

Telemedicine in palliative care: a review of systematic reviews

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Abstract

Aims. To evaluate the quality of systematic reviews on telemedicine applications in palliative care.

Methods. A structured literature review was conducted to identify systematic reviews dealing with telemedicine in palliative care; the AMSTAR (Assessment of Multiple Systematic Reviews) checklist was used to appraise the evidence related to the systematic reviews.

Results. 405 records were initially identified; of these 14 were eligible for full-text analysis. In summary, the research strategy allowed the identification of 6 reviews to be included which showed a medium quality (AMSTAR score in between 4 and 7). All the included systematic reviews considered telemedicine applications as a feasible means to be used in palliative care; however, the positive findings are counterbalanced by several critical issues mainly related to the evidence from the primary studies included in each single review.

Conclusions. Results of this first attempt to appraise the evidence in the field of telemedicine applications in palliative care highlighted that there is still limited evidence related to this approach. Strengths and weaknesses that impact on the general quality of the reviews were identified and relevant points to be taken into account for future research were suggested.

Key words

- palliative care
- telemedicine
- systematic review
- quality assessment
- AMSTAR

INTRODUCTION

The World Health Organization (WHO) defines palliative care as an “approach that improves the quality of life of patients and their families facing the problem associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial, and spiritual” (www.who.int/cancer/palliative/definition/en/).

Palliative care and hospice care are sometimes confused and often used interchangeably. However, differences exist between the two approaches [1, 2] with respect to main goals, providers, logistics, reimbursement policy, eligibility, and so on [3]. For the purposes of this review, it is worthy to point out the main difference between palliative and hospice care. Palliative care can be given at the same time as treatments meant to cure or treat the disease and, most important, may be delivered at different stages of the illness (*i.e.* when the illness is diagnosed, throughout treatment, during follow-up, and at the end of life). Hospice care in most cases begins after treatment of the disease is stopped or, even when continued, it is much less effective, and when it

is clear that the patient is not expected to survive the illness for more than 6 months.

Since the focus of this study is centered on end-of-life care in general, *i.e.* without being restricted to the last 6 months of life, this review uses the term palliative care, hereby including both palliative and hospice care delivered at the final stage of illness, and taking into account all the possible environments and settings where both palliative and hospice care might be delivered, *i.e.* homes, hospitals, nursing homes, hospice centers. This approach is consistent with indications coming from some international initiatives aimed at encouraging the use of the term palliative care for both palliative and hospice care [4]. Aside from the environment, the focus is mainly centered on comfort and support to patients as well as caregivers and families.

A recent Cochrane systematic review highlighted that, despite the lack of evidence about cost-effectiveness of treatment, home palliative care increases the chance of dying at home and reduces symptom burden in particular for adult patients with cancer [5]. Another recent systematic review, aimed at identifying preferences for palliative care among patients in the terminal phase of their illness highlighted that patients would

like palliative care to help them achieve “living a meaningful life” [6].

At least in industrialized countries, with the increasing elderly population and prevalence of chronic comorbidities, the need for palliative care has increased and its provision is becoming longer-lasting and increasingly complex [7]. People are living increasingly longer during the terminal phases of life, often with cancer and other chronic diseases. Consequently, the number of patients needing palliative care will continue to increase [6]. Some international initiatives, such as The Global Atlas of Palliative Care at the End of Life, are in place to advocate for the inclusion of palliative care in the global, regional and national health agendas [8]; in Italy, since 2010 access to palliative care and pain management is regulated by a national law (n. 38 - March 15th, 2010) which also calls for the implementation of a national network where all the main actors involved in the care delivery process should cooperate in order to assure adequate levels of health care continuity from the hospital to patient's home [9].

Despite the importance placed on palliative care, these services will also have to cope with the current economic constraints that has led to general austerity in all policies including health policies, with severe restrictions on public health care; avoiding unnecessary admissions and shortening hospital stays are rapidly becoming urgent priorities [10].

As for the quality of care during the last phase of life, the literature indicates that it is likely to increase when a multidisciplinary team not only provides medical interventions but also involves patient and family perspectives in a multidimensional approach [11]. Thus, the use of telemedicine in the field of palliative care seems to be a relevant approach in order to cope with increasing challenges in palliative care services, since telemedicine is considered to increase the efficiency of the services provided while at the same time containing the associated costs. However, despite potential positive effects, some studies raised concerns [12] related to the implementation of palliative services by means of telemedicine technologies.

