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Smart Home Health Technologies and Elder Care: Mapping Ethical Issues Through a Systematic Review

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Abstract

The growing global population of older adults has intensified the need for technological approaches to address caregiver shortages and support independent living. Smart home health technologies (SHHTs) are increasingly promoted as practical and cost-efficient solutions. Alongside these benefits, the ethical implications of SHHTs demand careful examination. Following PRISMA guidelines, we performed a systematic review to explore the extent and manner in which ethical issues are considered in SHHTs for elder care. We analyzed 156 peer-reviewed articles in English, German, and French, retrieved from 10 electronic databases. Narrative synthesis revealed seven key ethical themes: privacy, autonomy, responsibility, human versus artificial interaction, trust, ageism and stigma, and other relevant concerns. Our findings reveal limited ethical attention in the development and deployment of SHHTs for older adults. This review emphasizes the importance of incorporating ethical considerations into the design, research, and application of smart home health technologies to improve elder care responsibly.

Keywords: Biomedical ethics, Elder care, Smart home technology, Aging, Health technology, Systematic review

Introduction / Background

Advances in medicine, public health, and technology have contributed to a global increase in life expectancy, leading to a rising proportion of older adults (aged 65 and above) [1]. This demographic shift has resulted in greater demand for caregiving and higher associated costs [2]. Many older adults prefer to age in place and receive care at home [2], even if doing so entails risks such as falls, which become more likely with frailty [3]. Nevertheless, many choose these risks over relocating to long-term care facilities [4–6].

Smart home health technologies (SHHTs) are increasingly seen as a potential solution to the challenge of supporting safe, cost-effective aging at home. Demiris and colleagues define a smart home as a "residence equipped with technology that monitors residents' well-being and activities to enhance quality of life, foster independence, and prevent emergencies" [7]. SHHTs, a subset of smart home technologies, encompass non-invasive, unobtrusive, interoperable, and sometimes wearable devices connected through the Internet of Things (IoT) [8]. These systems can monitor older adults remotely, detect deviations in daily routines or vital signs, and alert formal or informal caregivers when necessary. By providing timely support, SHHTs allow older adults to maintain independence while ensuring access to healthcare services at their convenience.

While these technologies offer clear practical advantages for aging in place, ethical considerations are equally crucial. Biomedical ethics principles, such as autonomy, justice [9], privacy [10], and responsibility [11], should guide not only healthcare professionals but also technology developers, embedding ethical practices directly into SHHT design.

The objective of this systematic review is to examine whether, and to what extent, ethical concerns are addressed in the theoretical and empirical literature on

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SHHTs for older adults between 2000 and 2020. Unlike previous reviews [12–14], which primarily focused on practical aspects, our study explicitly investigates the discussion of ethical issues. We differentiate between ethical considerations highlighted in theoretical versus empirical studies to identify potential gaps in how ethics are integrated into SHHT research. Understanding these gaps is a critical first step toward bridging bioethical principles with real-world technology deployment, informing policy, guidelines, and design practices [15]. To our knowledge, this is the first systematic review to focus specifically on ethical challenges in SHHTs for elder caregiving.

Methods

Search strategy

In collaboration with an information specialist from the University of Basel, we developed a systematic search strategy guided by the PICO framework: Population 1 (older adults), Population 2 (caregivers), Intervention (smart home health technologies), and Context (home settings). The outcome of ethics was intentionally excluded from the search criteria to ensure a comprehensive capture of relevant studies, including those not explicitly labeled as ethical. Within each PICO category, we used synonyms and alternative spellings to maximize inclusivity. The search strings were adapted for each database using controlled vocabulary and thesaurus terms.

We searched ten electronic databases: EMBASE, Medline, PsycINFO, CINAHL, SocIndex, SCOPUS, IEEE, Web of Science, Philpapers, and Philosophers Index. The search was limited to peer-reviewed articles published between January 1, 2000, and December 31, 2020, in English, French, or German, capturing the evolution of SHHTs as an emerging field.

Inclusion criteria

Eligible studies had to meet the following criteria:

1. The study must be an original empirical or theoretical research article. Book chapters, conference proceedings, newspapers, commentaries, dissertations, theses, and other systematic reviews were excluded to avoid duplication.
2. Empirical studies had to focus on older adults (aged 65+) and/or their caregivers, including both professional (paid) and informal (unpaid) caregivers.
3. The study must investigate the use of SHHTs within the older adult's residence.

