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Aging in Place Together: The Journey Towards Adoption and Acceptance of Stairlifts in Multi-Resident Homes

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Stairlifts are a widely-used technology in the home that help people with mobility issues to go up and down stairs. However, it is unclear how stairlifts are experienced by all household members and what this understanding implies for home healthcare technologies. We investigated the impact of stairlift installations on older adults’ households in the UK through a qualitative study investigating the lived experience of the adoption and acceptance of this technology. Interviews and focus groups with primary users, household residents and service providers showed how the wider household identify misalignments between simplified stairlift installation models from service providers and describe a more complex, nuanced emotional journey which involves decision making, conflict and trauma and catharsis and independence. Findings provide transferrable outcomes for the smart home domain by highlighting the multi-resident home, the emotional intrusiveness of home healthcare technologies and the diversity that comes with providing care, unique to every household.

CCS Concepts: • Human-centered computing → Collaborative and social computing; Empirical studies in collaborative and social computing; • Human-centered computing → Accessibility; Accessibility technologies;

KEYWORDS
Stairlifts, households, assistive technology, aging in place, user studies, multi-resident homes, health, care, older adults

ACM Reference format:

1 INTRODUCTION
The scale of the global aging population crisis facing governments around the world is immense - particularly with regard to providing sufficient healthcare and sustaining people's Quality of Life (QoL) as they age. According to the UK Office for National Statistics, by 2050 one in five people over the age of 60 will live with one or more age related chronic health condition [35]. This will place a greater demand on global health services to sustain people’s QoL as they get older.

The popularity of smart home technology is also set to increase exponentially in the coming decade [16]. Wireless, ubiquitous and autonomy-enabling Internet of Things (IoT) technologies such as hands-free vacuum cleaners and smart speakers (e.g. Amazon Echo, Google Home) have brought smart home technology to the forefront of public attention, both commercially and in academia. Despite the increased prevalence and recent uptake in smart
home technology, there are a number of grand challenges for the smart home domain which have yet to be addressed, not least of these is the aging population crisis.

The World Health Organisation (WHO) suggest the approach to tackling the aging population crisis begins at home [34]. Their approach underlies the principles of ‘aging in place’: the "ability to live in one’s own home and community safely, independently, and comfortably, regardless of age, income, or ability level" (p. 1) [30]. Therefore, the majority of technological interventions to support older adults to date, have been deployed in the home e.g. pendant alarms and other Low-Tech Home Modifications (LTHMs) such as stairlifts [21]. Previous studies of LTHMs show how they can improve older adults’ quality of life [5]. Yet there are a number of drawbacks to this previous work; namely, that they focus on the primary owner/user of the technology and not the wider household. Since 1997, there has been a 93% increase in the number of cohabiting families in the UK (increasing from 1.5 million to 2.9 million as of 2017), with multi-resident, inter-generational families now the largest growing household group [35]. Therefore, important evidence of how the addition of home health technologies impact the greater household is missing: how do we age in place together, amongst multiple residents, with the assistance of health and care technology?

Our qualitative approach in this study, starts with this gap in understanding the complex sociotechnical nature of a household (which we define as containing people either living inside or regularly visiting a dwelling), who are engaging with or involved in health and care technology adoption, acceptance and use. We look at the impact of a substantial and intrusive LTHM, a stairlift installation, through engagements with numerous stakeholders who are privy to the journey from adoption to acceptance: primary users, other residents, occupational therapists, care technology providers and stairlift installers. We combine focus groups and semi-structured interviews to produce an aggregate picture of the lived experience of the stairlift for the primary user and also more broadly, across the whole household [14]. We document the emotional journey that the household goes through from adoption to acceptance, providing insights into the importance of engaging entire households in the design and process of installation of intrusive home health and care technologies. We also address the implications for future smart home technologies that are impacted by the whole household’s socio-technical dynamics. Consequently, this study extends previous research on home healthcare technologies in the following ways by:

- Providing an empirical account that advances the simplistic view of stairlift installations from the perspective of the primary user, to account for the complexities of the entire multi-resident home;
- Illustrating people’s pragmatic and emotional journeys of the stairlift through: decision making, conflict and trauma, and catharsis and independence; and,
- Presenting transferrable research and design implications for smart home healthcare technology: 1) highlighting the roles of the multi-resident home in the context of the stairlift and providing transferrable design recommendations for different contexts; 2) suggesting support for these households to cope with adverse experiences; and 3) to cater for the highly diverse and unique nature of health and care technology installations in homes.
2 RELATED WORK

In this section, we discuss a selection of work that has informed our methodological approach and research question. We firstly discuss health and care technologies that support aging in place in the home. Following this, we discuss more broadly how smart technologies have supported aging and propose a research direction, by way of 'aging in place together' (amongst multiple residents in the home), which encourage studies of the health and wellbeing of entire households.

2.1 Assistive Technology & Collaborative Care

Assistive technology (AT) describes a range of devices that are adaptive, rehabilitative or that support people's physical needs [27]. The term covers a broad range of technology from small and simplistic devices such as pendant alarms (which send alerts to emergency services and carers), to more complex machinery such as mobility scooters and stairlifts. Although there have been moves towards more digital assistive technologies, current AT devices are generally not considered 'smart' or available off-the-shelf, in the same way that a commercially available smart home technology might be, such as Amazon Echo [59].

Research on the use of AT in health and care settings has been studied within the HCI community (e.g. [2, 3, 8]), however there are also examples from other disciplines that are relevant to the move towards technologies to support aging in place together. The work of Caldeira et al. [10] highlights how many existing health and care technologies are developed to improve the QoL of a single older adult in their home, but they also identify how supervised and collaborative use is an essential part of older adults being able to sustain their own self-care. Similarly, Karlsen et al.'s study [36] of telecare systems in the home, sets out the advantages of shared care in this space, where another family member supervises the use of technology with an older adult. Their findings also build upon Caldeira et al.'s work [10] and lay out how other caregivers, supporting the use of assistive technology (telecare) systems are a necessary part of its continued use and adoption by older adults [36]. These cross-disciplinary studies exemplify the benefits of conducting qualitative and mixed-methods research into the use of assistive technology.

Other studies have also dealt with the stigma that is associated with assistive and accessible technologies being "visible" in people's lives, which can lead to misuse and abandonment [52]. Hearing aids, for instance, are often not adopted because of their association with frailty [46]. Shinohara et al. [57] discuss how blind and low-vision users take steps with others in their homes to make their devices accessible such as putting braille stickers onto microwave number pads, however, they can still feel stigma and shame. Whilst there are movements to tackle misconceptions around assistive technology (e.g. online bloggers [43]), there is still much work to be done on 'invisible' or unconscious ageism for people using assistive technology. These studies suggest that the visibility of assistive technology in shared environments such as the home and related feelings of stigma are important considerations for the adoption and acceptance of these technologies.

