Efficacy of Telerehabilitation Programs for Patients Undergoing Hip Fracture Surgery. Systematic Review

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ABSTRACT

Introduction: Hip fracture is the leading cause of hospitalization in frail geriatric patients, due to osteoporosis and frequent falls. They affect 18% of women and 6% of men. The global number of hip fractures is expected to increase to 4.5 million by 2050. Surgery remains the predominant treatment of choice, and clinical practice guidelines recommend starting rehabilitation early. However, patients often have difficulty attending physical therapy clinics. **Objective:** To evaluate the effectiveness of telerehabilitation programs for patients undergoing hip fracture surgery. **Materials and Methods:** A review was carried out following the PRISMA guidelines. The databases of PubMed, Cinahl, PsycINFO, SPORTDiscus, Academic Search Complete, Lilacs, IBECS, CENTRAL, SciELO, and WOS were consulted. The Cochrane tool was used to assess the risk of bias. **Results:** 59 articles were retrieved from all databases. After applying the inclusion criteria, 5 clinical studies remained. The total sample was 282 patients operated on for hip fractures. The total duration of telerehabilitation ranged from 3 to 12 weeks. All studies showed safety and good tolerability. **Conclusions:** Telerehabilitation is effective in patients undergoing hip fracture surgery. This method improves mobility, quality of life, effectiveness of falls, anxiety, depression, and supports physical recovery to pre-fracture levels.

Keywords: Telerehabilitation; hip fracture; review.
Level of Evidence: IV

Eficacia de los programas de telerrehabilitación para pacientes operados de fractura de cadera. Revisión sistemática

RESUMEN

Introducción: La fractura de cadera es la causa más común de hospitalización en personas de edad avanzada, frágiles, debido a la osteoporosis y las caídas recurrentes. El 18% de las mujeres y el 6% de los hombres sufren este tipo de fractura. Se espera que el número global de estas fracturas aumente a 4,5 millones en el 2050. La cirugía sigue siendo el tratamiento de elección predominante, y las guías de práctica clínica recomiendan iniciar la rehabilitación de forma precoz. Sin embargo, en muchas ocasiones, los pacientes tienen problemas para asistir a las clínicas de fisioterapia. **Objetivo:** Evaluar la eficacia de los programas de telerrehabilitación para pacientes operados de fractura de cadera. **Materiales y Métodos:** Se realizó una revisión siguiendo la normativa PRISMA. Se consultaron las bases de datos de PubMed, CINAHL, PsycINFO, SPORTDiscus, Academic Search Complete, LILACS, IBECS, CENTRAL, SciELO y WOS. Se utilizó la herramienta Cochrane para valorar el riesgo de sesgo. **Resultados:** Se obtuvieron 59 artículos. Tras aplicar los criterios de inclusión, quedaron 5 ensayos clínicos. La muestra total estaba formada por 282 pacientes operados de fractura de cadera. La duración total de la telerrehabilitación osciló entre 3 y 12 semanas. En todos los estudios, se comunicó la seguridad y la buena tolerabilidad. **Conclusiones:** La telerrehabilitación es eficaz en pacientes operados de fractura de cadera. Este método mejora la movilidad, la calidad de vida, el nivel de miedo a caerse, la ansiedad, la depresión, y favorece la recuperación del nivel de estado físico anterior a la fractura.

Palabras clave: Telerrehabilitación; fractura de cadera; revisión.
Nivel de Evidencia: IV

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How to cite this article: Sánchez-Lozano J, Martínez-Pizarro S. Efficacy of Telerehabilitation Programs for Patients Undergoing Hip Fracture Surgery. Systematic Review. *Rev Asoc Argent Ortop Traumatol* 2024;89(4):385-392. https://doi.org/10.15417/issn.1852-7434.2024.89.4.1942

INTRODUCTION

Hip fracture is a serious injury affecting the upper part of the femur, which can occur either in the neck of the femur or in the intertrochanteric region. It causes severe pain, immobility, bruising, and swelling. Visually, one lower limb may appear shorter than the other, often accompanied by an outward twisting of the lower limb on the side of the injured hip.[1,2]

Hip fracture is the most common cause of hospitalization among frail elderly individuals, primarily due to osteoporosis and recurrent falls. It is a significant and debilitating condition in the elderly, particularly in women.[3]

