

Why you should read this article:

- To enhance your awareness of the potential benefits of digital health technology (DHT)
- To understand the factors that can affect DHT implementation in nursing homes
- To learn about the components of a three-step process model that could be used to implement DHT innovations in nursing homes

Digital health technology: factors affecting implementation in nursing homes

Katherine Curtis and Sheila Brooks

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Correspondence

k.curtis@sgul.kingston.ac.uk

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Abstract

Background Digital health technology (DHT), which includes digital algorithms and digital records, is transforming the way healthcare services are delivered. In nursing homes, DHT can enhance communication and improve the identification of residents' health risks, but its implementation has so far been inconsistent. Therefore, the LAUNCH (Leadership of digital health technology Uptake among Nurses in Care Homes) study was undertaken to identify factors that may affect DHT implementation in these settings.

Aim To identify the factors that enable nurses to implement DHT in nursing homes and to co-design a nurse-led stepped process supporting the effective implementation of DHT innovations in nursing homes.

Method An appreciative inquiry methodology was used. A total of 20 interviews with managers, residents and relatives, and nurses from five nursing homes in England were undertaken. The interview questions focused on their understanding of DHT, their experiences of it, and its potential benefits in nursing homes. Data from the interviews were thematically analysed and the emerging themes were used to inform two co-creation workshops, during which participating nurses discussed a practical, evidence-based process for DHT implementation in nursing homes.

Findings Three broad themes emerged from the interviews: improving communication; engaging with DHT and retaining humanised care; and introducing DHT and protecting data security. The co-creation workshop participants formulated the LAUNCH process model, a nurse-led, stepped approach supporting DHT implementation in nursing homes.

Conclusion The LAUNCH study identified factors enabling staff in nursing homes to introduce and sustain DHT innovations. Participating nurses co-created a three-step process for the effective implementation of DHT innovations in nursing homes, which have the potential to release staff time, improve quality of care, and have positive effects on staff recruitment and retention.

Author details

Katherine Curtis, associate dean external engagement, Kingston University, Kingston-upon-Thames, England; Sheila Brooks, post-doctoral research assistant, Bournemouth University, Poole, England

Keywords

care homes, change management, information technology, leadership, management, nursing care, nursing homes, older people, professional issues, technology

Background

Digital innovation in healthcare, such as telehealth and telemedicine, is transforming the way services are delivered – a trend that

is expected to continue at an exponential rate (El-Miedany 2017). Digital health technology (DHT) includes algorithms for analysing health data and 'intelligent'

systems that can be programmed to respond to aspects of an individual's daily life, such as exercise-tracking or diet-tracking apps. Patient records are increasingly digitalised and accessible through handheld devices such as smartphones and tablets. This enables patients, staff and managers to communicate increasingly efficiently and reduces their reliance on paper-based systems. Smartphones and wearable devices that monitor patients' health trends – for example their movement, sleep or blood glucose levels – can provide people with access to their own and publicly accessible health data (Hänsel et al 2015).

DHT can enhance patients' understanding of health, increase their independence in managing their conditions and improve health outcomes. DHT can be used to enhance person-centred care, encourage people to participate actively in managing their health and provide access to health information (Ware et al 2017).

Some older people are engaging in this technological revolution (Cotten 2017) and showing interest in the potential of DHT to enhance their care (Curtis and Price 2017). A review of digital inclusion by Age UK found that older people are increasingly using DHT (Davidson 2018). However, if older people are to engage successfully with DHT, consideration needs to be given to their sight and hearing capabilities, to the negative emotional effects that can result from challenges in using technology, and to the support required by those caring for them, such as nurses working in care homes (Urban 2017).

The increasing number of older people in the UK means that finding efficient and cost-effective methods for addressing their healthcare needs is a priority for healthcare providers (Cruickshank and Harding 2013, Levine et al 2016). High-quality nursing home care is increasingly required to meet older people's multiple and complex healthcare needs (Caley and Sidhu 2011). The introduction of DHT can support management processes such as communication and risk identification, potentially resulting in improved health outcomes (Imison et al 2016). The potential of DHT has not been fully realised in the UK and therefore increasing its use is a priority of the NHS Long Term Plan (NHS England 2019).

