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Review Article

Patient Navigators for Transition Care of Heart Failure: A Systematic Review and Meta-Analysis

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SUMMARY

The aims of the systematic review and meta-analysis were to explore the health outcomes and participation in cardiac rehabilitation of patient navigators for the heart failure during the transition period. PubMed, Embase, CINAHL, and the Cochrane Central Register of Controlled Trials and Chinese Electronic Periodical Services were searched up to September 2020, and the reference lists of relevant articles were also checked. We included randomized controlled trials and cohort studies to evaluate the effectiveness of a heart failure patient navigator program compared to usual care. Two reviewers reviewed the literature independently for eligibility, methodological quality, and extracted outcome data for the meta-analysis. Seven articles were recruited for eligibility after screening, including six randomized controlled trials and one cohort study.

The results of the analysis showed that the 30-days readmission rate was not significantly different, but through subgroup analysis, the intervention group had a higher readmission rate in patients ≤ 60 years old (OR = 2.37, 95% CI [1.47, 3.84], p = .0004). The patient navigator group had higher cardiac rehabilitation enrollment (OR = 2.61, 95% CI [1.05, 6.47], p = .04), hospital-based utilization (95% CI -0.21 [-0.41, -0.01]), and health care cost ($5,676 vs. $7,640; p = 0.03) were significantly lower.

The results suggest that patient navigators may promote cardiac rehabilitation enrollment and reduce hospital-based utilization and health care costs. The younger patients were at high risk of readmission during the transition period and may require novel strategies.

1. Introduction

Medical innovations, aging populations, and longer life expectancy lead to increased prevalence of heart failure. An estimated 6.2 million American adults had heart failure between 2013 and 2016.[1] In Asia, estimates of prevalence were from 1.26% to 6.7%.[2] Compared with the United States of America (USA) and Europe, Asian patients were younger with more severe, and in-hospital mortality was higher.[3] Prognosis is worse for those hospitalized with heart failure. The mortality within 30 days and 1 year of admission was 10.8% and 30.7%. The incidence and prevalence increase strikingly with age, and heart failure is the most common reason for hospitalization among older adults. The short-term readmission rate is as high as 25–30%.[4,5] Readmission factors may more strongly relate to age-independent variables, such as the quality of transitional care and complex social factors.[4]

Transitional care interventions include early evaluation of health literacy, with an understanding of what patients need for self-care at home, to improve the continuity of care from admission to after hospital discharge. Therefore, transitional care interventions might prevent rehospitalization among the elderly and reduce mortality, increase patient satisfaction, improve health-related results, and improve the overall quality of life of patients with heart failure.[6–8] Optimal management of heart failure requires a multidisciplinary approach across the care continuum to reduce readmissions, through effective communication and education to enhance the patient experience, ensuring accurate medication reconciliation and follow-up appointments, and providing good hand-off communication to other healthcare providers improving patient care.[8] Navigators and case management are difference in the transition care. Case management division is usually held by nurses, but navigators may be nurses, social workers, or lay health workers, including peers, they can help patients overcome modifiable barriers to achieve their care goals by providing a tailored approach to addressing individual needs.[9] Cardiac rehabilitation can resolve multiple problems of patients with heart failure, which confer significant benefits even in the elderly. Trained patients at 6 months had significantly increased six-minute walking distance, increased Activities of Daily Living scores, 40% reduced risk of rehospitalization, and improved quality of life.[10,11] However, many enrollees don't adhere to and complete the program. Meta-regression revealed that the intervention deliverer (nurse or allied healthcare provider; $p = 0.02$) and delivery format (face-to-face; $p = 0.01$) were influential in increasing enrollment. Even for the elderly, peer navigators or post discharge visits may improve enrollment and completion.[12]

Navigator programs to fill the gap in transitional care, between

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the acute care setting and home, enhanced self-management skills, and improved follow-up compliance, to promote the best outcomes for chronically ill and high-risk patients.[13,14] This model can address the needs with chronic conditions and is also widely implemented for cancer, diabetes, chronic kidney disease, and Acquired Immunodeficiency Syndrome.[9,15] However, the heart failure relies on complex self-management strategies. Therefore, this article evaluated whether patient navigators (PNs) are associated with readmission rate, post-discharge appointments, and cardiac rehabilitation enrollment with transition care.

