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Original Article

Health-Related Quality of Life in Older Adults With Acute Cardiovascular Disease Undergoing Early Mobilization

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ABSTRACT

Background: Early mobilization (EM) is safe and feasible in older adults with acute cardiovascular disease (CVD) and may improve posthospitalization patient-centred outcomes. Our objective was to assess posthospitalization health-related quality of life (HRQOL) in older adults with acute CVD undergoing EM.

Methods: Patients aged ≥ 60 years with acute CVD undergoing EM at an academic tertiary centre in Montreal, Quebec were prospectively enrolled from January 2018 to January 2020. Functional status was measured using the validated Level of Function Mobility Scale. HRQOL

RÉSUMÉ

Introduction : La mobilisation précoce (MP) est sécuritaire et réalisable chez les personnes âgées atteintes d'une maladie cardiovasculaire (MCV) aiguë et peut permettre d'améliorer les résultats axés sur les patients après l'hospitalisation. Notre objectif était d'évaluer la qualité de vie liée à la santé (QVLS) après l'hospitalisation chez les personnes âgées atteintes d'une MCV aiguë se soumettant à la MP.

Méthodes : Les patients ≥ 60 ans atteints d'une MCV aiguë se soumettant à la MP dans un centre universitaire de soins tertiaires à

Older adults are at risk of "posthospital syndrome" following hospitalization for acute cardiovascular disease (CVD).[1] Posthospital syndrome is characterized by a period of increased vulnerability to physical, cognitive, and emotional stressors, and is associated with an increased risk of hospital readmission.[1,2] Involuntary bedrest and immobility during hospitalization can lead to a rapid loss of muscle mass and strength, which in turn leads to a functional decline that can persist well beyond hospitalization.[2–4]

Early mobilization (EM) consists of progressively ambulating patients as soon as they are hemodynamically stable, typically within 24 to 48 hours of hospital admission.[5] Nurse-driven EM has been shown to be feasible and effective in older adults with acute CVD and provides early physical rehabilitation that may prevent the physical deconditioning found in posthospital syndrome.[6] Physical activity may also improve posthospitalization mood and cognitive outcomes.[7]

Older adults may prioritize functional independence and quality-of-life measures over other more standard outcome measures.[8] Geriatric professional societies have responded by advocating for the use of person-centred outcomes in studies involving older adults.[9] Assessment of person-centred outcomes, such as health-related quality of life (HRQOL), can provide insight on the effect of interventions upon patient care, provide evidence-based decision making in the care of older adults, and influence practice guidelines for future patient care.[10]

There are limited data on posthospitalization HRQOL in older adults with acute CVD. Moreover, although the feasibility and efficacy of nurse-driven EM in older adults have been established, the association of EM and posthospitalization HRQOL in older adults with acute CVD has yet to be explored. Thus, our objective was to assess posthospitalization HRQOL in older adults with acute CVD undergoing EM. Data obtained from this study can inform future studies to assess whether EM interventions can improve posthospitalization outcomes for older adults with acute CVD.

Methods

Study design, participants, and setting

Patients aged ≥ 60 years admitted to the cardiovascular intensive care unit (CICU) or the cardiovascular ward were

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Ethics Statement: Institutional research ethics approval was obtained for this study.

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was measured using the Short-Form 36 questionnaire at 1 and 12 months posthospitalization. The primary outcome was the questionnaire's physical component summary (PCS) score at 1 month posthospitalization.

Results: There were 147 patients included in the analysis (aged 75.0 ± 8.7 years; 44.6% female; 48.6% with ischemic heart disease). The mean 1-month PCS score was 34.7 ± 9.7, which was 11.5 points and 8.4 points lower compared to age-matched Canadian normative data for people ages 65-74 years and ≥ 75 years, respectively. The mean PCS score at 12 months (36.5 ± 9.2) and the mean mental component summary scores at 1 and 12 months (36.9 ± 11.1; 40.5 ± 11.5) were lower than those of the age-matched population (all $P < 0.0001$). In the multivariable analysis, increased age and worse prehospitalization function were associated with lower PCS score at 1 month.

