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Review

Experiences of Digital Transitions in Health and Social Care Services in Later Life: Findings and Reflections from a Collaborative, Interdisciplinary Exploratory Review

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Abstract: Health and social care services are increasingly shaped by the emergence of new digital developments. Research suggests that older adults are less likely to use digital devices and, therefore, risk missing out on essential health and social care services as these become more digital by design. We carried out an exploratory literature review using the terms 'onboarding' and 'offboarding' within the design, engineering, health, and social science literature to understand how researchers are currently thinking about older adults' digital service needs, informed by discussions of stakeholder engagement with older adults in Edinburgh to explore their own experiences of digital transitions. The review process was implemented based on the methodology of Arksey and O'Malley for scoping reviews, and the findings were reported according to the PRISMA-ScR checklist. The databases used were Web of Science, PubMed, CINAHL Plus, IEEE Xplore, Engineering Village, PsycINFO, ASSIA and ACM. In total, 18 studies were finally included. Our findings show different interpretations of onboarding across disciplines and a lack of use of offboarding in the design of digital interventions. Additionally, our findings reveal inequalities in digital onboarding, as evidenced by the limited number of studies. Finally, we share a snapshot of our findings, together with reflections on interdisciplinary and collaborative processes.

Keywords: onboarding; offboarding; digital inclusion; older adults

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1. Introduction

Understanding older adults' experiences of using digital health and social care services has never been more important or timely. The twin trends of demographic change and increasing digitisation combine to make this a pressing concern. It is predicted that between 2015 and 2050, the number of older adults aged over 60 years will double (WHO 2018). Additionally, many older adults prefer to age in place, with digital technology supporting independent living by providing monitoring and assistance with health problems while at home. Thus, calling for new solutions that transcend any single field of knowledge (Peine et al. 2021). However, as a group of early-career researchers from various disciplines (Engineering, Public Health, Political Sciences, Medical Anthropology, Optometry, Occupational therapy, and Social Sciences), with a shared interest in ageing, we have recognised the challenges of this kind of work, such as different epistemologies, ontologies, methodologies, and terminologies colliding. Consequently, we have observed the need

for a shared language, facilitating efforts to address such contemporary challenges across disciplinary fields.

In this paper, we share the findings of a literature review—informed by scoping review methodology—through which we aimed to explore, beyond our disciplinary boundaries, the potential of developing a shared understanding of the terminology for older adults' use of digital health and social care services. As a group, we focused on two terms, "onboarding" and "offboarding", which are now emerging in the literature on the design of digital transitions (Junginger 2023). Following this review, we reflect on our disciplinary perspectives, challenges, and opportunities for increased interdisciplinary understanding.

Context

The digitalisation of health and social care services is a pressing and timely issue. The agendas driving the growth of digital public services are themselves diverse—often overlapping and sometimes conflicting—with key considerations including: reducing the cost of public services (Andersson et al. 2022); stimulating the private sector (Collington 2022); increasing privatisation or creating public-private partnerships in service delivery (Voorwinden 2021); or improving the customer service experience (Tunn et al. 2020). In the context of an ageing population, digitisation is presented as a way of keeping health and social care services sustainable (Martínez-Alcalá et al. 2021), while aiming to promote independent living and improve the quality of life for older adults (Cicirelli et al. 2021).

The COVID-19 pandemic substantially accelerated and facilitated the digitisation of public services (Kebede et al. 2022). Many digital processes introduced as temporary solutions during the pandemic are now fixed in existing care systems in the UK (Litchfield et al. 2021). The pandemic further exposed massive digital inequalities, with older adults among those who faced some of the most significant barriers to the use of technology (Sixsmith et al. 2022). The enforced transition to digital services as a means of coping with the unprecedented nature of the COVID-19 pandemic contributed to further unearthing the depth of the "digital divide" with access to the internet. Lack of awareness, access to technology, and digital skills all exacerbated existing digital inequalities (Kebede et al. 2022; Wang et al. 2019), which reflects broader societal inequalities.

It is, therefore, paramount to understand and explore the transition to digital services from different disciplinary perspectives—allowing due consideration of user needs in the design and delivery phases to mitigate potential barriers to access and use.

The terms onboarding and offboarding offer one way to consider this issue. From discussions within the interdisciplinary team, we define onboarding as various processes of planned introduction to the digital device, including the necessary knowledge and skills needed to use the device effectively, as well as the support infrastructure to facilitate digital transition. On the other hand, offboarding describes a set of processes that involve discontinuing user engagement with the digital service and transferring information back to the organisation to ensure a smooth exit (Junginger 2023). In the case of older adults, the notion of offboarding is used to explore the tensions of digital dependency and its consequences (Junginger 2023). While alternate terminology for these processes, such as digital inclusion, digital exclusion, deactivation, and digital engagement, also exists, the terms onboarding and offboarding are becoming increasingly prevalent across disciplines (Macleod 2021; Wilson-Menzfeld and Brittain 2022; Silva et al. 2023). However, their use and connotation change across case studies and research projects, lacking a universal definition. This paper sets out to explore the different ways these terms are understood and operationalised in the literature.

Before conducting our scoping review, we conducted three stakeholder engagement sessions with a small group of older adults in Edinburgh. We wanted to explore how meaningful the concepts of onboarding and offboarding were for older adults using digital technologies and how well these processes worked for them. The findings of these stakeholder engagements informed our plans for the scoping review and reiterated the need for further engagement with this topic at the macro, meso, and micro levels. The stakeholder engagements presented an opportunity for us to discuss, explore, and hear the

lived experiences of older adults who have witnessed and engaged in digital transitions. These engagement sessions were not formal research but rather a process in which members of the public had the opportunity to share their experiences. Therefore, the discussions generated are not considered data, but instead starting points to inform our research project. By listening to individuals with lived experiences, we ensured that our research topic was relevant and reflected some of the considerations raised by the older population.

