DIGITAL HEALTH technologies (DHTs) that are being used to engage with, diagnose and treat patients include electronic health records, mobile phone applications (apps), wearable devices and telemedicine (or telehealth). The adoption of DHTs in the NHS has significantly increased, in particular over the past few years (NHS England 2023a). The coronavirus disease 2019 (COVID-19) pandemic has catalysed this technological shift, particularly in oncology outpatient services (Adames et al 2023), many of which have transitioned to telehealth platforms (Marks et al 2023).

The ‘digital transformation’ of health and social care is one of the main strategic priorities of NHS England (Department of Health and Social Care 2022). DHTs are expected to improve patient care, experience and outcomes, and research has started to identify their potential benefits. DHTs can give patients greater autonomy and responsibility in terms of managing their health (Madanian et al 2023). Health apps can enhance patients’ understanding of their condition, enable them to monitor it and empower them to self-manage (Shaw and Donia 2021). In cancer care, benefits of DHTs include improved quality of life and earlier identification and management of side effects (Larson et al 2018, Ferreira et al 2023). Advances in technology have changed the way healthcare professionals can interact...
with patients, with an increased use of videoconferencing, but technological evolution extends beyond interactions with patients. For instance, more multidisciplinary teams in NHS cancer services have been using videoconferencing platforms to enhance service efficiency and patient prioritisation (Soukup et al 2023).

However, many DHTs have not been thoroughly evaluated (Abernethy et al 2022). Furthermore, digital innovations such as virtual reality, remote monitoring and virtual wards, while they have gained traction as part of service delivery, have also demonstrated the need for nurses to be digitally literate (Vasilia et al 2023). Shaver (2022) noted that the use of teledmedicine in the US greatly expanded with the COVID-19 pandemic but that clinicians cite lack of training as a barrier to practising it.

While DHTs appear promising, without the involvement of nurses in their development, evaluation and implementation, such innovations could be unsuccessful or cause unintended harm to patients. However, nurses’ involvement in DHTs could add to already high workloads, creating an additional burden in terms of time, technical training and workload management (Borges do Nascimento et al 2023). It is essential that healthcare organisations acknowledge and address these challenges and provide nurses with the necessary training and support to integrate DHTs into their practice effectively, while understanding the benefits and limitations of these technologies for patient care (Krick et al 2020).

This article explores some of the challenges and opportunities arising for cancer nurses from the shift towards digital health and discusses the role of nurses in supporting the use of DHTs.

Use of digital health technologies in cancer care

Since the COVID-19 pandemic there has been a significant increase in the use of DHTs, notably the NHS App (NHS England 2023a, NHS Digital 2023). The NHS App offers users access to GP records, appointment scheduling and prescription management while also providing reliable information and management advice regarding various conditions (NHS Digital 2023). Previously, such services were only offered in GP surgeries and on a wide range of websites that were unstandardised and often challenging to navigate. In contrast, the NHS App offers a standardised experience and improved accessibility, although it is limited to people equipped with a suitable smartphone. While 87% of individuals aged 65 years and over use a mobile phone, only 58% use a smartphone (Age UK 2023). Consequently, a significant proportion of the demographic group that is most prone to cancer (Cancer Research UK 2021) may find accessing digital healthcare challenging.

The implication of lower smartphone use in older adults is that they could be excluded from advances in DHTs and therefore from some aspects of cancer care, especially remote monitoring and electronic patient-reported outcome measures, which are being developed, piloted and evaluated in oncology practice (West et al 2022). Examples of electronic patient-reported outcome measures that are being developed in cancer care include health-related quality of life, performance status and toxicity assessments. These digital innovations usually require the use of a mobile app. Therefore, policymakers need to establish plans for either increasing smartphone use among older adults or providing alternatives (Tang and Reddy 2022).

