Rates and predictive factors of return to the emergency department following an initial release by the emergency department for acute heart failure

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ABSTRACT

Objectives: Following release by emergency department (ED) for acute heart failure (AHF), returns to ED represent important adverse health outcomes. The objective of this study was to document relapse events and factors associated with return to ED in the 14-day period following release by ED for patients with AHF.

Methods: The primary outcome was the number of return to ED for patients who were release by ED after the initial visit, for any related medical problem within 14 days of this initial ED visit.

Results: Return visits to the EDs occurred in 166 (20%) patients. Of all patients who returned to ED within the 14-day period, 77 (47%) were secondarily admitted to the hospital. The following factors were associated with return visits to ED: past medical history of percutaneous coronary intervention or coronary artery bypass graft (aOR = 1.51; 95% CIs [1.01-2.24]), current use of antiarrhythmics medications (1.96 [1.05-3.55]), heart rate above 80 /min (1.89 [1.28-2.80]), systolic blood pressure below 140 mm Hg (1.67[1.14-2.47]), oxygen saturation (SaO2) above 96% (1.58 [1.08-2.31]), troponin above the upper reference limit of normal (1.68 [1.15-2.45]), and chest X-ray with pleural effusion (1.52 [1.04-2.23]).

Conclusions: Many heart failure patients (i.e. 1 in 5 patients) are released from the ED and then suffer return to ED. Patients with multiple medical comorbidities, and those with abnormal initial vital signs are at increased risk for return to ED and should be identified.

RÉSUMÉ

Objectif: Le retour au service des urgences (SU) de patients atteints d'insuffisance cardiaque aiguë qui ont reçu leur congé du service après une première consultation signe une détérioration importante de l'état clinique. L'étude décrite ici avait pour objectif de documenter les rechutes et les facteurs associés à un retour au SU de patients souffrant d'insuffisance cardiaque aiguë (ICA) dans les 14 jours suivant leur congé du service.

Méthode: Le principal critère d'évaluation consistait en le nombre de retours de patients au SU après qu'ils eurent reçu leur congé du service, pour tous problèmes médicaux connexes, dans les 14 jours suivant une première consultation.

Résultats: Il y a eu nouvelle consultation au SU chez 166 (20 %) patients et, parmi ceux qui y sont retournés dans les 14 jours, 77 (47 %) ont été hospitalisés. Les facteurs suivants, soit des antécédents médicaux d'intervention coronarienne percutanée ou de pontage coronarien (risque relatif approché rajusté = 1,51; IC à 95 % : [1,01-2,24]), l'utilisation en cours d'antiarythmiques (1,96 [1,05-3,55]), une fréquence cardiaque supérieure à 80 battements/min (1,89 [1,28-2,80]), une pression systolique inférieure à 140 mm Hg (1,67 [1,14-2,47]), une saturation du sang en oxygène (SaO_2) supérieure à 96 % (1,58 [1,08-2,31]), un taux de troponine dépassant la limite supérieure de référence de la normale (1,68 [1,15-2,45]) et un épanchement pleural visible à la radiographie pulmonaire (1,52 [1,04-2,23]), ont été associés à de nouvelles consultations au SU.

Conclusions: De nombreux insuffisants cardiaques, soit 1 sur 5, reçoivent leur congé du SU, mais doivent y retourner peu de temps après. Les patients qui souffrent de plusieurs maladies concomitantes et ceux qui ont des signes vitaux anormaux à l'arrivée connaissent un risque accru de nouvelle consultation au SU et devraient être reconnus comme tels.

Keywords: cohort studies, emergency service, heart failure, multivariate analysis, risk assessment

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 CJEM 2018;20(2):222-229 DOI 10.1017/cem.2017.14

INTRODUCTION

An estimated 83 million American adults have one or more types of cardiovascular diseases. Of these, more than 5 million have cardiac heart failure, and the prevalence is rising.[1] In 2009, there were more than 1 million U.S. primary heart failure hospitalizations and another 3 million with heart failure as the secondary diagnosis.[2] Heart failure is the second most common reason for hospitalization with an average length of stay being 12.9 days and accounting for 1.4 million hospital days.[3] Similarly, in Canada, heart failure is a common and serious condition that affects 500,000 people.[4]

Readmissions within 30 days following heart failure hospitalization approach 25%.[5] Relapses that result in return visits to the emergency department (ED) represent important adverse health outcomes for heart failure patients and result in important costs to the health care system.[6] Moreover, a reduction in hospital readmissions has been identified as one of the pillars of Medicare reform in the United States. Whereas many studies are related to readmission rates among patients with an initial admission for heart failure, little is known about the issue of the return to the ED for patients initially treated and released by the ED for acute heart failure (AHF).

