Social Science & Medicine 358 (2024) 117187

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Navigating artificial intelligence in care homes: Competing stakeholder views of trust and logics of care

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ARTICLE INFO

Handling editor: Medical Sociology Office

Keywords:
Artificial intelligence
Qualitative research
AI
Older people
Long-term care
Nursing homes
Stakeholders
Sociotechnical care
Trust
Aged care

ABSTRACT

The COVID-19 pandemic shed light on systemic issues plaguing care (nursing) homes, from staff shortages to substandard healthcare. Artificial Intelligence (AI) technologies, including robots and chatbots, have been proposed as solutions to such issues. Yet, socio-ethical concerns about the implications of AI for health and care practices have also been growing among researchers and practitioners. At a time of AI promise and concern, it is critical to understand how those who develop and implement these technologies perceive their use and impact in care homes. Combining a sociological approach to trust with Annemarie Mol's *logic of care* and Jeanette Pol's concept of *fitting*, we draw on 18 semi-structured interviews with care staff, advocates, and AI developers to explore notions of human-AI care. Our findings show positive perceptions and experiences of AI in care homes, but also ambivalence. While integrative care incorporating humans and technology was salient across interviewees, we also identified experiential, contextual, and knowledge divides between AI developers and care staff. For example, developers lacked experiential knowledge of care homes' daily functioning and constraints, influencing how they designed AI. Care staff demonstrated limited experiential knowledge of AI or more critical views about contexts of use, affecting their trust in these technologies. Different understandings of 'good care' were evident, too: 'warm' care was sometimes linked to human care and 'cold' care to technology. In conclusion, understandings and experiences of AI are marked by different *logics of sociotechnical care* and related levels of trust in these sensitive settings.

1. Introduction

In many Western countries, such as Canada and Australia, the COVID-19 pandemic exacerbated the challenges and failures of care homes (also known as nursing homes, residential aged care, or long-term care facilities) in providing high-quality care to older people (Cook et al., 2023; Estabrooks et al., 2023). These challenges, from chronic staff shortages to substandard health practices, are not new (Cleland et al., 2021; Royal Commission into Aged Care Quality and Safety, 2021). This has prompted policymakers to increasingly look to emerging technology—and, recently, Artificial Intelligence (AI)—to mitigate staff shortages and constrained resources (Hajkowicz et al., 2019; Lukkien et al., 2021). The potential application of AI, from robots to smart diagnostics, across healthcare areas has been widely recognised in social and health sciences (De Togni et al., 2021). It is therefore unsurprising that AI has been heralded as a solution to the crisis of care provision in later life (Neves et al., 2023; Marks, 2023).

Despite popular narratives about the potential of AI for the sector, we still have a limited understanding of how diverse groups operating in care homes perceive and approach AI-human relationships of care. To address this gap, we employ a comparative perspective to explore views of AI use in care homes. We draw on an Australian case study, based on interviews with AI developers and care home staff and advocates. These stakeholder groups were selected because they develop and/or influence which AI technologies are implemented in care homes. Care homes represent sensitive contexts of care, tending to older people grappling

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https://doi.org/10.1016/j.socscimed.2024.117187
Received 31 October 2023; Received in revised form 19 March 2024; Accepted 3 August 2024
Available online 5 August 2024

with health and social vulnerabilities who are expected to reside there until they die. To frame our exploration of AI-human relationships in such settings, we combine ideas from the sociology of trust with Annemarie Mol's 'logic of care' (2008) and Jeannette Pols' concept of 'fitting' (2012). By combining these ideas, we can better capture the complex interfaces between AI and later-life care, as explored next.

2. Care, new technology, and trust

Care is a contested concept, holding differing meanings across contexts and disciplines (Fine, 2014; Mol, 2008; Pols, 2012). We conceptualise care in a relational way, grounded in the understanding of distinct recipient definitions, needs, and circumstances (Fine, 2014). What is taken to be 'care' is constituted by practices that, while underpinned by good intentions, can have harmful outcomes. This may occur when care is primarily market-oriented or adapted to institutional demands rather than fulfilling human needs (Mol et al., 2010). For instance, in care homes, implementing person-centred (personalised) care is an ideal; yet, its implementation for residents of diverse ages, biographies, cultural and socio-economic backgrounds, health conditions and capabilities remains challenging (Dahl, 2017). Residents not only require clinical, but personal and social care (Cleland et al., 2021). Systemic substandard practices and staff shortages have limited such care provision (Cook et al., 2023). In Australia, elder abuse cases uncovered by the media and advocacy groups—coupled with rising concerns about the sector's operations and sustainability—led to the establishment of a Royal Commission into Aged Care[1] Quality and Safety (a quasi-judicial public inquiry with powers to compel witnesses to testify under oath) in 2018. The Commission revealed a care crisis, including neglect, lack of transparency and regulation, and workforce training and retention issues (Royal Commission into Aged Care Quality and Safety, 2021). This is not merely an Australian problem; similar care failures permeate other industrialised countries (Cleland et al., 2021; Estabrooks et al., 2023).

In this context, innovative technologies like AI are proposed solutions to the increasing demands for monitored care, staff shortages, and clinical, personal and social needs of an ageing population (Hajkowicz et al., 2019; Lukkien et al., 2021). The Commission (2021) concluded that these technologies are vital to improve care, but technology uptake in care homes is slow. An Australian survey found that only one-third of the 282 surveyed providers used technology like digital documentation systems, and that most were uncertain whether they would incorporate new technologies into their practices (Barnett et al., 2020). While the COVID-19 pandemic accelerated the use of digital technologies like telehealth (Yu et al., 2023), strategic technological investment in aged care lags (Barnett et al., 2020; Royal Commission into Aged Care, 2021).

