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Disposition of emergency department patients diagnosed with acute heart failure: an international emergency medicine perspective

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Many patients with acute heart failure are initially managed in emergency departments (EDs) worldwide. Although some require hospitalization for further management, it is likely that a sizeable proportion could be safely discharged either directly from the ED or after a more extended period of management in an observation-type unit. Identification of low-risk patients who are safe for such an approach to management continues to be a global unmet need. This is driven in part by a lack of clarity on postdischarge outcomes for lower risk patients and a nonexistent consensus on what may be acceptable event rates. The current paper reviews previous studies carried out on patients directly discharged from the ED, suggests a general disposition algorithm and focuses on discharge metrics, which are based on both evidence and expert opinion. In addition, we propose that the following variables be considered for future determination of acceptable event rates: (a) baseline characteristics and risk status of the patient; (b) access to follow-up; (c) ED capability to provide an extended period of observation before discharge; (d) the temporal relationship between the event and ED discharge decision; and (e) the type of event experienced. ***European Journal of Emergency Medicine*** **24:2–12 Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.**

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Introduction

Shortness of breath is a frequent complaint in patients presenting to emergency departments (EDs). As only a small proportion of patients have acute heart failure (AHF), differentiating shortness of breath into an actionable diagnosis is a critical skill. Clinical history and physical examination, along with ancillary testing, such as chest radiography, ECG, natriuretic peptides (NPs) and bedside echocardiography, are the key elements to diagnose AHF [1]. However, even with this information, characterization of AHF patients is challenging as they have multiple different aetiologies, cardiac structural abnormalities, comorbid conditions, differences in compliance, precipitating factors of decompensation and presenting characteristics. To facilitate management, classification schemes have been developed that subgroup patients by common presenting phenotypes [2] and corresponding treatment recommendations have been provided by American and European societies [2–4].

One of the most important decisions made in the ED after the initial AHF diagnosis and management is disposition: can the patient be safely discharged or should he/she be admitted for further evaluation and management? This decision is complex and challenging as a wide spectrum of clinical presentations ranging from minor forms of decompensation to life-threatening illness can be observed in AHF. This is often complicated by the presence of multiple comorbid conditions, psychosocial,

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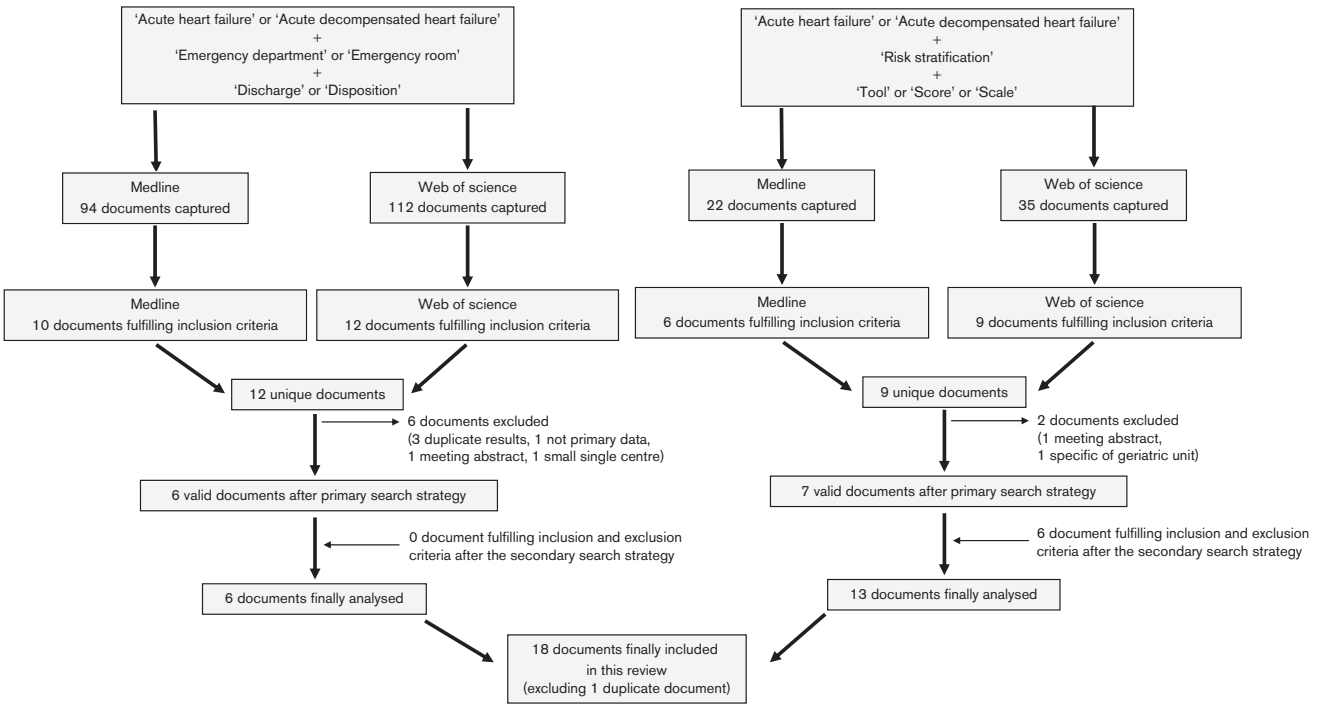
socioeconomic, self-care and health literacy issues [5]. Furthermore, for many patients, response to AHF treatment is not immediate, and they often require an observation period to determine adequacy of response, ranging from a few hours to more prolonged surveillance ($\leq$48 h). However, not all EDs worldwide can provide this observation time frame, and this may strongly influence disposition decisions. Without the option of a prolonged period of ED observation, patients may end up being admitted to the hospital.