Epidemiological data vary between countries, but it is estimated that globally, about 18% of women and 6% of men will suffer a hip fracture. Although the age-standardized incidence is gradually decreasing in many countries, this trend is more than offset by the aging population. As a result, the global number of hip fractures is expected to increase from 1.26 million in 1990 to 4.5 million in 2050.[4,5]

Patients with hip fractures are typically elderly and often have various comorbidities. Upon hospital admission, they frequently present with acute pain, electrolyte disturbances, anemia, coagulopathy, and delirium. As hip fracture rates increase with age, so do morbidity, mortality, and functional impairment, making the management of these patients a significant challenge for orthogeriatric and rehabilitation healthcare professionals. [6,7]

The economic cost associated with hip fractures is substantial, as they require prolonged hospitalization and subsequent rehabilitation. Additionally, hip fractures are linked to other negative outcomes, such as disability, depression, and cardiovascular disease, all of which add to the cost.[8] Despite the poor prognosis, surgery remains the predominant treatment of choice today.[9]

Clinical practice guidelines for rehabilitation after hip fracture surgery recommend early initiation of treatment. However, many patients face difficulties in attending physiotherapy sessions due to mobility issues, transportation challenges, family availability, or economic constraints. For this reason, telerehabilitation has recently been proposed as a viable alternative.[10]

Telerehabilitation refers to the use of technology to deliver rehabilitation services to patients in their homes. Given the need for long-term care for individuals with hip fractures, home-based telerehabilitation could enhance independence, reduce hospital stays, and lessen the burden on caregivers.[11]

The aim of this study was to review the available scientific literature on the efficacy of telerehabilitation programs for patients with hip fractures.

MATERIALS AND METHODS

A literature review was conducted following the recommendations of the PRISMA (*Preferred Reporting Items for Systematic Review and Meta-Analysis*) Statement. Specifically, the PRISMA 2020 Statement and its accompanying 27-item checklist were used.[12]

Electronic searches were performed across multiple databases. The primary database utilized was PubMed, accessed via the *National Library of Medicine* platform. In addition, LILACS and IBECS were consulted through the *Virtual Health Library* platform; CENTRAL via the *Cochrane Library* platform; and Academic Search Complete, PsycINFO, CINAHL, and SPORTDiscus through the EBSCO Host platform. WOS Core and SciELO were accessed through the *Web of Science.*

The search strategy was based on the following PICOS (*Patient, Intervention, Comparison, Outcome, Study*) framework:[13]

- P (Patient): Patients who underwent surgery for hip fracture.
- I (Intervention): Telerehabilitation.
- C (Comparison): Not applicable.
- O (Outcome): Efficacy.
- S (Study Design): Randomized controlled clinical trials.

The search strategy in the various databases involved using a combination of terms from the English thesaurus, MeSH (*Medical Subject Headings*) terms, and free terms (TW terms). Additionally, the truncated term "Random*" was used to capture studies classified as randomized clinical trials. All terms were combined using the Boolean operators "AND" and "OR."

Only randomized clinical trials published in national and international peer-reviewed journals within the last 10 years were included. These studies specifically evaluated the efficacy of telerehabilitation programs for hip fracture patients. The risk of bias was analyzed individually using the tool proposed by the Cochrane Handbook for Systematic Reviews of Interventions. This tool comprises six specific domains that are assessed as having a high, medium, or low risk of bias. The domains evaluated include selection bias, performance bias, detection bias, attrition bias, reporting bias, and other biases.[14]

The quality of evidence was assessed using the *Grading of Recommendations, Assessment, Development and Evaluation* (GRADE) system. This system evaluates the quality of evidence based on the confidence users can have that the reported effect accurately reflects the item being assessed. The quality of evidence assessment considers factors such as risk of study bias, inconsistency, imprecision, publication bias, indirect outcomes, and other elements that may influence the overall quality of evidence. To summarize this information, summary of findings tables were developed.[15]

RESULTS

A total of 59 studies were retrieved from all the databases consulted. After removing duplicates using the Rayyan QCRI program,[16] the titles and abstracts of 27 studies were reviewed, with 16 meeting the inclusion criteria. Upon reading the full text of these studies, 11 were excluded for not meeting the specific selection criteria. Ultimately, five trials were included in this systematic review (Figure).