As with other innovations in care delivery, systematic reviews of the scientific literature are useful tools to summarize the evidence relating to many aspects concerning innovative interventions such as the clinical efficacy, feasibility and its possible sustainability; rigor and the systematic methods according to which they should be conducted are aimed at minimizing bias, thus providing more reliable findings from which conclusions can be drawn and decisions made [13]. However, usefulness of the information reported is strictly related to quality of such review studies [14].

The aim of this paper is to investigate and discuss the quality of the current evidence related to published systematic reviews dealing with telemedicine applications in palliative care; the goal is to identify current strengths and weaknesses that impact on the general quality of the reviews, thus identifying relevant points to be taken into account for future research. A systematic review of systematic reviews will then be conducted since it's considered a useful tool to inform policy-makers, cli-

nicians and researchers since such a tool provides an evidence-based summary related to a specific issue to be investigated [15]. The focus in this review will be on the pathology, the specific technology involved in the remote care if the review addressed or specified one, and the environment/setting the care took place (home/hospital/nursing home/hospice center). Whenever the quality of the retrieved systematic reviews is adequate, reliable findings are detailed and discussed as well.

MATERIALS AND METHODS

Search strategy and eligibility criteria

Systematic reviews describing telemedicine applications in palliative care were retrieved by querying the following scientific databases starting at the earliest date available for each database and ending in April 2015: i) Medline; ii) CINAHL; iii) Cochrane Library; iv) Database of Abstracts of Reviews of Effects (DARE); v) PsychINFO. These databases were queried for articles using a combination of keywords which are reported in *Figure 1*. A systematic review was included if it met the following criteria [13]: 1) a set of clearly formulated research objectives or questions are defined, as well as clear and defined eligibility criteria for the selection of relevant studies; 2) a well defined and reproducible methodology is described and applied; 3) a systematic search strategy is defined and implemented; 4) a systematic presentation, analysis, and synthesis is presented concerning the main information extrapolated by the analysed articles. In addition to the former points, reviews were included if they described the palliative intervention in the terminal phase of life only; thus articles describing telemedicine applications in multiple stages of a pathology (acute, chronic, terminal phase) were excluded; this choice was based on the consideration that such articles most likely report results in an aggregated form, thus making it impossible to extrapolate results related to the terminal phase only.

The main steps of the search phase are reported in *Figure 1* using the PRISMA flow diagram [16]; after using the selected keywords, the entire set of records was analysed to identify duplicate articles retrieved from different sources; then titles and abstracts were used to exclude articles which were not systematic reviews or reviews dealing with multiple stages of the investigated pathology. The remaining articles were finally assessed in full text to ensure they met the eligibility criteria for inclusion.

Data analysis

AMSTAR

The authors have recently applied the AMSTAR (Assessment of Multiple Systematic Reviews) checklist to appraise the evidence related to telerehabilitation services [17] and this tool was considered suitable for the purposes of the present study; details, strength and limitations related to the application of the AMSTAR checklist are reported elsewhere [17-19]. Two reviewers (MR, CG) independently rated study quality using the 11-item AMSTAR checklist; where differences were noted, these were resolved by discussion between the two reviewers, and where agreement could not be reached, the