While DHT cannot take the place of personal one-to-one care, it can release staff time by replacing paper-based records with more accessible and secure digital records, thereby enhancing efficiency and

safety and increasing the amount of time staff have to provide care (Wachter 2016, Raney et al 2017). DHT-related efficiency gains can improve nurses' job satisfaction by enabling them to focus on care and enhance the quality of the care they provide (Spence Laschinger and Fida 2015).

The recruitment and retention of nurses in UK nursing homes are significant concerns (Skills for Care 2019) and innovation can contribute to improving the work environment, job satisfaction, retention and recruitment in that setting (Barrett and Robinson 2018).

Nursing leadership is fundamental to DHT innovation in nursing environments (Remus and Kennedy 2012), and change management in relation to digital innovation is known to benefit from clear processes (Kotter 1996). However, little is known about the factors that enable the effective implementation of DHT in nursing homes – although nurses are understood to have a crucial role in this (Weng et al 2015).

Management structures in nursing homes vary; some have a clearly structured hierarchy while others have less clear boundaries between administrative, management and leadership roles. These differences can be because of the size of the nursing home, whether it is part of a large organisation, and whether it is privately or publicly funded. Despite the organisational diversity across nursing homes, competent nurse leadership and clear management structures are important components for improving the quality of care (Siegel and Sikma 2015).

Further research is necessary to understand why the implementation of DHT in nursing homes – which could enhance communication and improve the identification of residents' health risks – has been inconsistent. Therefore, the LAUNCH (Leadership of digitAl health technology Uptake among Nurses in Care Homes) study was undertaken to identify factors that may affect DHT implementation in these settings. It is hoped that, through improved understanding of DHT and its challenges, staff in nursing homes will be supported to implement digital innovations, thereby improving the quality of care.

Aim

To identify the factors that enable nurses to implement DHT in nursing homes and to co-design a nurse-led stepped process supporting the effective implementation of DHT innovations in nursing homes.

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Method

Appreciative inquiry

Appreciative inquiry is a research methodology that provides a framework for identifying effective practices and developing innovations in collaboration with stakeholders. It consists of a cycle of phases referred to as the '5 Ds' (Stavros et al 2015):

- » Definition – understanding the topic of inquiry.
- » Discovery – appreciating the best of 'what is' and 'what works'.
- » Dream – imagining 'what could be'.
- » Design – determining 'what should be'.
- » Destiny – developing 'what will be'.

Appreciative inquiry identifies core strengths in practice – such as the skills of an individual nurse or the commitment of the workforce as a whole – and uses these strengths to reshape practice by co-creating methods of working that can be contextualised to specific practices and environments. For example, in nursing homes, appreciative inquiry could lead to improved methods of working – in this case, through the implementation of DHT – to support compassionate care or improve the quality of care (Dewar and Nolan 2013, Curtis et al 2017). Therefore, appreciative inquiry was considered an appropriate methodology for exploring the factors that enable the implementation of DHT in nursing homes and supporting the co-creation of new methods of working for nursing home staff.

The use of appreciative inquiry in the LAUNCH study comprised the following phases:

- » Define and discover – using individual interviews with participants from five nursing homes to explore their understanding of DHT and their experiences of using DHT in healthcare settings.
- » Dream or imagine – using interview-based discussions with participants to explore their ideas of what elements DHT could bring to assist them in improving the quality of care in their nursing home.
- » Design or determine – using co-creation workshops with participating nurses to design their imagined DHT innovations and explore how these could be implemented.
- » Destiny or create – using co-creation workshops with participating nurses to develop a nurse-led stepped process for implementing an innovative DHT programme in a nursing home.

