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Technology use for care, support and social connect in the community: preliminary findings from the DIALOGUE project

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ABSTRACT

Digital technologies (smart phones, tablets and smart speakers) are becoming prevalent in social care provision to facilitate older people to maintain independent living. However, there is a paucity of understanding of what type of technologies are being trialled by social care services, or if people are being offered the chance to use them. To understand what type of technologies may/not be suitable for social care delivery, a series of workshops were conducted across three sites in England (Northeast, Southwest and Central England), with adults aged 65+ years. Eighteen older adults were recruited: 13 were women; white British (n= 16); and seven self-reported a physical impairment, disability or social care package in place. Findings identified four themes: 1. everyday technology use, 2. perceived benefits of technology for care and independence, 3. concerns and barriers to technology adoption, 4. priorities for future technology-enabled care. This work identifies the need for researchers to be cognisant of challenges, including digital literacy, and it lays the foundation for future research priorities in the field of applied research in social care.

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1. Introduction

A combination of population ageing and declining availability of state resources to support this increasingly ageing population means that health and social care services across the world are seeking solutions to this growing area of demand (House of Lords, 2013; Organisation for Economic Co-operation & Development (OECD), 2021). As technologies continue to advance, social care services are looking to integrate recent smart technologies, such as smart phones, tablets, apps and, more recently, artificial intelligence and social robotic platforms into their services (Dikken et al., 2025). The integration of technology into social care services (Hamblin & Lariviere, 2023; Lynch et al., 2021) has been based on an argument described as a 'silver bullet'; increasing efficiencies in care delivery will inevitably solve the problem of growing care demands (Eccles, 2021; Gathercole et al., 2021; Lynch et al., 2021). However, there are nuances within and across this broad intersectoral, inter- and multi-disciplinary discourse, and understanding the wider contextual and societal impacts and relationships influencing the adoption of technologies in social care is imperative, especially if those receiving such social care services are to benefit.

Arguably, the greatest priority for local authority technology enabled care services is to help older people to age-in-place; to keep them living independently at home for as long as possible (Brittain et al., 2010; Gathercole et al., 2021). This may be achieved by returning home from the hospital sooner or by

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preventing or delaying entry into residential or nursing care (Eccles, 2021; Lynch et al., 2019; van Hoof et al., 2017). Such a policy goal for social care is generally supported by all stakeholders in the system, including older people themselves (Eccles, 2021, Gibson et al., 2024; Lynch et al., 2019). Yet, for many people, there are challenges to the uptake and use of technologies provided within social care to support this goal. Generating and then mainstreaming evidence for the effectiveness of technology-enabled social care services is frequently poor, characterised by small-scale pilot evaluations delivered across a highly fragmented social care sector and a historic lack of evidence to support their effectiveness when delivered at scale (Steventon et al., 2013; Howard et al., 2020; Lynch et al., 2019). In addition, there can be tensions between the stated goal of technology-enabled care (Woolham et al., 2019, 2021) and the degree to which such services can address the emergent interactions resulting from the creative individual use of technologies by service users (Gibson et al., 2019; Greenhalgh et al., 2013, 2015) or their carers (Steils et al., 2019). For older people themselves, factors that limit the uptake and use of technologies or lead to future abandonment include relative levels of confidence and self-efficacy when learning and using technologies (and the degree to which technologies and services providing them can be personalised to individual need) (Gibson et al., 2019; Gilbert, 2022).

1.1. Technology use and adoption in society

As social care technologies continue to advance, the greater the necessity of local authorities to explore opportunities for their deployment and adoption across the communities they support. Several off-the-shelf technologies are available that could be adopted to support formal community care provision and informal care delivery by family members. Such technologies include health tracking apps, handheld devices for remote monitoring of heart palpitations, smart speakers (e.g. Alexa) for informal caregivers of vulnerable people, or new forms of artificial intelligence (AI) (Dikken et al., 2025) software and social robots (Gilbert, 2022). When deployed within social care, such technologies can enable end-users to live independently at home (age-in-place) (van Hoof & Demiris, 2017) or return home from the hospital sooner. Importantly, when compared to existing services (Gilbert, 2022), these technologies and digital practices might be easier for end-users to use while also being preferable to what is usually offered and less expensive than traditional technologies offered by social care providers.

It is important to understand how social care providers and older adults, including those from marginalised communities (e.g. people with low income, people from diverse ethnicities, etc.) navigate the increasing provision of technology-enabled care services across social care (Marston et al., 2022). Co-production approaches provide means through which to explore new models of technology-enabled care service provision (Marston et al., 2023). Complementing co-production activities are frameworks including the 'Technology Acceptance Model' (TAM) (Davis et al., 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), to establish why people adopt or reject technologies. These models include four key factors to consider: (1) performance expectancy, (2) effort expectancy, (3) social influence and (4) facilitating conditions. Additional frameworks, including the dynamic acceptance model for the re-evaluation of technologies (DART) (Amberg & Fischer, 2005) and the system usability scale (SUS) (Borsci et al., 2009), can complement the TAM or the UTAUT, facilitating greater understanding of the technology evaluation (Vaziri et al., 2016). Models to assess the adoption of technologies in health and social care, such as the non-adoption, abandoning, scale-up, spread and sustainability (NASSS) framework, also provide mechanisms to evaluate the co-production of technology-enabled care service models within social care (Greenhalgh et al., 2017).

Co-production is a mechanism that has been postulated as a means to bridge divides between care technology providers, services and end users (Rolfe et al., 2024). When used in relation to technology research and development and in technology-enabled care service design, delivery and implementation, co-production can potentially reduce inequalities between service providers and their end users, bridging the digital divide and ensuring that technology-enabled care services meet the nuanced and dynamic needs of older people (Marston et al., 2023; Rolfe et al., 2024). Employing co-production activities together with members of the community, facilitated through community groups and organisations, affords multidisciplinary research teams the opportunity to identify appropriate applied solutions involving technology-enabled care services, benefiting social care provision now and in the future (Marston et al., 2022).

2. Methods

In this paper, we discuss findings from the DIALOGUE project, which collaborated with older people with experience using social care services to co-produce priorities for the future development of research for technology-enabled care within UK social care. Specifically, we report results from a series of co-production workshops with older people who either had used technology-enabled social care or had experience with others using it, held across three geographically diverse regions of the UK (1. Northeast, 2. Southwest and 3. Central England). The aim of co-production workshops was to understand what older people with experience of social care technology-enabled care services identify as priorities for the ongoing and future development, deployment, and implementation of technologies within social care. This data will be used to develop a future, person-centred agenda for social care-based research on the future delivery, adoption and implementation of smart care technologies to support ageing in place.