Conclusions: Older adults with acute CVD had lower HRQOL at 1 and 12 months posthospitalization than age-matched Canadian norms. Prehospitalization functional status was predictive of poor posthospitalization HRQOL. The EM program was safe and feasible in this patient population. Further studies are needed to determine whether EM can improve posthospitalization patient-centred outcomes in older adults, particularly those with poor prehospitalization functional status.

Montréal, au Québec, ont été inscrits de façon prospective de janvier 2018 à janvier 2020. Nous avons mesuré l'état fonctionnel au moyen de l'échelle de mobilité fonctionnelle validée. Nous avons mesuré la QVLS à l'aide du questionnaire d'évaluation de la santé en version abrégée (SF-36, de l'anglais Short-Form 36 questionnaire) un mois et 12 mois après l'hospitalisation. Le principal critère d'évaluation était les scores du sommaire de la composante physique (SCP) du questionnaire un mois après l'hospitalisation.

Résultats : Cent quarante-sept patients ont fait l'objet de l'analyse (âgés de 75,0 ± 8,7 ans; 44,6 % de femmes; 48,6 % atteints d'une cardiopathie ischémique). Les scores moyens du SCP après un mois étaient de 34,7 ± 9,7, soit 11,5 points et 8,4 points plus bas que les données normatives canadiennes appariées selon l'âge pour les personnes de 65 à 74 ans et ≥ 75 ans, et ce, respectivement. Les scores moyens du SCP après 12 mois (36,5 ± 9,2) et les scores moyens du sommaire de la composante mentale après un mois et après 12 mois (36,9 ± 11,1; 40,5 ± 11,5) étaient plus bas que les scores de la population appariée selon l'âge (toutes les $P < 0{,}0001$). Dans l'analyse multivariée, l'âge avancé et le plus mauvais fonctionnement avant l'hospitalisation ont été associés à un score plus bas du SCP après un mois.

Conclusions : Les personnes âgées atteintes d'une MCV aiguë avaient un mois et 12 mois après l'hospitalisation une QVLS inférieure aux normes canadiennes appariées selon l'âge. L'état fonctionnel avant l'hospitalisation permettait de prédire une QVLS médiocre après l'hospitalisation. Le programme de MP était sécuritaire et réalisable pour ces patients. D'autres études sont nécessaires pour déterminer si la MP peut contribuer à l'amélioration des résultats axés sur les patients après l'hospitalisation chez les personnes âgées, particulièrement chez celles qui ont un état fonctionnel médiocre avant l'hospitalisation.

prospectively enrolled at the Jewish General Hospital, an academic tertiary care centre in Montreal, Quebec, Canada from January 1, 2018 to January 31, 2020. Exclusion criteria were projected CICU length of stay of < 24 hours, undergoing cardiac surgery during index hospitalization, and very poor prehospitalization functional status (as defined by a level of function (LOF) of 0, 1, or 2 from the Level of Function Mobility Scale). The study was registered at ClinicalTrials.gov (NCT03616873).

The EM program

The EM program is a nurse-driven, structured care program initiated on admission to the CICU. The EM program for acute cardiac care has been previously described.[6] The objective of the EM program is to prevent in-hospital deconditioning by progressively mobilizing patients as soon as hemodynamic stabilization has occurred, typically within 24 to 48 hours following unit admission. Patients are considered hemodynamically stable if they do not meet any of the hemodynamic or respiratory exclusion criteria for mobilization. The EM program uses the validated LOF scale to assess the patient's maximal functional capacity to guide tailored mobilization activities.[6] The LOF score ranges from 0 (maintain range of motion) to 5 (increase general endurance and mobility). Bedside nurses assess the LOF score on unit arrival and then subsequently twice daily (morning and evening shift) and administer 3 level-specific activities per shift. Nurses also determine the prehospitalization LOF at the time of admission based on patient and/or corollary history from family members. Nurses may also instruct willing family members on how to perform the mobilization activities with their relatives. During each shift, the bedside nurse documents the LOF, contraindications to mobilization, activities performed, and adverse events. Patients are excluded from mobilization during that nursing shift if they meet any of the following contraindications. Contraindications to mobilization include device-related (femoral sheaths, intra-aortic balloon pumps, transvenous pacemakers), hemodynamic (systolic blood pressure < 90 mm Hg or > 200 mm Hg, active ischemia, uncontrolled arrhythmia, increasing vasoactive medication needs), respiratory (rate < 10 or > 35 breaths per minute, and fraction of inspired oxygen more than 60%), and neurologic (seizures within 24 hours) criteria.