Through our interdisciplinary literature review, we aimed to explore how the concepts of onboarding and offboarding are used in the design of digital or technologically enabled health and social care services as a way of meeting the particular access needs of older adults. We present the methods and results of this review below. In our discussion, we contextualise these findings by presenting our interdisciplinary reflections and conclude with some suggested future directions for interdisciplinary collaboration on digital health and social care services—and intentional alternatives—in the context of an ageing world.

Research Question: How are the terms and concepts of onboarding and offboarding used in the design of digitally enabled health and social care services as a way of transitioning into and out of digital services to meet the access needs of older adults?

2. Materials and Methods

We conducted an interdisciplinary literature review, informed by the scoping review methodology (Arksey and O'Malley 2005). We sought to use a systematic approach to map out the relevant literature and were guided by the PRISMA Scoping Reviews extension (PRISMA-ScR) to report our methods and findings (See supplementary material) (Tricco et al. 2018). However, our approach diverged from the scoping review methodology. We aimed to explore how different disciplines used and understood onboarding and offboarding in health services as particular terms and concepts, rather than to provide an exhaustive overview of the existing research literature and its gaps.

2.1. Study Design

Given the rapid and exploratory nature of our review, we did not publish a protocol. Our review was framed by the research question: how, if at all, are the concepts of onboarding and offboarding used in the design of digitally enabled health and social care services as a way of transitioning into and out of digital services to meet the access needs of older adults?

We used the ECLIPSE framework (Avenali et al. 2023; Wildridge and Bell 2002) to provide a suitable question framework and structure our inclusion and exclusion criteria. The nature of the ECLIPSE framework, which includes questions about service users and providers, as well as the nature and effect of service delivery, lent itself well to an exploration of onboarding and offboarding concepts in a way that more commonly used question frameworks, such as PEO and PICO, would not.

Table 1 presents our inclusion and exclusion criteria, following the ECLIPSE framework.

Table 1. Inclusion and Exclusion Criteria.

Question Framework	Inclusion Criteria	Exclusion Criteria
Expectation	Papers that refer to onboarding or offboarding of older adults in the context of digital service provision. Papers that discuss on-boarding or off-boarding without specifically using these terms.	Papers that refer to onboarding and offboarding in other contexts—e.g., "off-boarding" a retiring employee. Papers that do not discuss digital service provision/digital transitions. Papers that are not in a health and social care context.

Table 1. *Cont.*

Question Framework	Inclusion Criteria	Exclusion Criteria
Client Group	Older people (loosely chronologically defined as over 50—either individually or as the average age of the study population)	No older people involved, or it not possible to separate older people's experience from that of younger participants (and the average age is below 50)
Location	Anywhere	No limitations
Impact	Not Applicable	Not Applicable
Professionals	Health and social care professionals Researchers and designers working on digital health and care services People working with older adults who are accessing digital health and care services Older adults using digital health and care services	Digital service providers, researchers, and designers (outside health and social care contexts)
Service	Health and social care services provided digitally	Public services that have nothing to do with health and social care Health and social care services that are not provided digitally

In addition to the above criteria, we restricted our search to articles published from 2014 onwards. This was to ensure that we focused on the most contemporary research in a rapidly developing field. Due to time and language constraints, we only included papers written in English. We excluded systematic and scoping reviews.

2.2. Information Sources and Search Strategy

Our search strategy aimed to explore a common term across a range of different disciplinary perspectives. Our search strategy combined our core terms of interest, onboarding (and variants "on boarding" or "on-boarding") and offboarding (and variants "off boarding" or "off-boarding"), with a set of terms designed to capture the experience of older adults (old OR older OR elderly OR later life OR ageing OR senior). The search terms were limited to onboarding and offboarding due to their increasing prevalence across disciplines. We were interested in exploring how the specific terms/concepts of onboarding/offboarding are represented in the literature.

The search strings for all the databases can be found in Appendix A.

A broad range of databases were selected to represent the diversity of disciplines involved in the project, including Web of Science (multidisciplinary); PubMed and CINAHL Plus (health sciences); IEEE Xplore and Engineering Village [Ei Compendex] (engineering); PsycINFO (psychology); ASSIA (social sciences) and ACM (informatics). Searches were conducted between 4 March and 13 March 2024.

2.3. Study Selection and Data Extraction

The results of all database searches were uploaded to Covidence (Covidence 2024), and duplicates were removed. All titles and abstracts were screened by two independent reviewers using the pre-determined eligibility criteria. Any conflicts between the reviewers were discussed and resolved. Two reviewers then screened the full texts, and conflicts were resolved in the same way.

We developed and piloted a simple data charting form that captured the core characteristics of each paper (title and authors, study design, and study population) and information on the digital intervention, approach to onboarding, approach to offboarding, and any other

relevant information. Data charting was carried out by a single reviewer for each paper, and a second reviewer checked and finalised each extraction, with any disagreements discussed and resolved between the two reviewers. Critical appraisal of the included studies was not deemed relevant to exploring how authors used concepts of onboarding and offboarding within their work.

3. Results

The PRISMA flowchart in Figure 1 summarises the identification and inclusion process. The literature search retrieved 1233 studies: 485 from Engineering Village (Ei Compendex), 311 from ASSIA, 130 from PubMed, 106 from Web of Science, 88 from CINAHL, 72 from ACM, 23 from PsycINFO and 18 from IEEE Xplore. Two hundred eighty-six duplicates were automatically removed, and one further duplicate was manually removed. Nine hundred and forty-six studies were screened by title and abstract, and 59 studies were brought forward for full-text screening. A further 41 studies were removed at full-text screening due to either the wrong study population (too young, or it was not possible to separate out the experiences of older adults) (23 studies) or wrong focus (no digital service or intervention, or no information about onboarding or offboarding) (18 studies). Finally, 18 studies were included in data extraction. The inclusion of only 18 studies was not unexpected or abnormal when considering the specific inclusion criteria. This reflects the acknowledged paucity of research on older adults and digital technology (Kebede et al. 2022).