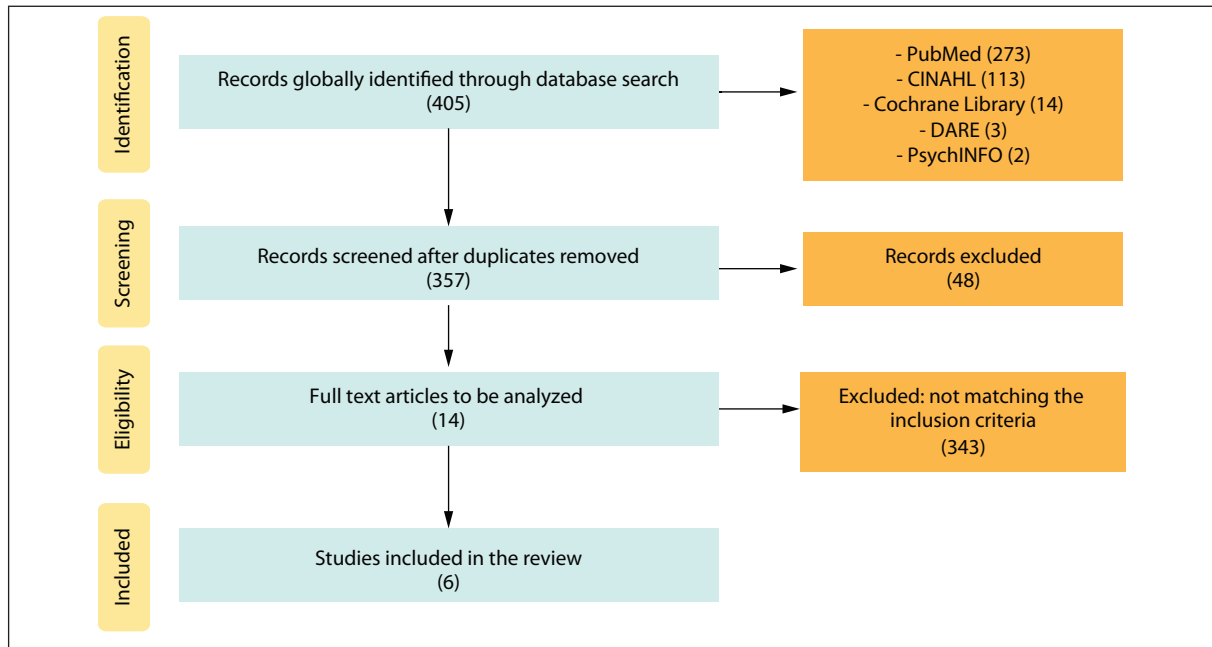


Figure 1

The PRISMA flow chart of the included reviews. Scientific databases were queried by using the following set of keywords: (((((((((Telemedicine) OR telecare) OR telemonitoring) OR telehealth) OR telehomecare) OR tele-homecare)) AND (((palliative care) OR terminally ill) OR terminal care) OR end of life care)))

third reviewer solved the discrepancies (MG). The quality assessment of each review was computed by globally summing positive rates, with higher scores indicating a higher level of methodological quality. As reported elsewhere, an AMSTAR score in between 4 and 7 indicates medium quality, while a score equal to or higher than eight is considered to indicate a high-quality review [20, 21]. Finally, each item of the checklist was individually analysed (AMSTAR matrix analysed by columns) to identify which items future research should focus on in order to improve the quality of reviews.

Analysis of findings

For each included review, the following information was extrapolated: i) quantification of the quality of the review; ii) pathology addressed, iii) technology used, iv) place/facility where palliative care was delivered (hospice center, patient's home, hospital, nursing home, etc.), v) number of citations, vi) number of included studies, vii) period covered by the review; viii) year of publication, ix) main study findings. According to the methodology authors applied in a former study [17], the focus was on the reviews that had high AMSTAR scores, *i.e.* an AMSTAR score higher than or equal to eight. If the body of literature did not allow a quantitative synthesis of the evidence, key findings of each single review would be narratively reported [22]. In particular, key benefits for patients, health professionals and caregivers were highlighted when reported in the review.

RESULTS

405 records were initially identified, which resulted in 357 different articles screened after the elimination of

48 duplicate items which were retrieved in more than one database. Of this, 343 articles were excluded since, on the basis of analysis of title and abstract, they could not be classified as systematic reviews. 14 articles were then analysed full-text and 8 were excluded since they either did not properly deal with the aims of the current study or their full-text did not comply with the inclusion criteria. In summary, the research strategy allowed the identification of 6 reviews to be included. *Table 1* reports on i) the list of journals where the included reviews were published, ii) year of publication (Period covered by the review); iii) range of publication year of the included studies; iv) number of references (total number of included studies).

Year of publication ranged from 2007 to 2014, indicating that the field of evaluation in telemedicine for palliative care is quite recent. The six systematic reviews synthesized evidence from 96 original articles in total, excluding duplicates, where patients were cared for by telemedicine applications. *Figure 2* reports on the distribution of studies over time (range 1997-2012).

With respect to the population who received remote palliative care, all the included reviews dealt with adults, except one which was aimed at investigating telehealth applications in paediatric palliative care [27]; however authors of the considered review also included primary studies addressing adult-focused care because findings might be relevant to the care of children as well.

With respect to the generalizability of the findings, one review investigated the evidence of telehealth applications in palliative care delivered in one single country, United Kingdom in detail [26].