Adoption and use of emerging technologies in care and clinical contexts depend on numerous factors, from perceived usefulness of that system by staff to uncertainty surrounding how they might alter existing practices (e.g., clinician-patient interactions) (Neves and Vetere, 2019; Barlow, 2016). Broader politico-economic and sociocultural factors, like institutional and cultural contexts, closely influence the development of health and care technologies and their definitions (Neves and Omori, 2023; Neves and Mead, 2021). Thus, we define technologies as *sociotechnical systems* (Mackenzie and Wajcman, 1999). This means we not only focus on the materiality of devices, but on the entanglement of social and technical dimensions that inform the design of technology and shape how it is perceived and used. We consider how these dimensions frame views on human-AI relations, including resistance, rejection, adoption, and use of emerging technologies and their nuances (Neves and Mead, 2021; De Togni et al., 2021).

Central to technological views and outcomes is trust (Choung et al., 2022). Like care, trust is a polysemic concept, defined and approached differently across disciplines and contexts. In technology adoption studies, trust is usually understood as the ability of technology to function reliably (Asan et al., 2020; Lankton et al., 2015). To expand this perspective, Borsci et al. (2018) proposed bridging trust and user experiences via object- and subject-related factors. The former refer to abilities, performance, and functions of technologies. The latter include end-users' prior experience with technology, digital literacy, attitudes, and technological expectations (Borsci et al., 2018). For decades, however, sociological studies of technology have shown that broader sociotechnical contexts and relations shape object- and subject-related factors (Mackenzie and Wajcman, 1999; Pinch and Bijker, 1984). For instance, trust in health technologies is influenced by living settings, existing technologies, social relationships, and wider ideas of care (Brownlie and Howson, 2005; Neves and Vetere, 2019; Petersen, 2018).

Our approach to trust is also sociological, following the field's long tradition of conceptualisalising the phenomenon from diverse perspectives (Durkheim, 1893; Giddens, 1991; Luhmann, 1979; Misztal, 1996; Simmel, 1950; Weber, 1951). While we still lack a universally agreed-upon definition, a sociological approach to trust goes beyond a 'cognitive' lens, considering its relational and social nature (Giddens, 1991; Luhmann, 1979; Simmel, 1950). Simmel (1950) emphasised that trust encompasses knowledge, but also an "affective, even mystical, 'faith' of man in man [sic]" (p. 318)—that is, a belief others will act in our interest. Such personal and interpretative dimensions operate within social interactions and systems (Brownlie and Howson, 2005; Simmel, 1950). Trust is socially situated, changing over time: in modern societies, trust was not 'pre-given', but had to be 'worked on' and 'won', requiring individuals to calculate "risks/benefits in a world where systems produce and reproduce the evidence/universe of events" (Ward, 2006, pp. 146–147). In late modern societies, trust tends to be invested in systems like science (Giddens, 1991). Trust has been an important topic in the sociology of health, often linked to notions of risk (Meyer and Ward, 2013). As shown by Brownlie and Howson (2005) in their study of vaccination, trust is a "complex relational practice happening within particular socio-political contexts" (p. 222). Thus, a sociological approach to care and technology requires engaging with trust as a multilayered concept, bridging micro- and macro-level insights. For this, we combine *interpersonal* trust—i.e., between social actors—and *system-based* trust—i.e., between social actors and institutional, political, and sociotechnical systems (Brownlie and Howson, 2005; Ward, 2006).

We contend that this multidimensionality is already evident in care settings: trust is central to health systems, which are "complex socio-political institutions and not merely delivery points for bio-medical interventions" (Gilson, 2003, p. 1463). Trust functions in relation to the care people can receive from health systems and in relation to wider contributions those systems can make to societal well-being (Gilson, 2003). The same can be said regarding care homes, given the embedded types of care they entail and associated risks and expectations. For example, in many contemporary societies, care is marketised, with services bought/sold and subject to the logic of consumer choice—'you get what you pay for' (Petersen, 2018). Acquiring care services requires trust in not only care systems but also in market transactions and expectations. Care homes involve diverse stakeholders, perspectives, and sociotechnical systems. The introduction and adoption of AI technologies in these settings depend on *trusting* not as a static initial step, but as a continuous action that accompanies how AI can play caring roles, facilitating or complicating practices and decision-making processes. For Luhmann (2000), trust concerns future actions that are relevant in circumstances of uncertainty. Due to the risk and uncertainty linked to AI and care homes as sensitive contexts, these settings provide a fruitful case study to explore the interactions between trust, care, and AI. To better frame these AI-human relationships, we expand our theoretical model by integrating trust into *logics of sociotechnical care,* as elucidated below.

[1] 'Aged care' is the official Australian term for care homes/long-term care facilities.