Study variables and outcome measures

Covariates of interest included age, sex, primary admission diagnosis, length of CICU and hospital stay, and LOF scores at 3 intervals (prehospitalization, hospital admission, and CICU discharge). The primary outcome of interest was the physical component summary (PCS) score from the 36-item Short Form Health Survey questionnaire (SF-36) at 1 month post–hospital discharge. Secondary outcomes were total SF-36 scores at 1 and 12 months, SF-36 PCS at 12 months, and SF-36 mental component summary (MCS) scores at 1 and 12 months. Other outcomes of interest were the SF-36 subsection scores at 1 and 12 months, mortality in-hospital and at 1 and 12 months, hospital readmission at 1 month, and discharge destination.

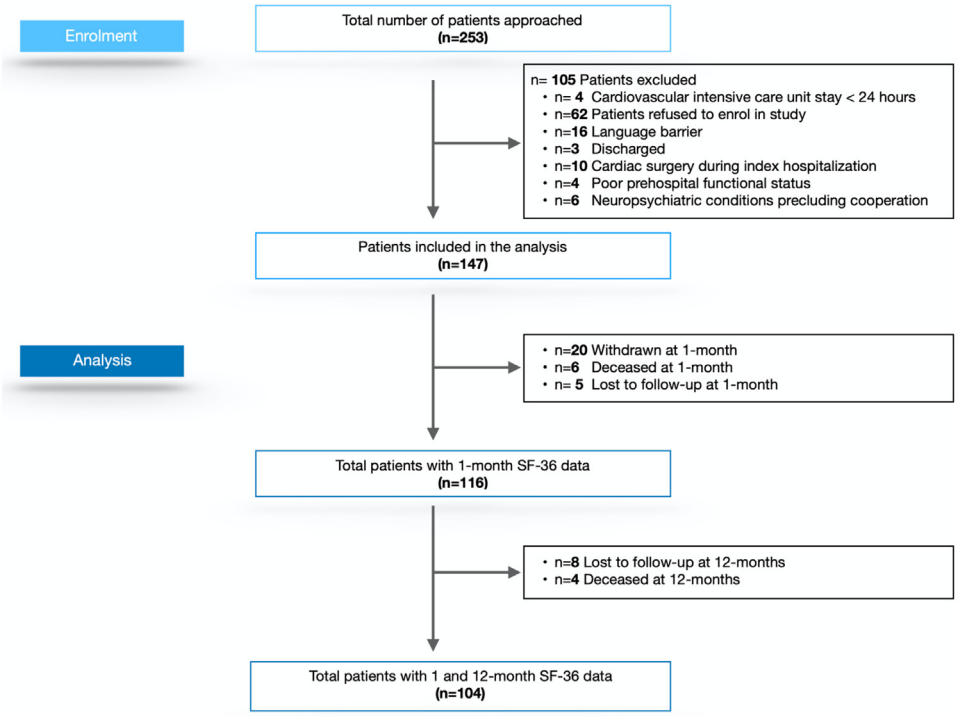

Figure 1. Flow diagram. SF-36, 36-item Short Form Health Survey questionnaire.

Study instrument: SF-36 scale

The SF-36 is a patient-reported 36-item questionnaire of HRQOL.[11] Physical and mental summary components are scored 0-100.[11] Low scores indicate high disability, with a mean score of 50 standardized to Canadian normative values.[12] Data on patient physical and mental health is stratified across 8 domains: vitality, physical functioning, bodily pain, general health perceptions, physical role functioning, emotional role functioning, social role functioning, and mental health.[11] The SF-36 is the most widely used HRQOL instrument, is easy to administer in person and by telephone, and has been shown to be valid and reliable in elderly populations.[13]

