TITEL

Integrating AI and Telemedicine in Caregiving: A Review of Advances, Insights, and Recommendations from the Salzburg Seminar Group San Diego Meeting on Monitoring Processes in Elderly Women and Chronic Care

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Findings:
Experts highlighted that AI enables real-time analysis of health data, facilitating early detection of health issues through continuous monitoring. Telemedicine supports remote monitoring, enhancing accessibility and reducing caregiver burden. The synergy between AI

ABSTRACT

Background:
The Salzburg Seminar group held in San Diego Conference 2024., on caregiving and monitoring processes gathered experts to explore advancements in caregiving practices, one of the discussed topics focusing on the integration of AI and telemedicine technologies. These innovations aim to improve the efficiency and effectiveness of healthcare delivery, particularly in managing chronic conditions and elderly care.

Main Goal
The main goal of this review is to evaluate the impact of AI and telemedicine on caregiving monitoring processes. By synthesizing insights from the conference proceedings and conducting a systematic review of literature from Google Scholar,

Web of Science, and PubMed, this review aims to highlight key findings and expert recommendations on how these technologies can enhance caregiving practices.

Methodology:
The review included a qualitative analysis of discussions and presentations from the San Diego Conference, supplemented by a structured search of academic databases using keywords related to AI, telemedicine, monitoring, and caregiving. Relevant studies were reviewed to identify current trends and advancements in the field.

and telemedicine improves monitoring accuracy, fosters proactive healthcare interventions, and increases patient satisfaction.

Conclusion:
Integrating AI and telemedicine into caregiving represents a significant shift toward proactive and personalized healthcare. This review emphasizes the transformative potential of these technologies in improving health outcomes and enhancing the caregiving experience. It also calls for continued research and implementation to fully realize their benefits in clinical practice.

KEYWORDS

1. Caregiving
2. Artificial Intelligence (AI)
3. Telemedicine
4. Personalized care
5. Ethical considerations
6. Policy adjustments

INTRODUCTION

Caregiving for aging women is an important and complex issue that requires attention and innovative solutions. The Salzburg Global Seminar, a non-profit organization that convenes programs on diverse topics including healthcare, technology, and public policy, held a seminar from January 16 to January 19, 2024. Titled Women as They Age: Addressing the Next Inequity Frontier, the seminar focused on various aspects of caregiving and monitoring processes for aging women. The conference brought together experts to explore advancements in monitoring practices within caregiving contexts, with a particular emphasis on integrating artificial intelligence (AI) and telemedicine technologies. The main goal of these innovations is to enhance the efficiency and effectiveness of healthcare delivery, particularly in managing chronic

conditions and elderly care. This review identifies existing gaps in caregiving, including the shortage of caregivers, the need for personalized care, and the challenges of monitoring and managing health conditions [1]. However, AI has the potential to address these gaps and revolutionize caregiving for aging women.

Existing Gaps in Caregiving for Aging Women:

Shortage of Caregivers

There is a growing demand for caregivers as the aging population increases, but there is a shortage of qualified caregivers to meet this demand [2]. This shortage can lead to inadequate care and limited support for aging women.

Addressing Gender-Specific Care Gaps Currently Present in Shortage of Caregivers for Aging Women: The Role of AI and Telemedicine

Since there is a current shortage of caregivers, telemedicine complements AI by improving accessibility to care and providing remote monitoring capabilities. For aging women, telemedicine offers a practical solution to overcome barriers such as mobility issues and geographic isolation, ensuring they receive continuous support and timely interventions [3]. This is especially important given the mentioned shortage of qualified caregivers, which exacerbates difficulties in providing adequate and personalized care [4]. By leveraging AI and telemedicine, we can address these gender-specific care gaps and improve the management of quality of life and addressing to general and specific needs in aging women, ensuring better health outcomes and enhanced quality of care [4].

Lack of Personalized Care Program for Aging Women:

Each aging woman has unique needs and preferences, but traditional caregiving models often provide a one-size-fits-all approach [5]. This lack of personalized care can result in dissatisfaction and ineffective support for aging women.

Addressing Gender-Specific Care Gaps Currently Present in Lack of Personalized Care Programs for Aung Women: The Role of AI and Telemedicine

The need for personalized care programs for aging women is critical due to distinct gender-specific challenges that are not adequately addressed by existing treatments [6]. Aging women face unique physiological changes such as altered alcohol metabolism and hormonal fluctuations, which affect both the safety and efficacy of standard pharmacotherapies [7,8]. AI technologies can play a pivotal role by providing personalized treatment plans based on these specific metabolic and hormonal differences [9]. AI systems analyze large datasets to predict individual

responses to medications and adjust treatments accordingly, offering a tailored approach that traditional one-size-fits-all methods lack [10].

Telemedicine further addresses these gaps by offering accessible, ongoing care and support. For aging women, telemedicine reduces barriers related to mobility and access to specialized care, enabling continuous monitoring and adjustments to treatment plans without requiring frequent in-person visits [11]. This is particularly valuable given the increasing shortage of qualified caregivers, which exacerbates challenges in providing personalized care [12,13]. Together, AI and telemedicine ensure that aging women receive care that is specifically adapted to their unique needs, improving overall treatment outcomes and addressing gaps in current personalized care programs.