The research took place with a sample of older people with experience using social care-delivered technology-enabled care services in three UK regions. Services in each region were provided by local authorities (Northeast and Central England) or an Integrated Care Board (ICB) that integrates health and social care provision (Southwest England). Findings were generated through a co-production methodology built around a series of four co-production workshops with older people in each study region ($n = 12$). Workshops were conducted between April and December 2024. Two face-to-face workshops (Southwest England and Northeast England) were organised with the assistance of partner organisations in each region. Two were held in person in two areas (Northeast England and Southwest England). The third site (Central England) was held online to be inclusive of a geographically diverse group of participants living across central England.

Workshops used a structured, iterative co-production approach to identify experiences of using technology-enabled care services among workshop attendees (Table 1) (Greasley-Adams & Robertson, 2017; Robertson et al., 2020). Workshops were facilitated by two to three members of the research team: a lead facilitoator who conducted the workshop and a rapporteur who took notes. In the central England group, the PPI co-lead, an older person with experience in social care also co-facilitated the workshop. A member of each partner organisation was present to support administrative activities in each workshop (e.g. distributing pre/post workshop information, arranging transport, catering and reimbursements, etc.).

Workshop one introduced participants to the project and explored attendees' experiences of using household and care technologies to support their lives. Subsequent workshops produced an initial thematic analysis of data generated in workshop one alongside data from previous research projects involving team members (Marston & van Hoof, 2019) to create a series of four vignettes: exemplar scenarios of a particular characteristic or issue associated with technologies being used by older people or by social care services. These vignettes were used to explore in greater depth participants' thoughts and feelings pertaining to each scenario presented in the vignette. After presenting vignettes and gaining feedback about priorities, the research team generated a set of seven thematic areas that the research team identified as priority areas for future development in technology-enabled care research (Figure 1). A fourth workshop brought each group to a consensus in terms of which of the seven themes were priorities. Consensus was determined through a ranking exercise, in which each group was asked to rank themes from greatest to least important priorities at the beginning of each workshop. A subsequent discussion with each group took place, in which group members debated the relevant scores allocated to each theme. The scoring exercise was then repeated at the end of each workshop. Scores were aggregated in groups during each workshop and then across each group on a score of 1 (most important) to 7 (least important). Scores

Table 1. Workshop programme.

Workshop #	Workshop content
1	• Introduce members to the project partnership and set terms of reference. • Explore experiences of using social care technologies and consider social care technology priorities.
2	• Identify priorities for social care service delivery. • Identify specific technologies to be included in the project.
3	• To explore key outcomes and facilitators and barriers for technologies among service users. • Present service priorities and outcomes.
4	• To gain a consensus of key findings and priorities across groups. • Identify priorities for future outputs (e.g. papers, funding applications).

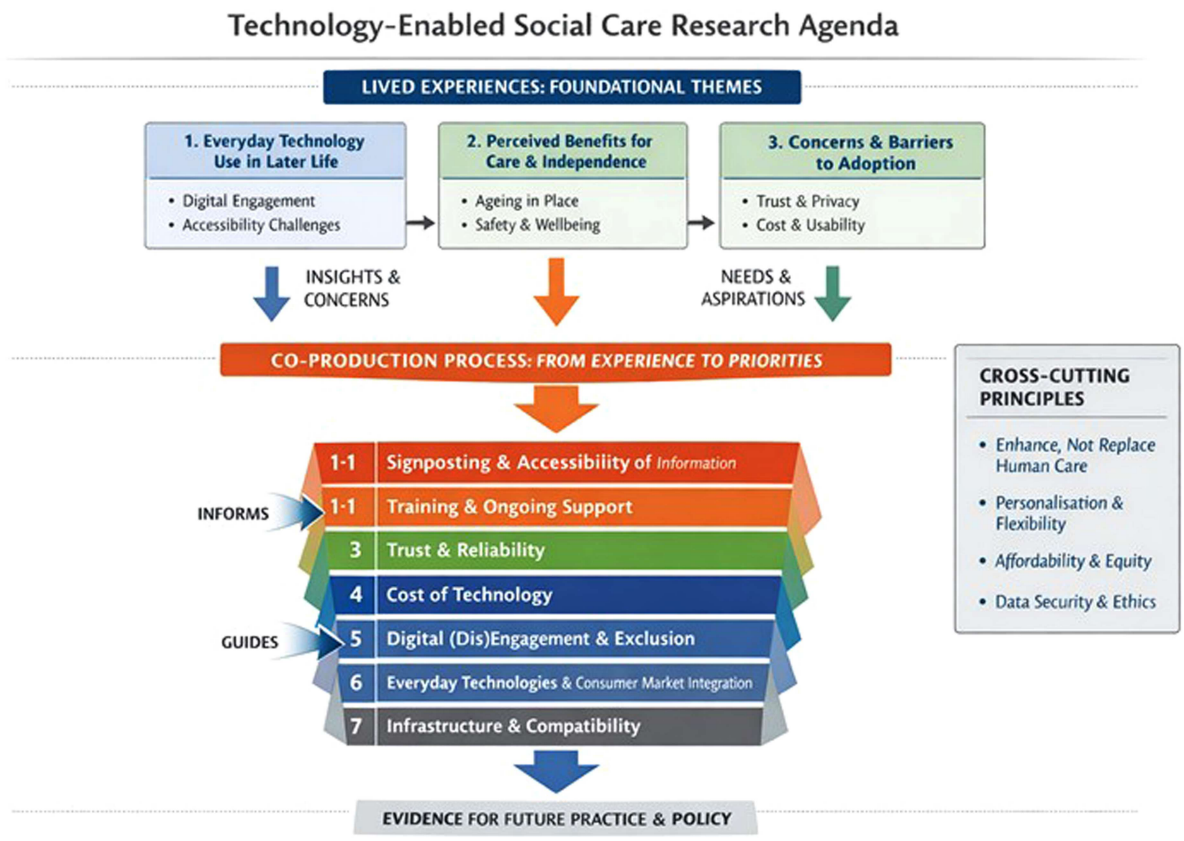

Figure 1. Framework diagram summarising research themes and research priorities.

were then aggregated together across all three groups. Scores for each priority were added together with scores ranked to generate the final order of priorities. Where scores were the same, the priority with more lower responses were ranked highest.

2.1. Participant recruitment

We recruited a convenience sample of self-selecting participants who responded to invitations circulated through our three community partner organisations who facilitated co-production activities. One organisation (Southwest England) was the local branch of a major UK charity that supported older people from a diverse range of ethnic and income-based groups. The second organisation (Central England) was a charity that supported older social care users to be involved in social care research. The third was a co-production group set up and facilitated by the participating local authority to support the development of their social care services. Each organisation facilitated the recruitment of older people with experience of using or caring for someone using social care services through their own network or contacts. Co-production sites were characterised by elevated levels of economic deprivation (e.g. Northeast), areas of economic wealth (Central) and significant variations in deprivation (Southwest). Study areas include areas with high (Central, Southwest) and low (Northeast England) life expectancies; populations older than the national average (Central) and higher-than-average minority ethnic populations (Southwest, Northeast). Participants were initially approached by the project partner, who approached older people using social care services within their existing networks of supported people. Those people who showed an interest in taking part in the project were then contacted by a member of the research team and sent further participant information from the research team and given an opportunity to ask any questions. All the participants were asked to provide written consent at the beginning of the first workshop via a provided consent form. Participants were also asked to re-confirm consent verbally at the beginning of each subsequent workshop. Eighteen

Table 2. Participant characteristics.