The objective of this study was to document relapse events and factors associated with return to the ED in the 14-day period following release by the ED for patients with AHF.

MATERIALS AND METHODS

Study design and setting

The Respiratory Admission (RAD) studies were conducted in Canada to develop risk scales for ED patients with AHF and acute exacerbation of chronic obstructive pulmonary disease. We pooled data related to only patients with AHF from two prospective cohort studies[7,8] of the RAD researches. This study is a secondary analysis of two studies[7,8] conducted from September 2007 to September 2014 in six Canadian teaching hospitals in Ottawa, Ontario (two sites); Toronto, Ontario; Kingston, Ontario; Montréal, Quebec; and Edmonton, Alberta. These hospitals have a combined annual ED volume of approximately 350,000 patient visits. These studies were approved by the research ethics boards at each centre. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Population

We did not enrol patients who were obviously too ill to be considered for discharge within the 2- to 15-hour ED treatment study window or who were otherwise unsuitable for the study for the following reasons: 1) resting oxygen saturation (SaO2) < 85% on room air or after being on their usual home oxygen setting for 20 minutes after ED arrival; 2) heart rate greater than or equal to 120 beats/minute on arrival; 3) systolic blood pressure < 85 mm Hg on arrival; 4) ischemic chest pain requiring treatment with nitrates on arrival; 5) acute ST-segment elevation on electrocardiogram (ECG) on arrival; 6) terminal status – death expected within weeks from chronic illness; 7) patient was from nursing home or chronic care facility; 8) patient was enrolled into the study in the previous 2 months; or 9) patient was on chronic hemodialysis.

We included a convenience sample of adults above 50 years of age who presented with acute shortness of breath secondary to exacerbations of chronic heart failure or new-onset AHF and subsequently release by the ED after this initial visit. We did not include patients who experienced an inpatient admission during the initial AHF hospitalization. We used pragmatic criteria for the diagnosis of AHF as recommended by the working group on heart failure of the European Society of Cardiology.[9–11] If doubt remained, a beneficial response to treatment (for example, a brisk diuresis accompanied by substantial improvement in breathlessness) was also considered.

Measurements

Patient assessments were made by emergency physicians, registered respiratory therapists, or registered nurses. There was ongoing evaluation of the quality of the patient assessments by a central study nurse coordinator who provided regular feedback to the sites. Blood samples in each of the two cohorts were collected at the time of the study enrolment.

Outcome measures

The primary outcome in this substudy was the number of return visits to the ED for patients who were released

by the ED after the initial visit, for any related medical problem within 14 days of the visit. Assessment of the primary outcome measure was made by the investigators, blinded to the patient status for the predictor variables, from these source documents: 1) ED health records, 2) hospital health records, 3) computerized hospital patient tracking and record system, and 4) review of provincial death records. Patients were not contacted by telephone.

Data analysis

We described patient characteristics using percentages for qualitative variables and using means and standard deviation, or median with interquartile range (IQR), depending on the type of distribution, for quantitative variables. Variable distributions were tested with the Shapiro-Wilk normality test. Comparisons between groups were performed using the chi-square test and t-test for parametric distributions, Fisher exact test, and Mann-Whitney-Wilcoxon test for nonparametric distributions. Despite the large number of univariate tests performed, no correction was applied because the goal was to detect associations, not conclude significance. Binary logistic regression with backward stepwise selection was conducted for variables found to be associated with return to the ED on univariate analysis with a p value of < 0.2. For the different models, identification of each covariate was adjudicated by the empiric association with the primary outcome using Akaike's information criterion. Overall model fit was assessed using the Hosmer-Lemeshow test. Analyses were performed using R version 3.1.1 (R Core Team 2013, R: A language and environment for statistical computing, R Foundation for Statistical Computing, Vienna, Austria). A p value (two-tailed) below 0.05 was considered to indicate statistical significance.

