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REVIEW ARTICLE

REMOTE MONITORING OF ADULT CANCER PATIENTS UNDERGOING CHEMOTHERAPY: SCOPING REVIEW

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ABSTRACT

Objective: to map scientific evidence on the remote monitoring of adult cancer patients undergoing chemotherapy. **Method:** Scoping review, carried out in February 2025 in the *National Library of Medicine*, *Web of Science*, *Cumulative Index to Nursing and Allied Health Literature*, EMBASE, and the Virtual Health Library Portal data sources. Randomized or non-randomized clinical trials that used remote monitoring during chemotherapy treatment were selected. **Results:** 2611 publications were found; six studies made up the sample after removing duplicates and applying the inclusion criteria. The objective of the studies was related to evaluation/testing (of the efficacy and feasibility of remote monitoring). The results differed concerning the average number of emergency room visits/hospitalization / supportive care. The means used for remote monitoring were apps, phone calls, text messages, and a system that worked from a phone call. **Conclusion:** Remote monitoring of adult cancer patients undergoing chemotherapy has the potential to positively impact the period between chemotherapy cycles, helping patients and healthcare teams.

Keywords: Neoplasms. Remote monitoring. Chemotherapy. Telehealth. Adult Health.

INTRODUCTION

Information and Communication Technologies (ICTs) enable the transmission of information by digital means, such as computers, tablets, *smartphones*, and other devices. Widely used in the educational, personal, business, and health fields, they have become an essential tool for health care by enabling the dissemination and updating of knowledge in a way that aids clinical decision-making by the health team.[1]

Among ICTs, Digital Health stands out, a concept based on e-health, encompassing mobile health, telemedicine, telemonitoring, digital therapeutics, and digital health systems, including mobile applications and *web* pages. These technologies can involve various tools and sometimes monitor various health determinants, including weight, blood pressure, sleep patterns, nutrient intake, symptom management, and adverse events [2].

In oncology, the healthcare team needs to offer post-treatment support to patients and carry out therapy. The international organization *Multinational Association of Supportive Care in Cancer* (MASCC) defines *supportive* care in cancer as "the prevention and management of the adverse effects of cancer and its treatment, including the management of physical and psychological symptoms and side effects from diagnosis to treatment and post-treatment care"[3].

In this scenario, digital health has emerged as an alternative to effectively address supportive care, unmet needs, and managing adverse effects through remote patient monitoring. The most widely used ways of carrying out remote monitoring include calls, *smartphones*, applications (*web* and *smartphones*), text-messaging (SMS), videoconferencing (by computer, phone, tablet), and specific *software*, among others[2]. These technologies offer utility and safety,

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enabling self-management of symptoms and improving survival and quality of life[4].

A scoping review that evaluated digital health solutions in oncological support care identified several positive points in using these tools. Among them: ease of use, reassurance regarding care, high usability and usefulness, improved communication, alert generation and rapid response, patient empowerment, and the convenience of reporting symptoms in real time[5], however, the context studied was not exclusively antineoplastic chemotherapy, nor was it outpatient. Unlike hospitalized patients, those who undergo treatment on an outpatient basis are only under the care of the healthcare team during the administration of medications, so complications can occur at home without the supervision of a healthcare professional, highlighting the need for remote monitoring[6].

In this sense, including digital health solutions in care practice is an essential component, as it represents the possibility of comprehensive management, providing quality care, organizational improvement, and improving and optimizing the patient experience using health services[7].

Based on the above, the aim was to map scientific evidence on the remote monitoring of adult cancer patients undergoing chemotherapy.

METHOD

This is a scoping review developed according to the review method proposed by the Joanna Briggs Institute (JBI)[8] and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension *for Scoping Reviews* (PRISMA-ScR) *checklist*[9]. The protocol for this scoping review is registered on the international platform *Open Science Framework* (OSF), DOI: https://doi.org/10.17605/OSF.IO/BK7ZF.

The guiding question was drafted using the mnemonic combination PCC, in which P (Population) refers to adult cancer patients, C (Concept) refers to remote monitoring, and C (Context) refers to antineoplastic chemotherapy. Based on these definitions, the research was conducted with the following guiding question: What do high-impact studies show about the remote monitoring of adult cancer patients undergoing chemotherapy?

The search took place in February 2025 and was carried out using the *National Library of Medicine* (PubMed—Medline), Web of Science, Cumulative Index to Nursing and Allied Health Literature(CINAHL), EMBASE, and the Virtual Health Library Portal (BVS—Lilacs), via the CAPES journal portal, with the help of a professional librarian and using the CAFe (Federated Academic Community) platform.

