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RESEARCH ARTICLE

Effectiveness of telemedicine use to improve patient outcome in cancer patients: A narrative review

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Keywords

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Abstract

Background: Cancer as a chronic disease requires special attention and intensive care to all aspects of treatment. Besides, in a crisis like the ongoing COVID-19 pandemic, telemedicine is beneficial for healthcare, including patient care in cancer. **Objective:** This review aims to explore the different types of telemedicine interventions that effectively improve patient outcomes and describe their effectiveness in improving these outcomes. **Method:** This study was a narrative review with articles retrieved from PubMed and Scopus databases according to inclusion and exclusion criteria. **Result:** A total of 26 articles was analysed in this study. The most effective form of telemedicine was mHealth, followed by web or internet-based, with the majority of activities replaced by telemedicine being monitored and followed up. **Conclusion:** Telemedicine is effective in improving cancer patient outcomes. This study can be considered for telemedicine implementation in Indonesia.

Introduction

Chronic conditions of noncommunicable diseases (NCDs) such as cancer can lead to longterm and lifetime treatments, potentially leading to an economic burden for the patients (Bloom *et al.*, 2015), resulting in ineffective patient outcomes, specifically clinical and other outcomes such as adherence, satisfaction, and knowledge (Schoders *et al.*, 2017). In 2019, telemedicine use only reached 11%, whilst in 2020, it increased to 76% and resulted in 80 new devices approved by the Centres for Medicare & Medicaid Services (CMS) (Bestsenny *et al.*, 2020). Furthermore, in a crisis like the ongoing COVID-19 pandemic, with contact restrictions, telemedicine has become an essential asset for the healthcare industry (Vidal-Allabal *et al.*, 2020). The development of telemedicine in healthcare is expected to improve cancer patient outcomes effectively. Pharmacists, as healthcare providers, have to contribute optimally in cancer patient care with the new digital technology, particularly in the COVID-19 pandemic. Based on the above reasoning, telemedicine is a beneficial

technology to improve patient care in cancer disease in the future.

Method

Study design

A narrative review method was undertaken to identify the effectiveness of telemedicine use in cancer patients to help improve patient outcomes. Search terms related to the query study had been adjusted to a narrative review writing.

Selection and data extraction

A literature search was conducted in PubMed and Scopus databases using the Boolean search method. The keywords entered were (Telemedicine OR Telepharmacy) AND (Cancer OR Oncology) AND (Symptoms OR Knowledge OR Satisfaction OR Adherence OR Clinical Outcome); alternative keywords were (Telemedicine OR Telepharmacy) AND (Cancer OR Oncology) AND (Symptoms OR Knowledge OR

Satisfaction OR Adherence OR Clinical Outcome) AND COVID-19, which resulted in a total of 2813 articles (n=2813). Articles were then filtered by year, study type, and full-text availability. Duplicates were removed, and articles were selected based on title, abstract, and the determined exclusion and inclusion criteria. Selected articles were again screened based on the title and abstract, and full-text articles were retrieved for data interpretation and analysis. Figure 1 shows the pattern

of selection and data extraction. The focus point of the selected papers was the technology used for the clinical interventions.

Inclusion and exclusion criteria

Table I displays the inclusion and exclusion criteria used in this article.

