

Towards a Digital Revolution: Advancements in Elderly Care Provision in the United Kingdom

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Abstract

The current landscape of healthcare provision for older people in the United Kingdom reflects a demographic shift towards an increasingly senior population, prompting the need for transformative reforms to address existing challenges. Financial constraints have hindered equitable access to care services, exacerbating issues such as fragmentation and personnel shortages. Despite these barriers, both the British and Welsh governments are pursuing ambitious strategies to enhance the efficiency and accessibility of care through digitalisation and technology integration. Information and Communication Technology plays a vital role in addressing the complex healthcare needs of older adults by facilitating health monitoring, social connectivity, and integrated care models. However, challenges such as the digital divide and trust dynamics need to be addressed to ensure the inclusive and effective implementation of these technologies. Similarly, Artificial Intelligence presents promising solutions for improving healthcare outcomes for older adults, but ethical considerations regarding bias, depersonalisation, and privacy must be carefully addressed. Considering these aspects, the proposed recommendations include implementing protocols for bias detection in AI algorithms, integrating digital literacy and ethics training into healthcare education, developing regulatory frameworks for AI in healthcare, and prioritising research on patient autonomy and dignity in AI-driven healthcare. By addressing these recommendations, a more inclusive, equitable, and patient-centred healthcare system can be achieved, ensuring the rights and dignity of older adults are upheld.

Introduction

The Earth's demography faces an escalating age ratio prevalence, with a substantial spike in the mature generation. While troubling estimates of growing comorbidities among this group present challenges in addressing the demands of healthcare, there is a greater acknowledgment of the importance of developing future sustainable care delivery solutions (Ma et al., 2023). The aim of this report is to investigate and evaluate the integration of Information and Communication Technology (ICT) and Artificial Intelligence (AI) in healthcare of the older persons. Starting by analysing current initiatives and policies in United Kingdom (UK) and Wales, this report sheds a light on the potential benefits, challenges, and ethical considerations of these innovative technologies, that impact the health and care of older persons.

1. Current landscape of health and social care provision for old persons

Demographically, the UK is undergoing a senior generation, with predictions displaying that the number of older individuals is set to substantially rise over time. The trends reveal a notable rise in the array of Welsh seniors aged 75 and above, at around 385,000 by 2031 (Older People's Commissioner for Wales, 2023), alongside the growth in British seniors aged 65–79, at over 10 million by 2063 (Centre for Ageing Better, 2024). In the next decade, the rate of developing multi-morbidities is projected to nearly double for adults aged 65 and older (Kingston et al., 2018). In addition, those aged 85 and above, will experience a significant rise in low and high dependency levels (Kingston, Comas-Herrera and Jagger, 2018). This demographic change intensifies the requirement for care services, which, according to some studies, is not equitable and appropriate to respond to the requirements of older adults in the UK, particularly those facing difficulties with everyday activities (Spiers et al., 2022) or living with chronic conditions (Abdi et al., 2019).

In terms of delivery services, the financial constraints represent a significant hurdle to ensuring adequate care provision for older adults. Despite the increasing demand, social care services in the UK have faced longstanding underfunding, leading to limitations in access to publicly funded care (Bosch and Isden, 2023; Schlepper and Dodsworth, 2023). Insufficient funding not only impacts the quality and availability of care services but also contributes to fragmentation in service provision, personnel shortages, turnover or low wages (Bosch and Isden, 2023; Siôn

and Trickey, 2020). Moreover, the latest statistics released by QualityWatch depict these systemic barriers as a governmental failure to adequately address the growing demands of older persons requiring social care services (Schlepper and Dodsworth, 2033).

