



Interventions to Reduce Hospital Readmissions: A Scoping Review

Mohammad Amin Bahrami ¹, Erfan Kharazmi ¹, Farzaneh Ghaleh Golab ², Payam Farhadi ^{2,3}, Farideh Ahmadi ^{2,*}

¹ Health Human Resources Research Center, School of Health Management and Information Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

² Student Research Committee, School of Health Management and Information Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

³ Faculty Member of Management Department, Zand Institute of Higher Education, Shiraz, Iran

*Corresponding author: Department of Health Services Management, School of Management and Medical Informatics, Shiraz University of Medical Sciences, Shiraz, Iran. Email: farideh69ahmadi@yahoo.com

Received 2023 November 29; Revised 2024 April 15; Accepted 2024 May 20.

Abstract

Context: In response to the growing strain on healthcare resources, urgent measures are needed to encourage early discharge and prevent unnecessary hospital readmissions. This review aimed to systematically assess studies of interventions designed to reduce readmissions.

Methods: The search was conducted between February 20 and March 20, 2023. Original articles focusing on interventions to reduce hospital readmission rates were reviewed. Two researchers were separately responsible for selecting articles, extracting data, and conducting qualitative assessments using the STROBE and CONSORT guidelines.

Results: The study included a total of seventy-two articles. The proposed interventions for minimizing readmission rates were classified into 14 distinct groups.

Conclusions: Patient follow-up after discharge and education emerge as two effective approaches in this context. Moreover, robust evidence exists to support the efficacy of community-based interventions in decreasing hospital readmissions.

Keywords: Hospitals, Patient Readmission, Rehospitalization

1. Context

Hospital readmission refers to the act of being admitted to the same healthcare facility with the same initial diagnosis within an unspecified timeframe. The importance of understanding post-discharge hospital readmissions has been steadily increasing due to the upward trend in readmission rates observed in hospitals over the past few decades (1). It has been reported that approximately one-fourth of all hospital admissions in the United States consist of readmissions (2). Additionally, one out of every five Medicare beneficiaries is readmitted to the hospital within 30 days of discharge (3).

Unplanned readmissions are commonly regarded as indicators of inadequate healthcare service quality (4) and can signify shortcomings in hospital management or discharge procedures, often being avoidable (5). There is no consensus regarding the proportion of readmissions that can be avoided, with significant

variation across studies, ranging from 5% to 79% (6). Another study estimated that approximately 60% of hospital readmissions are potentially preventable (7).

Unplanned readmissions have implications for both individuals and society as a whole. Socially, these consequences exert pressure on healthcare systems and lead to increased hospital expenses (2). Reported estimates indicate that annual healthcare system costs associated with readmissions range from \$12 billion to \$17.4 billion in the United States and £1.6 billion in Britain (3). These figures underscore the importance of reducing unnecessary expenses related to readmissions (8). Additionally, another study conducted in the United States revealed that readmissions within 30 days of discharge accounted for costs totaling \$17.4 billion, with a readmission rate of 19.6% (9).

Penalties established through cost-effective care legislation and readmission reduction programs provide incentives for hospitals to adopt interventions

aimed at reducing the likelihood of readmission, particularly within 30 days (10).

Readmission is influenced by various patient-related factors, such as age, gender, ethnicity, the presence of comorbidities, chronic conditions, and functional disabilities. Research indicates that broader organizational factors and care processes also have a significant impact (11).

This scoping review examined the relationship between targeted interventions and hospital readmissions for the following common diagnoses: Cardiovascular disease, surgery, premature infants, psychiatry, respiratory disease, type 2 diabetes, hip and knee replacement, malnutrition, high blood pressure, and chronic obstructive pulmonary disease. In relation to interventions to reduce readmissions, a number of systematic studies have been conducted worldwide.

This study complements previous reviews of the readmission intervention literature, which focused narrowly on appropriate policy-making, interdepartmental communications, pharmaceutical counseling, social support, and disease management programs. In this study, we have determined which types of interventions are more promising for reducing hospital readmissions among patients with common diagnoses.

2. Methods

A scoping review was conducted following the PRISMA guidelines. In the initial stage, the research question was formulated based on the PCC elements. The objective of this study was to identify strategies and interventions used to decrease hospital readmissions (Concept) in the entire population of individuals in all countries of the world (Population) within hospital settings (Context). The search was conducted between February 20 and March 20, 2023.

Research keywords included [(Re-Hospitalization) OR (Readmission, Patient) OR (Hospital Readmission) OR (readmission rates) OR (Rehospitalization) OR (Unplanned Readmissions) OR (Unplanned Hospital Readmissions)) AND ((Early Intervention) OR (preventable) OR (Educational Early Intervention) OR (Reduction Program) OR (Reduction Strategy) OR (Interventions)], which were searched in PubMed, Scopus, Web of Science, and Google Scholar.

The investigated articles have different individual effects, and we have not yet established a relationship between them. The important thing is to determine the information and connections between the articles we reviewed and to maintain a macro view. Depending on

the type of study and subject matter, the type of data analysis will vary. Content analysis is one of the qualitative data analysis methods. Our analysis should be scientific, principled, and free from any bias. Text analysis software such as MAXQDA can be used to analyze qualitative data. In this study, the content analysis method and MAXQDA version 10 software were used.

It is better to analyze the data as a team. After recovering, screening, and extracting data, three consecutive meetings were held with health management professors, hospital managers, and experts for thematic analysis and classification of interventions to reduce the rate of re-hospitalization. After the third meeting, the final classification was obtained and confirmed based on the consensus of the participants.

2.1. Inclusion and Exclusion Criteria

The selection criteria included articles related to the purpose of the research, published in English and Farsi in domestic and international scientific-research journals. Articles were excluded if the full text was not available, if the topic was deemed irrelevant after reading the article, or if the article was repetitive. Protocols and review studies were not included in the present research.

2.2. Quality Assessment of Articles

Unduplicated articles were evaluated by two researchers based on the title, abstract, and text of the article using the STROBE checklist (<https://www.strobe-statement.org/>) and CONSORT checklist (<https://www.consort-statement.org/>). In case of disagreement between the two reviewers on the inclusion of articles, a third reviewer or an independent reviewer was consulted to provide an unbiased judgment. According to the agreement of the research team members, the selected articles had to cover at least 16 out of 22 points on the STROBE checklist and at least 18 out of 25 points on the CONSORT checklist. Articles with a lower score were excluded from the review.