Nunes et al. [48] evaluates the "complex contexts" that approaches to self-care often entail and in their review of self-management technologies in HCI. They highlight how the HCI lens on self-care in fact necessitates the involvement of others in care processes with the use of assistive technology and as such, one must also discuss the other actors in proximity to an individual to fully understand their self-care practises. This approach highlights the importance of collaborative care, as an extension of self-care. Zallio et al. [65] further distinguishes the role that users play in the home, by delegating in-home care actors with roles such as 'primary resident' referring to the person in care, 'secondary resident' referring to other resident immediate family or friends, and also a 'tertiary' resident; referring to
anyone not living in the home. However, Zallio et al.'s work does not account for the differences between the roles of temporary residents (who visit to provide care) or that of clinical and non-clinical providers who may have a care role within a household. It is here that Branham et al. [8] introduce the concept of negotiated access of care devices between multiple residents, and where Bennett et al. [5] discuss “interdependence” to describe the relational aspects of shared access and use of assistive technology devices. Whilst the owners of assistive devices often assert themselves in using the device (independence), it is often interdependence between the owner, other actors, their devices and the environment (e.g. the home), where equal access can be best supported and AT users can be empowered [5]. Procter et al. [51] build on this work by addressing collaborative care from the perspective of the care provider. In their study, the challenges of operating an 'assisted living' service show how much additional or 'hidden work' (such as travel, setting up devices in peoples' homes, guiding first responders to a patient's house) is performed by care providers and informal caregivers, both inside and outside the home. [51]. These 'hidden' activities and influences are important to uncover in the context of ageing in place together with technology.

2.2 Towards 'Aging in Place' Together

The challenge of an aging population has been the focus of a range of technology research and interventions. 'Aging in place' is used within the CSCW, HCI and aging literature to describe older people who are encouraged to live independently in their homes, for as long as possible - without the need to relocate e.g. to retirement communities for additional support, however, there are also barriers to successfully achieving this [44]. Aging in place is therefore an autonomy-driven approach to allowing older adults to age in their homes and reduce the burden on healthcare services, usually through the use of novel technologies that support older people [10]. Bradford et al. [7] propose how the integration of both technology and services in the home is a pathway towards the development of smart home technology that supports aging. Other work by Lazar et al. [44] deals with the implications of telecare solutions that support aging in place. Their findings show how the need for companionship, even through the medium of virtual assistants, is valued by older adults as a means of connecting with a real person - the "teleoperator" (a human being) on the other side of the virtual assistant. Chinner et al.'s [15] work also looks beyond the impact of technology to support aging beyond the individual, by looking at the social impact within communities.

Evidence shows that these groups living 'around' older adults in the home also perform care duties and must adapt to individualised and dynamic housing situations, which make the challenges for aging in place with others, uniquely difficult [39]. This is of increasing concern as the traditional household setup in places such as the UK is moving away from homes being traditionally comprised of adults and their younger offspring and instead can be made up of adult children, extended family and renters [4], with an increase in multi-generational homes [60]. There have been recent moves towards looking at the shared use of technology in the home to overcome these challenges [41]. Crawford et al. [18] illustrate how users derive meaning and substantial use from another domestic visible technology; the weight scale, which requires: "collective, rather than individual participation" (p. 494) [18] Ogonowski et al. [47] discuss how the shared experiences of fall detection systems had positive outcomes such as raising awareness about falls, which in turn encouraged the use of this type of preventative technology. These studies have identified how, for example, individual and group efficacy affects the use and practices around shared technologies (e.g. Alexa devices) in the home [35]. Their findings show that these groups are fluid and extend well beyond the immediate household, to neighbours, guests and other clinical and non-clinical visitors. Other work has shown that technology use and freedom of use in the home is also determined by the role that each of these actors plays in the home e.g. parents restricting access to certain
devices for their children [26]. This perspective provides a unique opportunity to explore the impact of technologies for care in households, considering the social structures that develop around the use of technology at home [25,59].

Beyond the primary user, it is of interest to study the holistic journey experienced by the range of stakeholders that will influence (and be influenced by) the introduction of a new healthcare technology that supports aging in place together. Therefore, there is benefit to an exploratory approach: capturing the process of adoption and acceptance of an existing visible home health technology, which focuses on lived experience of a whole household, rather than the introduction of new technology being an end goal [13,40,53].

2 METHODOLOGY

We use a qualitative approach to examine the journey towards stairlift adoption and acceptance, to explore the complex socio-technical environment inside of a household before, just after and three months after a stairlift installation [12,49]. Outside of the household, we engaged with occupational therapists, assessment centre workers and stairlift installers; all of whom oversee the different technical stages of the stairlift installation process (from referral, to assessment and eventually installation).

3.1 Recruitment and Data Collection

3.1.1 Household Data Collection

Members of households (residents) who were expecting a stairlift installation were recruited. Residents are defined as those living inside a dwelling (household), or those who live outside and visit the household frequently e.g. as a healthcare professional or an adult child. Residents over 18 years of age were recruited in the city of [redacted] in the south west of the UK through [redacted] City Council; a city based local government authority who fund care services for people who are older or vulnerable, including home adaptations and assistive technology devices. The city council also work with and fund local assistive technology providers so that vulnerable and older people can receive the technology they need, cost-free. The council’s own team of Occupational Therapists identified lower income people eligible for city council-funded stairlifts who would be suitable to be involved in the interview study and gave them the recruitment advertisement. Many of the people the OT team worked with were clinically extremely vulnerable or near their end of life, and as such, the OTs did not deem suitable for recruitment or interview. This consideration initially limited the scope of our recruitment, so the research team branched out participant recruitment through advertisements in local libraries, engaging with two local charities, through the occupational therapist’s contacts working within the community, and through word of mouth. Four households were recruited (see Table 1, all names are pseudonymised). Socio-economic status of our participants was not collected as part of our demographic questionnaire, however the authors provide an identification of whether each property was urban or rural and the living conditions of each of our participants within the notes column, in the table below. All members of the household who were eligible and willing to take part in the study were informed about the study and provided informed consent, if they were willing to take part.
Table 1. Demographic data and participant information for households recruited during the study.

<table>
<thead>
<tr>
<th>Household number/ID</th>
<th>Name</th>
<th>Age</th>
<th>Gender</th>
<th>Role</th>
<th>Install Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-A</td>
<td>Abbie</td>
<td>71</td>
<td>F</td>
<td>Stairlift Owner</td>
<td>Privately Funded (rural property)</td>
<td>Abbie lived with a chronic pulmonary condition, where only 35% of her heart was functional. She could not go upstairs more than once a day for bed and required assistance from her husband, Andrew, who not only supported her mobility inside and outside of the home, but also supervised and maintained the stairlift.</td>
</tr>
<tr>
<td></td>
<td>Andrew</td>
<td>71</td>
<td>M</td>
<td>Spouse</td>
<td></td>
<td>意向性</td>
</tr>
<tr>
<td>H-B</td>
<td>Brenda</td>
<td>58</td>
<td>F</td>
<td>Stairlift Owner</td>
<td>City Council Funded (urban property)</td>
<td>Brenda had thyroid cancer and recently had a highly invasive operation to her spine that left her severely mobility impaired and prone to falling down the stairs. She is assisted by her husband, Bradley who also supports her mobility inside and outside the home.</td>
</tr>
<tr>
<td></td>
<td>Bradley</td>
<td>55</td>
<td>M</td>
<td>Spouse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H-C</td>
<td>Claudia</td>
<td>54</td>
<td>F</td>
<td>Stairlift Owner</td>
<td>City Council Funded (urban, council owned property)</td>
<td>Claudia has been hospitalised numerous times from a chronic lung condition and countless falls. Shortly before our first visit, she was released from hospital again and was expecting a return for further surgery. She is assisted by an extensive family network and a live-in granddaughter who helped her up the stairs to prevent her falling, prior to installation of the stairlift.</td>
</tr>
</tbody>
</table>
Each household was asked to take part in three in-depth, semi-structured in-home or phone (post COVID-19) interviews before installation, shortly after installation (up to one week) and three months after installation. Interviews included questions on technology experience, ("How easy do you find it to use your household devices e.g. fridge/kettle?"), the design and aesthetics of the stairlift ("What are your thoughts regarding the look and feel of your stairlift?"), and the experiences of the other people in the home ("How do you feel about other people using your stairlift?"). For in-home interviews, two authors visited each of the four households recruited for the study to conduct these interviews in situ, however the first author led the interview. Phone interviews were conducted by the first author.