Despite this, little data exist on which subset of AHF patients could be directly discharged from ED without hospitalization. Further, once discharged, data are also lacking on what outcomes they experience and how frequently they occur. The aim of this study was two-fold. First, we sought to perform a focused review of previous studies of risk stratification in patients with AHF discharged from the ED. Second, we aimed to utilize the retrieved data and develop consensus recommendations, along with a testable algorithm with defined event rate goals, for selecting patients with AHF safe for direct ED discharge.

Literature search strategy

A review of the literature was performed using Medline and the Web of Science database. As a primary search strategy, we used the following combination of words as descriptors: 'acute heart failure' or 'acute-decompensated heart failure', plus 'emergency department' or 'emergency room', plus 'discharge' or 'disposition'. The inclusion criteria for the papers selected required data on at least one of our four review objectives: (a) ED discharge rate for AHF patients; (b) outcomes for ED discharged patients; (c) a comparison between discharged and admitted patients; and (d) tools for risk stratification of AHF. For the latter one, we used an additional word combination in the primary search strategy consisting of 'AHF' or 'acute-decompensated heart failure', plus 'risk stratification', plus 'tool' or 'scale' or 'score'. Exclusion criteria were articles not written in English, Spanish, French or German; studies with highly selected samples including clinical trials (our focus was population-based studies); papers not including primary data; single-centre studies unless they included more than 300 patients; studies only including particular subsets of patients that did not originate in the ED (e.g. patients admitted at ICU or geriatric wards); and meeting abstracts. In addition, for the search strategy looking for risk stratification tools, we excluded papers that only determined independent risk factors but did not provide specific data on discriminative capacity, unless other independent studies had calculated it using the proposed scale. When we identified different studies from the same database, we only selected the most recent one unless the redundant papers included additional specific data on any of the four review objectives. Finally, with all

Fig. 1



Flow chart for literature review document retrieval.

articles retrieved, we used a secondary inclusion strategy by cross-checking references to identify any study that our primary search strategy had failed to find. Our search was completed on 3 July 2015 and resulted in the final inclusion of 18 studies (Fig. 1) [6–23].

The evidence

Objective 1: proportion of AHF patients being directly discharged from ED

Six studies reported rates of direct ED discharge for patients with AHF (Table 1) [6–11], with all data coming from registries carried out in the USA, Spain or Canada. As a reflection of the heterogeneity of ED capabilities and resources, discharge rates ranged more than two-fold, from 16.3% in a USA study [6] to 36.2% in a Canadian study [8]. It is noteworthy that although all Canadian and American studies were based on administrative data, the Spanish study was collected prospectively utilizing an ED-based clinical diagnosis and rendered an intermediate discharge rate (23.9%) [10].

Objective 2: outcomes of patients directly discharged from ED

There is a paucity of outcome data in patients with AHF directly discharged from the ED. Further, there is a lack of homogeneity in the outcomes reported, both in terms of the type (mortality, ED revisit, hospitalization or combination) and the time period (7, 30, 90 and 365 days). Reliable data were available from four studies: three from Canada [7–9] and one from Spain [12] (Table 1). A consistently reported outcome across the studies was 30-day mortality after the ED index episode, which was found to be between 2.9 and 4.0% [7,8,12]; in addition, one study reported 7-day mortality (1.3%) [8] and another reported 1-year mortality (20%) [7].

