

Angelique Mallo^{1,3}, Lessly Feriah, OTR, CBIS, Director of Rehabilitation²

¹I.H. Kempner High School, Sugar Land, TX | ²TIRR Memorial Hermann–Southwest, Houston, TX | ³Gifted and Talented Mentorship Program, Fort Bend ISD, TX

Abstract

Older adults represent a rapidly growing U.S. population and account for more than 70% of emergency-to-acute-care admissions, with nearly 500,000 annually transitioning to Inpatient Rehabilitation Facilities (IRFs). Despite rehabilitation efforts, sedentary behavior and poor post-discharge compliance remain major contributors to preventable hospital readmissions. Exercise-prescription apps such as PT Pal and Medbridge aim to improve adherence, yet their impact on reducing mobility-related readmissions has not been directly evaluated.

This systematic review, following PRISMA 2020 guidelines, examines recent literature to identify common causes of readmission in older adults, assess the effectiveness of existing exercise-prescription apps, and evaluate the feasibility of a more user-friendly, therapist-supported app.

Findings indicate strong associations between functional limitations, reduced activity levels, and readmission risk. While current apps show potential, usability barriers limit their effectiveness.

A redesigned, accessible app with integrated progress tracking may enhance compliance and reduce sedentary-based readmissions among older adults.

Introduction and Summary

The U.S. has one of the largest populations in the world, contributing millions of people to the global population. A part of these millions is a steadily growing group of senior citizens. In Texas alone, there are more than 3.1 million senior citizens [1]. However, despite the decrease in mortality rate and increase in care, senior citizens are more prone to having medical emergencies (strokes, surgeries, heart failure, etc.) that eventually get them admitted into hospitalized care. Older adults make up more than 70% of emergency room to acute care admissions [2]. Of the acute patient population, nearly 500,000 people are transported to Inpatient Rehabilitation Facilities, IRFs [3]. IRFs, such as TIRR Memorial Hermann and the Houston Methodist Rehabilitation Center, are specialized rehabilitation centers focused on providing constant care and therapy to improve patient condition in a shorter period of time compared to outpatient rehabilitation facilities and Skilled Nursing Facilities (SNFs). IRFs are focused on helping patients regain some, if not all, of their independence as well as an improvement in quality of life. In these IRFs, patient compliance has been proven to be a significant issue; some patients regularly live sedentary lives, which puts them at a higher risk of being readmitted to the hospital. Exercise prescription apps such as PT Pal and Medbridge have begun to be implemented in hospitals and clinics to improve this issue of patient compliance. Despite the evolution of technology, senior citizens who live sedentary lives are frequently readmitted to the hospital or have stunted improvement due to many factors that will be discussed in this systematic review.

To date, a study specifically aimed to investigate the effects of exercise prescription apps in the prevention of previous inpatient rehab mobility-based (sedentary) hospital readmissions has not been conducted nor addressed. The goal of this research endeavor is to determine the common reasons for hospital readmissions in older adults and assess the probability of both therapist and patient use of a modified version of an exercise prescription app. The hypothesis that will either be confirmed or disproven in this study is that a modified exercise prescription app has significant potential to reduce hospital readmissions through user-friendlier function and consequently increased patient compliance. By presenting this data to the IRB, the suggested modifications could be considered to promote overall patient improvement after discharge from the hospital in order to prevent sedentary-based readmission. By refining an existing exercise prescription app, it is expected that patient readmission rates will decline.

Methodology

A systematic review was conducted to support this research, consisting of both quantitative and qualitative data. This study is written using the framework provided by the PRISMA 2020 Checklist [4]. Literature from the previous 5 years are included in this study, excluding sources that define certain terms; the aforementioned literature was pulled from public research databases such as EBSCO, PubMed, Google Scholar, and ScienceDirect and were filtered to be from peer-reviewed scientific journals, published in the previous 5 years, and had full text access to the public. The goal that this study aims to achieve, which therefore determines the inclusion of specific studies in this research, is to identify sedentary-based hospital readmissions in older adults, determine the effectiveness of existing exercise prescription apps, and gauge the possibility of any modifications that could be made and implemented in the currently most efficient exercise prescription app. Relevant quantitative and qualitative data are pulled from existing literature and are used to inform aspects of the established problem and a potential proposed solution.