All interviews were audio recorded and transcribed verbatim. All interviews lasted between 1 and 2 hours. 11 hours and 44 minutes of audio was captured from households and an additional 4 hours and 16 minutes from service providers (16 hours in total recorded and transcribed verbatim). Photos of any assistive technology in people's homes (including the stairlift) were taken during the first and second interviews. Informed consent was gained as per institutional IRB ethical approval. Participants were reimbursed £10 in shopping vouchers per hour for their time, per interview. All participants were sent a finalised version of the findings in this paper with their pseudonymised names. Participants then gave approval for the publication of their contributions to this study having read our account.

3.1.1 Service Providers Data Collection

A selection of service providers outside the household were engaged in this study. The role of these service providers added complementary insights to that of households. They provided a critical perspective on the installation process, the benefits of which have been highlighted in CSCW literature previously through providing more depth to a topic area [33] and by providing additional validation to directly captured data sets [36]. Five city council Occupational Therapists (OTs) involved in mobility assessments in [redacted] were interviewed in a single, one hour focus group. Two experienced stairlift installers from commercial companies in the UK participated in one-hour phone interviews, and two assistive technology customer service representatives (reps) participated together in a one-hour contextual interview at a local mobility assessment centre in [redacted]. Questions to these service providers were developed in line with those used in households, however we also asked the OTs about their role as health professionals and the assessments they carry out, the installers about the installation process, and the reps about how they discuss assistive technology with customers. Including the service providers’ accounts into the corpus for our data analysis allowed us to contrast the qualitative accounts provided by each household and supplement them, particularly about the early parts of the stairlift journey before adoption. All were audio or video recorded, and transcribed verbatim.
Table 2. Demographic data and participant information for service providers recruited during the study.

<table>
<thead>
<tr>
<th>Role</th>
<th>Participant ID</th>
<th>Recruitment Method</th>
<th>Engagement Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational Therapist</td>
<td>OT1</td>
<td>Email/telephone</td>
<td>Focus group at council offices</td>
</tr>
<tr>
<td></td>
<td>OT2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OT3</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td>OT4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OT5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stairlift Installer</td>
<td>IS1</td>
<td>Telephone</td>
<td>Interview at institution office</td>
</tr>
<tr>
<td></td>
<td>IS2</td>
<td>Email/telephone</td>
<td>Telephone interview</td>
</tr>
<tr>
<td>Assessment Centre</td>
<td>AC1</td>
<td>OT</td>
<td>Interview at Assessment Centre</td>
</tr>
<tr>
<td>Centre Workers</td>
<td>AC2</td>
<td>contacts/email</td>
<td></td>
</tr>
</tbody>
</table>

Informed consent was gained from institutional IRB ethical approval and service providers were reimbursed for their time with shopping vouchers for £10 per hour. All participants were sent a finalised version of the findings in this paper with their participant ID. Participants then gave approval for the publication of their contributions to this study having read our account.

3.2 Data Analysis

Interviews were transcribed using NVivo software by the first author and an inductive thematic analysis was performed [63]. Coding took place between all authors, however, the first author consolidated codes before the themes of the paper were agreed upon again by all authors. Codes were developed as interviews were completed within individual households. The experiences of participants were then compared across households which allowed for developing an in-depth understanding of the lived experiences of the stairlift in a household. In households where only one participant was interviewed (the stairlift owner), anecdotal accounts of other household members' experiences with technology and the stairlift were included (e.g. from household members who were under 18 years of age). These anecdotal accounts of other household members were provided second-hand from our participants and were included in the data corpus to provide a suitably diverse range of experiences around the stairlift from people whose voices would not have been captured otherwise e.g. as a result of being under the age of 18. Once the individual experiences of each participant had been identified, similarities and differences were then compared between households and consolidated among the rest of the research team [16]. At this stage, trends were developed from themes which were linked (e.g. decision making, and within it, coercion). These trends were iteratively compared and contrasted between the authors and against existing theoretical models in health and care research, leading to a higher level theme relating to household actors' emotional journeys of the stairlift's adoption and acceptance.

The inductive thematic analysis method was chosen over, for example, an Interpretive Phenomenological Analysis [21] due to the need to understand the stairlift experience from all of the stakeholders involved in the installation of stairlifts and not solely individuals or individual households. Adopting thematic analysis therefore, allowed us to examine themes which are common to and inclusive of the experiences of all households and individuals,
which in turn, allowed us to more easily derive transferrable research and design implications for smart home healthcare technology.

4 FINDINGS

Our analysis illustrates the emotional journey households went through in the process of adoption and acceptance of a stairlift. The process in which this journey takes place was articulated in different ways by the service providers involved in this research, often in a simple linear model beginning with a request being made to the city council and ending with a stairlift installation (see Figure 1a and 1b below).

![Diagram of Stairlift Installation Process]

However, we uncovered ways in which these linear journeys are quickly complicated by the socio-technical interactions between the wider household and the stairlift. This supposedly simple process towards getting and using a stairlift is impacted by the individual experiences of the residents and the household dynamics. This leads to a journey through decision making, conflict and trauma, and catharsis and independence towards the adoption and acceptance of this visible domestic assistive technology that is experienced by all residents in the multi-resident home. We discuss how these actors are each affected by the stages of this emotional journey.

4.1 Decision Making

4.1.1 Stairlift Decision Making in the Home

Decision making constitutes the first 'stage' of the stairlift installation process where households go through a process of discussion, argumentation, conflict and resolution between all residents as to how to reconfigure both the physical space of their home and what
lifestyle compromises they will make in order to accommodate a large piece of intrusive, assistive technology. As a result, the difficulty in making these decisions varied between households.

In H-A and H-B, residents were faced with a decision: to install the technology or to move to different accommodation. There was mutual agreement between both residents in H-A that “[...] it’s the right decision. No upheaval.” (Abbie). In H-B, there was considerable tension that developed between residents deciding whether or not to get the stairlift. Early in the decision-making process for H-B and after speaking to an OT about Brenda’s health, Bradley made a decision on her behalf to investigate how to get a stairlift installed. At this stage, Bradley’s daughter and granddaughters decided to arrange a mobility assessment from an OT, who came to their home. Brenda ignored the OT when he arrived: ”... she was very rude [...] she wouldn’t speak to him and just kept watching TV [...] but he was completely lovely [and] took it completely in his stride.” (Bradley).