Partner name/ID	Sex	Context
NE1	Woman	White British. Telecoms engineer.
NE2	Woman	White British. professional.
NE3	Woman	White British. professional.
NE4	Woman	White British. professional.
NE5	Man	White British. engineer.
CE1	Woman	Lives with a 24-h social care package funded by the local authority
CE2	Woman	Has a lifelong physical disability.
CE3	Woman	Has multiple long-term conditions.
CE4	Man	Is visually impaired.
CE5	Man	Is visually impaired.
SW1	Woman	Lives with a physical disability. Immigrated to the UK as an adult from a Middle East nation.
SW2	Man	White British.
SW3	Woman	White British.
SW4	Woman	White American.
SW5	Woman	White British.
SW6	Woman	Spouse of SW7. Has a diagnosis of dementia. Black British.
SW7	Man	Spouse and carer of SW6. White British.
SW8	Woman	White British.

Note: NE = Northeast, SW = Southwest, CE = Central England.

people participated in the workshops across all the sites (Table 2). The majority of participants were women ($n = 13$, 72%), and most were of white British ethnicity ($n = 16$, 88%).

2.2. Data analysis

With participant consent, workshops were recorded to support analysis and interpretation, and extensive notes were taken throughout. Discussions in each workshop were initially analysed, with data collected in the form of field notes, recordings, documentary analysis of activities undertaken during workshops and workshop transcripts. We used an iterative approach to data analysis, with data collection and analysis occurring concurrently so that insights from early workshops informed subsequent workshops. Our analysis followed the five-step process proposed by Braun and Clarke's thematic analysis (2006). Firstly, transcripts were read and re-read to support familiarisation with the data, followed by the development of initial codes, the identification of themes and then the subsequent review, refinement, and naming of those themes. Initial themes from the first workshop were also developed into the four vignettes, which then formed the basis for discussion in the following two workshops. Fieldnotes from the workshop were incorporated into the analysis to strengthen our reflective and interpretive process. To enhance credibility, themes were reviewed and discussed in ongoing group analysis sessions and in wider team meetings.

2.3. Ethics and co-production groups

The project recognised the central importance of the co-production group participants as equal partners in the co-production process. Ethical principles to inform co-production in ageing and dementia research, such as NIHR's INVOLVE co-production guidance tools (NIHR, 2024) and the DEEP Dementia Enquirers Gold standards for ethical research (DEEP, 2023a) and co-research (DEEP, 2023b), were used to ensure that co-production activities were conducted in an ethical, equitable and supportive manner. Both frameworks promote the recognition of shared values and of building relationships of trust and respect, and which acknowledge the skills and strengths of all participants. To manage the co-production groups, specific team members were allocated to support participants in each group alongside a dedicated project PPI lead and co-lead from an older person with lived experience in social care services. The project team developed a series of co-production protocols to support co-production activities, including a co-production participation agreement, information on support mechanisms (e.g. translation, support workers, reimbursements for participation and travel) and a set of 'house rules' to reduce the role that power dynamics may play or to manage any disagreements arising during meetings. To reflect the demands of participating in each workshop, all participants received reimbursement for participation at NIHR-recommended rates (£150 per day) alongside payments for travel and any support workers needed to participate. Briefing and de-briefing documents were provided to participants before and after each meeting. Ethical approval for

DIALOGUE was obtained via the lead institution [GUEP 2024 18182 13299] in April 2024. The research was conducted in accordance with the Declaration of Helsinki (World Medical Association, 2024).

3. Findings

At the first workshop, participants were asked to discuss their use of digital technologies in relation to care, what they viewed as the benefits of using these technologies, any concerns they had with the technology, and to identify priorities for how technology should be used in technology enabled social care services. Work in the initial workshops focused on the following theme—*existing technology usage*. Subsequent workshop discussions using vignettes were used to elicit a second and third theme of *benefits of technology use* and *concerns and barriers to technology adoption*. The final workshops synthesised discussions across all workshops and all groups to create and rank a series of *priorities for future technology-enabled care*, generated from the perspectives of the social care service users themselves.

3.1. Everyday technology use in later life

A summary of the vignettes used in the workshops and the key findings attached to each vignette can be found in Table 3.

Table 3. Summary of vignettes, discussion points and key implications for research.

Vignette	Scenario summary	Technology focus	Major discussion points	Key implications for research & practice
Vignette 1: Subah and the KOMP	62-year-old woman ageing without children seeks easier ways to stay connected with geographically dispersed family. Introduced to a one-button communication device (KOMP).	Accessible video communication device (single-dial interface).	• Importance of inclusive and simplified design • Value of visual communication for reducing isolation • Lack of awareness/ signing to such devices • Potential for mainstream devices to adopt accessible features	Inclusive design principles should inform both assistive and consumer technologies. Improving signposting to existing accessible technologies is essential.
Vignette 2: Alan and the Falls Detector	75-year-old widower recovering from hospital discharge after a fall. Offered a wearable fall detector linked to a family/call centre.	Wearable fall detection and remote alert system.	• Increased sense of safety and reassurance • Technology should complement, not replace, human support • Risk of over-reliance on family • Importance of discharge planning and coordinated response systems	Monitoring technologies must be embedded within integrated care pathways and clear response protocols. Voluntary use and person-centred consent are critical.
Vignette 3: Fred, Mavis and the Medication Carousel	Couple managing early dementia; occupational therapist suggests connected medication dispenser with GP oversight.	Connected medication dispenser with adherence monitoring.	• Practical usability for people with cognitive impairment • Risk of over-complexity • Questions about remote monitoring and autonomy • Need for ongoing support to maintain usage	Cognitive accessibility and real-world usability must be prioritised. Monitoring should balance autonomy, safety, and dignity.
Vignette 4: Doris and GPS Monitoring	93-year-old woman living independently; family suggests a wearable GPS tracker for safety.	GPS location tracking device.	• Privacy concerns and surveillance anxieties • Consent and dignity in later life • Fear of being 'watched' in the home • Trust in who accesses data • Distinction between safety monitoring and intrusion	Ethical safeguards and transparent data governance are essential. Technologies must respect autonomy and minimise perceived surveillance.