Telemedicine, another important digital innovation in cancer services, encompasses remote health assessments, interventions and treatment (Mahoney 2020). Potential benefits of telemedicine include reducing the time and cost of travelling to cancer centres – which is crucial for patients with mobility or transport issues – and giving patients greater control over their care (Dhillon et al 2022, Vercell et al 2023). However, telemedicine may not fully accommodate patients with sensory impairments or language barriers (Ali et al 2023), who may find it challenging to understand complex information over the phone or via videoconferencing platforms. A systematic review of telemedicine studies by van der Berg et al (2012) outlined that many trials excluded patients with sensory or language barriers. This highlights a significant unmet need, especially considering that some systemic anticancer therapy (SACT) regimens can cause temporary cognitive and sensory issues.

Despite the use of telemedicine being established in the UK, its large-scale application in oncology practice has yet to undergo comprehensive evaluation to determine its safety, effectiveness and acceptability to patients and staff. There is also a need for broader policy frameworks to guide best practice across cancer specialties (Tang and Reddy 2022). Larger-scale studies, meta-analyses and randomised controlled trials are necessary to determine the safety, effectiveness and acceptability of teledmedicine.

Key points

- Benefits of digital health technologies (DHTs) in cancer care include improved quality of life and earlier identification of side effects
- Older adults with cancer could miss out on some of the benefits of DHTs because of their lower smartphone use
- Nurses need to explore each patient’s understanding, enthusiasm and acceptance regarding the use of DHTs
- Healthcare organisations need to better understand the benefits and limitations of DHTs and provide nurses with the necessary training to integrate DHTs into practice
- DHTs should complement nurses’ professional judgement and enhance their interactions with patients, not replace them
Nurses’ role in digital transformation

It has been shown that nurses can influence patient decision-making and DHT adoption (De Regge et al 2022), and they have a crucial role in the successful implementation of DHTs. Their role may involve guiding patients to use DHTs effectively, engaging in discussions with patients about remote consultations, addressing any concerns patients may have, and directing patients to resources that can assist with digital access.

The nurse’s role may also include addressing inequalities and improving digital health literacy, thereby working towards equitable and effective digital cancer care. This involves understanding and responding to each patient’s concerns, capabilities and receptiveness to technology. It is essential that DHTs complement rather than replace professional judgement and advice, and enhance rather than replace the personal interactions nurses have with patients (Isidori et al 2022).

Given nurses’ ability to demystify complex medical jargon as part of routine cancer care, they are well positioned to explain DHTs to patients. They can take a person-centred approach by listening to patients’ needs in relation to their care and taking these into account when explaining the potential benefits of using DHTs (Busse et al 2022, Navarro Martínez et al 2023). The nurse’s role may encompass providing simple instructions on the use of devices, apps and online services, thereby bridging information gaps and fostering digital confidence among patients.

However, to undertake that role, nurses require training in the use of the relevant technologies so that they are adequately equipped to guide patients (Macalindin et al 2023).

It is crucial that nurses acknowledge the varying levels of digital health literacy and enthusiasm among patients. Nurses can adopt an individualised approach, offering hands-on assistance to patients who are less familiar with technology and encouraging self-guided exploration for those who are more experienced in its use. This approach is supported by the technology acceptance model, which has been adapted for telemedicine in hard-to-reach populations (Kamal et al 2020).

The original technology acceptance model, developed by Davis (1985), suggests that several factors influence an individual’s decision about how and when they will use a new technology. The extended model encompasses several domains that can affect people’s intention to use technology (Kamal et al 2020):

- Trust.
- Perceived usefulness.
- Perceived ease of use.
- Social influence.
- Facilitating conditions.
- Technology anxiety.
- Resistance to use.
- Perceived risk.
- Privacy.

Nurses can use their understanding of how these domains can influence a patient’s acceptance of technology to increase the acceptability and subsequent use of DHTs. The trust and therapeutic relationship that nurses establish with patients can foster greater confidence in DHTs, potentially increasing their uptake. This personalised approach ensures all patients receive the necessary support, expanding the scope of holistic nursing care in a digital context (Busse et al 2022).

It is crucial that efforts to equip nurses for a digital future are collaborative and that patients are offered the choice to access traditional care delivery, such as face-to-face clinics, if preferred. It is important to recognise that DHTs may not be suitable for all patients, particularly in oncology. For instance, remote monitoring is typically more applicable to patients whose condition is stable, have tolerated their treatment well, have experienced few side effects and have high adherence to their treatment regimen. These factors need to be considered when discussing DHT options with patients, and care should be taken when assessing patients’ suitability for remote monitoring, using a multidisciplinary team approach (Maguire et al 2021, Chan et al 2022).