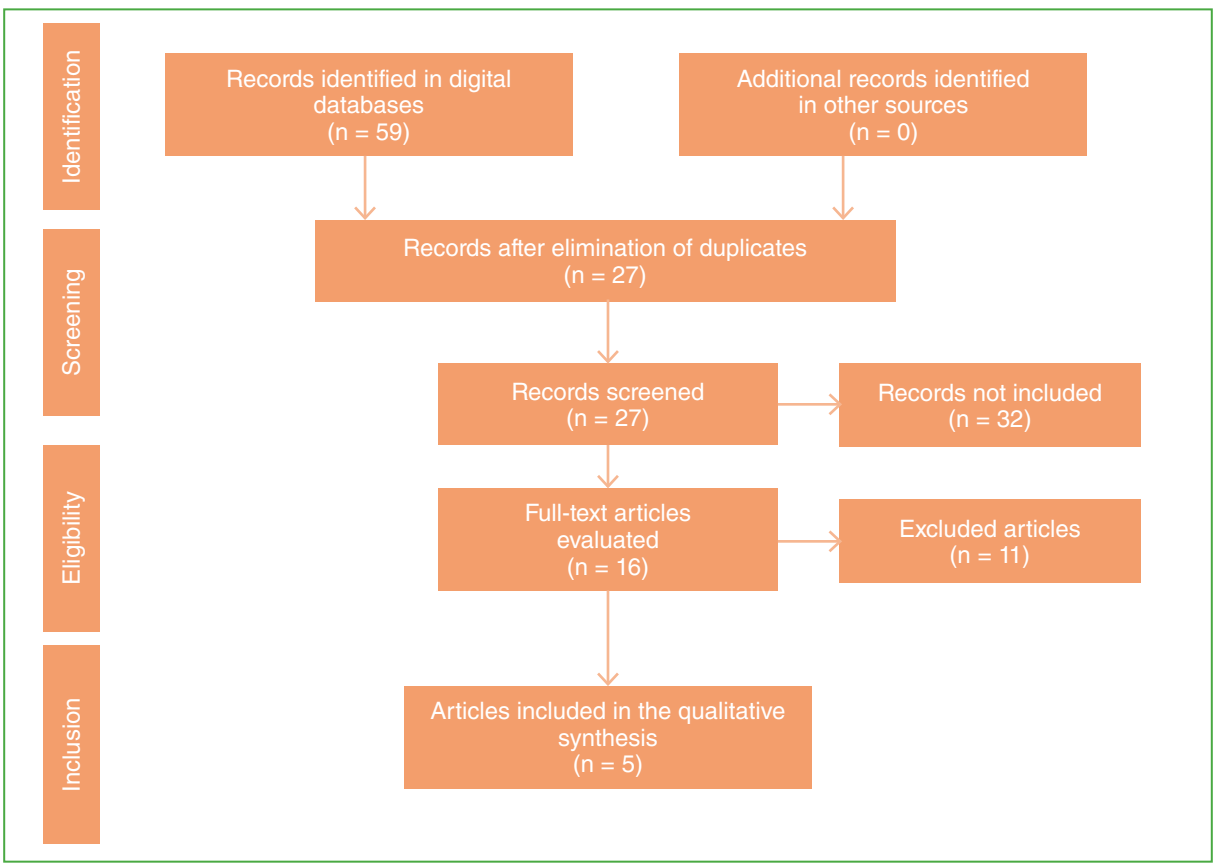

Figure. Flowchart.

All studies included in this review were randomized controlled clinical trials, published between 2015 and 2024.

Regarding the countries where these studies were conducted, 40% were from Spain, 20% from the United States, 20% from Israel, and the remaining 20% from China. The studies were published in journals such as: *Stud Health Technol Inform, BMC Geriatr, Int J Environ Res Public Health*, and *J Telemed Telecare* (Table 1).

Table 1. Included studies

Author	Year	Journal	Country	Design
Bedra and Finkelstein[17]	2015	Stud Health Technol Inform	United States	RCT
Gilboa et al.[18]	2019	BMC Geriatr	Israel	RCT
Ortiz-Piña et al.[19]	2021	Int J Environ Res Public Health	Spain	RCT
Li et al.[20]	2022	J Telemed Telecare	China	RCT
Mora-Traverso et al.[21]	2024	J Telemed Telecare	Spain	RCT

RCT = randomized controlled trial.