Participants described themselves as generally technologically literate, using a wide array of household consumer technologies, such as smart phones, tablets and laptops, smart TVs, kitchen gadgets and smart 'internet of things' devices, such as smart speakers, thermostats and sensor devices. The majority were familiar (if not always comfortable) with using technology for activities, including seeking out information on the Internet, for more domestic use, or for accessing retail (shopping, banking) and post-COVID, public services (GPs, social care). For most, technologies were therefore a ubiquitous feature required to live their lives and participate in society.

> **NE5:** *I've got a smartphone. I use computers. I play with computers. I do things like putting Linux operating systems on them and trying different operating systems and things. We've got a Smart TV. We've got Google Home. Anything else? We've got microwaves. We've got air fryers. A washing machine. Fridges. You know, the usual general domestic appliances, to some degree or other, use some sort of IT technology.*

> **NE2:** *Well, I think it's so much part of your life that you probably don't even think it's technology. But, yeah, similarly to the others, computer, iPad, smartphone, used to do a lot of Zoom meetings, Teams meetings, the Google variety [...] I do lots of things, you know, banking. Internet banking, that type of thing. I don't know. It's just so much a part of what you use every day that you don't even think, "Oh, that's technology".*

The workshops indicated differing levels of enthusiasm for technology and its use in their everyday life. Some talked of their enthusiasm for the future of technology in care and how they had embraced technological support to make their lives easier. One participant called herself the 'gadget lady', demonstrating a level of knowledge that marked her as distinct from many social care technology users:

> **CE2**: *Well, I'm known as the gadget lady. I absolutely love everything. So I'm already all over it. I've got everything going. I watch programmes on it and so I'm very into AI. That sort of thing. It's very funny because I had a technical advisor [from social services] come out to give me some advice on how I could be technically more independent in this home and he actually offered me a job [...] he said I knew as much as him, probably a little bit more.*

Other participants gave more pragmatic and circumspect reasons for engaging with technology, highlighting an apprehensiveness associated with the requirement to engage in technologies as more and more essential services moved online.

> **NE4:** *I think we should mention that the reason why we got involved in the (workshop) thing is that we didn't have smartphones, and we were apprehensive of being left out of a lot of things because you need a smartphone for accessing stuff and getting tickets, rail tickets, etc., on your smartphone, which you couldn't do on the ordinary phones that we had before.*

Where positive views were given, a key issue related to the accessibility of device designs, particularly for those with visual or cognitive impairments. One of the vignettes (Vignette 1) from 'Subah' concerned the use of the KOMP, an accessible device for video calls that is controlled with a single dial.

Vignette 1. Subah and the KOMP

Subah is a 62-year-old woman who recently took a severance package from her employer. She has never married, is ageing without children, and her extended family are scattered across the UK and Bangladesh. She enjoys cooking, growing vegetables, volunteering at the local charity shop and church and arts and crafts. Despite her busy social schedule, she wished that it was easier to keep in contact with her family, particularly ageing aunts, and cousins in Bangladesh. Barry, a friend from church, recommended Komp, a one-button computer that can be used to send messages, photographs and videos to any other smart device, such as a mobile or computer. Barry mentioned that he used the device to keep in touch with his grandson in Australia.

Participants praised KOMP's single button design as an exemplar of inclusive design whose principles should be applied across assistive devices, which could also influence the design of inclusive versions of household consumer technologies such as smartphones or tablets. Interestingly, this discussion suggested that many workshop participants were unaware of the existence of such devices on the commercial retail market or through care services, indicating that a lack of effective signposting to such devices remains a significant barrier.

Despite their ubiquity and often required use for social life, some expressed frustration with the unintended and sometimes intended consequences arising from the integration of many consumer technologies into health and care services. Digital counterparts to legacy, analogue products, systems or

services (e.g. remote GP consultations) as they increasingly moved online were considered problematic for many reasons, including difficulties with navigating online resources and increasing isolation for people who previously enjoyed interacting with local services in person. Despite familiarity with technology, some participants lamented the shift to solely digital technologies to access the same services and systems. Some of the problems associated with the new technological default could be mitigated, but these could also introduce new barriers for those unfamiliar with them.

> **CE5**: *I get text messages which I do not find accessible. I can't read, you know with the speed [because of my sight loss]. Can't understand. I try to but it's quite complicated. I can't go by character by character or word by word and so I try to, you know, tell them please send me by e-mail. But you know, nowadays most of the people send you by text messages. I use Alexa. Alexa is good. But again, Alexa may not understand my accent or speech. For example, if I send a WhatsApp message and the name of the person is spelt incorrectly, it gets difficult.*

In a similar vein, one individual in the Southwest of England had made extensive use of Alexa smart speakers, but eventually abandoned the device when Alexa repeatedly responded, 'I don't recognise that' to his queries, arguing that *'we won't go back to technology if it makes us anxious'*. Unsurprisingly, these devices could quickly be abandoned if people experienced such frictions on a regular basis, even if only for a short time.

3.2. Perceived benefits of technology for care and independence

Participants noted the importance of living independently at home for as long as possible, highlighting how technologies within the home could support them to achieve this aim.

> **NE1:** *I've got a fear of going in a home. I want to stay independent as long as I can in my own home. Whatever it costs, I just get everything in to stay in my own home, really. And I think a lot of people would rather be in their own home if they could.*

Well-established care technologies, such as pendant alarms, door sensors and fall detectors were also in common use. Discussing a vignette about Alan's use of a fall detector (Vignette 2), the participants recognised that such technologies could increase confidence and safety post discharge from hospital, provided that the device was optional and complemented human support.

Vignette 2. Alan's experience of using a fall detector

Alan is 75-years-old and has recently widowed. His wife Stella died 8 months ago from a neurological condition at the age of 72 years. Alan is adjusting to live on his own in Bristol; his daughter, Amy, lives approximately 2 h away and tries to visit him on the weekend. Alan still has friends and tries to maintain odd social events at his local club, where he could still interact. However, he does not always feel confident to leave the home unassisted.

Alan recently experienced a bad fall, which resulted in a fracture to his right leg and hospitalisation. After surgery to repair the fracture and a few days to recover, the ward's consultant was concerned about appropriate support for him to return home safely. An assessment from Emma, a hospital occupational therapist, presented an opportunity. Alan could be discharged within the next 24 h, if he agreed to wear a fall detector on his wrist. The fall detector would be connected to his internet at home and would notify Amy on her mobile or a local call centre, if he had fallen again.

This vignette triggered discussions about people's own experience of using fall detectors, noting the enhanced sense of safety and security for friends or family members, if a family member was vulnerable to falls—although notably it was rare for workshop participants to include themselves in such considerations.