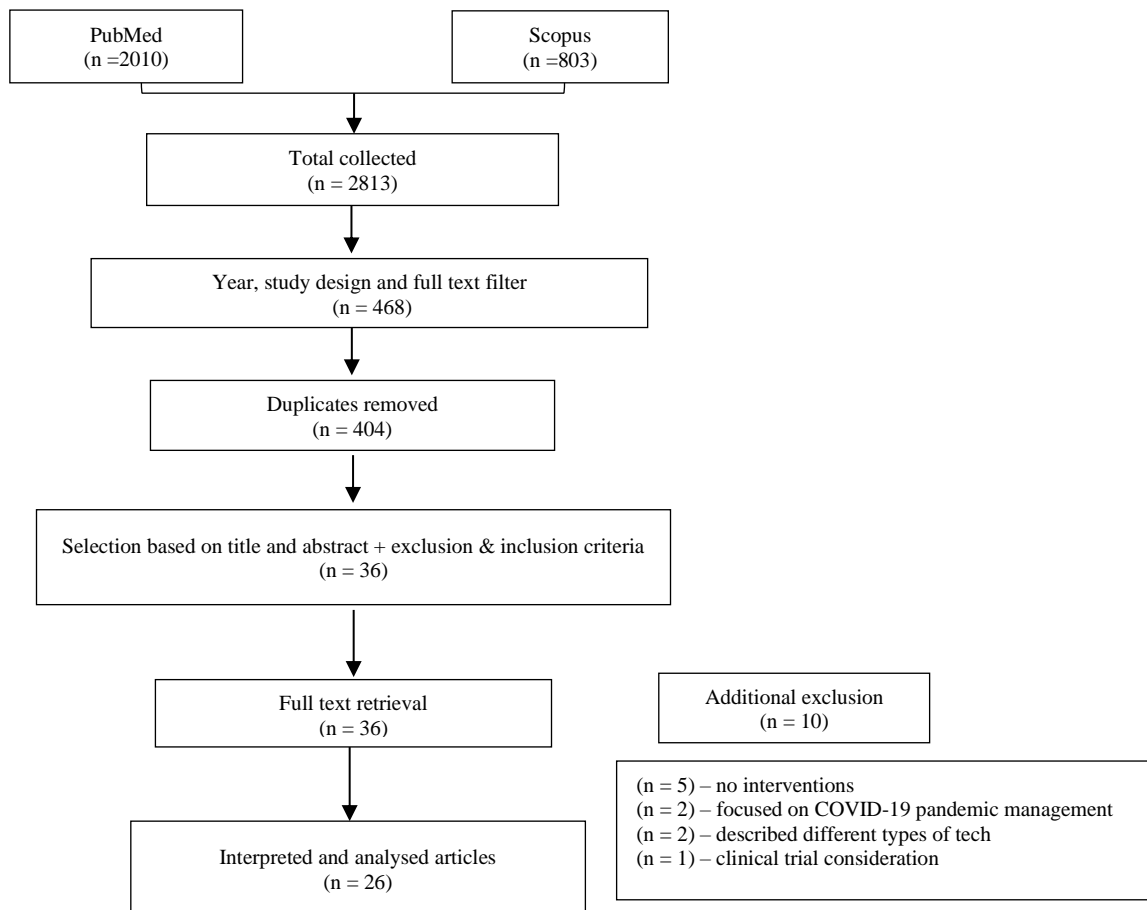


Figure 1: Selection and data extraction

Table I: Inclusion and Exclusion criteria

| Inclusion criteria | Exclusion criteria |
|---|---|
| The population used in the article involves cancer patients. | The article is not in full text. |
| The focused intervention provided in the article is any form of digital treatment that involves roles of pharmacist. | The focused interventions mainly involve health professionals other than pharmacists. |
| The article analyses patient outcome for example but not limited to clinical outcome, knowledge, patient adherence, patient satisfaction rate, and symptoms management. | The articles discuss health technology that has not been implemented to patient use. |
| The article is either an original article and uses research methods that include interventional study, feasibility study, randomized-controlled trials, or the article is in the form of a meta-analysis, or systematic review. | |
| Article is published between 2015-2021 | |
| The article is in English or Indonesian | |

Results

Article characteristics

Table II describes the distribution of article characteristics in this research. Most of the 26 analysed articles were randomised controlled trials (RCTs) involving interventions longer than six months. Long durations were usually owed to the need to follow the whole process pre, during, and post-chemotherapy, where interventions were focused on symptom management, providing pre and post-test.