2. Methods

This meta-analysis follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

2.1. Inclusion and exclusion criteria

We included randomized controlled trials (RCTs) and cohort studies evaluating the effectiveness of heart failure PNs compared to usual care. Protocols, conference abstracts, and ongoing studies without results were excluded. Further details are provided below.

2.1.1. Participants

Patients with heart failure ($\geq$ 18 years old) were included.

2.1.2. Interventions

Trials for PNs were included. PNs programs have different names (nurse navigator, peer navigator, personal navigator, health navigator, etc.). We defined PNs as people with or without a healthcare-related background, who engaged with patients to assist self-management.

2.1.3. Controls

Studies with usual care were included.

2.1.4. Outcomes

The primary outcomes were rates of rehospitalization, post-discharge appointments, and enrollment of cardiac rehabilitation. Secondary outcomes were descriptions of economic costs.

The exclusion criteria were (1) Abstracts, case reports, letters, reviews, or animal experiments. (2) Articles not presented in English or Chinese.

2.2. Search strategy and data sources

The search strategy aimed to find peer-reviewed published studies, clinical trials, and grey literature such as conference proceedings. We also searched reference lists of the included studies and relevant reviews. An initial search of PubMed was undertaken, followed by analyses of the text words contained in the title and abstract, and index terms. We performed a detailed literature search using keywords and index terms from articles published inception by database to September 2020, using PubMed (1996–2020), Embase (1947–2020), CINAHL (1937–2020), the Cochrane Central Register of Controlled Trials (1993–2020) and Chinese Electronic Periodical Service (2000–2020). In addition, we searched the reference lists of systematic reviews for appropriate articles. Subject heading search terms were "heart failure" and "Patient navigators" and included their text word or free text.

2.3. Data extraction

Two reviewers (S-F, Hsu; J-J, Lee) independently assessed the titles and abstracts of studies after removing duplicates. The full texts of the potentially eligible studies were retrieved and evaluated to identify studies that completely fulfilled the inclusion criteria. Discrepancies were resolved by discussions or when necessary by consultations from a third reviewer (H-H, Tung). Reviewers resolved potential discrepancies by discussions, and a customized extraction form was designed and utilized to record the details of each study.

2.4. Quality assessment

All included articles were independently assessed for risk of bias by two raters (S-F, Hsu & S-Y, Lee). In case of discrepancies, a third assessor (H-H, Tung) would resolve it and was included in the discussion, and final decisions were based on consensus. For individual RCTs, the revised Cochrane risk of bias tool was used.[16] Items retained from the tool to assess bias were random sequence generation, allocation concealment, blinding of outcome assessment, incomplete outcome data, group similarity at baseline, and intention-to-treat analysis. Each item was assessed as high risk, unclear and low risk. The Newcastle-Ottawa Scale was used to assess the quality of the cohort study. The highest quality studies are awarded one star for each numbered item within the selection and exposure categories and a maximum of two stars can be given for comparability. The overall scores were ranges between zero and nine stars.[17]

2.5. Data synthesis and analysis

A systematic review was conducted to provide a quantitative assessment of the effects of an intervention. Meta-analysis was conducted using Review Manager 5.3 software (Copyright © 2017 The Cochrane Collaboration). Relative risk (RR) and 95% confidence intervals (CI) were used to summarize the effect size on the rate of readmission, post-discharge appointments, and enrollment of cardiac rehabilitation. $p < 0.05$ was considered as statistically significant. Statistical heterogeneity among studies was estimated using the Q statistic ($p < .10$ as significant) and I^2 statistic ($I^2 < 25\%$, no heterogeneity; $I^2 > 50\%$, large or extreme heterogeneity). If significant heterogeneity existed, a random-effects model was selected for data pooling; otherwise, a fixed-effects model was selected. We used subgroup analysis to explore possible sources of heterogeneity, including different study designs and age groups. The intention-to-treat analysis data in all included studies were provided and used in the meta-analyses. If outcomes could not be pooled into meta-analyses, descriptive analyses were adopted.

3. Results

We identified 609 potentially relevant abstracts through databases and other sources. Seven articles were considered for eligibility after screening, including six RCTs and one cohort study. Figure 1 presents the results of the search and application process.[18] Table 1 provides an overview of the individual studies. Three RCTs had different outcome measures in the same large research.[19–21] The majority of studies (85.7%) were conducted in the USA and the sample size varied from 40 to 1,937 participants. A summary of the RCTs quality assessment is presented in Figure 2, and cohort study quality assessment is presented in Table 2. Six studies of RCTs, quality varied lacked information on the blinding of participants and personnel and incomplete outcome data. The Newcastle-Ottawa Scale of the cohort study was 7, which was of high quality.