Procedure

Initially, a systematic search was conducted across all selected databases, and duplicates were removed using EndNote (for a complete list of included studies, see Supplementary Table 1, Appendix Part 1). One researcher manually screened all titles and excluded those clearly irrelevant. Subsequently, two authors independently reviewed the abstracts to further remove unsuitable papers, resolving any disagreements through discussion with a third author. The third author also merged the included articles and eliminated any remaining duplicates.

Final inclusion and data extraction

All eligible articles were retrieved online, and studies without accessible full texts were excluded. Data extraction was then carried out by three coauthors, during which additional papers were excluded for irrelevant content. A coding template was developed and tested during the first round of extraction, and the finalized template was applied using Microsoft Excel for the remaining studies. Information recorded included study demographics and ethical considerations. Each author was assigned a portion of the articles for extraction, and any uncertainties or disputes were resolved through discussion. To verify reliability and reduce bias, 10% of the articles were independently reviewed, showing an 80% consistency rate between extracted data.

Data synthesis

The extracted data were combined, and ethical issues identified within the publications were analyzed through narrative synthesis [16]. Through this process, the authors identified seven primary ethical categories. Within these categories, subcategories were developed to provide additional detail and context to the main ethical themes.

Results

Characteristics of included articles

The initial database search retrieved 10,924 records across ten databases. After removing duplicates, 9,067 titles were screened, resulting in the exclusion of 5,215

records **(Figure 1)**. Screening of 3,845 abstracts led to 374 studies selected for full-text retrieval. Due to accessibility issues, 20 full texts could not be obtained, leaving 354 articles for in-depth review. During the full-text assessment, 198 studies were excluded for reasons such as hospital-based technologies or interventions unrelated to health. Ultimately, the review included 144 empirical studies and 12 theoretical papers that explicitly addressed normative or ethical considerations of SHHTs in elder caregiving.

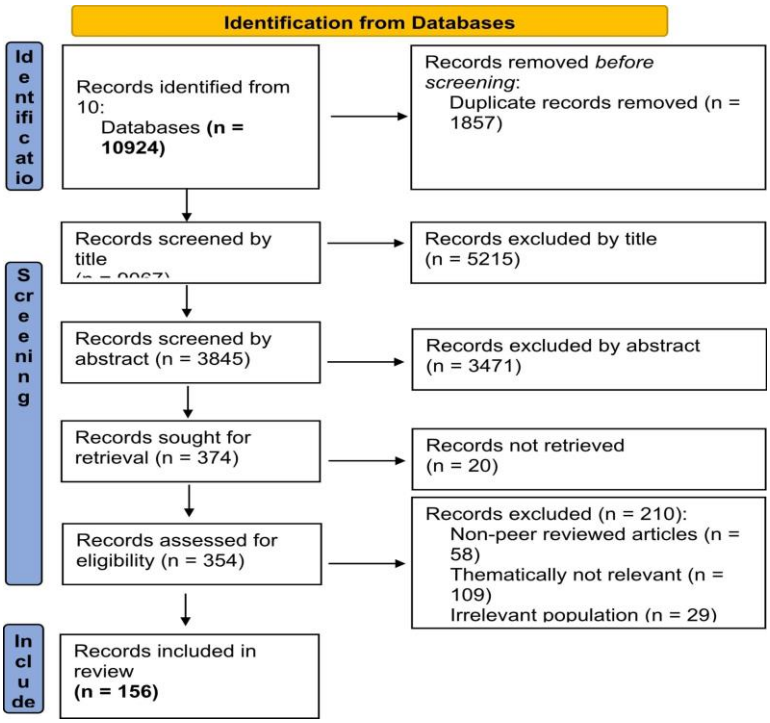

Figure 1. PRISMA 2020 Flowchart

Of the 156 studies reviewed, nearly all (154) were published in English. The majority appeared between 2014 and 2020 [105; 67%]. Another 41 papers (26%) were released from 2007 to 2013, while only 10 (7%) dated back to 2000–2006. Aside from 12 theoretical works, the 144 empirical papers used a range of research designs. Mixed-methods were most common (42; 29%), followed by experimental (39; 27%), qualitative (38; 26%), and quantitative approaches (15; 10%). The rest relied on observational studies, ethnography, case studies, or iterative testing.