Primary articles published in open access in any language were included. No date filter was used. In the eligibility stage, it was decided to include only clinical trials, whether randomized or not. This was done to guarantee studies with high evidence on the subject. The type of study was identified based on the names given by the authors of the articles.

The search strategy used is shown in Chart 1.

Chart 1. Search strategy used. Curitiba, PR, Brazil, 2025

Data sources consulted	Search strategy used
Pubmed	*neoplasms/exp AND "antineoplasic agents" AND telemonitoring OR "distant monitoring" OR "remote monitoring"*
Web of science	*Cancer (Topic) and telemonitoring OR "distant patient monitoring" OR "remote distance patient monitoring" OR "remote patient monitoring" OR "tele monitoring" AND "drug therapy" (Topic) or "antineoplasic agents" (Topic)*
Cinahl	*"Malignant Neoplasms" AND "telemonitoring" OR "distant patient*

	monitoring" OR "remote distance patient monitoring" AND "antineoplasic agents"
Embase	*('malignant neoplasm'/exp OR 'cancer' OR 'cancers' OR 'malignant neoplasia' OR 'malignant neoplasm' OR 'malignant neoplastic disease' OR 'malignant tumor' OR 'malignant tumour' OR 'neoplasia, malignant' OR 'neoplasmic malignancy' OR 'neoplastic malignancy' OR 'oncologic malignancy' OR 'oncological malignancy' OR 'tumor, malignant' OR 'tumoral malignancy' OR 'tumorous malignancy' OR 'tumour, malignant') AND ('chemotherapy'/exp OR 'chemotherapeutics' OR 'chemotherapy') AND ('telemonitoring'/exp OR 'distant monitoring (patient)' OR 'distant patient monitoring' OR 'remote distance patient monitoring' OR 'remote monitoring (patient)' OR 'remote patient monitoring' OR 'remote patient surveillance' OR 'tele monitoring' OR 'tele surveillance' OR 'telemonitoring' OR 'telesurveillance')*
BVS	Neoplasms AND telemonitoring

The *Rayyan* online platform removed duplicates and selected the studies between the two independent reviewers. The titles and abstracts were read blindly, and any doubts were discussed with a third reviewer.

Two independent reviewers also read the selected studies in full, and any discrepancies were resolved with a third reviewer who helped with the final selection of the studies included in the sample. The data was analyzed and synthesized descriptively.

To collect data from the studies included in the review, a script was drawn up with the following items: identification of the article and authors, year and country of publication, objective of the study, details of the sample, type of monitoring, and main results.

Submission to the Research Ethics Committee for analysis and approval was waived, as this was a review study based on articles available in literature.

RESULTS

The initial survey obtained 2611 publications, distributed as follows: 666 in *Web of Science*, 1843 in PubMed, 82 in Embase, 16 in Cinahl and four in the VHL. After removing duplicates and applying the inclusion criteria, six studies were identified as being pertinent to the subject, making up the final sample. The flowchart of the selection process for the included studies is shown in Figure 1.

The studies that constituted the sample and the United Kingdom. All the studies sampled participants with an average age of over 50. The studies that made up the sample: three [A2, A5, A6] were carried out in the United States of America, one[A4] in Canada, one[A3] in the United Kingdom and one [A1] is a multicenter study being conducted in Austria, Greece, Norway, the Republic of Ireland and the United Kingdom. All the studies sampled participants with an average age of over 50.

Although the objective of all the selected studies was related to evaluation/testing (of the efficacy and feasibility of remote monitoring), symptoms appeared as the primary outcome in four of them[A1, A2, A3, A6]. Concerning the results obtained by the studies, it was possible to observe that one study[A4] found no difference in the average number of emergency room visits or hospitalizations between the groups surveyed. In contrast, one study[A1] found that supportive care needs were lower in the intervention group. Both studies were carried out in 2021. However, they used different means of remote monitoring.

Symptom burden and severity also differed between the studies[A1, A6]. The studies highlighted the number of alerts generated[A5] and the lack of action after receiving them[A6].