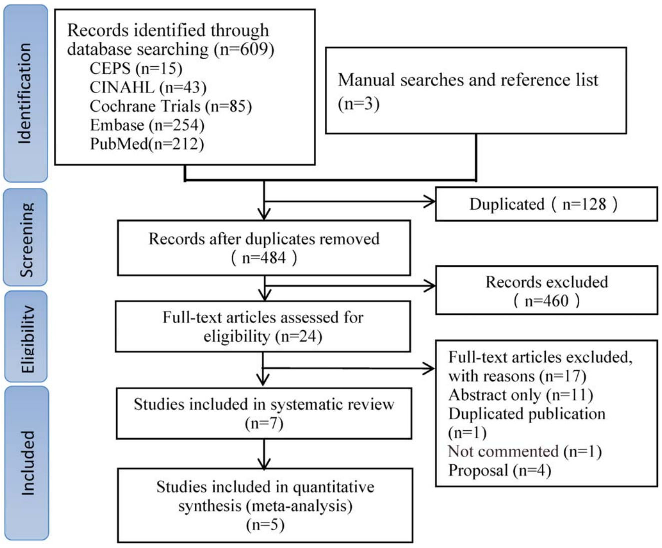

Figure 1. PRISMA flow diagram of studies selection.

3.1. 30-days readmission rate

Three studies discussing PNs interventions to conduct a meta-analysis of 30-days readmission rates, two of which were RCTs, and one was a cohort study, with a total of 1644 participants.[19,22,24] The studies were directly analyzed by subgroup because they had deviations in the combined analysis for the difference in study design. The subgroup analysis heterogeneity test I^2 was 0%, which showed that the studies were homogeneous. Therefore, a fixed-effects analysis was used (Figure 3-1). The different studies design showed that PNs interventions during the transition period did not significantly reduce the 30-day readmission rate (OR = 1.04, 95% CI [0.78, 1.38], p = 0.78). Age was also analyzed by subgroup, and analysis results were highly heterogeneous (I^2 = 87%). Therefore, the random effects mode was used for integrated analysis (Figure 3-2). There were no significant differences between groups (OR = 1.05, 95% CI [0.39, 2.84], p = 0.93). But younger than 60 years old populations, the 30-days readmission rate in intervention group was significantly higher the control group (OR = 2.37, 95% CI [1.47, 3.84], p = 0.004).

3.2. Post-discharge appointments

Two studies discussing PNs interventions conducting a meta-analysis of the post-discharge appointments with a cardiologist or primary care provider within 7–14 days, included one of them being RCTs and one was a cohort study, with a total of 1550 participants.[19,22] The studies were directly analyzed by subgroup because they had deviations in the combined analysis for the difference in study designs. The subgroup analysis heterogeneity test I^2 was 76.4%, which showed that the studies were highly heterogeneous. Therefore, a random-effects analysis was used (Figure 4). The results of analysis of post-discharge appointments were not significantly different (OR = 1.92, 95% CI [0.79, 4.67], p = 0.15). However, the two studies tended to favor PNs who had better post-discharge appointments.

3.3. Cardiac rehabilitation enrollment

In addition, a comprehensive analysis of two studies on PNs interventions for cardiac rehabilitation enrollment 12 weeks post-discharge, included two RCTs, totaling 275 participants.[24,26] The analysis result was moderately heterogeneous (I^2 = 56%), so random effects mode was used for analysis (Figure 5). The result indicated, compared to control groups, the intervention groups were significantly highly enrolled in the 12-week cardiac rehabilitation (OR = 2.61, 95% CI [1.05, 6.47], p = 0.04).

