Remote Palliative Care: A Systematic Review of Effectiveness, Accessibility, and Patient Satisfaction

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***Abstract*—Remote palliative care has emerged as a viable option to address the complex needs of patients facing life-limiting illnesses, particularly in the context of evolving healthcare landscapes and technological advancements. This systematic review aims to comprehensively examine the effectiveness, accessibility, and patient satisfaction of remote palliative care interventions. Through a meticulous analysis of empirical studies, clinical trials, and qualitative research, this review synthesizes evidence about the impact of remote palliative care on clinical outcomes, patient access to services, and overall satisfaction levels. Our findings highlight the benefits of remote palliative care, including improved symptom management, enhanced patient autonomy, and greater convenience in accessing care, particularly for individuals in rural or underserved areas. Moreover, we identify key facilitators and barriers influencing the implementation and uptake of remote palliative care services, such as technological proficiency, infrastructure limitations, and concerns regarding the quality of interpersonal communication. By critically evaluating the existing literature, this review underscores the significance of remote palliative care as a patient-centred approach to delivering compassionate end-of-life care. Furthermore, it underscores the need for ongoing research efforts and policy initiatives to optimize the effectiveness and accessibility of remote palliative care services to ensure equitable and high-quality care for all patients facing serious illnesses.**

Keywords*—*Palliative care; eHealth; patient; artificial intelligence; well-being

I. Introduction

Palliative care is a comforting approach to alleviating illness. It focuses on easing symptoms, pain, and emotional strain rather than solely aiming for a cure. The main aim is to enhance the quality of life for the patient and their family by addressing not just the physical aspects of the illness but also psychological, social, spiritual, and cultural factors.

The most common diseases shown in Fig. 1 that require palliative care include a wide range of chronic and life-threatening illnesses [1].

Supportive care extends beyond end-of-life assistance, encompassing individuals of all ages and at any phase of an ailment. It is tailored to meet patients' requirements rather than their future outlook [2].

Elderly individuals, those who are 65 years and older and dealing with conditions like heart failure, Chronic Obstructive Pulmonary Disease (COPD), and cancer, receive significant attention in palliative care. The care rates for discharged patients are highest among those 85 years and above when adjusted for age [3].

There is a rise in the burden of health-related suffering among the elderly, particularly in low-income nations, and individuals with dementia experience the fastest increases [4].

Additionally, teenagers and young adults facing illnesses also benefit from care. Adolescents are typically considered to be between 10 and 22 years old, while young adults fall within the range of 16 to 39 years [5].

A. The Role of Palliative Care in the Well-Being of Patients

A fundamental principle of palliative care is its patient and family-centric nature. It honours the preferences, needs and decisions of the patient and their loved ones by helping them comprehend the illness, anticipate what lies ahead and guide them in making choices about care and treatment options. In recent times, remote palliative care has surfaced as an essential aspect of healthcare, striving to enhance the quality of life for individuals facing severe, life-limiting conditions.

Palliative care goes beyond addressing physical symptoms; it encompasses emotional, spiritual, and practical support to help patients and their caregivers cope effectively with the challenges associated with severe illnesses. By providing a holistic approach to care, palliative services aim to enhance patients' overall well-being by addressing their physical comfort, emotional distress, and spiritual needs. This comprehensive care model not only supports patients in managing symptoms like pain and difficulty in breathing but also helps them live as actively as possible until death, promoting dignity and respect for the individual's wishes. Moreover, palliative care plays a significant role in addressing the psychosocial dimensions of illness, offering interventions that can positively impact patients' psychological well-being and coping skills. By integrating resistance exercise programs, nutritional support, spiritual care, and other holistic interventions, palliative care enhances patients' emotional resilience and overall quality of life. Additionally, by involving family members in care discussions and providing bereavement counselling, palliative care supports the patient and their loved ones through the challenges of serious illness.

The implementation of palliative care has been motivated by factors such as the increasing demand for palliative care services due to an ageing population and the rising prevalence of chronic diseases alongside advancements in telehealth technologies. The COVID-19 pandemic has further expedited the adoption of telehealth services, including care, to continue delivering

essential healthcare services while reducing the risk of virus transmission.

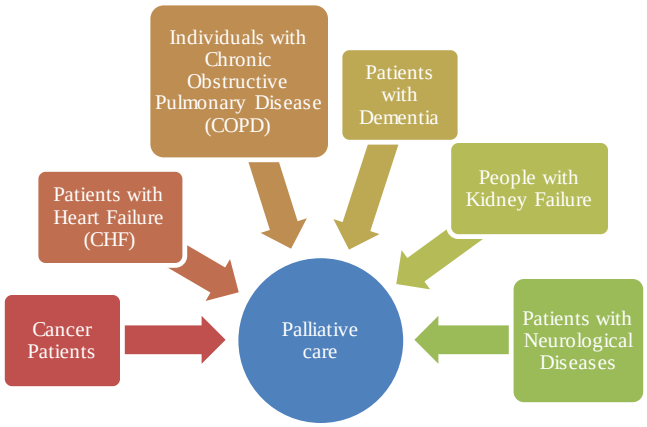

Fig. 1. Most common diseases required palliative care.

B. Integration of Technologies in Palliative Care

The integration of digital technologies in palliative care, including telemedicine consultations and mobile health applications, supports continuous patient monitoring and personalized care plans. However, challenges remain in ensuring equitable access to these technologies and maintaining the quality of the patient- provider relationship.