The research also explored different roles of SHHTs. Twenty-nine papers (20.14%) addressed (a) monitoring of physical and functional health, 16 (11.11%) focused on (b) safety or security support, 23 (15.97%) emphasized (c) enabling social interaction, and 9 (6.25%) examined (d) cognitive or sensory aid. A further 46 studies (29%) looked at technologies that combined several of these functions. In terms of specific tools, smart homes were most common (71; 49.3%), followed by assistive robots (49; 34.03%), virtual/augmented/mixed reality (7; 4.4%), and AI-driven apps or wearables (4; 1.39%). The remaining 20 studies (12.8%) either assessed multiple tools or technologies outside these categories.

Ethical aspects were not always addressed. Out of 156 studies, 55 made no mention of them. Among the 101 that did, issues fell into seven themes: (1) privacy, (2) human–AI relationships, (3) autonomy, (4) responsibility, (5) stigma and age-related bias, (6) trust, and (7) other normative concerns **(Table 1)**. Each theme included more specific sub-issues that explained how SHHTs might affect older adults or their caregivers in real caregiving settings **(Table 2)**. These seven areas are examined in detail in the following sections.

Table 1. Ethically relevant topics mentioned in included manuscripts (N = 156)

Theme	# of empirical articles	# of theoretical articles	Total
Privacy	49	9	58
Human vs. Artificial Relationships	45	9	54
Autonomy	30	10	40
Responsibility	19	6	25
Ageism and Stigma	18	6	24
Trust	17	2	19
Other	0	4	4
None mentioned	55	0	55

Table 2. Specific concerns mentioned within each ethically relevant topic

Privacy	Human vs. artificial	Autonomy	Responsibility	Ageism and Stigma	Trust
General awareness	Importance of human caregiving	Control	Downsides of responsibility	Fear of being stigmatized by others	Characteristics promoting trust
Designing privacy	Fear of replacement of humans	Protecting autonomy/dignity	New responsibilities	Social Influence	General mistrust
Risk & Regulation	Preferences for technology	Importance of autonomy	Reducing burden of care	Exacerbating stigma for women	
Privacy in the case of cognitive impairment	Collaboration	Relational autonomy			

Privacy

Privacy was a recurring theme in 58 of the reviewed articles. In fact, 9 out of 12 theoretical papers raised privacy as one of the most significant ethical concerns. Across these 58 studies, four main privacy-related issues were identified.

(A) **Awareness of privacy** – The degree of privacy concern varied among SHHT end-users. Some were highly sensitive to privacy risks, while others expressed little or no worry, or shifted their concerns depending on other priorities such as access to healthcare [17] or a sense of safety [18]. Caregivers and researchers often placed a stronger emphasis on privacy [19–21], whereas older adults were generally less worried and instead focused on issues like cost and usability [22–24]. Many were willing to compromise privacy in exchange for remaining at home safely. Several papers also emphasized that privacy is highly individual, shaped by context and personal preference, and thus cannot be universally generalized [25–28]. On the other hand, some studies reported no evidence of privacy worries at all, with participants even seeing continuous monitoring as useful rather than intrusive [29–31].

(B) **Privacy by choice** – Both older people and caregivers expressed the need to have a say in what technologies are used, what data is collected, and where devices should be installed [32, 33]. Certain spaces in the home were perceived as particularly private, making monitoring there feel more intrusive [34–36]. Professional caregivers were also uneasy about the possibility of being recorded at work [37, 38]. Moreover, older adults often felt uncomfortable with cameras [39, 40] or even the sense of being watched, regardless of whether cameras were actually present [41–43].

(C) **Risks and regulation** – Concerns also focused on data misuse, such as unauthorized sharing or theft [44–47], and how interactions with technology could alter behavior or relationships [48, 49]. Researchers stressed the importance of both legal safeguards and design measures to minimize these risks [45, 50, 51].