3. Results

A total of 4482 articles were retrieved, and after screening, 72 studies met the eligibility criteria for inclusion in the study. The article retrieval and screening process is shown in [Figure 1](#). Descriptive characteristics of the included articles are provided in [Table 1](#). The articles selected for this study spanned from

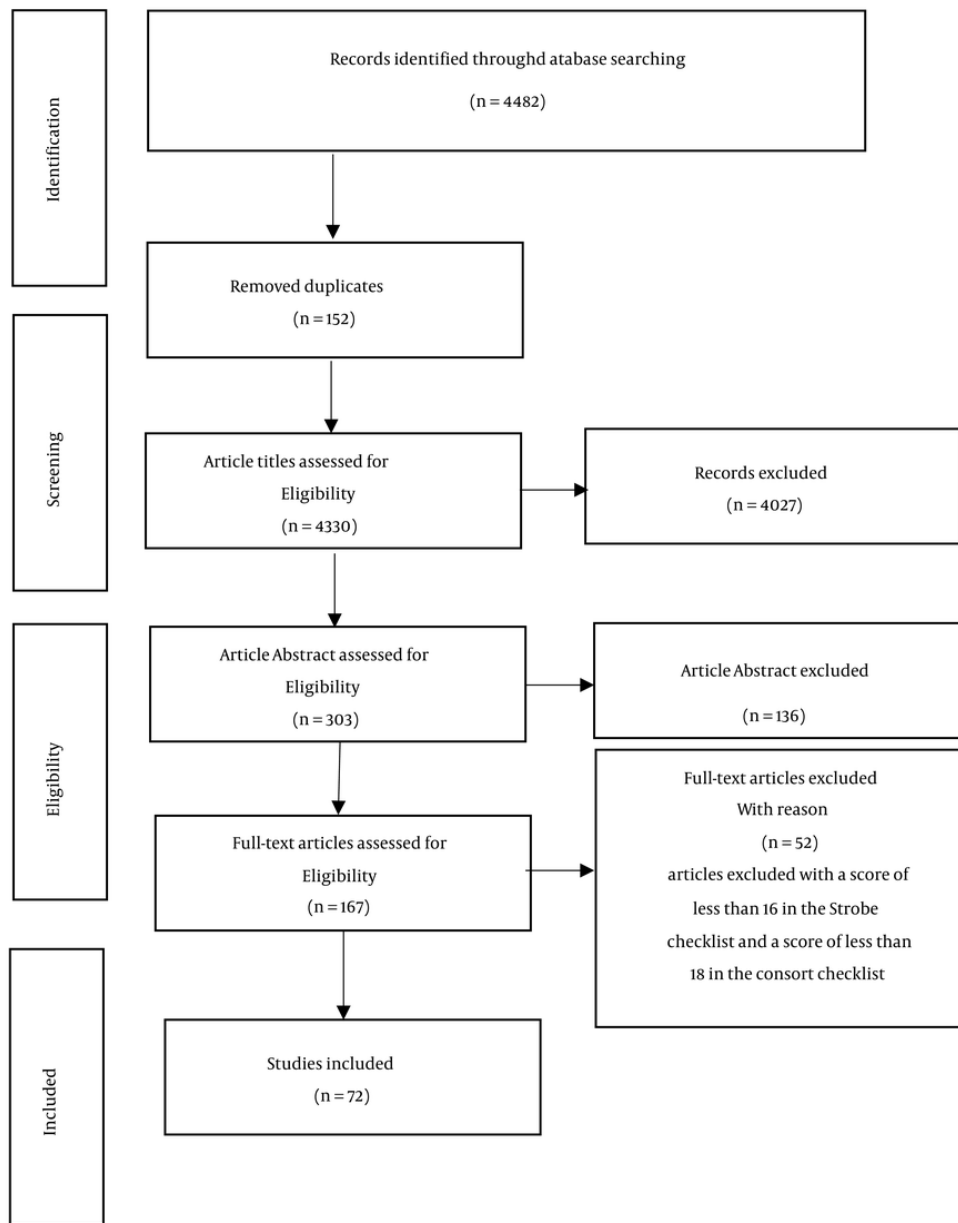


Figure 1. Prisma flow diagram

1990 to 2023, with many (50%) published between 2015 and 2019. Due to increased awareness of the importance of this issue and the rise in the number of studies in recent years, more research has been conducted under the title of readmission strategies in developed countries.

Out of these studies, rehospitalization within 30 days after discharge was monitored in 29 studies (44%). The sample sizes of the studies varied from 40 to over 1000 participants, with almost 39% of the studies including a study population ranging from 100 to 499 individuals. Cardiac diseases were the focus of most studies (43%). Approximately 50% of the studies utilized clinical trial