Data collection

For each subject, the following data were obtained from the electronic medical record: age, sex, primary admission diagnosis, length of CICU and hospital stay, discharge location, vital status at discharge, mobility assessments (LOF scores, contraindications, activities completed, and adverse events). Acute CVD was operationalized with the following primary admission diagnoses and International Statistical Classification of Diseases and Related Health Problems (ICD codes): ischemic heart disease (ICD I20- I25); heart failure (ICD I50); arrhythmia (ICDs I47.0, I47.1, I47.2, I47.9, I48.0, I49.0-I49.5, I49.8, I49.9); valvular disease (ICDs I33-39. I34.x, I37.x, I05.x, I08.x, I09.9, T82.0); or other (all other I-codes). Severity of disease burden was assessed using the diagnostic-related group (DRG) coding system, which determines severity of disease burden based on age, admission diagnosis, and medical comorbidities, rated from 0 (least severe) to 4 (most severe). Discharge destinations were categorized as home, rehabilitation facility or acute care hospital, or a long-term care facility. Patients were contacted by a member of the research team at 1 and 12 months after hospital discharge by telephone to assess HRQOL with the SF-36, and to ascertain vital status.

Data analysis

Continuous data are presented as mean $\pm$ standard deviation with differences between groups tested using the Student *t* test. Categorical data are reported as frequencies and percentages and were compared using the χ^2 test or the Fisher exact test, as appropriate. PCS and MCS scores were calculated from subscale scores, for comparison against the general population (considered to have a mean of 50 and a standard deviation of 10) using Canadian normative data and the methodology described by Taft et al.[12,14] Continuous data were compared to Canadian normative data using the Student *t* test (GraphPad *t* test calculator, GraphPad, La Jolla, CA). The minimally clinically important difference in PCS score is 3 points.[15] A linear multivariable regression model was used to evaluate the relationship between the PCS score at 1 month (a continuous variable) and predictor variables of interest (age, sex, admission diagnoses, and mobility levels). Multiple imputation was used to account for missing 1-month SF-36 scores. A *P*-value of ≤ 0.05 was considered to be statistically significant. Data were analyzed using the statistical software SPSS 24.0 (IBM, Armonk, NY) and STATA/SE 16 (StataCorp, College Station, TX). Institutional research ethics approval was obtained for this study. All subjects signed an informed consent form prior to participation in the study.

Table 1. Characteristics of the overall cohort

Variable	Participants (N = 147)
Demographic	
Age (y)	75 ± 8.659
Female	66 (44.6)
Primary admission diagnosis	
Ischemic heart disease	72 (48.6)
Heart failure	19 (12.8)
Arrhythmia	22 (14.8)
Valvular disease	8 (5.4)
Other*	27 (18.4)
Clinical	
CICU length of stay, d	3.4± 3.4
Hospital length of stay, d	11± 7.00
Mobility	
Pre-hospitalization LOF	4.7± 0.5
Admission LOF	3.4± 1.3
CICU discharge LOF	4.2± 0.7
Mobility activities / activities possible	87.0 (1835/2109)
Mobility opportunities used / total opportunities, % (n/n)	93.2 (655/703)
Adverse events	8 (0.4)
Contraindications to mobilization	27 (20.3)
Contraindications and eventual mobilization	27 (100)

Values are M ± SD, or n (%), unless otherwise indicated.

CV, cardiovascular; CICU, cardiovascular intensive care unit; LOF, level of function

The LOF score ranges from 0 (maintain range of motion) to 5 (increase general endurance and mobility).

*Myocarditis, n = 4; pericardial disease, n = 4; pulmonary hypertension, n = 4; cardiomyopathy, n = 3; hypertension, n = 3; cancer, n = 2; hypertrophic cardiomyopathy, n = 2; infection, n = 2; aortic dissection, n = 1; drug toxicity, n = 1; electronic device complications, n = 1.