3.4. Economic cost

The hospital-based utilization for elderly was significantly lower in the PNs group (95% CI -0.21 [-0.41, -0.01], p = 0.038), and the cumulative decrease in post-discharge 180 days was 18.7%; in younger populations, hospital-based utilization increased by 31.7% (95% CI -0.79 [0.14, 1.45], p = 0.017). Especially in the previous 30 days, the rate rose sharply (p = 0.002), and there was no significant change afterwards.[20] The PNs group had lower costs for the elderly over the 180 days post-discharge ($5,676 [$4,553–$6,799] vs. $7,640 [$6,372–$8,907], p = 0.03). The cost for youngers was not statistically different ($9,942 [$7,556–$12,327] vs. $ 9,046 [$7,180–$10,912], p = 0.58).[21]

4. Discussion

The meta-analysis presents the effect of PNs interventions after participating in cardiac rehabilitation for 12 weeks. Compared to the control group, the enrollment rate was significantly higher (OR = 2.61, 95% CI [1.05, 6.47], p = 0.04), similar to Santiago et al.'s[12] integrated analysis that interventions may increase cardiac rehabilitation enrollment, adherence, and completion, especially participants with outpatient cardiac rehabilitation awareness or in home-based programs. Therefore, the implementation status of cardiac rehabilitation should be included in the interview content during follow-up visits after discharge to maintain continuity.

Age was an important factor. The 30-day readmission rate of the intervention group was higher in the younger group than in the control group (OR = 2.37, 95% CI [1.47, 3.84], p = 0.004), indicating that the PNs did not improve the short-term readmission rate of the younger population. Compared with the elderly, the average cost within 6 months after discharge was higher in the younger group (intervention group: $9,942 vs. $5,676; control group: $9,046 vs. $7,640). Awareness the PNs promote the hospital-based utilization of 37.1% (p = 0.017) and older adults higher than younger people (60.5% vs. 46.3%, p = 0.002).[20] A retrospective research shown that younger people have higher readmission rate than older adults under the similar disease in the USA. In heart failure, there are similar or higher adjusted readmission rates for younger versus elderly individuals.[26,27] Ali-Faisal et al.[28] summarized the effect of PNs on healthcare utilization. Patients were more able to accept health screening (OR 2.48, 95% CI 1.93– 3.18, p < .00001) and focus on the recommended care (OR 2.55, 95% CI 1.27–5.10, p < .01), which helps adherence, follow-up care, positive attitudes, and behaviors towards disease management. If post-discharge appointments can be made in a short period of time after discharge, the risk of readmission will be reduced.[29] PNs have been widely used in the USA, Canada, and Australia to optimize healthcare services processes, especially chronic diseases. It promotes the continuity of care, enhances care and communication processes, reinforces the importance of these workers with the multidisciplinary team in health promotion and patient self-care.[30] Although, it is mostly implemented in cancer cases,[9] it also applies to heart failure populations because they have high readmission rates and could be a financial challenge for the organization.[28]

This article is the first analysis of a PNs in heart failure. Although

Table 1
Summary of included studies.

Author Years Country	Size	Design	Population	Intervention	Control	Outcome: Attendance at cardiac rehabilitation	Outcome: 30-days readmission	Outcome: Post-discharge appointments	Outcome: Others
Ali-Faisal SF.[23] 2016 Canada	94	RCT	Adult cardiac inpatients eligible for cardiac rehabilitation after discharge	The PNs: (1) Visited at the bedside, (2) Mailed a card to home reminding about CR (3) Called participant 2 weeks post-discharge to discuss CR barriers. (n = 46)	Usual care (n = 48)	43.5% vs. 31.3%			
Balaban RB.[19] 2015 USA	1937	RCT	(1) Age ≥ 60 y/o; (2) in-network inpatient admission within prior 6 months; (3) index length of stay ≥ 3 days; or (4) admission diagnosis of HF or (5) chronic obstructive pulmonary disease.	Hospital visits and weekly telephone outreach, discharge preparation, medication management, scheduling of follow-up appointments, communication with primary care, and symptom management. (n = 747)	Usual care (n = 1190)		All: 14.2% vs. 13.1% > 60 years old 10.1% vs. 13.5% ≤ 60 years old 25.0% vs. 12.3%	All: 27.9% vs. 22.6% > 60 years old 10.1% vs. 13.5% ≤ 60 years old 22.5% vs. 18.2%	
Balaban RB.[20] 2017 USA	1937	RCT	As Balaban RB (2015)	As Balaban RB (2015)	Usual care As Balaban RB (2015)				Hospital-based utilization > 60 years old decrease 18.7% (p = 0.38) ≤ 60 years old decrease 31.7% (p = 0.017)
Di Palo KE.[22] 2017 USA	94	Cohort study	Acute decompensated HF	Providing HF education and obtaining a 14-day follow-up appointment prior to discharge. (n = 51)	Usual care (n = 43)		17.6% vs. 20.9%	56.8% vs. 18.6%	
Galbraith AA.[21] 2017 USA	1937	RCT	As Balaban RB (2015)	As Balaban RB (2015)	Usual care As Balaban RB (2015)				Total cost per patient of 180 days $7,092 vs. $7,953, ($p$ = 0.27) Aged ≥ 60 $5,676 vs. $7,640 ($p$ = 0.03) Aged ≤ 60 $9,942 vs. $9,046 ($p$ = 0.58)
Leavitt MAM.[24] 2017 USA	40	RCT	Hospitalized ≥ 65 y/o, with HF	The first home visit within 24 hours of discharge then once per week for 30 days. Notify Navigator for any care needed for worsening symptoms. (n = 19)	Usual care (n = 21)		15.8% vs. 28.6%		
Scott LB.[25] 2013 USA	181	RCT	≥ 21y/o Diagnosis included myocardial infarction, stable HF	Provide education and support (informational, social) about OCR while visiting at the bedside by phone (approximately 1 week after hospitalization) and via mail. (n = 90)	Usual care (n = 91)	23.3% vs. 6.6%			