Objective 3: comparison of outcomes between discharged and hospitalized AHF patients

Whether patients discharged from the ED experience an increased number of adverse events compared with those discharged from the hospital is not well known. The different risk profiles of discharged and admitted patients, along with the confounding introduced by hospitalization itself, make it difficult to directly compare these two groups. Indeed, we have found only two studies directly comparing these two cohorts [8,9]. Brar *et al.* [9] compared composite outcomes (death, hospitalization, ED visit) over a 30-day period and found higher rates for patients directly discharged from the ED (30.2, 35.3 and 44.9% for high-volume, medium-volume and low-volume EDs) compared with those discharged after hospital admission (23.5, 30.1 and 37.5%, respectively). Interestingly, these differences decreased when outcomes at 90 days were examined (48.9, 54.6 and 65.7% vs. 46.7, 54.1 and 63.8%, respectively). Conversely, Lee *et al.* [8] reported that short-term mortality was very similar when comparing those discharged from the ED versus those discharged after hospital admission (with comparable predicted risks of 7 and 30-day death) but divergent thereafter, with patients discharged from the ED doing worse. The relationship between late outcomes and ED management decisions is speculative as many other confounders are introduced, but failure to initiate guideline-directed medical therapy and lack of timely, outpatient follow-up postdischarge are two variables that appear to be particularly important. Ideally, outcomes should be better for patients discharged from the ED as emergency physicians (EPs) are more likely to reserve this approach for those patients at lowest risk. The paradoxical finding of higher readmission and mortality risk among discharged ED patients highlights the need for robust risk-stratification instruments and structured discharge planning.

Objective 4: current tools for AHF risk stratification

A severity score for patients in the ED may readily identify low-risk patients and improve disposition decision-making. Unfortunately, few objective data exist for the development of such a score and identification of low-risk patients in the clinical arena remains difficult. In other disease processes, such as community-acquired pneumonia or acute coronary syndromes, important advances have been made and such risk scores (pneumonia severity index [24] and thrombolysis in myocardial infarction risk score [25], respectively) have been applied to the ED setting. Criteria identifying AHF patients who are at an increased risk of adverse events and may benefit from admission are better delineated than those variables characterizing patients as safe for ED discharge. In addition, most previous attempts for AHF scores have been derived and validated in cohorts of hospitalized patients, ignoring the fact that a part of AHF, probably those at lowest risk, are being directly discharged from ED.

We have found only two risk scores designed specifically for use in ED patients with AHF, both being developed in Canada (Table 2). The Ottawa Heart Failure Risk Scale (OHFRS) [13], developed from clinical data and based on 10 clinical variables, yielded a *c*-statistic of 0.77 in the derivation study. When the scale was limited to nine variables (by excluding the results of NPs), the *c*-statistic remained quite similar (0.75). The Emergency Heart Failure Mortality Risk Grade (EHMRG) [14] is a risk score also based entirely on data from a cohort of ED patients diagnosed with AHF in Ontario. The authors used administrative data, did not prospectively enroll patients and excluded patients on palliative treatment, but they did include both admitted and discharged (28.9% of the total cohort) ED patients. On the basis of 10 items easily obtained during the ED evaluation, EHMRG showed good predictive capability (*c*-statistic = 0.80). Interestingly, NPs were not included in the score, which may make EHMRG applicable even for

Table 1 Acute heart failure patients attended at the emergency department: rates of direct discharge and outcomes for patients directly discharged

References	Country	Origin of data	ED (*n*)	Patients (n)	Period of inclusion	ED discharge rate (%)	7-day mortality (%)	7-day combined endpoint[a] (%)	30-day mortality (%)	30-day ED revisit (%)	30-day hospital admission (%)	30-day combined endpoint[a] (%)	90-day combined endpoint[a] (%)	1-year mortality (%)	1-year ED revisit (%)	1-year hospital admission (%)
Storrow *et al.* [6]	USA	Administrative	> 950	4 790 837	2006–2010	16.3	–	–	–	–	–	–	–	–	–	–
Ezekowitz *et al.* [7]	Canada	Administrative	1	10 415[b]	1998–2001	35.0	–	–	3.3	44	19	–	–	20	82	34
Lee *et al.* [8]	Canada	Administrative	86	50 816	2004–2007	31.7	1.3	–	4.0	–	–	–	–	–	–	–
Brar *et al.* [9]	Canada	Administrative	93	44 925	1999–2009	36.2	–	16.9	–	–	–	37.2	56.9		–	–
Llorens *et al.* [10]	Spain	Clinical	29	5845	2007–2011	23.9	–	–	–	–	–	–	–	–	–	–
Blecker *et al.* [11]	USA	Administrative	NR	2158	2002–2010	23.4[c]	–	–	–	–	–	–	–	–	–	–
Miró *et al.* [12]	Spain	Clinical	20	1669	2007–2009	32.7[d]	–	–	2.9	23.8	–	–	–	–	–	–

ED, emergency department; NR, not reported.
[a]Combined endpoint consisted of death, ED revisit or hospital admission.
[b]65 years of age or older.
[c]Includes 3.1% of patients admitted to observation units.
[d]This figure corresponds to a subset of patients from the Llorens *et al.* [10] series.

those EDs with laboratory limitations. However, it would be important to determine whether there is incremental prognostic value of including biomarkers (especially NPs) and patient baseline functional status as other previous studies suggest [16,26,27].