In all these studies, telerehabilitation was implemented for hip fracture patients in the experimental group. In the trials by Bedra and Finkelstein, Ortiz-Piña et al., and Mora-Traverso et al., the control group received face-to-face rehabilitation, whereas the control groups in the studies by Gilboa et al. and Li et al. were provided with an exercise booklet for self-directed practice.

The sample consisted of 282 patients who underwent hip fracture surgery. The clinical trial by Ortiz-Piña et al. had the largest sample size (133 patients), while the trial by Bedra and Finkelstein had the smallest (14 patients).

Telerehabilitation duration ranged from 3 to 12 weeks. Across all studies, telerehabilitation was found to be safe, tolerable, and free of significant side effects.

A variety of measurement instruments were used to evaluate the patients. The *Timed Up and Go* test was used in the trials by Gilboa et al. and Ortiz-Piña et al. Motor performance was assessed in the studies by Gilboa et al., Ortiz-Piña et al., and Li et al. Bedra and Finkelstein, along with Mora-Traverso et al., used anxiety and depression scales. The *Yale Physical Activity Survey* and Barthel Index were utilized only in the study by Bedra and Finkelstein. The *2-minute walk* test, *10-meter walk* test, *sit-to-stand* test, gait speed, and mean stride length were used exclusively in the study by Gilboa et al. The *Functional Independence Measure* and the *Short Physical Performance Battery* were only employed in the study by Ortiz-Piña et al. The level of fear of falling was assessed only in the study by Li et al., while the EuroQol scale and the level of physical fitness, evaluated with the *International Fitness Scale*, were used only in the study by Mora-Traverso et al (Table 2).

The main results are summarized below in chronological order:

The study by Bedra and Finkelstein, conducted in 2015 in the United States, examined the efficacy of home-based telerehabilitation in older adults following hip fracture. The study aimed to assess the impact of home-based telerehabilitation on range of motion, psycho-behavioral factors, quality of life, and satisfaction with care in community-dwelling older adults during the post-acute phase of recovery after hip fracture. It also sought to estimate the acceptance of the telerehabilitation system and compliance with the exercise program. Fourteen patients were randomly assigned to either the telerehabilitation or face-to-face rehabilitation group. The instruments used included the *Center for Epidemiologic Studies Depression Scale*, the *Yale Physical Activity Survey*, and the Barthel Index. Results showed statistically significant improvements in exercise self-efficacy, range of motion, quality of life, and patient satisfaction after 30 days of telerehabilitation.[17]

Table 2. Intervention characteristics.

Author	Intervention	Sample	Safe	Duration	Instruments	Results
Bedra and Finkelstein[17]	Telerehabilitation vs. on-site rehabilitation	14	Yes	4 weeks	*Center for Epidemiologic Studies Depression Scale*, *Yale Physical Activity Survey*, Barthel Index	Telerehabilitation improves exercise self-efficacy, range of motion, quality of life and patient satisfaction.
Gilboa et al.[18]	Telerehabilitation vs. workbooks	40	Yes	6 weeks	*Timed Up and Go*, *2 min walk* test, *10 m walk* test, *sit-and-stand* tests, gait speed and mean stride length	Telerehabilitation generates a positive effect on the mobility of people after hip fracture surgery
Ortiz-Piña et al.[19]	Telerehabilitation vs. on-site rehabilitation	133	Yes	12 weeks	*Functional Independence Measure*, *Timed Up and Go* and *Short Physical Performance Battery.*	Telerehabilitation improves *Functional Independence Measure* scores and functional recovery.
Li et al.[20]	Telerehabilitation vs. workbooks	31	Yes	3 weeks	Motor performance, function in activities of daily living and fear of falling.	Telerehabilitation improves the level of fear of falling and the performance of instrumental activities of daily living
Mora-Traverso et al.[21]	Telerehabilitation vs. on-site rehabilitation	64	Yes	12 weeks	EuroQol questionnaire, *Hospital Anxiety and Depression Scale* and fitness level, according to the *International Fitness Scale.*	Telerehabilitation improves quality of life, anxiety, and depression, and favors the recovery of the level of previous physical condition