Table 1. Bibliographic Report of the Articles Included in the Scoping Review ^a

| Participant or Study Characteristic | Number of Studies ^b | References |
|---------------------------------------|--------------------------------|--|
| Year of publication | | |
| 1990 - 1999 | 1 (1.5) | (12) |
| 2000 - 2004 | 2 (2.5) | (13, 14) |
| 2005 - 2009 | 3 (6) | (15-17) |
| 2010 - 2014 | 15 (20) | (18-32) |
| 2015 - 2019 | 36 (50) | (6, 9, 10, 33-65) |
| 2020 - 2023 | 15 (20) | (5, 66-79) |
| Country | | |
| Developed nations | 39 (55) | (6, 14, 22-24, 27-32, 39-42, 44-47, 50, 51, 53-59, 61-64, 71-74, 77, 78) |
| Developing nations | 33 (45) | (5, 10, 12, 13, 15-21, 25, 26, 33-38, 43, 48, 49, 52, 60, 65-70, 75, 76, 79) |
| Study design | | |
| Historical cohort study | 9 (12.6) | (6, 21, 24, 30, 50, 65, 72, 75, 77) |
| Cross-sectional study | 19 (26.7) | (10, 28, 31, 32, 40-42, 45, 52-54, 57-62, 73, 74) |
| Clinical trial | 36 (50) | (5, 9, 13, 15-20, 22, 23, 26, 27, 33-39, 43, 44, 46-49, 51, (63, 66-71, 76, 79) |
| Case-control study | 4 (5.6) | (12, 29, 55, 78) |
| Before-after study | 2 (2.8) | (14, 25) |
| Qualitative | 1 (2.30) | (64) |
| Hospital readmission period | | |
| < 30 days | 6 (9) | (13, 21, 34, 40, 63, 67) |
| 30 days | 29 (44) | (5, 10, 12, 19, 23, 24, 27, 30, 35, 36, 41-43, 45-48, 50-52, 54, 59, 61, 65, 66, 71, 72, 76, 79) |
| 60 days | 4 (8) | (9, 10, 16, 35) |
| 90 days | 12 (18) | (5, 17, 18, 20, 33, 35, 38, 44, 51, 68, 70, 73) |
| Six months to one year | 14 (21) | (6, 14, 15, 22, 25, 26, 28, 37, 39, 49, 53, 55, 62, 69) |
| Sample size | | |
| < 100 | 22 (37) | (5, 12, 13, 15-18, 26, 28, 34-38, 44, 49, 66-70, 74) |
| 100 - 499 | 23 (39) | (9, 14, 19-21, 23-25, 27, 33, 39, 40, 43, 46-48, 51, 55, 63, 65, 71, 76, 77) |
| 500 - 999 | 4 (8) | (6, 30, 32, 79) |
| ≥ 1,000 | 10 (16) | (22, 41, 42, 45, 50, 52-54, 72, 75) |
| Type of Disease | | |
| Cardiovascular disease | 19 (40) | (9, 12, 13, 15, 16, 18, 20, 22, 32, 33, 35, 38, 39, 43, 46, 57, 62, 67-70) |
| Surgery | 3 (6) | (40, 58, 60) |
| Premature infants | 5 (10.5) | (19, 34, 36, 48, 66) |
| Psychiatry | 5 (10.5) | (14, 17, 26, 27, 37) |
| Respiratory disease | 3 (6) | (24, 25, 44) |
| Type 2 diabetes | 1 (3.5) | (71) |
| Hip and knee replacement | 2 (3.5) | (29, 45) |
| Malnutrition | 3 (6) | (28, 49-54) |
| Blood pressure | 1 (3.5) | (75) |
| Chronic obstructive pulmonary disease | 5 (10.5) | (24, 25, 44, 51, 52) |

^a Limitations: All the information displayed in the above table is based on the available articles, and more than 95% of the articles in each category have been repeated.

^b Values are expressed as No. (%).

methodology, comparing intervention groups with control or placebo groups to investigate the effectiveness of interventions.

Other findings reveal that a total of fourteen key intervention groups have been suggested as effective in reducing hospital readmissions. These interventions

encompass disease management programs, appropriate policy-making, utilization of advanced discharge planning models, education, post-discharge patient follow-up, implementation of health information technology, interdepartmental communication, departmental structure, adequate staffing, professional skill development, social support, pharmaceutical

counseling, rehabilitation and recovery, and nutritional counseling (Table 2). Each group includes several categories, the findings of which are shown in Table 2.

4. Discussion

Reducing hospital readmissions is a top priority in any healthcare system, and several interventions have been proposed to address this issue. Post-discharge patient follow-up was identified as the most crucial intervention, with telephone follow-up being the most frequent category. Among the eighteen intervention studies that included telephone follow-up, twelve demonstrated significant effectiveness in reducing readmission rates (6, 9, 19), (21-23), (32, 38, 39), (41, 64, 67). Most of these studies integrated telephone follow-up with other interventions, while only five studies focused exclusively on telephone follow-up (6, 22, 39, 41, 68).

Educational interventions were identified as the second most common approach. Our findings indicate that educational interventions are often integrated with telephone follow-up, pharmaceutical counseling, and discharge planning (9, 16, 19), (23, 35, 38), (45, 48, 63), (70, 77). Our investigation incorporates evidence from various authors who have assessed the impact of educational interventions on aspects such as quality of life, disease awareness, self-care, reduction in readmission costs, and cost-effectiveness of the intervention (5, 9, 13), (14, 18, 19), (21, 23, 34, 70).

Nutritional interventions included individual nutrition counseling during discharge. Supplementation with oral nutritional supplements (ONS), whether administered during hospitalization or in a community setting following discharge, contributes to a reduction in readmissions (51, 52, 56).

A community-based care transition program illustrates a well-established and formal network of collaborations between acute care hospitals and community-based organizations. These collaborations involve social service organizations that offer timely post-discharge care to patients and monitor their progress. Among the five available studies, four have highlighted the impact of these collaborations on reducing hospital readmissions (31, 61, 62, 66). In another study, EMS personnel played a key role in connecting patients to community-based support mechanisms for both physical and mental health. Patients who received the intervention experienced a relative decrease of 44% in physician visits and a relative reduction of 28.4% in 30-day readmissions.

Providing medication upon patient discharge is crucial for preventing errors and ensuring continuity of

care. Delivering post-discharge medications at the bedside and providing medications to patients before discharge can help overcome initial barriers to medication access and address any insurance or medication discrepancies that may arise (73).

4.1. Conclusions

Post-discharge follow-up and patient education were identified as two effective interventions for reducing readmissions. However, their effectiveness can be enhanced when combined with other interventions. Furthermore, our study provides strong evidence supporting the effectiveness of community-based interventions in reducing readmissions, including appropriate policy-making, interdepartmental communications, pharmaceutical counseling, social support, and disease management programs. The results of this study offer valuable insights for health policymakers and hospital administrators, particularly on a global scale.

4.2. Limitations

It is possible that our search method did not capture all relevant studies. To mitigate this, all steps were performed by two independent researchers.

Footnotes

Authors' Contribution: Farideh Ahmadi was responsible for the study conception and design; FA, FGH and PF searched the relevant databases and included the appropriate articles according to the study objective; at the same time, Mohammad Amin Bahrani and Erfan Kharazmi supervised the whole paper. All authors prepared the first draft of the manuscript. All authors did the data analysis, made critical revisions to the paper for important intellectual content, and supervised the study. All authors have read and approved the final manuscript.

Conflict of Interests Statement: The authors declare no conflict of interest.

Data Availability: The data presented in this study are uploaded during submission as a supplementary file and are openly available for readers upon request.

Funding/Support: The study has received no funds.

