International Journal of Innovative Technologies in Social Science

e-ISSN: 2544-9435

Operating Publisher
SciFormat Publishing Inc.
ISNI: 0000 0005 1449 8214

2734 17 Avenue SW,
Calgary, Alberta, T3E0A7,
Canada
+15878858911
editorial-office@sciformat.ca

ARTICLE TITLE	AI-ASSISTED DEMENTIA CARE: A REVIEW OF EFFECTIVENESS AND ETHICAL CHALLENGES
DOI	https://doi.org/10.31435/ijitss.2(50).2026.5124
RECEIVED	12 February 2026
ACCEPTED	06 April 2026
PUBLISHED	17 April 2026
LICENSE	The article is licensed under a **Creative Commons Attribution 4.0 International License.**

AI-ASSISTED DEMENTIA CARE: A REVIEW OF EFFECTIVENESS AND ETHICAL CHALLENGES

Wiktoria Dybizbańska *(Corresponding Author, Email: w.dybizbanska00@gmail.com)*
Independent Public Healthcare Institution of the Ministry of the Interior and Administration in Kraków, Kraków, Poland
ORCID ID: 0009-0000-9899-7272

Karolina Dziki
5th Military Clinical Hospital with Polyclinic SPZOZ, Kraków, Poland
ORCID ID: 0009-0005-1720-3810

Agnieszka Burzej
5th Military Clinical Hospital with Polyclinic SPZOZ, Kraków, Poland
ORCID ID: 0009-0003-0066-3197

Maciej Komenda
105 Military Hospital SP ZOZ in Żary, Żary, Poland
ORCID ID: 0009-0009-7327-417X

Julia Szklarska-Komenda
105 Military Hospital SP ZOZ in Żary, Żary, Poland
ORCID ID: 0009-0000-9914-4917

Katarzyna Garncarz
5th Military Clinical Hospital with Polyclinic SPZOZ, Kraków, Poland
ORCID ID: 0009-0001-7554-2715

Aleksandra Marek
Central Teaching Hospital of the Medical University of Łódź, Łódź, Poland
ORCID ID: 0009-0002-3391-5082

Krzysztof Jamroch
5th Military Clinical Hospital with Polyclinic SPZOZ, Kraków, Poland
ORCID ID: 0009-0003-2562-1276

Mateusz Kacalak
The Nicolaus Copernicus Provincial Multispecialty Center for Oncology and Traumatology in Łódź, Łódź, Poland
ORCID ID: 0009-0006-3386-0906

Zofia Nowakowska
Upper Silesian Medical Center of Prof. Leszek Giec of the Silesian Medical University in Katowice, Katowice, Poland
ORCID ID: 0009-0000-8030-7341

ABSTRACT

Background: Dementia affects more than 57 million people worldwide and remains one of the most disabling and least treatable syndromes associated with aging. Given the lack of a pharmacological cure, there is significant interest in utilizing artificial intelligence to improve both the accessibility and quality of care. At present, AI-powered tools are applied in three main areas: early diagnosis through neuroimaging analysis, non-pharmacological management of behavioral symptoms with social robots, and continuous safety monitoring using smart home and wearable technologies.
Objective: This review synthesizes peer-reviewed evidence from PubMed published between 2015 and 2025, evaluating the practical impacts of AI tools in dementia care and examining the moral challenges associated with their use in populations experiencing progressive cognitive decline.
Key Findings: Deep learning techniques applied to brain MRI have demonstrated diagnostic validity for Alzheimer's disease that equals or exceeds the performance of specialist clinicians. However, questions remain regarding their effectiveness across diverse populations. Robotic companions, such as the PARO seal robot, have been shown to reduce agitation and depression in individuals with dementia and to significantly decrease the use of psychotropic medications. Observation technologies improve safety and alleviate caregiver anxiety, but they also introduce surveillance practices that may compromise the individual dignity and autonomy of those they are intended to protect.
Conclusions: AI provides significant clinical benefits in dementia care; however, these advantages are inseparable from the ethical conditions governing its use.

KEYWORDS

Dementia, Alzheimer's Disease, Artificial Intelligence, PARO, Social Robots

CITATION

Wiktoria Dybizbańska, Karolina Dziki, Agnieszka Burzej, Maciej Komenda, Julia Szklarska-Komenda, Katarzyna Garncarz, Aleksandra Marek, Krzysztof Jamroch, Mateusz Kacalak, Zofia Nowakowska. (2026) Ai-Assisted Dementia Care: a Review of Effectiveness and Ethical Challenges. *International Journal of Innovative Technologies in Social Science*. 2(50). doi: 10.31435/ijitss.2(50).2026.5124

1. Introduction

Dementia is a uniquely devastating condition. While most serious illnesses threaten life, dementia progressively erodes personal identity, beginning with memory, followed by language, the ability to recall familiar faces, and ultimately, independent thought. Currently, more than 57 million individuals worldwide are living with dementia, a number projected to rise to 153 million by 2050 as populations age (Livingston et al., 2024). Economically, the global cost of Alzheimer's disease and related dementias has exceeded one trillion dollars annually in recent years, mainly due to the extensive hours of unpaid family care required (Nandi et al., 2022). The human cost, suffered by individuals with dementia and their families, remains incalculable.

Dementia care is defined by high labor demands, significant emotional challenges, and persistent resource limitations. Behavioral and psychological symptoms of dementia (BPSD), which include agitation, aggression, depression, anxiety, wandering, hallucinations, and sleep disturbances, affect up to 90% of individuals with dementia during the course of the illness (Cerejeira et al., 2012; Feast et al., 2025). These symptoms are the main contributors to caregiver burnout, the leading cause of premature admission to residential care, and among the most distressing experiences for both individuals with dementia and their caregivers (Brodaty & Donkin, 2009; Feast et al., 2025). Pharmacological interventions remain limited in efficacy. Antipsychotic medications, commonly prescribed for agitation, are associated with increased risks of stroke, heart failure, pneumonia, and accelerated mortality in older adults with dementia. These risks are sufficiently severe to warrant regulatory warnings in multiple countries (Maust et al., 2023; Tampi et al., 2016). Although non-pharmacological interventions can be effective, their success depends on trained staff and consistent implementation, which many care settings are unable to provide reliably (Cerejeira et al., 2012).