Amidst the ongoing drawbacks posed by the actual landscape of health and social care, the British devolved governments envision transformative reforms for a more efficient, personalised, and accessible health and social care system (Department of Health and Social Care, 2022; Welsh Government, 2023). In England, the key advancements include widespread adoption of digital tools such as the NHS App, electronic patient records, and support for managing long-term health conditions at home. Central to this vision is the NHS App, envisioned as the primary gateway to healthcare services, with plans for continuous enhancement and expansion of its functionalities (Department of Health and Social Care, 2022). The Welsh Government's (2023) 'Digital and data strategy for health and social care' targets leveraging high-tech to standardise and optimise healthcare provision, embracing emerging technologies like Artificial Intelligence and genomics, empowering the digital workforce, improving information sharing, and utilising data for population health management. Both the evolving and pressing needs for care of the ageing population have influenced the advancement of ambitious strategies to harness technology without disregarding the possible benefits and difficulties that may be encountered.

2. Information and Communication Technology (ICT) in healthcare

ICT in the context of ageing takes a holistic approach, including digital tools and systems designed to assist older adults in various facets of their lives, from health monitoring and management (see Appendix 1) (Fares, Sherratt and Elhaji, 2021), social connectivity, to combat loneliness and social isolation (Choi and Lee, 2021), to autonomous homecare driven by ambient intelligence (Shareef et al., 2021). These technologies not just tackling biomedical obstacles but also cater to the complex healthcare needs of old adults by promoting independent living, reducing health and social costs, and enhancing overall well-being (Fares, Sherratt and Elhaji, 2021; Begde et al., 2023). Furthermore, ICT extends its reach beyond individual care to encompass integrated care models that leverage technological tools and platforms to streamline healthcare delivery and enhance coordination among multidisciplinary

health professional teams, such as electronic health records, digital communication systems, and clinician data systems (Yutong et al., 2023).

Studies suggest that the integration of ICT into elderly care holds promise to enhance the standard of care and patient outcomes. By leveraging emerging technologies such as assistive robots, online platforms, and smart home devices, health professionals can offer more tailored, comprehensive, and accessible care to seniors (Fares, Sherratt and Elhajj, 2021). These technologies enable remote monitoring, timely interventions, and boost communication patients-healthcare personnel, leading to more proactive management of chronic conditions and better health outcomes (Fares, Sherratt and Elhajj, 2021; Yutong et al., 2023). ICT fosters social inclusion and connectivity among older people, mitigating the risks of isolation and loneliness (Choi and Lee, 2021). Online platforms and communication technologies empower older adults to maintain social connections, participate in meaningful activities, and engage with assistance networks (Choi and Lee, 2021). On the other hand, by assisting older persons to make informed decisions about their health and well-being (Yutong et al., 2023), ICT interventions foster a sense of agency and control, leading to more fulfilment and involvement in their care (Fares, Sherratt and Elhajj, 2021). Moreover, the adoption of ICT-based integrated care models facilitates coordination among multidisciplinary teams, streamlining care delivery and ensuring that older adults receive the right care at the right time (Yutong et al., 2023). However, drawbacks can be identified in terms of the digital divide, which disproportionately affects older adults due to factors such as limited technological literacy and access to resources (Begde et al., 2023), as well as “technophobia” (Yutong et al., 2023). In addition, there are challenges related to trust dynamics concerning seniors' acceptance of ICT. Weck and Afanassieva (2023) highlight the influence of beliefs in human nature, perceptions of institutional reliability, and considerations of ICT self-efficacy in fostering initial trust toward digital assistive technology. Older individuals' trust in digital high-tech and autonomous homecare systems is not solely determined by technological features but is also influenced by broader perceptions of reliability, ease of use, and familiarity with the technology (Shareef et al., 2021; Weck and Afanassieva, 2023). Moreover, the presence of social support networks and cultural norms significantly shape older individuals' trust in these technologies (Weck and Afanassieva, 2023). Furthermore, the inclusion of ICT into healthcare systems presents logistical and organisational

challenges, particularly in the context of implementing integrated care models (Yutong et al., 2023). Ensuring seamless communication, data sharing, and coordination among multidisciplinary teams requires investment in infrastructure, interoperable systems, and workforce training (Yutong et al., 2023). Overall, Ji and Kim (2022) advocate for a patient-centred approach to the integration of smart healthcare systems for older adults. They stress the importance of empowering older individuals to make educated judgements about their healthcare, while also emphasising the need to address ethical worries surrounding data privacy and autonomy (Ji and Kim, 2022). By promoting digital literacy and bridging the digital divide, Ji and Kim (2022) argue for a more inclusive and equitable healthcare system that maximises the advantages of smart technology while safeguarding the privileges and decency of older adults.