Results

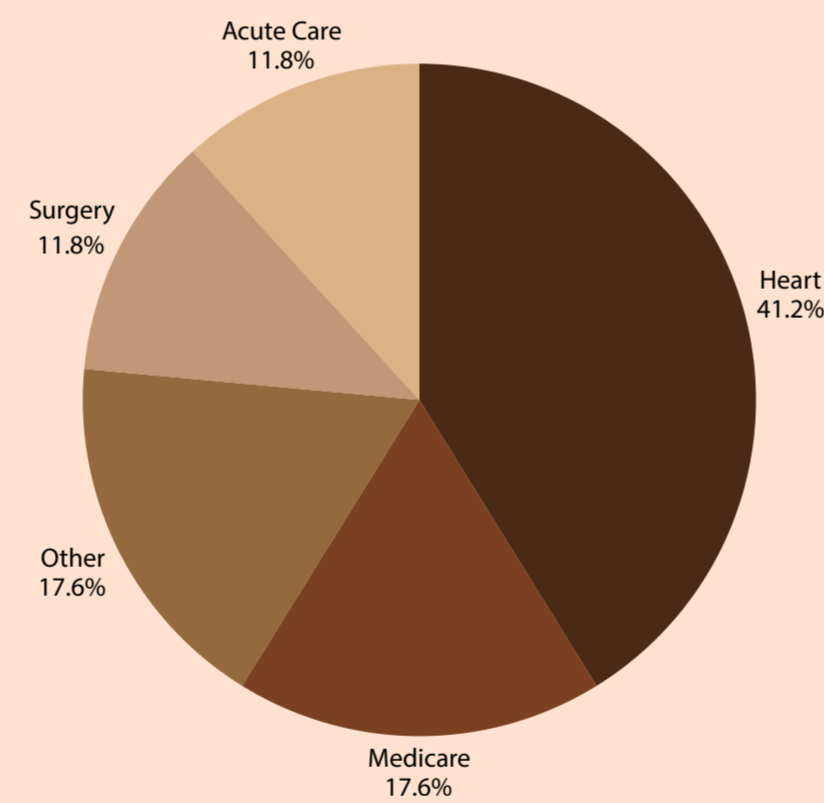


Figure 1. Data pulled from correlations between reasons for hospital admission and physical function [5]