Artificial intelligence has emerged in this field with three primary promises. First, machine learning algorithms can identify Alzheimer's disease in brain scans years before clinical symptoms manifest, thereby enabling earlier intervention opportunities. Second, robotic companions are capable of supplying consistent and emotionally engaging interactions that may reduce agitation and depression without the adverse effects associated with medication. Third, smart home technologies can continuously monitor the safety of individuals living alone with dementia by detecting falls, wandering, and changes in functional status in real time. Each of these progressions has received considerable research attention over the past decade and has yielded substantive, though not flawless, evidence (Fan et al., 2025; Liu et al., 2022; Schneider et al., 2024).

Carefully interpreting this evidence has significant practical consequences. Clinicians are increasingly asked to recommend AI monitoring tools to families of patients with mild dementia. Care homes are acquiring PARO units, and neurologists are encountering AI-generated risk scores within clinical software. The integration of AI into dementia care is no longer a matter of debate; rather, the critical issue is whether these technologies will be implemented effectively.

1.1. The Necessity of a Distinct Ethical Framework for Dementia

Most existing ethical models for medical AI were developed with the assumption that patients possess full cognitive capacity. These frameworks presume that individuals can comprehend technological functions, evaluate benefits and risks, ask pertinent questions, and provide or withhold informed consent. However, individuals with dementia progressively and irreversibly challenge each of these assumptions. In the early stages of dementia, individuals may retain near-complete capacity for intricate decision-making. As the condition advances to the middle stages, the capacity for certain decisions may persist while others are lost. In late-stage dementia, individuals may lose the ability to recognize family members, communicate needs, or understand their environment. This progression is neither linear nor uniform; it differs among individuals, fluctuates daily, and differs depending on the type of decision (Poth et al., 2023).

Cognitive capacity is inherently decision-specific. An individual who is unable to reliably recall a recent conversation may nonetheless be fully capable of articulating clear preferences regarding the presence of a robot in their room or the tracking of their location. Standard institutional practices, which often interpret a dementia diagnosis as indicative of global incapacity, have been demonstrated to be both ethically flawed and practically detrimental (Poth et al., 2023; Köhler et al., 2024). Artificial intelligence tools in dementia care cannot be effectively governed by one-time consent procedures; instead, they require ongoing, relationship-based assessments of each individual's developing preferences, values, and capacities. This level of individualized attention is particularly challenging for overburdened care systems to provide.

2. Research materials and methodology

Articles published from 2010 to 2025 were included, with earlier publications reviewed as needed to establish historical background. Only English-language, peer-reviewed articles with accessible abstracts were considered. The literature search utilized PubMed, Google Scholar, and ScienceDirect. The following keywords and combinations were used: “dementia,” “Alzheimer's disease,” “artificial intelligence,” “PARO,” “social robots.”

A total of 52 studies were selected based on relevance, methodological quality, and recency, with preference given to high-quality and high-impact research. Study quality and the strength of evidence were assessed based on study design, sample size, and methodological soundness. The review was conducted as a narrative synthesis of current evidence.

3. Results

3.1. AI in Dementia Diagnosis

3.1.1. Capabilities of Machine Learning in Brain Imaging Analysis

The most technically advanced results in dementia artificial intelligence research have emerged from the application of deep learning to brain MRI and PET imaging. Clinically, this is significant because Alzheimer's disease begins to damage the brain at least a decade before symptoms manifest. By the time individuals present at memory clinics with noticeable cognitive decline, substantial neuronal loss has already occurred, and any effective treatment would have needed to begin years earlier (Livingston et al., 2024; Franc et al., 2025). AI-based neuroimaging enables the detection of subtle, early structural changes that human radiologists often miss, thereby creating opportunities for preventive intervention (Liu et al., 2022).

Liu et al. (2022) developed a three-dimensional deep learning model trained on brain MRI data to differentiate early Alzheimer's disease from mild cognitive impairment and normal aging. When evaluated on an independent dataset from a separate institution, which is essential for assessing real-world generalizability, the model achieved accuracy comparable to expert clinician review. Importantly, the model identified structural changes in the hippocampus, entorhinal cortex, and medial temporal lobe, regions where Alzheimer's pathology typically begins (Liu et al., 2022; Veneziani et al., 2024). These findings indicate that the model detected relevant pathological patterns rather than random features.

Building on these findings, more recent work has further improved accuracy by using hybrid architectures that combine different neural network types, each capturing a distinct aspect of imaging data. For example, a hybrid model reported by Mmadumbu et al. (2025) that combined recurrent and convolutional networks on the NACC dataset achieved near-perfect classification accuracy under controlled conditions. However, this figure demands interpretive caution: benchmark accuracy in research settings routinely overstates real-world clinical performance, because research datasets are more homogeneous, scans are acquired under controlled protocols, and the boundary between normal aging, mild cognitive impairment, and early Alzheimer's disease is far less sharp in clinical practice (Franc et al., 2025; Veneziani et al., 2024).

A systematic review and meta-analysis conducted by the Aging JMIR group (2024) included 24 studies published between 2010 and 2024 and demonstrated that machine learning classifiers consistently outperform traditional diagnostic methods when provided with high-quality imaging data. Additionally, a separate systematic review by Veneziani et al. (2024), which analyzed 37 papers on artificial intelligence in neuropsychological assessment, found that AI can both accelerate the diagnostic process and predict which individuals with mild cognitive impairment are likely to progress to dementia. This capability may enable clinicians to focus intensive monitoring and support on those at the highest risk.

3.1.2. Linking the Gap Between Laboratory Research and Clinical Application

Despite promising results, a translational gap persists between AI's research abilities and its clinical use. Three practical obstacles determine whether clinicians can reliably use these tools.

The first obstacle is demographic representation. Most models use datasets like ADNI or OASIS, which include mostly white, highly educated, English-speaking participants from North American centers. These models may be less accurate with patients from other racial, ethnic, or educational groups (Hinton et al., 2024; Scerri et al., 2025). Studies show Black and Hispanic older adults have higher dementia rates than white adults, largely due to cardiovascular and social and economic factors (Mayeda et al., 2016; Arenson et al., 2024). If AI tools are less accurate for these populations, existing gaps in diagnosis could grow.