Results

Cohort characteristics

A total of 147 patients were included in the study, 116 with 1-month SF-36 data, and 104 with 1- and 12-month SF-36 data (Fig. 1). The mean age was 75.0 ± 8.7 years; 66 (44.6%) were female (Table 1). The most common primary admission diagnoses were ischemic heart disease (n = 72; 48.6%), heart failure (n = 19; 12.8%), and arrhythmia (n = 22; 14.8%). The mean length of stay in the CICU was 3.4 ± 3.4 days, and total hospital length of stay was 11.0 ± 7.0 days. One-fifth of patients (n = 27; 20.3%) had contraindications to mobility at some point during hospitalization; all of these patients were eventually mobilized. Patients were mobilized during 93% (655 of 703) of mobility opportunities, and 87% (1835 of 2109) of prescribed mobility activities were completed. Mean LOF of patients was 4.7 ± 0.5 prehospitalization, 3.4 ± 1.3 on admission, and 4.3 ± 0.9 on CICU discharge. There were 8 adverse events during mobilization, out of 1835 mobility activities (adverse event rate = 0.4%; dyspnea/tachypnea/desaturation, n = 4; tachyarrhythmia, n = 3; chest pain, n = 1), all of which were transient, and none affected clinical management.

Outcomes

For the primary outcome, the mean 1-month PCS score for patients was 34.7 ± 9.7 (Fig. 2; Table 2). For the secondary outcomes, the mean total SF-36 score was 60.4 ± 21.9 at 1 month, and 69.3 ± 21.7 at 12 months; the mean PCS score was 36.5 ± 9.2 at 12 months; and the mean MCS score was 36.9 ± 11.1 at 1 month, and 40.5 ±11.5 at 12 months.

The discharge location was home (n = 122; 82.4%), acute care facility or rehabilitation center (n = 14; 9.5%), and long-term care facility (n = 3; 2.0%; Table 2). In all, 9 patients died in-hospital, 6 at 1 month, and 4 patients at 12 months. There were 10 patients (6.8%) readmitted at 1 month.

In the multivariable analysis, age and prehospitalization LOF were predictive of PCS at 1 month (Table 3; $P < 0.05$). When only patients aged ≥ 75 years were included (n = 78), the PCS score at 1 month was 33.6 ± 10.4, compared to 42.0 in the age-matched normative data ($P < 0.0001$; Supplemental Table S1). Patients with a prehospitalization LOF ≤ 4 had lower PCS and MCS scores at 1 and 12 months compared to age-matched normative data. Patients with a prehospitalization LOF ≤ 4 had lower PCS scores at 1 and 12 months, but no difference in the MCS at 1 and 12 months, compared to patients with prehospitalization LOF 5 (Supplemental Table S2).

During CICU admission, there were 69 (46.9%) patients with improved functional status, 70 (47.6%) who maintained the same function, and 2 (1.4%) with worsened function (Supplemental Figure S1). There were 81 (55.1%) patients who recovered to at least their prehospitalization level of function by CICU discharge. Patients who recovered their prehospitalization LOF by CICU discharge, as compared to those who did not, had no difference in their PCS score at 1 month (36.4 ± 7.9 vs 33.1 ± 11.6, $P = 0.09$). This remained true for mean PCS scores at 12 months for patients that recovered their prehospitalization LOF compared to those that did not (37.1 ± 8.0 vs 35.9 ± 11.0, $P = 0.6$). Mean MCS scores at 1 and 12 months also did not differ significantly in those recovering to prehospitalization LOF: 1-month scores in those recovering to prehospitalization LOF compared to scores in those not recovering were 36.3 ± 10.5 vs 38.2 ± 11.7 ($P = 0.4$), respectively, and 12-month scores in those recovering to prehospitalization LOF compared to scores for those not recovering were 41.8 ± 10.9 vs 39.4 ± 12.3 ($P = 0.4$), respectively. There were no significant differences by primary admission diagnosis in the mean PCS score at 1 or 12 months (Supplemental Table S3; $P = 0.48$ and $P = 0.62$, respectively) or in the mean MCS score at 1 or 12 months ($P = 0.65$ and $P = 0.23$, respectively). There was no difference by DRG group for PCS score at 1 or 12 months ($P = 0.65$ and $P = 0.26$, respectively).

