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Technology to Support Older Adults in Home Palliative Care: A Scoping Review

Ilaria Basile[1], Letteria Consolo[2], Stella Colombo[3], Daniele Rusconi[4], Flavia Rampichini[5], and Maura Lusignani[6]

Abstract

Background: Today, many older adults use health technologies, approach their final days with laptops, smartphones, and tablets. *Telepalliative care* is a service that remotely delivers palliative care through videoconferencing, telephonic communication, or remote symptom monitoring. The service meets the needs of patients who want to die at home and reducing unnecessary hospitalizations. The objective of this study is to map the literature on the use of technology by the terminally ill older adult population being cared for at home, to identify which technology systems are in use, to determine how technology can change communication between palliative care professionals and patients, and to explore the strengths or weaknesses patients perceive regarding the use of technology. **Methods:** We conducted a scoping review following the methodology of Arksey and O'Malley. A literature search was conducted in the MEDLINE, Embase, Web of Science, SCOPUS, PsycINFO, CINAHL, Ilisi and Google Scholar databases. **Results:** Fourteen eligible papers identified various tools available in clinical practice and found that most older adults are comfortable and satisfied using them. Despite being physically distanced from clinicians, patients felt cared for even though eye contact was lacking. Being unfamiliar with technology emerged as a barrier to telepalliative care in addition to difficulties caused by screen size and internet connection problems. **Conclusions:** Older adults in palliative care at home perceive technology as a means of receiving efficient care. However, future research is needed to investigate what they look for in a technological tool and to develop more suitable technologies for them. **Clinical Trial Registration:** The protocol of this study has been published in the Open Science Framework (OSF) preregistrations at https://osf.io/acv7q to enhance replicability and transparency and reduce any publication or reporting bias.

Keywords

older, terminally ill, palliative care, home palliative care, technology, remote communication, telepalliative care

Background

Based on a United Nations report, the global population of individuals aged 65 years and older is anticipated to double, increasing from .7 billion (9%) in 2019 to 1.5 billion (16%) by 2050.[1] Increased longevity implies that many people are living longer with chronic diseases and various comorbidities that complicate the end of life,[2,3] characterized by difficult clinical decisions, complex symptom management,[4] psychosocial problems and spiritual distress.[5] This increases the need for palliative care.[6,7] Palliative care provides an interdisciplinary and patient/family-centered approach that addresses the physical, psychological, emotional, and spiritual suffering of terminally ill patients and their families.[8] Palliative care can help older adults manage symptoms in the final stage of life and improve their quality of life by considering their needs and requirements.[5,9,10] In the last year of life, older adults experience various symptoms, including pain, anorexia, deflected behavior, mental confusion, constipation, insomnia and incontinence problems.[9] Thus, clinicians need to consider the patient's totality, physical, psychological and social needs,[5] and very often, they must address several problems simultaneously.[11,12]

[1]High-Complexity Unit of Palliative Care, Pain Therapy and Rehabilitation, IRCCS, National Cancer Institute Milan, Milan, Italy
[2]Bachelor School of Nursing, IRCCS, National Cancer Institute, Milan Italy
[3]Intensive Care Unit, IRCCS, National Cancer Institute, Milan, Italy
[4]Urology Unit, IRCCS, National Cancer Institute, Milan, Italy
[5]Central Medical and Surgical Pole Library, University of Milan, Milan, Italy
[6]Associate Professor, Department of Biomedical Sciences for Health, Milan, Italy

Corresponding Author:
Ilaria Basile, High-Complexity Unit of Palliative Care, Pain Therapy and Rehabilitation, IRCCS, National Cancer Institute Milan, Via Venezian, 1 Milano 20133, Milan, Italy.
Email: ilaria.basile@istitutotumori.mi.it

Many older people desire to spend their final days at home,[9,13] while maintaining social ties with neighbors and family.[14] Home palliative care teams play a crucial role in enabling this scenario and providing patients with a sense of being accompanied instead of being left alone; these teams help patients cope with advanced life-limiting diseases at home by being available at any time to be contacted or to make a home visit.[15]

The COVID-19 pandemic created a rapid surge in demand for remote palliative care services,[7] and the use of technology (video conferencing, email, wireless tools) has become common.[16,17] There is growing evidence for the usefulness of telehealth in providing health and allied services for older people in various contexts, including geriatrics and gerontology, rehabilitation and palliative care.[18] Digital technologies are progressively employed to bolster wellbeing, foster the autonomy of older adults, and monitor their health. However, older adults may possess limited experience and familiarity with technology, while their chronic conditions can impede the usability of telehealth. This is further exacerbated by the fact that system designers often overlook this age group as potential users.[19,20]

Telehealth is defined as the "provision of healthcare remotely by means of a variety of telecommunication tools"[21,22]

In the palliative context, it is known as *telepalliative care*, a service that remotely delivers palliative care to patients through videoconferencing, telephonic communication, or remote symptom monitoring.[23,24] This mode of care delivery could improve the quality of life of care recipients and the accessibility of care services for those who decide to die at home while reducing unnecessary hospital admissions.[21]

Telehealth for palliative care patients at home gives patients an increased sense of safety by providing greater and easier access to healthcare professionals and overcoming geographical distances;[24,25] it may empower patients to manage their illness, improve patient quality of life, decrease hospital admissions, and improve access to home palliative care services.[26]

The use of technology is often associated with youth, but an increasing number of older people are using the internet and connected health technologies.[27] However, older adults, with their frailty and age-related physical or sensory limitations, may encounter obstacles in using devices and software[28-30] due to the size of buttons, brightness, text fonts or language used.[31-33]

Patients who receive palliative care at home report unmet needs, such as the lack of regular communication with clinicians.[21] This may be because different health care staff visit patients, making it difficult for the patients to form relationships with so many caregivers and leaving them feeling that they are not being listened to enough.[33] Communication is an essential component of home palliative care that facilitates the provision of individualized care,[15] and the use of technology systems has a positive impact.[34,35]

In this new health care trend, many older people approach their final days with their laptops, smartphones, and tablets by their side, and they are increasingly using their devices to access the internet and connected health technologies.[27] For this reason, research is needed to better frame the benefits of these technologies for individuals at the end of life. Given the heterogeneity of the literature, it was decided to choose a scoping review as the study design; In contrast to other reviews, scoping reviews serve the purpose of delineating the fundamental concepts that form the basis of a research field.[36]

The objective of this review is to map the literature with respect to the use of technology in the home by the terminally ill older population. In particular, we aim to identify the types of technology systems in use in the world, how technology can change communication between palliative care professionals and patients, and what is known about the strengths or weaknesses regarding the use of technology by patients in palliative care at home.