In H-C and H-D, extended family and friends who visited these households frequently took a central role in helping to make decisions about getting the stairlift installed. As such, Claudia’s decision-making around the stairlift was impacted by the variety of different family members who frequently visited her. Whilst she had minor home health modifications installed into her home before (e.g. grab rails), the decision to get the stairlift appeared a step too far to her, despite the insistence from her regular visitors: “my granddaughter said ’oh nan, don’t you think it’s time...’ [...] but I didn’t want to [...] I’ve always been the carer of the family I suppose... I didn’t want to give in.” (Claudia). Similarly, in H-D, Doris also had a number of frequent visitors to her home including extended family and friends, and as her mobility declined, Doris’ daughter had started increasing her visits from once every other day to almost twice per day. On our first visit, Doris’ number of falls had recently increased and as a result, like Claudia, she was becoming hospitalised more often. At this time, her daughter and a friend both happened to make a suggestion to her: “[they] just came in one day, saw the mess [after a fall and said], ’[Doris], you’ve gotta put in for one.’ [...] A few days later, my daughter said: ‘mum, I’m doing it.’” (Doris). At this stage, Doris resented the decision: ”I didn’t want one [...] [they’re] horrible, ugly things. But, y’know, needs must.” (Doris). As with Claudia and Brenda, Doris began the installation journey feeling resistant to the technology, but also feeling despair at her health situation. Whilst much of the initial decision-making process experienced by residents was informed by a physical need, arising from their underlying health conditions, other emotional considerations affected these decisions and were reported across each household.

In H-A, the decision to get the stairlift extended beyond Abbie’s physical health. Andrew managed to persuade Abbie early in her decision-making process that moving out of their current home wouldn’t be beneficial: “The alternative was moving into a bungalow [and] for the cost of the stairlift [...] with the [property acquisition tax] on top, it wasn’t worth it.” (Andrew). To this, Abbie retorted: ”He made the decision more than me! [laughter] [...] [Andrew] phoned [local stairlift company] for me. To tell you the truth, I was a bit reluctant.”. However, it was not just her spouse who influenced her to remain in place in her home and to go ahead and get the stairlift: ”My daughter was bullying me into it, [...] even my granddaughter who’s only 3 had a go at me about it [laughter]. She had been primed, I must admit. ’Tell grandma she needs one!’” (Abbie, Figure 2). This account exemplifies how it is not just the stairlift owner making the decision about getting the stairlift for their own health. The wider household have suggested to, argued with and (sometimes with the help of grandchildren) coerced the stairlift owner into considering their feelings as well. Abbie’s account describes explicit coercion (“bullying”) which impacted her decision to get the stairlift. In H-B, H-C and H-D, however, the influence of other residents is more nuanced: “my
daughters really wanted me to get it. [I'd] had a fall once and they couldn't get a hold of me, so they bought me a new mobile. That was before they told me to get the lift!” (Brenda).

![Figure. 2. Abbie (H-A) making use of the stairlift in her home.](image)

Participants recounted stories from close friends or relatives who had a stairlift in their homes, and in some cases residents actively sought out stairlift owners to source information and experiences to alleviate their own unease about the technology. In H-A, Abbie described how her mother had a stairlift, with Andrew later confirming (or perhaps reassuring Abbie): "it's an old rickety thing [...] ours [will be] much better" (Andrew). Both Claudia and Doris also describe how they reached out to their sister and mother respectively, to gather more info: "I've used my sister's before now... it was quite slow. But I didn't have any problems on it. I knew what to expect." (Claudia). Brenda describes a situation where she sought out friends to find out more about the stairlift and to help guide her decision on it: "I was feeling very unsure about it so [I spoke to] our neighbours... they were very interested that I was getting one put in. They had one put in. So I asked them [what it's like] and they went 'ooh, it's so good [Brenda], it'll be a big help.'" (Brenda).

At the same time as these high anxiety levels were reported, participants described reaching out to friends or relatives for their opinions based on experience (either lived or anecdotal), but they did not describe looking for written clinical or diagnostic information. The self-reporting of high anxiety levels at the start of this shared stairlift journey, supports the accounts of "unsure" participants seeking out advice, stories or information from trusted (rather than official i.e. government health) sources, as an important step for our participants towards tackling this anxiety and moving forward with their installation journeys.

4.1.2 Clinical Decision Making in the Home

Conversation with the OTs began by informing us that stairlifts are designed and tailored to a person’s dimensions and their home environment (e.g. height, weight of a person, space on the staircase, which all informs the type of stair lift (stand up, kneeling) that is provided and where it sits in the home. This is contrasted interestingly, with accounts from our Assessment Centre Workers (ACWs), who describe how the ability for stair lift owners to personalise their stairlifts (e.g. change the colour, fabric etc.) is in fact "limited" (ACW1) to only basic choices on colour (e.g. cream, black). Decisions relating to stairlift installations paid for by the local city council often take place outside of the home. Clinical assessments of a person’s mobility and health, to determine whether they should have a stairlift installed or not by OTs can take
place over many months. However, during the focus group with the OT team, they described how they form strong relationships with households as part of their roles through numerous home visits. As OT2 pointed out: "It’s a holistic assessment... we speak to family members, carers, especially if that person isn’t able to [...] communicate very well." (OT2). OT1 added: "Often, these people are not in the best of health." (OT1). This account emphasised how important it is to not only get to know and assess the person who the stairlift will be designed for, but also to complete a holistic, interpersonal assessment of the whole household and each individual’s needs to ensure that the right equipment can be put in place for the right person and health condition, aiming for acceptance of the technology by other residents as well.

The OTs expand on how it is often necessary for them to speak to other members of the household during an assessment, if the stairlift owner is, for example, cognitively impaired: "we look at all sorts of options first [...] who’s supporting them, who’s affected [...] [I was] working in the children’s team... so we had children with severe autism. So we had to look at putting a stairlift in that was going to meet the mum’s needs [for her home], and her child’s as well." (OT3). When the user of the stairlift is not able to give voice to this decision, the OT must then weigh the benefits of the stairlift for the entire household, in order to carefully make a decision that balances all of the residents’ needs. The OTs described how, often, it is the fears of the other residents (as seen with OT4) that lead to the decision-making around the stairlift taking place: "... families want to jump to this [getting a stairlift], because they’re scared, because they’re not living there. They’re afraid - they’re afraid they’re gonna get a phone call that person’s falling - and... [...] if we’d put a stairlift in, that wouldn’t have happened." (OT5). However, the OTs role also requires them to dissuade people from choosing a stairlift: "They see it on the TV and they think ‘Yeah, that's what I need.’ Or I’ve had [another case where] the son was like ‘well if she needs a stairlift, we’re going to buy one. We’ll do it ourselves. We don’t need you.’ [...] They were quite rude actually. But [...] they’re scared [...]" (OT2). In this case, the OT described how families often ignore their clinical decisions and dismiss the wishes of the person with mobility needs, to get the stairlift, even if that is not the most clinically suitable option. This supports findings from H-A and H-B, where family members used coercion (H-A) and intervened on behalf of the person requiring care (H-B) in order to ensure the stairlift would be put in.

4.2 Conflict, Trauma and Risk

4.2.1 Conflict Outside of the Home

Following the decision-making stage that takes place between residents within the home, our participants discussed a stage of struggle that sometimes takes place outside of the home in local assistive technology showrooms. At the facility called the "Assessment Centre" (Figure 3) (OT3), city council-funded households are referred for an appointment to test their mobility and cognitive ability, if this information cannot be gleaned from a home visit by the OT. This site was where conflict and trauma was experienced most by our participants.