Discussion

Key findings

The study found that a heterogenous group of acute CVD patients, with diagnoses ranging from ischemic heart disease to valvular heart disease, had much poorer physical and mental HRQOL at 1 and 12 months compared to age-matched population norms. The nurse-driven EM program in the CICU was feasible, with more than 9 out of 10 mobility opportunities resulting in a mobility activity, and with a similar percentage of mobility activities completed. The EM program was also safe with a low rate of adverse events

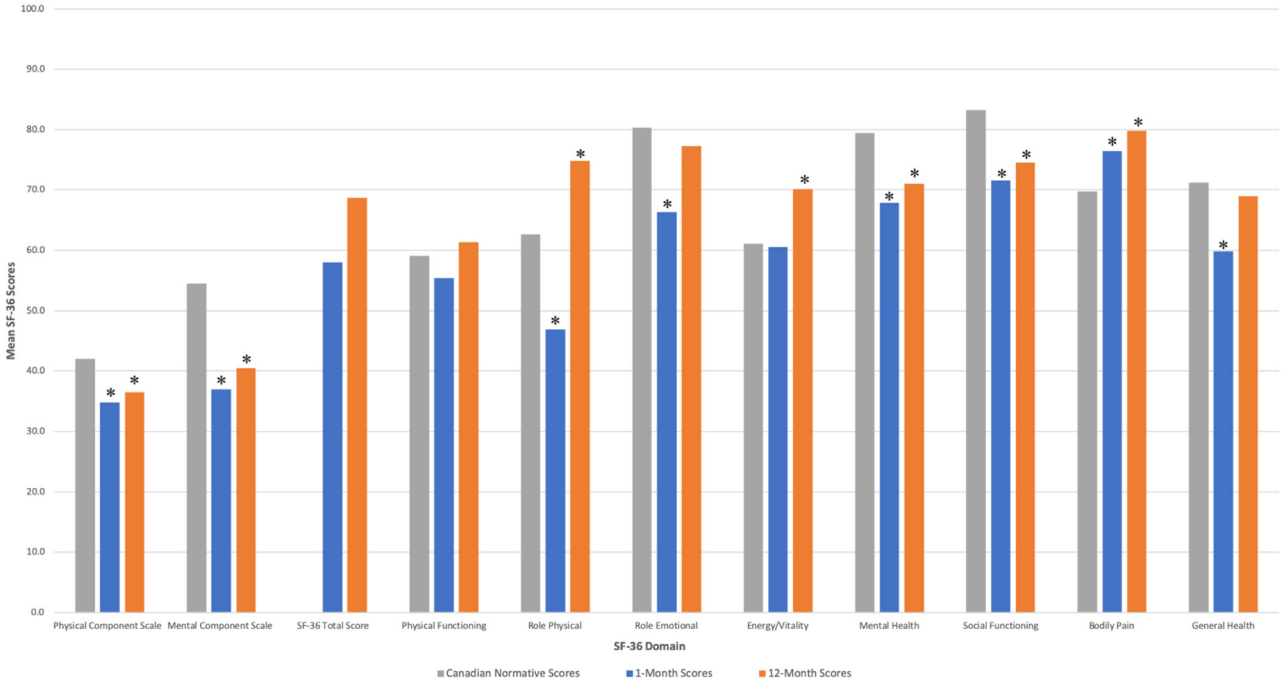

Figure 2. Health-related quality-of-life measures posthospitalization at 1 and 12 months. SF-36, 36-item Short Form Health Survey questionnaire. Canadian normative data are from Hopman et al.[12] *Indicates a significant *P*-value $\leq$ 0.05 compared to Canadian normative data.

and no major or life-threatening events. More than 80% of patients were discharged home, and about 1 in 14 patients (7.1%) were readmitted within 30 days, which is close to half of the expected readmissions among older adults in this population.[16] Patients' functional status improved from admission toward prehospitalization functional levels. Importantly, a relationship between prehospitalization functional status and posthospitalization HRQOL was observed; older patients with worse prehospitalization functional status were at higher risk for decreased HRQOL following hospitalization.