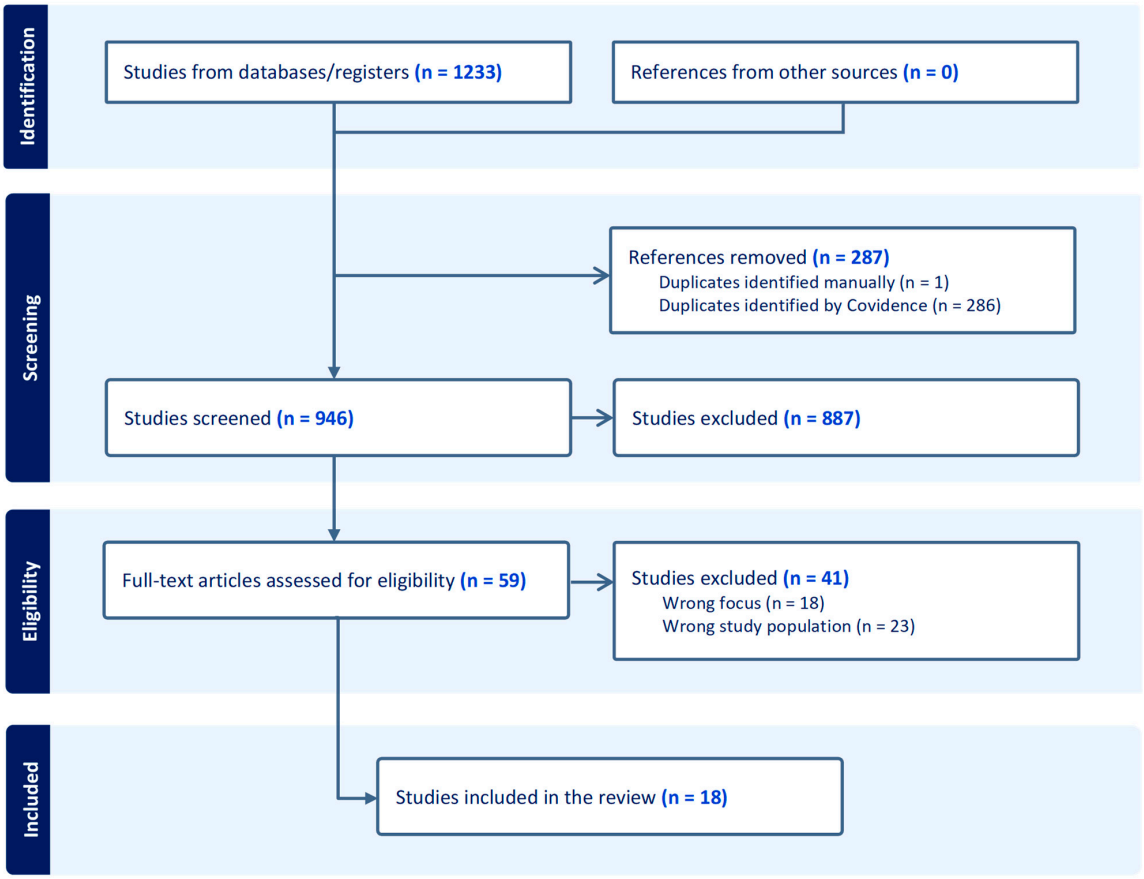


Figure 1. PRISMA flow diagram of the study selection process.

Table 2 below sets out the key characteristics of each included paper, including the number, age and location of the study population, the digital intervention studied, and the paper's approach to onboarding and offboarding older adults from that intervention (Gray et al. 2021).

Table 2. Summary of papers meeting the inclusion criteria.

First Author	Year	Study Title	Population	Digital Service or Intervention	Use of Onboarding	Use of Offboarding
Auton	2023	Smartphone-based remote monitoring for chronic heart failure: Mixed-methods analysis of user experience from patient and nurse perspectives	Seventy-nine older adults with chronic heart failure with reduced ejection fraction. Average age 62 years. 55% White, 16% Black	A smartphone app, Luscii, designed to support self-measurement of vital signs, instant messaging with carers, and e-learning	The onboarding approach is limited. The app has e-learning modules explaining how to recognise important symptoms and medication queries, but there is no indication of onboarding to use the app.	Offboarding is not discussed.
Avram	2022	Patient onboarding and engagement to build a digital study after enrollment in a clinical trial (TAILOR-PCI Digital Study): Intervention study	One hundred fifty older patients (mean age 65.3) in the US and Canada.	A digital study intended to provide follow-up to an RCT comparing routine care to alternative therapy after percutaneous coronary intervention.	The study addresses a partial onboarding approach by mailing letters to participants with instructions on how to access a website and learn more about the study. Those who accepted received a text message with a link to download the app on their phones.	Offboarding is not addressed as part of the study, but it happened due to lack of engagement from participants. The study identified that 11.5% of participants abandoned because they did not understand what was expected of them.
Azevedo	2022	Designing instructional materials for older adults to successfully onboard and use mHealth applications	The materials are designed for "older adults" (age not specified) with hypertension.	A mobile app, MEDSReM, is linked with a wireless blood-pressure monitor to help people with hypertension manage their condition.	The importance of developing onboarding materials is emphasised as an integral part of the app development process rather than solely meeting regulatory standards. Researchers demonstrate their approach to developing onboarding materials through various methods: literature review, comparative analysis, task analysis, storyboarding, reviews by different subject matter experts, and user testing with individuals from diverse backgrounds.	Offboarding is not discussed.