Monitoring and Managing Health Conditions in Aging Women:

Aging women often have multiple health conditions that require careful monitoring and management. However, it can be challenging for caregivers to keep track of medication schedules, detect changes in health status, and provide timely interventions [14].

Potentials of AI in Caregiving for Aging Women: The Role of AI and Telemedicine

Aging women often face multiple health conditions simultaneously, which necessitates meticulous monitoring and management. Traditional caregiving can struggle with the complexity of coordinating medication schedules, detecting changes in health status, and ensuring timely interventions [15]. AI and telemedicine offer targeted solutions to these gender-specific challenges.

AI technologies enhance the management of health conditions by enabling real-time data analysis and personalized care [16]. For aging women, AI systems can track medication adherence, analyze trends in health metrics, and predict potential health issues before they become critical [17]. This proactive approach helps address the unique physiological changes in aging women, such as altered drug metabolism and hormonal shifts, which can complicate treatment [8,10].

Telemedicine complements AI by providing remote monitoring and continuous care. It allows caregivers to track health conditions and medication compliance without frequent in-person visits, which is particularly beneficial for aging women who may have mobility issues or reside in remote areas [17]. Additionally, telemedicine facilitates prompt medical consultations, ensuring timely adjustments to treatment plans based on real-time health data [18]. Together, AI and telemedicine offer comprehensive solutions to the care gaps specific to aging women, improving the effectiveness and accessibility of their health management [19].

Gaps in Care for Aging Women: Addressing Alcohol Use Disorder with AI and Telemedicine

Alcohol Use Disorder (AUD) among aging women is a significant concern, especially as menopause can trigger or worsen pre-existing AUD. Hormonal fluctuations during menopause lead to mood swings, anxiety, and depression, which increase the likelihood of alcohol misuse as a coping mechanism. Additionally, aging-related changes like the loss of fertility, social withdrawal, and widowhood often exacerbate loneliness and distress, further contributing to AUD. Altered alcohol metabolism in older women also makes them more vulnerable to the physical and psychological effects of alcohol [20].

AI and telemedicine offer promising solutions to these challenges. AI can create personalized treatment plans, accounting for the hormonal and metabolic changes aging women undergo. By analyzing large datasets, AI predicts individual responses to treatments and adjusts interventions, ensuring that care is tailored to the specific needs of aging women with AUD. Additionally, telemedicine provides remote monitoring, allowing healthcare providers to track alcohol consumption and adjust treatments without requiring frequent in-person visits, which is particularly beneficial for women facing mobility issues or geographic isolation.

The emotional and social factors that contribute to AUD, such as loneliness and widowhood [20]., can be mitigated with AI-powered tools. Virtual support systems and digital therapeutic programs can help reduce isolation, providing emotional support and fostering connection. AI can also identify co-occurring conditions like depression or anxiety, ensuring integrated care that addresses both AUD and underlying mental health issues [20].

By integrating AI and telemedicine, aging women with AUD can receive continuous, personalized care, ensuring their complex health needs are met comprehensively.

Revolutionize Caregiving for Aging Women Through AI-Powered Remote Monitoring and Personalized Assistance

Remote Monitoring: AI-powered devices and sensors offer crucial support for remotely monitoring the health and activities of aging women. These advanced technologies can continuously track vital signs, detect falls, and observe daily routines [21]. By providing real-time data to caregivers and healthcare providers, remote monitoring enables early detection of health issues and facilitates timely interventions, thereby improving overall care and reducing emergency situations [22].

Personalized Assistance: AI-driven virtual health coaches, such as MiiCare's Monica, deliver personalized support tailored to aging women's specific needs. These virtual assistants can manage reminders for appointments, medication schedules, and exercise routines. They also provide companionship and can summon help in emergencies, addressing both health management and emotional support [23,24]. This personalized approach helps ensure adherence to treatment plans and enhances the quality of life for aging women [25].

Decision Support: AI algorithms analyze extensive data sets to offer valuable insights and recommendations to caregivers and healthcare professionals. These insights aid in medication management, treatment planning, and identifying potential health risks. By simplifying complex medical information and presenting it in an accessible manner, AI supports informed decision-making and enhances the effectiveness of care strategies [26,27].

Main Goal:
The main goal of this review is to thoroughly assess the impact of AI and telemedicine on caregiving monitoring processes, particularly in the context of elderly care and chronic disease management. By synthesizing insights gathered from the proceedings of the San Diego Conference and conducting a comprehensive systematic review of relevant literature from reputable academic databases such as Google Scholar, Web of Science, and PubMed, this review seeks to provide an in-depth understanding of how these technological innovations are reshaping caregiving practices. The aim is to identify the specific ways in which AI and telemedicine can improve caregiving efficiency, accuracy, and outcomes. Additionally, the review will highlight key findings from experts in the field, exploring both the benefits and challenges associated with integrating these technologies into caregiving workflows, and providing actionable recommendations for future advancements and applications in clinical practice.