Methods

To address the aims of this study, we conducted a scoping review, following the 5 stages of the methodology outlined by Arksey and O'Malley[36] and the recommendations of Levac et al.[37] The 5 stages are as follows: 1. Identifying the research question, 2. Identifying relevant studies, 3. Study selection, 4. Charting the data, 5. Collating, summarizing and reporting the results.[34] The Preferred Reporting Items of Systematic reviews and Meta-Analysis extension for Scoping Reviews (PRISMA-ScR) checklist guided the reporting of our review.[38]

Stage 1: Identifying the Research Question

Objective. The present study is a scoping review on the use of technology at home by the terminally ill older population. The purpose is to identify what types of technology systems are in use, how technology can change communication between palliative care professionals and older adult patients, and what is known about the strengths or weaknesses regarding the use of technology by older adults in palliative care at home. This scoping review will systematically map the relevant research.

The objective is guided by the following research questions:

1. Which technological systems are the most widely used by older people in palliative care at home?
2. How does the use of technology affect and change communication between older adults in palliative care at home and care professionals?
3. What strengths or weaknesses do older patients perceive in using technology for receiving palliative care at home?

Stage 2: Identifying Relevant Studies

Eligibility Criteria. Studies included in the research are relevant to meet the research objectives. All primary studies (qualitative and/or quantitative) were eligible, with no language or date restrictions; an external translator will be involved if necessary. Published studies and gray literature studies were included, excluding dissertations and theses. The target population was patients receiving palliative and/or end-of-life care at home and using technology. We excluded studies reporting the use of only telephones for calling and the use of e-mail for communication but included studies in which technologies also support non-verbal communication in addition to verbal communication between patients and clinicians. Studies were selected if they included adults over age 65. We excluded all review papers and studies with unavailable abstracts and full-texts.

Stage 3: Study Selection

Information Sources. A professional health science librarian (F.R.) in collaboration with the research team prepared the search strategy in the MEDLINE (through Ovid), Embase, Web of Science, SCOPUS, PsycINFO, CINAHL and Ilisi databases. In addition, the grey literature was searched in Google Scholar, grey literature databases, and relevant charity and organization websites.

Search Strategy. The final search results were exported into Mendeley Reference Manager[39] and screened for duplicates. After deleting duplicates, the remaining articles were entered into the Rayyan reviewing system online.[40] All abstracts were screened independently by 2 reviewers (IB and LC). If there was disagreement between the 2 reviewers, a third, more senior reviewer assessed the abstract to determine eligibility for inclusion (ML). All stages of full-text review and data abstraction were performed independently by the 3 reviewers (IB, LC, and DR). Studies that did not meet the inclusion criteria were excluded for documented reasons. Any disagreement between the reviewers was discussed among all team members who determined the eligibility. The search decision process was described using the PRISMA flow diagram.[38] The search strategy is available in the Supplementary Materials. Cohen's Kappa statistic was used to measure the interrater reliability of the study selection.[41]

Stage 4: Charting the Data

We extracted general characteristics of the included studies, such as year of publication, study location, study population, aims of the study, methodology (quantitative vs qualitative), types of technology used (ie, software/hardware), outcome measures (process of care, assessment of patient needs, goal setting, care plans, outcome monitoring, intervention reporting frequency, communication effectiveness, and patient perspectives on positive or negative aspects of technology) and notes on usability or satisfaction.

Stage 5: Collating, Summarizing and Reporting the Results

We collected all the evidence from the included studies by reading them with reference to the 3 research questions and wrote a narrative summary of the studies about the topic. The studies were analyzed in terms of their general characteristics and with special attention to the electronic device and software used by the older adult subjects. Frequencies and percentages were utilized to describe nominal data. The results are presented and categorized into 3 main sections: (1) types of software and devices used by older adults in palliative care at home; (2) the effect of technology use on communication between professionals and patients; and (3) strengths or weaknesses perceived by older adults in the use of technology.

Results

We found 8169 articles, exported them into Mendeley[39] and screened for duplicates. A total of 2936 duplicates were removed, leaving 5233 records. One hundred three articles were found to be eligible. Articles were excluded if they considered the wrong population (eg, caregivers/clinicians; individuals who were not in palliative or terminal care, were not older adults, were hospitalized/ambulatory patients), were the wrong publication type (eg, a dissertation), or used the wrong tools (eg, telephone/e-mail). Studies reporting on both older adult and adult or pediatric populations were included only if relevant measures used for the older adults were reported separately. The 3 independent reviewers resolved any disagreements about study inclusion through discussion; if consensus could not be reached, the senior member was engaged. K was .69 with good agreement. Fourteen studies were included: 8 were quantitative (1 was a protocol), 2 were qualitative, and 4 had a mixed-method design. The search and decision-making process is described using the PRISMA flow diagram[38] in Figure 1.