Eight other studies were found that sought to develop risk scores with a goal of identifying low-risk patients. However, all of them were derived using exclusively hospitalized patients with AHF (Table 2) [15–22]. By not including the 16.3–36.2% of patients being directly discharged from the ED without hospitalization, these scores are missing a significant proportion of low-risk patients who are of particular interest to the EPs, which are especially relevant in the derivation of a risk score aimed to help them select patients for direct discharge. Further, some of these risk scores contain data not available during the initial period of ED evaluation [17], decreasing their applicability for ED decision-making. Despite these limitations, these tools serve as a good starting point because they are outcome based and do identify variables associated with lower risk. Once refined to include data collected in the first 3–6 h of an ED stay as well as patients discharged from the ED, they could have significant utility for EPs.

External validation is an important step before clinical implementation of any risk score. Only three studies have externally tested their risk scores [16,21,23] and each yielded slightly different results compared with the original studies. The acute decompensated heart failure national registry risk tree (from the ADHERE Registry) was validated independently by two different studies [21,23] and has been quite consistent with the original results: the reported *c*-statistic for in-hospital all-cause mortality is between 0.68 and 0.70 (originally 0.69/0.67) and the proportion of patients allocated to the low-risk group is between 55 and 73% (originally 63%/65%), with an in-hospital all-cause mortality for this subgroup of patients ranging from 2.5 to 5% (originally 2.1%/2.3%). One of these two studies also validated the acute decompensated heart failure national registry logistic regression model (also from the ADHERE Registry), obtaining figures very close to those reported originally [23]. External testing of the enhanced feedback for effective cardiac treatment (EFFECT) score by two independent studies [16,23] suggested a slight worsening of test characteristics. The *c*-statistic for 30-day all-cause death was between 0.69 and 0.73 (instead of 0.80/0.79), whereas the 30-day all-cause mortality rates for very low and low-risk patients was 1.7 and 4.1% (instead of 0.4%/0.6% and 3.4%/4.2%, respectively). Finally, with respect to the Brigham and Women's Hospital (BWH) rule, although the authors who originally reported the scale did not include a *c*-statistic, an external study obtained values of 0.61 for inpatient death and 0.59 for 30-day all-cause mortality; 41.7% (instead of 37.9%) of the patients were allocated to the lowest risk group, with a

Table 2 Primary studies derivating tools, scales and scores to stratify risk in patients with acute heart failure