Other characteristics of the included reviews are re-

Table 1

Details of the included set of systematic reviews in terms of: i) the title of the journal where the review is published; ii) year of publication (period used in the search criteria); iii) range of years of publication of the studies included in the review; iv) number of citations; v) total number of the included studies

Ref.	Journal title	Year of publication; [period covered by the review]	Range of years of publication of the included studies	Number of citations	Total number of included studies
[23]	<i>Telemedicine and eHealth</i>	2011; [2000-2010]	2000-2010	37	26
[24]	<i>Journal of Medical Internet Research</i>	2014; [till June 2012] ¹	2004-2012	28	17
[25]	<i>Journal of Medical Systems</i>	2007; [1966 - till 2005] ²	2000-005	12	6
[26]	<i>Journal of Telemedicine and Telecare</i>	2010; [1999-2009] ³	1997-2009	46	20
[27]	<i>BioMed Central Palliative Care</i>	2013; [till 02-2012]	1998-2012	46	33
[28]	<i>Journal of Comparative Effectiveness Research</i>	2012; [1980-2012]	2001-2011	19	11

¹Authors only reported that the search was conducted in June 2012.

²Authors searched Medline (1966-2005), PsycINFO (1967-2005) and CINAHL (1982-2005).

³Authors stated that electronic database searches ran from 1999 until 2009, but one article published in 1997 was included as well.

ported in *Table 2*. One study was focussed on one specific pathology (cancer [28]) while the others did not specify this aspect. Two reviews specifically investigated the home setting for palliative care delivery [27, 28], while the remaining four did not address this aspect. Two reviews were specifically focussed on hospice care [23, 25], while the others globally referred to palliative care without any further specification.

As for the technology, one review highlighted that the technology used comprised a variety of different instruments, including telephone advice lines, videophones, personal digital assistants, pen tablets, and computers [23]; one article investigated the use of internet applications in hospice care [25] and one review was focussed on the utilization of telephone for cancer population [28]. Two reviews investigated the application of telehealth to palliative care but did not specify the defini-

tion or connotation of its meaning in terms of technology involved [26, 27]; of these, one only focussed on real-time telehealth in home setting [27]. One review used the term eHealth to include any information and communication technology designed to conduct measurements, enhance communications, or deliver relevant information for patients, caregivers, or health care providers [24].

Quality assessment

Table 3 reports on the AMSTAR score for each question included in each review, the overall AMSTAR score for each review and the total score for each single item of the checklist. The six systematic reviews resulted in a median AMSTAR score of 5.5 (interquartile range 5-6); none of them reached the threshold of eight to be considered a high quality review. Analysing each item of the AMSTAR checklist (analysis by columns), it can be noted that all the included reviews:

- provided a clear a priori design (Q-1);
- performed a comprehensive literature search (Q-3);
- reported the list of the included studies addressing their characteristics as well (Q-6).

Five out of the six reviews clearly reported that independent reviewers were used for selecting studies and extracting data (Q-2). Four out of the six explicitly reported a clause concerning the absence of any conflict of interest (Q-11) and for the remaining two reviews the above condition can be assumed since, according to the journal publication policies, prior to publication, authors are asked to disclose all relationships or interests that could have direct or potential influence or impart bias on the work. Two reviews considered the publication status as inclusion criteria, investigating the scientific and the grey literature as well (Q-4). As for the scientific quality of the included studies, it was assessed and documented by two reviews (Q-7). One review out of six provided the list of both the included and excluded studies (Q-5). As for the latter item, two out of the six reported just the number studies that were

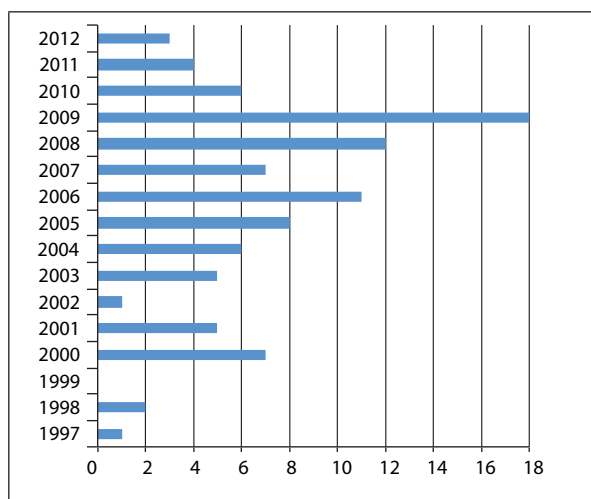


Figure 2
Distribution over time of the 96 primary studies/original articles extrapolated from the set of the six systematic reviews included.