Types of intervention

Table III shows the different types of telemedicine interventions among cancer patients in the analysed

papers. The types of intervention were divided into two sub-topics, i.e., the technology used and the activity in which it was used. Most types of technology interventions found in this study were synchronous, although asynchronous forms were also found. Synchronous and asynchronous forms found in this article were distributed between the types of intervention groups. Interventions were divided into six groups, mHealth, video conferencing, telephone-based, e-mail-based, web and internet-based, and emerging technologies. Activities consisted of three main groups, i.e., consultations, monitoring/follow-up, and prescription/dispensing/drug delivery services.

Table II: Article characteristics

| Characteristics | Number of articles (n=26) | Author(s) |
|---------------------------------|---------------------------|---|
| Type of study | | |
| Systematic review | 7 (26.92%) | Agboola <i>et al.</i> , Buneviciene <i>et al.</i> , Cheng <i>et al.</i> , Cho <i>et al.</i> , Cox <i>et al.</i> , Larson <i>et al.</i> and Pang <i>et al.</i> |
| Randomized-controlled trial | 10 (38.46%) | Ariza-Garcia <i>et al.</i> , Buchanan <i>et al.</i> , Eldeib <i>et al.</i> , Fjell <i>et al.</i> , Hou <i>et al.</i> , Kim <i>et al.</i> , Livingston <i>et al.</i> , Mooney <i>et al.</i> , Spoelstra <i>et al.</i> and Wheelock <i>et al.</i> |
| Interventional study | 7 (26.92%) | Barsom <i>et al.</i> , Chen <i>et al.</i> , Darcourt <i>et al.</i> , Duman-Lubberding <i>et al.</i> , Hamilton <i>et al.</i> , Innominato <i>et al.</i> and Mette <i>et al.</i> |
| Feasibility study | 2 (7.69%) | Anderson <i>et al.</i> and Fortier <i>et al.</i> |
| Duration of intervention | | |
| < 6 months | 9 (34.61%) | Kim <i>et al.</i> , Anderson <i>et al.</i> , Livingston <i>et al.</i> , Spoelstra <i>et al.</i> , Barsom <i>et al.</i> , Darcourt <i>et al.</i> , Fjell <i>et al.</i> , Innominato <i>et al.</i> and Fortier <i>et al.</i> |
| ≥ 6 months | 6 (23.08%) | Chen <i>et al.</i> , Mooney <i>et al.</i> , Ariza-Garcia <i>et al.</i> , Hou <i>et al.</i> , Wheelock <i>et al.</i> and Hamilton <i>et al.</i> |
| General | 7 (26.92%) | Buneviciene <i>et al.</i> , Cox <i>et al.</i> , Pang <i>et al.</i> , Cheng <i>et al.</i> .; Cho <i>et al.</i> , Agboola <i>et al.</i> and Larson <i>et al.</i> |
| Not mentioned | 4 (15.38%) | Buchanan <i>et al.</i> , Mette <i>et al.</i> , Duman-Lubberding <i>et al.</i> and Eldeib <i>et al.</i> |