(D) **Privacy and cognitive impairment** – Debate also surrounded whether individuals with cognitive decline should face more intrusive monitoring for safety reasons or whether their right to privacy should remain equally protected [52, 53].

Human versus artificial relationships

Fifty-four articles discussed the balance between human and machine involvement in caregiving.

(A) **Fear of replacement** – A common concern was that robots might substitute for human caregivers [28, 54–56], raising issues such as job loss [40, 57], reduced interpersonal contact [17, 46], and greater risks of social isolation [41, 58].

(B) **Value of human care** – Many studies underscored the irreplaceable nature of human caregiving, stressing the importance of physical touch [26, 47, 50, 59], emotional connection [17, 33, 60], and attentiveness to subtle signs of decline during in-person interactions [57]. Older adults themselves often preferred direct human contact and reacted cautiously toward fully virtual forms of care [31, 61, 62]. Several works argued that relying too much on technology risks dehumanizing care, which should remain inherently person-centered [27, 48].

(C) **Positive views on technology** – At the same time, some findings suggested acceptance or even attachment toward care technologies [47, 49, 58]. A few studies reported that participants welcomed robots in caregiving roles, with some redefining what "good care" could mean [63–66]. Theoretical works also pointed out the potential of technology to support social interaction and relationships [67, 68].

(D) **Human–machine collaboration** – A number of studies called for partnership rather than replacement, highlighting the potential drawbacks if collaboration is absent—for example, informal caregivers withdrawing from their roles [69] or reinforcing unequal care dynamics [70]. Opinions differed on whether robots should have life-like voices, faces, or emotions, with recognition of the current limitations in achieving convincing realism [46]. Some users wanted simple voice-based communication, while others preferred customized features, including specific voice types [65, 71].

Autonomy

Autonomy was addressed in 40 of the reviewed papers. The first theme (A) related to control. On the positive side, SHHTs were described as potentially empowering older adults [25, 26, 72, 73]. On the negative side, concerns arose that technology might instead take control away from them, increasing dependency [55, 74] and reducing decision-making freedom [48]. Many older adults expressed a desire to retain control—for instance, being able to switch technologies on or off easily, regulate what data is shared, or choose where devices are allowed [17, 30, 35, 69, 75]. Loss of autonomy was also linked to fears of being constantly monitored [28, 48] or becoming more isolated through overreliance on technology [76].

The second theme (B) focused on dignity and protection of autonomy. Issues such as deception [46, 49, 54, 77], infantilization [31, 60], and paternalism [17, 27, 57] were identified as threats to older adults' dignity [78–80]. At the same time, many accepted technology as a way to avoid burdening others, which highlighted its role in supporting functional independence [52, 81, 82]. Trade-offs also emerged, such as balancing autonomy with safety [24] or nudging older adults toward certain behaviors for their own benefit [32].

Two additional sub-themes were primarily discussed in theoretical works. (C) Relational autonomy emphasized that autonomy should not be viewed in isolation but rather in connection with relationships to family, caregivers, and community [27, 41, 47, 49, 58]. (D) Normative arguments for autonomy explained why autonomy should be preserved, pointing to benefits such as greater well-being [65, 67], happiness, and a stronger sense of purpose [83].

Responsibility

Twenty-five articles raised questions about responsibility in relation to SHHTs.

(A) Some works described downsides of shifting responsibility. Technology use was seen to conflict with moral duties of caregiving [57–59], raise worries about over-reliance on devices [58], and add extra tasks. Caregivers in particular expressed concern about increased workload: learning systems, interpreting data, and managing frequent alerts [18, 35, 36, 53, 84]. Older adults also feared additional responsibility or pressure [60].

(B) Other studies discussed ongoing negotiation between professional and informal caregiving duties. Smart technologies were expected to require stronger cooperation between formal and informal caregivers [80], with fears that existing gendered divisions of labor, especially dependence on female caregivers, could worsen [70].

(C) At the same time, several papers reported positive outcomes, such as reducing caregiver burden by enabling them to prioritize urgent needs [5, 18, 49, 73, 79, 80].

Some older persons also described this shift of responsibility onto technology as liberating [48].

Ageism and stigma

Concerns about ageism and stigma appeared in 24 articles.