Remote palliative care represents a pivotal evolution in the delivery of healthcare services. It leverages technology to provide compassionate support to patients with serious, life-limiting illnesses outside of traditional healthcare settings. This innovative approach to palliative care has gained prominence due to its potential to overcome geographical barriers, improve access to care, and enhance the quality of life for patients and their families.

Traditionally delivered in person by healthcare professionals, palliative care aims to alleviate symptoms, manage pain, and provide emotional, social, and spiritual support tailored to the patient's needs and preferences. However, the physical constraints of healthcare facilities and the growing demand for palliative services challenge the scalability and accessibility of such care.

The advent of remote palliative care, facilitated by digital technologies such as telemedicine, telehealth platforms, and mobile health applications, offers a solution to these challenges. Patients can receive timely and personalized care directly in their homes through virtual consultations, digital symptom tracking, and electronic communication tools. This enhances comfort and convenience and allows for continuous monitoring and support, which is crucial for managing the complex and evolving needs of palliative care patients.

Moreover, remote palliative care extends the reach of specialized services, making them more accessible to rural and underserved populations who might otherwise face significant barriers to receiving adequate care. It also provides a platform for integrating multidisciplinary teams, enabling seamless collaboration among doctors, nurses, social workers, and other specialists to offer comprehensive care.

Despite its benefits, implementing remote palliative care raises questions regarding technology access, digital literacy among patients and providers, and the maintenance of personal connection and empathy in virtual interactions. Addressing these challenges requires thoughtful consideration of patient needs, robust infrastructure, and ongoing research to optimize and personalize remote care interventions.

As we continue to explore the capabilities and limits of remote palliative care, it remains a beacon of innovation in healthcare, promising to transform the way palliative care is delivered and experienced by patients worldwide.

II. Methods

A. Study Design

The systematic review on remote palliative care addresses a specific research question focusing on the effectiveness, feasibility, and acceptability of remote palliative care interventions. The study employs the Population, Intervention, Comparison, Outcome (PICO) framework to define the scope of inquiry, targeting patients receiving palliative care remotely across various settings [6],[7].

Table I depicts the PICO framework employed in this systematic review. The population of interest comprises individuals aged 50 years and above, encompassing both males and females, with no geographic restrictions, who receive palliative care. This includes individuals with terminal illnesses or conditions necessitating palliative care services, with a focus on the population primarily affected by cancer. Our focus is exploring various remote interventions, including telemedicine consultations, remote monitoring devices, online support groups or resources, and mobile health applications. These interventions are alternatives to standard in-person palliative care, forming our comparison's basis. Through this review, we aim to assess critical outcomes such as patient satisfaction with care, quality of life measures, and the effectiveness of symptom management. By systematically analyzing the existing literature, we seek to provide insights into the efficacy and impact of remote palliative care interventions on patient outcomes compared to traditional in-person care modalities.

TABLE I. PICO Framework

PICO	Characteristic
Population	Patients receiving palliative care
Intervention	– Telemedicine consultations – Remote monitoring devices – Online support groups or resources – Mobile health applications
Comparison	Standard in-person palliative care
Outcome	– Patient satisfaction with care – Quality of life measures – Effectiveness of symptom management

Compared to standard in-person care or alternative remote delivery methods, the intervention encompasses diverse modalities, including telehealth consultations, remote symptom monitoring, and virtual support groups. Outcomes of interest encompass patient-reported outcomes, healthcare utilization metrics, and caregiver outcomes. The study follows a rigorous methodology, including a comprehensive search strategy, predefined inclusion and exclusion criteria, and systematic data extraction. Ultimately, the review aims to provide evidence-based insights to inform clinical practice and guide future research in remote palliative care.

B. Study Selection Process

Between January 2, 2024, and March 16, 2024, a comprehensive and extensive literature search was carried out on the following electronic database: "Pub Med" for high-quality studies between the periods 2021 and 2023, following the search strategy shown in Table II.

TABLE II. SEARCH STRATEGY

Limitations	English full text studies, up to November 2023
#1	"telehealth" OR "eHealth" OR "remote" OR "digital"
#2	"Palliative care"
#3	"Patient satisfaction" OR "Effectiveness" OR "Accessibility"
Search strategy	#1 AND #2 AND #3

After the database was screened, the inclusion and exclusion criteria were used to choose studies that satisfied the eligibility requirements.

C. Inclusion and Exclusion Criteria

The inclusion criteria for this systematic review were focused on studies examining remote palliative care interventions tailored explicitly for cancer patients. Studies were required to involve adult cancer patients receiving palliative care services remotely through telehealth, telemedicine, or other digital platforms. Both randomized controlled trials (RCTs) and observational studies were considered eligible for inclusion. Exclusion criteria encompassed studies focusing solely on pediatric populations, those lacking primary data (e.g., reviews, editorials, commentaries), and articles not meeting open-source accessibility criteria. Additionally, studies not written in English were excluded. The systematic review prioritized accessibility and rigour while concentrating on remote palliative care interventions tailored to adult cancer patients, employing a selective approach.