> **NE4:** *Well, I know several people who've had falls at home, and they didn't have any technology, or anyone to call at all [They didn't have a necklace [= pendant alarm]?] No. I mean, they do now, so that's improved, but, you know, people that we know. So, you know, quite nasty falls and really hurt themselves, and had to bang on the wall for a neighbour or something. But now, this particular person has got a similar thing to (NE1). She feels much more safe and secure.*

People with dementia were identified as a particular group who could benefit from assistive technologies, with several participants noting how care technologies such as fall detectors, GPS monitors and pendant alarms could provide them, or more commonly their families, a greater sense of safety and security:

NE2: *My sister's husband had Alzheimer's disease, and they had alarms on the doors, so she knew if he decided to do a runner or anything. Because one night, he did go out and they found him at his daughter's house. So she had these installed. I think the council must have installed them, and that gave her a lot more peace of mind that, you know, she would know if he was trying to launch an escape.*

In supporting people to maintain social connections with family and friends, such technologies had the potential to generate wider benefits for wellbeing by maintaining abilities and potentially reducing the likelihood of further declines in health. **SW3** split her time between living in Southwest England and Central England. She described the importance of her smartphone to enable her to stay in contact and feel like 'part of a community' with people in both areas, no matter where she currently resided. **CE3** also expressed similar thoughts about technologies, but in her case noting the benefits of continued social connection for physical health.

CE3: *Especially when you've got any kind of disability, it's very easy to become isolated and you can get a bit down about the things you used to do, and you can't do now, and that can put you in a downward spiral. So I think it's important to have communication with outside people. If you can't physically go out, see them online. It really makes a difference.*

Participants identified examples of the specific technologies they liked to use, from ubiquitous technology such as email and WhatsApp to piloting sophisticated new devices, such as virtual reality headsets. Voice-activated digital assistants were popular for providing a convenient way to set alarms, provide information quickly and mitigate issues with mobility, such as hand dexterity:

CE1: *one thing I learned about 3 weeks ago from one of my PAs was how to use Siri to take a screenshot and I can't quickly do that myself. So that's been quite useful.*

Technologies, such as Google nest which allowed for lights or thermostats to be turned on/off remotely (via an app) or set on a timer, could be potentially helpful for those who have lost their mobility. 'Fancy' video doorbells also aided someone who has mobility needs or even act as a form of security (video via the app). Such devices could be used in combination with personal care to support a person to remain at home. Taken from field notes, the scenario below describes one participant's use of an array of devices, including traditional aids and adaptations, household digital technologies and care technologies in combination with personal care and paid services to support her.

NE1: *spoke about her own personal use of different technologies that have supported her social assisted living needs. She has mobility needs and uses an electric scooter to access outside spaces, she also has chronic obstructive pulmonary disease (COPD) which leaves her with shortness of breath and fatigue. She has no help through social services, and pays for her pendant alarm through the council at £5 a week. NE1 has a carer to help dress and wash her, a cleaner to help with the house. She has a variety of aids and adaptations to help in and outside of her home, including: a raised toilet seat, grab rails, a ramp outside her home, 2–3 walkers and walking sticks, and a smoke alarm that is linked to her bed so that it alerts her in case of a fire. (workshop field notes).*

Overall, the participants highlighted the importance of combining configurations of household and care technologies as key supports for independence, safety and wellbeing. Established care technologies, such as fall detectors, pendant alarms and door sensors, were valued for increasing confidence and providing reassurance to both users and families, particularly for those at risk of falls or living with dementia. Everyday tools such as smartphones, messaging apps and voice-activated assistants were seen as vital for sustaining social connection and reducing isolation, while emerging smart home technologies had the potential to offer additional support for mobility, security and convenience if and when integrated into current care services. Collectively, these accounts emphasised how combining traditional assistive technologies with newer digital household technologies can further extend autonomy, promote social participation, and enable older adults to remain at home for longer periods, achieving ends greater than in the use of such technologies and services in isolation.

3.3. Concerns and barriers to technology adoption

Alongside the perceived benefits, participants voiced a range of concerns about technology-enabled care, focusing on accessibility, affordability, trust and the risk that technology might replace human support.

Concerns about technology focused on issues of accessibility. Examples included difficulties with getting online and the need for better 1:1 support to be provided, particularly for disabled people. Smart technologies, such as Internet-enabled TVs and voice-activated software, were considered challenging by some of our participants, with more basic technologies, such as non-smart phones and email communication, being preferable in these cases. Care technologies raised other concerns about their user-friendliness, seeming to be designed in the interests of services rather than service users.

A key concern shared across all three sites is related to people's ability to access appropriate technologies. Ensuring that people and/or services were in place to facilitate and coordinate access to and use of technologies provided as part of a person's formal or informal care was emphasised as a priority. Poor signposting to suitable technology was considered a major barrier to older and disabled people's ability to embrace technological options, regardless of whether the technologies were commercial retail devices or devices offered through care services. This was specifically noted by a participant who had a neighbour, no children living close by and any familial support network living in another part of the country. She had dementia and was unable to remember how to use video calling even though she loved seeing friends through it.

> **NE4:** *She's convinced that she wouldn't know how to use it, even though she's been told lots of times, she can't retain the memory of how to use it. And there's a great desire to be in contact with friends, and she would use her landline, and she's absolutely delighted if she sees something on FaceTime or whatever, where you can see the person, but she's unable to retain how to do it herself. So there's a willingness there if somebody else is facilitating it, but there's a barrier.*

Another participant who was also living with dementia explained her difficulties when using similar technologies to access her GP via the surgery eConsult platform.

> **SW6:** *[It was] horrendous, people don't want to answer 10 pages of irrelevant questions. The receptionist may do it for you but gets it wrong.*

She expressed frustrations with a 'slow' computer and '*multiple-choice questions that do not cover everything*'. Reflecting on the effects of her dementia, she explained that she '*couldn't do the trail of things that you need to do*'to use the system.

Vignette 3. Fred, Mavis and a medication carousel.

Fred and Mavis have been married for 42 years and have recently moved to the city of Milton Keynes, after spending most of their lives in London. Mavis retired 18 months ago after experiencing a couple of transient ischaemic attacks (TIAs). Health practitioners have recently informed Mavis and Fred that Mavis has early signs of dementia.

Both Mavis and Fred have discussed this situation, and they want to explore what kind of assistive technologies are available that could offer support to each other. They have a niece, Rachael, who lives 30 min away, and she has offered to help them whenever she can. They are surrounded by nice neighbours who have offered to help them with anything they need (such as shopping, gardening, health checkups and socialising). While Mavis's condition has not deteriorated too much, the future is very uncertain, and they still enjoy socialising with friends through the church.

Jane, an occupational therapist from the local council, has suggested a connected medication carousel to help Mavis take her medication to control her health problems. The medication carousel provides an alarm to Mavis to remind her to take her medication at specific times of the day. Mavis' GP can remotely check to see whether she has adhered to the medication dosage as prescribed.