(A) Stigmatization was a recurring issue. Using SHHTs was sometimes seen as signaling frailty, forgetfulness, or incompetence [26, 33, 76, 81, 85–87]. Some older adults delayed adoption, claiming they did not need the technology "yet" [83, 88]. Robots were occasionally perceived as disrespectful toward older users [52, 84, 89]. Frustration also arose from difficulties in using healthcare technologies, which could reinforce feelings of inadequacy [72]. Other challenges included discomfort with learning new systems [42, 66, 90] and a sense of pressure to adopt them [62, 88].

(B) Social influence played a strong role. Longer technology use often led family members to encourage continued adoption, creating reinforcing cycles [27]. Self-esteem was also important, as many older adults felt they needed to reach a certain point before openly acknowledging their need for technology [84]. Some caregivers doubted whether older persons could use devices effectively [36]. This partly explained preferences for discreet or hidden technologies, which could avoid social stigma from visitors [22, 55, 87].

(C) A few theoretical papers discussed broader stigmatization issues, suggesting that SHHTs could reinforce gendered caregiving roles and exacerbate inequalities faced by women and migrants [47, 70].

Trust

Trust was mentioned in 18 studies.

(A) **General mistrust** was noted toward technologies when compared to human caregiving [33, 42]. Caregivers often acted as intermediaries, tasked with understanding the systems and maintaining trust on behalf of older adults [48]. Some worried about leaving older persons alone with devices [80], or that technology would undermine their own roles [23, 29, 32]. Interestingly, in contrast, some older adults reported trusting technology more than humans, perceiving it as safer and more reliable [58, 69].

(B) **Factors influencing trust** included the level of automation [30], the involvement of trusted individuals in design and use [34, 91], the perceived usefulness of the technology, and the amount of experience users had with it [59, 71, 92]. Robots tended to be trusted more than virtual agents such as Alexa [60, 65]. Furthermore, robots with higher automation and less human-like appearance were found to increase trust [30].

Other considerations

Some issues that did not fit the previously identified categories were grouped here.

(A) **Research-related concerns** – Two theoretical papers noted the limitations of current research. Ho [27] argued that there is insufficient empirical evidence supporting the effectiveness of SHHTs, which makes their role in supporting aging in place less convincing. Palm *et al.* (2013) pointed out that many caregiving costs remain hidden because of unpaid informal caregivers, which complicates calculations of the true economic value of SHHTs.

(B) **Psychological dimensions** – Two studies highlighted psychological phenomena linked to SHHT use. Pirhonen *et al.* [58] suggested that robots may foster well-being by promoting feelings of hope. In contrast, another paper described how caregivers may experience blame or fear if they do not adopt SHHTs, creating pressure to use them [18]. This pressure also led some to believe that using SHHTs could only be beneficial, reinforcing the idea that adopting them is always preferable to not using them.

Discussion

This review examined how ethical issues are addressed in research on SHHTs for older adults, incorporating both empirical and theoretical works. Unlike earlier reviews [12–14] that primarily examined empirical evidence and paid little attention to ethical concerns, our study provides a broader view. It not only confirms the importance of widely recognized themes such as autonomy and trust [93, 94], but also highlights underexplored areas like responsibility [95] and ageism or stigma.

One of the most striking findings was that more than one-third of the included publications did not reference ethics at all. Several explanations for this silence can be proposed.

First, there may be a scarcity of space within publications. Einav & Ranzani [96] note that medical technologies themselves are not inherently ethical—the ethical dimension emerges in questions of when, how,

and for whom they are used. Since answering these questions requires empirical data (e.g., evidence of benefits, reporting on long-term harms), authors may prioritize presenting measurable outcomes over ethical reflection, especially when constrained by strict word limits. This could explain why values such as beneficence and non-maleficence, central in biomedical ethics [9], were rarely made explicit in the reviewed papers. Authors may consider empirical benefits as sufficient demonstrations of those principles.

Second, there is a scarcity of time and resources in caregiving research [2]. Faced with pressures to demonstrate solutions to resource shortages, researchers may focus on empirical results rather than exploring ethical debates. Similarly, competition for limited funding [97] plays a role, as technological projects typically receive more financial support than ethics-focused studies [98]. This funding imbalance likely contributes to the higher volume of empirical publications compared to theoretical or combined empirical-ethical works.