The second obstacle is explainability. When a machine learning model flags an MRI as early Alzheimer's, clinicians need to know the reasoning. This includes the flagged areas, the model's confidence, and its common errors. Without this, clinical oversight is impossible, and patients cannot be adequately counseled (Franc et al., 2025). Most top-performing deep neural networks give results without clear explanations.

The third obstacle is workflow integration. Even highly accurate diagnostic AI systems are only effective if they can be embedded within existing clinical systems, connected to imaging infrastructure, and positioned to support rather than replace clinical consultations. The literature predominantly describes models developed in isolation from actual clinical processes, often without input from neurologists, radiologists, or geriatricians who would ultimately use them (Franc et al., 2025; Veneziani et al., 2024). This challenge extends beyond technical limitations and shows a fundamental failure to design these systems in genuine collaboration with clinical communities.

3.2. Social Robots in Dementia Care

3.2.1. PARO: Definition and Significance in Dementia Care

PARO is a soft, fur-covered robotic baby harp seal. It was developed by Japan's National Institute of Advanced Industrial Science and Technology. The device responds to touch, voice, light, and posture through movements and sounds that mimic a living animal and adjusts to individual users' preferences over time. The United States Food and Drug Administration (FDA) cleared PARO as a biofeedback device in 2009. Recent meta-analyses show that PARO has been evaluated in clinical trials. These trials involved more than one thousand participants across several countries (Koh et al., 2023; Yu et al., 2022).

The relevance of a robotic seal in dementia care is rooted in the challenges presented by behavioral and psychological symptoms of dementia (BPSD). These symptoms include agitation, aggression, depression, anxiety, and wandering. Up to 90% of individuals with dementia will experience BPSD during the disease. These symptoms are the main contributors to caregiver burnout and premature institutionalization (Cerejeira et al., 2012; Feast et al., 2025). There is a paramount need for safe and effective non-pharmacological management strategies. Antipsychotic medications, commonly prescribed for agitation, are associated with increased risks of stroke, heart failure, pneumonia, acute kidney injury, and excess mortality. These risks have led to regulatory warnings in several countries (Maust et al., 2023; Tampi et al., 2016). Although non-pharmacological interventions such as structured activities, music therapy, and person-centered care can be effective, their implementation often requires trained staff and consistent delivery. Many care settings are unable to provide this level of support (Cerejeira et al., 2012).

3.2.2. Summary of Clinical Trial Outcomes

The most comprehensive meta-analysis of PARO in dementia care, conducted by Koh et al. (2023), synthesized data from 12 clinical trials involving 1,461 participants. Key findings showed that participants in PARO groups used significantly less psychotropic medication than controls, a reduction with direct patient safety implications due to the documented harms of these drugs (Maust et al., 2023). PARO groups also exhibited reductions in agitation, depression, and anxiety, while effects on sleep duration were minimal. Furthermore, narrative summaries across included trials reported reduced apathy and increased social engagement with staff and other residents.

An earlier meta-analysis by Pu et al. (2019) examined seven randomized controlled trials (RCTs) of pet-type robot companions and found consistent reductions in agitation levels with low variation across studies, signifying robust results. The analysis also identified associations between session length, weekly contact time, and depression outcomes, suggesting that dosing considerations similar to those in pharmacotherapy or structured exercise should be applied to robotic interventions (Pu et al., 2019). Brief or infrequent sessions provided minimal benefit, whereas more sustained contact was necessary to achieve clinical effects.

A recent well-designed randomized controlled trial by Chen et al. (2024) investigated group-based PARO sessions in participants with mild dementia from day care centers. The trial assessed both physiological indicators of autonomic stress and psychological outcomes, including depression, loneliness, and overall psychological well-being. Participants in the PARO groups demonstrated improvements across all measures compared to controls, with effects maintained at the one-month follow-up. This finding is significant because most previous trials measured outcomes only immediately after the intervention, leaving the durability of effects unaddressed (Chen et al., 2024; Fan et al., 2025).

The most comprehensive recent review, conducted by Fan et al. (2025), analyzed 14 randomized controlled trials of intelligent robot interventions in dementia, comparing pet robots such as PARO with humanoid robots such as NAO. Both types demonstrated benefits for neuropsychiatric symptoms, though heterogeneity across individual symptom measures was observed. The review identified the quality of implementation, including consistency, emotional responsiveness, and integration with trained staff, as an important moderator of effectiveness (Fan et al., 2025). Robots that are not actively integrated into structured care programs do not provide the same benefits as those skillfully deployed.

3.2.3. A Critical Perspective on Current Evidence

While the data have generated considerable enthusiasm, a significant finding warrants caution. The systematic review and meta-analysis by Yu et al. (2022), applied more stringent methodological criteria than most prior reviews. By limiting the pooled analysis to randomized controlled trial data and excluding uncontrolled before-and-after studies, which are more prone to bias, the authors did not find statistically reliable effects of PARO on any individual outcome, including agitation, depression, anxiety, cognition, or quality of life (Yu et al., 2022).

This finding does not indicate that PARO is ineffective; rather, it highlights that, although promising, the current evidence base is insufficient to support definitive clinical recommendations. Most published trials have been small, short-term, used heterogeneous outcome measures, and lacked effective blinding of participants or caregivers to treatment assignment. These limitations are present across meta-analyses (Yu et al., 2022; Fan et al., 2025). Clinically, PARO consistently elicits positive emotional responses in individuals with dementia, reduces psychotropic medication use in certain care settings, and is considered both acceptable and safe. However, determining whether these effects justify standard-of-care clinical recommendations will require larger, longer, and better-controlled trials than those conducted to date (Fan et al., 2025).

In practice, many clinicians and care homes are proceeding with implementation based on the available evidence and the absence of documented harm. This approach is defensible given the severity of the challenges PARO seeks to address and the unfavorable risk-benefit profile of the medications it may replace (Maust et al., 2023; Koh et al., 2023).

3.3. Monitoring Technologies: Benefits and Limitations

Continuous monitoring through smart home sensors, wearable devices, and GPS trackers is a key artificial intelligence application in dementia care, directly addressing the clinical challenge of maintaining safety while supporting independence for individuals with dementia living at home. Individuals with dementia are at increased risk of falls, wandering, medication errors, and domestic accidents. These risks are the leading factors prompting families to seek residential care placement and are a primary source of caregiver anxiety (Nandi et al., 2022; Dada et al., 2022).