Setting and recruitment

The LAUNCH study was undertaken over several months in 2018. The researchers

undertook purposeful recruitment (where researchers rely on their judgement for recruiting participants) of participants in five nursing homes in England. In each nursing home, the manager, two nurses with leadership responsibilities, one resident and one relative of that resident were recruited. This mix of participants enabled researchers to explore a range of perspectives from various stakeholders.

The nursing homes had been chosen to represent variety in size, organisational structure and previous DHT use. Three of them employed staff with basic experience of digital communication; one employed staff with experience of sophisticated DHT and digital algorithms for risk identification; and one employed no staff with experience of DHT.

To ensure potential participants were adequately informed, the researchers made preliminary visits to each nursing home to share information and provide leaflets detailing the study's aims and methods.

Data collection and data analysis

In the 'define and discover' and 'dream or imagine' phases of the study, the manager and the two nurses in each nursing home were interviewed individually, while the resident and their relative were interviewed together. This meant that 20 interviews took place in total; four interviews in each nursing home. The interviews were undertaken face to face and were audio recorded. Participants were informed that there were no 'right' or 'wrong' answers and the interviews followed a loose conversational structure, exploring participants' thoughts and experiences.

Interview questions focused on:

- » Participants' understanding of the term DHT.
- » Participants' experience of using DHT or of seeing it being used.
- » The potential benefits of using DHT.
- » What incorporating DHT innovations might look like in the future.

The interviews resulted in a substantial amount of qualitative data. The interviews were transcribed verbatim and the data were thematically analysed. The anonymised themes that emerged were used as the evidence base for two co-creation workshops, which formed the 'design or determine' and 'destiny or create' phases of the study. The ten nurses who had participated in the interviews took part in the co-creation workshops. The aim of the co-creation workshops was to design a nurse-led stepped process that supported the

effective implementation of DHT innovations in nursing homes.

Ethical considerations

The study was designed to ensure it upheld all the required ethical research principles such as consent, confidentiality and voluntary participation. Ethical approval was granted by the university where the researchers worked.

Findings

The thematic analysis of interview data identified three broad themes common to all participant groups (managers, residents and relatives, and nurses):

- » Improving communication.
- » Engaging with DHT and retaining humanised care. Humanised care aims to place the patient at the centre of care and includes elements such as compassion; it is opposed to task-oriented care, which focuses on the completion of tasks (Todres et al 2009).
- » Introducing DHT and protecting data security.

Managers

Participating nursing home managers had diverse experiences of, and attitudes towards, DHT – from supporting full engagement to believing that technology would not be useful. Their responses provided a rich and wide-ranging overview of their perspectives on enabling DHT innovation.

Improving communication

Overall, nursing home managers considered that DHT would become integral to nursing home care in the future. They understood that investment in secure digital systems and improved connectivity would be required to bring about benefits such as improved communication, digital algorithms for risk identification and risk management applications (for example digital alerts that are generated when a risk of falls is identified and suggest management actions).

One manager who was already fully engaged with DHT suggested that embracing innovation was part of their professional duty to improve care, saying 'It is the ethos of the home, we embrace progress and always like to move forward'. However, managers who had less experience of DHT expected there to be practical and administrative challenges with DHT implementation, for example training agency staff. Nevertheless, they recognised the benefits of a common digital communication system shared between health and social care services.

Engaging with DHT and retaining humanised care

Some nursing home managers discussed how residents might be anxious about the use of DHT in case it resulted in decreased human interaction; for example, one manager mentioned the possibility of 'staff looking at screens instead of looking at residents'. This was balanced by the views of other managers, who recognised the potential efficiency gains that DHT could bring; for example, staff spending less time 'doing paperwork' and using that time to 'spend quality time' with residents instead. Some managers suggested that easier access to residents' records could assist staff in identifying health risks and improve continuity of care across shifts.