In the 2019 clinical trial by Gilboa et al. in Israel, the effects of telerehabilitation on range of motion after hip fracture surgery were evaluated. This randomized controlled trial included 40 participants who were randomly assigned to either a control group or a telerehabilitation intervention group (6 weeks, 3 sessions/week). Telerehabilitation was based on video clips of common rehabilitation exercises focused on the lower extremities. The control group received an exercise booklet. Both groups participated in twice-weekly physical therapy sessions. Outcome measures included the *Timed Up and Go* test, *2-minute walk* test, *10-meter walk* test, *sit-to-stand* tests, gait speed, and mean stride length. The telerehabilitation group showed greater improvements in five out of six tests compared to the control group. The most significant improvements in the telerehabilitation group were observed in the 2-minute walk (86.1%) and gait speed (65.6%) tests. At follow-up, the telerehabilitation group continued to improve in all outcome measures, whereas the control group showed no change in five of the six measures. Telerehabilitation, as a complementary treatment to standard physical therapy, had a positive effect on mobility in patients following hip fracture surgery.[18]

The study by Ortiz-Piña et al. (2021) in Spain examined the effect of a telerehabilitation program on the functional recovery of older adults who underwent surgery for hip fracture, comparing it to face-to-face rehabilitation. The telerehabilitation group participated in a 12-week program supervised by their family caregivers, while the control group received the usual postoperative rehabilitation. The primary endpoint was patient-reported functional status, assessed using the *Functional Independence Measure*. Performance-based functional recovery was also evaluated using the *Timed Up and Go* test and the *Short Physical Performance Battery*. The study included 133 participants. Those in the telerehabilitation group scored higher on the *Functional Independence Measure* and performed better on the *Timed Up and Go* test compared to the control group. However, differences between the groups on the *Short Physical Performance Battery* were not statistically significant after the intervention. The telerehabilitation intervention proposed in this study is a valuable treatment option in the recovery process of older adults with hip fractures.[19]

The study by Li et al. (2022) in China examined the efficacy of home telerehabilitation using a smartphone to improve motor performance, function in activities of daily living, and the level of fear of falling in outpatients receiving rehabilitation after hip fracture surgery. Thirty-one patients were randomly assigned to either the experimental group or the comparison group. The experimental group followed a telerehabilitation program, while the comparison group received paper-and-pencil instructions for the home program weekly for three weeks. In the experimental group, the level of fear of falling and performance of instrumental activities of daily living improved significantly in the post-intervention period and at follow-up. This study supports the potential use of telerehabilitation for adults after hip fracture surgery.[20]

The study by Mora-Traverso et al. (2024) in Spain analyzed the efficacy of telerehabilitation on quality of life, psychological factors, and physical condition in patients who had suffered a hip fracture. The study included 64 patients. The intervention group received multidisciplinary telerehabilitation at home for 12 weeks, while the control group received traditional care and rehabilitation. Outcomes measured included patients' quality of life using the EuroQol Questionnaire (EQ-5D), psychological factors (anxiety and depression) using the *Hospital Anxiety and Depression Scale* (HADS), and fitness level assessed with the *International Fitness Scale*. The telerehabilitation group showed an increase in quality of life, while the control group's score worsened after three months. The total HADS score decreased more in the telerehabilitation group than in the control group. Additionally, the telerehabilitation group recovered a fitness level closer to that at the time of the hip fracture compared to the control group ($p = 0.022$). The telerehabilitation program appears to be a promising treatment to improve the quality of life and psychological factors (anxiety and depression) of older adults after a hip fracture, as well as to help them regain their previous level of physical fitness.[21]

DISCUSSION

The results obtained indicate that telerehabilitation is a valuable tool for use in patients with hip fractures.