Table 2. *Cont.*

First Author	Year	Study Title	Population	Digital Service or Intervention	Use of Onboarding	Use of Offboarding
Czech	2023	Independence for whom? A critical discourse analysis of onboarding a home health monitoring system for older adult care	Six participants aged 61+	A home health monitoring system (not named), using wearable and motion sensors to monitor health.	The onboarding process is delivered through a technician to discuss user needs and choose sensors. Then a system overview is presented, together with a guide on how to use the voice assistance. Four themes associated with onboarding are presented: independence, safety, peace of mind, and how the initial onboarding affects the other themes.	Offboarding is not discussed.
Frishammar	2023	Older individuals and digital healthcare platforms: Usage motivations and the impact of age on postadoption usage patterns	One hundred fifty-two thousandpatients in Sweden. Seventy-six thousand patients are aged 60 and over.	A digital healthcare platform accessible by phone, computer or tablet, designed to enable interaction between patients and healthcare professionals.	The paper analyses data related to the use of a digital health platform and discusses that older adults spend more time during onboarding compared to the younger generation. Those in the group 75 plus are significantly different from the age groups of 40–59 and 60–74. Compared to the younger generation, the seniors were over-represented in dropouts before the first onboarding question and during onboarding.	Offboarding is not discussed.
Gray	2021	Assessing the implementation and effectiveness of the electronic patient-reported outcome tool for older adults with complex care needs: Mixed-methods study	Forty-four patients aged 60 and above with 10 or more visits to Family Health Teams (FHTs) within the previous 12 months.	A mobile app and portal for electronic Patient-Reported Outcomes (ePRO), designed to enable goal-oriented primary care delivery.	Both the patients and the providers undergo training as part of the onboarding process. Patients are trained one-on-one with a research team member on how to use the mobile device and platform just before their onboarding visit with the provider. Usual manuals and contact information for the research team are provided to the providers and patients for technology support.	Offboarding is not discussed.

Table 2. *Cont.*

First Author	Year	Study Title	Population	Digital Service or Intervention	Use of Onboarding	Use of Offboarding
Haddad	2023	Patient satisfaction with a multisite, multiregional remote patient monitoring programme for acute and chronic condition management: Survey-based analysis	3172 survey respondents. Average age 66.5. White: 95.96%, Hispanic or Latino: 2.43%, Black or African: 1.51%, and Asian: 1.2%	A remote patient monitoring (RPM) system included internet-based video consultations and integrated vital sign monitors overseen by a team of RPM nurses.	Onboarding is provided in different ways. Initially, with a telephone call with nonclinical staff to assist in setting up the system. Additionally, a kit is included with condition-specific educational information. Further assistance is provided by technical and nonclinical staff via toll-free phone calls.	Planned offboarding is not discussed. One of the participants' most frequent concerns was related to returning equipment at the end of the study, indicating that there is a need for a clearly communicated offboarding process, which is not currently being met.
Janssen	2023	A digital gaming intervention to strengthen the social networks of older Dutch adults: Mixed-methods process evaluation of a digitally conducted Randomized Controlled Trial	Thirty-three older adults (mean age 69) in the Netherlands.	A mobile gaming app, Playing Together, is intended to decrease loneliness in people aged 65+.	In-person interaction and repetition are seen as vital for effective onboarding. Older adults should be 'taken by the hand', and researchers should 'invest in them', giving them an enjoyable introductory experience in order to encourage uptake. Distractions (in this case, the evaluation questions) should be minimised, as these can interfere with effective onboarding.	Planned offboarding is not discussed. Unplanned offboarding is reflected in a high non-engagement rate, which is attributed to the lengthy onboarding process and some user experience issues.
Matthews	2023	Barriers to using a patient portal among low-income patient populations: A qualitative descriptive study	Volunteer convenience sample. 25 Participants Average age: 53. 76% of participants were Black/African American and were patients at a Federally Qualified Health Centre (FQHC).	A patient portal, MyChart, is designed to provide web- or phone-based access to personal health information for low-income patients in particular.	This study finds that lack of awareness of the app's capabilities and lack of administrative support for enrolling and utilising the app are the main barriers to uptake. Many of them feel frustrated about the lack of education on the app's use, features, and functionalities. Additionally, patients report deficiencies in technological assistance from the provider, leading to demotivation for its use.	Planned offboarding is not discussed. Strong personal preferences of patients for communicating directly with their health providers are discussed. Users report having enough time and opportunity to contact the clinic and receive all the information they need during appointments, relying on traditional services due to lack of engagement with the digital option.

Table 2. *Cont.*

First Author	Year	Study Title	Population	Digital Service or Intervention	Use of Onboarding	Use of Offboarding
Nadadur	2022	Medication adherence app for food pantry clients with diabetes: A feasibility study	Ten participants enrolled, with an average age of 52.5 years old. 60% African American, 30% Hispanic. 30% had a college degree	A mobile app, Wellth, designed to facilitate diabetes treatment adherence.	Onboarding is enabled with interviews to establish customisation in the app of preferred time for medication intake. A brief induction is given to explain how the app works step by step, with a link in the participant's phone.	Offboarding the digital intervention is not discussed. However, dropping out of the study is not penalised with restrictions to the food pantry.
Peterlin	2024	Older adults' perceptions of online physical exercise management	11–24 older adults (over 55) in Slovenia.	Online physical activity classes, which took place over a three-month period.	Onboarding is not a major focus, and discussion is limited. The paper recommends appointing someone to help older adults overcome any technological barriers that prevent them from taking part.	Planned offboarding is not discussed. Unplanned offboarding may be reflected in participants' preference for in-person classes given additional perceived benefits (transport, social interaction, etc).
Pierz	2024	Investigation of the impact of Wellinks on the quality of life and clinical outcomes in patients with Chronic Obstructive Pulmonary Disease: Interventional research study	One hundred forty-one participants with Chronic Obstructive Pulmonary Disease were fully enrolled. Average age 70.	A mobile app, Wellinks, with connected devices, designed to support home monitoring of Chronic obstructive pulmonary disease (COPD).	A coach contacts each of the participants via telephone to ensure the technical setup and devices are in order and to introduce the coaching process. Participants are also instructed to use the monitoring devices that come with the system at least once a week throughout the duration of the study. In addition, participants are encouraged to use the app to track symptoms and medication and to monitor their own spirometry and pulse oximetry data.	Planned offboarding is not discussed. Unplanned offboarding is reflected in gradual reductions in adherence to the app, as well as limited uptake of educational sessions.