One of the vignettes (Vignette 3) featured a connected medication dispenser and explored the complexity of using technology to support medication management. The connected medication carousel was seen as helpful for medication management, with features such as alarms and remote GP monitoring. However, there were questions about how these features worked in practice and whether it was realistic for a person with dementia to use it without significant support.

The role of local authorities in signposting people to appropriate technologies was questioned. Notably, people's existing relationship with social care influenced some views about accessing technology-enabled care services:

> **CE1:** *I just worry. I personally don't want digital things in my home that reduce my social care package. At the moment they've not got a digital robot that can manage to take me to the bathroom, etcetera, so I'm not too worried about it, but it does concern me a lot, especially in the climate that we're living in, where social care is*

underfunded. A lot of my friends are having to give their care packages back because they can't afford the charges and I do feel that a lot of local authorities are upping the charges in order to ration out social care.

Few participants felt they had access to good sources of information about technology, and most people learnt about technology by doing their own research or hearing about the experiences of others. Some participants noted the role other actors, such as friends and family and third-sector organisations played in signposting participants to appropriate care technologies. Charitable or community-based organisations, such as British Wireless for the Blind Fund and the Royal National Institute for the Blind, were described as good sources of signposting to support the use of technologies.

In contrast, consumer technologies were felt to be more aesthetically acceptable when compared to care technologies, such as community alarms, mobility aids or service e-platforms, which fit more seamlessly into their everyday environments and lives. However, the flip side was the amount of information such technologies routinely hold about individuals and the potential for these data to be misused. Examples of such misuse included privacy concerns associated with data collected by technologies, such as a GPS location monitor, explored in one of the workshop vignettes (Vignette 4).

Vignette 4. Doris's experience of using a GPS location monitor.

Doris is a 93-year-old woman who has lived in Yorkshire village for 80 years. She lives independently in her council house, which she used to share with her husband. However, Stan died 25 years ago; she has five children, seven grandchildren and four grandchildren. Some of her grandchildren and great grandchildren live abroad; however, the majority of her family still live close by. Each week, two of her children pick her up and take her out for the day, either to do grocery shopping, for lunch, or for a day trip. Doris is partially sighted and relies on her children to help her; although she can still cook her dinner and lunch, she does have trouble walking outside on her own and needs assistance.

Her children would like to ensure her safety when they are not with her and are wondering what type of technology they could use. They are not really tech savvy, but they use a smartphone and have social media platforms. Doris also welcomes the concept of having her children/grandchildren keeping an eye on her for safety. Although she has stated that she does not want cameras up and around the house, because she does not want to feel as though she is being watched or spied on. Simon, one of Doris' great grandchildren, recommends a wearable GPS tracking device to Doris in case she gets lost or has a fall when she leaves the house.

While GPS monitors are typically used to monitor people with dementia when outside the home, participants highlighted the potential for such technology to be misused in the home, acting as unwanted surveillance, either by state actors (social care services), or in the form of intrusive monitoring from family members. Having any form of monitoring in the home would make them feel as though they had to 'behave' and consider how they would feel if the bathroom was monitored and 'going to the loo'. Interestingly, many telecare systems monitor such activities but were not overtly associated with such difficulties, suggesting concerns over privacy relating to the potential misuse of monitoring devices for other purposes (e.g. data harvesting by private companies).

One specific, if unsurprising fear highlighted regularly in all three groups and arising from being increasingly required to engage with digital technologies for everyday activities such as online banking related to people's experiences and vulnerability to being 'scammed'.

NE1: *Well, I've been scammed twice with the computer. I've had to buy a whole new computer, change all my bank cards and everything, because somebody got into my computer and remotely controlled it and had access to all my bank details and everything, and I was imminently going to transfer £9,000 over, and my chiropodist arrived and she said, "This is a scam." I was on the phone. "We should go to the bank straight away now and report it to the police and go and change all your bank cards." [...] It was my own fault. It was just so convincing, and I was so gullible [...] But at the time it happens, and it's happened to me twice, it's happened with something else as well, at the time it happens, they're so convincing, they panic you. Like, you must have panicked.*

Most participants reported either having experienced telephone or Internet-based scams or feeling that they were at greater risk to them, leaving those who had experienced this feeling vulnerable and less trusting of digital technologies. The regularity of such feelings raises moral and ethical questions when access to services is dependent on technologies that can put older people at risk of such harms. This also gives rise to an expectation that where people are required to use technologies to access services, then those self-same services bear responsibility to mitigate risks of harm, including social harms such as scams.

Related to the lack of signposting and ongoing support for both care and household technologies, supporting technological self-efficacy and ensuring that technology is matched to an individual's needs helped older people to become more confident in using technology.

NE3: *But how do you get people to be confident enough to use the technology? I think that's the big issue, really, isn't it?*

Our participants felt that there was a real need for digital champions—individuals or services who could educate people about technologies on offer and how to use them and provide ongoing support for technologies within the community. Despite the existence of such services, for example, within public libraries, several participants continued to highlight a lack of awareness of such schemes and the need for further education and additional materials to guide them in how to use the range of technologies available to them. **SW1** explained the need for guidance and educational resources to be available in multiple ways, stating that '*people hear and understand in the moment when they're on the phone, but forget quickly [or] lose focus*'.

While there was enthusiasm for technology to support care, most participants were ambivalent or hostile to the idea that technology should be the focal point of future services, particularly if it was positioned as a replacement for human care. Some participants worried that technology might reduce or replace human care packages. As one participant with high support needs explained:

CE1: *"At the moment they've not got a digital robot that can take me to the bathroom … but it does concern me … a lot of my friends are having to give their care packages back."*

There was consensus that technology alone would be insufficient in such cases–rather, it should complement a more holistic approach to care plans that balance physical and emotional needs. However, given how fragmented services—GPs, pharmacies and local authorities—appeared to be, a significant question was whether this range of services could share responsibility for managing alerts and maintaining devices, as well as what would happen if no one responded to any alarms. They reiterated the challenges with current technologies and felt that there may be better options, notably family and friends, to rely upon when they had difficulties. Despite enthusiasm for technology, the key priority in such conversations was to emphatically de-emphasise the centrality of technology to care and focus on how people can be enabled to provide care supported and augmented by technology instead.

One of the most frequently discussed concerns, occurring at all three study sites, was a lack of clarity over the cost of technology, particularly digital care technologies. A lack of clear information available about how much the different devices cost, or any subscription fees that might be required by local authorities, created anxiety and therefore a reluctance to pursue technological options. **SW1** explained that she was worried about the costs associated with accessing or using digital care technologies and the infrastructures they relied on (broadband and power) due to living on a fixed income. '*I know that it will probably cost me something, but I don't necessarily know what*'. There was also acknowledgement that digital care technologies '*could save money for the NHS*' and could be '*cheaper and better for people's mental health and keep them out of care homes*' (SW3). However, these benefits would be negatively impacted if costs were transferred from services to individuals, meaning that some in need would be unable to afford the costs. As a result, many scholars have argued that when used for care purposes, such technologies '*should be free for some people*'with little or no income.