Applying digital health technologies in practice

An example of the practical application of DHTs in cancer care is the use of remote monitoring in the management of SACT, an area of care where nurses’ interventions are crucial. One of the roles of nurses involved in the provision of SACT is to monitor patients for treatment-related side effects and escalate these as appropriate. One potential benefit of doing this remotely is that it can reduce delays in patients reporting treatment-related side effects, which is important because these delays can lead to deferrals of SACT regimens, prolonged inpatient stays and increased morbidity and mortality (Olver et al 2018, Mir et al 2022).
In cancer care, treatment-related side effects are graded on a scale of 1 to 5 using the Common Terminology Criteria for Adverse Events, a universal and standardised classification developed by the National Cancer Institute (2017). However, some patients may underreport the severity of the side effects they are experiencing to their cancer nurse, while others may accept that side effects are to be expected and therefore omit to report them even if they are severe (Gandhi et al 2015). This may lead to the nurse underestimating the severity of side effects and subsequently taking no action (Atkinson et al 2017). The introduction of remote monitoring and real-time toxicity reporting could mitigate these issues, leading to enhanced safety and better adherence to treatment (Mir et al 2022).

Rasschaert et al (2021) explored the feasibility of real-time toxicity reporting in a study of 168 patients receiving oral chemotherapy. Participants used a web-based patient-reported toxicity registration and management system to regularly input data on toxicities and adherence to treatment. This real-time reporting alerted nurses to significant side effects and facilitated immediate self-management advice. The study identified that 86% of participants were likely to recommend the technology to others undergoing cancer treatment and that 79% reported improved communication with their healthcare team. Adherence to treatment was high, with a median of almost 99% (Rasschaert et al 2021).

These results suggest that this type of technology could be scaled up and adopted in routine clinical practice. It should be noted, however, that Rasschaert et al (2021) focused solely on patient satisfaction and did not explore the perspectives of healthcare professionals. Nurses’ acceptance is important, since it will likely increase the chances of successful implementation of new DHTs in a multidisciplinary context (Nguyen et al 2020).

Rouidi et al (2022) discussed the fundamental role of cancer nurses in increasing their patients’ use of DHTs, including providing technical support and offering clinical advice on symptom management when an alert is triggered. This view is supported by Rasschaert et al’s (2021) findings. In Rasschaert et al (2021), the ability of patients to use the new technology to a high level contributed to its success. This highlights, in turn, the important role of nurses in ensuring effective remote symptom monitoring in clinical practice. Once appropriately trained, nurses can provide patients with advice on symptom management and technical advice, maintaining patient satisfaction and communication with the healthcare team.

The promising outcomes of Rasschaert et al’s (2021) study reinforce the argument for integrating DHTs into cancer care, particularly in outpatient settings. The study also indicates how nurse-patient relationships might evolve to incorporate remote monitoring technologies safely and efficiently. However, further work is required to ensure DHTs achieve the levels of efficiency required for them to be cost-effective for the NHS (Jalilian et al 2024).

**Addressing digital health inequalities**

The rapid adoption of DHTs during the COVID-19 pandemic meant that assessments of consequences, such as equality impact assessments, were often bypassed, thereby potentially exacerbating health inequalities (Shah et al 2022). Nurses are well positioned to help address digital health inequalities, for example by identifying patients’ unmet digital needs, offering alternative resources to those reluctant to use technology and incorporating patient education on the use of technology into routine care.

The integration of DHTs in cancer care may improve patient satisfaction and clinical outcomes (Rasschaert et al 2021, Mir et al 2022), but it also risks exacerbating health disparities. Lower health literacy, which contributes to digital health inequalities, often correlates with lower educational attainment (Simpson et al 2020), meaning that individuals with lower education levels may find it challenging to understand health-related information, particularly in digital form. This is a challenge in cancer care, where patients often receive extensive written information and instructions about their diagnosis, care and treatment. Nurses are well placed to identify and support patients with lower health literacy, and can use visual aids, videos and simplified text to enhance people’s understanding of, and engagement with, health information (Kemp et al 2021). Providing education and guidance in this way can mitigate digital health inequalities.