METHODOLOGY

Strategy Direction and Study Selection Criteria

Strategy Direction: The strategy direction of this review was to evaluate gender-specific caregiving programs for postmenopausal women using telemedicine and artificial intelligence (AI). The goal was to synthesize evidence from various study designs to understand the efficacy and impact of these advanced caregiving solutions on this demographic.

PICO Criteria: The PICO (Population, Intervention, Comparison, Outcome) criteria were employed to structure the review:

- **Population:** Postmenopausal women requiring caregiving services.
- **Intervention:** Caregiving programs for aging women that utilize telemedicine and/or AI technologies.
- **Comparison:** Comparisons were made between traditional caregiving options provided by in-person caregivers and those offered through telemedicine or AI-assisted caregiving programs.
- **Outcome:** Outcomes of interest included the efficacy of telemedicine and AI-based caregiving programs, their ability to address current gaps in caregiving, and the overall improvement in quality of life for aging women.

Study Selection

Inclusion Criteria:

1. **Meta-Analyses and Systematic Reviews:** Given the novelty of the topic, priority was given to meta-analyses and systematic reviews that offer a comprehensive overview of existing evidence. These studies are crucial for summarizing broad evidence and identifying research gaps.
2. **Randomized Controlled Trials (RCTs):** RCTs were included to evaluate the effectiveness and safety of caregiving programs with rigorous methodological standards.
3. **Cohort Studies, Case-Control Studies, and Observational Studies:** These studies were included to provide additional evidence and insights, especially where meta-analyses and systematic reviews were unavailable or not applicable. This broad approach ensured a thorough assessment of the evidence.
4. **Language:** Studies published in English were included to ensure consistency and clarity in the review.
5. **Population:** Studies focusing on postmenopausal women needing caregiving services were included to maintain relevance to the specific demographic.
6. **Interventions:** Studies evaluating caregiving programs that utilized telemedicine and/or AI were included.
7. **Outcome Measures:** Studies reporting on the effectiveness of caregiving interventions, their ability to fill existing caregiving gaps, and improvements in quality of life were considered.

Exclusion Criteria:

1. **Study Designs:** Non-peer-reviewed articles, editorials, opinion pieces, and non-systematic reviews were excluded to ensure high-quality, evidence-based research.

2. **Population:** Studies that focused on populations other than postmenopausal women or those with conditions not specific to the scope of caregiving for aging women were excluded.
3. **Interventions:** Studies not evaluating telemedicine or AI-based caregiving programs or those focusing solely on non-technological interventions were excluded (human caregivers providers studies were considered for Comparisment aspect of PICO criterion).
4. **Outcome Measures:** Studies lacking quantitative data on caregiving efficacy, gap fulfillment, or quality of life improvements were excluded.

Search Strategy

A thorough literature search was performed across three key databases: Web of Science, PubMed, and Google Scholar. The search strategy included specific keywords and medical subject headings (MeSH) related to postmenopausal women, caregiving, telemedicine, and AI technologies. The search was confined to studies published in the last two decades to ensure the inclusion of recent and relevant evidence.

Data Extraction and Analysis: Data extraction was performed by independent reviewers using a standardized form. Key data points included study design, sample size, caregiving interventions, outcomes, and reported benefits or challenges. Each study's quality was assessed using established criteria to evaluate bias and methodological rigor. The data were synthesized through a narrative review, highlighting trends and identifying gaps in the existing evidence.

Synthesis of Search Outcomes and Seminar Insights:
The methodology of this review employed a comprehensive strategy to assess gender-specific caregiving programs for postmenopausal women using telemedicine and AI. By including a range of study designs—meta-analyses, systematic reviews, RCTs, cohort studies, case-control studies, and observational studies—and applying rigorous inclusion and exclusion criteria, the **main goal** of this review was to provide a thorough assessment of the efficacy and impact of these advanced caregiving solutions. This approach sought to offer a well-rounded understanding of how telemedicine and AI are influencing caregiving practices for postmenopausal women, highlighting both the benefits and challenges of integrating these technologies into caregiving programs.

The synthesis of the search outcomes was further informed by insights from the discussion and lectures presented during the Salzburg Global Seminar held from January 16 to January 19, 2024, on the topic of **"Women as They Age: Addressing the Next Inequity Frontier."** The original ideas discussed during this seminar

served as a guiding framework for the review outcomes and inspired the search findings. These insights and perspectives were integrated into the discussion section and influenced the final synthesis of the review. The findings underscore the need for personalized and technology-enhanced caregiving approaches to address the unique needs of aging women and improve their quality of life.

Evaluating AI and Telemedicine Solutions for Addressing Caregiver Shortages, Personalized Care Needs, and Health Monitoring Challenges in Postmenopausal Women

In this methodology, we assess the effectiveness of AI and telemedicine solutions in addressing key challenges in caregiving for postmenopausal women. Specifically, we focus on three primary issues identified in the literature and expert discussions:

1. **Caregiver Shortages**: The review explores how AI and telemedicine technologies can help mitigate the shortage of caregiving professionals by enabling remote monitoring and reducing the physical demands on caregivers.
2. **Personalized Care Needs**: We examine how these technologies offer the potential for personalized care through AI-driven solutions that tailor interventions based on the specific health conditions and preferences of postmenopausal women.
3. **Health Monitoring Challenges**: The methodology investigates how AI and telemedicine can enhance real-time health monitoring, improving the accuracy and timeliness of interventions, thus addressing the ongoing challenge of effectively managing chronic conditions in aging populations.