Study Characteristics

In Table 1, we report the main characteristics of the included studies. The studies were published from 2004[42] to 2022[43,44] and carried out in several countries: 5 studies were carried out in the USA,[42,43,45-47] 3 in Sweden,[48-50] 2 in Australia[51,52] 2 in Japan,[53,54] 1 in India,[44] and 1 in Canada.[55] The mean age of the participants ranged from 67[50] to 84,[49] and 1 case report study involved a 93-year-old person. The percentage of female participants ranged from 20%[53] to 60.4%.[46] 4 published articles focused exclusively on older adults.[45,49,54,55] The pathology that was most represented in the studies was advanced

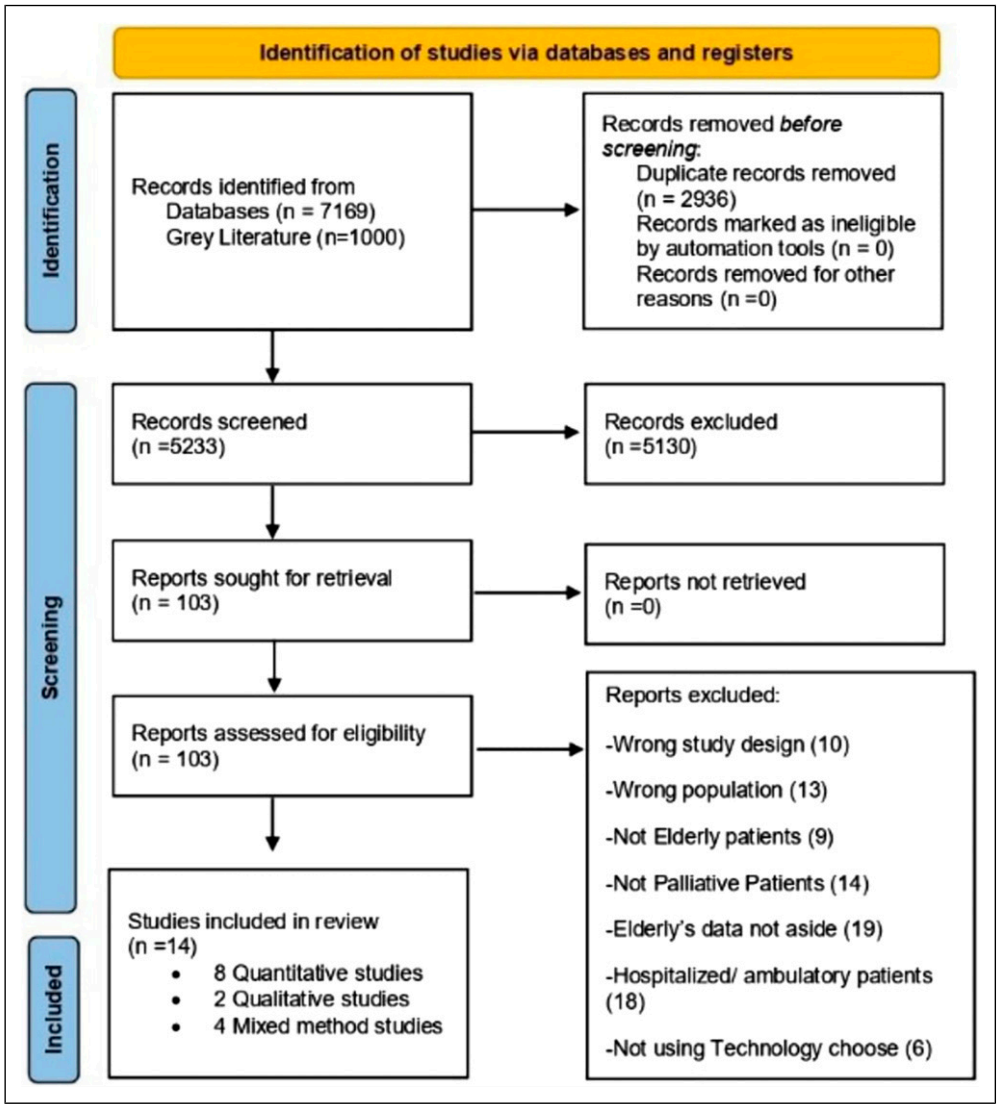

Figure 1. PRISMA flow diagram, 2020.

cancer;[44,47-49,53,54] the most frequent cancer was lung cancer (66.7%),[53] while the remaining published articles included other conditions, such as advanced pulmonary, cardiac, renal, and gastrointestinal diseases.

Technology Systems Used by Older Adults in Palliative Care at Home

In the included studies, the most frequent devices used by patients were tablets (21%)[43,47,51] and smartphones (21%).[42,48,53] 2 studies reported the use of computers (14%)[44,55] and in 2 studies, the software was usable on any device (14%).[46,52] Lind and Karlsson[49] and Lind et al.,[50] in their 2 studies, used a pen with an embedded camera on a paper sheet; the other 2 studies used a device for videoconferencing (14%),[45,54] 1 of which recorded vital signs. The technology offered in the protocol study of Maramis et al[48] was composed of a smartphone and a wristband employed for measuring the physical activity and sleep quality of patients.

Regarding the frequency of use, in 6 studies, patients used the technology every day,[47,49-51,53,54] in 1 study monthly,[42] in 5 studies periodically,[44,46,48,52,55] and in 2 studies, the frequency of use was not indicated.[43,45] Additionally, in 3 studies, the technology was used in case of need.[42,51,52]

The main characteristics of the technology systems are reported in Table 2.

In 9 studies, patients used different devices and software to hold videoconferences with their clinicians; 5 of these studies used devices that only conducted videoconferences.[42-44,52,55] In 2 studies, the hardware also supported peripherals for collecting vital signs, such as blood pressure devices, pulse oximeters, and stethoscopes.[45,54] In the study by Tieman et al.,[51] the video consultation was associated with

Table 1. General Characteristics of the Included Studies.