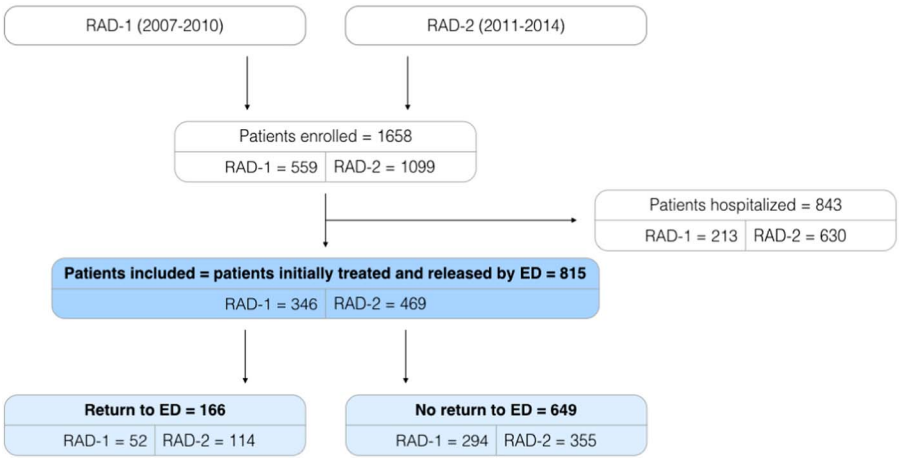
RESULTS

Characteristics of study subjects

Patient visits totalling 815 were included from September 2007 to May 2014 (Figure 1). Overall, 56% patients were male. Patients had a mean (± SD) age of 76.1 (10.5) years. Return to the EDs occurred in 166 (20%) patients. The main documented reason was worsening dyspnea (71%). Of all patients who returned to the ED within the 14-day period, 77 (47%) were secondarily admitted to the hospital. Table 1 shows the characteristics and the outcomes of the patients.

Univariate analysis

Patients who return to EDs had a lower systolic blood pressure (134.3 ± 27.5 v. 144.4 ± 28; $p < 0.001$) and a higher heart rate (85 ± 20.1 v. 80 ± 18.6; $p = 0.005$). Overall, 22 of the univariate associations between hemodynamic profiles and prespecified risk factors were statistically significant with a p value of < 0.2. Among them, 16 variables were considered for the multivariate analysis. Because of high Pearson correlation coefficients and missing values, six variables were not included in the final model. Table 2 shows the univariate analysis



ED = Emergency department; RAD = respiratory admission.

Figure 1. Patient flow diagram.