Taken together, these concerns underscored participants' view that technology must remain accessible, affordable, trustworthy and embedded within supportive human care systems, if it is to be acceptable and effective. Collectively, these findings highlight the need for accessible, affordable and user-centred technological design, supported by clear signposting, ongoing local support and policy safeguards to ensure that technologies enhance rather than diminish care.

3.4. Priorities for future technology-enabled care

For the final workshop, groups were presented with a list of seven themes identified from an analysis of the previous three workshops (Figure 1). Each priority was discussed to ensure a common understanding before each workshop group independently ranked their relative priority and importance (Table 4). Groups identified the two highest priorities to be signposting and information provision about technologies and providing adequate training and support in technology usage. Infrastructure, design and environment were unanimously considered the least important in relative terms.

Table 4. Ranking of themes by priority.

	Rank			
Theme	Northeast England	Southwest England	Central England	Total rank
Signposting and accessibility of information	1	3	1	1
Everyday technologies	5	6	5	6
Trust and reliability	4	4	2	3
Cost of technology	7	2	4	5
Digital exclusion	3	5	4	4
Training and support	2	1	2	2
Infrastructure	6	7	7	7

3.4.1. Signposting and accessibility of information

Better signposting to technology-enabled care services was a recurrent issue arising across all the groups. Knowledge about specific care technologies was rare, with most participants being unaware of devices, and knowledge/access usually depends on direct referrals from social care services after interaction with health care. While general household technologies were available and had significant potential to support care, older people were unaware of scenarios where such technologies could help or feel overwhelmed by the range of technologies available. Signposting services, offered by trusted sources, such as GPs or local charities or support services, could provide personalised and person-centred support regarding potential technologies, including how to appropriately integrate them into a person's existing patterns of care or perceived needs. Participants stressed the importance of clear, centralised information and outreach, especially for those who are not digitally connected.

3.4.2. Training and ongoing support

Personalised, ongoing training and support with technologies should be available both to users and carers, with community initiatives and digital champions suggested as valuable resources. Teaching methods must be adapted to users' skill levels, and there was resistance to age-based assumptions about digital competence. For technology-enabled care services, thorough orientations to technologies and ongoing contact for support and to assess ongoing needs were also indicated as key priorities.

3.4.3. Trust and reliability

Trust and reliability of technologies were highlighted as a key concern which would influence the adoption of technologies as part of a person's care. While accessing services was becoming increasingly dependent on technologies (e.g. remote GP consultations via tablets or smart phones), trust issues were raised throughout workshops. Such technologies and their integration into services may be seen as unreliable or untrustworthy. There was a preference for tried-and-tested technologies or substitutes for tried and tested technologies. In systems where these technologies complemented, not replaced, human-care-human supports could help people in navigating these platforms. Trust in local authorities or NHS-endorsed services tended to be stronger than that in commercial offerings, meaning that greater trust could be placed in care service-provided devices rather than those sought privately.

3.4.4. Costs of technology

Household technologies usually involve a cost, while many care technologies may require subscriptions or care fees provided, even if offered by care services. While weekly fees for services were often seen as affordable, upfront costs could be a barrier, particularly if users were purchasing household technologies. Family members may purchase devices on a person's behalf, but this raises questions about how ongoing subscriptions may be covered when needed (e.g. a broadband connection or monthly subscription to services underpinning a device). In the face of difficulties accessing care services, such as waiting times or difficulties with referrals, some choose private purchases or used household technologies as alternatives. Finally, there appeared to be a lack of awareness and/or misperceptions about how technologies provided by social care services would be paid for—did recipients have to pay or were these provided by social care services with no charge. The reality for funding such devices was messy, involving subscription costs for some, free access for certain conditions or for state benefit claimants and a general lack of awareness of

what funding models for care technologies could and should look like. Clarity was therefore needed in order to promote greater transparency and trust.

3.4.5. Digital (Dis)engagement and exclusion

Many older adults identified digital exclusion as a barrier to accessing technologies to support with care. A lack of skills, support, confidence or trust in digital platforms, such as social media, had wider impacts when accessing care technologies or when using household technologies to access care services. Participants acknowledged that digital connection is increasingly necessary to access services and that this has not only accelerated but also highlighted the need for simpler, safer and more accessible technology, signposting and support services to help access technology and that technology supplemented rather than replaced human care.

3.4.6. Everyday technologies and the consumer market

A range of retail household technologies have the potential to be integrated into care, with an increasing number of such devices also being provided by social care services (e.g. Alexa speakers, GPs monitors). However, awareness of available technologies, ways in which such technologies are integrated into formal and informal caring practices and issues of trust and privacy limit their uptake. Participants emphasised that consumer trust was more easily established with products recommended or supported by trusted organisations, such as social services rather than private companies.

3.4.7. Infrastructure and compatibility

The provision and use of care technologies was dependent on the existence of adequate technological and care infrastructures. Technological infrastructures included both hard components such as broadband connections of adequate quality and speed. Care infrastructures included informal carers (e.g. family members) with an awareness and ability to provide, install and monitor technologies on an ongoing basis and formal care services that were able to respond to technical problems or to changes in care needs. Frustrations with outdated or incompatible technology and issues such as poor broadband access limit people's engagement with technologies.

4. Discussion

This paper reports findings of a project with the goal of co-producing, with older people with experience of social care services, priorities for research that can support the continuing development of technology-enabled care services in social care. Technology use and adoption have been areas of scholarly research for over 30 years, founded through the domain of gerontechnology (Marston et al., 2022). However, much of the discourse surrounding care technologies and technology-enabled care prioritises a combination of deterministic assumptions that technologies will invariably provide 'silver bullet' solutions (Eccles, 2021; Greenhalgh et al., 2012; Lynch et al., 2019). Our paper seeks to move beyond such assumptions by identifying with and from the perspectives of service users, their priorities for technology development. This paper complements previous work by Wilson-Nash et al. (2024) and Woolham et al. (2021), who identify priorities for research from the perspective of social care service providers.

The ranking exercises across the three sites clearly present the needs and expectations of workshop participants, demonstrating that older people welcomed the potential of technologies to improve individual safety, independence and connection with others. Older people also suggested that technologies provided by services must be affordable, trustworthy, able to be personalised to an individual's circumstances (including the capacity to change as abilities and needs change), and always located within, rather than replacing, care provision by humans. Adequate signposting and information seeking include both digital and analogue forms of information sharing to reach residents who are not digitally connected (e.g. social media, email), as they would not see local authority notices shared through mailing lists or Facebook pages. Safety, security and trust relate to ensuring that people's data is secure but also providing knowledge and information to users about cybersecurity information (e.g. password protection, 2-step authentication). Trust plays a significant role in the acceptance and effectiveness of technology (Lie et al., 2016), and building trust can take time. When that expectation of reliability is lost and technology does not

respond appropriately when needed, then confidence in that technology and associated devices is lost (Greenhalgh et al., 2013). Learning from peers in the community (Baker-Green, 2013) is imperative.