Table 2

Characteristics of the included studies; details are reported in terms of disease/multiple diseases, year of publication (period covered by the review), technology used in the application, setting (hospital/home/hospice), number of references (total number of included studies) and main study findings

ID/ reference	Disease/ multiple diseases	Technology	Setting (hospital/ home/ hospice)	Main study findings
[23]	NI	See note 1	Hospice	Several technologies may be of use for telehospice, stakeholders (staff, patients, and family members) are interested and acceptance in use is increasing; there are potential clinical outcomes and cost benefits. If hospices want to invest in telehospice technology, then the evidence needs strengthening.
[24]	NI	See note 2	NI	The review highlighted: 1. the need to formally evaluate the effectiveness of eHealth technologies; 2. as for the efficacy of eHealth interventions in palliative care some studies reported positive results in terms of quality of care, communication, and cost savings, but since they were all observational or quasi-experimental studies, risk of bias is significant; 3. in terms of user needs, the most frequent issue was knowledge about pain management. This need was prevalent not only with patients and informal caregivers, but also health care professionals not specialized in palliative care. The review also highlighted the lack of information about the use of eHealth for palliative care in developing countries.
[25]	NI	Internet (from a general point of view)	Hospice	None of the discussed studies followed the design of a randomized clinical trial and thus, effectiveness of web based interventions is not documented. However, the implications of Internet-based interventions were, overall, positive. Patients using the Internet to report pain had more contact with their providers. Providers were able to access information quickly, through journals and online training opportunities, and apply what they have learned to their practice. Patients reported finding support groups and other information helpful as well. Caregivers looked for information and support.
[26]	NI	Telehealth	NI	In UK the most common applications included dedicated out-of-hours specialist advice or support telephone lines. Concerns remain over the staffing for such services, emphasizing the need for appropriate infrastructure to support such telehealth services. The use of telehealth in education in the UK appears to be gaining acceptance and has also been shown to be a valuable and cost-effective means of learning and information exchange. Many of the applications reported appear to hold advantages for direct patient care by improving the patient and carer experience, clinical practice and health service delivery. Telehealth can provide faster access to health professionals, better use of time and improved efficiency of service delivery. Little is known, however, about the clinical benefits of many telehealth initiatives and how they relate to existing systems of care.
[27]	NI	Real-time home based telehealth	Home	Telehealth has been demonstrated to be a feasible and effective method of delivering information, education and support. The full potential of telehealth applications has not been realised and the use of telehealth to support palliative care patients being cared for at home requires further investigation. Over the last decade a number of studies have attempted to measure the outcomes of telehealth applications in the home setting afore mentioned population. The inability of these studies to establish effectiveness demonstrates the difficulty of measuring an effect of an intervention such as telehealth in palliative care.
[28]	Cancer	Telephone	Home	Telephone follow-up was a feasible alternative to traditional hospital follow-ups for assessment of symptom palliation. There were fewer burdens on the patient, allowing for a better maintenance of the quality of life and lower rates of attrition in clinical trials. Patients had an overall positive opinion of the use of this alternative approach with no common disadvantages. A combination of follow-up strategies, such as clinic follow-up and telephone contact for those not attending, may result in a more comprehensive assessment.

¹ Studies assessing the use of telehospice included the evaluation of telephone advice lines, videophones, personal digital assistants, pen tablets, and computers.

² The article investigated eHealth applications with the following meaning: eHealth interventions as any information and communication technology designed to conduct measurements, enhance communications, or deliver relevant information for patients, caregivers, or health care providers.

NI: not investigated.

excluded, while a list of the included studies only was found in the remaining three reviews. One out of the six appropriately used the scientific quality of the included studies in formulating conclusions (Q-8); four couldn't address Q8 because did not evaluate the quality of the

included studies while one did not use this information for drawing conclusions.