Early mobility and posthospital syndrome

Posthospital syndrome consists of a decline in patient ability to perform activities of daily living, an increased vulnerability to stressors, and decreased likelihood of successful recovery following discharge.[17] Healthcare providers and healthcare systems often primarily focus upon the patient's acute illness and place less emphasis upon managing the stressors that accompany hospitalization, which include disturbances of circadian rhythm, bedrest leading to loss of muscle mass and strength, and depletion of physiological reserves that impair optimal patient recovery.[1] Ultimately, many patients are left in a decompensated state following hospital discharge, placing them at risk for further disability.[17] Patients may experience an inability to fulfill previously completed activities of daily living, along with experiencing further physical and cognitive functional decline.[1,17,18] Mobilizing patients, particularly early in their hospital course once hemodynamic and respiratory stability has been achieved, may combat the immobility and prolonged bedrest that is a primary contributor to posthospital syndrome. EM has been shown previously to be safe and feasible in people with acute CVD and is associated with lower rates of discharge to healthcare institutions (ie, rehabilitation centres and long-term care facilities).[6,19] Our current study similarly found that EM was safe and feasible. Adverse events were rare (0.4% of mobility activities), transient, and not clinically relevant. In addition, about one-fifth of patients had contraindications to mobilization during hospitalization, and all of these patients were eventually able to be mobilized. However, a recent survey of healthcare providers found that safety concerns were a considerable barrier to EM.[20] Physicians had much greater barriers to mobilization than nurses or physiotherapists in terms of beliefs, knowledge, and attitudes towards mobilization. Other important provider barriers to mobilization include need for physician orders, inadequate staffing, and provider time restraints. For EM program implementation, efforts are needed to address these barriers.

Older adults are a patient population that is particularly susceptible to posthospital syndrome, especially in the physical domain of HRQOL. We found that the 1-month PCS scores for adults over age 75 years in our cohort to be 7.3 points lower than those in the Canadian population age-matched norm, which is greater than the minimally clinically important difference of 3 points.[15] Notably, the 1-month PCS scores obtained in this study were with an established nurse-driven EM program intervention in place and there was no comparator group. It is possible that the 1-month PCS scores could be worse without an EM program in place. Other studies similarly have showed that critically ill patients have lower posthospitalization PCS scores compared to population norms. A study in Germany following intensive-care unit stay found that 1-month PCS scores were 10.3 points lower compared to population norms.[21] Future studies should explore whether an EM intervention improves

Table 2. Primary and secondary outcomes

Primary outcome	Mean ± SD; n (%)
PCS, at 1 month	34.7 ± 9.7
Secondary outcome	
Total SF-36 score, at 1 month	60.4 ± 21.9
Total SF-36 score, at 12 months	69.3 ± 21.7
PCS, at 12 months	36.5 ± 9.2
MCS, at 1 month	36.9 ± 11.1
MCS, at 12 months	40.5 ± 11.5
Death	
In hospital	9 (6.1)
At 1 month	6 (4.1)
At 12 months	4 (2.7)
Discharge destination	
Home	122 (82.4)
Rehabilitation or acute care hospital	14 (9.5)
Long-term care facility	3 (2.0)
Hospital readmission	
At 1 month	10 (6.8)

MCS, mental component summary of SF-36; PCS, physical component summary of SF-36; SD, standard deviation; SF-36, 36-item Short Form Health Survey questionnaire.

posthospitalization functional and HRQOL outcomes. Within specific HRQOL domains, there are several important observations to note. Mental health and social functioning scores were lower than those for age-matched norms up to 12 months post-discharge (Fig. 2). Emotional health was also lower shortly after discharge but was similar at 12-month follow-up. Indeed, there was more of a marked difference in MCS than in PCS scores. This underscores the importance of addressing the mental and emotional needs of older adults with acute CVD.

Predictors of poor posthospitalization HRQOL

We found that low prehospitalization LOF scores were associated with poorer HRQOL posthospitalization outcomes. Prehospitalization LOF was determined based on intake history from the patient and/or family member by the bedside nurse on admission. Thus, this suggests that an easy-to-perform functional history on admission can help identify patients who are expected to have poorer functional status following hospital discharge. Patients at higher risk of poor longer-term outcomes may particularly benefit from earlier mobilization and focus on maintaining or improving functional capabilities during their hospital stay. A study on EM in older adults in an American quaternary care CICU found that mobilization was associated with improved functional status regardless of frailty status or initial functional status on admission.[5] Frail older adults had lower prehospitalization, admission, and discharge functional status than non-frail older adults, but both groups had similar overall improvements in functional status.