Abbreviation: CR, cardiac rehabilitation; HF, heart failure; PN, patient navigators; RCT, randomised control trial.

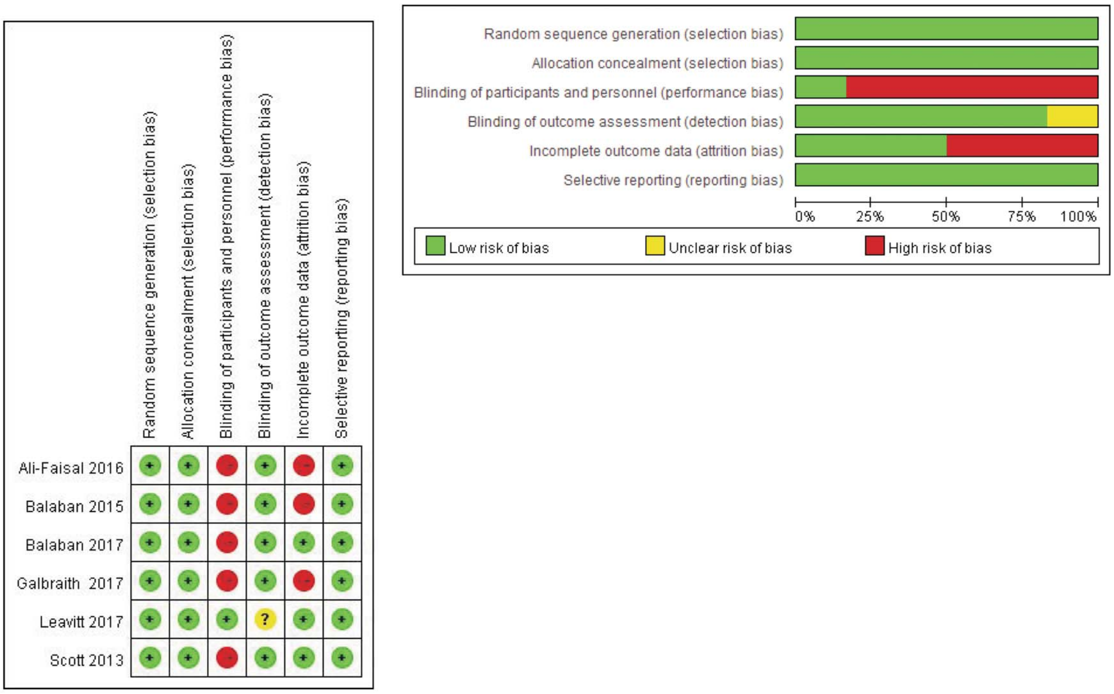

Figure 2. Summary of risk of bias across studies.

Table 2
The Newcastle-Ottawa Scale for quality of cohort study.