Author, year and Title	Study Design	Aim of the study	Sample	Country	Journal of Publication
Whitten et al, (2004) Telehospice in Michigan: Use and patient acceptance[42]	Mixed-methods study	To examine telephospice acceptance from the patient's perspective	200 patients with all diagnosis with average age of 71 years	USA	American journal of hospice and palliative medicine
Aoki N., et al, (2006) Triangulation analysis of telepalliative care implementation in a rural community in Japan[54]	Mix-methods design	To assess the quality of telepalliative care compared with in-person care and evaluate the clinical and economic impact of remote care	2 patients, 1 male aged 72 with prostate cancer and 1 female aged 78 with esophageal cancer receiving palliative care at home in a rural area	Japan	Telemedicine journal and e-Health
Slater S.G., et al, (2006) Measuring quality of life outcomes through the use of home telehealth: Using a case study model in a terminal heart failure patient[45]	Case study	To illustrate how much support can be provided in the home setting through augmentation with telehealth	1 patient aged 93 with heart failure, chronic obstructive pulmonary disease, chronic renal insufficiency, hypertension, abdominal cancer	USA	Home health care management and practice
Lind L., et al, (2008) Patients' use of digital pens for pain assessment in advanced palliative home healthcare[50]	Qualitative cross-case content analysis	To explore and describe palliative home care patients' experiences of assessing their pain by using a pain diary	12 cancer patients receiving home-based palliative care with an average age of 67	Sweden	International journal of medical informatics
Hachizuka et al, (2010) Development of a personal digital assistant (PDA) system to collect symptom information from home hospice patients[53]	Observational study	To develop a personal digital assistant (PDA) system to collect information on symptoms and mood states in patients with cancer using computerized ecological momentary assessment (cEMA)	15 patients with terminal cancer receiving in-home palliative care with an average age of 67.1±9.2	Japan	Journal of palliative medicine
Lind, L., et al, (2014) Telehealth for "the digital illiterate"-elderly heart failure patients' experiences[49]	Qualitative study	To explore and describe patients' experiences in using the health diary system	14 patients with heart failure in home care with an average age of 84	Sweden	IOS press
Tieman et al, (2016) Using telehealth to support end-of-life care in the community: A feasibility study[51]	Prospective cohort study	To assess the feasibility of a telehealth-based model of service provision for community-based palliative care patients, caregivers and clinicians	43 patients diagnosed with cancer with average age of 71.6	Australia	BMC palliative care
Bonsignore, L., et al, (2018) Evaluating the feasibility and acceptability of a telehealth program in a rural palliative care population: Tapcloud for palliative care[46]	Mix-methods design	To describe a telehealth palliative care program, evaluate the feasibility, usability, and acceptability of a telehealth system	101 patients with 1 or more life-limiting illnesses in palliative care with an average age of 72	USA	Journal of pain and symptom management
Paul, L., et al, (2019) Web-based videoconferencing for rural palliative care consultation with elderly patients at home[55]	Descriptive study	To gain preliminary experience with mobile web-based videoconferencing for in-home palliative care consultations	10 patients with all diagnoses referred to rural palliative home care with an average age of 77	Canada	Supportive care in cancer

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Table 1. (continued)

Author, year and Title	Study Design	Aim of the study	Sample	Country	Journal of Publication
Maramis, C., et al, (2019) Using electronic patient reported outcomes to foster palliative cancer care: The mypal approach[48]	Protocol for a multi-center, interventional, unblended, randomized controlled trial (RCT)	To exploit advanced eHealth technologies to develop and evaluate 2 e-PRO-based general palliative care interventions for cancer patients	Patients with chronic lymphocytic leukemia (CLL) or myelodysplastic syndromes (MDS) with a median age of 72	Sweden Italy Greece Czech republic	19th international conference on bioinformatics and bioengineering (BIBE)
Jiang et al, (2020) Integrated telehealth-assisted homebased specialist palliative care in rural Australia: A feasibility study[52]	Prospective mixed-methods pilot study	To assess the feasibility of integrating telehealth-assisted home-based specialist palliative care (TH-SPC) in a rural community setting	21 patients with a diagnosis of malignancy or not with an average age of 70.4	Australia	Journal of telemedicine and telecare
Schoppee, et al, (2020) Patients and caregivers rate the PAINReportIt® wireless internet-enabled tablet as a method for reporting pain during end-of-life cancer care[47]	Pre-test/post-test study	To examinate computer use acceptability	234 patients with end-stage cancer in palliative care with an average age of 68.5	USA	Cancer nursing
Hutchinson et al, (2022) A formative mixed-methods study of emotional responsiveness in telepalliative care[43]	Mixed-methods study	To examine the feasibility, acceptability, and emotional responsiveness of tele-PC interactions involving seriously ill, home-bound patients	11 patient with all diagnoses with an average age of 70.8	USA	Journal of palliative medicine
Balasubramanian, S., et al, (2022) Patient satisfaction in home care services through e-palliative care – an experience of tertiary cancer centre from Kerala[44]	Prospective study	To determine the level of satisfaction of patients receiving e-Palliative homecare	120 home-care patients with advanced cancer with a median age of 69	India	Indian journal of palliative care

Abbreviations: USA, United States of America; PDA, personal digital assistant; cEMA, ecological momentary assessment; CLL, chronic lymphocytic leukemia; MDS, myelodysplastic syndromes; e-PRO, electronic Patient reported outcome; BIBE, Bioinformatics and Bioengineering; TH-SPC, telehealth-assisted home-based specialist palliative care.

Table 2. Characteristics of Software and Devices.

Study	Software	Hardware	Characteristics	Patient Outcomes	Intervention Reporting Frequency
Whitten et al[42]	Videoconference software	Smartphone	ND	-Allow traditional hospice services, spiritual care televisits, physical assessment by nurses -Assess pain -Allow emergency calls -Meet patients' and families' needs improving EoL care -Connect patients in rural areas with clinicians -Give patients the opportunity to die comfortably at home	Each month, in case of emergency and for follow up visits
Aoki et al[54]	Videoconference	Polycom viewstation video conferencing equipment	The system allows patients and caregivers to contact the palliative care unit at the okayama central hospital 24 hours/7 days a week in case of emergency	-Collect symptoms and vital signs -Receive advice from HCPs every day and support in case of emergency -Give patients the opportunity to die at home Increase access to clinical services	Every day in the evening
Slater et al[45]	Video conferencing software	ViTel net turtle 800 with video and stethoscope	It is composed by -Interactive video unit to provide two-way, interactive audio and video assessments -Internal blood pressure device, scale-cabled, pulse oximeter and stethoscope -Camera, to provide medication review and wound care assessment	-Monitor health status - Improve QoL	ND
Lind et al[50]	Pain diary	Pen with a camera and an ordinary paper sheet	The pain diary included a visual analogue scale (VAS) for assessment of pain intensity. The technology makes use of ordinary paper, although with a close-to-invisible pattern read by a camera inside the digital pen. The digital pen looks, feels and functions like an ordinary ballpoint pen, but the strokes made by the pen are recorded and can be transferred via wireless internet technology to a server using the digital pen infrastructure	-Assess pain and consume of analgesics more sincerely -Report pain every hour of the day -Increase patients' participation in their own care and contact with HCPs -Sense of peace for patients	Three times per day or more
Hachizuka et al[53]	Symptoms' intensity system	Palm-sized portable device	It has a liquid crystal screen and a stylus. Intensities of symptoms were rated on a visual analog scale (VAS) from 0 to 100 and data recorded were not accessible to the patients. Patients were allowed to voluntarily skip a signal and asked to complete these ratings at the sound of an alarm generated by the device, produced when they took their usual analgesics (1 to 3 times per day) and also at randomly scheduled times (once in the morning and once in the after- noon)	-Evaluate and record real time symptoms -Make a post medication analysis of symptom transition -Reduce drug noncompliance	Several times per day for a week, when patients took rescue medications and when an alarm sounded