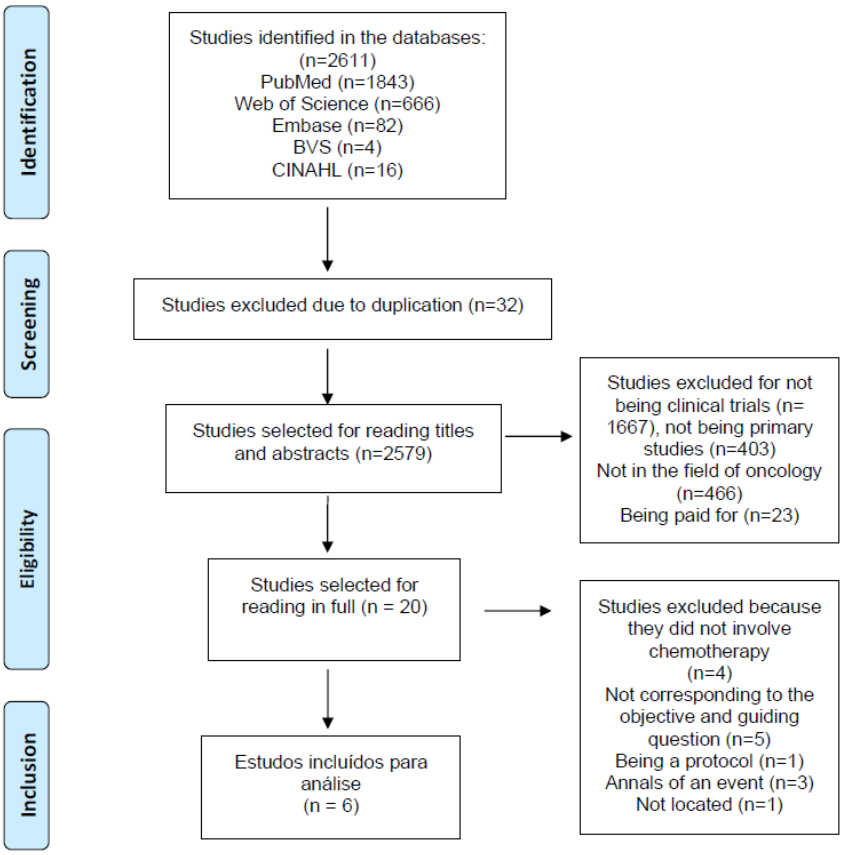

Figure 1. Flowchart for the search and selection of articles, adapted according to the recommendations of the *Preferred Reporting Items for Systematic Reviews and Meta Analyses* (PRISMA - ScR). Curitiba, PR, Brazil, 2025

Three studies[A1, A3, A5] used cell phone applications, two telephone calls[A4, A6], and one text message [A2] to carry out remote monitoring.

Chart 2. Summary of the studies included in the analysis. Curitiba-PR, Brazil, 2025

Identification of studies	Authors/ year of publication/country of publication	Objective	Sample/average age of participants	Type of monitoring used	Main results
A1 [10]	Maguire et al. (2021) Austria, Greece, Norway, Republic of Ireland, and United Kingdom	To evaluate remote monitoring of the side effects of adjuvant chemotherapy on symptom burden, quality of life, supportive care needs, anxiety, self-efficacy, and work limitations.	829 patients 52.4 years	Cell phone application	Significant reductions were observed in the global suffering index, psychological symptoms, physical symptoms, and anxiety. The intervention had positive effects on symptom burden. Quality of life scores were higher in the intervention group, and supportive care needs were lower in the intervention group.
A2 [11]	Manz et al. (2024) United States of America	Evaluate the association of patient-reported outcomes with	108 patients 57 years	Text message and wearable acceleromet	The outcomes strongly associated with hospitalization or death were pain, dyspnea, and sadness. A