References	Name of the scale	Derived using ED patients	Tested in the ED setting	Variables in the scale	Measured outcome (*c*-statistic in derivation/validation cohorts)	Patients in the lowest-risk groups (derivation and validation cohorts)	Outcome rates for lowest-risk groups (derivation and validation cohorts)
Stiell *et al.* [13]	OHFRS (Otawa Heart Failure Risk Scale)	Yes	Yes	10 (previous stroke or transient ischaemic attack, and intubation for respiratory distress; HR, oxygen saturation at ED arrival; HR during 3 min walk test; and acute ischaemic changes in ECG, BUN, serum CO_2, elevated troponin and NT-proBNP in ED investigations)	Serious adverse event (30-day all-cause mortality, or 14-day admission to critical care unit, or endotracheal intubation, or noninvasive ventilation, or myocardial infarction) (0.77/NR)	NR	Two lowest score groups (0 or 1 point): 2.8%/5.1%
Lee *et al.* [14]	EHMRG (emergency emergency heart failure mortality risk grade)	Yes	Yes	10 (age, transported by EMS, SBP, HR, oxygen saturation, creatinine, potassium, troponin, active cancer, metolazone at home)	7-day all-cause mortality (0.80/0.80)	NR	Two lowest quintiles: 0.3%/0.4%
Lee *et al.* [15]	EFFECT (enhanced feedback for effective cardiac treatment)	Not	Not	11 (age, RR, SBP, BUN, sodium, cerebrovascular disease, dementia, COPD, hepatic cirrhosis, haemoglobin)	30-day all-cause mortality (0.80/0.79) 1-year all-cause mortality (0.77/0.76)	NR	Very low-risk category: 30-day: 0.4%/0.6% 1-year: 7.8%/2.7% low-risk category: 30 day: 3.4%/4.2% 1-year: 12.9%/14.4%
Martín-Sánchez *et al.* [16]	BI-EFFECT (Barthel index and enhanced feedback for effective cardiac treatment)	Not	Yes	12 (all the eleven EFFECT variables plus the Barthel index)	30-day all-cause mortality (0.75/ND)	NR	NR
Salah *et al.* [17]	ÉLAN-HF Score (European Collaboration on Acute Decompensated Heart Failure)	Not	Not	8 (NT-proBNP reduction; NT-proBNP discharge value; age, peripheral oedema, SBP, and hyponatraemia at admission; BUN and NYHA class at discharge)	180-day all-cause mortality (0.78/NR)	Low risk: 28.7%/ 23.1%	Low risk: 3.6%/7.0%
Chin *et al.* [18]	BWH rule (Brigham and Women's Hospital rule)	Not	Not	4 (SBP, RR, sodium, and ST-T wave changes on initial ECG neither known to be old nor attributable to digoxin)	In-hospital death or major complications (NR/NR)	Patients without risk factors (0 points): 37.9%/ND	Patients without risk factors (0 points): 6%/NR
Fonarow *et al.* [19]	ADHERE risk tree (acute decompensated heart failure national registry risk tree)	Not	Not	3 (BUN, SBP, and creatinine)	In-hospital all-cause mortality (0.69/0.67)	Low risk: 63.0%/ 64.6%	Low risk: 2.1%/2.3%
Fonarow *et al.* [19]	ADHERE risk LR (acute decompensated heart failure national registry logistic regression)	Not	Not	4 (BUN, SBP, HR and age)	In-hospital all-cause mortality (0.76/0.76)	Low risk: NR	Low risk: NR
Auble *et al.* [20]	AHFI (acute heart failure index)	Not	Not	21 (sex; previous myocardial infarction, angina, percutaneous transluminal coronary angioplasty, diabetes or lung disease; cardiac rate; RR; SBP; temperature; sodium, potassium; BUN; creatinine; glucose; WBC count; arterial pH; acute myocardial infarction and myocardial ischaemia in ECG; and pulmonary congestion and pleural effusion on chest radiography)	In-hospital death, life-threatening clinical condition or life-saving treatment (NR/NR) 30-day all-cause mortality (NR/NR) 30-day rehospitalization for AHF (NR/NR)	Low-risk: 17.2%/ND	Low-risk: In-hospital: 1.4%/NR 30-day mortality: 2.0%/NR 30-day rehospitalization: 5.0%/NR
Rohde *et al.* [21]	HFRS (heart failure revised score)	Not	Not	6 (age, SBP, BUN nitrogen, creatinine, sodium, cancer)	In-hospital all-cause mortality (0.76/ND)	Low risk: 55%/ND	Low risk: 5%/ND
Peterson *et al.* [22]	GWTG-HF (get with the guidelines–heart failure)	Not	Not	7 (age, race, COPD, and admission SBP, BUN, sodium, and HR)	In-hospital all-cause mortality (0.75/0.75)	ND	Three lowest-risk deciles: 0.7%/ND

AHF, acute heart failure; BUN, blood urea nitrogen; COPD, chronic obstructive pulmonary disease; EMS, emergency medical services; HR, heart rate; ND, not done; NR, not reported; NT-proBNP, N-terminal of the prohormone brain natriuretic peptide; RR, respiratory rate; SBP, systolic blood pressure; WBC, white blood count.

7.2% (instead of 6.0%) risk of in-hospital mortality or adverse events [23].

Present and future implications

After reviewing the aforementioned data, our next goal was to identify current unmet needs, develop a consensus-based algorithm for patient disposition and propose testable hypotheses to inform subsequent research studies. After arriving at a consensus on the unmet needs, two authors (O.M., S.C.) formulated conceptual proposals that were submitted to a two-round validation by the rest of the authors. In the first round, modifications were added to the initial proposal and served to build up the second and final version. Consensus was not agreed upon until all of the authors supported the proposal.

Definition of low risk and the need for risk-stratification tools

As the majority of ED patients with AHF are admitted to the hospital, the authors believed that the greatest unmet need is safely transitioning patients into the outpatient setting and avoiding unnecessary hospitalization. EPs are often reluctant to discharge patients with AHF because of concerns of clinical stability, the lack of robust risk-stratification guidelines identifying patients safe for ED discharge [2–4] and the unpredictable nature of outpatient self-care management, which is strongly associated with hospital readmission [26]. Accordingly, we all agreed that the most urgent task force to be carried out in the near future is to develop and validate risk-stratification tools to indicate to EP which patients are at low risk. Although some efforts have been made, no prospectively derived scale has been tested externally to be recommended worldwide. However, those developed in the ED, such as OHFRS [12] and EHMRG [13] scales, are promising and may be the best candidates to be externally tested.

A proposal of algorithm

Although EPs lack a reliable easily implementable risk-stratification tool, it is necessary to provide some guidance for their decision-making. On the basis of the studies aimed at identifying low-risk patients [13–23], other expert opinion documents published in this field [19,28–35], and with our broad, international experience, we propose a consensus algorithm that can help EPs to appropriately identify, among patients with AHF, those who are potentially safe for ED discharge (Fig. 2). Similar to others [33, 34], our algorithm focuses on the identification of higher risk features early during the course of management and incorporates multiple points of re-evaluation.