(continued)

Table 2. (continued)

Study	Software	Hardware	Characteristics	Patient Outcomes	Intervention Reporting Frequency
Lind and karlsson[49]	Pain diary	Pen with a camera and an ordinary paper sheet	It comprises a pen and an ordinary paper with a close-to-invisible pattern read by a camera inside the digital pen; the strokes made by the pen are recorded and transferred via internet to a server -It also allows free text messages to the care provider -It supports the daily report of shortness of breath, intake of medications, weight and other measurements -The system generated alarms if patient-reported values are below/above a certain limits	Daily reporting of health status monitored by HCPs	Every day
Tieman et al[51]	Software for video consultation and self-report electronic diary	iPad tablet	It includes patient self-assessment tools such as AKPS, assessment of quality of life (AQoL) and symptom assessment scale (SAS). Alerts are sent to the health professional if scores breached pre-specified thresholds	-Remote monitoring and management of symptoms -Planned responses if self-reported assessments exceed pre-defined thresholds generally identified by alerts -Quicker problem management and identification of problems that may not have been recognized -Shares information with different health professionals -Enables a more equitable management of palliative care resources	Weekly, daily and when necessary
Bonsignore et al[46]	TapCloud application	Tablet, phone or computer	It includes questions and a word cloud to assess symptoms Patients click current symptoms and double tap if that symptom is particularly bad or getting worse. The word cloud is generated by a mapping engine and chooses words based on the common symptoms of the patient's diagnosis, the word cloud is customized to each patient and gets smarter with each use. Symptom words include both physical and emotional symptoms and display positive and negative words. In addition, symptoms can be added by the patient/caregiver Pain assessment is based on a 0-to-10 likert scale	-Monitors symptoms, wellbeing and medication management -Promotes personalized care -Facilitates patient-HCP real = time interaction and access to clinicians even in rural areas -Allows exchange of information on the goals of care -Improves efficacy and quality of care -Increases comfort and peace of mind of patients -Makes medication refills easy -Meets patients' spiritual and emotional needs by offering prayers or encouragement through messages -Alerts prevent unnecessary suffering and potential ER access	Spontaneous reporting by patient. Clinicians monitoring twice daily the dashboard

(continued)

Table 2. (continued)

Study	Software	Hardware	Characteristics	Patient Outcomes	Intervention Reporting Frequency
Paul et al[55]	Microsoft Lync®	Computer with speakerphone, and an external webcam	The PC-CNS used an AHS laptop to establish a secure, encrypted internet connection to the distant PC-MD through the wireless network in the patient's home or through a cellular network, using the computer's aircard	-Save time and distance travel in rural areas -Reduce travel costs -Provide effective communication even about concerns -Respond to needs online as well as in person -Improve decision making -Enable non-verbal communication -Help connect HCPs to older adults in rural areas -Promote continuity of care by involve multidisciplinary team members	During the visit
Maramis et al[48]	MyPal eHealth platform	Smartphone and smart wristband	My pal envisages the integration of several eHealth tools supporting self-management of cancer such as ePRO systems The smart wristband is used to monitoring the physical activity and the sleep quality of the patients	-Could improve QoL and self-management of symptoms -Report various physical and psycho-emotional symptoms thought ePRO questionnaires -Timely assessment of symptoms by HCPs -Increase patient involvement, centeredness and satisfaction -Improvement in cost-effectiveness	Periodical or spontaneous reporting
Jiang et al[52]	Web real time communication (WebRTC) platform on google chrome	Any personal device with an online camera and microphone or provided laptop	It was accessible via any personal device with an online camera, microphone and 3 G/4G network access	- Enhances time efficiency of the service and user satisfaction -Improves patient performance levels -Facilitates specialist access -After 3 months, ↑AKPS scores (P = .04) -Reduces healthcare resource usage during EoL care	Regularly appointments organized by nurses and when patient needs them
Schoppee et al[47]	PAINReportIt®	Tablet	PAINReportIt® used on a wi-fi-enabled tablet in patients' homes, an interactive, touch-screen version of the McGill pain questionnaire (MPQ), reporting intensity, quality, pattern of pain, and other pain-related information	- Assesses and reports to hospice real-time pain, distress and common symptoms -Steps up timely intervention -Evaluates the acceptability and usability of the program and tool	Daily for 1-week period

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Table 2. (continued)

Study	Software	Hardware	Characteristics	Patient Outcomes	Intervention Reporting Frequency
Hutchinson et al[43]	Health recovery solutions clinician connect and zoom	Tablet	ND	-Patients feel heard and understood, and report -Emotional support -The emergence of more good feelings than bad ones -Empathic communication -Improved access to care -Reduced preparation for visits -Video consultation brings added value to care -Enhances efficiency of visits -Provides the possibility for patients to not leave home for visits -Reduces distraction due to office décor	ND
Balasubramanian et al[44]	e-PC software application	Laptop with integrated camera	The laptop is connected to the *PC* physician stationed in the hospital who gets an alert when the care teams in homes come online	-Facilitates doctors' virtual presence at patients' bedside -Reduces travel costs for patients and caregivers -Avoids transport of very sick people to the hospital, reduces wait times and hospital stays	During nurses' home visits