Evidence from reviews highlights both benefits and limitations of monitoring technologies in dementia care. A review by Schneider et al. (2024), evaluated the impact of digital assistive technologies on the quality of life of individuals with dementia across 30 studies. Safety monitoring technologies, including fall detectors, door sensors, GPS tracking, and bed-exit alarms, were shown to reduce safety-related incidents and caregiver anxiety (Schneider et al., 2024). However, the direct effects on the subjective quality of life of individuals with dementia were less consistently positive. Most studies have focused on behavioral competence rather than the lived experience of the monitored individual, a significant gap given that the primary justification for these technologies is the well-being of the person with dementia.

The acceptability of monitoring technologies is a central factor influencing their success in dementia care. A systematic review by Dada et al. (2022) specifically examined the acceptability of monitoring technologies and found that wearable sensors were consistently the least accepted category. Participants described these devices as cumbersome, uncomfortable, and incompatible with their self-image. Bed sensors were reported to disrupt sleep. These findings possess direct clinical implications: a monitoring system that an individual with dementia removes, hides, or resists will not effectively prevent falls or detect wandering (Dada et al., 2022; Schneider et al., 2024). Acceptability is therefore a critical factor that determines whether the technology is functional in practice.

The effects of monitoring technologies often benefit family caregivers most directly by easing their burden. Multiple studies document that caregivers who know a monitoring system is in place sleep better, worry less, and report lower levels of psychological distress, effects with downstream consequences for care quality (Schneider et al., 2024; Loveys et al., 2022). A caregiver who is less exhausted and anxious is more patient, more attentive, and better able to notice meaningful changes in the person they care for. In this sense, monitoring can benefit people with dementia indirectly, through the relational channel of family caregiving.

3.4. Ethical Aspects in AI-Assisted Dementia Care

Research on AI in dementia care shows both great potential and notable methodological issues. Ethics literature shows persistent and urgent tensions that remain unresolved. Unique ethical challenges emerge from the progressive nature of dementia. The disease weakens cognitive capacities essential to ethical and legal protections. These include the ability to comprehend information, evaluate alternatives, express preferences, and give or withhold consent. As dementia advances, individuals become more dependent on others. Family, clinicians, institutions, and AI systems must often make decisions for them (Poth et al., 2023; Köhler et al., 2024). The way this association is managed will determine whether AI improves or lessens the quality of life.

3.4.1. Consent in Contexts of Variable Decision-Making Capacity

Informed consent is the ethical and legal foundation of medical care. It requires individuals to understand the proposed intervention, appreciate its relevance, evaluate options, and communicate a decision. Dementia gradually and heterogeneously impairs these abilities. Complete loss typically occurs only in advanced stages (Poth et al., 2023). In clinical settings, management of consent capacity in dementia is often inadequate. Poth et al. (2023) found that clinicians often assume a categorical lack of decision-making capacity after diagnosis. They continue without individualized assessment. These practices violate statutory standards in most jurisdictions. They also disregard clinical evidence showing that beneficial interventions can improve consent capacity in many who might otherwise be excluded (Poth et al., 2023; Köhler et al., 2024).

Within the context of AI technologies, consent must be addressed at multiple, overlapping levels. Individuals are required to understand what data the monitoring system collects, whether their movements are tracked by GPS, that the robot seal is not a living being, and that an AI system generates the risk score referenced by clinicians. Each of these items may require a distinct capacity assessment, further complicated by the well-documented phenomenon of variable capacity in dementia. This phenomenon entails considerable fluctuations in decision-making ability across the day, with effects of fatigue and emotional state (Poth et al., 2023). A qualitative study by Köhler et al. (2024) demonstrated that people with dementia, caregivers, clinicians, and technology developers consistently described consent as an ongoing process of verification rather than a single event. This perspective is fundamentally at odds with the prevailing consumer technology model, which typically secures agreement once and then operates without further engagement.

In practice, care settings that implement AI tools require protocols for continuous reassessment. These protocols should include structured conversations at regular intervals to determine whether the person with dementia remains comfortable with the technology, what they currently understand about its function, and how their preferences may have changed as the disease progresses. This approach is not simply bureaucratic formality; rather, it operationalizes the principle of treating people with dementia as persons rather than as objects of care (Köhler et al., 2024; Pageau et al., 2024).

3.4.2. Lifelike Robots: Dignity and Ethical Aspects of Therapeutic Deception

PARO is intentionally designed to appear lifelike, with movements, sounds, and responses that stimulate emotional engagement and provide therapeutic benefits. Research indicates that many individuals with moderate-to-severe dementia perceive PARO as a living being. These individuals frequently name the robot, converse with it, convey concern for its well-being, and display grief when sessions conclude. This phenomenon raises a central ethical question in dementia care technology: is it ethically permissible to allow or encourage a false belief if it results in genuine therapeutic benefit (Ruiz-Fernández et al., 2024)?

The primary argument against therapeutic deception focuses on the preservation of dignity. Dementia leads to the loss of memory, recognition, language, and independence. Employing technology to create additional false impressions in cognitively vulnerable individuals, without their knowledge or consent, risks objectifying them rather than treating them as individuals deserving respect (Pageau et al., 2024). A systematic review by Ruiz-Fernández et al. (2024) emphasized human dignity and identified informed consent regarding the robot's non-living nature as an important unresolved ethical issue. The concern is not that PARO causes harm, as evidence indicates it does not (Koh et al., 2023), but that employing deception as therapy may establish a problematic precedent for valuing the perspectives of individuals with cognitive impairment.

The justification for therapeutic deception is grounded in clinical pragmatism. For individuals with moderate-to-severe Alzheimer's disease who experience significant agitation and distress, the distinction between a living being and a simulation may become inconsequential. The primary consideration is whether the interaction promotes calm rather than distress, participation rather than isolation, and comfort rather than suffering (Ruiz-Fernández et al., 2024). The 2025 Frontiers in Digital Health analysis of artificial intelligence in older adult care supports this viewpoint. Given that the alternative frequently involves psychotropic medication, which carries documented risks of stroke and increased mortality (Maust et al., 2023), a robot that provides authentic comfort should be regarded as a therapeutic intervention operating through affective mechanisms, rather than as morally culpable deception.