Table 1. Patient characteristics and outcomes

Characteristics	N = 815
Age, years (mean, SD)	76.1 (10.5)
Range	50-100
Male (%)	361 (44)
Arrival status	
Arrival by ambulance (%)	252 (31)
Temperature (mean, SD) (N = 763)	36.1 (0.7)
Heart rate (mean, SD) (N = 812)	81 (19)
Respiratory rate (mean, SD) (N = 765)	21.3 (4.9)
Systolic blood pressure (mean, SD) (N = 806)	142.4 (28.2)
Diastolic blood pressure (mean, SD) (N = 343)	77.1 (15)
SaO2 by oximetry (mean, SD) (N = 810)	95.3 (3.7)
Past medical history (%)	
Heart failure	585 (72)
COPD	128 (16)
Intubation for respiratory distress	3 (0)
Myocardial infarction/angina	340 (42)
CABG/PCI	290 (36)
Pacemaker	130 (16)
Atrial fibrillation (permanent)	290 (36)
Peripheral vascular disease (intervention)	43 (5)
Cancer (active)	41 (5)
Hypertension	539 (66)
Stroke or TIA	98 (12)
Diabetes	321 (39)
Dementia	19 (2)
Chronic renal failure	110 (13)
Home oxygen (%)	34 (4)
Current cardiac meds (%)	
ACE inhibitors (N = 813)	367 (45)
Antiarrhythmics (N = 813)	71 (9)
Anti-platelet meds (N = 813)	373 (46)
Beta blockers	455 (56)
Calcium channel blockers (N = 813)	235 (29)
Digoxin (N = 813)	102 (13)
Diuretics	603 (74)
Nitrates (N = 813)	229 (28)
Statins (N = 813)	462 (57)
Vasodilators (N = 813)	36 (4)
Antibiotics (N = 811)	43 (5)
Inhaled anti-cholinergics (N = 811)	96 (12)
Beta-agonists (N = 811)	158 (19)
Inhaled steroids (N = 811)	109 (13)
Oral steroid (N = 811)	32 (4)
Laboratory values (mean, SD)	
Hemoglobin (g/L) (N = 807)	121.2 (19)
Urea (mmol/L) (N = 787)	9.8 (6.5)
Creatinine (mmol/L) (N = 809)	115 (61.6)
Serum CO2 (mmol/L) (N = 803)	25.9 (3.6)
Glucose (mmol/L) (N = 794)	7.5 (3.1)
pCO2 (mm Hg) (N = 208)	45.8 (9.3)
pH (N = 208)	7.4 (0.1)
Troponin on arrival (99th percentile = 1) (mean, SD) (N = 766)	1.7 (5.4)
NT-proBNP level (ng/L) (N = 451)	7,289.8 (11,829.6)
ECG findings (%)	
Atrial fibrillation/flutter (N = 794)	273 (34)
Acute ischemia on initial ECG (N = 794)	12 (2)
Old infarction on initial ECG (N = 793)	91 (11)
CXR findings (%)	
Pulmonary congestion (N = 804)	451 (56)
Pleural effusion (N = 804)	401 (50)
Pneumonia (N = 804)	35 (4)
Cardiomegaly (N = 804)	433 (54)
Return to emergency department (%)	166 (20)
Reasons (%)	
Dyspnea	118 (71)
Fever (N = 162)	3 (2)
Sepsis (N = 162)	0 (0)
Chest pain (N = 162)	29 (18)
Other (N = 160)	60 (37)
Admitted to hospital (%) (N = 165)	77 (47)
Death within 30 days (%) (N = 164)	10 (6)

ACE = angiotensin-converting enzyme; CABG = coronary artery bypass graft; COPD = chronic obstructive pulmonary disease; CXR = chest X-ray; ECG = electrocardiogram; NT-proBNP = N-terminal prohormone of brain natriuretic peptide; PCI = percutaneous coronary intervention; pCO2 = partial pressure of CO2; SaO2 = oxygen saturation; TIA = transient ischemic attack; URL = upper reference limit.

between return to the ED and the characteristics of the 815 patients released by the ED after management of AHF.

Multivariate analysis

Multivariable analysis indicated that the following factors were independently associated with return to the ED (Table 3): past medical history of percutaneous coronary intervention (PCI) or coronary artery bypass graft (CABG) (aOR = 1.51; 95% CIs [1.01-2.24]); current use of antiarrhythmics medications (aOR = 1.96; 95% CIs [1.05-3.55]); heart rate above 80/minute (aOR = 1.89; 95% CIs [1.28-2.80]); systolic blood pressure below 140 mm Hg (aOR = 1.67; 95% CIs [1.14-2.47]); SaO2 above 96% (aOR = 1.58; 95% CIs [1.08-2.31]); troponin above the upper reference limit of normal (aOR = 1.68; 95% CIs [1.15-2.45]); and chest X-ray with pleural effusion (aOR = 1.52; 95% CIs [1.04-2.23]). This model was developed on a data set of 730 cases without missing values. This model had a nonsignificant Hosmer-Lemeshow chi-square goodness-of-fit (GOF) statistic (GOF = 0.66), and the area under the receiver operating characteristic curve was 0.69 (95% CIs [0.65-0.73]).