3. AI and the logics of sociotechnical care

The push to introduce AI into care homes means these technologies, such as social robots and smart voice assistants like Siri or Alexa, will likely play a role in models of care for older people (Lukkien et al., 2021). AI encompasses diverse sociotechnical systems that include technologies (e.g., chatbots) and analytical and conceptual techniques (e.g., machine learning). The definition of AI has faced ongoing debate since its emergence in the 1950s (Elliott and Timulak, 2005; Neves et al., 2023; Neves and Omori, 2023). While researchers tend to privilege a technological definition, how we understand and react to AI hinges on societal structures, values, and norms (Crawford, 2021). Following our sociological approach to technology, we see AI as a sociotechnical system, considering its technical or material elements—but also its social dimensions (Neves et al., 2023; Crawford, 2021). In their theorisation of 'intelligent' AI in health contexts, De Togni et al. (2021) call attention to these dimensions by exploring the affective relationality of human-AI interfaces. According to them, we can explore the 'intelligence' of AI via three forms: physical (e.g., robot-assisted surgery), interpretive (e.g., diagnosis), and emotional (e.g., social robots). Central to these forms of intelligence is how they can be co-constituted through relations of social and technical care in technologically-mediated contexts (De Togni et al., 2021).

We assert that AI-human relations require a deeper understanding of the conceptual and empirical links between trust and sociotechnical care in complex and sensitive settings like care homes. The heterogeneity of residents and the importance of personalised support mean care in these contexts is frequently more complex than in other clinical environments (Cleland et al., 2021; Dahl, 2017). To explore the relationships between care homes, AI, and trust, we expand our relational approach with two concepts: i) Annemarie Mol's (2008) *logic of care* to grasp whether, if, and how technologies are perceived as useful and trusted in care environments, and ii) Jeannette Pols' (2015) concept of *fitting*, which posits 'good care' should not be pre-defined, but continuously refined by actors to improve care practices that *fit* the individual in specific circumstances. We combine these lenses into a *logics of sociotechnical care*.

Mol's (2008) 'logic of care' shows care practices have a 'logic' or rationale of their own, involving different actors/stakeholders that introduce subjective measurements and values. For example, the unpredictable can happen—like a patient refusing treatment—and, therefore, flexibility and negotiations between actors is critical (Mol, 2008). Care depends on interdependent actors (Mol, 2008), encompassing practices of caring about, taking care of, care-giving, and care-receiving (Tronto, 2020). But what happens when technology is an element of and an actor in that context—such as a carebot that serves as carer, companion, and monitoring system?

Mol (2008) demonstrates the potential for collaboration between humans and technologies in a logic of care whereby technology is used as part of an ongoing discussion to inform practices meeting recipients' desired goals. Such logic never seeks to answer what is inherently good or bad (right or wrong), unlike the principle-driven approach dominant in biomedicine. Rather, it suggests "'caring practices' entail a specific modality of handling questions to do with the good" (Mol et al., 2010, p. 13). What is good care thereby depends on actors and socio-political circumstances. Symbolically, 'good' care is associated with human warmth, compassion, and sympathy, contrasting with technology—-which is denoted as cold, rational, efficient, and instrumental (Mol, 2008; Mol et al., 2010). But, as Mol (2008) states, "care is … a matter of various hands working together (over time) towards a result" (p. 18). Technologies can be one of those hands, as "inventive mediators" (Mol, 2008, p. 50). Exploring how those 'hands' are trusted, viewed, and work in care homes is critical to understanding AI's role in care contexts. Mol's (2008) critique of the care/technology dichotomy through a logic of care aligns with our approach to AI as sociotechnical systems interweaving material, technical, and social dimensions.

Building upon Mol's work, Pols (2012) further challenges the warm/cold care dichotomy in care environments. She illustrates how technologies, like telehealth, can mediate relational care and help enhance relationships between caregivers and recipients, establishing personalised practices. Technologies—symbolically cold—can promote warm care, too. According to Pols (2012), 'good care' requires a combination of warmth and coldness:

> Instead of separating and opposing warm and cold care, or ethics and knowledge, my analysis suggests a third metaphor to understand the goodness and badness of care, one that overcomes these fruitless oppositions: the metaphor of fitting. I analysed fitting as engaging in practical and aesthetic relation between patient and carer or caring device (p. 42).

Fitting is an interactive activity through which technology users (care-givers and recipients) and technologies find common ground (Pols, 2012, 2015). The former engages with and benefits from the latter, and the latter is accepted and used by the former. With successful *fits*, technologies are embedded in care and share responsibility with carers and patients (Pols, 2015). Yet that fitting requires constant 'tinkering' and trusting relations between different actors, including technologies (Mol et al., 2010).

Although the logic of care allows us to map relations between machine and human caring practices and perceptions, the fitting metaphor helps tease out the 'good' caring relationships that 'fit' individual recipients. On the one hand, the *logic of care* emphasises the importance of understanding care practices in their local and situated contexts, rather than applying rigid and standardised protocols. On the other, *fitting* allows us to specify relationships and procedures necessary to find and maintain mutual agreements across human and technological actors (which may include warmth and coldness) that 'fit' the care-receiver. While a 'logic of care' and 'fitting' mean different things, we do not see them as conveying separate processes: fitting can be part of a particular logic of care. A *fitting logic of care* would occur when a common and appropriate 'good' caring ground is found between the diverse human and non-human actors involved. Trust is integral here since a fitting logic of care depends on building trusting interfaces at both interpersonal and system-based levels. But can AI be trusted as a collaborative partner by individuals and institutions? And if so, when?