References

1. Hekmatpou D, Mohammadi E, Ahmadi F, Arefi SH. [Barriers of readmission control among patients with congestive heart failure: A

- qualitative study]. *J Arak Univ Med Sci*. 2008;**11**(4):49-58. Persian.
2. Lærum-Onsager E, Molin M, Olsen CF, Bye A, Debesay J, Hestevik CH, et al. Effect of nutritional and physical exercise intervention on hospital readmission for patients aged 65 or older: a systematic review and meta-analysis of randomized controlled trials. *Int J Behav Nutr Phys Act*. 2021;**18**(1):62. [PubMed ID: 33971901]. [PubMed Central ID: PMC8112053]. <https://doi.org/10.1186/s12966-021-01123-w>.
 3. Jayakody A, Bryant J, Carey M, Hobden B, Dodd N, Sanson-Fisher R. Effectiveness of interventions utilising telephone follow up in reducing hospital readmission within 30 days for individuals with chronic disease: a systematic review. *BMC Health Serv Res*. 2016;**16**(1):403. [PubMed ID: 27538884]. [PubMed Central ID: PMC4990979]. <https://doi.org/10.1186/s12913-016-1650-9>.
 4. Ferdinand AO, Cheon O, Bako AT, Kash BA. Interventions aimed at addressing unplanned hospital readmissions in the U.S.: A systematic review. *J Hosp Adm*. 2018;**8**(1):16. <https://doi.org/10.5430/jha.v8n1p16>.
 5. Bagherzadi A, Habibzadeh H, Didarloo A, Kalkhali HR. [The Effect of Educational Intervention Based on Health Belief Model on Preventive Behaviors of Readmission in Patients with Early Diagnosis of Acute Coronary Syndrome]. *Quarterly J Manag Strateg Health Syst*. 2022;**6**(4). Persian. <https://doi.org/10.18502/mshsj.v6i4.8986>.
 6. Vernon D, Brown JE, Griffiths E, Nevill AM, Pinkney M. Reducing readmission rates through a discharge follow-up service. *Future Healthc J*. 2019;**6**(2):114-7. [PubMed ID: 31363517]. [PubMed Central ID: PMC6616175]. <https://doi.org/10.7861/futurehosp.6-2-114>.
 7. Bamforth RJ, Chhibba R, Ferguson TW, Sabourin J, Pieroni D, Askin N, et al. Strategies to prevent hospital readmission and death in patients with chronic heart failure, chronic obstructive pulmonary disease, and chronic kidney disease: A systematic review and meta-analysis. *PLoS One*. 2021;**16**(4). e0249542. [PubMed ID: 33886582]. [PubMed Central ID: PMC8062060]. <https://doi.org/10.1371/journal.pone.0249542>.
 8. Upadhyay S, Opoku-Agyeman W, Borkowski N. An environmental analysis of the evolution of readmission reduction strategies: A study of United States hospitals. *J Hosp Adm*. 2017;**6**(5):40. <https://doi.org/10.5430/jha.v6n5p40>.
 9. Laal N, Shekarriz-Foumani R, Khodaie F, Abadi A, Heidarnia MA. [Effects of patient education and follow up after discharge on hospital readmission in heart failure patients]. *Pejouhesh dar Pezeshki (Res Med)*. 2017;**41**(1):24-30. Persian.
 10. Bowles KH, Chittams J, Heil E, Topaz M, Rickard K, Bhasker M, et al. Successful electronic implementation of discharge referral decision support has a positive impact on 30- and 60-day readmissions. *Res Nurs Health*. 2015;**38**(2):102-14. [PubMed ID: 25620675]. [PubMed Central ID: PMC4363131]. <https://doi.org/10.1002/nur.21643>.
 11. Conroy T, Heuzenroeder L, Feo R. In-hospital interventions for reducing readmissions to acute care for adults aged 65 and over: An umbrella review. *Int J Qual Health Care*. 2020;**32**(7):414-30. [PubMed ID: 32558919]. <https://doi.org/10.1093/intqhc/mzaa064>.
 12. Perk J, Hedback B, Engvall J. Effects of cardiac rehabilitation after coronary artery bypass grafting on readmissions, return to work, and physical fitness. A case-control study. *Scand J Soc Med*. 1990;**18**(1):45-51. [PubMed ID: 1969679]. <https://doi.org/10.1177/140349489001800107>.
 13. Hosseini MA, Mandegar H, Zand BM. [Assessment the effects of cardiac rehabilitation program on occurrence of clinical manifestation and rehospitalization of patients after coronary bypass grafting surgery]. *Jundishapur Sci Med J*. 2004;**2**(39):7. Persian.