Table 2 . Univariate association with return to ED for 815 heart failure patient visits then discharged

Characteristics	No relapse (N = 649)	Relapse (N = 166)	*p*-value
Age, years (mean, SD)	76 (10.5)	76.7 (10.6)	0.335
Male (%)	293 (45)	68 (41)	0.337
Arrival status			
Arrival by ambulance (%)	200 (31)	52 (31)	0.925
Temperature (mean, SD) (N = 610 and 153)	36.1 (0.7)	36 (0.8)	0.403
Heart rate (mean, SD) (N = 647 and 165)	80 (18.6)	85 (20.1)	0.005
Respiratory rate (mean, SD) (N = 606 and 159)	21.4 (4.9)	21.2 (4.9)	0.657
Systolic blood pressure (mean, SD) (N = 641 and 165)	144.4 (28)	134.3 (27.5)	<0.001
Diastolic blood pressure (mean, SD) (N = 291 and 52)	77.3 (15.1)	76.2 (14.5)	0.657
SaO2 by oximetry (mean, SD) (N = 644 and 166)	95.2 (3.5)	95.5 (4.2)	0.067
Past medical history (%)			
Heart failure	454 (70)	131 (79)	0.026
COPD	98 (15)	30 (18)	0.341
Intubation for respiratory distress	3 (0)	0 (0)	1
Myocardial infarction/angina	267 (41)	73 (44)	0.537
CABG/PCI	221 (34)	69 (42)	0.084
Pacemaker	96 (15)	34 (20)	0.076
Atrial fibrillation (permanent)	226 (35)	64 (39)	0.414
Peripheral vascular disease (intervention)	32 (5)	11 (7)	0.435
Cancer (active)	33 (5)	8 (5)	1
Hypertension	435 (67)	104 (63)	0.312
Stroke or TIA	72 (11)	26 (16)	0.11
Diabetes	248 (38)	73 (44)	0.183
Dementia	12 (2)	7 (4)	0.084
Chronic renal failure	83 (13)	27 (16)	0.253
Home oxygen (%)	25 (4)	9 (5)	0.384
Current cardiac meds (%)			
ACE inhibitors (N = 647 and 166)	293 (45)	74 (45)	0.93
Antiarrhythmics (N = 647 and 166)	51 (8)	20 (12)	0.092
Anti-platelet meds	292 (45)	81 (49)	0.432
Beta blockers	366 (56)	89 (54)	0.54
Calcium channel blockers (N = 647 and 166)	193 (30)	42 (25)	0.291
Digoxin (N = 647 and 166)	85 (13)	17 (10)	0.359
Diuretics	473 (73)	130 (78)	0.166
Nitrates (N = 647 and 166)	170 (26)	59 (36)	0.02
Statins (N = 647 and 166)	361 (56)	101 (61)	0.254
Vasodilators (N = 647 and 166)	31 (5)	5 (3)	0.401
Antibiotics (N = 645 and 166)	35 (5)	8 (5)	0.848
Inhaled anti-cholinergics (N = 645 and 166)	75 (12)	21 (13)	0.688
Beta-agonists (N = 645 and 166)	126 (20)	32 (19)	1
Inhaled steroids (N = 645 and 166)	89 (14)	20 (12)	0.611
Medication oral steroid (N = 645 and 166)	24 (4)	8 (5)	0.505
Laboratory values (mean, SD)			
Hemoglobin (g/L) (N = 642 and 165)	122.2 (18.7)	117.4 (19.5)	0.005
Urea (mmol/L) (N = 631 and 156)	9.5 (6.5)	11.2 (6.3)	<0.001
Creatinine (mmol/L) (N = 644 and 165)	114 (63.9)	119 (51.6)	0.039
Serum CO2 (mmol/L) (N = 639 and 164)	26.1 (3.7)	25.3 (3.3)	0.006
Glucose (mmol/L) (N = 631 and 163)	7.4 (3.2)	7.9 (3)	0.003
pCO2 (mm Hg) (N = 165 and 43)	46.3 (9.6)	43.7 (7.8)	0.158
pH (N = 165 and 43)	7.4 (0.1)	7.4 (0.1)	0.092
Troponin on arrival (99th percentile = 1) (mean, SD) (N = 608 and 158)	1.6 (4.9)	2.2 (6.9)	0.001
NT-proBNP level (ng/L) (N = 358 and 93)	6,361.6 (11,487.2)	10,862.8 (12,497.5)	<0.001