Unsurprisingly, privacy emerged as the most prominent ethical concern, especially in relation to monitoring and health data [99–101]. A noteworthy contribution of this review was the link between privacy and cognitive impairment. While autonomy and cognitive decline are widely debated in bioethics [102, 103], privacy in this context has only recently attracted scholarly and design attention [104]. Interestingly, the reviewed studies suggested that privacy intrusions were more readily justified when cognitive impairment was involved [35, 53]. While this reflects practical caregiving challenges, it raises questions about ethical legitimacy. One explanation may be the strong connection between privacy and autonomy: since autonomy enables individuals to consent to privacy intrusions, the loss of autonomy in cognitive decline can indirectly weaken privacy protections [105].

Human vs. artificial relationships

An unexpected finding was that more studies addressed human–technology relationships than autonomy, even though autonomy is usually the dominant ethical concern in discussions on technology [94]. Recently, however, fears of technology replacing human caregiving have become more prominent [106–108]. This concern is particularly strong because caregiving for older persons has traditionally been viewed as a deeply human-centered activity [109]. Yet, as the number of both paid and unpaid caregivers continues to decline [110], technology is increasingly presented as a possible solution [111]. Despite this, our review showed that both older adults and caregivers remain wary of such substitution [56, 61].

The most frequently expressed fear was that human care would be replaced entirely by machines, echoing broader anxieties seen in other professions where technology threatens job security [112]. Within this debate, the value of human touch and interaction was repeatedly emphasized [107, 108]. Physical touch plays a crucial role in caregiving, particularly for patients with dementia, as it can calm and connect with them when other forms of communication fail [113]. Similarly, face-to-face interaction is seen as essential to caregiving, fostering dignity and respect for older persons [114, 115], while also giving caregivers a sense of meaning and healing in their work [89, 114]. Consequently, introducing technology into caregiving may evoke associations with coldness and detachment [59]. Future development and implementation of SHHTs will therefore require careful reflection and dialogue to determine how much of the human element must be preserved.

Responsibility

Another noteworthy ethical concern—largely absent in earlier studies [116, 117]—was the issue of responsibility, particularly how SHHTs may negatively affect it. Since caregiving is rooted in human interaction [114, 115], it is closely tied to uniquely human concepts such as moral responsibility [118]. Transferring tasks to machines—entities that cannot hold moral accountability in the same way humans do [119]—risks creating a moral gap that caregivers are reluctant to accept. Evidence suggests that when professional and personal values conflict, caregivers experience stress and discomfort [120]. Thus, the introduction of SHHTs may be met with resistance, as it can alter the very foundations of professional responsibility.

Beyond ethical concerns, practical challenges also emerged. Some caregivers lacked time to learn how to operate SHHTs [35], while others worried about the burden of monitoring and interpreting health data [36]. Instead of reducing workload, SHHTs may generate new, sometimes stressful, obligations. For instance, continuous monitoring can pressure caregivers to check

data constantly, while older adults may conceal negative health information to avoid appearing burdensome [121]. Another dimension of responsibility relates to its redistribution among stakeholders. In assistive technology, ongoing efforts are being made to assign clearer accountability to developers through policies and regulations [122]. In healthcare, these debates become urgent in high-risk cases, particularly emergencies [123]. Critical questions emerge: Who is responsible if a device fails to detect a life-threatening situation? Who is liable if an alert is missed? Such legal and moral uncertainties contribute to the cautious pace of adopting SHHTs in caregiving [124].

Ageism and stigma

Ageism, though less frequently discussed, was another ethical concern in the literature. Stereotypes portray older adults as slow, dependent, or incompetent [125]. These prejudices align with a widespread fear of becoming a burden in later life, reinforced by societal expectations that individuals remain independent until death [126]. The rapid spread of digital technologies may exacerbate this issue, as older people are pressured to keep pace with increasingly fast-moving and tech-driven lifestyles [127]. Despite its significance, ageism does not appear to be a dominant theme in current SHHT research, suggesting it may also be under-recognized in society more broadly.