 14. Montero I, Asencio A, Hernandez I, Masanet MJ, Lacruz M, Bellver F, et al. Two strategies for family intervention in schizophrenia: a randomized trial in a Mediterranean environment. *Schizophr Bull*. 2001;**27**(4):661-70. [PubMed ID: 11824492]. <https://doi.org/10.1093/oxfordjournals.schbul.a006905>.
 15. Abedi H, Arefi S, Ahmadi F, Faghihi-Zadeh S, Ghofranipour F. [Effect of continuous consultation care model on re hospitalization and chest pain in patients with coronary artery disease]. *J Qazvin Univ Med Sci*. 2005;**35**(9):99-103. Persian.
 16. Davoudvand SM, Elahi N, Ahmadi F, Haghighi-Zadeh MH. [Effectiveness of the Short-Term Cardiac Rehabilitation Programs on the Rate of Disease Relapse, Again Refer and Rehospitalization in Patients with Myocardial Infarction]. *Arch Rehabil*. 2008;**9**(1):17-22. Persian.
 17. Fallahi Khoshknab M, Khankeh HR, Hosaini MA, Mohammadi F, Rahgou A, Ghazanfari N. [Home care effectiveness in preventing rehospitalization of acute schizophrenic patients]. *Iran J Nurs Res*. 2009;**4**(14):59-66. Persian.
 18. Ghahramani A, Kamrani F, Mohamadzadeh S, Namadi M. [Effect of self care education on knowledge, performance and readmission of heart failure patients admitted in city hospitals of Ardabil]. *Iran J Nurs Res*. 2013;**8**(2):65-72. Persian.
 19. Dashti E, Rassouli M, Khanali Mojen L, Puorhoseingholi A, Shirinabady Farahani A. [Correlation between discharge preparation and rehospitalization of premature newborns]. *J Health Prom Manag*. 2014;**3**(4):37-45. Persian.
 20. Shojaee A, Nehrir B, Naderi N, Zareyan A. Assessment of the effect of patient's education and telephone follow up by nurse on readmissions of the patients with heart failure. *Iran J Crit Care Nurs*. 2013;**6**(1):29-38.
 21. Harrison PL, Hara PA, Pope JE, Young MC, Rula EY. The impact of postdischarge telephonic follow-up on hospital readmissions. *Popul Health Manag*. 2011;**14**(1):27-32. [PubMed ID: 21090991]. [PubMed Central ID: PMC3128446]. <https://doi.org/10.1089/pop.2009.0076>.
 22. Black JT, Romano PS, Sadeghi B, Auerbach AD, Ganiats TG, Greenfield S, et al. A remote monitoring and telephone nurse coaching intervention to reduce readmissions among patients nurse with heart failure: study protocol for the Better Effectiveness After Transition - Heart Failure (BEAT-HF) randomized controlled trial. *Trials*. 2014;**15**:124. [PubMed ID: 24725308]. [PubMed Central ID: PMC3990010]. <https://doi.org/10.1186/1745-6215-15-124>.
 23. Altfeld SJ, Shier GE, Rooney M, Johnson TJ, Golden RL, Karavolos K, et al. Effects of an enhanced discharge planning intervention for hospitalized older adults: a randomized trial. *Gerontol*. 2013;**53**(3):430-40. [PubMed ID: 22961467]. <https://doi.org/10.1093/geront/gns109>.
 24. Gavish R, Levy A, Dekel OK, Karp E, Maimon N. The Association Between Hospital Readmission and Pulmonologist Follow-up Visits in Patients With COPD. *Chest*. 2015;**148**(2):375-81. [PubMed ID: 25611698]. <https://doi.org/10.1378/chest.14-1453>.
 25. Ko FW, Ngai JC, Ng SS, Chan KP, Cheung R, Leung MY, et al. COPD care programme can reduce readmissions and in-patient bed days. *Respir Med*. 2014;**108**(12):1771-8. [PubMed ID: 25459450]. <https://doi.org/10.1016/j.rmed.2014.09.019>.
 26. Sledge WH, Lawless M, Sells D, Wieland M, O'Connell MJ, Davidson L. Effectiveness of peer support in reducing readmissions of persons with multiple psychiatric hospitalizations. *Psychiatr Serv*. 2011;**62**(5):541-4. [PubMed ID: 21532082]. https://doi.org/10.1176/ps.62.5.pss6205_0541.
 27. Taylor C, Holsinger B, Flanagan JV, Ayers AM, Hutchison SL, Terhorst L. Effectiveness of a Brief Care Management Intervention for Reducing Psychiatric Hospitalization Readmissions. *J Behav Health Serv Res*. 2016;**43**(2):262-71. [PubMed ID: 24627234]. <https://doi.org/10.1007/s11414-014-9400-4>.
 28. Hall BT, Englehart MS, Blaseg K, Wessel K, Stawicki SP, Evans DC. Implementation of a dietitian-led enteral nutrition support clinic results in quality improvement, reduced readmissions, and cost savings. *Nutr Clin Pract*. 2014;**29**(5):649-55. [PubMed ID: 25606646]. <https://doi.org/10.1177/0884533614538285>.