By synthesizing insights from the Salzburg Seminar and San Diego Conference 2024 and conducting a systematic review of relevant literature, this approach aims to provide a comprehensive evaluation of how AI and telemedicine can offer innovative solutions to these caregiving challenges. The research includes a review of various study designs (meta-analyses, RCTs, observational studies, etc.) and applies a structured search strategy to ensure a well-rounded assessment of current trends and advancements.

RESULTS

Given the described methodology, we identified our main findings through a comprehensive review of high-impact journal articles on relevant topics. In this section, we present our main findings, drawn from the highest rated identified studies, focusing on those with direct or indirect mentions of key issues and where authors reached consensus on critical points and having consensus to include the main finding in the list from both authors. Below we present our results in the form of main

findings. We present results in the form of main findings to ensure clarity and focus in our review. This approach highlights the most significant outcomes of our search, making it easier for readers to quickly grasp the key discoveries without wading through extensive details. By structuring the Results section around these main findings, we provide a clear and organized summary of our data, which facilitates a more straightforward interpretation. Herewith, we maintain objectivity, reserving deeper analysis and discussion for subsequent sections. Overall, we present results in this manner in order to enhances the readability and impact of our search methodology.

At the end of this review, you will find a table titled "Summary of Key Findings in Detail and Discussion Points Overview Regarding Implications for AI and Telemedicine in Caregiving." (Tabel1) This table encapsulates the main findings, provides detailed explanations, and highlights discussion points, including insights, advantages, and future considerations for AI and telemedicine in caregiving.

AI Technologies Offer Promising Assistance

AI has shown considerable potential in enhancing caregiving by improving medication management, analyzing biomarkers, and issuing timely reminders [28]. These capacities are crucial in managing the complex needs of older adults, particularly in medication adherence and health monitoring [29]. AI algorithms can analyze vast datasets to determine the optimal medication regimens, while also monitoring for adverse reactions and interactions [30]. Moreover, AI-driven tools can provide caregivers with reminders for medication administration, ensuring adherence and minimizing the risk of missed doses [31]. The ability to analyze biomarkers in real-time allows for more personalized and responsive care, adapting treatment plans based on individual health data [32].

Specific AI Capacities for Caregiving

AI has shown considerable potential in enhancing caregiving by improving medication management, analyzing biomarkers, and issuing timely reminders [33;34]. These capacities are crucial in managing the complex needs of older adults, particularly in medication adherence and health monitoring [35]. AI algorithms can analyze vast datasets to determine the optimal medication regimens, while also monitoring for adverse reactions and interactions [36] as well as monitoring potential sunstance abuse or alcohol use diorder or mental state [37]. Moreover, AI-driven tools can provide caregivers with reminders for medication administration, ensuring adherence and minimizing the risk of missed doses [38]. The ability to analyze biomarkers in real-time allows for more personalized and responsive care, adapting treatment plans based on individual health data [27].

Enhancement of Safety and Efficiency

AI and telemedicine collectively enhance safety and improve caregiving efficiency by streamlining processes and reducing caregiver burdens. These technologies facilitate better care delivery by automating routine tasks and providing tools for remote monitoring. For example, telemedicine platforms enable virtual consultations, which can reduce the need for physical visits and allow for quicker adjustments to treatment plans [39]. AI systems support these improvements by analyzing health data and predicting potential issues, thus allowing for timely interventions [40]. By integrating these technologies, caregivers can manage their responsibilities more efficiently, leading to improved outcomes and reduced stress [38].

Need for a Regulatory Framework

A robust regulatory framework is essential to address the ethical, legal, and social implications of AI and telemedicine in caregiving [41]. The implementation of such technologies must be guided by clear regulations to ensure their responsible and effective use [42]. This framework should address privacy concerns, data security, and the equitable distribution of technological benefits [43]. As AI and telemedicine become more integrated into caregiving, it is crucial to establish standards that protect both patients and caregivers while fostering innovation [44]. Clear guidelines will help mitigate risks and ensure that these technologies are used to their full potential, providing safe and ethical care [45].

Efficacy of Human-Guided Caregiving for Aging Women is Not Optimal

Current human-guided caregiving treatments often fall short of optimal efficacy, despite some pharmacotherapies showing robust support [46]. This is especially the case with the aging women population due to specific needs they have [47]. AI and telemedicine offer promising alternatives to enhance these treatments. AI technologies can improve medication management by providing continuous monitoring and real-time feedback, which helps in adjusting treatment plans and avoiding adverse effects [48]. Additionally, telemedicine facilitates regular health assessments, enabling more frequent evaluations and adjustments [49]. This integrated approach ensures better management of side effects and overall health, contributing to improved treatment outcomes for aging women.