H-B was visited by an OT in their home and also attended their local assessment centre. Brenda describes how initially: "It was difficult in the beginning, but I’ve grown to like him [OT]." (Brenda). As a result of this, Brenda eventually conceded: "I said I'd go [to the assessment centre]... but, only if [my husband] went with me." (Brenda). Despite this initial agreement to attend the appointment at the centre, conflict was apparent almost as soon as they arrived: "When I first got there. I did say ‘I don’t think I need one. I’m quite alright to walk at this stage’...and I went to leave" (Brenda). Her husband disagreed because despite her recent spinal operation and her frequent falls, which impact him: "She likes to fall.. in the night. She’ll get up and sometimes I’ll hear a loud. crash. [...] Only the day before this [appointment] you fell
again, didn’t you?” (Bradley). However, the OT spoke further with Brenda and convinced her to stay for the rest of her appointment: “…he kind of knew that I wasn’t happy being there [and having a stairlift].” (Brenda). Brenda and Bradley then argued over the need for getting the stairlift in the assessment centre with the OT present: "She told me ‘I don’t need it, I can do without it.’ But I said back to her. ‘just try’” (Bradley). Brenda proceeded to walk up a small set of stairs which were built into the centre for their clients to use during assessments. After failing twice, the OT came over to her and said: "‘Okay, I’ve seen enough […] I can’t force you to get one but you do need one’ […] at that stage, [Brenda] was in tears. And I knew that that meant she had surrendered to the idea. And there are advantages to being married for nearly 30 years. [laughter].” (Bradley). Sometimes, the OTs made recommendations for additional modifications at the assessment centre (at no extra financial cost), but which would further support the stairlift owner's mobility elsewhere in the home. Doris also reported how the OT suggested to her that she must consider getting an accessible bathroom installed, to further support her in the upstairs of her home: "… Yeah I cried. Because it was such a shock. I thought ‘oh we’re only having a stairlift’ […] but then […] I didn’t want to lose any more space in my home.” (Doris).

The experience that H-B describes is echoed by the Assessment Centre Workers (ACW1, ACW2). The ACWs describe their role as: "...not here to sort of pressure sell them. We’re not here to say ‘this is what you must have’. It’s just to give them advice. [...] We have an in-house OT, as well as [OT from the local council]. [...] It’s all about… giving them the information they need.” (ACW1). However, in some situations, despite solely acting as information providers, the ACWs are drawn into a household conflict: "You can be like a referee as well!” (ACW1), "[we say], ‘take your domestic outside!’ [laughs]" (ACW2). Throughout this conflict stage, the assessment centre staff try and remain neutral and uninvolved, however, this is not always practical or easy to do. ACWs describe how public arguments can break out in the centre over anything from the cost of a stairlift installation ("they have to weigh up the expense sometimes, and that sets them off” (ACW2)) to the colour scheme of a particular modification ("they both [had] conflicting views over what [colour scheme] would look nice in their bathroom.. there was a bit of a domestic.” (ACW1)).

Figure 3. The Assessment Centre, which provides a range of low-tech home modifications that can be trialled and/or purchased.
The ACWs highlight how the nature of this conflict could be linked to a sense of embarrassment experienced by the person receiving the home modification: "they go 'oh, I'm ever so sorry, I wish I didn't have to be here'. then turn round and carry on bickering." (ACW1). This extends our findings from H-C who also experienced a sense of embarrassment when attending the assessment centre. Claudia describes how: "I [tried] to climb the stairs [in the assessment centre] and just fell flat first time. It was so embarrassing." (Claudia). Participants' experiences of embarrassment in the assessment centre were described as linked to their attempt to climb the stair case, but also with trying out the technology itself: "I felt a bit embarrassed at first [trying out the stairlifts] just that I got to that stage to show how bad you are. [...] [daughter] said 'go on mum, put in for one.' and then I cried. Oh I cried." (Claudia). This account demonstrates that trauma experienced by the stairlift owners is not necessarily a result of direct conflict or disagreement. In this case, Claudia was encouraged by her daughter but not confronted or coerced whilst in the assessment centre. Nevertheless, this experience is still described in traumatic terms by Claudia, as she had to come to the same realisation as with the other households that she must ultimately "give in" and get the stairlift for her own health benefit.

Whilst these accounts provide an idea of how stairlift installations can be traumatic for households inside of a public space like the assessment centre, there is also a great deal of trauma experienced by all residents in their own homes, both before installation and after the stairlift has been installed.

4.2.2 Lived Trauma in the Home

Residents also provide accounts of their trauma with stairlift installations in their own homes. Doris recounted the experiences with her new stairlift only a few days after installation: "[It's] Ugly and scary [...] It looks like - well, it's a monorail. [...] I think it'd be better suited to a ski resort than on my stairs." (Doris). Doris's account attests to how the stairlift is not a 'neutral' healthcare technology in the home [28], but rather intrusive to the space. She goes on to describe how the other members of her household have similarly experienced the stairlift: "Even my granddaughter - and my grandson who's sort of frightened of nothing, he said, 'I can see where you're coming from, Nan, I can see you'd find it a bit scary.'" (Doris).

The experience of the stairlift installation itself (the day of installation), presents a further traumatic experience in the homes of both H-D and H-B. "...about a week before [installation] somebody had come and he'd put stickers everywhere and taken hundreds of photos. You know when you see these detectives doing crime scene things and they put little stickers there and they take photos, I thought, 'Any minute now, he's going to draw out a body on the ...' It was like that." (Doris). She describes how, later on in the day of the installation "I heard a bang, so I didn't say anything but they have scratched it [stairlift rail] [...] I saw him touch it, he thought I didn't see him. I sort of looked up and he's sort of touching it up with Tippex. [...] It was a bit of a shock really." (Doris). H-B recount a similar experience of their own stairlift installation, which was provided by the local city council: "It was actually quite traumatic. They arranged a date for the installation [...] The following morning they didn't turn up. This upset [Brenda], and she'd just come around to the idea of getting the stairlift.] So we re-arranged." (Bradley). Of the installation itself, Brenda describes: "I found it very difficult looking at it. I got very emotional. When it was being put in, I got very emotional because it's like it's another thing to accept. That sounds strange but everything I've been through - it's accepting what I can't do any longer." (Brenda). After installation, H-A also described a traumatic experience with the technology shortly after beginning to use it: "there was a bleeping noise [...]" (Andrew), "we just couldn't turn it off at first [...] [it was like] my alarm clock." (Abbie), "[...] so we had to come and get someone out to tell us how to fix it." (Andrew).
4.2.3 Risk in Stairlift Installation Settings

The stairlift installers also recounted their own perspectives of changing installation plans that might cause stress or unease in the household: "you have to assess the risk every time you go to a property [...] some homes may be unhygienic. I had a [client] who I turned up to, went into the hallway and had to politely leave. I then phoned my manager and said 'look, sorry, I can't do this job. It's not safe. [...] I'll re-arrange it though.' It's hard, because you know they need it." (IS2). The installers described the wide variety of installations that they deal with day to day (e.g. "six million-pound yacht [and] a high-security prison." (IS1)) and the importance of being able to empathise with peoples' needs for stairlifts, despite their circumstances. In many cases, the installer described how it could "take all day" in order to teach new stairlift owners how to use the technology. Despite being provided a brochure on its use, the installer does not leave the property until they are confident that the owner understands how to use the technology, "otherwise, you just have to go back." (IS1). To this end, he argues that "patience" and "calm" are essential to his role, even if not prescribed for every installer, as the learning process, particularly for people with different cognitive abilities, cannot be rushed. IS1 described how each installation provides its own challenges, which can be linked with the trauma of installations: "I mean each job is different. Sometimes... if you've got say, a curved track, you need two guys going in and it can take all day. But if it's just a simple straight, it might take just a few hours. [...] Sometimes there's damage.. and you can't avoid that." (IS1). Whilst this account does not provide contrary information to H-B or H-D's installation experience, IS1's experience of installations does show the challenges he experiences due to the diversity of stairlift products, home settings and challenging working environments.