Table 2. *Cont.*

First Author	Year	Study Title	Population	Digital Service or Intervention	Use of Onboarding	Use of Offboarding
Quinn	2019	Mobile support for older adults and their caregivers: Dyad usability study	Eight older people (over 65, mean age 77.8) and their caregivers in the USA.	A mobile app for older adults to record their health and social care information and share it with their caregivers.	The study follows a strong onboarding process. Participants received an onboarding guide, with the chance to choose between individual or group training on the app. The training materials were the same for both sessions. Participant training had three elements: (1) guiding participants through creating a new account and entering basic demographic information; (2) linking dyads using the Family Sharing feature; (3) sending a test message to the app team to ensure they were properly connected.	Planned offboarding is not discussed. Unplanned offboarding is reflected in gradual reductions in weekly survey participation (attributed to lack of reminders); and in delayed or limited engagement (attributed to log-in and connectivity issues). Technical issues, including log-in and connectivity issues, are important discouraging aspects causing delayed or limited use of the app
Ross	2023	Influences on patient uptake of and engagement with the National Health Service digital Diabetes Prevention Programme: Qualitative interview study	Thirty-two participants diagnosed with nondiabetic hyperglycemia in England. Referred via primary care OR self-referred. Average age 58.3. individuals White: 69%, Black: 6%, Asian: 6%	The NHS Digital Diabetes Prevention Programme (DPP).	Onboarding is addressed by contacting people interested in participating who have received information about the study. Additionally, some healthcare providers onboard participants using a programme handbook, while others do so with a brief telephone call.	Offboarding is not discussed.

Table 2. *Cont.*

First Author	Year	Study Title	Population	Digital Service or Intervention	Use of Onboarding	Use of Offboarding
Stamenova	2022	Hospital-based ambulatory clinic adoption of video and telephone visits before and during the COVID-19 pandemic: a convergent mixed-methods study: Managing community care	One hundred twelve patients. Average age 57 White: 84%, Middle-easter: 4%, Mixed heritage: 4%	Remote clinic consultations, using Zoom video or phone calls; integrated with the hospital's EMR information system.	Onboarding is provided after participants registration to the hospital's Electronic Health Records Patient Portal. Additionally, technical support is given to set up the portal and the video conferencing technology.	Planned offboarding is not discussed. Unplanned offboarding is reflected in barriers to access experienced by some participants, including poor internet connection, lacking consistent access to technology, and not being comfortable to use technology.
Steinert	2018	Effects of a long-term smartphone-based self-monitoring intervention in patients with lipid metabolism disorders	One hundred people with lipid metabolism disorders in Germany. Average age 52.6; 61% over 50.	A smartphone app, MyTherapy, to support self-management of lipid metabolism disease.	The onboarding process consists of written instructions (user manual) explaining how to download the app to the users' Android or iOS device. However, the terminology and abbreviations were seen as difficult to understand.	Offboarding is not discussed.
Wali	2021	Expanding telemonitoring in a virtual world: A case study of the expansion of a heart failure telemonitoring programme during the COVID-19 pandemic	Sixteen patients with heart failure in Canada. Average age 54.5.	A phone-based telemonitoring programme, Medly, designed to provide remote clinical support to patients with heart failure.	Onboarding is initially delivered in-person but switched to telephone calls due to COVID-19 restrictions. This approach was seen initially as negative by participants who were not aware of this change but ultimately enabled patients to be part of the programme without leaving their home. The study compares both situations and concludes that remote onboarding needs more support for technical issues.	Offboarding is not discussed.

Table 2. *Cont.*

First Author	Year	Study Title	Population	Digital Service or Intervention	Use of Onboarding	Use of Offboarding
Wei	2021	Habits heart app for patient engagement in heart failure management: Pilot feasibility randomized trial	23 Patients with heart failure from the cardiology clinics and inpatient units at Massachusetts General Hospital. Average age 63 years.	A smartphone (provided as part of the study) loaded with the Habits Heart App. This app was designed to monitor weight changes, track sodium content (in diet) and exercise logging.	Those randomised to the intervention group are given a 30-min onboarding session to be acquainted with the Habits Heart App and the study smartphone. At the end of the 30-min session, patients are asked to demonstrate their app use competency by performing actions in five key areas, including opening and watching the introduction patient education video, logging weight on the app using the Bluetooth-linked scale, inputting sodium content entries, inputting exercise entries, and messaging the study team through the app.	Offboarding is not discussed.

3.1. Overview of Findings

The included papers were published in a range of disciplines, including medicine and public health (10 studies), human factors and design (two studies), technology and engineering (three studies), and integrated care (three studies). The papers explored four categories of digital intervention: digital alternatives to in-person services (7 studies), smartphone-based interventions (11 studies), home care systems (1 study) and online delivery of intervention (1 study). The digital alternatives included online physical activity classes (Peterlin et al. 2024), telehealth services (Wali et al. 2021; Haddad et al. 2023; Stamenova et al. 2022), and online patient portals (Matthews et al. 2023; Frishammar et al. 2023). The smartphone-based interventions included apps for social connection (Janssen et al. 2023) and health management (Steinert et al. 2018; Quinn et al. 2019; Auton et al. 2023; Wali et al. 2021; Nadadur 2022). Three of the smartphone app studies included connected devices and apps (Ross et al. 2023; Azevedo et al. 2022; Pierz et al. 2024), and one included the smartphone itself (Wei et al. 2021). One study included a full home health system, including voice assistants and sensors (Czech et al. 2023), and another examined the online delivery of a follow-up study to a clinical trial (Avram et al. 2022). Two studies focused on the experiences of marginalised people, exploring an app for diabetes management among people who use food pantries (an indicator of economic disadvantage) (Nadadur 2022) and a patient portal used by low-income participants who were predominantly Black/African American (Matthews et al. 2023).