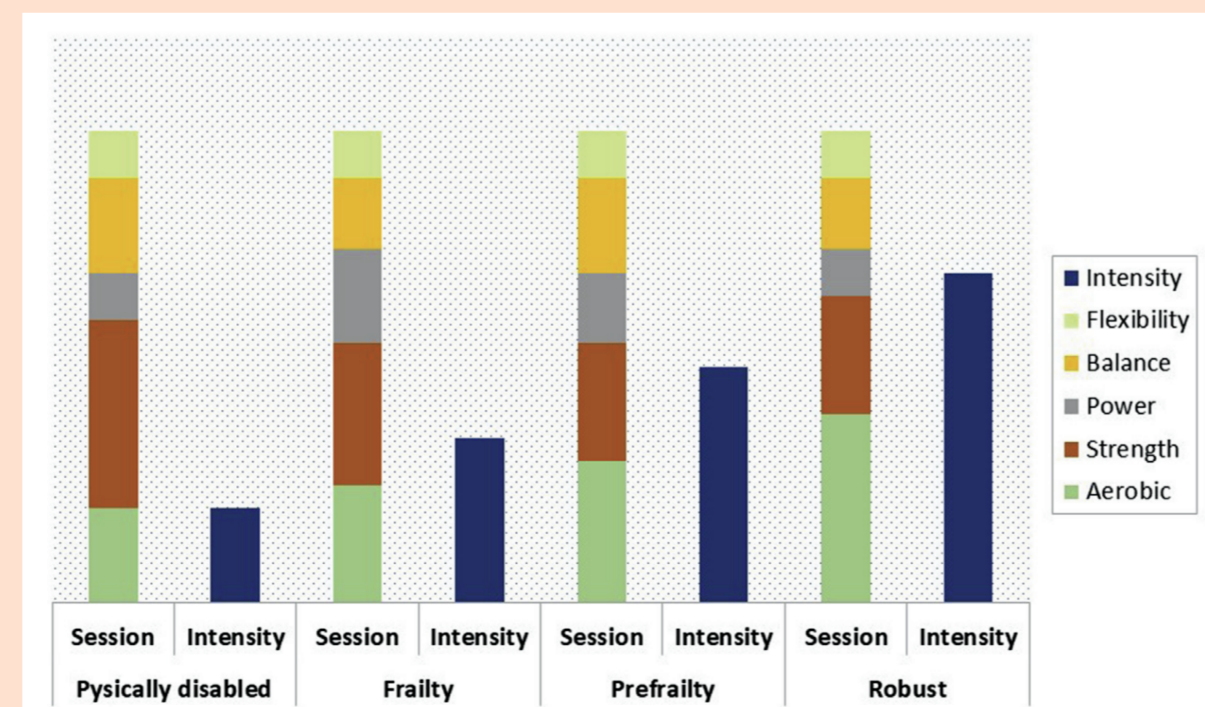


Figure 2. Screenshot of graph demonstrating distributions of exercise prescriptions for patients of varying physical function [6]

Findings and Discussion

There are a number of reasons as to why older adults make up a larger amount of acute patients in hospitals. These reasons contain, but are not limited to: falls/fall risk, surgery, and overall functions. However, readmissions often stem from similar roots—limited mobility in daily life. ADLs, or activities of daily living, are constantly surveyed by PTs and OTs in the hospital as ADLs are the main points and measurements of development for patients in Rehab. A patient's ability to complete ADLs are indicators of their level of independence or dependence [5]. In Thomas's systematic review, there was a strong identified correlation between patient functional limitations and hospital readmissions after analyzing over 80,000 hospitalized participants across seventeen studies. Older adults are more prone to inconsistent developments in mobility; these inconsistencies become more discernable when the patient transitions from increased mobility during hospitalization back to their previous sedentary lifestyle.

Older adults are in more need for consistent tracking, especially when used to living lives that do not promote improvements in mobility and physical functionality, which is focused on in physical and occupational therapy. Exercise prescription apps could be utilized in hospitals, Assisted Living, Skilled Nursing Facilities, and other establishments that consistently treat older adults. Including functions such as tracking physical improvements could possibly help aid recent discharges as well as prevent any sedentary-based readmissions. Physical function is directly correlated with lower readmission rates, increasing the need for consistent exercise—especially in the 30-day discharge period.

Limitations and Implications

There are potential biases within this systematic review due to my own experience within inpatient rehabilitation. Such experiences include any outside influence of physical therapists that I have personally talked to and conferred with about my research. There are multiple reasons as to why older adults are readmitted to the hospital—all of which were not entirely acknowledged in this study. Sedentary living can strengthen the effects of these reasons, which calls for a need for an exercise prescription app that can be utilized by therapists and discharged patients. Additionally, there are many valuable and informational sources that I have had to look past due to a need for subscriptions on databases such as ResearchGate and PubMed. Realistically, an exercise prescription app that also tracks progress would be difficult for physical therapists to update after a period of time due to an increased amount of discharged patients unless the company plans to charge the user to pay the therapists. AI may be necessary to generalize patients and allow for widely distributed simple prescriptions, which increases the risk of at-home injury.

References

1. "Seniors and the Elderly | Office of the Attorney General." Texasattorneygeneral.gov, 2019, texasattorneygeneral.gov/consumer-protection/seniors-and-elderly.
2. "Patient-level Factors and Their Impact on Hospital Admissions." Hcp.hms.harvard.edu, 23 June 2023, hcp.hms.harvard.edu/news/patient-level-factors-and-their-impact-hospital-admissions.
3. Sparling, Tawnee L., et al. "Development of a 30-Day Readmission Risk Calculator for the Inpatient Rehabilitation Setting." Journal of the American Medical Directors Association, vol. 23, no. 12, Elsevier BV, Dec. 2022, pp. 1964–70, doi.org/10.1016/j.jamda.2022.08.005. Accessed 9 Jan. 2024.
4. Page, Matthew J., et al. "The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews." BMJ, Mar. 2021, p. n71. DOI.org (Crossref), https://doi.org/10.1136/bmj.n71.
5. Thomas, Erin M., et al. "Association of Physical Function with Hospital Readmissions among Older Adults: A Systematic Review." Journal of Hospital Medicine, vol. 20, no. 3, Mar. 2025, pp. 277–87. DOI.org (Crossref), doi.org/10.1002/jhm.13538.
6. Angulo, Javier, et al. "Physical Activity and Exercise: Strategies to Manage Frailty." Redox Biology, vol. 35, Aug. 2020, p. 101513. DOI.org (Crossref), doi.org/10.1016/j.redox.2020.101513.