INPLASY

The Effect of Telemedicine on Readmissions of Patients with Heart Failure and/or COPD: a Systematic Review

Corresponding author:
Georgios M. Stergiopoulos

stergiopoulos.georgios@mayo.edu

Author Affiliation:
Johns Hopkins University.

Stergiopoulos, GM; Elayadi, AN; Chen, ES; Galiatsatos, P.

ADMINISTRATIVE INFORMATION

Support - No sources of funding were/ are used for this work.

Review Stage at time of this submission - Completed but not published

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202460097

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 24 June 2024 and was last updated on 24 June 2024.

INTRODUCTION

*R*eview question / Objective Assessment of current literature on the effect of telemedicine employing telemonitoring technologies on hospital readmissions in patients with heart failure (HF) and/or chronic obstructive pulmonary disease (COPD). Inclusion and exclusion criteria followed the Participants-Intervention-Comparison-Outcome (PICO) framework:

1. Participants were defined as adults (≥18 years old) who had been previously hospitalized and diagnosed with HF and/or COPD. Studies including patients <18 years old or patients who were not hospitalized before the initiation of the intervention were excluded.

2. Interventions consisted of telemedicine incorporating remote vital sign monitoring. Studies not using any type of telemonitoring (e.g., the only intervention were follow-up calls, texts, and video visits) were excluded.

3. The comparison was HF and/or COPD patients receiving usual care. Studies comparing telemedical interventions with inpatient hospitalization or in-person rehabilitation were excluded.

4. The outcomes included any readmission-related outcome, such as the incidence or rate of all-cause readmissions, HF-readmissions, acute exacerbation of COPD (AECOPD)-readmissions, time to first readmission, days alive spent in the hospital, composite endpoints of readmission and mortality, etc.

Rationale Hospital readmissions pose significant economic, social, and psychological issues for patients and their families and remain one of the main preventable financial strains in modern healthcare systems. Investigating the effect of

telemedicine on hospital readmissions is essential for understanding its potential advantages in healthcare.

Our primary focus for this review is on two chronic conditions that significantly contribute to hospital readmissions: heart failure (HF) and chronic obstructive pulmonary disease (COPD).

HF is one of the most prevalent diseases, with more than 38 million people suffering worldwide. It is characterized by recurrent hospitalizations due to decompensation of cardiac function, and studies suggest that about a quarter of patients with HF are readmitted within 30 days upon discharge.

COPD is characterized by persistent airflow limitation due to airway and/or alveolar abnormalities, with the most common risk factor being tobacco smoking. Acute exacerbation of COPD (AECOPD) is an acute event characterized by a worsening of the patient's respiratory symptoms that is beyond normal day-to-day variations and leads to a change in medication. Patients with AECOPD often require hospitalization, which accounts for about 70% of total COPD-related medical costs.

Condition being studied Heart failure (HF) and chronic obstructive pulmonary disease (COPD).

METHODS

Search strategy Our search strategy includes the following terms: hospital readmission(s) OR patient readmission(s) OR readmission or readmissions OR re-admissions AND telemedicine OR smartphone(s) OR telehealth OR digital health OR eHealth OR health application(s) OR mHealth OR health app(s) OR mobile application(s) OR mobile app(s) OR portable electronic app OR smartphone app(s) OR smartphone.

The databases used were PubMed, Scopus, and ProQuest's ABI (Abstracted Business Information)/INFORM.

Our search was limited to English-language articles published between 2012 and 2023 and when applicable limited to adults and excluded wire feeds, blogs, newspapers, magazines, dissertations, and working papers from the results.

Participant or population Patients with heart failure (HF) and/or chronic obstructive pulmonary disease (COPD) who have had a recent hospitalization.

The patients need to have been monitored with telemedicine using at least one telemonitoring modality in the outpatient setting.