Managers also suggested that using digital algorithms to monitor the risk of deterioration and identify clinical 'red flags' – such as skin breakdown on pressure areas – could 'back up staff's perceptions, intuitions and gut feelings' and ultimately improve care. Another suggestion was that DHT could increase opportunities for staff to communicate with relatives, who might be able to provide information about the resident's health, for example letting staff know what the resident had eaten or how mobile they had been during an outing. One manager commented: 'It would be fantastic if relatives could also input information on an iPad at the front desk.' Overall, managers suggested that the use of effective DHT that enhances personalised care would encourage staff to support digital innovation.

Introducing DHT and protecting data security

Nursing home managers felt that staff using handheld devices such as tablets and smartphones in the presence of residents would require careful introduction so that all stakeholders would be comfortable. Some concerns were expressed about potential technological challenges, such as giving agency staff access to temporary login details and managing the transition from paper-based to digital records. Some managers favoured gradual change, with paper-based and digital records running simultaneously for a short time and senior staff trained to cascade information to the rest of the team. Managers identified that discussion and detailed planning were the optimal strategies to move from paper-based to digital records, recognising that implementing change could be challenging but that sharing the potential benefits of DHT with staff could encourage engagement.

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Residents and relatives

The interviews with residents and relatives reflected many of the views expressed by nursing home managers. Participating residents and relatives had diverse levels of experience with digital technology, but most were positive about the introduction of DHT.

Improving communication

Residents and relatives identified that the 'age of technology' represented the future of healthcare and considered keeping up with technological advances to be important for nursing homes. They recognised that improved access to information would be positive for staff in terms of the efficiency and accuracy of internal and external communications.

Some residents and relatives suggested that devices such as tablets could be used to enable communication through online platforms such as Skype or FaceTime, as well as sharing updates between residents, relatives and staff. A further suggestion was that DHT would speed up information sharing in nursing homes and reduce reliance on paper-based records.

Engaging with DHT and retaining humanised care

The quality of care was often mentioned by residents and relatives, who were interested in the implications of DHT for human interactions and concerned about the possible depersonalisation of care. One expressed concern about 'forgetting the person in the room', while another stated 'they can't wash you while they're using a keyboard'. However, residents and relatives acknowledged that implementing DHT could improve communication and therefore release staff time to spend on care. When digital algorithms were explained to them, they recognised the potential benefit of having an 'extra set of eyes' that could assist in identifying risks and reducing errors.

Introducing DHT and protecting data security

Residents and relatives identified that DHT could pose a risk to data security and confidentiality, although they thought that most of these challenges could be resolved. Most of the residents and relatives thought that, if DHT was carefully introduced, the majority of residents would be happy to see it used in their nursing home. Overall, residents and relatives wanted to encourage DHT innovation.

Nurses

Participating nurses expressed an interest in DHT and regarded its implementation as the future of healthcare. They suggested that achieving successful DHT implementation would enhance the quality of nursing care, provided that the introduction process, cost, security and management were all carefully considered.

Improving communication

Nurses' responses indicated that they understood how DHT could be used to monitor health trends, such as blood glucose levels, more effectively than paper-based records or charts. Nurses identified positive effects of DHT on communication between staff; for example, DHT would enable information, such as a new resident's dietary requirements, to be communicated in real time. One nurse cited the example of a resident who was at the end of life and whose relatives had arrived at the nursing home to say goodbye; digital communication in the form of a mobile phone text message was used to alert cleaning staff so that they would not disturb the family.

Nurses were particularly interested in the use of digital records and their potential to reduce the burden of paperwork and save time. One nurse used the example of accessing a resident's latest podiatry appointment, explaining how this involved searching through paper-based records stored in the nursing home office, whereas DHT would enable staff to retrieve the information digitally through 'a single click'. With paper-based records, nurses and care staff had to spend significant amounts of time amending care plans; with digital records, it would be possible to amend care plans with comparative ease.

Engaging with DHT and retaining humanised care

The interviews with nurses showed that some had limited knowledge of the algorithms available through DHT. Nurses emphasised the value of knowing residents and using their own clinical judgement to identify any risk of deterioration, stressing that personal contact enabled high-quality nursing care. This was balanced by the understanding that the 'extra set of eyes' provided by DHT could be of assistance, particularly since nurses experienced high workloads and often relied on care staff observations to formulate clinical judgements.