D. Data Extraction

In this systematic review, we adhered to the PRISMA 2020 Statement [2] to ensure methodological rigour and transparency throughout the data interrogation process. Fig. 2 visually represents our study selection process, as depicted in the PRISMA flow diagram. Following the guidelines outlined in PRISMA 2020, we meticulously screened titles and abstracts, followed by a full-text assessment, to identify relevant studies meeting our predetermined inclusion criteria. This systematic approach enabled us to comprehensively capture and evaluate the available evidence on remote palliative care interventions.

Following the selection of relevant studies, data extraction was carried out independently by two authors using JBISUMARI software to ensure accuracy and reliability. We employed a structured data extraction table, facilitating systematic organization and analysis of crucial study information.

Table III encompassed various elements: the author's names, the study's title, objectives, technology used, names of specific tools employed, significant findings from each study, and factors influencing the effectiveness of remote support. This comprehensive approach allowed us to methodically extract pertinent data from each study, enabling a thorough examination of the evidence base on remote palliative care interventions and their outcomes.

III. RESULTS

A. Accessibility and Effectiveness of Remote Palliative Care

Examining studies included in the review about remote palliative care has revealed significant findings concerning accessibility and effectiveness, offering valuable insights into the factors that shape the implementation and outcomes of remote care interventions.

Accessibility concerns primarily revolve around rural areas lacking adequate internet access or where residents may feel uncomfortable using various electronic devices. This disparity underscores the importance of addressing infrastructural gaps and ensuring equitable access to telehealth services across diverse geographical regions.

Effectiveness in remote palliative care hinges on several key considerations. Personalized follow-up strategies tailored to individual patient needs have emerged as crucial in optimizing care delivery [8]. These customized approaches facilitate better understanding and management of patient symptoms and concerns, enhancing overall satisfaction and outcomes.

Additionally, continuously adjusting telemedicine applications based on patient feedback and evolving medical requirements is vital for ensuring relevance and efficacy. Flexibility in application functionality allows for responsive and patient-centred care delivery, fostering greater engagement and adherence to treatment protocols.

TABLE III. STUDIES INCLUDED IN THIS SYSTEMATIC REVIEW

Author's names	Study's title	Description of the technology used	Tools employed	Major findings	Factors influencing the effecvtiveness of remote support
Emiliyan Staykov, al.	Development of the electronic consultation long-term care utilization and savings estimator tool to model the potential impact of electronic consultation for residents living in long-term care	Tele-consultation	Microsoft SharePoint platform (online application)	Achieve a median specialist response time of 0.6 days and an average cost of $50 per eConsult case, compared with an average of 79 days and $133.60 for non-urgent face-to-face referrals.	Fast answers from specialists
Desiree R Azizoddin, al.	Development and pre-pilot testing of STAMP + CBT : an mHealth app combining pain cognitive behavioral therapy and opioid support for patients with advanced cancer and pain	Iterative process of patient review and feedback	Mobile app (STAMP + CBT)	73% of patients completed ≥ 50% of daily surveys; 87% of acceptability items were rated ≥ 4/5	The brevity, clarity and relevance of the application
Lina Oelschlägel, al.	Implementation of remote home care: assessment guided by the RE-AIM framework	Tele-consultation	Tablet containing personalized questions for self-reporting of symptoms and, sensor data via medical measurement devices (such as scales, pulse oximeters, glucose meters, blood pressure monitors and electronic drug dispensers)	Although the RHC improved the routines of patients' daily lives, they perceived it as a static service unable to adapt to disease progression, underlining the need for a person-centred approach that prioritizes individual needs and preferences as the basis for care delivery.	Adaptability to disease progression
Omolola Salako, al.	Remote Symptom Monitoring to Enhance the Delivery of Palliative Cancer Care in Low-Resource Settings: Emerging Approaches from Africa	Standardization of side effect reporting, documentation and recording of patient views	Mobile app (PROSE & mPCL)	PROSE's estimated 62% take-up rate reassures us that the remote symptom monitoring approach is feasible and offers promising engagement levels. mPCL aims to facilitate the timely identification and management of symptoms in order to treat and alleviate symptom burden, similar to the elements described in the concentual diagram	Continuous availability of symptom evolution
Lina Oelschlägel RN, MSc, al.	Patients' experiences with a welfare technology application for remote home care: A longitudinal study	Tele-consultation	Tablet device containing an application featuring questions from the ESAS questionnaire, including a function for patients to chat with HCPs at the RHC service team	Infrastructure issues concerning data access, information sharing and the lack of ongoing adjustments to the application represented major challenges, with the potential to impose a burden on cancer patients in the palliative phase.	Personalized follow-up Continuous adjustments of the application
Nicola Carey, al.	Co-design and prototype development of the 'Ayzot App': A mobile phone based remote monitoring system for palliative care	Tele-consultation	Mobile app (Ayzot)	Patients and caregivers agree on the main symptoms and problems associated with palliative care, including pain, nausea, fatigue, drowsiness, and access to relevant information.	Cultural and language considerations
Yun Xian Ho, al.	How a Digital Case Management Platform Affects Community-Based Palliative Care of Sub-Saharan African Cancer Patients: Clinician-Users' Perspectives	Clinical status communication and care coordination	Mobile app (mPCL)/phone-contact POS collection	Rapid access to POS responses and medical records was identified as a key benefit.	Variable patient access to smartphones and cards SIM Internet access

(CONTINUE)