Abbreviations: AKPS: australia-modified karnofsky performance scale; EoL: end of life; ePRO: electronic patient-reported outcomes; HCPs: health care professionals; QoL: quality of life; VAS, Visual analogue scale; AQoL, Assessment of Quality of Life; SAS, Symptom Assessment Scale; WebRTC, Web Real Time Communication; PC-CNS, palliative care clinical nurse specialist; PC-MD, palliative care physician consultant; AHS, Alberta Health Services; e-PC, electronic palliative care; *PC*, Palliative Care; MPQ, McGill Pain Questionnaire; ND no date.

a self-report electronic diary made up of the Assessment of Quality of Life (AQoL) questionnaire and Symptom Assessment Scale (SAS). If self-reported assessment scores breached prespecified thresholds, the software sent alerts to the health professional or programmed responses to the patient.[51]

In the study of Bonsignore et al.,[46] the TapCloud application included a dynamic screen view of words used to describe both physical and emotional symptoms the patient might be experiencing (word cloud). Patients tapped current symptoms and double-clicked to indicate if that symptom was particularly bad or worsening.[46]

Hachizuka et al.,[53] Schoppee, et al.,[47] Lind and Karlsson,[49] Lind et al.,[50] and Maramis et al.[48] promoted the self-report of symptoms directly by patients through different devices and software.

Hachizuka et al[53] described an electronic diary in which participants indicated the intensity of their symptoms on a visual analog scale (VAS) with their fingers or a stylus on the screen of a tablet.

Schoppee et al.[47] used the PAINReportIt® on Wi-Fi-enabled tablets to report pain in real time to health care providers, indicating pain location, intensity, quality, pattern, and other pain-related information measured by the McGill Pain Questionnaire (MPQ). Wi-Fi allowed patients to use the anywhere in their homes and not be limited in their movement by the length of an internet cable.[47]

Lind et al[50] in 2 studies reported the use of a digital pen, apparently a normal ball-point pen but with a built-in camera that could record and transfer to a server whatever a patient wrote in an ordinary paper diary, with a printed close-to-invisible pattern read by the camera. The diary made it possible to report pain and other symptoms, such as shortness of breath, intake of medications, weight and other measurements.[49,50]

Maramis et al.[48] presented a new idea for an eHealth tool for the reporting of physical and emotional symptoms using patient-reported outcome (PRO) self-report questionnaires on a smartphone application. Patients in this study also wore a smart wristband to record lifestyle parameters such as physical activity and sleep quality.[48]

Technology Impact on Communication Between Older Adults and Care Staff in Palliative Home Care

Twelve studies in this review considered the aspect of communication in the use of technology by older adults in palliative care at home, of which 4 focused only on the older adult population.[42-50,52,54,55]

Table 3 shows the absolute frequencies of barriers and facilitators perceived by older adults in the use of technologies for communication with clinicians.

Three studies claim that the use of technological tools in home palliative care has a positive impact on communication between clinicians and patients,[44,49,55] promoting a stronger connection between the 2 parties than in-person visits.[45,49,50,52,55] In the studies of Paul et al[55] and Jiang et al.,[52] patients using video conferencing compared to other visit formats, said they could communicate effectively and felt comfortable discussing their concerns.

In studies that used self-reported symptom tools, patients had better communication of symptoms to their clinicians.[44,46-50,54,55] Schoppee et al.[47] reported that the software used for self-reporting pain was a clear and concise tool that was easy to understand and offered a method of communicating directly and quickly; they found that the software helped older people who often lacked the language or knowledge to adequately communicate the suffering they were experiencing.

The reporting of symptoms recorded by and available in electronic systems, the opportunity to consult at any time and the advantage of being able to connect multiple professionals to the patient simultaneously improve the decision-making process regarding patient care, as shown by the studies of Paul et al.[55] and Balasubraimanian et al.[44]

The screens on devices allow little more than the patient's face to be seen, which cuts out gestures and body movements that could sometimes be signals for clinicians to continue the conversation or to calibrate communication patterns and words, for example when dealing with thorny issues such as death. Therefore, verbal communication often fails as a key element of dialog; tone of voice can be an aspect that makes people feel empathy and helpfulness, as underscored in the study of Hutchinson et al.[43] The use of humor, silence, interpretation of body language, eye contact and touch remain challenges for digital communication. For example, the use of silence might be misinterpreted by patients as a technological problem.[43]

Despite the physical distance between patients and caregivers, patients said they felt cared for, assisted in a positive way,[42,43,50,52] and were much more comfortable and relaxed when having a consultation or discussion with clinical staff at home;[43] they cited the lack of distraction due to office décor, which made focusing on conversation simple.[43] However, the presence of multiple team participants in real time was slightly intimidating for some patients.[55]

Although physical proximity and eye contact were lacking, some individuals preferred using technology to maintain the relationship with clinicians rather than to initiate it,[55] and some preferred in-person visits over virtual visits.[43,46,55]

Strengths and Weaknesses Perceived by Older Patients in Using Technology at Home

It has been seen that technology has a positive influence on care, improving the quality of assistance,[44,49-51,55] promoting the centeredness of patients,[46,49,50,52] improving their quality of life[45] and making them feel more secure.[42,49,50,54,55] Table 4

Table 3. Barriers and Facilitators in the use of Technology for Communication Between Patients and Clinicians.