3. Artificial Intelligence (AI) in healthcare

3.1. Implementation's benefits

AI is now recognised as an innovative approach for healthcare, providing new solutions to the complicated demands of the ageing population (Bajwa et al., 2021; Devenport and Kalakota, 2019). It refers to the simulation of human intelligence processes by computer systems in terms of acquiring knowledge and critical thinking (Bajwa et al., 2021). AI applications in healthcare range from diagnostic and predictive analytics to personalised treatment recommendations, virtual assistants, and administrative automation (see Appendix 2) (Bajwa et al., 2021). Machine learning algorithm, natural language processing, and computer programs on servers are among the key AI techniques employed to extract insights from large data sets, enhance decision-making, and improve healthcare outcomes (Devenport and Kalakota, 2019). Some studies identified that AI has the potential to positively impact older adults' healthcare outcomes and quality of life (see Appendix 3 for the emergent applications), as following:

- Improved patient care by using machine learning-based algorithms to early detection of frailty and associated signs (Shiwani et al., 2023; Rubeis, 2020), enhance illness's diagnosis and treatment recommendations (Devenport and Kalakota, 2019; Bajwa et al., 2021; Ho, 2020).

- Extend patient monitoring through AI chatbots, like Babylon and Ada, able to support, inform and assist persons in managing their health, as well as home-health systems and ambient intelligence care that detect anomalies or changes in behaviour and alert carers or healthcare personnel in case of emergencies (Bajwa et al., 2021; Ho, 2020; Rubeis, 2020).
- Stratified and personalised care offered through integration of AI analysis within the Electronic Health Records facilitate the development of tailored interventions or therapies that are precisely targeted patients with the same chronic illness (Shiwani et al., 2023; Rubeis, 2020).
- Assistance in rehabilitation extends beyond traditional therapeutic approaches; AI algorithms offer continuous monitoring and assessment of progress based on real-time data analysis in the benefit of older adults' recovery and regaining independence and functionality in daily life tasks (Ma et al., 2023).

3.2. Ethical concerns and challenges associated

Researchers' interest in scrutinising the moral considerations of AI in healthcare has increased in line with the escalated popularity of AI innovations. The myriad of ethical consequences potentially risky to patients' healthcare because of the use of AI encompass preoccupations related to:

- a) Bias, discrimination and fairness originated from the algorithmic factors, like incomplete input data, errors into the systems or 'black-box problems', and the quality of instruction data for AI models characterised by failures in considering person's gender and race, thereby compromising the equitable distribution of medical goods and services (Li, Ruijs and Lu, 2022; Rubeis, 2020). In addition, ageist perceptions can be integrated in these digital tools, potentially overlooking the diverse preferences and needs of older individuals, reducing them to a simplistic and predetermined notion of old age (Rubeis, 2020).
- b) Depersonalisation and dehumanisation, as AI-based gerontechnology's standardised data and automated processes tend to view patients primarily as bodies rather than individuals (Rubeis, 2020). Furthermore, the

interaction with assistive robotics may cause older persons to feel childish or deceived by robots that mimic human characters (Rubeis, 2020).