Given often opaque funding structures for social care, where some technology deployments may require subscription costs and where increasingly, although from a small base, people are sourcing and/or reappropriating household technologies to support care, cost and finance (Gibson et al., 2019; Marston et al., 2023) are important factors in determining the adoption of technology to support care. Findings here have shown that cost can be a barrier, although many older people are willing to pay for a service through the private market or as a subscription to local authorities, if they feel that such services bring clear added value to their lives. However, not everyone in our communities has the same levels of finance. While the economic characteristics of older people have changed to the point that older people are the wealthiest age cohort in many developed societies, there will remain many older people who live in poverty (Marston et al., 2023) and who are disproportionately likely to have higher levels of social care need. Therefore, any marketisation of technology-enabled care that requires access to often expensive devices, particularly if they are not provided by social care services (e.g. the broadband needed to install telecare or the smartphone/tablet required to remotely access a person's monitoring data), will be limited for those living in poverty. This theme needs to be unpacked more within the literature on telecare adoption. Exercises such as the use of discrete choice experiments (e.g. Kaambwa et al., 2016), which can identify which attributes within technologies provided in social care are valued most by different stakeholders, may prove useful in elucidating how decision making over the costs and benefits of technologies are made and then evaluated by stakeholders.

4.1. Strengths, limitations and contributions

In the context of social care, we identify several strengths and limitations that we anticipate will aid future research and push the boundaries of discourse surrounding technology-enabled care in local authorities. Limitations of this work include the following: (1) Methodological approaches aligning with and intersecting with organisational tech-enabled care provision facilitating broader ageing-in-place discourse. Additional methodological limitations include the following: (1) solely focusing on co-production activities, with limited quantitative data collected from frameworks such as the TAM, UTAUT, and SUS; future work should consider utilising these frameworks (Lee et al., 2025). Further, the DART framework could be considered to evaluate qualitative approaches of future technology-enabled care social care provision, expanding the knowledge of more wider sub-populations including people who are prone to falling (Vaziri et al., 2016), who may have life-limiting, life-shortening health conditions (Marston et al., 2025), or (older) people with disabilities and their carers.

The notion of digital and health literacy is growing (House of Lords, 2021) and is interconnected with the broader discourse of the digital divide (Marston et al., 2022; van Dijk, 2020). Similarly, the digital divide is connected to finance and social security, whereby the purchasing of digital devices, or monthly Internet subscriptions (Marston et al., 2023; Marston et al., 2022), or even maintaining existing platforms through existing social care packages that aid monitoring upon hospital discharge. Therefore, if technology-enabled care is to be deployed as a primary approach within a community, further methodological approaches should be considered. This includes (1) digital literacy levels of service users and organisational personnel in charge of technology-enabled care provision and (2) community health and social care personnel engaging with service users to support service users in inquiring about new technology-enabled care or requesting support for issues. We recommend that future work should consider a mixed-methods approach to understand digital literacy levels and the self-efficacy of organisational personnel.

Likewise, technologies and digital practices can facilitate people in our communities irrespective of their age, disability (Degenholtz et al., 2025) or health condition (Marston et al., 2025). Technologies can facilitate information access and stay socially connected, offering another layer of safety provision through remote monitoring (Marston & van Hoof, 2019) situated within the home. For many people, there is the challenge of confidence—self-efficacy for learning and using technologies—and they may require guidance from knowledgeable health professionals (e.g. social workers and care agency staff) (Gilbert, 2022).

Secondly, demographic characteristics of the recruited and future participants were observed identifying two key limitations regarding participant recruitment, sex and ethnicity, with our sample being predominantly female and white British. This sex distribution reflects ongoing biases in gerontological research, where older women are more likely to participate in research than older men (Ong et al., 2024). There are differences in sex associated with technology use through the lens of caregivers (Xiong et al., 2020) or perceived use and interaction (Sobieraj & Krämer, 2020; van Volkom et al., 2013). Similarly, ethnicity can also play a role in the use of technology (Mitchell et al., 2019; Yoon, et al., 2018). Researchers must be cognisant of barriers, such as digital literacy, irrespective of ethnicity. Older adults from ethnically diverse communities, whose first language is not English, may find it more difficult to communicate in workshops. Overcoming these challenges, we would explore the use of professional translation services, which, in turn, have the potential to connect, learn and understand the challenges, barriers and enablers of technology use and, in the context of social care delivery, through the lens of ethnically diverse communities. We recruited through three different local organisations, and we acknowledge that this may introduce bias to participants who are already involved in or seeking services from voluntary organisations. Such groups may exhibit extra need but also indicate that a group is more willing to seek help or assistance.

To combat these limitations, future research will broaden our approaches to participant recruitment across the three sites, for example, by seeking to broaden recruitment outside partners, such as direct communication with local community faith leaders, to hear more ethnically diverse voices and to ensure a balance of men and women in future research. The Northeast England site is ethnically diverse; however, in those workshops, all the participants were white. Future work should consider greater efforts to recruit participants from more ethnically diverse communities to facilitate a greater understanding of social care needs, experiences and understanding of technologies. Likewise, it is important to report on participant demographics pertaining to sex (Sullivan, 2025) and gender, especially in the realm of social care delivery (Marston et al., 2025), to ensure that data collection is reported correctly, free from bias or irregularities (Sullivan, 2025) and working within the law (Marston et al., 2025). Whilst we acknowledge limitations, the data and contribution set the foundations for unique organisational understanding pertaining to community members' needs, barriers and concerns. Future work, together with clear and concise methodological approaches, will provide greater understanding of age-in-place, applied scholarly and intersectoral approaches.

5. Conclusions

There is no straightforward answer, or a one-size fits all solution to tackling social care provision in society. Understanding how user priorities contrast with the existing landscape of technology-enabled care services across social care provision and delivery can potentially reduce inequalities and improve social care provision for age-in-place (Gilbert, 2022). Such efforts can result in the design and delivery of technology-enabled social care services that better meet older people's priorities and needs. If the policy goals for such services are to be achieved, greater efforts are required to understand how technology-enabled care is utilised through an intersectional lens.

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Data availability statement

The data that support the findings of this study are available from the corresponding author, [GG], upon reasonable request. This study was not pre-registered.

Ethical standards

The research was approved by the University of Stirling's General University Ethics Panel [GUEP 2024 18182 13299]. All workshop participants were required to complete informed consent forms prior to the workshops commencing.

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