		Selection				Comparability	Exposure			
First author	Year	Representativeness of the exposed cohort	Selection of the non-exposed cohort	Ascertainment of exposure	Demonstration that outcome of interest was not present at start of study	Comparability of cohorts based on the design or analysis	Assessment of outcome	Was follow-up long enough for outcomes to occur	Adequacy of follow up of cohorts	Total score
Di Palo[22]	2017	*		*	*	*	*	*	*	7/9

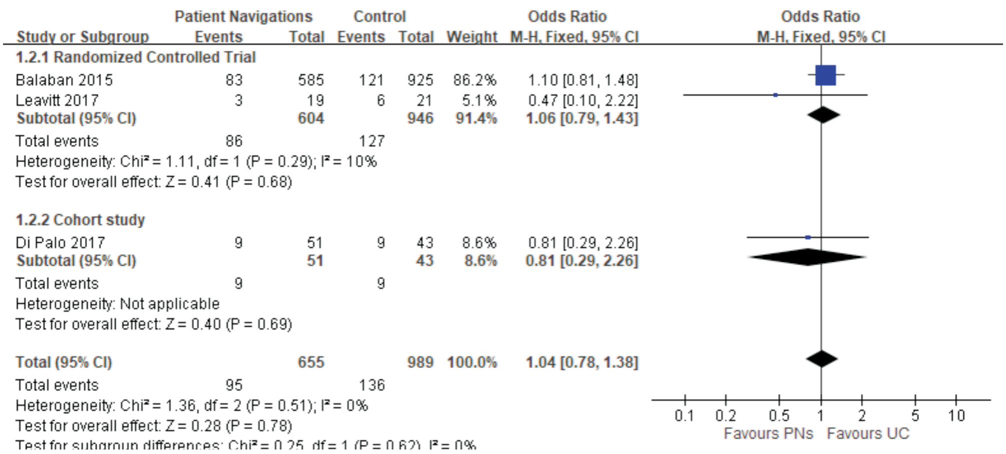

Figure 3-1. Meta-analysis of readmission rate: Forest plot demonstrating pooled data of readmission w/in 30 days in different study designs using a fixed effects model.

the studies included randomized controlled trials and cohort studies, the subgroup analysis showed no significant differences in the readmission rate and post-discharge appointments. We cannot rule out that there was no selection bias because of language limitations in English and Chinese, resulting in regional articles not being included. However, we have also discussed hospital-based utilization, medical costs, and cardiac rehabilitation enrollment. The PNs were indeed helpful for populations of heart failure from inpatient care to home stay.

5. Conclusion

We conclude that the PNs can increase cardiac rehabilitation enrollment, reduce the hospital-based utilization within 6 months of the elderly, but the 30-days readmission rate of younger populations was elevated. In Asian countries, heart failure appears at younger ages, hospitalization symptoms are severe, and mortality rate is higher. We recommend that PNs strengthen and maintain self-disease management and increase adherence after discharge. Even,

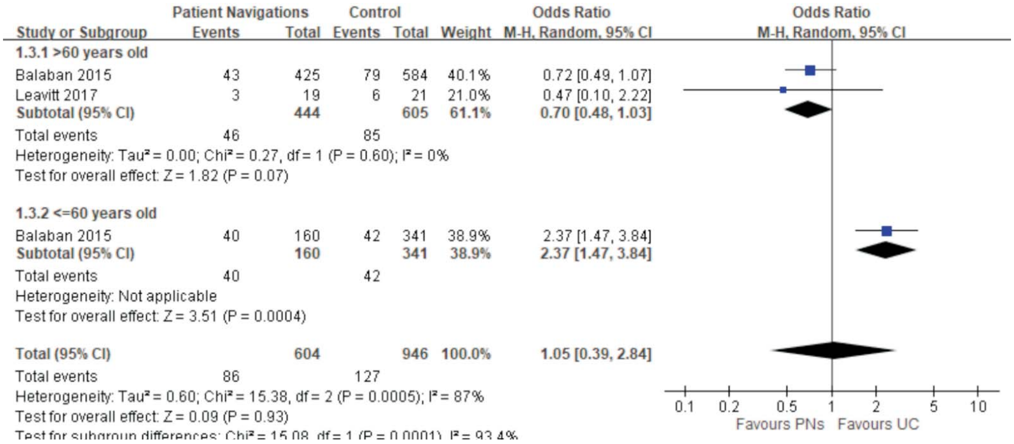

Figure 3-2. Meta-analysis of readmission rate: Forest plot demonstrating pooled data of readmission w/in 30 days in studies with > 60 years old versus ≤ 60 years old using a random effects model.