To explore perceptions and uses of AI in care, we combine Mol and Pols' concepts into *logics of sociotechnical care* to emphasise the interplay between social, technological, and physical/material dimensions, highlighting multiple subjectivities that position care as situational, structural, emotional, and personal. The *socio* involves social values, actions, norms, and circumstances, whereas the *technical* encompasses technological structures (e.g., material) and a wider sense of technicalities (e.g., competencies, skills). By embedding the sociotechnical lens more clearly into the conceptual apparatus and opting for plural 'logics', we combine and extend the prior concepts in two ways. Firstly, the sociotechnical perspective overcomes general dichotomies of 'good'/'bad' care, following Mol and Pols, but it also considers that the localised values and nuances of what is perceived as 'good'/'bad' AI-human care critically inform how technologies are designed and deployed in care. Thus, attending to how those dichotomies emerge, unfold, and persist is essential. Secondly, the sociotechnical assists in mapping the relationships between human and technological care, but also considers that they are often co-constituted and co-assembled, which can make those assemblages hard to disentangle. This, therefore, requires paying attention to how social and technical scripts or templates of ageing and later life care are entangled and might mutually reinforce each other, fitting in specific logics of care.

Our 'logics of sociotechnical care' does not avoid limitations or negative consequences of technology in care. In that sense, Mol and Pols' perspectives can be misread in an overly positive fashion through a logic of care or fitting lens. Our approach recognises the importance of capturing in-depth contexts, interrelations, and assemblages to grasp challenges and limits—but also contributions of technology to situated and fitted logics of care. Although logics of sociotechnical care can serve as a framework for exploring diverse health and communication technologies, we employ it here to attend to AI-human relations as a case study. We apply it to framing views on AI among key stakeholder groups in care homes, both advancing a valuable theoretical lens amidst growing use of and high hopes for AI and contributing to comparative empirical knowledge of technologies and human actors.

4. Methods

This study used a qualitative, interpretive design to explore perceptions and experiences of using AI technologies in care homes. Findings are based on semi-structured interviews with stakeholders, including AI developers, care staff, and health/family advocates. Studies incorporating diverse stakeholder perspectives and the use of multiple AI technologies in care homes—rather than just one type, like robots—remain limited (Marks, 2023). By involving distinct stakeholders, we aimed to identify similarities and differences in their perceptions and experiences of AI. However, due to prolonged COVID-19 lockdowns in Australia, care home providers restricted access to residents for research purposes (many of which are still in effect in 2024, as residents continue to suffer the highest rates of infections and deaths). Care homes were also significantly understaffed and overworked during this period because of illness, death, and infection. Consequently, we were unable to interview residents in-person, via telephone or online. The project was approved by our university's ethics committee and participants provided informed consent.

5. Participants and data collection

We conducted 18 interviews during the COVID-19 pandemic in 2020. Participants comprised seven AI developers (including manufacturers and researchers), seven care home staff (frontline care workers and managers; all from different facilities housing diverse groups of older people), and four advocates, including three representatives of health organisations for older people and one family member of a care home resident (see Table 1). We recruited through email invitations sent to home care providers and AI companies. Potential participants were also sought through our professional networks and snowball sampling. All developers had designed AI-based technologies to assist later life care, from clinical apps to chatbots and robots. Four were already being implemented in care homes (two clinical apps, a chatbot, and a robot), while others were in the prototype and testing phase. Only two of these specific technologies (a pain app and robot) had been trialled by one of the care home staff members that we interviewed. We faced significant challenges in recruiting care home staff because of pandemic-related lockdowns, but those who participated were particularly interested in AI or wanted to share their experiences of using AI-based care assistance, mostly robots and chatbots. Health advocacy organisation representatives had been involved in product development requiring AI systems (algorithms, machine learning) or used AI technologies (chatbots, robots) in community settings and care homes. The family member was familiar with AI and interested in how it could help her mother, a care home resident.

Table 1
Participants & stakeholder groups.

Stakeholder Group	Pseudonym	Occupation	Age	Gender
AI Developers	Camille	Academic Researcher	38	W
	Gary	Academic/Founder of Tech Company	60+	M
	Jeff	Academic/Founder of Tech Company	60+	M
	Larry	Academic Researcher	50+	M
	Mark	Founder/CEO of Tech Company	55	M
	Don	Project Manager of Tech Company (Clinical Trial Lead)	56	M
	Ken	Founder/CEO of Tech Company	50+	M
Care Home Staff	Kathy	Quality Assurance Manager	42	W
	Tom	Geriatrician	73	M
	David	Innovation Manager	49	M
	Nita	Clinical Manager	38	W
	Jen	Innovative Manager	40+	W
	Melissa	Lifestyle Coordinator	39	W
	Brian	CEO	43	M
Advocates	Sam	Older People's Health, Advocate	37	W
	Marita	Older People's Health Advocate	56	W
	Nicola	Technology Advocate for Older People with Disabilities	40+	W
	Lisa	Family member/Daughter	51	W

Overall, developers and advocates referred to AI as a mix of general AI technologies and techniques, from chatbots to machine learning, while care staff referred to AI as specific technologies like robots. Embracing a qualitative ethos and upholding our comprehensive and interdisciplinary approach to AI, our team—from diverse backgrounds, spanning sociology, computer science/AI, and medicine/bioethics—refrained from imposing definitions before or during the interviews, opting to engage with participants' understandings. When describing and talking about AI, interviewees privileged a technical definition mentioning smart and autonomous technologies. As we recruited participants with AI experience or knowledge, all were familiar with numerous technologies, citing several examples during the interviews. Thus, AI is used throughout this article as an umbrella term to encompass various technologies (e.g., chatbots) and techniques (e.g., machine learning), preserving our participants' general sense of AI. When interviewees discuss a particular AI, that is specified in the results section.