		step count and hospitalization or death.		er.	decrease in 1000 steps was associated with a 16% greater chance of hospitalization or death.
A3 [12]	Kearney et al. (2009) United Kingdom	To evaluate the impact of an advanced mobile phone-based symptom management system on the incidence, severity, and distress of six chemotherapy-related symptoms (nausea, vomiting, fatigue, mucositis, hand-foot syndrome, and diarrhea) in patients with lung, breast, or colorectal cancer.	112 patients 56 years	Cell phone application	The control group reported significantly higher fatigue rates than the intervention group, and reports of hand-foot syndrome were, on average, lower in the control group. The system used can support symptom management in breast, lung, and colorectal cancer patients receiving chemotherapy. It may provide a more accurate reflection of chemotherapy-related toxicity and provide a means of monitoring toxicity in clinical practice, with the potential to decrease chemotherapy-related morbidity.
A4 [13]	Krzyzanowska et al. (2021) Canada	To evaluate the effectiveness of remote management of toxicities during chemotherapy for early-stage breast cancer.	2158 Patients / 55.7 years	Phone call	47% had at least one emergency room visit or hospitalization during chemotherapy; 48% of participants in the intervention group had at least one grade 3 toxicity. No improvements were seen in self-efficacy, anxiety or depression. There was no difference in the average number of emergency room visits or hospitalizations between the groups.
A5 [14]	Basch et al. (2020) United States of America	Evaluate the perceptions and questions of the PRO-TECT digital ePRO system.	496 patients, 57 nurses, and 39 oncologists. 63 years	Cell phone application	For 95% of patients, the system and questions were easy to understand (93%); 91% considered them relevant to their care; 70% reported better discussions with doctors, and 73% felt in control of their care. Among the nurses, 79% reported that the PRO information was helpful in clinical documentation, and 84% considered that it increased the efficiency of patient discussions. Among the 39 oncologists, 91% found the useful information; 65% used the system to guide patient talks and to make treatment decisions. The number of alerts bothered the professionals.

A6 [15]	Mooney et al. (2014) United States of America	Evaluate daily symptoms during chemotherapy for patients at home and send automated alerts of unrelieved symptoms to the patient's oncologist and nurse.	223 patients 55.5 years	Automated system based on telephone calls.	More than 80% of providers reported the usefulness of the symptom alert reports. Ten monitored symptoms resulted in an average of nine moderate to severe intensity alerts per patient over 45 days of the study. Providers rarely contacted patients after receiving alerts. There were no significant differences in the change in symptom severity between the two groups (mean difference = 0.06, p = 0.58).

DISCUSSION

This integrative review mapped studies on the remote monitoring of adult cancer patients undergoing chemotherapy and found that although the topic is relevant and current, studies with a high level of evidence are incipient in the context of cancer chemotherapy. They may have gained greater prominence since the COVID-19 pandemic, evidenced by the year of publication of the studies analyzed.

According to a recently published current affairs article[16], before the COVID-19 pandemic, many countries already used mobile health technologies to carry out *online* treatments, monitor patients' health status, and write prescriptions. With the need for social distancing, other forms of care were needed in addition to face-to-face care, and several cities and countries worldwide began to use different methods of providing health services[17]. According to research published in 2023, the Whatsapp application was the most used tool by primary health care nurses to monitor, guide and schedule consultations and exams during the COVID-19 pandemic[18].

The innovation of the subject can also be seen in the fact that the objectives of the selected studies focus on evaluation, showing that these tools are still being tested in terms of acceptability, adherence, and other aspects. One of the reasons there is concern about the usability of technologies in the oncology scenario may be related to the age at which cancer most affects the population. According to the National Cancer Institute, the most relevant risk factor for developing cancer is an age over 50[19]. In this sense, and according to the editorial on the elderly, the use of digital platforms and tools represents an additional challenge for older people[20].

On the other hand, an essential Brazilian institute points out that, although there are difficulties in accessing technology, the percentage of elderly people (aged 60 or over) who use the internet has risen from 24.7% in 2016 to 62.1% in 2022. This shows that this section of the population embraces technology, a favorable condition for remote monitoring and follow-up by health teams.[21]

In this sense, teams need to be prepared to guide the use of remote monitoring tools so that users understand how they work and the existing resources. This guidance should be given to everyone (not just the elderly), as understanding the process will lead to greater patient compliance. According to a review study[22], digital tools can provide people with greater empowerment, quality of life, and well-being.

It is important to note that remote monitoring can help in addition to physical symptoms in other spheres of treatment and post-treatment. This includes the security of contacting the team at any time of the day, reducing anxiety, and improving quality of life (QoL). The multicenter study that evaluated the effectiveness of an *e-support* program for breast cancer patients found that mobile applications improved patients' QoL[23].

From the perspective of post-treatment and improving QoL, using digital tools can be an interesting strategy for tracking unmet needs. Once treatment has ended, patients are monitored sporadically and often maintain or develop late toxicities that impact their QoL.

Regarding the alerts generated and the post-

alert behavior, the institution needs to offer training and conditions to the team so that the tools help in the care provided and do not generate more workload. In this sense, the authors emphasize that the use of screening systems, apps, and phone calls can even prevent unnecessary consultations[24].