Author's names	Study's title	Description of the technology used	Tools employed	Major findings	Factors influencing the effecvtiveness of remote support
Virginia LeBaron, al.	Deploying the Behavioral and Environmental Sensing and Intervention for Cancer Smart Health System to Support Patients and Family Caregivers in Managing Pain: Feasibility and Acceptability Study	Record and characterize painful events from their own and their partner's perspective	"BESI-C Performance Scoring Instrument" Environmental sensors to assess the home context (e.g. light and temperature), Bluetooth beacons to help locate dyad positions, and smartwatches worn by patients and caregivers, equipped with heart rate monitors, accelerometers, and a customized app to provide Ecological Momentary Assessments (EMAs).	Seriously ill cancer patients and their carers record painful events in real-time using a smartwatch, enabling rapid intervention.	Pain management
Lina Oelschlägel, al.	Implementing welfare technology in palliative homecare for patients with cancer: a qualitative study of health-care professionals' experiences	Tele-consultation	Tablet device containing an application featuring questions, including a function for patients to chat with HCPs at the RHC service team	The results showed that the shift from a disease-centered to a person-centered approach enables healthcare professionals to assess patients' personal priorities.	Feeling supported
Clément Cormi, al.	Building a telepalliative care strategy in nursing homes: a qualitative study with mobile palliative care teams	Tele-consultation, tele-expertise, tele-assistance, tele-monitoring, and remote medical triage	Phone call	The use of telemedicine could be envisaged under certain conditions, and decisions are made on a case-by-case basis. In cases of psychosocial distress, it's tricky to envisage treatment via telemedicine.	Tailoring the need for telemedicine to the symptoms communicated
Ravi Bhargava, al.	RELIEF: A digital health tool for the remote self-reporting of symptoms in patients with cancer to address palliative care needs and minimize emergency department visits	Remote symptom self-reporting using human-centered design processes; without a focus on any one symptom, disease, or disease stage; and with a focus on seamless integration into the clinical workflow for healthcare providers	Mobile app (RELIEF)	92% of clinicians said they had gained confidence in providing care and improved their customers' experience, and 75% of clinicians perceived an improvement in their patients' quality of life.	Effort required on the part of the patient to fill out forms repeatedly
Ryuichi Ohta, al.	Improvement in palliative care quality in rural nursing homes through information and communication technology-driven interprofessional collaboration	Information and communication technology (ICT)	Mobile app	Reduction in the number of emergency patient transports in nursing homes and rural clinics (29.3% instead of 54.2% for the team not using ICT).	Mastery of the use of ICT
Matea Pavic, al.	Feasibility and Usability Aspects of Continuous Remote Monitoring of Health Status in Palliative Cancer Patients Using Wearables	Tele-monitoring	Mobile app (Activity Monitoring)	For the successful integration of electronic devices into clinical practice, it's crucial that patients can effectively adapt to using these devices.	The willingness of the patient to use electronic devices

(CONTINUE)

Author's names	Study's title	Description of the technology used	Tools employed	Major findings	Factors influencing the effecvtiveness of remote support
M. Nguyen, al.	Using the technology acceptance model to explore health provider and administrator perceptions of the usefulness and ease of using technology in palliative care	Telehealth, an information sharing platform	Device with web browser	This study explored the acceptance of telehealth among providers and administrators involved in palliative care. Acceptance depended on the ability to address key challenges in this field without imposing a significant burden on providers and patients.	User-friendliness with ready access to technical support
Matea Pavic, MD, al.	Mobile health technologies for continuous monitoring of cancer patients in palliative care aiming to predict health status deterioration: A feasibility study	Tele-monitoring	Mobile app (Activity Monitoring)	76% of participants stated that they appreciated the monitoring and would recommend it to other patients.	Feeling supported
Jonathan Nicolla, MBA, al.	The need for a serious illness digital ecosystem (SIDE) to improve outcomes for patients receiving palliative and hospice care	Tele-monitoring	Device with web browser	In contrast to traditional home-based patient monitoring, SIDE improves patient identification, integrates the systematic collection of data on distress, symptom burden, and functional impact using validated questionnaires shared with the clinical team, enables patients to feel closer to their clinical team as they provide constant feedback outside the clinic, and efficiently uses clinical staff resources.	Performance of the technology in identifying, analyzing and processing the information collected
Lindsay Bonsignore, al.	Evaluating the Feasibility and Acceptability of a Telehealth Program in a Rural Palliative Care Population: TapCloud for Palliative Care	Tele-consutation and tele-monitoring	Mobile app (TapCloud)	Remote patient monitoring via TapCloud led to enhanced management of symptoms, accompanied by a notable hospice transition rate of 35% among patients in the study.	Prompt responses, and improved efficiency of care
Manuel Ramón Castillo Padrós, al.	A Smart System for Remote Monitoring of Patients in Palliative Care (HumanITcare Platform): Mixed Methods Study	Tele-consultation, tele-expertise, tele-assistance, tele-monitoring and remote medical triage	Digital plategorm (HumanITcare) and mobile app	Continual assessment and critical examination of symptoms by both the patient and the physician are the cornerstones of effectiveness in outpatient palliative care.	Easy-to-use electronic devices
Gudrun Theile, al.	mHealth technologies for palliative care patients at the interface of in-patient to outpatient care: Protocol of feasibility study aiming to early predict deterioration of patient's health status	Tele-monitoring	Mobile app and bracelet	*Results concerning the acceptability of the application were not published in the article.*	Intervening just in time
Jelle van Gurp, al.	How outpatient palliative care teleconsultation facilitates empathic patient-professional relationships: A qualitative study	Tele-consutation	Mobile app	When properly implemented, teleconsultation can facilitate the relationship between the patient and the palliative care specialist through a computer, all while maintaining empathy. This enables tailored professional care in the patient's context and fosters their involvement.	Trustful relationships and experiences of intimacy and relief from long-term interaction

