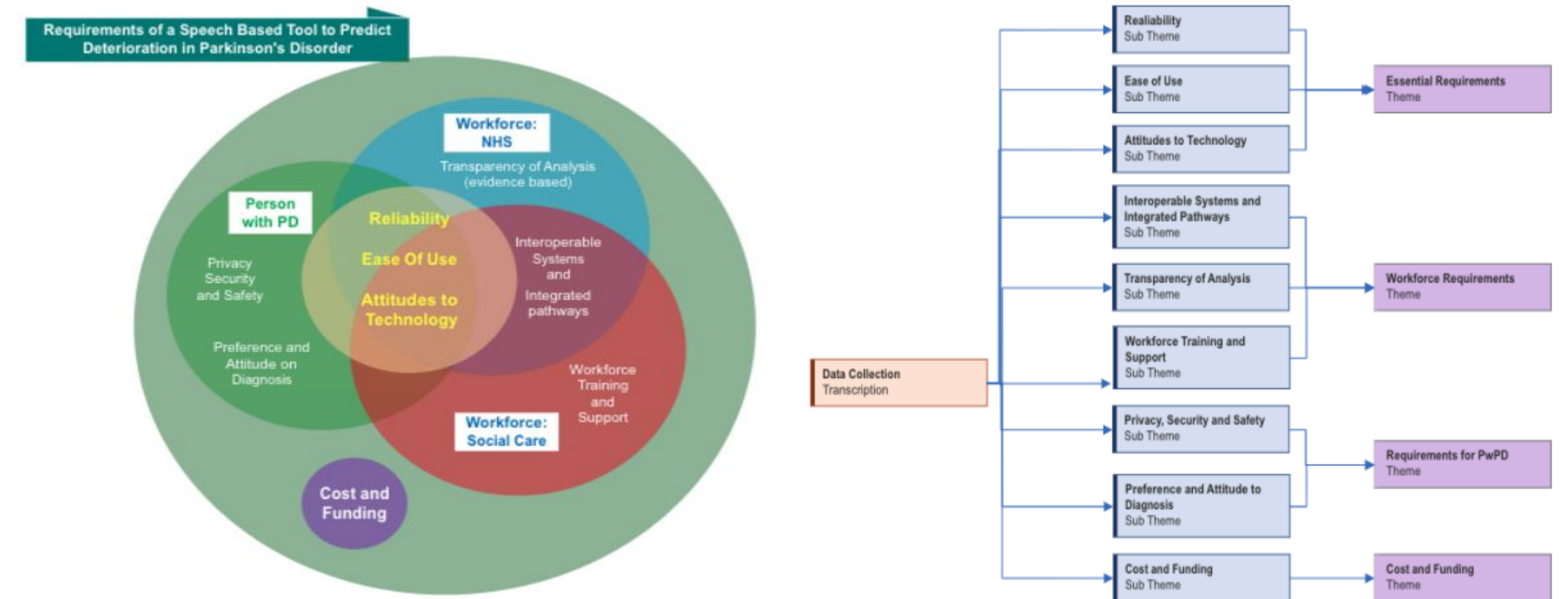
A mixed-methods qualitative approach was adopted to gain a comprehensive understanding of implementation requirements. Data were collected through surveys, focus groups, and follow-up interviews with health and social care professionals within the Bridgend Community Integrated Health and Social Care Service. In total, 31 surveys were completed, 12 staff participated in focus groups, and 11 participated in follow-up interviews. The participants represented a range of disciplines including Parkinson's specialist nurses, speech and language therapists, physiotherapists, pharmacists, social workers, and care managers.

A grounded theory approach guided the data analysis (Merriam & Tisdell, 2016). Using Delve qualitative analysis software, transcripts were coded and thematically analysed to identify emerging patterns. Data triangulation across all sources enhanced validity, credibility, and trustworthiness.

Outcomes

The analysis generated four major themes encompassing nine subthemes. The first theme, **Essential Requirements**, highlighted the importance of reliability, ease of use, and attitudes to technology. Participants emphasised that a reliable tool capable of distinguishing true disease deterioration from natural fluctuations in symptoms is vital for safe clinical decision-making (Carrón et al., 2021). Equally, the tool must be simple and intuitive, recognising that many PwPD experience tremors, reduced dexterity, and cognitive challenges (Ozanne et al., 2018; Laar et al., 2023). Finally, the attitudes of both staff and patients toward technology were seen as critical, as user trust and perceived value strongly influence adoption (Riggare, Stamford & Hägglund, 2021).

The second theme, **Workforce Requirements**, reflected the need for comprehensive training, ongoing technical support, and system transparency. Participants expressed that successful implementation depends on digital literacy and a clear understanding of how AI processes and interprets speech data. Integration and interoperability with existing digital systems were identified as essential to ensure seamless data sharing and real-time alerts within care teams (Virbel-Fleischman et al., 2022).



The third theme, **Patient-Centred and Ethical Considerations**, raised concerns that continuous monitoring could remind PwPD of disease progression, potentially affecting emotional well-being. Ethical implementation must therefore balance clinical benefit with respect for individual preferences and privacy (Kappelle et al., 2022; Grosjean et al., 2022).

Finally, the fourth theme, **Cost and Funding**, underlined the importance of developing sustainable financial models that allow for ongoing support, maintenance, and evaluation.

Learnings

This study revealed that the successful introduction of a speech-based diagnostic tool for Parkinson's Disease requires not only technical accuracy but also a human-centred approach grounded in co-production. Co-design between patients, carers, and clinicians ensures that digital tools are clinically relevant, ethically sound, and aligned with lived experiences. Reliability, trust, and interoperability are non-negotiable components for clinical adoption, while staff readiness and appropriate training are key enablers. Integrating digital health innovation into community pathways must be supported by leadership, infrastructure, and ongoing evaluation to ensure equity and sustainability (Kaplan et al., 2020; Rajan et al., 2020).

What's next?

The next stage of this research will focus on direct co-design with people living with Parkinson's and their carers to refine the prototype and explore real-world usability. Collaboration with academic and industry partners is planned to gather larger, more diverse voice datasets to improve model accuracy and generalisability. Future research will also explore ethical frameworks for voice data collection and transparency in AI decision-making to align with NHS Wales governance standards. Ultimately, the goal is to develop a clinically trusted, patient-centred tool that enhances timely, value-based, and integrated care for people with Parkinson's.

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