Table 2 . (Continued)

Characteristics	No relapse (N = 649)	Relapse (N = 166)	*p*-value
ECG findings (%)			
Atrial fibrillation/flutter (N = 631 and 163)	215 (34)	58 (36)	0.712
Acute ischemia on initial ECG (N = 631 and 163)	11 (2)	1 (1)	0.476
Old infarction on initial ECG (N = 630 and 163)	70 (11)	21 (13)	0.581
CXR findings (%)			
Pulmonary congestion (N = 640 and 164)	357 (56)	94 (57)	0.791
Pleural effusion (N = 640 and 164)	307 (48)	94 (57)	0.036
Pneumonia (N = 640 and 164)	26 (4)	9 (5)	0.397
Cardiomegaly (N = 640 and 164)	346 (54)	87 (53)	0.861

ACE = angiotensin-converting enzyme; CABG = coronary artery bypass graft; COPD = chronic obstructive pulmonary disease; CXR = chest X-ray; ECG = electrocardiogram; NT-proBNP = N-terminal prohormone of brain natriuretic peptide; PCI = percutaneous coronary intervention; pCO2 = partial pressure of CO2; SaO2 = oxygen saturation; TIA = transient ischemic attack; URL = upper reference limit.

Table 3. Independent predictors of return to ED as determined by stepwise logistic regression analysis for acute heart failure patients*

Characteristics	Beta	Odds ratio	95% CI	*p*-value
Past medical history				
CABG/PCI	0.41	1.51	(1.01, 2.24)	0.043
Current cardiac meds				
Antiarrhythmics	0.67	1.96	(1.05, 3.55)	0.029
Arrival status				
Heart rate > 80/minute	0.64	1.89	(1.28, 2.80)	0.002
Systolic blood pressure < 140 mm Hg	0.51	1.67	(1.14, 2.47)	0.009
SaO2 by oximetry > 96%	0.45	1.58	(1.08, 2.31)	0.019
Investigations				
Troponin on arrival >1 URL	0.52	1.68	(1.15, 2.45)	0.007
CXR pleural effusion	0.42	1.52	(1.04, 2.23)	0.032

Hosmer-Lemeshow goodness-of-fit *p* value = 0.66; area under ROC curve = 0.69 (95% CI [0.65-0.73]).
*Model developed for 730 patients without missing values. CABG = coronary artery bypass graft; CXR = chest X-ray; PCI = percutaneous coronary intervention; SaO2 = oxygen saturation; URL = upper reference limit.

DISCUSSION

Interpretation

The patients in our study were relatively older in age (median [IQR] = 77 years [69-84]). They had important medical comorbidities and cardiovascular risk factors (72% with heart failure; 66% with hypertension). They well represent patients presenting in the EDs in Organisation for Economic Co-operation and Development (OECD) countries. Because of these significant morbidities, patients in our study were often treated inconsistently (55% beta blockers; 74% diuretics). In our study, half of the AHF patients who presented for the first time were released by the ED. Yet, among these patients, 20% returned to the ED within 14 days, most commonly for dyspnea (71%). This is a relatively high rate of returns to the ED (i.e., one in five patients). We are concerned by this disturbingly high rate. Indeed, it exposes patients to potential harms such as hospital acquired infection. Moreover, it leaves an important overwork on EDs and acute care resources. As a consequence of this overwork, EDs and hospital crowding adversely impact patient care. Of these patients who returned, nearly half of the patients were subsequently hospitalized (47%).

To prevent the ED returns of these patients, we identified several independent variables associated with this return. The two clinical variables most strongly associated with returns to the ED were initial high heart

rate and low systolic blood pressure. These two parameters can be interpreted as a reflection of a hemodynamic stress. However, these differences were of minimal clinical significance. We also assume that these parameters reflect an already low extracellular volume while the patient has congestive symptoms, reflecting a sign of acuteness. Other variables independently associated with a return to the ED reflect the important comorbidities of patients and reflect their fragility. Indeed, patients with a medical history of PCI or CABG were more likely to return to the ED.