The framework for NHS action on digital inclusion (NHS England 2023a) identifies five domains to improve digital inclusion:
- Access to devices and data, so that everyone can access digital healthcare if they choose to.
- Accessibility and ease of using technology, so that user-centred digital content and products are co-designed.
Skills and capability, so that everyone has the skills to use digital health approaches and health services respond to the capabilities of all. Beliefs and trust, so that people understand and feel confident using digital health approaches. Leadership and partnerships, so that digital inclusion efforts are co-ordinated and help reduce health inequalities.

Nurses can focus on these domains to enhance their patients’ access to digital tools and develop their patients’ skills and trust in using them. Nurses can also use the extended technology acceptance model (Kamal et al 2020) to reduce digital health inequalities. Perceived value, technology-related self-efficacy and the social environment surrounding technology have all been found to influence the use of DHTs (Han and Nam 2021), so nurses can have discussions with their patients about each of these factors. An example of how services can collaborate locally to enhance digital inclusion is the 100% Digital Leeds programme (digitalinclusionleeds.com), which provides people with affordable access to devices.

The authors of the present article suggest that nurse-led patient education could significantly increase patients’ self-efficacy and confidence in relation to the use of DHTs, and therefore increase the likelihood that patients will continue to use DHTs, troubleshoot any issues and ask questions during consultations (Han and Nam 2021). Co-designing educational interventions with patients can ensure that DHTs are tailored to meet their needs while acknowledging cultural and linguistic diversity in communities (Lyles et al 2023).

Nurses can leverage the trust and therapeutic relationships they have developed with patients to champion the use of DHTs, ensuring these innovations are accessible and beneficial to all. They can also help ensure equitable access to, and use of, digital health resources by adhering to the principles of the framework for NHS action on digital inclusion (NHS England 2023a) and by using a person-centred approach.

Privacy and data security
Integrating DHTs in patient care creates several ethical and practical challenges regarding privacy and data security (Abernethy et al 2022). These challenges merit careful consideration by healthcare professionals, regulators and policymakers.

One important role of nurses is to address patients’ concerns about safety and privacy in relation to DHTs by providing education on data privacy, accessibility and security. Nurses can guide patients on safe digital practices, explain data protection protocols and empower them to make informed decisions about their online health information and technology use.

Privacy and data security are vital considerations in relation to digital health. Data protection laws in the UK, notably the Data Protection Act 2018 – the UK’s implementation of the General Data Protection Regulation (GDPR) – set high standards for the use of DHTs. Potential implications of data collection, storage and processing by artificial intelligence must be considered when implementing DHTs in cancer care. Furthermore, third-party companies providing remote monitoring technology to healthcare organisations must show they have robust security measures in place (NHS England 2023b). Ensuring the confidentiality of patient data is crucial for maintaining trust in these technologies (Sheppard 2020). The NHS has been criticised for vulnerabilities in its IT systems and inadequate IT infrastructure (Sheikh et al 2021), and addressing these issues will be essential for the successful implementation of DHTs.

Nurses need to have the knowledge and confidence to explain subjects such as privacy and data security to patients. They need a working knowledge of the relevant standards and laws as part of their training on information governance and data protection, which should enable them to reassure patients about the security of their health data and use of digital tools. However, to be equipped with adequate knowledge and confidence, nurses need to receive training on these issues beyond the current information governance and UK GDPR training (Kleib et al 2022).

Conclusion
The shift towards digital health will continue as evidence of the benefits of DHTs continues to emerge, including improvements in quality of life and reduced risk of developing treatment-related toxicities. Nurses can leverage the trust and therapeutic relationships they develop with patients to support the effective implementation of DHTs. However, it is important to be aware that the use of DHTs in cancer care may not have benefits for all patients and that there may be digital health inequalities that need to be addressed.