Interviews included questions, adapted to each stakeholder, on: experience with AI technologies and later life care; clients'/residents' reactions to AI technologies being used; advantages; challenges; and priorities to be considered for AI development and implementation in care homes. Benefiting from a semi-structured format, the interview guide was flexible to include new/follow-up questions. Interviews were conducted through Zoom (online communication platform), lasting approximately 1h each.

6. Data analysis

Interviews were recorded and transcribed verbatim. Data was thematically analysed through three main steps. Firstly, research members independently read interview transcripts to familiarise themselves with the data. Secondly, line-by-line coding was conducted to extract units of meaning, which were then sorted into 'domains' that grouped codes based on similar topics (Miles and Huberman, 1994). Coding was both deductive and inductive (Saldaña, 2021), meaning we used our framework of sociotechnical care to guide the process but were also open to new ideas identified in the data. Thirdly, we compared codes and domains within and across stakeholder groups, looking for themes running across in- and outer-groups (Miles and Huberman, 1994). This allowed us to identify commonalities and differences within and beyond stakeholder groups. Each author engaged in independent analysis, and we then reached consensus on final themes (see Table 2) as a team, discussing analytical consistencies and discrepancies.

7. Findings

In this section, we report the three overarching themes identified in the data regarding the role of AI in care homes, namely: i) warm versus cold care, ii) integrative sociotechnical care, and iii) trust in AI-assisted care. These themes show elements that can shape design and use of AI in

Table 2
Main themes and sub-themes.

WARM VS. COLD CARE	INTEGRATIVE SOCIOTECHNICAL CARE	TRUST IN AI-ASSISTED CARE
AI for clinical care	Collaborative AI	Interpersonal:
AI unsuitable for care	AI as communication	Experiential trust
Good care as human care	Human-AI for caregivers	Responsibility/ Accountability
Harms and risks of AI care	Human-AI for care-receivers	System-based:
Care practices	Understandings of good care	Contextual trust
	Models of care	Anti-risk cultures
		Reliability/Compliance
		Care surveillance

care homes, influencing perceptions and practices of sociotechnical care. They intertwine views and imaginaries of AI, care, and trust, but also highlight ambivalences within and across the different stakeholders, showing different logics of sociotechnical care.

7.1. Warm versus cold care

The warm and cold care distinction—i.e., seeing technology-based care as cold and human care as warm (Pols, 2012)—was particularly evident in the views of care home staff. For most, there were clear boundaries between what AI-based technology "can do" and "should not do" in care. For example, Tom, a geriatrician, explained:

> Clinical approach comes to mind as having more obvious approach for AI … as you go from the continuum of harder, factual, data-driven, objective parameters to the softer, humanistic psychosocial inter-subjective phenomena. I think AI becomes far less suitable, in fact, unsuitable probably as you move along that continuum.

Likewise, for Melissa, a lifestyle coordinator: "Social, emotional, and spiritual care are all human-based. I can't see how AI can help in that." On the one hand, many questioned whether AI technologies would be of any help in social and emotional domains because they believed those types of care require human interaction, depicting a 'warm' perspective. On the other hand, care not involving human interaction, described as 'cold' in nature, was viewed as suitable for AI-based assistance—this included object-related applications like smart data-driven clinical assessments and electronic health records. Thus, types of care informed staff's perspectives: AI could be more useful for cold forms of clinical care, rather than for warm social care, as illustrated by Tom and Melissa.

Even within this warm/cold dichotomy, concerns about dehumanisation of care were explicit. As further clarified by Melissa:

> Something like medicating residents, for staff, I think it [AI] could potentially be beneficial. Unfortunately, I believe that it would take away the human element, the truth of care.

Melissa employed the words "truth of care" as "good care" interchangeably, emphasising how crucial human involvement is in care. Technologies are assumed to be detrimental and to reduce 'humanness' in caregiving. This understanding of good care was reiterated by Tom, who was apprehensive about technological overreliance in clinical practice that neglects the role of patients:

> … doctors do now have good medical software systems that give them very good access to data and really make their everyday practice more efficient and safer. … the doctor has a screen, the patient is there, the doctor is interacting with screen. … the screen is giving you all those hard data. The patient is giving you the diagnosis, the patient is telling you what you need to do. If you don't pay attention to that, then, everything on the screen is not going to be optimal.

For Melissa and Tom, how AI is used—and for what type of care—might undermine the care-giver and care-receiver relationship and negatively impact quality of later-life care. The warm/cold and good/bad distinctions found across care staff interviews appear to be contextually embedded in discourses and practices, informing perceptions and actions about AI-based care. As these distinctions were not found with other stakeholders, we can see how diverse *logics of sociotechnical care* are enacted across actors operating in similar settings and how the above dichotomies constitute elements of sociotechnical care. This framework sheds light not only on different logics and how they unfold, but also on how sociotechnical scripts interplay, highlighting the social dimensions of the technical (e.g., values/beliefs linked to AI technologies) and the technical dimensions of the social (e.g., how AI can influence clinical and social practice).

Interestingly, a common expectation held by care staff was that AI could take over some mundane tasks—the 'cold care'—which are essential but do not necessarily require human involvement. This would give staff more time to spend with older people in 'warm' and 'good' practices. Therefore, types of cold care can lead to more warm/humanistic care. Advocates and developers also alluded to this notion that AI could replace mundane care tasks. However, such replacement was conceptualised within collaborative and integrative care, as described next.

7.2. Integrative sociotechnical care

This theme captured the views across stakeholders that AI can be used for integrative sociotechnical care—i.e., integrating technological affordances with human care to provide comprehensive and collaborative caregiving, akin to Pols' fitting metaphor (2012). Yet, ideas of integrative sociotechnical care also displayed different logics not always *fitting* across caregivers and care-receivers, as outlined in this section.