Six studies were conducted in Europe (Auton et al. 2023; Czech et al. 2023; Ross et al. 2023; Frishammar et al. 2023; Janssen et al. 2023; Steinert et al. 2018; Peterlin et al. 2024). Nine studies were conducted in North America (Wali et al. 2021; Stamenova et al. 2022; Quinn et al. 2019; Haddad et al. 2023; Nadadur 2022; Matthews et al. 2023; Wei et al. 2021; Pierz et al. 2024; Avram et al. 2022), and one unspecified (Azevedo et al. 2022). No studies were found in Africa, Asia, Central or South America, or Oceania.

3.2. Definitions and Types of Onboarding

There was no standard definition of the concept of onboarding across digital intervention studies. Some studies have conceived of onboarding as accompaniment or assistance (Janssen et al. 2023) or as education and training (Quinn et al. 2019). Others have associated onboarding with well-designed instructional materials (Azevedo et al. 2022). This lack of consistency in the conceptualisation of onboarding and offboarding further reiterates the importance of exploring the literature specific to these concepts. Nevertheless, despite this lack of standardisation, we identified three types of approach to onboarding in the included studies, as defined in Table 3 below:

Table 3. Categories of approach to onboarding.

Category of Onboarding	Description
Weak onboarding	No planned onboarding process; however, researchers or designers acknowledged barriers that would not have existed if planned onboarding had been in place.
Partial onboarding	The intervention design included some kind of onboarding but without significant interaction with end users (e.g., a manual, or written instructions).
Strong onboarding	The intervention design took into account both materials and interaction with people and was as supportive as possible (e.g., researchers would provide guidelines and personalised assistance).

Three studies reflected a "weak" onboarding process (Peterlin et al. 2024; Auton et al. 2023; Matthews et al. 2023), in which onboarding was not part of the intervention design, but appeared as a "lesson learned": with the need for personal support identified to increase

uptake (Peterlin et al. 2024) and feelings of frustration from users who were not aware of the full capabilities of the digital intervention (Matthews et al. 2023).

Five studies reflected a "partial" onboarding process, where users received only written or online instructions for accessing the digital device or service (Avram et al. 2022; Steinert et al. 2018; Nadadur 2022; Stamenova et al. 2022; Frishammar et al. 2023). The characteristics of partial onboarding could include failure to tailor instructions to the needs of older adults (Frishammar et al. 2023; Steinert et al. 2018) or the provision of instructions online, requiring users to have pre-existing digital skills (Avram et al. 2022). Partial onboarding processes could involve providing one-to-one support to help users with technical issues, but on an ad hoc basis, rather than being part of planned onboarding (Stamenova et al. 2022).

Nine studies reflected a "strong" onboarding process (Janssen et al. 2023; Quinn et al. 2019; Wali et al. 2021; Haddad et al. 2023; Ross et al. 2023; Wei et al. 2021; Pierz et al. 2024; Czech et al. 2023; Azevedo et al. 2022). Strong onboarding was characterised by the planned provision of human support, either in-person or over the phone, alongside written instructions. Key features of a strong onboarding process included requiring users to demonstrate skills after training (Quinn et al. 2019; Wei et al. 2021), providing repeated support for learning (Janssen et al. 2023), and ongoing personal support (Haddad et al. 2023; Czech et al. 2023). Face-to-face support was found to be more effective than phone-based support (Wali et al. 2021). Strong onboarding acknowledged the importance of support from healthcare staff and family members (Czech et al. 2023; Quinn et al. 2019) by providing them with training to assist older adults in using digital services. It also involved the co-creation of user instructions with users from the beginning and throughout the research design process (Azevedo et al. 2022).

3.3. Offboarding Is Non-Existent

Planned offboarding was not discussed in any of the papers. Several papers reported that participants disengaged, delayed or limited their use of the digital service due to barriers such as lack of knowledge about the technology, lack of digital skills, confidence or poor connectivity (Janssen et al. 2023; Avram et al. 2022; Quinn et al. 2019; Stamenova et al. 2022). Other obstacles included poor user experience, preference for in-person alternatives, inappropriate onboarding and lack of technical support (Janssen et al. 2023; Peterlin et al. 2024; Matthews et al. 2023; Avram et al. 2022; Quinn et al. 2019). Some studies reported that traditional services were still available for those users who stopped using digital intervention (Matthews et al. 2023; Nadadur 2022). Participants who stopped or reduced their use of the digital intervention were, in effect, offboarding themselves in an unplanned and unstructured manner with no clear alternatives. Concerns were raised by the participants about returning the equipment provided (Haddad et al. 2023).

3.4. Inequalities in Digital Onboarding

As evidenced by the limited number of studies included in our literature review, older adults are often left out of the conversation around their usage and inclusion in using digital approaches. The populations further at risk that identify as being older adults are also limited in representation, as seen with People of Colour (PoC), low-income, or disabled people (unless their health condition was the explicit focus of the study) (Husain et al. 2022). In reality, older adults can have a variety of intersectional aspects of their lives which influence the accessibility or usability of digital technologies.