29. Jordan CJ, Goldstein RY, Michels RF, Hutzler L, Slover JD, Bosco JA. Comprehensive program reduces hospital readmission rates after total joint arthroplasty. *Am J Orthop (Belle Mead NJ)*. 2012;**41**(11):E147-51. [PubMed ID: 23431519].
30. Flood KL, MacLennan PA, McGrew D, Green D, Dodd C, Brown CJ. Effects of an acute care for elders unit on costs and 30-day readmissions. *JAMA Intern Med*. 2013;**173**(11):981-7. [PubMed ID: 23609002]. <https://doi.org/10.1001/jamainternmed.2013.524>.
31. Costantino ME, Frey B, Hall B, Painter P. The influence of a postdischarge intervention on reducing hospital readmissions in a Medicare population. *Popul Health Manag*. 2013;**16**(5):310-6. [PubMed ID: 23537154]. [PubMed Central ID: PMC3771544]. <https://doi.org/10.1089/pop.2012.0084>.
32. Amarasingham R, Patel PC, Toto K, Nelson LL, Swanson TS, Moore BJ, et al. Allocating scarce resources in real-time to reduce heart failure readmissions: a prospective, controlled study. *BMJ Qual Saf*. 2013;**22**(12):998-1005. [PubMed ID: 23904506]. [PubMed Central ID: PMC3888600]. <https://doi.org/10.1136/bmjqs-2013-001901>.
33. Shahbaz A, Hemmati-Maslakpak M. [Relationship of self-care behaviors with hospital readmission in people with heart failure]. *Cardiovascular Nurs J*. 2017;**6**(2):24-33. Persian.
34. Moradi S, Valizadeh S, Arshadi Bostanabad M, Seyed Rasouli A, Tapak L. [Impact of Empowerment Program on the Self-efficacy of Mothers of Premature Infants and their Re-hospitalization]. *Iran J Nurs Res*. 2019;**13**(5):30-5. Persian.
35. Roohani M, Gheiasi F, Hanifi N, Kamali K. [The effect of teaching heart failure patients and their families based on their learning needs on frequency of re-admission]. *Preventive Care Nurs Midwifery J*. 2016;**6**(3):1-11. Persian.
36. Karbandi S, Momenizade A, Heydarzade M, Mazlom SR, Hassanzade M. [Effects of Maternal Empowerment Program on the Length of Hospitalization and Readmission Rate of Premature Infants]. *J Babol Univ Med Sci*. 2015;**17**(10):28-33. Persian. <https://doi.org/10.22088/jbums.17.10.28>.
37. Esazadeh N, Radfar M, Khalkhali H. ["Adaptive sustainability" model: A new approach to reduce readmission in depressed patients]. *Nurs Midwifery J*. 2016;**14**(5):417-25. Persian.
38. Zolfaghari A, Dadgari F, Farsi Z. [Effect of Telephone Follow-up Care on Rehospitalization and Depression in Patients Undergoing Open Heart Surgery in a Selected Military Hospital]. *Military Caring Sci*. 2017;**4**(2):129-37. Persian. <https://doi.org/10.29252/mcs.4.2.129>.
39. Boyde M, Peters R, New N, Hwang R, Ha T, Korczyk D. Self-care educational intervention to reduce hospitalisations in heart failure: A randomised controlled trial. *Eur J Cardiovasc Nurs*. 2018;**17**(2):178-85. [PubMed ID: 28832179]. <https://doi.org/10.1177/1474515117727740>.
40. Nettleton J, Jelski J, Ahmad A. Reducing readmissions and improving patient experience following urological surgery, through early telephone follow-up. *BMJ Open Qual*. 2020;**9**(2). [PubMed ID: 32303500]. [PubMed Central ID: PMC7199917]. <https://doi.org/10.1136/bmjopen-2018-000533>.
41. Alvarez R, Ginsburg J, Grabowski J, Post S, Rosenberg W. The Social Work Role in Reducing 30-Day Readmissions: The Effectiveness of the Bridge Model of Transitional Care. *J Gerontol Soc Work*. 2016;**59**(3):222-7. [PubMed ID: 27276523]. <https://doi.org/10.1080/01634372.2016.1195781>.
42. Jackson C, Shahsahebi M, Wedlake T, DuBard CA. Timeliness of outpatient follow-up: an evidence-based approach for planning after hospital discharge. *Ann Fam Med*. 2015;**13**(2):115-22. [PubMed ID: 25755032]. [PubMed Central ID: PMC4369604]. <https://doi.org/10.1370/afm.1753>.
43. Santaularia N, Caminal J, Arnau A, Perramon M, Montesinos J, Abenoza Guardiola M, et al. The efficacy of a supervised exercise training programme on readmission rates in patients with myocardial ischemia: results from a randomised controlled trial. *Eur J Cardiovasc Nurs*. 2017;**16**(3):201-12. [PubMed ID: 27162127]. <https://doi.org/10.1177/1474515116648801>.
44. Johnson-Warrington V, Rees K, Gelder C, Morgan MD, Singh SJ. Can a supported self-management program for COPD upon hospital discharge reduce readmissions? A randomized controlled trial. *Int J Chron Obstruct Pulmon Dis*. 2016;**11**:1161-9. [PubMed ID: 27330284]. [PubMed Central ID: PMC4898045]. <https://doi.org/10.2147/COPD.S91253>.
45. Lasater KB, McHugh MD. Nurse staffing and the work environment linked to readmissions among older adults following elective total hip and knee replacement. *Int J Qual Health Care*. 2016;**28**(2):253-8. [PubMed ID: 26843548]. [PubMed Central ID: PMC4833205]. <https://doi.org/10.1093/intqhc/mzw007>.
46. Schumacher C, Moaddab G, Colbert M, Kliethermes MA. The Effect of Clinical Pharmacists on Readmission Rates of Heart Failure Patients in the Accountable Care Environment. *J Manag Care Spec Pharm*. 2018;**24**(8):795-9. [PubMed ID: 30058987]. [PubMed Central ID: PMC10397892]. <https://doi.org/10.18553/jmcp.2018.24.8.795>.
47. Feldmann JD, Otting RI, Otting CM, Witry MJ. A community pharmacist-led service to facilitate care transitions and reduce hospital readmissions. *J Am Pharm Assoc (2003)*. 2018;**58**(1):36-43. [PubMed ID: 29097094]. <https://doi.org/10.1016/j.japh.2017.09.004>.
48. Bastani F, Abadi TA, Haghani H. Effect of Family-centered Care on Improving Parental Satisfaction and Reducing Readmission among Premature Infants: A Randomized Controlled Trial. *J Clin Diagn Res*. 2015;**9**(1):SC04-8. [PubMed ID: 25738051]. [PubMed Central ID: PMC4347142]. <https://doi.org/10.7860/JCDR/2015/10356.5444>.
49. Yang PH, Lin MC, Liu YY, Lee CL, Chang NJ. Effect of Nutritional Intervention Programs on Nutritional Status and Readmission Rate in Malnourished Older Adults with Pneumonia: A Randomized Control Trial. *Int J Environ Res Public Health*. 2019;**16**(23). [PubMed ID: 31783672]. [PubMed Central ID: PMC6926802]. <https://doi.org/10.3390/ijerph16234758>.
50. Mullin GE, Fan L, Sulo S, Partridge J. The Association between Oral Nutritional Supplements and 30-Day Hospital Readmissions of Malnourished Patients at a US Academic Medical Center. *J Acad Nutr Diet*. 2019;**19**(7):1168-75. [PubMed ID: 30954446]. <https://doi.org/10.1016/j.jand.2019.01.014>.
51. Snider JT, Jena AB, Linthicum MT, Hegazi RA, Partridge JS, LaVallee C, et al. Effect of hospital use of oral nutritional supplementation on length of stay, hospital cost, and 30-day readmissions among Medicare patients with COPD. *Chest*. 2015;**147**(6):1477-84. [PubMed ID: 25357165]. [PubMed Central ID: PMC4451705]. <https://doi.org/10.1378/chest.14-1368>.
52. Lindegaard Pedersen J, Pedersen PU, Damsgaard EM. Nutritional Follow-Up after Discharge Prevents Readmission to Hospital - A Randomized Clinical Trial. *J Nutr Health Aging*. 2017;**21**(1):75-82. [PubMed ID: 27999853]. <https://doi.org/10.1007/s12603-016-0745-7>.
53. Sriram K, Sulo S, VanDerBosch G, Kozmic S, Sokolowski M, Summerfelt WT, et al. Nutrition-Focused Quality Improvement Program Results in Significant Readmission and Length of Stay Reductions for Malnourished Surgical Patients. *JPEN J Parenter Enteral Nutr*. 2018;**42**(6):1093-8. [PubMed ID: 29392736]. <https://doi.org/10.1002/jpen.1040>.
54. Sriram K, Sulo S, VanDerBosch G, Partridge J, Feldstein J, Hegazi RA, et al. A Comprehensive Nutrition-Focused Quality Improvement Program Reduces 30-Day Readmissions and Length of Stay in Hospitalized Patients. *JPEN J Parenter Enteral Nutr*. 2017;**41**(3):384-91. [PubMed ID: 27923890]. <https://doi.org/10.1177/0148607116681468>.
55. Navarro DA, Boaz M, Krause I, Elis A, Chernov K, Giabra M, et al. Improved meal presentation increases food intake and decreases readmission rate in hospitalized patients. *Clin Nutr*. 2016;**35**(5):1153-8. [PubMed ID: 26627844]. <https://doi.org/10.1016/j.clnu.2015.09.012>.