Despite the warm/cold dichotomy across staff's narratives, the potential of AI to assist with cold care and facilitate more human-based/warm care was for a few, like nurse manager Nita, a way of integrating AI:

> I think technology is the way this world is going. So, if technology can do something, I would say 'why not?' …. Staff can have more time to focus on what they really need to do.

Illustrating this possibility, David, an innovation manager at a care provider with experience in the technology industry, reported how an AI-operated documentation system they used cut staff time on repetitive tasks, allowing for more one-on-one support. He also described how AI can be integrated into more individualised/localised tasks, giving the example of an AI bed sensor that uncovered a resident's sleep problem. This led to discussions with staff and a solution (changing the mattress). As David noted:

> Small things like this, you can improve [residents'] quality of life, using the technology because firstly, you will never know a person has trouble sleeping, and secondly, you will not know the reason why.

This idea that AI can ease interaction and information-sharing between caregivers, facilitating good care, was also emphasised by AI developers. Gary, the founder of an AI-based clinical assessment app, highlighted his device "increases collaboration and improves communication, all the things that we want it to do. Artificial intelligence is not there to remove the need for the clinician".

But AI's role in integrative care appeared to embody distinct conceptions of technology-human relations. David and Gary cited enhanced care via monitoring and communication among staff, whereas most care staff and advocates focused on residents' choice and independence. Sam, a health advocate and former care worker, elaborated:

> Some residents in their rooms at Facility M—their families installed those little Google boxes that you talk to. If you want your TV on, you tell Google to turn it on for you. They did that for their family members and that's made a big difference to them to be able to work all the little gadgets and things in their rooms without having to look for a remote for the Foxtel or another remote for the Netflix or something.

Sam noted personal assistants can do more than support daily tasks. While turning the TV on might seem trivial, for those with motor impairments, it increases self-sufficiency and dignity. This was reiterated by Nicola, an assistive technology advocate:

> What's useful is anything that enables someone to have a bit more autonomy, independence, choice and control over how they live. … It might be something as simple as a personal assistant like Google that can just answer questions for you, that can dial a phone number for you, that can look up a number for you.

While AI developers' views of integrative care were fitted mostly with *care-giving* practices (AI assisting care via monitoring and data to be used by caregivers), for advocates and staff, *care-receiving* was crucial, namely providing residents with opportunities to amplify their daily agency.

Nevertheless, and despite a few exceptions among staff and advocates like Nicola, most interviewees across stakeholder groups referenced a generic standard of care, supporting technology design and implementation that match an assumed 'typical' user/resident. This user/resident was stereotyped as passive, technologically inept, and defined by illness. For developers, this user required constant surveillance. AI technologies were delineated via a 'one-size-fits-all' model, neglecting residents' aspirations and desires, varying physical and mental capacities, and preferences or abilities to embrace AI. And so, although all interviewees were passionate about later life care, some of their views and language reflected unconscious ageism (Neves et al., 2023).

The logics of sociotechnical care illuminate different perceptions of what may constitute 'good' care and the role AI technologies can play in its integration. They also offer critical insights into what might facilitate or inhibit acceptance and adoption of AI in care settings. As trust can further shape implementation and use of AI in care homes, we now turn our attention to it.

7.3. Trust in AI-assisted care

Exploring trust in our data unveiled interpersonal and system-based dimensions, tied to context, experience, and familiarity. For instance, some care staff's experiences with chatbots and smart sensors fostered positive perceptions of AI deployment. They had developed what we identified and termed as 'experiential trust'—i.e., derived from experience—with technologies. This does not mean they found AI fully trustworthy; rather, they had developed an appropriate measure of trust based on experience, understanding what they could and could not trust about AI. They were often part of organisations open to innovative technologies. However, for AI developers and advocates, such positive organisational openness was rare due to fear of uncertainty. But for Brian, CEO of a care provider:

> We've heard of robots, like a robot moving food carts here in Victoria. We just don't know, or trust how that would work. … providers are very reluctant to spend money on technology. … I think once they see value in it, you might get providers take it on. … You need to weigh up the differences between staff doing it and non-staff doing it.

Additionally, Brian briefly alluded to resource scarcity and financial sustainability to explain that technological investment is not an easy cost-benefit equation for good care since it can mean disinvesting in critical areas of need, noting that "the things we can control, we need them to be efficient". Care staff explained that AI developers habitually lack experiential knowledge of care facilities, eroding trust by staff and providers towards technologies developed for the sector. Several interviewees felt AI technologies were created in isolation: ignoring the care ecosystem and culture while targeting one small problem that misses broader structural issues like limited technological infrastructures or low digital literacy among staff. These issues influenced what we termed 'contextual trust'—i.e., trusting that developers understand the context they are targeting. In part because of lack of contextual trust, staff recounted various reliability and accountability concerns—asking who would be accountable and responsible if AI malfunctioned and affected care. For some, AI adoption requires structural change that might not benefit recipients and providers.

Yet, AI developers and care advocates saw distrust amongst staff/providers stemming from risk aversion and resistance to change. Martha, an advocate, noted that whenever technological changes were discussed:

> You'll get all these excuses about "We need to have security; we need to have privacy" … the risk aversion in aged care is so high that change is really difficult.