These findings are consistent with those of similar studies, such as the 2021 study by Ariza-Vega et al., which explored family caregivers' perspectives on the recovery process of older adults with hip fractures and described the experiences of caregivers who used telerehabilitation or home care. Forty-four caregivers were interviewed. Caregivers preferred the telerehabilitation program over in-person rehabilitation because it improved post-fracture recovery, helped them acquire skills for home management, and was more convenient in terms of time, transportation, and cost.[22]

In 2023, Tsuge et al. conducted a systematic review similar to ours, aiming to determine the efficacy of telerehabilitation in patients after hip fracture surgery through a systematic review and meta-analysis. Data were collected until mid-2022. Their results were similar to ours regarding the efficacy of rehabilitation and further suggested that telerehabilitation could boost patients' confidence in performing activities of daily living without fear of falling.[23]

Another similar review was conducted by Bramanti et al. in 2023. They also analyzed the safety and efficacy of telerehabilitation in hip fracture patients. Their conclusions align with ours, finding that telerehabilitation is safe, effective, well-tolerated by patients, and not inferior to conventional physical therapy. Additionally, they

highlighted its positive role in psychological rehabilitation, the prevention of complications, and the maintenance of achieved goals.[24]

The limitations of this study include those inherent to the search strategies selected for this systematic review, such as the language restriction to Spanish and English, which may have led to the exclusion of relevant articles. However, appropriate thesauri were used during the database searches. Additionally, many clinical trials did not specify the exact form of telerehabilitation used, potentially leading to uncontrolled variations across studies. This, along with incomplete data in some of the articles reviewed, limits the scope of the analysisDespite the promising results obtained, further research is needed to establish a unified protocol regarding frequency, session duration, program duration, and the number of sessions, supported by long-term follow-up of patients. Randomized controlled clinical studies analyzing potential synergistic effects with other therapies or treatments are also necessary. This approach will enable healthcare professionals to provide the best care based on the latest scientific evidence.

CONCLUSIONS

Telerehabilitation is effective for patients recovering from hip fracture surgery. This rehabilitation method improves the *Functional Independence Measure*, exercise self-efficacy, range of motion, quality of life, fear of falling, and performance of instrumental activities of daily living. It is also effective in reducing anxiety and depression, increasing patient satisfaction, and promoting the recovery of pre-fracture fitness levels.

Conflict of interest: The authors declare no conflicts of interest.

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REFERENCES

1. Veronese N, Maggi S. Epidemiology and social costs of hip fracture. *Injury* 2018;49(8):1458-60. https://doi.org/10.1016/j.injury.2018.04.015
2. Bhandari M, Swiontkowski M. Management of acute hip fracture. *N Engl J Med* 2017;377(21):2053-62. https://doi.org/10.1056/NEJMcp1611090
3. Brink O. Hip fracture clearance: How much optimisation is necessary? *Injury* 2020;51Suppl 2:S111-S117. https://doi.org/10.1016/j.injury.2020.02.046
4. Li L, Bennett-Brown K, Morgan C, Dattani R. Hip fractures. *Br J Hosp Med (Lond)* 2020;81(8):1-10. https://doi.org/10.12968/hmed.2020.0215
5. Dapaah D, Martel DR, Iranmanesh F, Seelemann C, Laing AC, Willett T. Fracture toughness: Bridging the gap between hip fracture and fracture risk assessment. *Curr Osteoporos Rep* 2023;21(3):253-65. https://doi.org/10.1007/s11914-023-00789-4
6. Katsanos S, Sioutis S, Reppas L, Mitsiokapa E, Tsatsaragkou A, Mastrokalos D, et al. What do hip fracture patients die from? *Eur J Orthop Surg Traumatol* 2023;33(4):751-7. https://doi.org/10.1007/s00590-022-03250-x
7. Loggers SAI, Van Lieshout EMM, Joosse P, Verhofstad MHJ, Willems HC. Prognosis of nonoperative treatment in elderly patients with a hip fracture: A systematic review and meta-analysis. *Injury* 2020;51(11):2407-13. https://doi.org/10.1016/j.injury.2020.08.027
8. Inoue T, Maeda K, Nagano A, Shimizu A, Ueshima J, Murotani K, et al. Undernutrition, sarcopenia, and frailty in fragility hip fracture: Advanced strategies for improving clinical outcomes. *Nutrients* 2020;12(12):3743. https://doi.org/10.3390/nu12123743