56. Nielsen LM, Maribo T, Kirkegaard H, Petersen KS, Oestergaard LG. Development of a complex intervention aimed at reducing the risk of readmission of elderly patients discharged from the emergency department using the intervention mapping protocol. *BMC Health Serv Res*. 2018;**18**(1):588. [PubMed ID: 30055597]. [PubMed Central ID: PMC6064169]. <https://doi.org/10.1186/s12913-018-3391-4>.
57. Murtaugh CM, Deb P, Zhu C, Peng TR, Barron Y, Shah S, et al. Reducing Readmissions among Heart Failure Patients Discharged to Home Health Care: Effectiveness of Early and Intensive Nursing Services and Early Physician Follow-Up. *Health Serv Res*. 2017;**52**(4):1445-72. [PubMed ID: 27468707]. [PubMed Central ID: PMC5517672]. <https://doi.org/10.1111/1475-6773.12537>.
58. Ibrahim AM, Nathan H, Thumma JR, Dimick JB. Impact of the Hospital Readmission Reduction Program on Surgical Readmissions Among Medicare Beneficiaries. *Ann Surg*. 2017;**266**(4):617-24. [PubMed ID: 28657948]. [PubMed Central ID: PMC5968452]. <https://doi.org/10.1097/SLA.0000000000002368>.
59. Wasfy JH, Zigler CM, Choirat C, Wang Y, Dominici F, Yeh RW. Readmission Rates After Passage of the Hospital Readmissions Reduction Program: A Pre-Post Analysis. *Ann Intern Med*. 2017;**166**(5):324-31. [PubMed ID: 28024302]. [PubMed Central ID: PMC5507076]. <https://doi.org/10.7326/M16-0185>.
60. Schoenfeld AJ, Zhang X, Grabowski DC, Mor V, Weissman JS, Rahman M. Hospital-skilled nursing facility referral linkage reduces readmission rates among Medicare patients receiving major surgery. *Surgery*. 2016;**159**(5):1461-8. [PubMed ID: 26830069]. [PubMed Central ID: PMC4821789]. <https://doi.org/10.1016/j.surg.2015.12.012>.
61. Gardner RL, Pelland K, Youssef R, Morphis B, Calandra K, Hollands L, et al. Reducing Hospital Readmissions Through a Skilled Nursing Facility Discharge Intervention: A Pragmatic Trial. *J Am Med Dir Assoc*. 2020;**21**(4):508-12. [PubMed ID: 31812334]. <https://doi.org/10.1016/j.jamda.2019.10.001>.
62. Wright TE. A Novel Nesting Protocol to Decrease Readmission and Increase Patient Satisfaction Following Congenital Heart Surgery. *J Pediatr Nurs*. 2018;**43**:1-8. [PubMed ID: 30473150]. <https://doi.org/10.1016/j.pedn.2018.07.009>.
63. Finlayson K, Chang AM, Courtney MD, Edwards HE, Parker AW, Hamilton K, et al. Transitional care interventions reduce unplanned hospital readmissions in high-risk older adults. *BMC Health Serv Res*. 2018;**18**(1):956. [PubMed ID: 30541530]. [PubMed Central ID: PMC6291980]. <https://doi.org/10.1186/s12913-018-3771-9>.
64. Ahmad FS, Metlay JP, Barg FK, Henderson RR, Werner RM. Identifying hospital organizational strategies to reduce readmissions. *Am J Med Qual*. 2013;**28**(4):278-85. [PubMed ID: 23118202]. <https://doi.org/10.1177/1062860612464999>.
65. Hudali T, Robinson R, Bhattarai M. Reducing 30-Day Rehospitalization Rates Using a Transition of Care Clinic Model in a Single Medical Center. *Adv Med*. 2017;**2017**:5132536. [PubMed ID: 28831434]. [PubMed Central ID: PMC5558630]. <https://doi.org/10.1155/2017/5132536>.
66. Afshar Nia A, Rostami SR, Alijani Renani H, Haghighi Zadeh MH, Arshadi Bostan Abad M. [The effect of discharge planning program on the re-admission of premature infants]. *Iran J Pediatr Nurs*. 2021;**7**(4):31-8. Persian.
67. Khodaveisi M, Chaghazardi N, Pakrad F, Tapak L, Safarpour. G. [The Effect Of Post-Discharge Telephone Follow-Up (Telenursing) On Symptoms, Complications, And Readmission Of Patients After Coronary Artery Bypass Graft Surgery In Hamadan]. *Nurs Midwifery J*. 2020;**18**(6):436-46. Persian.
68. Azizi HR, Yousefian Miandoab N, Yaghoobinia F. [The Effect of Teach-Back Education on Readmission in Patients with Acute Coronary Syndrome]. *Critical Care Nurs*. 2020;**13**(2):14-21. Persian.
69. Chen HM, Wang ST, Wu SJ, Lee CS, Fetzer SJ, Tsai LM. Effects of PredischARGE Patient Education Combined With Postdischarge Follow-Ups on Self-Care, Readmission, Sleep, and Depression in Patients With Heart Failure. *J Nurs Res*. 2020;**28**(5). e112. [PubMed ID: 32694457]. <https://doi.org/10.1097/JNR.0000000000000395>.
70. Rahmani A, Vahedian-Azimi A, Sirati-Nir M, Norouzadeh R, Rozdar H, Sahebkar A. The Effect of the Teach-Back Method on Knowledge, Performance, Readmission, and Quality of Life in Heart Failure Patients. *Cardiol Res Pract*. 2020;**2020**:8897881. [PubMed ID: 33299604]. [PubMed Central ID: PMC7707936]. <https://doi.org/10.1155/2020/8897881>.
71. Magny-Normilus C, Nolido NV, Borges JC, Brady M, Labonville S, Williams D, et al. Effects of an Intensive Discharge Intervention on Medication Adherence, Glycemic Control, and Readmission Rates in Patients With Type 2 Diabetes. *J Patient Saf*. 2021;**17**(2):73-80. [PubMed ID: 31009408]. [PubMed Central ID: PMC7647006]. <https://doi.org/10.1097/PTS.0000000000000601>.
72. Segal JB, Apfel A, Brotman DJ, Shermock KM, Clark JM. Evaluation of Bedside Delivery of Medications Before Discharge: Effect on 30-Day Readmission. *J Manag Care Spec Pharm*. 2020;**26**(3):296-304. [PubMed ID: 32105180]. [PubMed Central ID: PMC10390977]. <https://doi.org/10.18553/jmcp.2020.26.3.296>.
73. Ferro EG, Secemsky EA, Wadhwa RK, Choi E, Strom JB, Wasfy JH, et al. Patient Readmission Rates For All Insurance Types After Implementation Of The Hospital Readmissions Reduction Program. *Health Aff (Millwood)*. 2019;**38**(4):585-93. [PubMed ID: 30933582]. [PubMed Central ID: PMC7137289]. <https://doi.org/10.1377/hlthaff.2018.05412>.
74. Haruna J, Masuda Y, Tatsumi H, Sonoda T. Nursing Activities Score at Discharge from the Intensive Care Unit Is Associated with Unplanned Readmission to the Intensive Care Unit. *J Clin Med*. 2022;**11**(17). [PubMed ID: 36079134]. [PubMed Central ID: PMC9457354]. <https://doi.org/10.3390/jcm11175203>.
75. Lovgren T, Connealy B, Yao R, Dahlke JD. Postpartum management of hypertension and effect on readmission rates. *Am J Obstet Gynecol MFM*. 2022;**4**(1):100517. [PubMed ID: 34757235]. <https://doi.org/10.1016/j.ajogmf.2021.100517>.
76. Gilbert T, Occelli P, Rabilloud M, Poupon-Bourdy S, Riche B, Touzet S, et al. A Nurse-Led Bridging Program to Reduce 30-Day Readmissions of Older Patients Discharged From Acute Care Units. *J Am Med Dir Assoc*. 2021;**22**(6):1292-1299 e5. [PubMed ID: 33229305]. <https://doi.org/10.1016/j.jamda.2020.09.015>.
77. Haj-Ali W, Moineddin R, Hutchison B, Wodchis WP, Glazier RH. Role of Interprofessional primary care teams in preventing avoidable hospitalizations and hospital readmissions in Ontario, Canada: a retrospective cohort study. *BMC Health Serv Res*. 2020;**20**(1):782. [PubMed ID: 32831072]. [PubMed Central ID: PMC7444082]. <https://doi.org/10.1186/s12913-020-05658-9>.
78. Geskey JM, Grile C, Jennings N, Good H, Crawford A, Kaminski M. Use of Postdischarge Emergency Medical Services to Reduce Hospital Readmissions: Does It Work and Is It Economically Feasible? *Popul Health Manag*. 2020;**23**(3):220-5. [PubMed ID: 31589089]. <https://doi.org/10.1089/pop.2019.0125>.
79. Dawson NL, Hull BP, Vijapura P, Dumitrascu AG, Ball CT, Thiemann KM, et al. Home Telemonitoring to Reduce Readmission of High-Risk Patients: a Modified Intention-to-Treat Randomized Clinical Trial. *J Gen Intern Med*. 2021;**36**(11):3395-401. [PubMed ID: 33506388]. [PubMed Central ID: PMC8606403]. <https://doi.org/10.1007/s11606-020-06589-1>.