For Martha, providers "are afraid of doing something new"; organisational hesitancy that might relate to Australia's care accreditation system, which rates facilities based on government compliance. This emphasis can hinder trust, as new methods/practices might be non-compliant and change inherently carries risk, including increasing workloads due to new training or professional demands. As highlighted by Jeffery, creator of a smart robot: "There's a whole culture you have to work against. And the … ability of workforce to accept technologies as a matter of care. And [there's] general resistance because people have to change." For other developers, distrust stemmed from dystopian narratives, "like AI will steal my job" (Ken).

Opposing views extended to care surveillance. Some staff feared AI's surveillance of both residents and workers, while developers argued those concerns came from AI's ability to detect problems that can impact providers' reputations if delivering 'bad' care. As described by developer Mark:

> I have had three aged care providers tell us that they will not buy our product because they don't want to be told about things that they should have done. I have one of them in writing—they actually wrote me a letter saying, "Love your product, love what it can do, we love how it could let us know that we need to act and so forth. But we're not going to buy it because if we don't [act], then there is an audit trail of our failure".

As he later remarked:

> We need to get AI into an environment where it is trusted; [where] people understand what they can do with it, and then they can start having some fun with it.

Don, a project manager at a technology company, also noted his product, which identifies health issues from residents' data, was viewed as problematic because it created important tasks to attend to. For Don, this was not due to staff's lack of AI knowledge or fear of uncertainty, but reflected the care system—short-staffed, resource-deprived, and hyper-standardised.

Thus, interpersonal (e.g., experiential) and system-based (e.g., contextual, care ecosystem, AI affordances) elements intertwined, supporting divergent forms of trust. This divergence illuminates the complexity—and often competing—logics of sociotechnical care, adding to understandings of human-AI relations in sensitive contexts. These findings and implications are discussed next.

8. Discussion

While positive perceptions and experiences of AI and care were identified among stakeholders, we also found ambivalence across the three identified themes. Such ambivalence appeared to relate to distinct ideas of AI-human care (and its quality), uncertainty around the trustworthiness of AI as sociotechnical systems (e.g., reliability, liability), what AI can offer (e.g., usefulness), and views of organisational adversity to risk and resistance to change. Notions of use and trust seemed to rest on differences between stakeholders' experiences, knowledge, and contexts. Experiential and contextual knowledge in AI among care staff contributed to shaping—alongside other factors like care culture and needs—how they envisioned and trusted it within care relationships. For instance, David, a care worker tasked with innovation and experienced with emerging technologies, saw AI as appropriately integrating caring arrangements. Lack of experiential knowledge in care practices appeared to shape the types of technological applications developers deemed relevant to design. The care home ecosystem or the low digital maturity of the sector (Barnett et al., 2020), due to several issues like underfunding and regulatory constraints, were not contemplated by developers. Yet, for adequate technological development and implementation, knowledge and lived experiences need to be translated between those involved in innovation and care (Barlow, 2016).

We uncovered shared ideas across stakeholders, too. Firstly, although all mentioned several different AI technologies, AI was frequently referred to homogenously, aligning with general public perceptions of these systems (Neves et al., 2023). Secondly, the experience of some care practitioners with AI (staff and advocates) matched developers' expectations that technologies can free staff from mundane and even advanced tasks (e.g., documentation, monitoring)—allowing for more one-on-one time with residents, which has been inhibited by existing staff-resident ratios and staff shortage (Ibrahim et al., 2020). Thus, a logic of sociotechnical care that *fits* and can be trusted within care contexts can be facilitated when AI technologies are seen as one of 'many hands' to seek desirable care outcomes (Mol, 2008; Pols, 2012). Still, many care workers viewed AI-assisted care through the warm/cold dichotomy (Mol, 2008). This appeared to reflect their practices in care delivery, separating clinical (seen as 'cold') from personal/social care ('warm') (Davis et al., 2016). But as our results demonstrate, stakeholders— including a few care staff—also envisaged an integrative sociotechnical approach, whereby AI is integrated into existing caring relationships, reducing staff burden and improving care quality. For this, the focus must be on how care recipient goals (from clinical to interpersonal) are *met and fit* within the sociotechnical care context and its logics, through continuous negotiation and planning with diverse stakeholders constituting the care-provision team (Cleland et al., 2021; Pols, 2012).

In this integrative perspective, cold and warm care are no longer a dichotomy; rather, they intertwine. This may also help dispel the idea that technology is cold, and humans are warm by shifting to a narrative of collaboration (Mol, 2008; Pols, 2012). Dahl (2017) argues that, in the present neo-liberal business model, the sector has struggled to provide quality care due to a drastic increase in cold care reducing warm care. Others claim the sector has failed to provide warm care even without technological assistance (Ibrahim et al., 2020). Nonetheless, in light of the sector's underfunding, it is worth considering whether AI may be used to 'cut corners' and devalue care instead of allowing for additional warm care (Topol, 2019). In fact, within the current landscape of the sector, AI might not entirely 'fit' the requirements of care homes and governmental compliance. One major staff concern—justified within the warm/cold care dichotomy—related to dehumanisation of care. Dehumanisation undermines recipients' agency, overlooking their lived experience of diseases and/or neglecting their emotional responses to care (Haque and Waytz, 2012). Many care staff feared technologies might take away 'humanness' in care (i.e., human touch and attention), echoing ongoing academic debates (Neves et al., 2023; Sharkey and Sharkey, 2012).