Table III: Frequency of types of intervention

| Intervention | Frequency | Author(s) |
|--|-----------|---|
| The technology | | |
| mHealth | 11 | Chen <i>et al.</i> , Buneviciene <i>et al.</i> , Kim <i>et al.</i> , Hou <i>et al.</i> , Livingston <i>et al.</i> , Cheng <i>et al.</i> , Spoelstra <i>et al.</i> , Fjell <i>et al.</i> , Duman-Lubberding <i>et al.</i> and Fortier <i>et al.</i> |
| Video conferencing | 6 | Buchanan <i>et al.</i> , Barsom <i>et al.</i> , Hamilton <i>et al.</i> , Darcourt <i>et al.</i> , Agboola <i>et al.</i> and Mette <i>et al.</i> |
| Telephone-based | 7 | Mooney <i>et al.</i> , Cox <i>et al.</i> , Pang <i>et al.</i> , Anderson <i>et al.</i> , Agboola <i>et al.</i> , Eldeib <i>et al.</i> and Larson <i>et al.</i> |
| Web or internet-based | 9 | Mooney <i>et al.</i> , Cox <i>et al.</i> , Ariza-Garcia <i>et al.</i> , Pang <i>et al.</i> , Cheng <i>et al.</i> , Wheelock <i>et al.</i> , Cho <i>et al.</i> , Agboola <i>et al.</i> and Innominato <i>et al.</i> |
| Email-based | 1 | Cox <i>et al.</i> |
| Emerging technologies | 1 | Cheng <i>et al.</i> |
| The activity | | |
| Consultation | 5 | Chen <i>et al.</i> , Buchanan <i>et al.</i> , Barsom <i>et al.</i> , Hamilton <i>et al.</i> and Mette <i>et al.</i> |
| Monitoring and follow up | 22 | Mooney <i>et al.</i> , Buneviciene <i>et al.</i> , Kim <i>et al.</i> , Cox <i>et al.</i> , Ariza-Garcia <i>et al.</i> , Hou <i>et al.</i> , Pang <i>et al.</i> , Anderson <i>et al.</i> , Livingston <i>et al.</i> , Cheng <i>et al.</i> , Spoelstra <i>et al.</i> , Wheelock <i>et al.</i> , Cho <i>et al.</i> , Barsom <i>et al.</i> , Darcourt <i>et al.</i> , Fjell <i>et al.</i> , Agboola <i>et al.</i> , Duman-Lubberding <i>et al.</i> , Eldeib <i>et al.</i> , Larson <i>et al.</i> , Innominato <i>et al.</i> and Fortier <i>et al.</i> |
| Prescription, dispensing and drug delivery | 1 | Chen <i>et al.</i> |

Effectiveness on patient outcomes

Table IV displays the different patient outcomes assessed by the 26 studies, including clinical outcomes and other aspects. The main focus of the study was to provide an analysis of articles regarding the effect of telemedicine use among cancer patients, especially in terms of adherence, knowledge regarding medication and disease, clinical outcomes (specifically symptom

management), and understanding the satisfaction of patients with telemedicine interventions in their care. Telemedicine use had both positive and negative impacts on the healthcare industry, but when used and implemented adequately, it has a great potential to help enhance cancer care.

Table IV: Effectiveness of patient outcomes

| Aspect of patient outcome | Frequency | Author(s) |
|---------------------------|-----------|---|
| Clinical outcomes | | |
| Symptom management | 10 | Mooney <i>et al.</i> , Kim <i>et al.</i> , Cox <i>et al.</i> , Ariza-Garcia <i>et al.</i> ; Anderson <i>et al.</i> , Cheng <i>et al.</i> , Wheelock <i>et al.</i> , Fjell <i>et al.</i> , Agboola <i>et al.</i> and Eldeib <i>et al.</i> |
| Quality of life | 9 | Buneviciene <i>et al.</i> , Kim <i>et al.</i> , Livingston <i>et al.</i> , Cox <i>et al.</i> , Hou <i>et al.</i> , Pang <i>et al.</i> , Fjell <i>et al.</i> , Agboola <i>et al.</i> and Larson <i>et al.</i> |
| Other aspects | | |
| Satisfaction | 13 | Chen <i>et al.</i> , Buchanan <i>et al.</i> , Livingston <i>et al.</i> , Spoelstra <i>et al.</i> , Cox <i>et al.</i> , Cho <i>et al.</i> , Barsom <i>et al.</i> , Darcourt <i>et al.</i> , Hamilton <i>et al.</i> , Mette <i>et al.</i> , Duman-Lubberding <i>et al.</i> , Innominato <i>et al.</i> and Fortier <i>et al.</i> |
| Adherence | 5 | Buchanan <i>et al.</i> , Kim <i>et al.</i> , Cox <i>et al.</i> , Spoelstra <i>et al.</i> and Eldeib <i>et al.</i> |
| Feasibility | 5 | Anderson <i>et al.</i> ; Cox <i>et al.</i> , Livingston <i>et al.</i> , Duman-Lubberding <i>et al.</i> and Innominato <i>et al.</i> |
| Knowledge | 3 | Kim <i>et al.</i> , Cox <i>et al.</i> and Livingston <i>et al.</i> |