Enhanced Personalization of Care

AI technologies significantly enhance the personalization of care by analyzing individual health data and preferences [50]. This capability allows caregivers to tailor their approaches to meet the specific needs and preferences of aging women [51].

Personalized care improves the relevance and effectiveness of interventions, making it easier to address unique health concerns. For example, AI can customize care plans based on detailed health analytics, ensuring that treatments are aligned with individual health profiles and preferences [52]. This tailored approach leads to more effective management of health conditions and a better quality of life for patients.

Improved Accessibility to Care

Telemedicine plays a crucial role in improving access to healthcare services, especially for aging women living in remote or underserved areas. By enabling virtual consultations and follow-ups, telemedicine reduces the need for travel and provides timely and consistent care. This increased accessibility ensures that patients receive necessary medical attention without the barriers associated with physical distance [53]. Additionally, telemedicine supports ongoing care and monitoring, which is essential for managing chronic conditions and maintaining health [54]. By bridging geographical gaps, telemedicine makes healthcare more accessible and equitable [55].

Data-Driven Insights for Better Decision-Making

AI tools offer advanced data analytics capabilities that provide valuable insights into patient health trends and treatment responses [56]. These data-driven insights support more informed decision-making by healthcare providers and caregivers [57]. AI systems can analyze large datasets to identify patterns and predict outcomes, allowing for proactive management of health conditions [58]. This approach enhances the ability to tailor treatments to individual needs, improving overall health management. The use of data-driven insights leads to more effective and timely interventions, ultimately benefiting the care of aging women [59].

DISCUSSION

AI Technologies Offer Promising Assistance: Optimizing Care Through Advanced Data Analysis and Personalized Monitoring

AI technologies present substantial advancements in caregiving by enhancing medication management, analyzing biomarkers, and providing timely reminders. These capabilities are crucial for addressing the complex needs of older adults, particularly in medication adherence and health monitoring [51]. AI tools optimize medication regimens and prevent adverse reactions by analyzing large datasets, while real-time biomarker analysis enables personalized care tailored to individual health profiles [60]. This personalized approach can significantly improve treatment outcomes and adherence, highlighting AI's potential to enhance caregiving effectiveness [61].

However, reliance on AI may overshadow the human aspects of caregiving, such as emotional support and personal interaction, which are vital for holistic care [62]. Future research should explore how AI can integrate with traditional caregiving methods to balance technological advancements with essential human elements [52]. This integration is crucial for developing a comprehensive caregiving approach that leverages AI's strengths while maintaining the irreplaceable human touch.

Specific AI Capacities for Caregiving: Evaluating Benefits, Challenges, and Future Directions

AI's potential in caregiving is significantly enhanced through its capabilities to optimize medication regimens, monitor adverse reactions, and provide timely reminders. These functions are critical in managing the complex needs of older adults, who often require precise medication management and continuous health monitoring [60]. AI's real-time biomarker analysis enables the creation of personalized and adaptive treatment plans, improving the relevance and effectiveness of care [61].

The benefits of AI in enhancing medication management and personalizing care are clear, offering substantial improvements in treatment outcomes [52]. However, the high costs associated with implementing AI systems and potential technological barriers pose significant challenges [56]. Moreover, while AI offers promising advancements, it is crucial to assess its long-term effectiveness and explore how it can be integrated with existing caregiving systems to maximize benefits [62]. Future research should focus on overcoming these barriers and ensuring that AI technologies complement traditional care methods effectively.

Enhancement of Safety and Efficiency: Insights on Caregiving Automation and Remote Monitoring

The integration of AI and telemedicine in caregiving significantly enhances safety and efficiency by automating routine tasks and enabling remote monitoring. AI technologies and telemedicine platforms streamline caregiving processes, reducing the need for physical visits and allowing for rapid adjustments to treatment plans [60]. This automation and remote capability alleviate caregiver burdens, improving overall care delivery and patient outcomes [51].

While the benefits are substantial, there are potential drawbacks. Technological issues or limitations in remote consultations can occasionally disrupt care continuity and limit the effectiveness of virtual interactions [61]. Moreover, not all patients or caregivers may have access to the necessary technology or may face difficulties using these systems, which can affect the efficiency and safety of care [63]. Moving

forward, it is essential to develop comprehensive frameworks that facilitate the seamless integration of AI and telemedicine into existing caregiving practices. This will ensure that these technologies complement traditional methods effectively while addressing potential challenges and maximizing their benefits [52].

Specific AI Capacities for Caregiving of Aging Women with Substance Abuses

As the aging population continues to grow, the need for specialized care for older women suffering from Alcohol Use Disorder (AUD) has become more pressing. Aging women are particularly vulnerable to the onset or exacerbation of AUD due to menopausal hormonal fluctuations, social isolation, and the physical and psychological changes that accompany aging [21]. AI and telemedicine present promising avenues to address these specific challenges and offer a more personalized, continuous, and accessible form of care.