Nurses felt that digital records would enable them 'to spend more time with the resident,

rather than on the paperwork', supporting the human interaction elements of care. They suggested that DHT innovations such as digital records and digital algorithms might release staff time, thereby reducing staff's workload, enabling them to take regular breaks and allowing them to leave work on time. Another suggestion was that time savings obtained through DHT would enable nurses to spend more time with residents, thereby improving their job satisfaction. Overall, the interviews with nurses emphasised that improvements in the work environment supported by DHT could benefit nurse retention and recruitment.

Introducing DHT and protecting data security

The security risks associated with digital records generated a significant amount of discussion, particularly in relation to nurses' professional responsibility to maintain confidentiality (Nursing and Midwifery Council 2018). While nurses identified that there were risks involved in using paper-based records, for example the risk of destruction by fire, they were aware that digital data security was a challenge, particularly when sharing data between settings. Nurses suggested that digital access to data would require careful management, including individualised and secure login details, and that access to patients' records should be traceable to individual members of staff. Agency staff would also require individualised and secure login details.

Training nursing home staff to use DHT was regarded as essential in the transition from paper-based to digital systems, with training tailored to individual staff's needs. A gradual transition to digital systems, with nurses leading the change from planning to completion, was considered the optimal strategy. Nurses suggested that 'DHT champions' could be involved in rolling out DHT innovations. Furthermore, nurses identified that DHT suppliers would need to provide 24/7 support to nursing homes in various formats, such as troubleshooting guides, telephone helplines and fast-response emergency visits. Nursing homes would need to purchase DHT devices and software and possibly upgrade their internet access. Nurses stated that the costs and benefits of DHT innovations would need to be carefully balanced if implementation was to be successful.

Overall, nurses felt that DHT could contribute to efficiency gains in nursing homes and improve the quality of residents' care and

the quality of the work environment. However, these improvements would rely on factors such as effective staff training, supplier support and data security measures, all of which were central to the planning and delivery of any DHT innovation.

Co-creation workshop outcomes

The themes that emerged from the data analysis were used to inform co-creation workshop discussions between the ten nurses who had participated in the interviews. Three main topics formed the structure of the co-creation workshops:

- » The process of DHT introduction.
- » Embedding DHT into daily practice.
- » Identification of successful DHT innovations.

The success of a DHT innovation was defined by its potential to enhance the quality of residents' care and staff members' experiences. The aim was to design a relevant, realistic and sustainable evidence-based process of practical steps that would enable nurses to implement DHT innovations in nursing homes.

An analysis of the data from all anonymised interviews was presented to the nurses. Co-creation took place through discussion between participants, the use of visual process maps, and the identification of important factors to consider before implementing DHT. This eventually led to the formulation of the LAUNCH process model, involving three steps:

- » Launching DHT.
- » Sustaining engagement.
- » Transforming care.

Box 1 details the steps involved in the LAUNCH process model.

Discussion

Findings from the interviews and outcomes from the co-creation workshops reflect existing evidence that DHT implementation can benefit those receiving and those providing care (Imison et al 2016). Participants identified improved communication and improved monitoring of clinical risk as important benefits of DHT, particularly using digital records and digital communication methods such as text messages between staff, residents and relatives.

The LAUNCH study findings support Wachter's (2016) recommendations that strategic planning and careful preparation of the nursing home workforce are required for the effective implementation of DHT. From the interviews and the co-creation workshops, it is clear that participants felt DHT could

Implications for practice

- Improving quality of care needs to be central to digital health technology (DHT) implementation in nursing homes
- The expectations and concerns of nursing home residents and staff need to be considered when introducing DHT
- DHT can enhance the identification of health risks and deterioration in nursing home residents
- DHT implementation can produce time and efficiency gains, releasing time for nursing home staff to spend with residents
- Benefits of DHT for nursing home staff can include improvements in their work environment and increased job satisfaction

have a positive effect on the quality of life of older people (Cotten 2017, Raney et al 2017). However, the findings also show that any plan to introduce DHT in nursing homes needs to consider the security of personal data, which is regarded as essential in gaining the trust of older people (Ware et al 2017).