These accounts from residents and installers show that they both understand the benefits of the stairlift and will work to make an installation happen, despite trauma from the installation itself (residents) or the challenges in working in environments with risk (installers).

4.3 Catharsis and Independence

The challenges of making a decision and the trauma experienced during and shortly after getting a stairlift is compounded by residents' ongoing chronic conditions and care burdens. Despite this, participants also had positive discussions around the stairlift that emerged as adoption moved towards acceptance. After the initial period of trauma, most residents (not just the stairlift owner) experienced a strong catharsis. Within HCI, cathartic practices (or actions that "have a strong impact on humans by releasing tension" (p. 22:5) [27]) are described in a variety of ways; from the destruction of physical objects, to playing video games to relieve stress [22]. Our findings see the stairlift used in a similar capacity - as a tool through which strong emotions, which have built up either in one resident or in multiple residents, prior to its installation, are released in a variety of ways after the initial installation.

The catharsis that is apparent in H-A comes in the form of shared play with the device. Once the stairlift was installed and "playtime" got underway with her granddaughter, Abbie discussed how she engaged with her grandchildren to share these experiences of fun and play with them: "It's grandma's up and down chair. 'It's a toy. It's a child's toy. [laughs][...] It's nice to be able to use it with them finally." (Abbie). After 3 months of living with the stairlift in their home, Andrew also described a sense of relief and discussed the changes to H-A's household dynamics: "[I] would never go out until [Abbie] was actually downstairs. [...] Now, because of the stairlift [I'll] go out knowing that [Abbie is] ok coming down the stairs. So I suppose it's made
life a bit more easier for both of us actually.” (Andrew). In contrast, Brenda described a cathartic moment when she recognised how her household dynamics could remain the same because of the installation: “[just after the installation] my husband said ‘if you didn’t have the chair we would’ve had to have moved - and lost this house and gone to a bungalow’. I cried. [...] I think they [husband, children] knew why. It was a relief honestly. It was the right decision.” (Brenda). Similarly, Claudia discussed how her moment of “relief” came when she considered that she had full access to her own home again. Having previously been planning to restrict her daily activities to the downstairs of her house, Claudia experienced a strong relief and realisation: “When I realised... I wouldn’t have to be living downstairs for the foreseeable... that was such a relief. And y’know it’s given me that [upstairs of her house back]. Oh I cried.” (Claudia). Doris also describes a catharsis, albeit tempered by her ongoing fear of the technology: “I mean... I know what it means to me, I came to that moment early on - bright light, aaah [laughs]. I know it’s gonna do good. I think that helps me get over the fear! [laughs].” (Doris). Despite this fear, Doris expresses that she can see the benefits of the technology for her own health and wellbeing. This is echoed by the stairlift owners, where their initial resistance to the stairlift has been reconciled with the benefits of their experience of using it.

Other residents in H-B and H-D also discussed a sense of relief, as well as a reduction in care burden and greater independence from not needing to be physically present in their house as often. Both Andrew and Bradley describe a much greater feeling of independence, with Andrew able to have greater freedom to exercise at their local gym “without worrying” and Bradley being able to visit their local allotment: “I don't have to worry anymore that I’ll get a call [from one of our kids], saying [Brenda] has fallen down the stairs.” (Bradley). Residents describe how they had benefitted (or would have benefitted) from greater freedom to engage in their hobbies and thus increase their own mental wellbeing. In H-C, Claudia’s family, also discussed the greater freedom they experienced with her: “means my granddaughter can go out and see her friends [...] my sister came over and said ‘this ain’t half bad [Claudia], is it’ and had a go on it.”

These accounts reveal not only the extent of the stairlift owners’ emotional struggle with their mobility (and subsequent sense of relief and release), but also the benefit of the stairlift installation to the quality of life of the wider household. Whilst the initial benefits to the stairlift owner become apparent almost immediately (e.g. Claudia being able to easily access all the parts of her house again), the benefits to the other residents become apparent after the stairlift has been installed for a longer period of time. From the accounts of residents who indirectly ‘used’ the stairlift, these benefits are apparent at the 3 month post-installation interview stage, with some residents (e.g. Andrew and Bradley) showing direct advantages to their physical Activities of Daily Living (ADLs) [25]. Others, such as the non-resident children and grandchildren in H-B and H-C discussed more indirect benefits at 3 months such as reduction of care burden and less worry or anxiety about the stairlift owners' welfare: “It's a relief for my daughter now too. She's autistic and she's seen me fall a few times and it scares her” (Brenda), “She [granddaughter] has to help me upstairs much less often. Still, a little bit time to time, but much less often” (Claudia).

5 DISCUSSION

We have investigated how stairlift installations affect the primary user and the wider household to see how this technology enables people to age in place together. Our findings showed that actors both inside and outside the home engage with the stairlift journey in different ways and at different times, meaning that this type of domestic health technology is in fact collaborative and social. This visible assistive technology is interdependent [4] on others to be emotionally accepted, not just relying on acceptance from the stairlift owner. Therefore, the simple models that the occupational therapists and home installers described
for the stairlift installation process (Figure 1a and 1b) are oversimplifications of a much broader, messier and more complex set of socio-technical activity in the home. Whilst each household’s emotional experiences of the stairlift journey are incredibly nuanced, dependent on the health condition of each stairlift owner and the socio-technical interactions between all household residents, the authors developed a summarised ‘view’ of the emotional installation journey (Figure 4, below), which extends the simple models (Fig 1a and 1b) and presents a more holistic emotional installation journey that encompasses all three aforementioned stages and where this journey is influenced by the wider household.

We next describe the stairlift’s influence on the wider household, how to mitigate some of the problematic elements of the shared emotional journey and then propose research and design implications directly arising from each stage of the stairlift journey for technologies aimed at supporting the management of health and wellbeing conditions in domestic settings, including assistive technologies [41], self-care technologies [28] and smart home technologies [37].