There is also likely a role for other interdisciplinary interventions to improve outcomes in people with poorer prehospitalization functional status (eg, dietary, pharmaceutical, social work, specialized geriatric consultation) during acute cardiovascular admission. Care structures in the early post-hospitalization period may also be of benefit to patients identified as having poor prehospitalization function. Early post-discharge nursing or physician visits may identify issues and decrease emergency department visits and readmissions.[22] Cardiac rehabilitation has been shown to improve the quality of life and functional capabilities for people with coronary disease.[23,24] However, cardiac rehabilitation in some geographical regions is often an underutilized resource.[25] In particular, older, frail people, and those with poorer functional status, are often under-referred to cardiac rehabilitation programs. Thus, early identification of older patients with poor baseline functional status may help prioritize patients who may benefit from structured posthospitalization care such as cardiac rehabilitation.

Although cardiovascular medicine studies traditionally have focused on "hard" outcomes, such as myocardial infarction and mortality, older adults may deem functional independence and quality of life just as important.[8,9] However, there currently are a lack of studies incorporating these geriatric-focused measures. Thus, a stronger evidence base is needed to understand the impact of interventions on patient-centred outcomes in older people with acute CVD. Our study provides a baseline for posthospitalization HRQOL using the widely reported, validated SF-36 score. Further randomized studies are needed to assess whether interventions targeting older adults with acute CVD can improve patient-centred outcome measures. Understanding functional and HRQOL outcomes could be a clinically useful tool as part of a shared decision-making approach to care decisions in older adults with acute CVD, and can influence societal guidelines and clinical practice.

There are limitations to our study. First, this was a single-centre study at an academic tertiary care hospital in Canada, so our results may not be generalizable to other healthcare settings or regions. Second, all patients in our study underwent EM, so there was no control group in our study. Although participants in our study had lower HRQOL scores than did age-matched peers in the population, it is possible that EM improved or had no impact on HRQOL outcomes. In addition, the age-matched normative dataset involved non-hospitalized individuals, as there was no published dataset of

Table 3. Multivariable linear regression

Variable	Regression coefficient	95% confidence interval	*P*
Age	−0.2	−0.5 to −0.03	0.03
Sex	0.5	−3.4 to 4.3	0.8
Admission diagnosis			
Ischemic heart disease	3.8	−1.2 to 8.8	0.1
Heart failure	4.3	−2.5 to 11.2	0.2
Arrythmia	−0.8	−6.7 to 5.0	0.7
Level of function prehospitalization	4.6	0.4 to 8.8	0.03

hospitalized patients available. Our data can be used as a baseline in future studies on whether EM can improve HRQOL outcomes. Third, objective measures of sarcopenia, a condition of low muscle mass and strength, were not assessed, and could be potential confounders since they can impact functional status. Fourth, data on specific comorbid disease were not collected. Pre-existing comorbid illness may negatively impact prehospitalization functional status, mobilization participation, and posthospitalization HRQOL outcomes. However, DRGs, which include pre-existing comorbid illness, were included in the analysis. There was no difference in the primary outcome by DRG score. Fifth, the time of first mobilization relative to admission was not captured. Time to mobilization may be a predictor of posthospitalization functional and HRQOL outcomes and is potentially modifiable. Time to first mobilization could be assessed in future EM studies. Lastly, HRQOL scores were not available for all patients at 1 month due to study withdrawal, loss to follow-up, and death. It is possible that these patients may have been sicker, with poorer longer-term HRQOL scores. We were able to ascertain vital status from the electronic medical record, and the majority of these patients were alive at the 12-month follow-up.

Conclusion

In a heterogenous group of older acute cardiovascular patients, posthospitalization HRQOL outcomes were lower than those for age-matched population norms. An EM program was safe and feasible in this population. Further studies are needed to investigate the impact of EM delivery on posthospitalization HRQOL in older adults with CVD.

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Disclosures

The authors have no conflicts of interest to disclose.

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Supplementary Material

To access the supplementary material accompanying this article, visit *CJC Open* at https://www.cjcopen.ca/ and at https://doi.org/10.1016/j.cjco.2021.02.013.