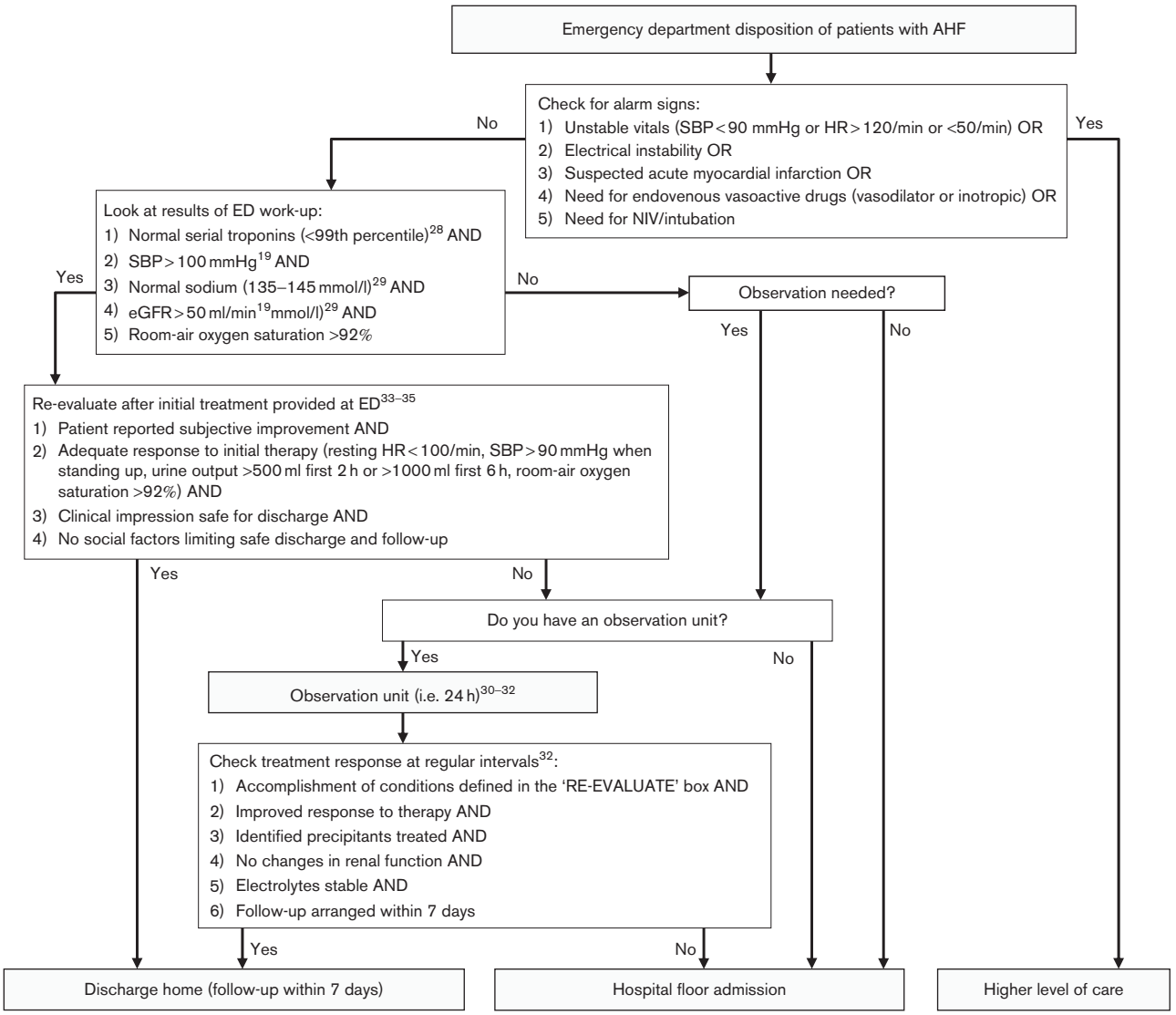
It is important to note that, although we have attempted to include in the algorithm only clinical or analytical data that would be widely available in most if not all EDs, no approach can be universally applicable and individual adaptation for each specific ED's, hospital's or system's resource availability is needed. In addition, we anticipate that this algorithm will evolve over time as clinical practice changes and research findings emerge in the future. This may be particularly true for high-sensitivity cardiac-specific troponin tests, which may or may not have the prognostic implications observed with conventional assay values that exceed reference limits [28,36]. Although NPs have proven useful for long-term risk stratification, the utility of a single measurement performed at ED to identify low-risk patients for ED discharge has not yet been shown. The largest ED-based study evaluating the ability of B-type NP (BNP) to augment clinical decision-making found that it had no impact on length of stay, 30-day readmission or all-cause mortality [37], and a similar study suggests neither the measurement of BNP (in those ED having this possibility) nor the fact that BNP measurement was available in the ED was associated with better clinical outcomes [38]. Further, as NP testing is not universally available in all EDs and may not be routinely obtained by clinicians in those with a high pretest probability, we believed that its inclusion would limit real-world clinical applicability of our proposed algorithm.