The diversity of ways remote monitoring can take place is a positive aspect that can benefit healthcare teams and patients because, depending on the context and purpose of use, the tool/resource can be adapted. Concerning the means used to carry out remote monitoring, the study[25] that compiled and analyzed experiences of using digital health technologies during the pandemic discusses the use of some means, such as telephone calls, which, according to the authors, can be used as a tool capable of helping mainly to provide guidance and manage minor symptoms, video calls as an option that can be more credible to patients by allowing visual contact, and *chatbots* that can recognize the first symptoms and support clinical decision-making.

Limitations of the study

The choice to include clinical trials reduced the number of articles selected.

Contributions to the field of health and nursing

This review contributes to the field of health and nursing by grouping studies with strong scientific evidence on the remote monitoring of adult cancer patients undergoing intravenous chemotherapy.

CONCLUSION

Remotely monitoring adult cancer patients undergoing chemotherapy can positively impact symptom management, clarify doubts, and identify other conditions between chemotherapy cycles, helping patients and healthcare teams.

The studies analyzed sampled patients with an average age of over 50, highlighting the importance of including accessible resources regarding the usability of remote monitoring tools. The healthcare team should be prepared to use the resources as facilitators of care, collaborating in the care process.

MONITORAMENTO REMOTO DE PACIENTES ADULTOS COM CÂNCER EM TRATAMENTO QUIMIOTERÁPICO: SCOPING REVIEW

RESUMO

Objetivo: mapear evidências científicas sobre o monitoramento remoto de pacientes adultos com câncer em tratamento quimioterápico. **Método:** scoping review, realizada em fevereiro de 2025 nas fontes de dados *National Library of Medicine*, *Web of Science*, *Cumulative Index to Nursing and Allied Health Literature*, EMBASE e no Portal da Biblioteca Virtual em Saúde. Foram selecionados ensaios clínicos, randomizados ou não, que utilizaram o monitoramento remoto durante o tratamento quimioterápico. **Resultados:** 2611 publicações foram encontradas; após a retirada das duplicatas e a aplicação dos critérios de inclusão, seis estudos compuseram a amostra. O objetivo dos estudos estava relacionado à avaliação/teste (da eficácia e viabilidade do monitoramento remoto). Os resultados divergiram com relação ao número médio de visitas ao pronto-socorro / hospitalização / cuidados de suporte. Os meios utilizados para o monitoramento remoto foram aplicativos, ligação telefônica, mensagem de texto e um sistema que funcionava a partir de ligação telefônica. **Conclusão:** o monitoramento remoto de pacientes adultos com câncer em tratamento quimioterápico tem o potencial de impactar positivamente no período entre os ciclos de quimioterapia, auxiliando pacientes e equipes de saúde.

Palavras-chave: Neoplasias. Monitoramento remoto. Quimioterapia. Telesaúde. Saúde do Adulto.

MONITORIZACIÓN REMOTA DE PACIENTES ADULTOS CON CÁNCER EN TRATAMIENTO QUIMIOTERÁPICO: *SCOPING REVIEW*

RESUMEN

Objetivo: mapear evidencias científicas sobre la monitorización remota de pacientes adultos con cáncer en tratamiento quimioterápico. **Método**: revisión exploratoria, realizada en febrero de 2025 en las fuentes de datos *National Library of Medicine*, *Web of Science*, *Cumulative Index to Nursing and Allied Health Literature*, *EMBASE* y en el Portal de la Biblioteca Virtual en Salud. Se seleccionaron ensayos clínicos, aleatorizados o no, que utilizaron la monitorización remota durante el tratamiento quimioterápico. **Resultados**: se encontraron 2.611 publicaciones; después de la eliminación de los duplicados y la aplicación de los criterios de inclusión, seis

estudios formaron la muestra. El objetivo de los estudios estaba relacionado con la evaluación/prueba (de la eficacia y viabilidad de la monitorización remota). Los resultados divergieron con respecto al número promedio de visitas a urgencias/hospitalización/atención de apoyo. Los medios utilizados para la monitorización remota fueron aplicaciones, llamada telefónica, mensaje de texto y un sistema que funcionaba a partir de una llamada telefónica. **Conclusión**: la monitorización remota de pacientes adultos con cáncer en tratamiento quimioterápico tiene el potencial de impactar positivamente en el período entre ciclos de quimioterapia, ayudando a pacientes y equipos de salud.

Palabras clave: Neoplasias. Monitorización remota. Quimioterapia. Telesalud. Salud del Adulto.

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