A slightly more subtle solution, supported by several qualitative studies, claims that the ethical significance depends on whether PARO use was discussed in advance. It is important to explore care options while individuals retain the ability to express their preferences for future care. Advance care planning that explicitly addresses robotic companions by asking individuals, while they have full decision-making capacity, whether they wish to use such tools as their disease progresses, alters the ethical context. This approach reframes the situation from potential deception to the honoring of personal preference (Köhler et al., 2024; Pageau et al., 2024). Consequently, dementia care practices should initiate these conversations early, document outcomes in accessible formats, and establish procedures to uphold individual preferences as capacity changes.

3.4.3. Monitoring, Safety, and the Risk of Turning Care into Control

Smart home monitoring, GPS tracking, and wearable biosensors provide families and clinicians with considerable benefits: early detection of adverse events, real-time assurance during stable periods, and the potential to prolong the time individuals with dementia can safely remain at home (Schneider et al., 2024). These benefits are meaningful. In contrast, alternatives such as continuous supervision or early residential placement impose considerable costs on independence, financial resources, and quality of life (Nandi et al., 2022).

However, observation technologies introduce a form of surveillance that presents ethical issues often overlooked in clinical discussions. A 2025 analysis in Frontiers in Digital Health identified a specific risk: when artificial intelligence tools override human decision-making or fail to consider user comfort and consent, they may transform care into control. The analysis detailed a scenario in which an emotion-recognition system in a care facility led staff to progressively rely on system outputs rather than direct interaction with residents, thereby undermining the relational, person-centered care fundamental to individuals with cognitive decline (Frontiers Digital Health, 2025). Technologies should support, not replace, human contact.

An ethnographic study by van den Berg et al. investigated how individuals with dementia in residential care settings experienced surveillance technology. The findings demonstrated a fundamental ambivalence: the same GPS tracker that enabled a resident to move freely within care home grounds, allowing staff to locate them if necessary, also resulted in continuous recording and monitoring of every movement (van den Berg et al., 2014). The experiences of freedom and surveillance were, paradoxically, inseparable. Whether monitoring technology improves or undermines autonomy depends not on the technology itself, but on the relational context in which it is implemented, specifically whether data is used to inform care decisions or to justify behavioral restrictions.

A comprehensive review by Chahine et al. (2025) of ethical dilemmas in dementia care across high-income and low-income countries identified a pronounced Global North-South divide. In high-income countries, formal legal frameworks such as advance directives, substituted decision-making legislation, and institutional ethics oversight provide structured mechanisms for monitoring technology oversight. In contrast, in low-income countries, care for individuals with dementia is usually managed by family networks with minimal institutional support. Decisions regarding monitoring are made informally, often without legal safeguards, and artificial intelligence tools marketed globally but governed by high-income country standards are introduced into distinct ethical contexts (Chahine et al., 2025). This asymmetry has received insufficient attention in both technology development and ethics literature.

3.4.4. Algorithmic Bias: Assessing the Beneficiaries of AI Technology

A comprehensive discussion of AI in dementia care must address equity, given its critical clinical and ethical consequences. Most published AI diagnostic models rely on datasets such as ADNI and OASIS, which are made up mainly of white, highly educated, English-speaking participants from specialist academic centers. This reflects enduring patterns of participation in clinical research, specialist service access, and research funding allocation (Hinton et al., 2024; Scerri et al., 2025).

The clinical consequences of these disparities are considerable. Dementia disproportionately influences Black and Hispanic older adults in the United States, with Black adults experiencing approximately twice the incidence of dementia compared to white adults. This difference is driven by differential exposure to cardiovascular risk factors, structural socioeconomic disadvantage, and unequal access to cognitively protective elements such as education and healthcare (Mayeda et al., 2016; Arenson et al., 2024). Racial and ethnic disparities in dementia prevalence persist even after adjusting for known risk factors, pointing to the cumulative impact of structural inequity (Mayeda et al., 2016; Churchill et al., 2024). When AI diagnostic models are trained on datasets limited to white, highly educated participants, these tools may not perform as well for Black patients due to relevant differences, possibly worsening current disparities.

Scerri et al. (2025), in a synthesis of multiple systematic reviews on ethical issues in AI dementia care, identified a lack of diversity in training data as a major gap. The design phases of these tools regularly lack representation from varied populations, and cultural retesting prior to international deployment is rarely conducted. This issue goes beyond race and ethnicity to include language, as most AI dementia care tools are designed for and validated in English, embedding assumptions about communication styles and help-seeking behaviors that may not be applicable across various languages and cultures (Scerri et al., 2025; Chahine et al., 2025).

A scoping review by Hinton et al. (2024), which examined healthcare inequalities among individuals living with dementia across a decade of PubMed-indexed literature, documented persistent inequities in access to specialist diagnosis, participation in clinical trials, and the quality of dementia care across racial and ethnic groups. If AI diagnostic instruments are deployed without equity auditing, they risk not only failing to remedy these gaps but possibly widening them, as such tools may perform best for populations with the greatest, and worst for those with the most limited, access to care (Hinton et al., 2024; Scerri et al., 2025).

Ruiz-Fernández et al. (2024) identified an additional equity concern: AI dementia care tools are disproportionately available to individuals with higher financial resources. For example, PARO costs several thousand dollars per unit, and commercial smart home monitoring systems require ongoing subscription fees. The assumption that these tools will extend care to underserved populations is contradicted by cost frameworks that restrict access to the most affluent families (Ruiz-Fernández et al., 2024). Achieving equity in AI dementia care requires both technically inclusive design and economically accessible deployment.

3.5. The Role of the Caregiver

A continuing gap in both the effectiveness and ethics literature is the tendency to treat caregivers as secondary beneficiaries, rather than as individuals whose needs and experiences are independently significant and who are ethical stakeholders in decisions regarding technology use. Dementia care is fundamentally dyadic; the person with dementia and their caregiver exist in a system of mutual dependency, and technologies that affect one will inevitably impact the other (Loveys et al., 2022).