Understanding this spectrum of positive and negative implications, as well as contextual challenges and opportunities, is vital to assessing potential roles and impacts of AI in models of later-life care. Whilst some interviewees held beliefs that AI assistance can be unethical because it might dehumanise care, others suggested that within the appropriate logics of sociotechnical care, AI can empower older people. According to them, if technology is employed sensibly and responsibly, such as illustrated by the 'Google box' example, it can support autonomy, independence, and dignity. Furthermore, situating technology and human care as interdependent and empowering might reduce the 'autonomy versus dependence' dilemma (Tronto, 2020) that frequently arises in care homes.

Nevertheless, our findings illuminate how competing views on caring and AI in sensitive contexts can originate diverse logics of sociotechnical care. Developers and care staff displayed different—and sometimes opposing—understandings of what good or quality care entails and how it could fit within contexts mediated by AI. These differences were visible even among staff who overcame the warm/cold distinction, espousing an integrative vision, as developers focused more on caregiving and staff and advocates on care-receiving. Trust was a critical differential here, linking to worries around reliability and accountability. Although Mol's (2008) logic of care advances technology as a beneficial and not dehumanising collaborator, and Pols' *fitting* (2012, 2015) rests on well 'tailored' ground between users and technologies, diverse sociotechnical logics emerged in our study. AI can both facilitate or impair care depending on specific contexts, experiences, knowledge, or stakeholders. This was perceptible even when the emphasis was on needs and expectations of recipients and caregivers. Such diversity of *logics* supports our use of the plural form; it also demonstrates that distinct scripts about ageing, care, and AI interplay to sustain different logics. As posited by Mol (2008), care is deeply rooted in actors' subjectivities (different meanings, practices, needs, contexts), rendering it context-dependent. This also means understanding human-AI relations in care homes depends on the stakeholders involved and their potential multiple logics. The challenge remains, then, to determine how sociotechnical care can uphold a *fitting logic of care*—combining Mol and Pols' perspectives—that fits with the care-receiver, incorporating all stakeholders (their needs and expectations) and overcoming care as pre-determined, fixed, or taken for granted (Tronto, 2020). Our research suggests this requires sociotechnical experiential and contextual trust (interpersonal and system-based), which must be continuously developed within the assemblages constituting care homes.

Trust is, indeed, a multifaceted relational practice that takes place in specific social, political, cultural, and technological milieus (Brownlie and Howson, 2005; Meyer and Ward, 2013). Thus, trust must be framed relationally, considering the interplays of various care home domains and recognising that these are complex institutions and not just spaces for clinical provision (Cleland et al., 2021; Dahl, 2017; Gilson, 2003). As exemplified by our findings, it is not sufficient to assess trust between staff and one technology; we must account for other technologies in place, organisational structures, understandings of accountability, as well as accreditation and regulatory systems, to fully grasp trust within care contexts. It is critical to consider that trust in care systems is often shaped by notions of risk, uncertainty, familiarity, and dependency (Gilson, 2003; Luhmann, 2000). Whilst not usually considered as such, trust is a key dimension of sociotechnical systems like AI in care homes. All these social and material dimensions—and their interaction—are central to grasping the complexity of AI-human relations in care and health settings (De Togni et al., 2021).

9. Conclusion

This article contributes to a conceptual and empirical understanding of AI-human relations of care in the sensitive social and health context of care homes. Industry and public discourses hold great hopes for the potential of AI applications for later-life care, from medical diagnosis to assisting workers in undertaking more routine, tedious tasks (Marks, 2023). Yet, little is known about how those who design and have the power to implement and use AI technologies in care homes view them. Our study uncovers the perceptions and experiences of AI among staff, advocates, and developers, and provides a first contextual analysis of critical stakeholders involved in health and personal later-life care.

A *logics of sociotechnical care* allowed us to frame different approaches to human-AI relations within aged-care contexts. As our findings make clear, care is a complex achievement, involving far more than attention to technical and material elements. Our concept of sociotechnical care captures this more-than-technical/material aspect of AI, which is imbued with scripts of hope and fear about technologies that can unsettle our very conception of humanness. We showed how concerns about AI's potential to dehumanise care are central for staff, and how the warm/cold dichotomy engrained in most of their narratives—and care practices—contributes to how AI-based care is perceived and resisted. In fact, AI might not match the needs of the current care sector and fit with the personalised care envisaged by many developers and proponents. We also demonstrated ambivalent positions toward AI in terms of trust, illustrating a disconnect between technology developers and care practitioners regarding experiences and knowledge. For trust to be formed amongst and between stakeholders in the context of AI, attention must be paid to the nature, dynamics, and circumstances of human-AI relations, exploring logics of sociotechnical care and trust across all actors. Much is at stake in such understanding: namely, whether and how AI can be utilised to appropriately serve caring needs in sensitive settings. Our study was limited by not including residents due to the COVID-19 pandemic; their perspectives must be included in future research.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article:

This work was supported by a Monash Data Futures Institute grant awarded to the project's team and by a Monash Faculty of Arts grant awarded to the first author.

IRB

The study was approved by Monash's University Human Research Ethics Committee, approval number 23715.

CRediT authorship contribution statement

Barbara Barbosa Neves: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing, Supervision. **Maho Omori:** Conceptualization, Data curation, Formal analysis, Investigation, Project administration, Writing – original draft. **Alan Petersen:** Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing. **Mor Vered:** Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing. **Adrian Carter:** Formal analysis, Validation, Writing – original draft, Writing – review & editing.

Data availability

Data will be made available on request.

Acknowledgements

The authors are grateful to all participants who took part in this project and to Claudia Del Campo Marin and Sandra Sanders for their support.

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