Reported Characteristics	Whitten et al[42]	Aoki et al[54]	Slater et al[45]	Lind et al[50]	Lind et al[49]	Bonsignore et al[46]	Paul et al[55]	Maramis et al[48]	Jiang et al[52]	Schoppee, et al[47]	Hutchinson et al[43]	Balasubramanian et al[44]	Absolute Frequency
Facilitators													
Communication of symptoms		x		x	x	x	x	x		x		x	8
Real-time communication		x		x	x	x				x		x	6
Closer to HCPs			x	x	x		x		x			x	6
Feel cared for	x			x					x		x		4
Enhanced communication with HCPs					x		x					x	3
Open discussion						x	x		x				3
Good emotional support						x					x		2
Supports decision making							x					x	2
Addresses needs and concern							x		x				2
Empathic communication											x		1
Positive emotions											x		1
Heard and understood											x		1
Overcomes lack of knowledge of patient to express their suffering										x			1
Voice to patient										x			1
Better patient–clinician rapport									x				1
Comfortable discussing prognosis											x		1
Reduces distractions											x		1
Barriers													
Prefer face-to-face visits	x					x	x				x		4
Feels intimidating							x				x	x	3
Non-verbal communication							x				x		2
Difficult to open up with HCPs at the beginning							x				x		2
Difficulties in understanding humor, silence, body language, eye contact and touch							x				x		2
Lack of physical proximity	x					x							2

Abbreviations: HCPs, Health care professionals.

Table 4. Strengths and Weaknesses in the use of Technology Among Older Adults in Palliative Care at Home.

Reported Characteristics	Whitten et al[40]	Aoki et al[52]	Slater et al[43]	Lind et al[48]	Hachizuka et al[51]	Lind and Karlsson[47]	Tieman et al[49]	Bonsignore et al[44]	Paul et al[53]	Maramis et al[46]	Jiang et al[50]	Schoppee et al[45]	Hutchinson et al[41]	Balasubramanian et al[42]	Absolute Frequency
Strengths															
Feasible and acceptable		x		x	x	x	x	x	x		x	x	x	x	11
Feeling comfortable	x	x	x	x		x		x	x		x		x	x	10
Enhanced efficiency of visits		x	x	x		x	x	x					x	x	8
Improved quality of care	x			x		x	x		x					x	6
Real time feedback		x		x		x		x	x		x				6
Improved access to care	x	x							x		x		x		5
Feeling secure	x	x		x		x			x						5
Avoids long/ expensive trip to hospital		x						x	x		x			x	5
Puts the patient at the center				x		x		x			x				4
Solves problems remotely	x	x		x											3
Automated alerts to HCPs					x		x	x							3
Awareness of symptoms		x		x		x									3
Multidisciplinary									x					x	2
Improves quality of life			x												1
Immediate access to HCPs	x														1
Weaknesses															
Difficulties with dimensions ofscreen/sound	x								x				x	x	4
Technical problems	x						x		x				x		4
Technology literacy													x		1

Abbreviations: HCPs, Health care professionals.

Table 5. Barriers and facilitators in the use of technology perceived by older adults in palliative care at home.

Study	Barriers	Facilitators
Whitten et al[40]	−Problem with initial telehospice setup in the home and with telehospice equipment −Lack of phone service in the patient's home −Approaching technology with so many worries and thoughts already −Poor health conditions	-The frequent use of the system
Aoki et al[52]	Never used technology before	−Living with caregiver −Respect of patients' privacy −Simple enough for non-technical and older adults
Slater et al[43]	ND	ND
Lind et al[48]	−Poor clinical conditions and high symptoms burden −Periods of dizziness or forgetfulness −Technical problems −Management of devices (charging) −Software not suitable for everyone (how to indicate pain location) −Confusion on how use the smartphone and pen	−Caregiver support −Feel the real main character of one's own health −Being able to see the changes over time −Receive information and training on the use of technology −Easy to use technology −A sense of increased security
Hachizuka et al[51]	ND	−User-friendliness of the device and the simplicity of the content −Quickly familiarizing themselves with technology −The input method allowed use of a finger instead of a stylus
Lind and karlsson[47]	−Patient not interested in using and learning technologies −Radical idea of older adults about technology −Patient afraid of new technologies	−Support by caregiver in using technology −Easy to use and tailored technologies for everyone −Instructions on how handle equipment
Tieman et al[49]	−Technology problems −Poor health conditions	−Explanation before starting to use the technology system −Familiarity with technology −User training and user support −The security of the system
Bonsignore et al[44]	Lack of good internet connection	−Receiving instructions and demonstrations on how to use technology −Using personal devices −Short time to complete the electronic assessment −Push-up notification to be reminded to use the app −Good usability, feasibility, acceptability of telehealth −Easy to use application and not time intensive
Paul et al[53]	−The absence of a good internet connection −Lack of trust in internet security and privacy −Increased visit time for set up of technology −Poor sound and picture quality −Patients feel important differences between in-person and WBVC interaction (eg human touch) −Not all patients are comfortable or appropriate for WBVC.	−Previous use of the videoconferencing software for online meetings −Real-time technical support given by the IT personnel −Training in the use of technology by the IT personnel −User-friendly, easily accessible and reliable technology
Maramis et al[46]	ND	Feasible and beneficial for the selected population

(continued)

Table 5. (continued)

Study	Barriers	Facilitators
Jiang et al[50]	−Being outside 3 G/4G coverage −Not able to use technology	−Explanation before starting using technology system −No privacy concerns −Good audio and video quality −Can be used with any personal device
Schoppee et al[45]	−Never used a computer before −Satisfaction of patients had a correlation with age (P = .010), with a statistically significantly lower score than younger	−Have already used computer-based technologies (P = .003) −Receiving instructions about how to use technology −Possibility to use device even without internet cable −Language concise and clear to understand
Hutchinson et al[41]	−Technical interruption −Not so comfortable for older people who can't use technology −Computer illiteracy −Dimension of tablet screen −Limited internet access in rural area −No or moderate experience with technology	Help in using technology
Balasubramanian et al[42]	−Inability to read or comprehend −The absence of a high-speed internet connectivity in the patients' location	ND

Abbreviations: WBVC, web based video conferencing; ND no date.

reports the main strengths and weaknesses of the use of technology perceived by older adult receiving palliative care at home, and Table 5 reports the usability of the tools they used. Overall, patients were satisfied.[42,52]

Most of the technologies described in the studies of this review were judged to be user-friendly by older adults patients with terminal illness receiving at-home hospice care.[42,43,50,53] They reported that the technology was convenient and comfortable in their situations,[52] considering their variable and often poor state of health.[50]

The older adults quickly became familiarized with the technology[49,53,54] when they had previous experience with computers or other devices,[47,51,55] caregivers' support[43,49] and explanations and training before using them.[46,47,50-52,55] Computer illiteracy,[43,47] radical negative ideas about technology,[49] and technical problems[42,43,50,51] were perceived by older adults as barriers to the use of technology.