Discussion

Types of intervention

Telemedicine or specifically teleoncology is rapidly emerging due to the limited number of health professionals and the need for well-documented cancer care. It was accessed in different areas (mainly rural) (Sirintrapun and Lopez, 2018). The results show a higher frequency in mHealth and web or internet-based interventions. The high frequency of these interventions may be due to feasibility. Telemedicine is more easily accessed and needs less equipment and manpower. Besides, it is less time-consuming for both the patients and practitioners (Sirintrapun and Lopez, 2018).

Telemedicine is a new technology mainly used to monitor and follow up services, specifically symptom management. It also provides care to ensure the patient quality of life before, during, and after therapy. The results of this study show that telemedicine had limited benefits in counselling services; however, it was essential for patients to understand their condition and treatment. For most interventions, telemedicine was feasible and had satisfactory rates.

Although mHealth and web or internet-based interventions had the same frequency, when observing more in-depth and correlating with other literature, mHealth was the most effective type of intervention. It had significantly higher satisfaction rates and required less equipment and cost. It provided better outcomes in cancer patients through increased information,

monitoring, and follow up and played an immense role in symptom management.

Effectiveness on patient outcome

Telemedicine helps measure the effectiveness of patient outcomes in cancer disease based on Patient-Reported Outcomes (PROs). Centres for Medicare & Medicaid Services (CMS) of the United States define a PRO as any report of the status of a patient's health condition or health behaviour that comes directly from the patient, without interpretation of the patient's response by a clinician or anyone else. Self-reported patient data provide a rich data source for outcomes. This definition reflects the key domains, including health-related quality of life (e.g., functional status), symptoms, and symptom burden (e.g., pain, fatigue). In the selected articles, telemedicine that involved pharmacist-specific interventions was limited. In terms of patient outcomes, satisfaction rate was the most frequently analysed aspect; it did not only focus on results of treatment and interventions but also covered the patient satisfaction rate. The second most explored aspect was symptom management, followed by the quality of life, both essential in cancer care. Current activities that involved monitoring and follow up procedures for these aspects had not been implemented fully. The severe lack of monitoring and the limitations of practice could be supported by innovative technology like telemedicine, which helped monitor symptoms and side effects, thus improving cancer patients quality of life. Of the 26 articles, 25 concluded that telemedicine interventions

had high satisfaction rates and provided adequate and beneficial care for cancer patients. However, digital interventions and digital innovations for cancer were still limited compared to other NCDs.

Policy consideration of telemedicine use

In terms of policy consideration, several requirements are needed for telemedicine use policymaking in middle-income countries (Heydari & Joulaei, 2018). Regular use of telemedicine in cancer care for patients in Indonesia and other low and middle-income countries may need a long time to be evenly distributed across areas. Suggesting telemedicine or making it mandatory in cancer treatment guidelines may improve several aspects of therapeutic outcomes. Currently, its use in Indonesia is still limited. Besides, the advantage of telemedicine in Indonesia is its affordability in various areas. Telepharmacy or pharmacist-based telemedicine should be considered for counselling, monitoring, and following up on cancer patients. It should also be included in cancer care guidelines, as it provides better healthcare services and could improve several aspects of patient outcomes in the future. Meanwhile, further research on telemedicine use related to pharmaco-economic analysis and Health Technology Assessment (HTA) is also needed.

Conclusion

All 26 articles concluded that telemedicine provided a beneficial and effective improvement in patient outcomes. Telemedicine is effective in improving cancer patient outcomes, and this study can be considered for telemedicine implementation in Indonesia.

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