9. Fairhall NJ, Dyer SM, Mak JC, Diong J, Kwok WS, Sherrington C. Interventions for improving mobility after hip fracture surgery in adults. *Cochrane Database Syst Rev* 2022;9(9):CD001704. https://doi.org/10.1002/14651858.CD001704.pub5
10. Griffiths R, Babu S, Dixon P, Freeman N, Hurford D, Kelleher E, et al. Guideline for the management of hip fractures 2020: Guideline by the Association of Anaesthetists. *Anaesthesia* 2021;76(2):225-37. https://doi.org/10.1111/anae.15291
11. Romero Pisonero E, Mora Fernández J. Multidisciplinary geriatric rehabilitation in the patient with hip fracture and dementia. *Rev Esp Geriatr Gerontol* 2019;54(4):220-9. https://doi.org/10.1016/j.regg.2018.11.001
12. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *J Clin Epidemiol* 2021;134:178-89. https://doi.org/10.1016/j.jclinepi.2021.03.001
13. Mamédio da Costa Santos C, Andrucioli de Mattos Pimenta C, Cuce Nobre MR. The PICO strategy for the research question construction and evidence research. *Rev Lat Am Enfermagem* 2007;15(3):508-11. https://doi.org/10.1590/s0104-11692007000300023
14. Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, Welch WA (eds). *Cochrane Handbook for Systematic Reviews of Interventions*. 2nd ed. Chichester (UK): John Wiley & Sons; 2019.
15. Aguayo-Albasini JL, Flores-Pastor B, Soria-Aledo V. Sistema GRADE: Clasificación de la calidad de la evidencia y graduación de la fuerza de la recomendación. *Cirugía Española* 2014;92(2):82-8. https://doi.org/10.1016/j.ciresp.2013.08.002
16. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Syst Rev* 2016;5(1):210. https://doi.org/10.1186/s13643-016-0384-4
17. Bedra M, Finkelstein J. Feasibility of post-acute hip fracture telerehabilitation in older adults. *Stud Health Technol Inform* 2015;210:469-73. PMID: 25991191
18. Gilboa Y, Maeir T, Karni S, Eisenberg ME, Liebergall M, Schwartz I, et al. Effectiveness of a tele- rehabilitation intervention to improve performance and reduce morbidity for people post hip fracture study protocol for a randomized controlled trial. *BMC Geriatr* 2019;19(1):135. https://doi.org/10.1186/s12877-019-1141-z
19. Ortiz-Piña M, Molina-Garcia P, Femia P, Ashe MC, Martín-Martín L, Salazar-Graván S, et al. Effect of tele-rehabilitation compared with home-based in-person rehabilitation for older adult's function after hip fracture. *Int J Environ Res Public Health* 2021;18(10):5493. https://doi.org/10.3390/ijerph18105493
20. Li CT, Hung GK, Fong KN, Gonzalez PC, Wah SH, Tsang HW. Effects of home-based occupational therapy telerehabilitation via smartphone for outpatients after hip fracture surgery: A feasibility randomised controlled study. *J Telemed Telecare* 2022;28(4):239-47. https://doi.org/10.1177/1357633X20932434
21. Mora-Traverso M, Prieto-Moreno R, Molina-Garcia P, Salas-Fariña Z, Martín-Martín L, Martín- Matillas M, et al. Effects of the @ctivehip telerehabilitation program on the quality of life, psychological factors and fitness level of patients with hip fracture. *J Telemed Telecare* 2024;30(3):549-58. https://doi.org/10.1177/1357633X211073256
22. Ariza-Vega P, Castillo-Pérez H, Ortiz-Piña M, Ziden L, Palomino-Vidal J, Ashe MC. The journey of recovery: Caregivers' perspectives from a hip fracture telerehabilitation clinical trial. *Phys Ther* 2021;101(3):pzaa220. https://doi.org/10.1093/ptj/pzaa220
23. Tsuge T, Yamamoto N, Taito S, Miura T, Shiratsuchi D, Yorifuji T. Efficacy of telerehabilitation for patients after hip fracture surgery: A systematic review and meta-analysis. *J Telemed Telecare* 2023 Jul 7:1357633X231181632. https://doi.org/10.1177/1357633X231181632
24. Bramanti A, Ciurleo R, Vecchione C, Turolla A, Piramide N, Ciccarelli M, et al. Telerehabilitation: A solution for patients after hip fracture? *Transl Med UniSa* 2024;26(1):30-7. https://doi.org/10.37825/2239-9747.1048