Loveys et al. (2022) examined AI tools in long-term care with respect to both acceptability and effectiveness. A consistent finding was that caregiver attitudes toward AI tools strongly influenced care recipient acceptance. For example, when the individual introducing PARO was enthusiastic and warm, the person with dementia was more likely to respond positively. Conversely, if the caregiver was skeptical or dismissive, the person with dementia frequently mirrored that attitude (Loveys et al., 2022). The human relationship remained the primary channel through which technological intervention was experienced.

These data have important practical implications. AI tools in dementia care should not be regarded as stand-alone interventions. Their effectiveness depends on the active involvement of caregivers, both family and professional, to function as intended (Loveys et al., 2022; Fan et al., 2025). This necessitates training, effective communication, and recognizing caregivers as co-implementers rather than bystanders. Furthermore, benefits experienced by caregivers, such as reduced anxiety, improved sleep, and greater confidence, should be considered legitimate clinical outcomes rather than peripheral effects, as caregiver well-being directly influences the quality of care received by individuals with dementia (Schneider et al., 2024; Loveys et al., 2022).

4. Discussion

4.1. What Clinicians Should Take Away

The reviewed literature supports multiple practical conclusions for clinicians in dementia care. Although the evidence is complex, these conclusions are actionable.

Regarding diagnosis, AI-assisted neuroimaging analysis is nearing clinical relevance for early identification of Alzheimer's disease, particularly in specialist settings with access to high-quality MRI (Liu et al., 2022; Veneziani et al., 2024). Clinicians in these environments should anticipate increased integration of AI-created risk scores into clinical software in the coming years. Evaluation of these tools should consider not only the claimed accuracy but also the population in which it was demonstrated, the presence of external validation, and the availability of explanations for the tool's reasoning. Tools that do not provide explanations for high-risk classifications lack the transparency required for responsible clinical decision-making (Franc et al., 2025).

Regarding behavioral symptoms, PARO and similar companion robots currently represent the most well-supported non-pharmacological interventions for agitation and depression in moderate-to-severe dementia, as indicated by meta-analytic data, although the evidence is not yet definitive (Koh et al., 2023; Fan et al., 2025). For patients receiving antipsychotic medication for agitation, or for families considering this option, a well-implemented robot companion program constitutes a meaningful alternative, especially in light of the documented risks associated with antipsychotic use in this population, such as increased rates of stroke, pneumonia, and mortality (Maust et al., 2023; Tampi et al., 2016). Practical considerations include ensuring adequate contact time, employing trained staff who recognize the robot's relational context, and engaging in earlier discussions with patients about their values and preferences for this type of intervention.

Regarding monitoring, smart home and wearable technologies should be presented to patients and families as options for extending safe independence at home. These discussions should explicitly address what is monitored, who has access to the data, and how the information will be used (Schneider et al., 2024; Dada et al., 2022). The manner in which monitoring is framed is significant: presenting it as a means to extend independence (for example, stating that it enables longer residence at home) differs from framing it as risk management (for example, emphasizing immediate awareness in the event of an incident). Both perspectives are valid and warrant transparent discussion during clinical consultations.

4.2. The Dignity-First Framework in Practice

The dignity-first framework for AI in dementia care consists of design and implementation principles, not prohibitive restrictions. These principles aim to increase the likelihood that AI tools achieve their intended clinical objectives. Four key principles consistently emerge from the literature reviewed.

Person-centered co-design entails involving individuals with dementia, particularly those in the early stages who retain decision-making capacity, in the design and evaluation of AI tools before deployment (Köhler et al., 2024). This approach is substantive rather than merely symbolic. Qualitative studies demonstrate that technologies developed without meaningful input from people with dementia often fail to reflect the lived experience of the condition, reducing both acceptability and effectiveness (Köhler et al., 2024; Loveys et al., 2022). Ethnographic and qualitative research included in this review identifies needs and concerns that would not have emerged through laboratory-based design processes.

Graduated consent refers to treating the introduction of an AI tool as the start of an ongoing consent process rather than its conclusion (Poth et al., 2023; Köhler et al., 2024). At each stage of the disease, it is necessary to actively assess whether the technology remains consistent with the individual's preferences, rather than relying solely on earlier decisions. This approach requires documentation systems that preserve evolving preferences as capacity changes, and staff who recognize that behavioral responses to robots or monitoring devices constitute meaningful communication that warrants attention and respect.

Transparency in clinical use requires clinicians to avoid relying on AI outputs as opaque inputs to clinical decisions (Franc et al., 2025). Any AI-generated risk score, diagnostic classification, or behavioral alert should be accompanied by sufficient information to enable critical evaluation, including the underlying data, the model's known limitations, and its specific implications for the patient. This standard obligates vendors to provide this information and clinicians to require it as a prerequisite for implementation.

Equity auditing prior to deployment requires determining whether an AI dementia care tool has been validated in populations comparable to those who will use it (Scerri et al., 2025; Hinton et al., 2024). If the evidence base is limited to white, English-speaking populations, clinicians should explicitly communicate this limitation to patients from other backgrounds and advocate for research investments to address these gaps.

4.3. Advanced Dementia: Addressing the Most Challenging Cases

Most studies focus on mild-to-moderate dementia. But the toughest ethical issues are in severe dementia, where research is limited, and the impact is great. In advanced dementia, people often cannot talk, know their caregivers, or understand what is around them. Usual care methods, like talking and explaining, no longer work. Body language, including facial expressions, sounds, posture, and movement, becomes the main way to understand how someone feels. AI systems that can pick up on these signals might greatly improve care at this stage, especially for finding pain and making people more comfortable. These people are often left untreated because they cannot speak for themselves.

Building on challenges in advanced dementia, recent research by Kisvetrová et al. (2024) examining personal dignity in early-stage dementia found that recognized threats to dignity remained relatively mild and stable over one year, and were more strongly influenced by the social and relational environment than by disease severity. This evidence indicates that preserving dignity in dementia, including in its most severe stages, depends primarily on the quality of surrounding human relationships rather than the sophistication of technological interventions (Kisvetrová et al., 2024; Pageau et al., 2024). While well-designed AI tools may support this relational foundation, they cannot replace it.