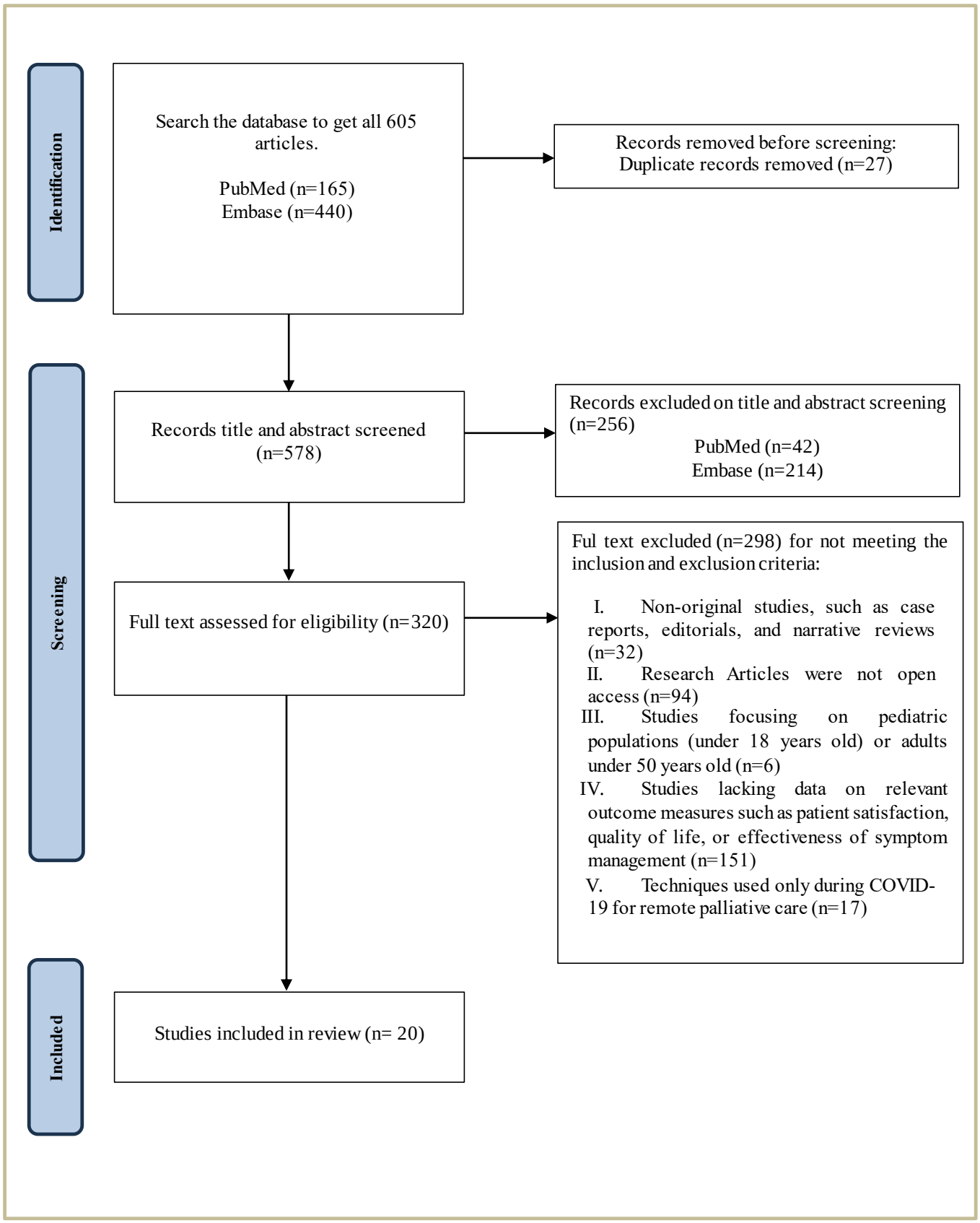

Fig. 2. PRISMA flow diagram of this systematic review

Cultural sensitivity and linguistic proficiency are paramount in effective communication and engagement with diverse patient populations [9]. Healthcare providers must adeptly navigate cultural nuances and language barriers to deliver patient-centred care that resonates with individual preferences and beliefs, promoting trust and rapport.

Tailoring telemedicine interventions to address specific patient symptoms and palliative care needs further enhances relevance and efficacy [10]. By aligning technological solutions with the communication of symptoms patients communicate, healthcare providers can optimize symptom management and patient outcomes, improving the overall quality of care [11].

Efforts to minimize patient burden, such as streamlining form completion processes, are essential for enhancing patient engagement and satisfaction [12]. Providing user-friendly interfaces and readily accessible technical support services further promotes patient acceptance and engagement with remote care platforms [13].

Ultimately, patients' willingness to embrace electronic devices for remote palliative care interventions significantly impacts effectiveness and adoption [14]. Addressing patient concerns, providing education, and fostering confidence in technology usage is critical in promoting patient acceptance and engagement and maximizing remote care initiatives' potential benefits.