- c) Transparency, explainability and responsibility as central pillars of ethical AI advancement and application. The allocation of liability for patient harm can be complex, particularly when AI technologies are taking part in decision-making alongside human clinicians. It may be unclear to what extent doctors should be held liable for decisions made by AI systems, especially if these systems lack transparency or if clinicians lack direct influence over their selections (Li, Ruijs and Lu, 2022).
- d) Freedom and autonomy of patients cannot be impeded, as they have the right of clear explanations of how AI algorithms work and how they influence medical resolutions, patients can preserve authority over their healthcare journey. Respecting human autonomy requires more than just obtaining consent; it involves actively involving patients in the decision-making protocol and respecting their preferences and principles. AI systems should be designed with patient-centred care in mind, prioritising individual autonomy and well-being (Li, Ruijs and Lu, 2022).
- e) Privacy and confidentiality, as these technologies compile large amounts of sensitive health data, raising worries about unapproved access, misuse, and breaches of privacy. Their prioritisation in AI-driven healthcare is not only ethically imperative but also fundamental to safeguarding the integrity and trustworthiness of healthcare systems (Li, Ruijs and Lu, 2022).

Conclusion

In summary, this report shed a light of the possibility of ICT and AI applications in healthcare to meet the diverse demands of older adults. ICT tools offer solutions ranging from health monitoring to social connectivity, promoting independence, while lowering healthcare expenses. Similarly, AI applications provide tailored care, early illness detection, and better treatment recommendations. However, ethical concerns such as bias, depersonalisation, and privacy breaches must be carefully addressed to ensure responsible technology development and implementation. Prioritising transparency, patient autonomy, and privacy safeguards is crucial for building trust in these technologies. By embracing these principles, a

more inclusive, equitable, and patient-centred healthcare system can be realised, ensuring the rights and dignity of older adults are respected.

Recommendations:

Considering the findings about the role of both AI and ICT in the healthcare of older people, the following recommendations are proposed:

1. Practice:

- ✓ Implement robust protocols for bias recognition and reduction in AI algorithms used in clinical and care environments.
- ✓ Develop guidelines and best practices for transparent and explainable AI systems in healthcare.

2. Training/education:

- ✓ Integrate digital literacy and AI ethics training into healthcare professional curricula to equip future practitioners with the knowledge and skills needed to navigate ethical barriers in AI-driven healthcare.