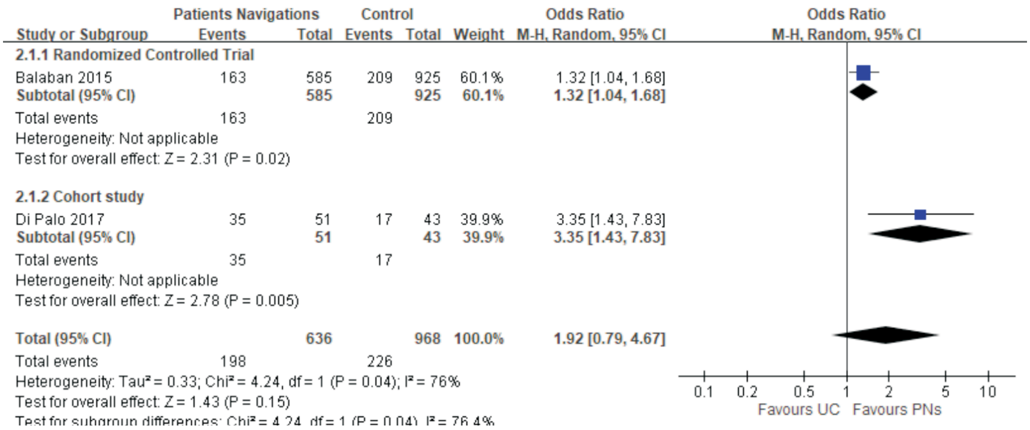

Figure 4. Meta-analysis of post-discharge appointments: Forest plot demonstrating pooled data of post-discharge appointments in difference study design using a random effects model.

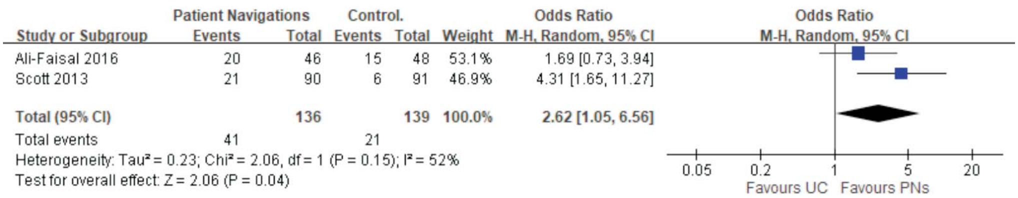

Figure 5. Meta-analysis of cardiac rehabilitation enrollment: Forest plot demonstrating pooled data of cardiac rehabilitation enrollment in studies using a random effects model.

follow-up of the process, actual understanding of the long-term complications of the chronic disease and reduce health disparities to promote self-care confidence. Finally, we optimized the healthy quality of heart failure.

Author disclosure statement

There are no potential conflicts of interest to disclose.

References

1. Virani SS, Alonso A, Benjamin EJ, et al. Heart disease and stroke statistics-2020 update: A report from the American Heart Association. *Circulation*. 2020;141(9):e139–e596.
2. Rajadurai J, Tse HF, Wang CH, et al. Understanding the epidemiology of heart failure to improve management practices: An Asia-Pacific perspective. *J Card Fail*. 2017;23(4):327–339.
3. Lam CS, Anand I, Zhang S, et al. Asian sudden cardiac death in heart failure (ASIAN-HF) registry. *Eur J Heart Fail*. 2013;15(8):928–936.
4. Dharmarajan K, Rich MW. Epidemiology, pathophysiology, and prognosis of heart failure in older adults. *Heart Fail Clin*. 2017;13(3):417–426.
5. Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the medicare fee-for-service program. *N Engl J Med*. 2009;360(14):1418–1428.
6. Kim H, Thyer BA. Does transitional care prevent older adults from rehospitalization? A review. *J Evid Inf Soc Work*. 2015;12(3):261–271.
7. Flanagan S, Damery S, Combes G. The effectiveness of integrated care interventions in improving patient quality of life (QoL) for patients with chronic conditions. An overview of the systematic review evidence. *Health Qual Life Outcomes*. 2017;15(1):188.
8. Mai Ba H, Son YJ, Lee K, et al. Transitional care interventions for patients with heart failure: An integrative review. *Int J Environ Res Public Health*. 2020;17(8):2925.
9. McBrien KA, Ivers N, Barnieh L, et al. Patient navigators for people with chronic disease: A systematic review. *PLoS One*. 2018;13(2):e0191980.
10. La Rovere MT, Traversi E. Role and efficacy of cardiac rehabilitation in patients with heart failure. *Monaldi Arch Chest Dis*. 2019;89(1). doi: 10.4081/monaldi.2019.1027.
11. Antonicelli R, Spazzafumo L, Scalvini S, et al. Exercise: a "new drug" for elderly patients with chronic heart failure. *Aging (Albany NY)*. 2016;8(5):860–872.
12. Santiago de Araújo Pio C, Chaves GS, Davies P, et al. Interventions to pro-