B. Satisfaction Patient of Remote Palliative Care

Integrating remote palliative care services has demonstrated notable advantages over traditional face-to-face referrals, marked by significantly faster specialist response times and cost savings. Achieving a median specialist response time of just 0.6 days and an average cost of $50 per eConsult case starkly contrasts the average of 79 days and $133.60 for non-urgent face-to-face referrals. This swift turnaround time is attributed to the provision of fast answers from specialists, ensuring that patient queries and concerns are addressed promptly and effectively [15].

The high completion rates of daily surveys by patients, with 73% completing at least 50% of surveys, are a testament to the acceptability and usability of remote care applications [16]. hese applications' brevity, clarity, and relevance are critical factors in facilitating patient engagement and satisfaction, as evidenced by the favourable ratings of acceptability items. This high level of patient involvement is crucial for the success of remote care applications.

Despite the evident benefits, patient perceptions reveal areas for improvement, particularly in the adaptability of remote care services to disease progression [17]. While remote care has improved patients' daily routines, some perceive it as a static service that must evolve alongside their changing needs. This underscores the need for a person-centred approach that prioritizes individual needs and preferences, ensuring a more responsive and tailored care delivery model.

Continuous availability of symptom evolution is crucial for timely identification and management of symptoms, alleviating patient burden [18]. Real-time monitoring enabled by smartwatches empowers seriously ill cancer patients and their caregivers to record painful events, facilitating rapid intervention and proactive symptom management [19], [20].

The transition from a disease-centred to a person-centred approach has yielded positive outcomes. It enables healthcare professionals to better understand and address patients' personal priorities. This shift fosters a sense of support and empowerment among patients, improving overall satisfaction with care [21].

Adequate mastery of ICT tools is essential for successful remote care implementation. Healthcare professionals benefit from reduced emergency patient transports and improved efficiency in nursing homes and rural clinics [22]. Moreover, patient engagement and satisfaction are bolstered by tailored professional care facilitated by teleconsultation, maintaining empathy and trustful relationships despite the digital medium [23].

In conclusion, the comprehensive integration of remote palliative care services offers a promising avenue for enhancing patient satisfaction, improving symptom management, and fostering trustful relationships between patients and healthcare providers. Continued efforts to address technological disparities and adapt services to evolving patient needs are essential for optimizing the delivery of remote care interventions [24].

IV. Discussion

Remote palliative care aims to tackle patients' obstacles, such as the shortage of specialist palliative caregivers and the physical, emotional, and financial challenges associated with travelling for treatment. By using telehealth, remote palliative care can provide continuous support to patients, allowing them to maintain their quality of life and receive care in the comfort of their homes. Despite the advantages, integrating palliative care encounters technological hurdles, resistance to change among healthcare providers and patients, and doubts about the suitability and effectiveness of telehealth services for individuals with advanced illnesses. Nonetheless, emerging data indicates that remote palliative care is viable, beneficial, and well-received by patients and caregivers, underscoring its capacity to improve care delivery in different regions. This comprehensive literature review examines the intersection of remote palliative care and technological advancements, shedding light on the opportunities and challenges that arise from this amalgamation.

Traditionally, palliative care has been dedicated to supporting individuals nearing the end of life, providing them with physical, emotional, and spiritual aid to enhance their quality of life during the final stages of their journey. However, with the emergence of sophisticated technologies and the growing capabilities of AI in processing and interpreting complex data, a unique opportunity arises to expand the scope of palliative care. Envision a shift from conventional approaches to a proactive and transformative model. Instead of merely accompanying patients towards the end of their lives, palliative care could serve as a platform to prepare individuals for a new existence that diverges from their past experiences. This vision is rooted in the belief that technological advancements could enhance the quality of life for end-of-life patients and equip them with the means to prepare for an unprecedented transition

to an afterlife, thereby fundamentally transforming the concept of palliative care.

AI is pivotal in crafting intricate digital narratives encapsulating patients' memories, values, stories, and teachings in this groundbreaking paradigm. These narratives, serving as a digital legacy, transmit their intellectual and emotional heritage to future generations. AI's ability to simulate conversations and interactions based on patients' behavioural patterns offers the potential for a continuous virtual presence post-mortem, redefining how we engage with the memories of our loved ones. This innovative approach prompts fundamental inquiries into the nature of identity, consciousness, and memory and the delineation between life and death. It also necessitates a reevaluation of the objectives and possibilities of palliative care, broadening its horizon to encompass not only the alleviation of physical suffering but also preparation for a transition to a post-mortem existence characterized by the preservation and transmission of the individual's essence.

This study aims to provide an in-depth overview of the technologies employed in remote palliative care, focusing on ensuring patient comfort and optimizing hospital beds for patients requiring long-term care. Examining the effectiveness, accessibility, and patient satisfaction associated with remote palliative care, this article identifies critical technologies such as telehealth platforms, remote monitoring devices, and AI-driven tools and assesses their integration into palliative care settings. It also identifies the constraints patients may have in trusting remote care and its effectiveness, as well as their first course of action in case of a problem. In this context, research in this field generally focuses on developing sensors, measurement equipment, and methodologies to collect patient health indicators, as well as the development of algorithms and control systems for automatic and discreet monitoring.