5.1 The Influence of the Wider Household

Our case study of the stairlift has shown how the journey towards the adoption, use, and acceptance of a visible domestic health technology is impacted by the messiness (events, places, people, emotions [11]) of everyday life. Our findings on this visible assistive technology also align with some of the critiques of stringent models of personal informatics behaviours, where actual use can involve complex, personal lived experiences [31] and complex social interactions [13]. Our findings exemplify this as a complex and collective emotional journey that is involved in the adoption and acceptance of an intrusive domestic health technology, that ultimately supports aging in place together. We have shown how this complex sociotechnical system is influenced by a range of actors, each with competing interests in the stairlift journey that often veer away significantly from the primary purpose of the technology to support the quality of life of a person with mobility needs. We delineate the actors within and outside of the household into four roles: primary-quaternary, that make up each home’s unique care support around the stairlift. Our findings illustrate that residents and non-residents can be characterised by these four roles which link our households’ accounts to existing descriptions of primary, secondary and tertiary residents in care networks.

Our understanding of these roles extends Consolvo et al’s [9] work on caregiver dyads, Buyuktur et al.’s work, that describes people’s experiences of technology that improves e.g. quality of life and independence with others in the home as being “collaboratively constructed” [7] and Zallio et al.’s work [40] which introduces the notion of “primary” (those who own the technology), ”secondary” (those who share the technology) and “tertiary” (dependents of primary and secondary and those who share in the use of the technology in the home e.g. children) users (p. 4) [62]. The defining characteristic of these ”users” is that their role in delivering care is both social and technical (sociotechnical) by way of providing care support to both the everyday care routines (incl. ADLs) of a person in care as well as support with the everyday use of their care technology. This reflects and directly builds on Branham et al.’s work [6] which suggests co-constructed support of accessible technologies is vital for their adoption. Building on this further, work from Abowed et al. [1] has presented similar caregiver network terminology, adopting e.g. ”primary” to denote the person with technology in receipt of care. Amiribesheli et al. (p. 1761) [2] extend this to describe how "care stakeholders" ("secondary" and "tertiary") play informal and social caregiving roles respectively; where the former assists in monitoring incidents, repairing broken devices and generally maintaining the device infrastructure in the home while the latter performs a more
remote role, checking in on the technology users, using devices themselves and making suggestions for improving the day to day use of the care technology, or contributes by making suggestions for purchasing new equipment. These primary, secondary and tertiary characterisations are familiar to our own findings with the stairlift. However, our study builds on this work in specific ways:

Figure 4. Illustrated summarised view of the three-phase emotional journey, for households adopting and accepting a stairlift. This view is neither complete nor prescriptive. Instead, this view intends to summarise and exemplify our participants’ lived experiences with the stairlift.

We found that the primary (live-in) resident, whilst still the owner and user of the care technology, is also as a conduit through which other socio-technical activity relating to the installation of the stairlift (e.g. decision making), is centred around. In the context of our findings, primary residents:

- demonstrate self-awareness of their prolonged chronic health conditions and seek advice, albeit reluctantly at first,
- whether through a sense of responsibility to themselves (H-A, B) or through feelings of guilt about burdening others (H-C, D), will eventually engage with clinicians (in-home),
- will engage in conflict with others (e.g. clinicians, spouses) privately and publicly (outside of the home) to defend their abilities, resisting the stairlift, even when they are shown that they require physical support, and
later, learn and adjust their lifestyles when they have the stairlift, to understand the technical facets of the technology and share their understanding and experience of the stairlift with other residents, who can support them in its use and upkeep.

To support the primary resident in the use of the stairlift, secondary (live-in) residents (spouses and live-in family members in our study):

• perform research and information gathering to help inform or persuade primary resident (H-A, B, D),
• provide social support and facilitation during out-of-home clinical assessments (H-B, daughter in H-C),
• engage in conflict with primary resident both in-home and in public (e.g. husband in H-B),
• supervise installers on the day of stairlift installations, out of general interest or concern for the physical structure of the property (H-A, B), and
• learn about the technology along with the primary resident in order to continue to maintain it and supervise its use (e.g. spouse in H-A).

Beyond this, our study revealed the role of tertiary (live-out) residents using the stairlift in each household. We categorised these people as those living outside of the home, who did not have a clinical role, but who could provide informal care and were socially related to the primary and secondary residents of the household and visited frequently (e.g. adult children, grandchildren, relatives, close friends of the household). These residents:

• contribute to decision making through influence (knowledge or coercion) (e.g. grandchildren in H-A, C),
• support physical changes to the home e.g. through redecorating (painting) the household (H-C),
• purchase technology to support the primary resident's chronic health conditions and mobility (H-B),
• physically support primary residents e.g. to get upstairs as part of caregiving duties (H-B, C, D),
• share information and experiential or anecdotal stories re. the stairlift from their own lives (H-C, D).

The primary-tertiary residents, which we expand on here from the aforementioned caregiver network literature, show how live-in and live-out residents interact to support the stairlift installation. What is less explored in previous literature, which we also have documented in this study, is the role of OTs, Installers and Reps inside and outside of the home who influence the adoption and acceptance of this technology. These quaternary (live-out) professional roles, which in our study included performing mobility assessments, identifying primary residents' cognitive capabilities, performing physical installations or taking measurements of a person for a home adaptation are prescriptive to these clinical roles, however, our findings shed light on the additional social support they provide that goes beyond their job roles, to support the people receiving a stairlift, for which they are largely unsupported. This includes:

• engaging in conflict management (ACW1/2) and setting expectations for concerned family members (OT2),
• acting as a referee/intermediary for primary, secondary residents when conflict arises (ACW2),
• providing structured, supervised learning support for new stairlift owners (IS1),
• problem solving on their feet e.g. fixing damage caused to a household after install, often in unique locations (e.g. prisons), or for non-stereotypical [10] home layouts (IS1, H-D).

As the OTs discuss, the support for the stairlift journey must be holistic and therefore supportive of all the actors in the multi-resident network. However, this should also take account of the fluid roles that quaternary professionals perform themselves, in order for them to provide individualised, sociotechnical support to each household (whilst being supported themselves). Therefore, future research and design should consider the versatility of quaternary professionals’ duties, from being socially engaged members of a household (albeit temporarily, for assessments), to understanding and having to judge the long-term impacts of a stairlift on each member of a household. Consideration should specifically be given to how technology can be used to help quaternary professionals in their holistic understanding of each household, reducing the potential for misunderstandings of a home within an assessment.

Prior work has demonstrated the benefits of investigating a wide range of low-fidelity tools to inform emerging technologies, from examining tangible money practices to inform digital financial systems [24,29] to exploring paper-based practices to inspire new self-tracking approaches [3,12] and digital medical checklists [26,32]. Digital health and care systems such as [39] and [19] have also previously supported holistic clinical interventions, so it is reasonable to propose that future smart home research and design could similarly support the varied duties of quaternary professionals using a combination of low-tech and digital systems to perform e.g. in-depth holistic assessments of technology interventions in multi-resident homes, with access to social data on the household structure that is made available to clinicians, on request.

5.2 Supporting Home Health and Care Technology Journeys

Reflecting on the three main stages of the emotional journey, we can identify transferable research and design implications for visible assistive technologies like the stairlift, which are aimed at supporting the management of health and wellbeing conditions in domestic settings, including other AT/LTHMs [41], self-care technologies [28] and smart home technologies [37].