mote patient utilisation of cardiac rehabilitation. *Cochrane Database Syst Rev*. 2019;2(2):CD007131.
13. LeRoy J. *Nurse Navigator Role Description and Processes for Best Outcomes Among At-Risk Patients*. Minneapolis, USA: Walden University; 2018. Available at https://scholarworks.waldenu.edu/dissertations/4868/. Accessed October 14, 2020.
14. Monza K, Harris D, Shaw C. The role of the nurse navigator in the management of the heart failure patient. *Crit Care Nurs Clin North Am*. 2015; 27(4):537–549.
15. Wells KJ, Campbell K, Kumar A, et al. Effects of patient navigation on satisfaction with cancer care: a systematic review and meta-analysis. *Support Care Cancer*. 2018;26(5):1369–1382.
16. Sterne JAC, Savović J, Page MJ, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ*. 2019;366:l4898.
17. Stang A. Critical evaluation of the Newcastle-Ottawa scale for the assessment of the quality of nonrandomized studies in meta-analyses. *Eur J Epidemiol*. 2010;25(9):603–605.
18. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ.* 2009; 339:b2535.
19. Balaban RB, Galbraith AA, Burns ME, et al. A patient navigator intervention to reduce hospital readmissions among high-risk safety-net patients: A Randomized Controlled Trial. *J Gen Intern Med*. 2015;30(7):907–915.
20. Balaban RB, Zhang F, Vialle-Valentin CE, et al. Impact of a patient navigator program on hospital-based and outpatient utilization over 180 days in a safety-net health system. *J Gen Intern Med*. 2017;32(9):981–989.
21. Galbraith AA, Meyers DJ, Ross-Degnan D, et al. Long-term impact of a postdischarge community health worker intervention on health care costs in a safety-net system. *Health Serv Res*. 2017;52(6):2061–2078.
22. Di Palo KE, Patel K, Assafin M, et al. Implementation of a patient navigator program to reduce 30-day heart failure readmission rate. *Prog Cardiovasc Dis*. 2017;60(2):259–266.
23. Ali-Faisal SF, Benz Scott L, Johnston L, et al. Cardiac rehabilitation referral and enrolment across an academic health sciences centre with eReferral and peer navigation: a randomised controlled pilot trial. *BMJ Open*. 2016;6(3):e010214.
24. Leavitt MAM. *The Effect of the Heart Failure Nurse Navigator on 30-Day Hospital Readmissions of Older Adults*. PhD thesis. Florida, US: Florida Atlantic University; 2017.
25. Scott LB, Gravely S, Sexton TR, et al. Examining the effect of a patient navigation intervention on outpatient cardiac rehabilitation awareness and enrollment. *J Cardiopulm Rehabil Prev*. 2013;33(5):281–291.
26. Berry JG, Gay JC, Joynt Maddox K, et al. Age trends in 30 day hospital readmissions: US national retrospective analysis. *BMJ*. 2018;360:k497.
27. Ranasinghe I, Wang Y, Dharmarajan K, et al. Readmissions after hospitalization for heart failure, acute myocardial infarction, or pneumonia among young and middle-aged adults: a retrospective observational cohort study. *PLoS Med*. 2014;11(9):e1001737.
28. Ali-Faisal SF, Colella TJ, Medina-Jaudes N, et al. The effectiveness of patient navigation to improve healthcare utilization outcomes: A meta-analysis of randomized controlled trials. *Patient Educ Couns*. 2017; 100(3):436–448.
29. Tong L, Arnold T, Yang J, et al. The association between outpatient follow-up visits and all-cause non-elective 30-day readmissions: A retrospective observational cohort study. *PLoS One*. 2018;13(7):e0200691.
30. Pautasso FF, Zelmanowicz AM, Flores CD, et al. Role of the nurse navigator: integrative review. *Rev Gaucha Enferm*. 2018;39:e20170102.