This system is composed of five modules:

1) Medical assistance module: The remote visiting doctor is responsible for receiving the patient's on-site medical report at the specified time, giving precise instructions for the examination, and providing initial medical advice to the patient.

2) Feedback module: Communicates with the patient's family about their physical condition and practical living environment, providing information about the first medical consultation and the arrival of the remote visiting doctor.

3) Reminder module: Creates regular and fixed reminders to prompt the patient to follow the doctor's consultation instructions and to schedule appointments.

4) Task determination module: Determines the priority of tasks, deciding who needs to be treated promptly.

5) Data collection module: Mainly collects data related to the patient's daily life trajectory and health status that affect the patient's diagnosis. It identifies the patient's latest care needs and records the end-of-life examination report content to ensure a fair medical judgment for the patient.

The architectural diagram of a Remote Palliative Care System, as represented in Fig. 3, is designed to deliver specialized medical care to patients with severe illnesses in a remote setting, ensuring they receive comprehensive and patient-centred healthcare seamlessly. At the core of this system are the patients and their caregivers. Patients, typically dealing with serious illnesses, require continuous monitoring and medical support to manage symptoms and improve their quality of life. Caregivers, often family members or friends, assist the patient with daily needs and communicate with healthcare providers on their behalf, providing essential emotional and physical support.

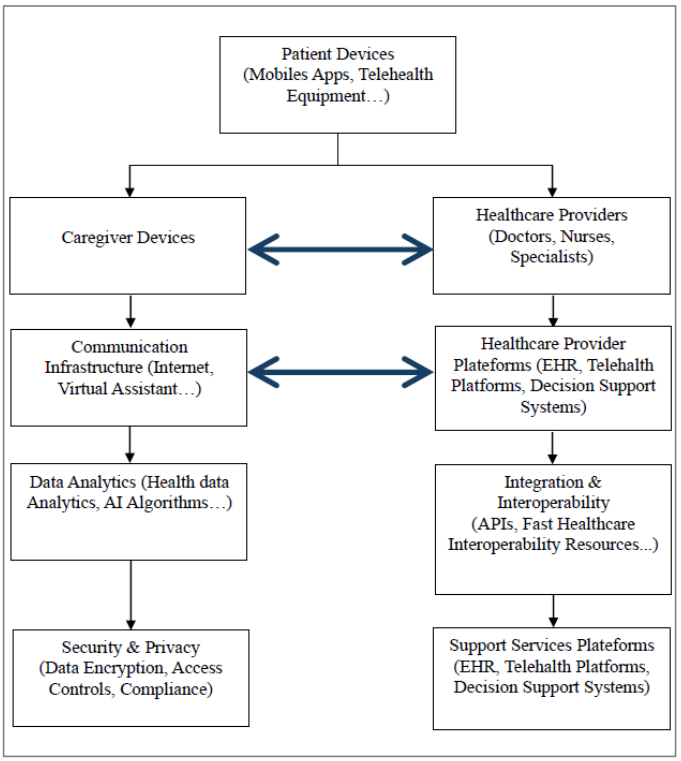

Fig. 3. The architectural diagram of the remote palliative care system

To facilitate this care, the system uses various patient devices. Wearables such as smartwatches monitor vital signs like heart rate, blood pressure, and oxygen levels, collecting real-time health data essential for monitoring the patient's condition. Mobile apps help patients manage their condition, track symptoms, schedule appointments, and communicate with doctors, facilitating easy access to healthcare services and personal health records. Additionally, telehealth equipment, including computers, tablets, or specialized telehealth terminals, enables patients to have virtual appointments with healthcare providers, reducing the need for physical visits.

Caregivers also use mobile apps to coordinate care activities, receive alerts, and access medical advice or support. These apps enable caregivers to manage their responsibilities effectively and stay informed about the patient's health status. Healthcare providers, including doctors, nurses, and specialists such as pain management experts, psychologists, or dietitians, provide primary health care and specialized palliative care. They diagnose conditions, prescribe treatments, and offer ongoing medical support, addressing complex symptoms and improving the patient's overall well-being.

Healthcare provider platforms play a crucial role in this system. Electronic Health Records (EHR) are central databases

for securely storing patient data, ensuring that all patient information is easily accessible to authorized healthcare providers. Telehealth platforms facilitate remote clinical services, including video calls and remote monitoring, enabling healthcare providers to deliver patient care regardless of location. Decision Support Systems (DSS) are advanced tools that help providers make informed clinical decisions based on big data analytics, analyzing patient data to recommend treatments and predict health outcomes.

The system's communication infrastructure ensures seamless data transfer and remote consultations. Reliable internet connectivity forms the backbone, enabling all forms of digital communication. Secure messaging ensures that all communications between patients, caregivers, and providers are encrypted and comply with privacy regulations, protecting sensitive health information. Voice and video communication tools like VOIP or video conferencing allow virtual face-to-face communication, which is crucial for conducting remote medical consultations and maintaining personal connections.

Data analytics and AI further enhance patient care. Health data analytics tools process large amounts of health data to identify trends, outcomes, and potential interventions, helping to understand patient conditions and improve care strategies.

AI algorithms predict patient outcomes, personalize treatment plans, and automate routine tasks, enhancing decision-making and providing insights that improve patient care.

Integration and interoperability are essential for the system's functionality. APIs enable different technologies and software solutions to communicate and function seamlessly, integrating various healthcare systems and ensuring smooth data flow. Standards like HL7 and FHIR are protocols for healthcare information exchange, promoting interoperability and data consistency across different systems.