Table 2. Factors Affecting the Unplanned Readmissions Reduction Interventions

| Row | Interventions | References |
|-----|---|---|
| 1 | Disease management programs | |
| | Implementation of continuous care model | (15) |
| | Daily patient assessments during hospitalization | (56, 75) |
| 2 | Improvement of the quality of nursing services during hospitalization | (74) |
| | Appropriate policy-making | |
| | Changing insurance reimbursement policies | (58, 59, 73) |
| | Awareness among service providers about the economic consequences and quality of life | (29) |
| 3 | Establishing a continuous review committee for readmission indicators | (64) |
| | Creating a mechanism for case-specific discharge reviews (disease-specific) | (64) |
| | Utilization of advanced discharge planning models | |
| 4 | Discharging plan | (66) |
| | Implementing a readiness program for discharge, including pre-discharge check-ups | (62, 74) |
| 5 | Education | |
| | Patient-centered education | (35, 39) |
| | OR companion-centered education (based on needs assessment) | (35) |
| | Empowering the patient | (5, 9, 12, 13, 17, 18, 20, 22, 33, 35, 44, 69) |
| 6 | Empowering the companion | (9, 17, 19, 34-37, 48, 66) |
| | Feedback-oriented education | (68, 70) |
| | Post-discharge patient follow-up | |
| | Follow-up by a family physician | (29, 57, 64) |
| 7 | Telephone follow-up | (6, 9, 18, 20-23, 31, 37, 38, 40, 44, 63, 66, 67, 69, 71, 76) |
| | Follow-up at the clinic | (12, 25) |
| | Post-discharge physician visit at the office | (17, 24, 42) |
| 8 | Implementation of health information technology | |
| | Development of computer technology for patient coordination and monitoring | (32) |
| | Development of remote care technologies | (79) |
| | Utilization of decision support systems | (10) |
| 9 | Development of electronic health records (EHR) | (64) |
| | Interdepartmental communications | |
| 10 | Establishment of post-discharge emergency services at the hospital | (78) |
| | Enhancement of communication between hospital departments and other service providers | (30, 60, 61, 65) |
| 11 | Departmental structure | |
| | Promoting a culture of teamwork among healthcare professionals | (77) |
| 12 | Adequate staffing | |
| | Increasing the number of nursing staff | (45) |
| 13 | Development of specialized skills | |
| | Training and employing specialized personnel for transitions (transition nurses) | (71, 76) |
| 14 | Social support | |
| | Family support | (14) |
| | Social worker assistance | (23, 41) |
| 15 | Peer support (mentoring) | (14, 26, 27) |
| | Pharmaceutical counseling | |
| | Employment of clinical pharmacists in the hospital | (46, 71) |
| 16 | Provision of necessary medications at the time of discharge | (72) |
| | Utilization of social pharmacists | (47) |
| 17 | Rehabilitation and recovery | |
| | Rehabilitation and recovery | (16, 25, 56) |
| | Exercise training | (12, 13, 43, 44, 63) |
| 18 | Nutritional counseling | |
| | Nutritional support during discharge | (28, 49-51, 53, 54) |
| | Nutritional support after discharge | (54) |
| | Individual nutrition counseling over the phone | (49, 52) |
| | In-person individual nutrition counseling | (52) |
| 19 | Dietary supplements and improving food status | (50, 51, 55) |