The LAUNCH study identified nurse-led initiatives focused on improving quality of care through DHT innovation; for example, the use of digital photography to monitor wound healing. These initiatives were cited by participating nurses as reasons to support the implementation of DHT in nursing homes that did not previously use it.

Participants recognised that supportive leadership and a whole-team approach involving all stakeholders were required to launch and sustain DHT innovations and positively transform care in nursing homes. This reflected findings from previous studies

about the importance of organisations developing a leadership culture that supports innovation and change (Weng et al 2015).

The value of effective nurse leadership in implementing quality of care initiatives is cited in the literature. Effective nurse leadership involves nurse leaders ensuring that nurses possess the digital skills required to transform services (Remus and Kennedy 2012). Nursing home managers need to ensure that nurses are appropriately prepared and trained for leadership roles (Siegel and Sikma 2015).

Ensuring data security, prioritising care and avoiding replacing human interaction with technology were all seen by participants as important factors when considering DHT implementation. Garner et al (2016) undertook a review of the ethical responsibilities involved in introducing digital technology in care settings for older people in the form of a 'virtual carer' system. Reflecting the LAUNCH study findings, Garner et al (2016) identified concerns about the effects of technology on data security, about the replacement of human interaction with technology, and about ensuring that digital innovations were in the best interests of older people.

Limitations

The main limitation of the LAUNCH study was its small sample size, which means that findings cannot be generalised to a wider geographical area and/or to other nursing homes.

Conclusion

Some nursing homes in England are not yet fully engaged with DHT and nurse-led initiatives can support its introduction, optimising the potential benefits for residents and staff. The LAUNCH study has identified factors that can enable staff working in nursing homes to introduce and sustain DHT innovations such as digital algorithms and digital records. It has explored the perspectives of nursing home managers, nurses, residents and relatives on DHT and how it could enhance the quality of care and the work environment.

Co-creation workshops undertaken as part of the study enabled participating nurses to co-create a three-step process that supported the effective implementation of DHT innovations, which have the potential to release staff time, improve quality of care, and have positive effects on staff recruitment and retention.

Box 1. Steps involved in the LAUNCH process model

Step 1 – launching digital healthcare technology (DHT)

This step requires:

- » Preliminary scoping work led by nurses in collaboration with nursing home managers and owners; for example, needs analysis, security, costs and procurement
- » Prioritisation of goals such as high-quality personalised care for residents, efficient communications and early identification of deterioration
- » Launch strategy – for example whether it should be fast or staged – determined by local needs and staff members' training preferences
- » Optimal communication with all stakeholders
- » Multimodal and reliable 24/7 support available from DHT provider
- » Identification of internal DHT champions to provide peer support to staff
- » Time and resources for the transfer of paper-based records to a digital system
- » Stakeholder preparation and education

Step 2 – sustaining engagement

This step relies on:

- » Nurses empowering all stakeholders to engage positively with DHT, for example using a 'buddy' system
- » Efficient DHT provider support, individualised and secure access for staff – including agency staff – and simple processes for password changes
- » Positive feedback from all users
- » Early achievement of positive outcomes, such as increased amounts of time for staff to spend with residents and reduced paper-based records
- » Celebration of successes

Step 3 – transforming care

This step is achieved by:

- » Adaptable and personalised digital care plans for residents that can accommodate staff comments, forms and images and can be accessed by the wider multidisciplinary team, residents and relatives
- » Data security; for example, secure data storage and traceable access to patient records
- » Efficient internal and external communications
- » Improved recognition of deterioration; for example, through digital algorithms that identify clinical 'red flags'
- » Time savings enabling:
 - Increased social interaction between staff and residents
 - Positive transformation in care and residents' health outcomes
 - Staff training and professional development
 - Improved work environment, job satisfaction and retention

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