Security and privacy are paramount in this system. Data encryption protects sensitive patient data during transmission and storage, ensuring that data is only accessible to authorized users. Access controls ensure that only authorized personnel can access patient information, maintaining privacy and security. Compliance with regulations like HIPAA in the US ensures that patient data is handled responsibly, protecting patient privacy and securing health information.

Finally, support services provide ongoing assistance. Technical support helps troubleshoot technical issues in patient and caregiver devices, ensuring all system components function correctly. Clinical support offers continuous medical assistance and advice, and it is available 24/7 to address any urgent patient needs, providing reassurance and immediate help in case of emergencies.

In summary, the remote palliative care system comprises the cloud and the demand side. The cloud part is primarily responsible for organizing and processing request data from the demand part. The demand side collects end-of-life palliative care data and transmits tasks to the cloud. The "cloud" comprises three main elements: client management, task management, and performance calculation. The "application" part consists mainly of five elements: the data collection module, the task decision module, the callback module, the feedback module, and the medical assistance module. Each part assumes different responsibilities.

Our research navigates this uncharted territory to expand the boundaries of palliative care and stimulate profound contemplation on mortality and human existence. It introduces fresh perspectives on how technology can reshape our understanding of life, death, and the realms beyond, thereby contributing to the philosophical discourse on human existence. Moreover, the forthcoming studies delve into a deep learning model to establish a continuous virtual medical connection for patients, which may occasionally transition into accurate contact based on their needs. This system is designed to provide indispensable support throughout the progression of the patient's illness, to offer reassurance and psychological reinforcement at every stage of the disease. Furthermore, it can be tailored to the patient's preferences.

In France, in 2021, 7% of individuals aged 60 or older experienced a loss of autonomy in their homes [25]. Leveraging AI enables the adaptation of this system based on the patient's autonomy level and health status, encompassing the detection of voice, signs, and facial expressions.

This study acknowledges several limitations. Firstly, focusing on English language studies may introduce language bias, potentially excluding relevant literature published in other languages. Additionally, restricting the search to two prominent health databases may lead to selection bias, limiting the representation of research in palliative care. Furthermore, the exclusive reliance on open-access articles may overlook valuable contributions from subscription-based journals, impacting the comprehensiveness of the review. Moreover, the possibility of publication bias in favour of positive results could influence the perceived effectiveness of remote palliative care interventions. Lastly, the generalizability of findings may be constrained due to the limited scope of the search strategy. Addressing these limitations necessitates a more comprehensive approach, including multilingual searches across diverse sources, to ensure a more representative and robust synthesis of the available evidence.

Despite these limitations, remote palliative care systems have the potential to transform end-of-life care. By leveraging advanced technologies such as AI, telehealth platforms, and remote monitoring devices, these systems can provide continuous and personalized support to patients, ensuring they receive high-quality care in the comfort of their homes. Integrating these technologies into palliative care settings can optimize resource use, improve patient satisfaction, and enhance the overall quality of life for individuals with serious illnesses.

The future of palliative care lies in the seamless integration of technological advancements with compassionate care practices. As the field evolves, ongoing research and innovation will be crucial in addressing existing challenges and unlocking new possibilities for improving end-of-life care. By embracing these advancements, healthcare providers can better meet the needs of their patients, offering them dignity, comfort, and peace during their final stages of life.

This study ultimately provides a comprehensive understanding of the current landscape of remote palliative care,

highlighting the opportunities and challenges associated withits implementation. By examining the technologies, system architecture, and practical deployment considerations, this research contributes valuable insights to the ongoing development of effective and compassionate remote palliative care solutions.

V. Conclusion

This systematic review has effectively synthesized the current evidence on remote palliative care. The results highlight the patient-centric nature of remote palliative care, primarily delivered through methods. This approach, well-received by patients requiring palliative care, effectively connects them with healthcare professionals in their homes, providing a profound sense of comfort and security. Telehealth interventions have shown promise in enhancing patient contentment for individuals residing in regions by offering increased access to medical services and potentially reducing unnecessary hospital visits.

The effectiveness of care in improving health outcomes like hospitalizations and satisfaction levels among patients and caregivers has been underscored. Key elements such as intervention, educational initiatives, and standardized sessions have demonstrated impacts on life quality-related results. However, the evidence concerning the cost-effectiveness of these program components is still evolving, necessitating research to ensure resource allocation.

Patients have expressed responses to service delivery approaches such as music therapy and involving volunteers in palliative care. However, assessing the implementation of personnel roles within community-based palliative care remains essential for determining optimal resource utilization. Many obstacles persist, such as the necessity for healthcare professionals to adjust to methods of care delivery that involve technology, which may differ from the touch typically associated with palliative care. Furthermore, while virtual appointments are well received by many, some patients still prefer in-person visits. This highlights the importance of balancing face-to-face interactions, as it acknowledges the diverse preferences of patients.

In essence, remote palliative care not only offers a solution to the shortage of healthcare providers but also opens up new avenues for innovative care delivery. It caters to the needs of patients who desire care in their homes, providing a more personalized and comfortable experience. As this field progresses, it remains vital to explore solutions and research to enhance the provision of palliative care in remote and rural areas, ensuring equal access to top-notch care for all patients.

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