We included studies that focused on participants aged 50 and above, recognising that chronological and biological age have different significance in specific communities and regions. This does not include a subgroup analysis by age. One paper found differences in the usage patterns of participants aged 75 years and above compared to younger age groups, with the oldest group dropping out before or during the onboarding process (Frishammar et al. 2023). Other demographic information captured by studies included health status, education level, ethnicity and income. Some studies excluded participants

with significant disabilities or complex health conditions (Steinert et al. 2018; Quinn et al. 2019). Around half of the studies tested digital interventions for the management of specific conditions, so participants were people living with these conditions.

Among the studies that reported on education level, it was typical to find that over 50% of the participants had higher education (Avram et al. 2022; Quinn et al. 2019; Wali et al. 2021). Steinert et al. (2018) found that 86% of participants had either a medium or higher level of education. Nadadur (2022), whose focus was on a marginalised patient group, found that only 30% of participants had a college degree.

Studies that reported on ethnicity found that at least half of the participants were from a white ethnic background (Quinn et al. 2019; Auton et al. 2023; Wali et al. 2021; Haddad et al. 2023; Wei et al. 2021). Only two studies reported a majority of non-white participants, both of which were designed to understand the experiences of socioeconomically disadvantaged people (Nadadur 2022; Matthews et al. 2023).

Bearing this in mind, emphasis must be placed on exploring inequalities concerning the growing use of digital approaches to address healthcare.

4. Discussion

4.1. Findings and Gaps in the Literature

To our knowledge, this is the first review regarding onboarding and offboarding in the context of digital health services for older people. The interdisciplinarity of the review team allowed for broad and complementary insights.

This literature review found that the understanding and implementation of onboarding and offboarding vary across disciplines. The degree of implementation of these processes is not uniform and can be experienced as weak, partial or strong. In practice, from the user's perspective, this translates into diverse perceptions of digital services. Studies with a weak onboarding process found that participants reported negative feelings, such as frustration, and faced significant challenges in understanding and using digital services. These feelings are often associated with barriers to digital inclusion (Kim et al. 2023). Similarly, participants experienced difficulties with partial onboarding, which required a certain level of digital literacy that was not always present. In contrast, studies that followed a strong onboarding approach provided a meaningful learning experience, in some cases including participants in the design process of the materials used.

The literature suggests that most researchers and designers do not typically include an offboarding plan for users of digital services. This can leave people without support or signposts to facilitate their transition back to traditional health services. Further, the absence of a common language about offboarding affects how we carry out research and design services. We recommend that studies consider including "gentle" offboarding mechanisms, establishing ways to support participants who decide not to continue using a digital service. Designing and implementing offboarding processes can enable individuals to make choices without facing the consequences if they later decide to reconsider the use of digital services or products.

While two of the included articles in the review included data using a socioeconomic status approach, these studies alone cannot robustly bridge the gap in data for inequalities experienced by some populations of older adults. We believe that there is an opportunity for academics and developers alike to bear in mind the realities caused by inequalities when designing new technologies or interventions (Hadjiat 2023). While this may require more work in the design phase, it must be acknowledged that systemic, structural, and institutional injustice will influence the uptake of usability and accessibility of digital approaches to healthcare. Therefore, we encourage the use of frameworks—such as the Digital Health Equity Framework (Crawford and Serhal 2020) or the eHealth Equity (Antonio and Petrovskaya 2019)—with an emphasis on equity to aid in the design process. Engagement with equity frameworks may minimise the need to modify or create new approaches that are appropriately equitable and sustainable (Hadjiat 2023).

4.2. Reflections from Interdisciplinary Dialogue

Our main intention was to explore how different fields understand and apply notions of onboarding and offboarding when it comes to digital public service provision for older adults, both within published research and in our own approaches to this topic. We realised that our disciplinary boundaries came into play at various stages of the project, shaping how we searched for, looked at, and analysed data and what kind of information we valued the most. This created an invisible data hierarchy, which we leveraged positively by openly sharing what we focused on and being curious about the suggestions each of us was able to make. This provided us with a richer understanding of the approaches taken by different disciplines, allowing us to 'borrow' aspects of different disciplinary agendas to illuminate our own.

Finally, being critical about how other disciplines collect, analyse, and use data has represented an opportunity for us to reflect on our own ways of working with data, who we might be excluded in the process, and who we are designing for. In the case of onboarding and offboarding, such a reflection has been particularly important, and we believe that being an interdisciplinary team has allowed us to proceed with a level of self-reflection and awareness that a 'single lens' would not have facilitated.

4.3. Strengths, Limitations and Ethical Considerations

4.3.1. Strengths

The project benefitted from an interdisciplinary approach, which included Engineering (Electronics, telecommunications and biomedical), Public Health, Political Sciences, Medical Anthropology, Optometry, Occupational therapy, and Social Sciences.

The use of two approaches, stakeholder engagement, which informed the literature review, strengthened the quality of the data collected. The scoping review methodology enabled the team to gather information from databases representative of the various disciplines, which included PubMed, Medline, Web of Science, ACM journal, PsycInfo, IEEE Explore, Engineering Village (compendex), ASSIA, and CINAHL. These sources provided comprehensive information that strengthened the quality of the literature review. Stakeholder engagement was an opportunity to listen to and learn from individuals with lived experiences about the topic under investigation. Combining stakeholder engagement discussions and scoping review findings significantly increased the strength of the project.

4.3.2. Limitations

The project focused primarily on two terms (onboarding/offboarding) which might have excluded other ways of thinking about digital transitions and skewed the research findings towards settings and countries that favour this use of language. The goal of focusing on these specific terms was to explore not only the topic but also the interdisciplinary interpretation and use of these terms in digital services for older adults.

There was very limited inclusion of PoC in the scoping review, and this group was completely absent in stakeholder engagement. This had an impact on the interpretation of the findings, especially on whether they could be compared to other communities.