None of the reviews:

- used appropriate methods to combine the findings of the included studies that addressed the heterogeneity

Table 3

AMSTAR score by each of the included systematic review : y = yes, n = no, c = can't say. Each item scored "yes" is assigned one point; the total score is computed by summing each raw

ID/ reference	1 Was an 'a priori' design provided?	2 Was there duplicate study selection and data extraction?	3 Was a comprehensive literature search performed?	4 Was the status of publication (i.e. grey literature) used as an inclusion criterion?	5 Was a list of studies (included and excluded) provided?	6 Were the characteristics of the included studies provided?	7 Was the scientific quality of the included studies assessed and documented?	8 Was the scientific quality of the included studies used appropriately in formulating conclusions?	9 Were the methods used to combine the findings of studies appropriate?	10 Was the likelihood of publication bias (a.k.a. "file drawer" effect) assessed?	11 Was the conflict of interest stated?	Total
[23]	y	y	y++++	n*	n***	y	y+	y	n++	n**	y	7
[24]	y	y	y	n*	y	y	n	n^	n++	n**	y	6
[25]	y	y	y	n*	n^^	y	n	n^	n++	n**	n+++	4
[26]	y	y	y	y	n^^	y	n	n^	n++	n**	n+++	5
[27]	y	c^^^	y	y	n***	y	y	n^^^	n++	n**	y	6
[28]	y	y	y	n	n***	y	n	n	n++	n	y	5
Total	6	5	6	2	1	6	2	1	0	0	4	

*Only scientific articles, grey literature was not investigated.

**Publication bias was considered but not evaluated.

***The review provided the list of the included studies only.

+ A proper methodological quality assessment was not performed; rather articles are rated for their methodological rigor.

++ The heterogeneity of the included studies was not investigated.

+++ The absence of conflict was not clearly stated, anyway authors are asked to declare it during the submission phase.

++++ Only two scientific databases were searched.

^ Study quality was not evaluated.

^^ The review provided the number of excluded studies only, not the list.

^^^ Quality of the included studies was evaluated but not used for drawing conclusions.

^^^^ The presence of at least two reviewers was not specified.

as well (Q-9); in fact none of the included studies performed a meta-analysis;

- assessed the likelihood of the publication bias (Q-10); five out of the six qualitatively discussed possible sources of bias but none of them quantified it.

Main findings of the studies

All the included systematic reviews showed a medium quality (AMSTAR score in between 4 and 7) but none of them reached the threshold of eight so to be considered as an high quality level; since the identified literature did not allow a quantitative synthesis of the evidence, key findings of each review are reported in Table 2 and are here narratively synthesized.

All the included systematic reviews considered telemedicine applications as a feasible means to be used in palliative care; in fact these applications may result in potential clinical effectiveness [27], cost benefits [23] and cost savings [24], and increased quality of care and communication [24]. Internet use in the specific context of hospice care was considered beneficial since patients had more contacts with their providers when reporting pain, caregivers found information and support related to care delivery, care providers were able to quickly access scientific information and online training opportunities [25].

The systematic review which investigated telehealth

applications in palliative care in the United Kingdom only highlighted that it appeared to gain acceptance from patients, caregivers and health professionals, and showed also that it was a valuable and cost-effective means of learning and information exchange, of providing faster access to health professionals, and of improving efficiency of service delivery [26].

As for the technological issues, it seems note-worthy that telephone follow-up is considered a feasible alternative to traditional hospital follow-ups for assessment of symptom palliation in a cancer population [28].

However, the previous positive findings are counterbalanced by several critical issues mainly related to the evidence from the primary studies included in each single review [23]; one of the systematic reviews highlighted that none of its primary studies followed the design of a randomized controlled trials [25], and a second one [24] pointed out a risk of bias since almost all its primary studies were observational or quasi-experimental trials. In addition to the former points, a general lack of evidence for effectiveness was reported and felt to be related to the difficulties of measuring the effects of telehealth interventions in palliative care [27]. With specific reference to the United Kingdom [28], the review highlighted a general lack of information about the clinical benefits of telehealth initiatives and on how they relate to existing systems of care [28];

the review also pointed out some concerns over the staff management of such services since most of them were based on an out-of-hours specialist advice or support telephone lines.

DISCUSSION

Considering the growing interests in both the fields of telemedicine and palliative care, evaluating the quality of evidence concerning telemedicine technologies to be applied in the last phase of life is crucial in order to identify possible fields of intervention with the related modalities. To our knowledge the present overview of systematic reviews is the first attempt to quantitatively assess the quality of systematic reviews on telemedicine in palliative care.

This review drew on established systematic review methodology to ensure rigour by minimising the risk of bias [13]. From the information reported in *Table 1*, since each review was published in a different journal, the bias coming from the journal selection is minimized.