Ageism, stigma, and unobtrusiveness

Linked to ageism is the desire of older persons to avoid being perceived as "old" or dependent on assistance. This may explain the strong preference for unobtrusive technology. In the context of SHHTs, obtrusiveness is commonly defined as "undesirably prominent and/or noticeable." However, this definition must account for the user's perspective and environment, making it inherently subjective [128]. For many older adults, "unobtrusive" technologies are those that remain unnoticed—by themselves, and perhaps more importantly, by others. This invisibility may help reduce the stigma attached to technologies associated with physical or cognitive limitations. Further research is needed to confirm whether unobtrusiveness genuinely decreases stigma or whether it simply fosters greater acceptance of SHHTs in caregiving contexts.

Another sub-theme uncovered was the stigmatization of women and immigrant caregivers, though this appeared in only two theoretical papers [47, 70]. It is well documented that the caregiving burden falls disproportionately on women [129, 130], many of whom are immigrants, particularly in live-in care roles [131, 132]. Surprisingly, our review did not reveal evidence of technology redistributing this burden. This may reflect the persistent perception of caregiving—whether technologically assisted or not—as a feminized and undervalued profession [133]. Moreover, while caregiving remains gendered as "feminine," technology development is still largely coded as "masculine." This mismatch risks reinforcing, rather than disrupting, existing biases, thereby exacerbating stigma for women and migrant caregivers [133].

Trust

Trust was an anticipated ethical theme, given its prominence in broader discussions about technology [119, 134] and in nursing specifically [93, 135]. Our review showed nuanced dynamics of trust in the caregiving context. Older adults tended to trust caregivers to understand and manage SHHTs [48], while caregivers often worried that older persons would not trust the technology—although older adults themselves did not always express these concerns [32]. Education tools may therefore help align perceptions, ensuring that both caregivers and care recipients develop a shared understanding of SHHTs [136].

Interestingly, some older persons expressed greater trust in SHHTs than in human caregivers, viewing technology as more reliable [69]. Trust was also higher when the technology was embodied in a physical robot rather than a purely virtual agent [60, 65], consistent with findings that embodiment (such as having a face or body) fosters more human-like interactions [51]. Other factors shown to increase trust included perceived usefulness [92], time spent using the technology [59], and trust in the person introducing the technology [34, 91]. Taken together, these findings suggest that the design and implementation of SHHTs must creatively integrate these elements to build trustworthiness and encourage adoption in caregiving.

Limitations

Our systematic review covered 10 databases over a 20-year span, but it is inevitable that some older or newer publications were missed. Whenever possible, relevant

newer studies encountered during manuscript preparation were incorporated into our findings. A further limitation stems from our deliberate choice not to use ethics-related terms in our search strings. This approach allowed us to capture instances where ethical issues were absent, but it may also have led to missing some relevant articles, particularly theoretical ones.

Finally, resource limitations prevented independent data extraction across all 156 included papers. Instead, we validated data quality through a random 10% sample check. Given the high level of agreement in this validation step, we remain confident in the robustness of our study findings.

Conclusion

Smart Home Health Technologies (SHHTs) hold promise in addressing the shortage of human caregiving resources and in supporting older persons to age in place with technological assistance. Yet, this shift introduces a range of ethical challenges. The aim of this systematic review was to examine how such challenges are currently reflected in research on SHHTs in the context of caregiving for older persons.

By analyzing 156 articles—both empirical and theoretical—we found that more than one third made no mention of ethical issues, while the remaining two thirds highlighted a wide spectrum of concerns. Key themes included human versus artificial relationships, ageism and stigma, and responsibility. Together, these findings provide a comprehensive overview of the ethical discussions currently shaping the field.

Importantly, ethical concerns are not static. They evolve with technological advances and the populations for whom these technologies are designed. For example, the growing integration of Artificial Intelligence and Machine Learning in SHHTs will likely introduce new ethical questions. Issues such as autonomy will require re-examination—particularly in cases where users develop cognitive impairments, raising questions about re-consent and decision-making capacity.

In sum, while SHHTs may help alleviate caregiving burdens, proactive and ongoing ethical inquiry is essential. Future research in gerontology, ethics, and technology must anticipate and address emerging concerns to ensure that technological innovation in caregiving develops responsibly and with respect for the dignity, autonomy, and well-being of older persons.

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