Intervention Telemedicine, using at least one telemonitoring modality, such as heart rate, body weight, blood pressure, oxygen saturation, respiratory rate, and electrocardiogram (ECG) monitoring.

Comparator The comparison group should be receiving usual care in the outpatient setting.

Study designs to be included Our review will include randomized controlled trials, non-randomized controlled trials, retrospective cohort studies, prospective cohort studies, case-control studies, pilot studies, and feasibility studies.

Eligibility criteria No additional inclusion or exclusion criteria are employed beyond those defined in the PICOS section.

Information sources Published literature accessible on at least one of the following three electronic databases: PubMed, Scopus, and ProQuest's ABI (Abstracted Business Information)/INFORM.

Main outcome(s) The primary outcome of our study are readmission-related outcomes which encompass the incidence or rate of all-cause readmissions, HF-readmissions, acute exacerbation of COPD (AECOPD)-readmissions, time to first readmission, days alive spent in the hospital, composite endpoints of readmission and mortality, etc.

Additional outcome(s) Secondary outcomes in our study are either associated with the healthcare burden (e.g., emergency department visits, outpatient visits, and total healthcare costs) or linked to patient benefits (e.g., mortality, quality of life assessed through standardized questionnaires, medication adherence, and medication reconciliation).

Data management One reviewer (GS) reviewed all titles and abstracts identified from the search strategy.

Full texts were subsequently independently reviewed by two reviewers (GS, PG).

Data extraction from full-text articles was done independently by two reviewers (GS, PG) and included: disease of the patient population studied, type of study, type of telemedical intervention, participant characteristics, comparison group intervention, number of patients enrolled in each group, country where the study took place, primary and secondary endpoints of the studies, study outcomes related to readmissions, and other

relevant study outcomes associated to patient quality of life or healthcare costs.

Data will be summarized and presented in a table.

Quality assessment / Risk of bias analysis
Quality assessment and risk of bias analysis was done independently by two reviewers (GS, PG).

Risk of bias assessment was done using Cochrane-developed tools such as risk of bias tool for randomized trials (RoB2) for randomized controlled trials (RCTs) and risk of bias in non-randomized studies of interventions (ROBINS-I) for non-RCTs.

For cohort studies the Newcastle-Ottawa scale (NOS) for cohort studies was used and for the case-control studies the Newcastle-Ottawa scale for case-control studies was employed.

Bias assessment for each study was conducted with respect to the reported readmission-related outcome(s).

Overall judgement of the certainty/confidence of our results was done independently by two reviewers (GS, PG) using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria for effects summarized narratively.

Strategy of data synthesis
Data are narratively assessed as a whole and separately for heart failure (HF), chronic obstructive pulmonary disease (COPD) and HF + COPD populations.

Subgroup analysis
Subgroup analysis will be done patients with heart failure (HF), chronic obstructive pulmonary disease (COPD) and HF + COPD.

Sensitivity analysis
A graphical or statistical assessment of reporting bias was not feasible due to the significant variability in reporting readmission-related outcomes.

The risk of publication bias in our study is taken into account in the certainty assessment the Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria.

Language restriction
We only include literature published in English in our systematic review.

Country(ies) involved
Unites States of America.

Keywords
Telemedicine, Telemonitoring, Readmission(s), Heart Failure, ADHF, COPD, AECOPD.

Contributions of each author
Author 1 - Georgios M. Stergiopoulos - Review of the literature, data extraction, risk of bias and certainty assessment, writing- original draft, writing- review & editing.
Email: stergiopoulos.georgios@mayo.edu
Author 2 - Anissa N. Elayadi - Writing- review & editing.
Email: anissa.elayadi@jhuapl.edu
Author 3 - Edward S. Chen - Writing- review & editing.
Email: echen3@jh.edu
Author 4 - Panagis Galiatsatos - Conceptualization, review of the literature, data extraction, risk of bias and certainty assessment, writing- review & editing.
Email: pgaliat1@jhmi.edu