AI technologies can provide significant benefits in tailoring treatment plans for aging women with AUD by factoring in hormonal and metabolic changes that occur with aging. By analyzing extensive health data, AI can predict how an individual will respond to various treatments, ensuring that the interventions are both effective and safe. For example, AI systems can monitor and adjust medications, preventing adverse effects, and optimizing alcohol reduction strategies based on real-time data. This predictive capacity allows for highly personalized care, addressing both the physical and emotional aspects of AUD that aging women face.

Telemedicine further enhances this care model by enabling remote monitoring and virtual consultations, which are particularly useful for women who experience mobility issues or live-in rural areas. Through telemedicine, healthcare providers can track alcohol consumption, adjust treatment protocols, and offer psychological support without the need for frequent in-person visits. This remote care option mitigates the emotional isolation that often exacerbates AUD, offering virtual support systems and digital therapeutic programs that help reduce loneliness, a major contributing factor to alcohol misuse [20].

Together, AI and telemedicine can bridge the gaps in traditional caregiving for aging women with AUD, offering them continuous, integrated, and individualized care that addresses both physical and emotional needs.

Need for a Regulatory Framework: Considerations for Ethical Standards and Technological Advancement

The development of a robust regulatory framework is crucial for addressing the ethical, legal, and social implications of AI and telemedicine in caregiving. Effective

regulations are needed to ensure privacy, data security, and equitable distribution of technological benefits [51]. Such regulations are essential for ensuring that AI and telemedicine technologies are used responsibly and ethically, protecting both patients and caregivers [60].

However, one challenge is that regulatory delays could potentially slow down the pace of technological advancement, potentially hindering the benefits that AI and telemedicine could offer [62]. Balancing the need for stringent regulations with the necessity for rapid innovation presents a significant challenge. Moving forward, it is important to propose comprehensive regulations that can adapt to the evolving landscape of technology [61]. This will ensure that regulations keep pace with technological advancements while maintaining high standards for safety and ethical use [55]. Developing flexible and forward-thinking regulatory frameworks will be key to integrating AI and telemedicine into caregiving practices effectively.

Efficacy of Human-Guided Caregiving for Aging Women is Not Optimal: Exploring the Role of AI and Future Improvements

Current human-guided caregiving frequently falls short in addressing the complex needs of aging women, even with effective pharmacotherapies available [51]. AI and telemedicine offer significant potential to improve treatment efficacy through continuous monitoring and frequent health assessments, which can lead to better overall outcomes [60]. These technologies enable more personalized and responsive care, addressing gaps left by traditional methods [62].

However, there is often resistance to integrating new technologies into established caregiving practices, which can impede the adoption of AI and telemedicine [62]. To overcome these challenges, future research should focus on understanding the specific needs of aging women and exploring how AI can be tailored to meet these needs more effectively [61]. This approach will help in bridging the gaps in current caregiving practices and enhancing care for this population.

Enhanced Personalization of Care: Balancing Tailored Interventions with Privacy Concerns

AI significantly enhances the personalization of care by analyzing comprehensive health data and patient preferences, which enables the development of tailored care approaches. This personalized method improves the relevance and effectiveness of interventions, addressing unique health concerns and thereby enhancing the overall quality of life for patients [60]. By leveraging detailed health analytics, AI can customize care plans that align more closely with individual health profiles, leading to better treatment outcomes [61].

However, there are notable concerns regarding data privacy and security. The extensive collection and analysis of personal health information increase the risk of data breaches and misuse [51]. Balancing the benefits of personalized care with stringent privacy protections is essential. Future research should focus on developing strategies to safeguard patient data while maximizing the effectiveness of personalized care approaches [62]. Addressing these issues will be crucial for maintaining trust and ensuring the responsible use of AI in healthcare [52]

Improved Accessibility to Care: Addressing Equity and Technology Gaps in Telemedicine.

Telemedicine has markedly improved healthcare accessibility, especially for individuals residing in remote or underserved areas. By enabling virtual consultations, telemedicine reduces the need for travel, allowing patients to receive consistent and timely care without the logistical challenges of physical visits [60]. This is particularly beneficial for managing chronic conditions, where regular monitoring and follow-ups are crucial for effective treatment [61].

The primary advantage of telemedicine is its ability to extend healthcare services to populations that might otherwise face significant barriers to access, thus promoting more equitable healthcare delivery [62]. However, there are notable concerns regarding disparities in technology access and digital literacy. Not all patients have the necessary technology or the skills to utilize telemedicine platforms effectively, which can exacerbate existing inequalities [51]. These gaps highlight the need for targeted interventions to bridge the digital divide and ensure that all patients can benefit from telemedicine services.

Moving forward, it is essential to develop comprehensive strategies to address these disparities and ensure that telemedicine access is equitable across different populations. Future efforts should focus on enhancing digital literacy and providing support for technology access to mitigate these issues and fully realize the benefits of telemedicine [52]. By addressing these challenges, the healthcare system can work towards more inclusive and effective telemedicine solutions. [64, 65, 66].

Data-Driven Insights for Better Decision-Making: Navigating Data Overload and Enhancing Usability

AI's data-driven insights significantly enhance decision-making by analyzing patient health trends and treatment responses. This capability allows healthcare providers to proactively manage health conditions, improving overall health management [62]. By utilizing advanced data analytics, AI supports more informed and timely decisions, which can lead to better patient outcomes [41].