5. Future Research Priorities

The reviewed evidence identifies five specific priorities. First, there is an urgent need for larger and longer clinical trials of PARO and other companion robots. These trials should include follow-up periods of at least six months, standardized outcome measures, and participant samples representative of populations with the highest dementia burden, such as Black, Hispanic, Indigenous, and low-income communities (Fan et al., 2025; Yu et al., 2022).

Second, external validation of AI diagnostic models in diverse populations is essential prior to responsible clinical adoption (Hinton et al., 2024; Franc et al., 2025). While validation in ADNI or OASIS is necessary, it is not sufficient. The field requires validation in community settings, among non-English-speaking populations, and within health systems that utilize different imaging protocols and demographic profiles from those in which the models were originally developed.

Third, implementation science research is critically needed - examining how AI tools are actually used, by whom, with what oversight, and with what unintended consequences in real care settings over extended periods (Loveys et al., 2022; Schneider et al., 2024). What happens to PARO when the research team leaves and the care home staff are responsible for incorporating it into daily routines without additional support? These questions have no answers in the current literature.

Fourth, ethics research should transition from normative analysis to empirical investigation (Scerri et al., 2025). While the current literature effectively identifies ethical challenges and proposes guiding principles, it lacks evidence of their practical implementation. Prospective studies that examine consent practices, dignity preservation, and equity outcomes in care settings utilizing AI tools would provide the necessary evidence base to evaluate ethical performance in real-world contexts.

Fifth, economic analyses of AI dementia care tools are largely absent from the current literature. Tools that reduce medication use, prevent falls, and decrease caregiver burnout may yield substantial health system savings (Nandi et al., 2022). Understanding these economic impacts is essential for informed health system decision-making and for addressing equity concerns. If the costs of these tools are borne by individuals rather than health systems, they will remain inaccessible to the populations most in need (Ruiz-Fernández et al., 2024).

6. Conclusion

Dementia represents a major healthcare challenge of the twenty-first century. It affects tens of millions of individuals, impairs fundamental cognitive capacities, imposes significant demands on families and health systems, and provides clinicians with only limited pharmacological interventions (Livingston et al., 2024; Nandi et al., 2022). The requirement for effective, accessible, and humane care solutions is urgent.

This review identifies three substantive clinical contributions of artificial intelligence to dementia care. AI-based analysis of brain MRI can detect early Alzheimer's disease with accuracy comparable to that of specialist clinicians in regulated environments, potentially enabling intervention years before symptom onset (Liu et al., 2022; Veneziani et al., 2024). Companion robots, particularly PARO, have been shown to reduce agitation, depression, and psychotropic medication use in individuals with moderate-to-severe dementia, addressing burdensome behavioral symptoms without the documented harms associated with antipsychotic therapy (Koh et al., 2023; Maust et al., 2023). Monitoring devices support safe independence at home and reduce caregiver anxiety, therefore indirectly improving care quality for individuals with dementia (Schneider et al., 2024; Loveys et al., 2022).

Although these contributions, major challenges remain. The diagnostic AI evidence base relies on datasets that do not adequately represent populations with the highest dementia burden (Hinton et al., 2024; Mayeda et al., 2016). Trials of companion robots are limited by small sample sizes and short durations. The most rigorous meta-analysis reports no statistically reliable effects in randomized controlled trial-only analyses (Yu et al., 2022). The literature on monitoring technologies demonstrates safety benefits. However, it largely neglects the surveillance aspect and its consequences for dignity and autonomy (Chahine et al., 2025; van den Berg et al., 2014). Ethical problems continue. These include unresolved questions regarding meaningful consent from individuals with diminished capacity (Poth et al., 2023), the defensibility of therapeutic deception by robots (Ruiz-Fernández et al., 2024), and the risk that AI surveillance may replace the human relationships that are fundamental to quality dementia care (Köhler et al., 2024).

Progress in this field requires simultaneous progress in both evidence generation and ethical structures. Larger, more diverse, and better-controlled trials are necessary to establish the evidence base required for clinical use. A dignity-first framework is also essential. This ought to prioritize ongoing consent, explainability, equity auditing, and human relational presence. These measures guarantee that these tools serve individuals living with dementia, rather than merely supporting institutional management.

Individuals with dementia represent some of the most vulnerable members of any health system. They possess histories, preferences, relationships, and inner lives. These are altered by disease but not erased. AI tools introduced into their care should merit the trust that such vulnerability necessitates.

Conflict of interest: The authors declare no conflict of interest

Declaration of the use of generative AI and AI-assisted technologies in the writing process: During the preparation of this manuscript, the authors used ChatGPT to assist with improving grammar, language clarity, and English spelling in order to achieve a consistent, correct text in academic English that adheres to scientific standards. The use of AI tools occurred under strict author supervision and AI-generated text was carefully reviewed, verified, and edited by the authors to ensure factual accuracy and scientific integrity. All conclusions, interpretations, and verified information presented in this work were identified, analysed, and validated solely by the human authors.