5.2.1 Mitigating Conflict and Empowering Accessible Technology Use

Due to the complexity of each stairlift journey, conflict and tension between the stairlift owner and other residents or professionals, was something each participant touched on, from conflicts with OT’s to public family arguments, such as in H-B, in the assessment centre. From our accounts of trauma in stage 2, we advocate for researchers, designers and care professionals to support the process of AT adoption and acceptance at each stage towards acquiring and using it, with the understanding that conflict arises around the technology, as part of a lengthy, often mentally and physically traumatic socio-technical process. Our participants’ accounts showed that the strong emotional experiences, such as attachments to their home’s physical space and not wanting to damage this (H-B, H-D), to worrying what others would think of the technology (H-A, C, D) and not wishing to come to terms with their own long-term health conditions.

These experiences around home health technology must be weighed equally as importantly as the practicalities of the installation itself; as the introduction of a new technology is going to affect the quality of life of the wider household care network, both inside and outside the
home. This observation has been made by others too. Kraemer et al. [15,23] discuss 'group efficacy', which refers to: "the ability of the group to exercise influence over the technology" (p. 7) [23]. Building on this, Gutierrez et al. [17] also observe "unbalanced" relationships that are "conflict-prone" (p. 1618) between older adults and the care stakeholders in household caregiving settings. Bennett et al.'s work too [4], shows interdependence between household residents on one another, for social support and catering for others' needs beyond the owner of the technology (a single person).

We see frequently from the stairlift journey, how power imbalances are apparent between residents, yet the pre-existing (simple) models of installation (Fig 1a, 1b) do not refer to any measures that would mitigate this conflict or any plans to support families during this experience. Schneider et al. [18] suggests that a structured understanding is needed in order to identify sources of disempowerment, which "requires a definition of the underlying maxim and goal of empowerment" (p. 10). Through understanding where difficulties such as conflict or trauma are arising e.g. from arguments with OTs (H-B, H-D), to multi-resident arguments in assessment centres (H-B) and emotional distress in these spaces too (H-C), actions can be taken to be able to prevent this and in turn support and empower the people getting a new home health technology. There are opportunities to prepare people for these conflicts and to reduce disempowerment in the multi-resident home by facilitating difficult conversations earlier in the adoption journey with the aim of reducing anxiety, apprehension or possibly resistance when encountering a new assistive technology for the first time. Potential technological solutions might help prepare households for the decision-making stage, by considering factors such as cost and downsizing their existing homes (H-A) to apprehension brought on by discussion with friends and family members (H-C). Considering these factors could encourage discussion in situ, in the home, instead of in public spaces where arguments and subsequently, embarrassment may occur. To support difficult conversations inside of the home, for example, an augmented reality system could be developed, to let users experience the technology being placed in their homes virtually, before committing to a physical installation. Embedding technology into the stairlift journey as a support mechanism for the journey itself, could help to empower the multi-resident household and help all residents feel greater control. Moreover, health professionals who work closely with households during the home health technology journey could help to refine this technology, by using their own experience to identify potential coping strategies where difficulty or conflict typically arises within the adoption and acceptance journey.

5.2.2 Supporting Complex and Bespoke Journeys

Beyond empowering each household and each primary user in decision making around the technology, it is necessary to consider how to cater to each new AT installation journey for each unique household. No two homes or installation journeys are the same; each come with its own set of challenges and rewards, showing again the fallibility of simple models for home health technology installations. Desjardins et al. [10] and Wolf et al. [38] exemplify this, showing that homes themselves impact the activities that take place there (e.g. the way food is prepared [10]), which has implications for health and wellbeing technologies where unique household contexts can influence adoption and acceptance journeys. This reflects our participants discussions of the physical space of their homes and how permanent changes to their homes is of great concern alongside the desire to mitigate disruption (H-B), mess (H-B, H-C) or damage (H-D) to their properties. Here, technology could benefit households through e.g. designing online guidance for participants, that explains what physical changes to their home are likely to occur in a range of household varieties (e.g. houses, apartments, boats etc.).
In addition, people living with diverse health and wellbeing conditions tend to have idiosyncratic self-care needs and technology preferences [3,8,28], which further diversifies each household and makes designing tailored technologies even more challenging. The household context itself, the people within the home, and the technology that is used there will always be unique. As such, we encourage healthcare professionals and service providers to address this socio-technical complexity by supporting home healthcare technology installations journeys flexibly and not to adhere rigidly to standardised 'one-size-fits-all' models, that often inform health and social care policy [20] (e.g. considering the complexity of risk that our installers described in their visits to different types of homes, the difficulties of conflict that ACWs have to mediate in assessment centres, and the judgement that OTs used with those who were resistant to stairlift assessments). A change in service design from the healthcare provider (in this case, the local city council) that 1) considers how the technology itself impacts the assessment and installation process, 2) considers what factors are known 'pain points' (e.g. instances such as the aforementioned conflict within the assessment centre), and 3) prepares residents for adjustments to their daily lives could improve communication and social interactions between the healthcare professionals (quaternary) and live-in (primary, secondary, tertiary) residents, throughout the stairlift journey. Adapting the provision of home health technology for diverse homes and to each household context should be a direct consideration for complex socio-technical journeys such as stairlifts installations, and also for new intrusive and emerging home health technologies.

5 LIMITATIONS

Our study took place over a 3-month period so it was not possible for us to understand the longer-term acceptability of the technology. Our data was also recollected by participants during each interview as opposed to gathering an understanding of lived, situated experiences. Although we were interested in the overall shared experience of the emotional journey, engaging with and analysing individual households provided further depth in understanding unique dynamics of those contexts for future work. Moreover, our investigation was only able to capture second hand accounts from other members of the household on the role that tertiary residents played in the stairlift installation. As such, we believe there is opportunity to further explore the use of LTHMs (or stairlifts) within the HCI domain.

While our qualitative approach provided retrospective accounts of the lived experiences of each household, further investigations of stairlifts could look at comparisons between e.g. stairlift usage log data, compared against people’s self-reported accounts of stairlift use, to identify and probe discrepancies around perceived use. Further, whilst our study ran for three months, experience sampling of participants getting a stairlift over a longer period of time (around 1 year post-install) could also be captured to further explore emerging issues we found in participants’ interviews at 3 months e.g. investigating the impact of longer-term maintenance of the technology.

6 CONCLUSION

We detail how the journey towards the adoption and acceptance of a stairlift is impacted by the messiness that arises from the needs and wants of all the residents in a multi-resident household. Our findings focussed on the difficulties that arise from the physical and emotional impact of the stairlift installation journey on household residents, who are aging in place together. Our qualitative approach revealed non-linear improvements in the quality of life of the stairlift owners and a trend towards technology acceptance for members of the wider
household. The case of the stairlift specifically builds on existing discussions of co-constructed support for care in the home. We found that the acceptance of the stairlift as an accessible health and care technology is reached as a direct result of being negotiated between all actors involved with the technology, across the decision-making and conflict and trauma stages - over time. It is adopted for all residents during the catharsis and independence stage and is used and even enjoyed, by family members once the earlier turbulent stages have been emotionally overcome. We propose that considerations for the adoption and acceptance of any home health technology take into account the four sets of actors that influence this emotional journey: primary residents relying on the technology, secondary residents living with the technology, tertiary residents regularly interacting with the technology, and quaternary professionals outside the home who specifically impact the journey through their service roles. We call for new ways of supporting multi-resident, socio-technical challenges in the adoption and acceptance journey to help to streamline the process of getting technology inside a home to ultimately support health, care or wellbeing needs.

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