However, challenges include data overload and difficulties in interpreting complex information, which can overwhelm providers and potentially impede effective decision-making [51]. Future research should focus on improving data integration and usability to ensure that AI-generated insights are accessible and actionable for healthcare professionals [52]. Developing user-friendly systems and clearer data presentation methods will be crucial for maximizing the benefits of AI in healthcare decision-making.

Integrating Insights: Moving Forward with AI and Telemedicine in Caregiving

As we advance in the integration of AI and telemedicine, it's clear that these technologies offer significant benefits, such as enhanced medication management, improved personalization of care, and greater accessibility for underserved populations. AI's ability to analyze data and provide timely insights leads to more informed decision-making and proactive health management. However, challenges remain, including concerns over data privacy, technology access disparities, and the need for robust regulatory frameworks. Addressing these issues is crucial for maximizing the potential of AI and telemedicine. Future efforts should focus on developing comprehensive strategies that balance innovation with ethical considerations, ensure equitable access, and improve the integration of technology into traditional caregiving practices. By tackling these challenges, we can harness the full potential of these technologies to enhance patient outcomes and streamline care [63].

Weaknesses of the Current Review

Despite its comprehensive approach, this review has notable limitations. First, the scope of literature may have been restricted by the search criteria or database limitations, potentially omitting relevant studies or recent developments in AI and telemedicine [48]. Second, the review relies heavily on articles from specific journals, which may introduce bias due to varying standards of evidence and quality across publications [23]. Additionally, the review does not thoroughly address the diversity of populations and settings where AI and telemedicine are applied. This lack of diversity could overlook variations in technology effectiveness and acceptance across different demographic groups [67]. The review also lacks a critical analysis of the long-term impacts and sustainability of integrating these technologies into existing caregiving practices [22]. Finally, the assessment of regulatory and ethical considerations appears superficial, which could affect the implementation and adoption of AI and telemedicine in caregiving contexts [24]. Addressing these weaknesses would enhance the review's robustness and applicability.

Strengths of the Current Review

This review demonstrates several notable strengths. Firstly, it offers a comprehensive analysis of how AI and telemedicine are transforming caregiving, with a focus on specific applications such as medication management, biomarker analysis, and real-time monitoring. By synthesizing high-impact journal articles, the review highlights key advancements and practical implications, providing valuable insights into the effectiveness of these technologies [67]. Additionally, the review addresses both the benefits and limitations of AI and telemedicine, offering a balanced perspective that helps readers understand the complexities involved in their implementation.

The review also emphasizes the importance of integrating these technologies with existing caregiving practices, making it relevant for current and future healthcare strategies. It provides actionable recommendations for addressing regulatory and ethical concerns. Regulatory and ethical concerns are crucial for guiding policy development and ensuring responsible use [24]. Finally, it is important that in this review we highlight and support the idea that the focus on improving accessibility to care for vulnerable populations reflects a commitment to addressing healthcare disparities and promoting equitable solutions, as mentioned in previously published evidence [23].

Future Research Directions

As we look to the future, several key areas require focused research to successfully integrate AI and telemedicine into caregiving for aging women.

Ethical considerations and privacy will be central to these efforts. It is crucial to examine the ethical implications of using AI in caregiving, including safeguarding data privacy and maintaining the dignity and autonomy of individuals. Addressing these issues will ensure that AI systems respect personal rights and contribute positively to decision-making processes.

Improving AI accuracy and reliability is another vital area. Research should focus on enhancing AI algorithms to interpret complex health data accurately, tailor recommendations to individual needs, and adapt to preferences for personalized care. Better algorithms will lead to more reliable and effective caregiving solutions.

Developing robust regulatory frameworks is essential for guiding the responsible use of AI and telemedicine. Clear guidelines are needed to define the roles of AI systems and healthcare providers, ensuring data security and compliance with existing regulations.

Training healthcare providers is also crucial. Effective training programs must be developed to help caregivers integrate AI and telemedicine into their practices seamlessly.

Expanding infrastructure and accessibility will address the need for equitable access to these technologies, particularly in rural and underserved areas. Research should explore how broadband access affects the adoption of AI and telemedicine among aging women and their caregivers.

Economic and reimbursement policies need to be explored to understand the cost-effectiveness of these technologies and develop policies that support their adoption while ensuring financial sustainability.

Finally, caser-Centered design should guide the development of AI and telemedicine solutions. Designing user-friendly and culturally sensitive technologies will help ensure that they are widely accepted and effectively used by aging women and their caregivers.

By focusing on these research areas, we can advance the integration of AI and telemedicine into caregiving practices, ultimately improving care efficiency and quality for aging women while addressing their unique needs and challenges.

CONCLUSION

In conclusion, the integration of AI and telemedicine offers a transformative approach to addressing the complexities of caregiving for aging women. The discussed potential benefits—such as remote monitoring, personalized assistance, and decision support—highlight AI's critical role in enhancing caregiving efficiency and improving quality of life. However, the realization of these benefits requires proactive policy adjustments. Establishing a robust regulatory framework that ensures patient privacy, defining clear reimbursement policies, and investing in healthcare professional training are essential steps. Furthermore, infrastructure development and increased research funding are crucial to ensuring equitable access and fostering ongoing innovation in AI-driven caregiving solutions.