3. Policy:

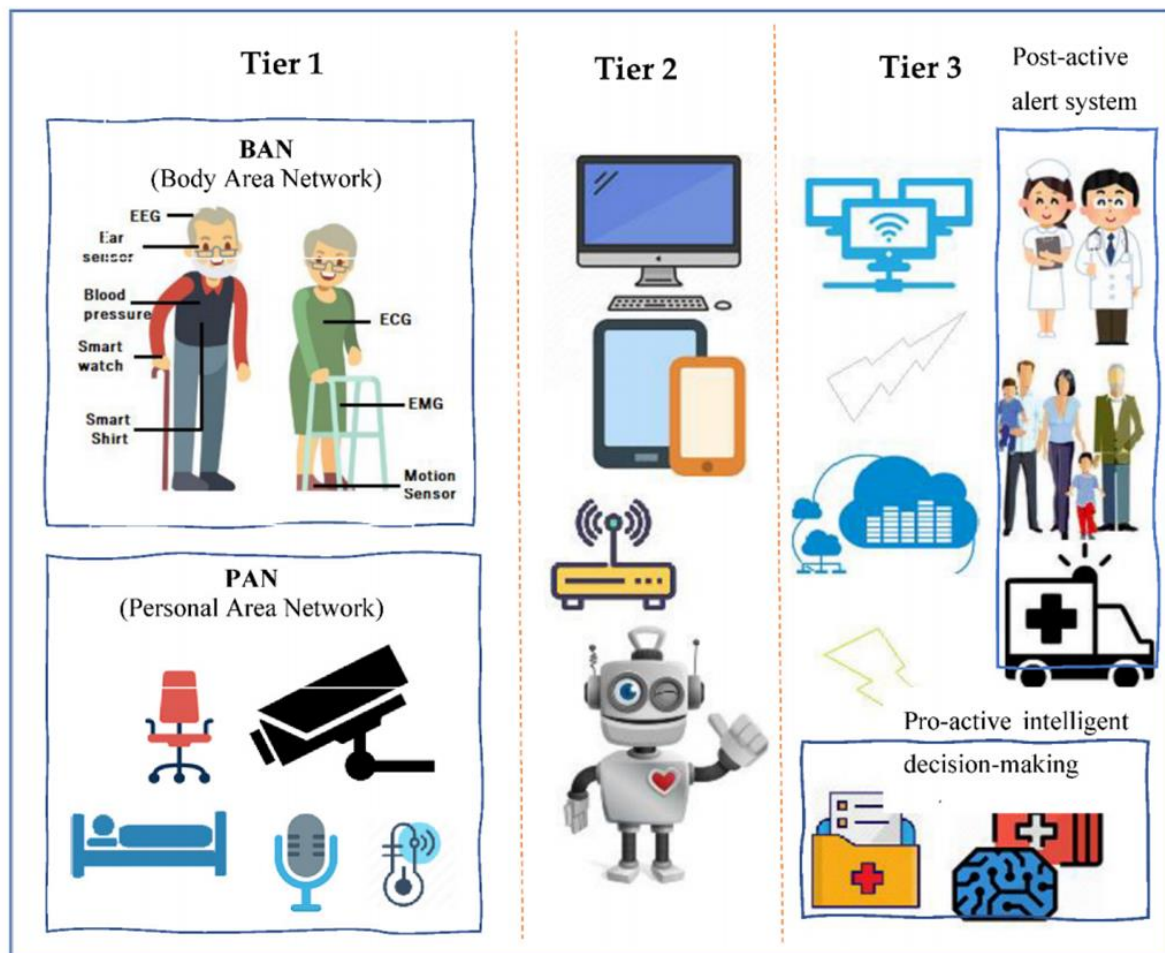
- ✓ Develop clear regulatory frameworks for the responsible development and deployment of AI instruments in healthcare.
- ✓ Enact legislation to protect patient privacy and confidentiality in the context of AI-driven healthcare, confirming that data is used ethically and securely.

4. Future research:

- ✓ Explore innovative approaches to promoting patient autonomy and dignity in AI-driven healthcare, such as participatory design methods that involve patients in the progression of AI technologies.

Appendices

Appendix 1. ICT Health Monitoring Systems (Fares, Sherratt and Elhajj, 2021)



Tier 1 – Sensors (collecting psychological, body motion, or environmental data).

Tier 2 - Gateway (customised devices collecting data from sensors and dispatching them to a remote server).