REFERENCES

1. Arenson, M., Bahorik, A., Xia, F., et al. (2024). Understanding racial disparities in dementia prevalence among veterans. *Journal of Alzheimer's Disease, 99*(4), 1225–1234. https://doi.org/10.3233/JAD-240181
2. Cerejeira, J., Lagarto, L., & Mukaetova-Ladinska, E. B. (2012). Behavioral and psychological symptoms of dementia. *Frontiers in Neurology, 3*, Article 73.
3. Chahine, L. M., et al. (2025). Ethical dilemmas in the care of patients with Alzheimer's disease and related dementias unable to give informed consent.
4. Chen, S.-C., Lin, M.-F., Jones, C., et al. (2024). Effect of a group-based PARO robot intervention on cognitive function, autonomic nervous system function, and mental well-being in older adults with mild dementia: A randomized controlled trial. *Journal of the American Medical Directors Association, 25*(11), Article 105228. https://doi.org/10.1016/j.jamda.2024.105228
5. Churchill, N., Barnes, D. E., Habib, M., & Nianogo, R. A. (2024). Forecasting the 20-year incidence of dementia by socioeconomic status, race/ethnicity, and region in the US. *Journal of Alzheimer's Disease, 99*(4), 1225–1234. https://doi.org/10.3233/JAD-231133
6. Dada, S., van der Walt, C., May, A. A., & Murray, J. (2022). Intelligent assistive technology devices for persons with dementia: A scoping review. *Assistive Technology, 36*(5), 338–351. https://doi.org/10.1080/10400435.2021.1992540
7. Fan, W., Zhao, R., Liu, X., & Ge, L. (2025). Intelligent robot interventions for people with dementia: Systematic review and meta-analysis of randomized controlled trials. *Journal of Medical Internet Research*. https://doi.org/10.2196/59892
8. Feast, A. R., et al. (2025). Behavioural and psychological symptoms of people with dementia in acute hospital settings: A systematic review and meta-analysis. *Age and Ageing, 54*(1), Article afaf013. https://doi.org/10.1093/ageing/afaf013
9. Franc, B., Nys, V., et al. (2025). Clinical prediction models using artificial intelligence approaches in dementia: A systematic review.
10. *Frontiers in Digital Health*. (2025). Designing for dignity: Ethics of AI surveillance in older adult care. https://doi.org/10.3389/fdgth.2025.1643238
11. Hinton, L., Tran, D., Peak, K., Meyer, O. L., & Quiñones, A. R. (2024). Mapping racial and ethnic healthcare disparities for persons living with dementia: A scoping review. *Alzheimer's & Dementia, 20*(4), 3000–3020. https://doi.org/10.1002/alz.13612
12. Kisvetrová, H., Bretšnajdrová, M., Jurašková, B., & Langová, K. (2024). Personal dignity in people with early-stage dementia: A longitudinal study. *Nursing Ethics, 31*(7), 1258–1270. https://doi.org/10.1177/09697330241244495
13. Koh, W. Q., et al. (2023). The effectiveness of PARO on behavioural and psychological symptoms, medication use, total sleep time and sociability in older adults with dementia: A systematic review and meta-analysis.
14. Köhler, S., Biernetzky, O. A., Kirste, T., & Perry, J. (2024). Ethics, design, and implementation criteria of digital assistive technologies for people with dementia from a multiple stakeholder perspective: A qualitative study. *BMC Medical Ethics, 25*, Article 84. https://doi.org/10.1186/s12910-024-01080-6
15. Liu, S., Masurkar, A. V., Rusinek, H., et al. (2022). Generalizable deep learning model for early Alzheimer's disease detection from structural MRIs. *Scientific Reports, 12*, Article 17106. https://doi.org/10.1038/s41598-022-20674-x
16. Livingston, G., Huntley, J., Liu, K. Y., et al. (2024). Dementia prevention, intervention, and care: 2024 report of the Lancet standing commission. *The Lancet, 404*, 572–628. https://doi.org/10.1016/S0140-6736(24)01296-0
17. Loveys, K., Prina, M., Axford, C., et al. (2022). Artificial intelligence for older people receiving long-term care: A systematic review of acceptability and effectiveness studies. *Lancet Healthy Longevity, 3*(4), e286–e297. https://doi.org/10.1016/S2666-7568(22)00033-5
18. Maust, D. T., et al. (2023). Multiple adverse outcomes associated with antipsychotic use in people with dementia: Population-based matched cohort study. *BMJ*. https://doi.org/10.1136/bmj-2023-076268
19. Mayeda, E. R., Glymour, M. M., Quesenberry, C. P., & Whitmer, R. A. (2016). Inequalities in dementia incidence between six racial and ethnic groups over 14 years. *Alzheimer's & Dementia, 12*(3), 216–224.

20. Mmadumbu, A. C., Saeed, F., Ghaleb, F., & Qasem, S. N. (2025). Early detection of Alzheimer's disease using deep learning methods. *Alzheimer's & Dementia, 21*, Article e70175. https://doi.org/10.1002/alz.70175
21. Nandi, A., Counts, N., Chen, S., et al. (2022). Global and regional projections of the economic burden of Alzheimer's disease and related dementias from 2019 to 2050. *EClinicalMedicine, 51*, Article 101580. https://doi.org/10.1016/j.eclinm.2022.101580
22. Pageau, F., Fiasse, G., Nordenfelt, L., & Mihailov, E. (2024). Care of the older person and the value of human dignity. *Bioethics, 38*(1), 44–51. https://doi.org/10.1111/bioe.13251
23. Poth, A., Penger, S., Knebel, M., et al. (2023). Empowering patients with dementia to make legally effective decisions: A randomized controlled trial on enhancing capacity to consent to treatment. *Aging & Mental Health, 27*(2), 292–300.
24. Pu, L., et al. (2019). Effectiveness of companion robot care for dementia: A systematic review and meta-analysis. *The Gerontologist*.
25. Ruiz-Fernández, M. D., et al. (2024). Ethical implications in using robots among older adults living with dementia. *Frontiers in Psychiatry, 15*, Article 1436273. https://doi.org/10.3389/fpsyt.2024.1436273
26. Scerri, A., Juul, F. S., Silva, R., et al. (2025). Ethical issues associated with assistive technologies for persons living with dementia and their caregivers: An overview of reviews. *Dementia*. https://doi.org/10.1177/14713012251341374
27. Schneider, C., Nißen, M., Kowatsch, T., & Vinay, R. (2024). Impact of digital assistive technologies on the quality of life for people with dementia: A scoping review. *BMJ Open, 14*(2), Article e080545.
28. Tampi, R. R., Tampi, D. J., Balachandran, S., & Srinivasan, S. (2016). Antipsychotic use in dementia: A systematic review of benefits and risks from meta-analyses. *Therapeutic Advances in Chronic Disease, 7*(5), 229–245.
29. van den Berg, N., et al. (2014). The experiences of people with dementia and intellectual disabilities with surveillance technologies in residential care. *Scandinavian Journal of Caring Sciences*.
30. Veneziani, I., Marra, A., Grimaldi, A., et al. (2024). Applications of artificial intelligence in the neuropsychological assessment of dementia: A systematic review. *Journal of Personalized Medicine, 14*(1), Article 113.
31. Yu, C., Sommerlad, A., Sakure, L., & Livingston, G. (2022). Socially assistive robots for people with dementia: Systematic review and meta-analysis of feasibility, acceptability and the effect on cognition, neuropsychiatric symptoms and quality of life. *Ageing Research Reviews, 78*, Article 101633.