On a global scale, AI and telemedicine hold the promise to bridge healthcare disparities, promote inclusivity, and transform caregiving across diverse populations. By thoughtfully navigating these challenges, stakeholders can fully harness the potential of AI to improve the lifestyle and care outcomes for aging women globally, as emphasized in the insights from the Salzburg Seminar San Diego Meeting 2024.

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Research and Development Funding:
Increasing investment in AI and telemedicine research and development is essential to driving innovation and developing technologies tailored to the needs of aging women. Such funding can support the creation of AI algorithms for personalized care, remote monitoring devices, and telemedicine platforms.

AI has shown promise in addressing existing gaps in caregiving for aging women. Innovations like MiiCare's Monica and the Together app are already making a meaningful impact by assisting caregivers in monitoring and providing care for older adults. However, to fully capitalize on AI's potential in caregiving, it is crucial to address concerns surrounding privacy and accuracy.

DECLARATIONS

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable.

Availability of data and material

Not applicable.

Competing interests

Authors declare no conflict of interest

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None to declare.

Authors' contributions

JM was responsible for the design and development of the manuscript. Literature review and drafting of the manuscript: JM and ML. And DS performed critical revision of the manuscript for important intellectual content.: JM and DS. Both authors saw and approved the final version.

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Tabel 1. Summary of Key Findings in Detail and Discussion Points Overview Regarding Implications for AI and Telemedicine in Caregiving

Main Finding	Details	Discussion Points
AI Technologies Offer Promising Assistance	AI improves medication management, analyzes biomarkers, and issues timely reminders. These capabilities help manage complex needs of older adults, such as medication adherence and health monitoring. AI tools can analyze data to optimize medication regimens and prevent adverse reactions, while real-time biomarker analysis allows for personalized care.	**Pro:** AI improves medication adherence and personalized care. **Contra:** Dependency on technology might overlook human aspects of caregiving. **Future:** Explore AI's role in integrating with traditional caregiving methods.
Specific AI Capacities for Caregiving	AI's potential includes optimizing medication regimens, monitoring adverse reactions, and providing timely reminders. This improves management of older adults' complex needs. Real-time biomarker analysis enables personalized and adaptive treatment plans.	**Pro:** Enhanced medication management and personalized care. **Contra:** High implementation costs and potential technological barriers. **Future:** Assess long-term effectiveness and integration of AI with existing systems.
Enhancement of Safety and Efficiency	AI and telemedicine streamline caregiving by automating tasks and enabling remote monitoring. Virtual consultations reduce physical visits and adjust treatment plans quickly. These technologies reduce caregiver burdens and improve efficiency and outcomes.	**Pro:** Reduced caregiver burden and more efficient care delivery. **Contra:** Possible technological issues or limitations in remote consultations. **Future:** Develop frameworks for integrating AI and telemedicine seamlessly into current practices.
Need for a Regulatory Framework	A strong regulatory framework is necessary to address the ethical, legal, and social implications of AI and telemedicine in caregiving. Regulations should cover privacy, data security, and equitable distribution of benefits. Clear guidelines will ensure responsible and effective technology use.	**Pro:** Ensures ethical and responsible technology use. **Contra:** Regulatory lag might slow down technological advancement. **Future:** Propose comprehensive regulations that adapt to evolving technologies.

Efficacy of Human-Guided Caregiving for Aging Women is Not Optimal	Current human-guided caregiving often falls short for aging women, despite some effective pharmacotherapies. AI and telemedicine can enhance treatment efficacy by providing continuous monitoring and frequent health assessments, improving overall treatment outcomes.	**Pro:** AI and telemedicine can enhance treatment efficacy. **Contra:** Resistance to change from traditional caregiving practices. **Future:** Investigate specific needs of aging women and how AI can address them more effectively.
Enhanced Personalization of Care	AI enhances personalization by analyzing health data and preferences, allowing tailored care approaches. This improves intervention relevance and effectiveness, addressing unique health concerns and improving patient quality of life.	**Pro:** More personalized and effective care. **Contra:** Risks of data privacy and security issues. **Future:** Study how to balance personalization with privacy concerns.
Improved Accessibility to Care	Telemedicine increases healthcare accessibility, particularly for those in remote areas. Virtual consultations reduce travel needs and ensure consistent care, essential for chronic condition management.	**Pro:** Greater access to healthcare for underserved populations. **Contra:** Potential disparities in technology access and literacy. **Future:** Develop strategies to ensure equitable access to telemedicine services.
Data-Driven Insights for Better Decision-Making	AI provides valuable data analytics for patient health trends and treatment responses, leading to more informed decision-making. This approach allows proactive management of health conditions and improves overall health management.	**Pro:** Enhanced decision-making and proactive health management. **Contra:** Data overload and interpretation challenges. **Future:** Investigate methods to improve data integration and usability for providers.

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