The study design and inclusion criteria skewed towards people with existing digital access which limited its generalisability to a larger population and its transferability to settings with varying levels of digital availability.

4.3.3. Ethics

This study used the University of Edinburgh College of Art Self-Audit Checklist, which confirmed the absence of a reasonably foreseeable ethical risk.

5. Conclusions

The findings from this interdisciplinary project provide some insight into the challenges faced not only by older adults using digital technology for health and social care but also by researchers. There is no common understanding, definition or implementation

framework for onboarding or offboarding in relation to the design of digital or technologically enabled health and social care services. The various conceptualisations of and approaches to the issue contribute to broader concerns about challenges faced by the older population. Studies rarely consider the specific challenges faced by different demographics within the older population. A more nuanced and sensitive approach to digital roll-out based on in-depth knowledge of health inequalities and specific concerns of older adults would allow a more holistic design of the onboarding and offboarding processes. Overall, there is significant potential to develop onboarding and offboarding processes by involving older adults in the design of digital services, recognising the importance of collaboration principles to ensure an inclusive, person-centred, and value-based approach.

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Appendix A

PubMed

Search: (onboarding OR offboarding OR "on boarding" OR "off boarding" OR on-boarding OR off-boarding) AND (old OR older OR elderly OR later life OR ageing OR senior) Filters: from 2014–2024

((("onboarding"[All Fields] OR "offboarding"[All Fields] OR "on-boarding"[All Fields] OR "off-boarding"[All Fields] OR "on-boarding"[All Fields] OR "off-boarding"[All Fields]) AND ("old"[All Fields] OR ("older"[All Fields] OR "olders"[All Fields]) OR ("aged"[MeSH Terms] OR "aged"[All Fields] OR "elderly"[All Fields] OR "elderlies"[All Fields] OR "elderly s"[All Fields] OR "elderlys"[All Fields]) OR ("later"[All Fields] AND ("life"[MeSH Terms] OR "life"[All Fields])) OR ("aging"[MeSH Terms] OR "aging"[All Fields] OR "ageing"[All Fields]) OR ("senior"[All Fields] OR "seniorities"[All Fields] OR "seniority"[All Fields] OR "seniors"[All Fields]))) AND (2014:2024[pdat])

Translations

older: "older"[All Fields] OR "olders"[All Fields]
elderly: "aged"[MeSH Terms] OR "aged"[All Fields] OR "elderly"[All Fields] OR "elderlies"[All Fields] OR "elderly's"[All Fields] OR "elderlys"[All Fields]
life: "life"[MeSH Terms] OR "life"[All Fields]
ageing: "aging"[MeSH Terms] OR "aging"[All Fields] OR "ageing"[All Fields]
senior: "senior"[All Fields]

Medline
((onboarding or offboarding or "on boarding" or "off boarding" or on-boarding or off-boarding) and (old or older or elderly or later life or ageing or senior)).mp. [mp=title, book title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary concept word, anatomy supplementary concept word]
limit 3 to yr="2014–2024"

Web of Science
(onboarding OR offboarding OR "on boarding" OR "off boarding" OR "on-boarding" OR "off-boarding") AND (old OR older OR elderly OR later life OR ageing OR senior) (Title) OR (onboarding OR offboarding OR "on boarding" OR "off boarding" OR "on-boarding" OR "off-boarding") AND (old OR older OR elderly OR later life OR ageing OR senior) (Abstract)
Timespan: 2014-01-01 to 2024-02-29 (Index Date)

ACM Journal
(onboarding OR offboarding OR "on boarding" OR "off boarding" OR "on-boarding" OR "off-boarding") AND (old OR older OR elderly OR later life OR ageing OR senior) (Title) OR (onboarding OR offboarding OR "on boarding" OR "off boarding" OR "on-boarding" OR "off-boarding") AND (old OR older OR elderly OR later life OR ageing OR senior) (Abstract)
(onboarding OR offboarding OR "on boarding" OR "off boarding" OR "on-boarding" OR "off-boarding") AND (old OR older OR elderly OR later life OR ageing OR senior) (Title) OR (onboarding OR offboarding OR "on boarding" OR "off boarding" OR "on-boarding" OR "off-boarding") AND (old OR older OR elderly OR later life OR ageing OR senior) (Title)

PsycInfo
Keyword search:
(onboarding OR offboarding OR "on boarding" OR "off boarding" OR on-boarding OR off-boarding) AND (old OR older OR elderly OR later life OR ageing OR senior)
Limit: 2014–2024

IEEE Explore
("All Metadata":"onboarding" OR "All Metadata":"offboarding" OR "All Metadata":"on-boarding" OR "All Metadata":"off-boarding" OR "All Metadata":"on boarding" OR "All Metadata":"off boarding") AND ("All Metadata":"old" OR "All Metadata":"older" OR "All Metadata":"elderly" OR "All Metadata":"later life" OR "All Metadata":"ageing" OR "All Metadata":"senior")
Timespan: 2014–2024

Engineering Village (compendex)
((((old OR older OR elderly OR later life OR ageing OR senior)) WN KY) AND (((onboarding OR "on-boarding" OR "on boarding" OR offboarding OR "off-boarding" OR "off boarding")) WN KY)) AND (JA WN DT) AND (English WN LA)
Timespan: 2014–2024

ASSIA
(onboarding OR offboarding OR "on boarding" OR "off boarding" OR on-boarding OR off-boarding) AND (old OR older OR elderly OR later life OR ageing OR senior)
Timespan: 01.01.2014 to 2024 (any date)

CINAHL
"(onboarding OR offboarding OR "on boarding" OR "off boarding" OR on-boarding OR off-boarding) AND (old OR older OR elderly OR later life OR ageing OR senior)"
Limiters—Publication Date: 20140101-20240231; Exclude MEDLINE records

Expanders—Apply equivalent subjects
Search modes—SmartText Searching

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