Despite the algorithm's simplicity and, in some aspects, lack of specificity, we believe that it could be implemented easily in most EDs. As a part of this current proposal, it will be important to validate it in the future. In the meantime, as for any proposal on the basis of experts' opinion and not randomized studies, caution with the use of the algorithm should be exercised until objective data become available in the near future from centres applying it.

The potential positive effects of benchmarking in AHF

Benchmarking has been shown to incentivize the use of best practices and helps to improve outcomes in healthcare systems [39]. Usually, the establishment (and further monitoring) of thresholds is one of the first steps when a policy of quality improvement is launched. We believe that this approach can also be applied for ED patients with AHF. However, we suggest that thresholds for event rates in AHF may need to be tailored on the basis of whether the hospital has the ability to provide a prolonged period of observation, whether in a dedicated unit or otherwise. We acknowledge that event rates are affected not only by ED decisions and resources but also by the organization of the hospital and its relationship with the ED. Further regional particularities and the healthcare system itself may have a significant impact on initial hospitalization rates, length of stay and subsequent return visits. However, to allow for broader implementation, we propose a more generalized structure as a starting point for discussion. Moreover, although we will differentiate benchmarks by the type of ED (with or without the capability of providing observation) in the next subheadings, we remain cognizant that this differentiation may need refinement as new data on local event

Fig. 2



Algorithm for identifying patients with acute heart failure eligible for direct discharge from the emergency department. AHF, acute heart failure; ED, emergency department; eGFR, estimated glomerular filtration rate; HR: heart rate; NIV, noninvasive ventilation; SBP, systolic blood pressure.

rates develop. After all, and following the benchmarking philosophy, the main objective of these thresholds is to challenge EDs to promote changes in AHF patient management to achieve these standards and, in turn, better outcomes.

Acceptable event rates for patients discharged from the ED without observation units

Defining 'low risk' mandates the establishment of benchmarks for adverse event rates in patients with AHF discharged from the ED. Although this is a difficult task, given the paucity of available data, creation of worldwide quality metrics presents even more challenges. Patients with AHF discharged after hospitalization have 30-day and 1-year all-cause mortality rates close to 10 and 30%, respectively, although this undoubtedly varies by health system and geographical region [27,40,41]. In this cohort, return visits to the ED for an AHF episode are also high, consistently ranging between 20 and 35% at 30 days [9,10,42,43], more than three-quarters of which lead to a new hospitalization. In fact, in the USA, heart failure accounted for the second highest overall hospital-based acute care utilization rates during the 30 days after hospital discharge (37.3%), only surpassed by psychoses [41].

As mentioned previously, patients directly discharged from the ED should be those at lowest risk and, accordingly, they have to achieve better outcomes than those discharged after hospitalization. In addition, it is also foreseeable that outcomes (mortality and return

Table 3 Proposed discharge rates and event rates in ED patients with AHF

	ED able to provide an observation frame time (%)	ED unable to provide an observation frame time (%)
Discharge rate	> 40	> 20
30-day mortality	< 2	< 1
7-day ED revisit	< 10	< 5
30-day ED revisit or hospital admission	< 20	<15

AHF, acute heart failure; ED, emergency department.

visits) vary according to the ability to observe a patient in the ED for prolonged periods [30,31]. Thus, EDs that cannot observe patients may discharge very few patients and only those who are at lowest risk, which could lead to better outcomes compared with EDs that can observe patients for prolonged periods before discharge.

Taking all these facts into consideration, we suggest that adverse event rates should be considered in two categories: (a) repeat ED and hospital visits and (b) mortality. With respect to the time frame where these adverse events have to be monitored closely, we believe that 30-day rates are very appropriate because they are used widely and are also the benchmarks established by payers in the USA [44]. However, from the perspective of the ED and EPs, a period shorter than 30 days may represent a good, complementary primary target for discharged patients as ED decisions are more likely to be causally related to a shorter time frame, especially for early ED revisits. On the basis of our experience, 7 days seems most reasonable as an attributable time period and has precedence, having been used in previous studies evaluating outcomes of ED patients with AHF [8,9]. Moreover, in the only study attempting to determine the temporal relationship of ED management decisions with ED revisits, such a time frame was suggested as a good marker of the impact of ED decision-making on outcome [45]. It seems highly plausible that events occurring after 7 days may be more reflective of postdischarge management decisions, where ideally, other providers will have participated in on going aspects of patient care. As with our discussion of low risk, clarity on this subject would require further input from a multidisciplinary group of providers.