Remote visits for patients who live far from metropolitan centers, have great importance in reducing the need for travel to face-to-face meetings and improving access to care, as shown in the studies of Whitten et al.,[42] Huchinson et al.,[43] Aoki et al.,[54] Paul et al.,[55] and Jiang et al.[52] This type of care makes it possible for patients and caregivers to avoid long and expensive trips to hospitals, and patients prefer their own homes to the hospital environment to continue to carry out normal activities of daily living.[54,55]

Even with some difficulties in the use of technology due to their age and lack of experience in the use of technology,[52] the older adults quickly familiarized themselves with it.[42,50,53] Problems with the equipment were reported, but were not enough to interrupt its use.

The input with a finger facilitated the use of the device in the study by Hachizuka et al, eliminating the need for a stylus to tap answers on the screen.[53]

Another system used is the digital pen described by Lind and Karlsson. In 2 studies in which subjects found it very easy to handle and overcame their reticence about using the internet. In another study by Lind et al,[50] there were no particular moments that prevented the use of the pen, but patients had some difficulty with the VAS scale for the reporting of pain in the diary.

One of the problems that older adults have found is the dimension of the device screen, which they perceived as a barrier to the use of the device.[42-44,55]

The use of the internet is necessary for almost all devices described, so this may represent a problem for people who live in rural areas with less reliable network coverage.[43,44,46,52,55]

Negative emotions decreased while positive emotions increased following the consultations because patients perceived that they were being totally heard and understood and that they were receiving appropriate emotional support through the technological approach to their care.[44]

Some tools, such as those of Timenan et al.,[51] Bonsignore et al.,[46] and Lind and Karlsson,[49] generated automated alerts when data entered by the patient breached predetermined thresholds; these alerts about emerging patient health issues were sent to health care providers, who could act immediately, preventing unnecessary suffering and potential emergency room visits or hospitalizations.[46,49]

During the end of life stage, compared to in-person visits, remote visits reduced healthcare resource usage (.13 per capita vs 3.88, effect size: 1.34) and hospital admissions (.02 per capita vs .2, effect size = .65); furthermore, performance status AKPS was better preserved (58.24 vs 43.88, effect size = 1.11), and patients experienced reduced symptom burden and distress, as reported in the study by Jian et al.[52]

Another aspect of remote care considered was privacy, which was not perceived as a concern[52,54] except in a study by Paul et al.,[55] in which older adult individuals expressed skepticism about the identity of distant clinicians.

Discussion

This study spans a wide range of publication years showing an evolution in the technologies used but finding that all had a positive impact on care, even in years when the technology was new, and especially new to the older adult population. We continue to assume that the older adult population is not capable of utilizing technology and that it is a hindrance to them. This review points out how the trend is changing; even older adults feel comfortable with the use of technological tools that are often far from their aptitudes. This is not a point in life when a person easily learns how to use new technologies, but nevertheless, in almost all studies, older people showed great openness to this new approach to care.

From the simplest video calls to remote symptom monitoring systems without the need for calls, technology is able to connect clinicians and patients in even the most remote rural areas. This makes available a health service far from people's homes, ensuring homogeneous and equitable access to care. In telepalliative care, the technology offers individuals the opportunity to spend the last days of their lives, even the most critical and difficult moments, at home in familiar surroundings with family and friends but still protected by direct and constant contact with clinicians. The preference for eye contact with their clinicians, concerns about privacy, and doubts about who is on the other side of the screen are aspects that could cause patients to lose confidence in health care professionals but, more importantly, these aspects of remote care may leave out a fundamental part of palliative care, which is the aspect of humanization.

In addition, the continuous monitoring of health status and symptoms of patients at home prevents unnecessary prolonged suffering over time and potential emergency room visits or hospitalizations.[46,49]

The involvement of patients in reporting their symptoms empowers them and increases their participation in their care. They become more aware of the progress of their illness with the highest honesty from their care providers; furthermore, there is a dual intention of these tools, which is not only to highlight a worsening of symptoms so they can be treated but also to provide the patient with the possibility of immediate responses to alleviate pain or other problems.[50]

Patients look for simple systems that are suitable for them, for their frailty and progressive deterioration and make their lives easier and more protected; in addition, there is certainly a need for them to receive information about how devices and software work and what value they add to their lives.[50] The training and the instructions are fundamental as well as the support of their caregivers to better use technology at home and to guide them into a new and unexplored world. This review has several limitations. As a scoping review, our objective was to provide a comprehensive description of all available information, which led us to include studies without conducting a formal quality assessment. Furthermore, of the included studies, only 4 exclusively considered the elderly population. The studies that considered different age groups instead may not have been sensitive enough to capture the exclusive specificity of elderly individuals.

Conclusion

This study highlights how older adult are using technological tools to communicate with the world around them. Even in a situation of frailty and complexity such as the end of life, technology can support older adults patients in palliative care at home. These patients perceive these tools as a means to efficient health care by clinicians. Future research should address the development of more appropriate tools for older adults and terminally ill population, considering that over time, the digitized population may grow and change. Details about what older adults look for in a technological tool and their expectations about how those tools can be integrated with care delivery should also be topics for future research.

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ORCID iDs

Ilaria Basile https://orcid.org/0000-0002-9033-9934
Letteria Consolo https://orcid.org/0000-0002-7207-2586
Stella Colombo https://orcid.org/0009-0008-9900-7080
Daniele Rusconi https://orcid.org/0009-0007-0450-2605
Flavia Rampichini https://orcid.org/0009-0005-4456-3109

Supplemental Material

Supplemental material for this article is available online.

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