Results of the present overview suggest that there is a still limited evidence concerning telemedicine applications in the field of palliative care; in fact, of the six systematic reviews that matched the inclusion criteria none of these, when scored with the AMSTAR checklist, reached the threshold of eight in order to be considered a high quality review. The main factors having an impact on the general quality of the included reviews can be here summarized in the following way:

- lack of appropriate methods to combine the findings of the included studies and to properly address their heterogeneity (0/6);

- lack of quantification of the likelihood of the publication bias (0/6); almost all (5/6) of the included reviews, in fact, did discuss possible sources of bias but did not quantify this aspect;

In addition to the former points and in order to encourage an increase in quality, it is suggested that future systematic reviews on the topic should:

- adequately quantify the scientific quality of the included studies, using this characteristic to properly formulate the study conclusions;

- provide a list of both the included and excluded studies;

- consider the status of publication (*i.e.* peer review journal, grey literature, etc.) to be used as an inclusion criterion, investigating the grey literature as well; in fact, it should be considered that failure to identify unpublished trials is considered to potentially affect the results of a systematic review [13]. Results of the present overview highlight that the following points have a positive impact on the general quality of each of the included review: i) the provision of a clear a priori design (6/6), ii) the conduction of a comprehensive literature search (6/6), iii) the presence of the list of the included studies reporting the their characteristics as well (6/6). In addition of the previous aspects it should be considered that only one review did not clearly highlight that independent reviewers were used in the selection and data-extraction phase.

As with other fields of application, palliative care telemedicine is considered a feasible and useful means having a potential clinical effectiveness, the capability of

increasing the quality of life and having also a potential positive impact on costs related to the service of care delivery. However, the former positive aspects should be considered with caution since the present overview addressed that there is still limited evidence related to this approach. In addition to the former considerations it seems note worthy that the included systematic reviews highlighted several criticalities related to methodological aspects having an impact on the quality of the primary studies included in each single review. With respect of the last point it seems important to underline the peculiarities of palliative care that renders this kind of clinical application difficult to quantitatively evaluate. For example, there are intrinsic difficulties in measuring the effects of palliative care interventions – provided either traditionally or by means of ICT– in terms of clinical benefits. In fact, the focus of such applications is related to several domains other than the clinical symptoms, such as patient and caregiver comfort, physiological and emotional status, quality of life, education and information sharing among the main actors involved in the care process (the latter being particular to telemedicine applications). Finally it is still unclear how telehealth initiatives in palliative care relate to existing systems of care since services also rely on out-of-hours specialist advice or support.

Limitations of the study

The authors conducted a rigorous and comprehensive electronic search focussed on the scientific literature only. However, mainly due to time and resource limitations, neither the grey literature nor the regulatory-body websites nor Health Technology Assessment databases were investigated; former points may be considered as possible sources of bias since it is hypothesized that unpublished trials may affect the results of a systematic review.

In addition the present study takes into account all the systematic reviews specifically addressing palliative care in the terminal phase of life thus excluding all those dealing with the description of telemedicine applications in different stages of illness; this point, on one hand avoided the inclusion of aggregated data related to different stages of the illness but, on the other hand, may have reduced the number of studies that could be analysed.

It should also be considered that authors' choice of conducting a systematic overview may have led to results potentially not reflecting the trend related to the most recent initiatives in palliative care as mentioned in the introduction; this is mainly due to the delay secondary studies are published in the scientific literature. In fact, as pointed out in *Figure 2*, latest reviews included in the present study were published in 2012 indicating that systematic reviews including primary studies on telemedicine applications in palliative care following a modern approach [4] are still missing.

CONCLUSIONS

The aim of this overview was to investigate and discuss the quality of the current evidence related to systematic reviews dealing with telemedicine applications

in palliative care. Results of this first attempt to appraise the evidence in this field highlighted that there is still limited evidence related to this approach. In fact, only six systematic reviews matched the inclusion criteria and none of them were of a high quality level. Strengths and weaknesses that impact on the general quality of the reviews were identified and relevant points to be taken into account for future research were suggested. We hope that this type of analysis contributes to generally increase the quality of incoming scientific papers

synthesizing evidence in this promising applications.

Conflict of interest statement

There are no potential conflicts of interest or any financial or personal relationships with other people or organizations that could inappropriately bias conduct and findings of the study.

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