For EDs that cannot provide an observation period, we agreed that the benchmarks for adverse events in patients discharged directly from the ED should be lower than those currently observed and, ideally, lower than those observed in patients discharged after an inpatient stay. This suggests that the 30-day all-cause mortality should be less than the reported 3.0% [7,8,12], the 30-day ED revisit rate should be less than 24% [7,12] and 30-day hospitalization should be less than 19% [7]. In accordance with these figures, our proposal of benchmarks is as follows (Table 3): less than 1% for 30-day mortality, and less than 5% and less than 15% for 7 and 30-day ED-revisit/hospitalization, respectively. With respect to the proportion of patients with AHF who could be directly discharged from EDs without observation units or capabilities, a goal of at least 20% seems reasonable as this figure is only slightly over half the lowest discharge rate reported currently in EDs [6–11].

Acceptable event rates in patients discharged from EDs after a period of observation

EDs that can provide a period of observation have become increasingly more commonplace worldwide [46–48]. A contributing factor towards such uptake is a growing trend in healthcare over the past decade that seeks to avoid unnecessary hospital admissions by putting in place structures, resources and pathways to support alternative approaches to the management of patients who otherwise would have had to be admitted to the hospital. Previous studies have shown that, when adequately organized, observation services provide the same level of quality care for lower risk patients as hospitalization, while reducing costs [35,49]. For these EDs with observation capabilities, we propose a discharge rate of at least 40% within 24 h as the target for management protocols of patients diagnosed with AHF in the ED [30,50], which is slightly over the highest discharge rate reported currently in some EDs [6–11]. This figure is also based on the previous published observation unit data where, on the basis of variable inclusion criteria and treatment algorithms, discharge rates of up to 75% were found [30,31]. Further, for such facilities, we propose event rates that are higher than those for ED without observation units, but still lower than those observed for admitted patients (Table 3). Although our proposed thresholds for events are lower than those reported in the literature [7–9,12] and based on our best estimates, we acknowledge that they are also somewhat arbitrary, highlighting the need for prospective studies to fill in this critical unmet data need [51,52].

Other considerations

To facilitate the achievement of projected adverse events rates, barriers to successful outpatient management should be considered (Table 4) with provision of appropriate resources needed to overcome them. When EPs perceive self-care barriers that cannot be overcome

Table 4 Key aspects of self-care that emergency physicians should emphasize and ensure their ability to be carried out before discharging acute heart failure patients from the emergency department

Recognize the warning symptoms of congestion and/or hypoperfusion
Periodic fasting weight control
Adherence with cardiovascular drug therapy and refrain from taking drugs without first consulting a physician (avoid NSAIDs)
Avoidance of toxic substances (and avoidance of tobacco, alcohol and caffeine)
Dietary habits (low in saturated fats and rapid absorption sugar, no salt restriction and fluid intake limited to 1.5 l per day)

during an ED stay, patients are often admitted to the hospital. A focused ED intervention to overcome these barriers may be necessary to reassure EPs that ED discharge is indeed safe. Periods of prolonged observation may be ideal to enable identification of these barriers and develop personalized strategies to overcome them [48, 49]. Heart failure management programmes with nurse-driven predischarge interventions may be particularly useful to support such an approach, whether or not observation capabilities exist at a given hospital [53].

Finally, the authors emphasize the importance of close follow-up during the week after ED discharge, as we believe that this is crucial to achieve the proposed benchmarks. In this sense, multiprofessional healthcare usually yields the best results for AHF patients; accordingly, heart failure clinics and teams, where available, should be integrated into the disposition pathway and a follow-up appointment should be arranged before the patient leaves the hospital. In the absence of these resources, such follow-up could be provided by general practitioners, ideally within 1 week after discharge [33]. Nonetheless, other possibilities or tracks for effective patient follow-up are possible in particular environments, always with the main objective in mind to provide patient reassessment as close as possible to their ED or hospital discharge date [53].

Summary

Worldwide, the ED is the primary point of contact for most patients with AHF. Yet, during the most acute phase of hospital management, practice varies widely. Much of this is because of variance in patients and practice patterns, along with geographic differences in ED and hospital staffing, training and management capabilities. Achieving equipoise in patient care would require practice standardization but, given such heterogeneity, development of universal recommendations, particularly as they relate to disposition, is challenging. Identification of low-risk patients with AHF who are safe for early discharge continues to be a related and important unmet global need that is driven largely by a lack of prospectively developed risk stratification tools. In this review, we propose an algorithmic approach to patient disposition that is based on existing, albeit limited, evidence and expert consensus. We remain cognizant of the need to carry out further prospective studies and, to help drive this, we also propose a set of postdischarge outcomes that can reasonably be attributed to ED care and provide estimates of potentially acceptable event rates. It is our hope that this review will lead to further study of AHF disposition from the ED and promote change in the long-standing approach to AHF patient care.

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Conflicts of interest

There are no conflicts of interest.

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