APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN HEALTH CARE

HUMAN-LED, MACHINE-AIDED HEALTH, EFFICIENCY AND EFFECTIVENESS IN THE WELSH NHS

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Key points:

- The Covid-19 crisis has shown the need to embrace technological health solutions to aid response time, maintain social distancing and deal with increasing demand on NHS services.
- AI can alleviate growing strain on the NHS and help to reduce health inequality by enhancing and complementing current healthcare provision at reduced costs while improving the quality and safety of patient care.
- AI can perform many time intensive tasks, thus reduce burden on staff. This frees up staff to focus on the 'human' aspects of healthcare by reducing administrative and menial burdens.
- Wales must work with universities and industry to explore the implications of AI in health care to ensure it is used to support Welsh needs in a public-facing manner.
- Joined up, integrated and ethical regulation will ensure that AI is used safely and transparently to reduce the risk of data manipulation and misuse by government or private sectors.

POLICY ISSUE

Artificial Intelligence (AI) is playing an increasingly central role in health policy as a way to address treatment gaps and lags between demand and availability of services. **This need has become more pronounced during the Covid-19 crisis, with NHS services operating beyond capacity, meaning innovative solutions are required to address this demand.** Research shows AI systems outperform human expertise in numerous preventative health interventions.[1] Spending on AI in healthcare is set to grow annually by 48% between 2017 and 2023,[2] and private companies are increasingly involved in developing healthcare related AI.[3] With increasing demand on the NHS, the costs to support this organisation are dramatically rising. In Wales, this amounts to roughly 41% of government spending, which is projected to grow as high as 66% by 2048. However, 'throwing money at the system is not the solution'[4], and emerging technologies such as AI may help alleviate some of these demands with vastly reduced cost to the service.

RESEARCH-LED APPLICATIONS OF AI IN HEALTH

Breast cancer prediction	Skin cancer prediction
Pneumonia detection	Eye impairments
Classification of diabetes and cardiovascular disease	Mental health support

AI can be integrated into diagnostic protocols and system and data management of the NHS. Digital Health Ecosystem Wales highlights several AI applications being trialled by the NHS or healthcare sector.[5] AI can support mental health by digital tracking of depression and mood through keyboard interaction, speech and facial recognition, as well as interactive chatbots that provide basic mental health advice.[6] AI can support and optimise personalised patient-centred care such as its effectiveness in predicting the success of anti-depressant treatment for specific individuals,[7] characterising depression[8] and predicting bouts of psychosis.[9]

AI, Healthcare and Wales

Already, Wales plays a leading role in integrating AI into healthcare and research. The UKRI Centre for Doctoral Training in Artificial Intelligence, Machine Learning and Advanced Computing is led by Swansea University[10] and focuses on health as part of its remit. The university has also conducted world-leading research on the use of AI and electronic health records in preventing suicide,[11] as well as projects working with both the NHS and tech start-ups (Crunch Simply Digital, We Build Bots and Alpha Tango Delta) to develop human-led, artificially intelligent chatbot and virtual-reality solutions for automating and gamifying well-being. Supercomputing Wales works on healthcare-related research alongside private partners like Dell EMC and Atos, and University Hospital Wales is pioneering semi-automated, AI-assisted screening for colon cancer.[12]

Artificial Intelligence in Health Practice
(Health Education Wales, 2018)

- Velindre University NHS Trust piloted an AI chatbot for patient communication on cancer patients and received a positive reception from patients.
- Glintt developed AI to help improve logistics in the healthcare system, which could improve the efficiency of routine scheduling in the NHS.
- Surrey and Borders Partnership NHS Foundation Trust used AI applications to facilitate monitoring of individuals with dementia at their homes. Patients demonstrated lower levels of anxiety, irritability, and depression, and were hospitalised less often.

Policy Recommendations

- ❑ A two-pronged public education campaign should a) raise awareness on the role Wales plays in leading-edge research on medicine and AI; and b) educate the public on benefits of AI-enhanced healthcare.
- ❑ The Senedd and the Welsh Government should work proactively with universities, industry and NHS boards in establishing the key areas to focus on developing for AI and healthcare in Wales.
- ❑ A strategic advisory board on AI in general should be established, with healthcare forming part of its remit. This body should include governmental, non-governmental, business and academic expert voices. Its healthcare experts and responsibility should consider immediate and longer-term impact of AI on healthcare, the relation between public- and private-sector investment and innovation in the NHS and connections with broader Welsh industry and research and development, including universities.

Health & AI Presence in Wales

- ❑ The Cardiff University Brain Research Imaging Centre
- ❑ Atos
- ❑ Dell EMC
- ❑ Supercomputing Wales
- ❑ Advanced Research Computing @ Cardiff
- ❑ British Society for Immunology
- ❑ Systems Immunity Research Institute
- ❑ Cardiff Institute of Tissue Engineering and Research
- ❑ The Initiative for Managing Policymaker-Academic Cooperation and Knowledge Transfer (IMPACKT)
- ❑ Swansea University, NHS and Welsh technology collaborations in wellbeing: Crunch Simply Digital, We Build Bots and Alpha Tango

Crucially, AI can play a key role in supporting human activities, but should not replace frontline staff. Health Education Wales (HEW) acknowledges distrust of AI and suggests that the public are more supportive of AI in monitoring systems (e.g. imaging, logistics) than in direct delivery of health care. Research identifies the need for transparency,[13] familiarity[14] and engagement[15] to address this trust gap and ongoing Swansea University research projects address AI concerns in psychological, ethical and political terms. Educating the public about the positive benefits of AI is crucial, as AI is already integrated into many aspects of society.[16] The NHS must account for data privacy and ethical use of AI in these applications. Electronic patient records and support bring benefits in terms of management and joined-up healthcare, but create issues in how these records are used and by whom. Given these data implications, a rapid and responsive governance model should oversee and advise how this system operates in order to ensure safe, ethical and human-centric use of AI.

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