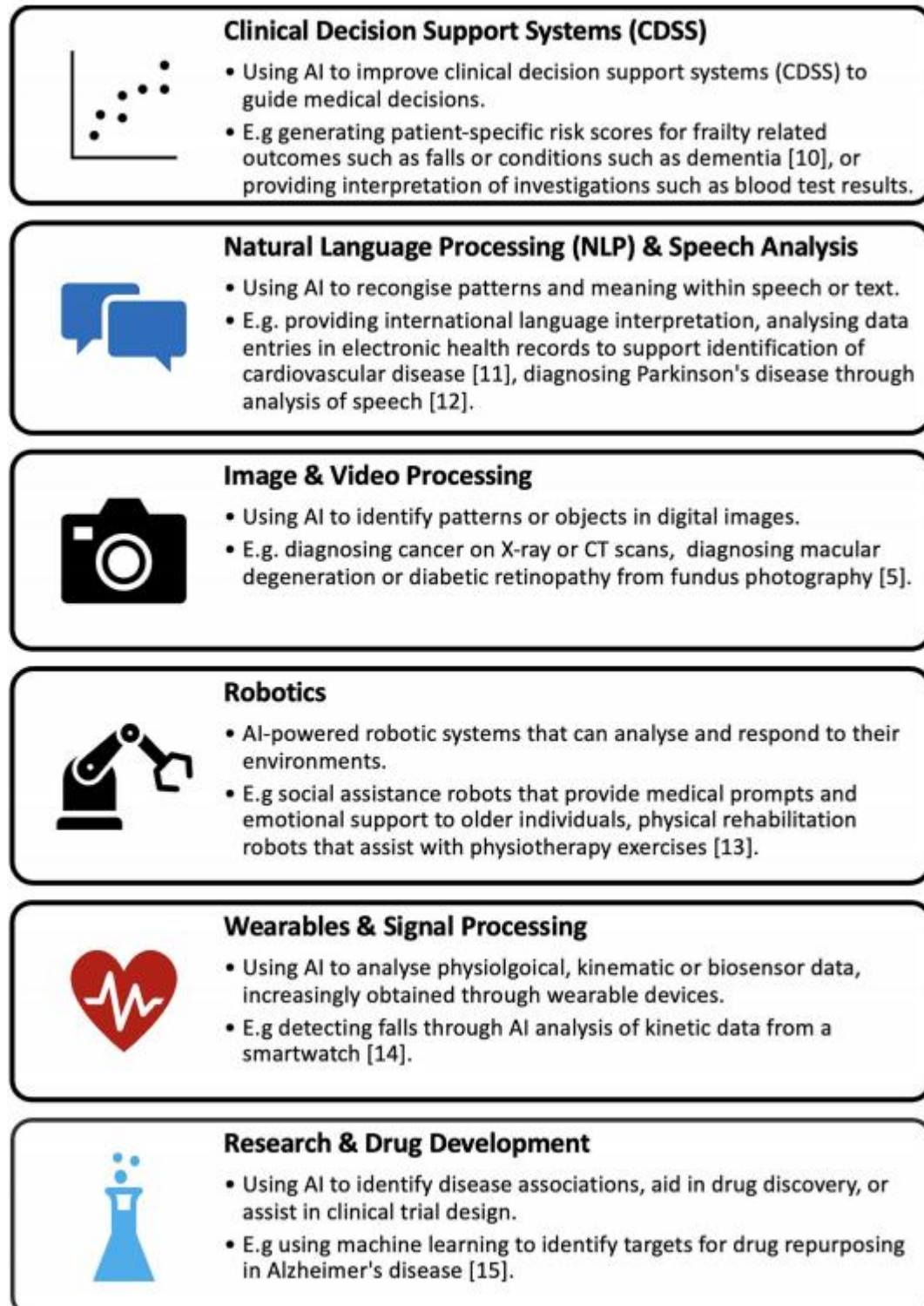
Tier 3 - Remote Monitoring, Feedback and Decision-Making System (the core of the ICT).

Appendix 2.

Widescale adoption and application of artificial intelligence in healthcare (Bajwa et al., 2021)

Timeline	Connected/ augmented care	Precision diagnostics	Precision therapeutics	Precision Medicine	Summary
Short term: 0–5 years	Internet of things in healthcare Virtual assistants Augmented telehealth Personalised mental health support	Precision imaging (eg diabetic retinopathy and radiotherapy planning)	CRISPR (increasing use)	Digital and AI enabled research hospitals ³⁰	AI automates time consuming, high-volume repetitive tasks, especially within precision imaging
Medium-term: 5–10 years	Ambient intelligence in healthcare	Large-scale adoption and scale-up of precision imaging	Synthetic biology Immunomics	Customisation of healthcare Robotic assisted therapies	AI uses multi-modal datasets to drive precision therapeutics
Long term: >10 years	Autonomous virtual health assistants, delivering predictive and anticipatory care Networked and connected care organisations (single digital infrastructure)	Holographic and hybrid imaging Holomics (integrated genomic/radiomic/ proteomic/clinical/ immunohistochemical data)	Genomics medicine AI driven drug discovery	New curative treatments AI empowered healthcare professionals (eg digital twins)	AI enables healthcare systems to achieve a state of precision medicine through AI-augmented healthcare and connected care

Appendix 3. Emerging applications of AI in healthcare, with examples of their use in the care of older people (Shiwani et al., 2023)



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