Review of previous literature

Our study confirms the frequent returns in ED for AHF patients and the issue of the initial care provided to patients.[12] In our study, the hospitalization rate for AHF patients was 47%. This rate is relatively low compared with other studies that found hospitalization rates between 70% and 80% in the United States.[13] Nevertheless, this difference between Canada and the United States has been previously described. Indeed, Lai et al. found a striking difference in the admission rates because it appeared that the Mayo Clinic admitted almost twice as many AHF patients compared to The Ottawa Hospital (95% v. 51%), and yet the outcomes of return to the ED and death within 30 days were similar.[14]

Our study shows that simple clinical parameters, such as a high heart rate and low systolic blood pressure, enable the detection of patients at risk of return to the ED. In a large retrospective study, Fonarow et al.[15] also found an association of these two parameters with mortality. Similarly, Gheorghiade et al.[16] showed that high blood pressure confers some form of advantage in heart failure patients. Unlike the Fonarow et al. study, in which patients were admitted in the ED, our study validates these results for patients released by the ED. Whereas Fonarow et al. found renal function to be strongly associated with prognosis, our study finds this factor to be true in the univariate analysis only. We found an association between cardiovascular patient medical history and return to the ED. However, medical history of dementia was not associated with more ED returns, whereas Dodson et al.[17] showed an association between dementia and poor prognosis in patients with heart failure. This can be explained by the increased number of cognitively impaired patients in this study (132 patients), whereas in our study we enrolled only 19 patients with dementia. In our study, a higher SaO2 was independently associated with returns to the ED. The mean difference between the two groups was very low (95.2% v. 95.5%). Given the limited clinical relevance of this finding, its interpretation is difficult.

Clinical impact

A recent systematic review showed that returns to the ED deemed potentially avoidable were relatively uncommon, comprising less than 20% of all returns to the ED following hospital discharge.[18] However, Retrum et al. showed that, contrary to prior literature, patient experiences were highly heterogeneous and not easily categorized as preventable versus not preventable.[19] These results appear to support a case-by-case assessment to improve the prognosis of patients. In addition, an early follow-up after discharge is critically important.[20] Several studies have shown that regular monitoring of the patient out of the hospital decreased returns to the ED in the week following the discharge[21] or later.[22] Identification of factors associated with return to the ED is the first step in developing interventions to reduce these events. Indeed, interventions to prevent these returns can be directly implemented in the ED. In a retrospective study, Hadi et al.[23] evaluated a very early and dedicated supportive intervention by a specific team to patients readmitted for AHF. The authors showed that such intervention reduced the rate of return to the ED within 30 days, from 23% to 17% ($p < 0.05$). Future prospective studies,[24] currently underway at six academic medical centres located throughout the state of California, USA, also aim to evaluate a more active monitoring of returns to the ED for AHF.

CONCLUSION

The aim of our study was to better understand the patients who return to the ED after an initial consultation for AHF. Many heart failure patients (i.e., one in five) are released from the ED and then suffer return to the ED. We show that it is the patients with multiple medical history, and those with a systolic blood pressure of < 140 mm Hg or heart rate > 80 bpm who are associated with returns to the ED. Their identification and monitoring could lead to interventions to reduce this important outcome.

Acknowledgements: The authors are very grateful to the many physicians, nurses, respiratory therapists, and research assistants at the study hospitals for their helpful assistance with patient identification and data collection. Authors confirm that they have read and approved the paper. They also confirm that they have met the criteria for authorship as established by the International Committee of Medical Journal Editors, believe that the paper represents honest work, and are able to verify the validity of the results reported. PGC and IGS conceived the study and wrote the manuscript. IGS was the director of this research project and participated in the writing of the manuscript. PGC was responsible for the statistical analysis. PGC, LAC, IGS, JWY, JJP, and BHR was involved in drafting the manuscript and/or revising it critically for important intellectual content. All authors have given their final approval of the version to be published and agree to be accountable for all aspects of the work and ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Financial support: Canadian Institutes of Health Research (Ottawa, ON) supported this research.

Competing interests: None declared.

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