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Guidelines

2023 SFMU/GICC-SFC/SFGG expert recommendations for the emergency management of older patients with acute heart failure. Part 1: Prehospital management and diagnosis

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1. Abbreviations

ACS acute coronary syndromes
AHF acute heart failure
BNP B-type natriuretic peptide
ED emergency department
ECG electrocardiogram
ESC European Society of Cardiology
GICC-SFC Groupe insuffisance cardiaque et cardiomyopathies de la Société française de cardiologie
GRADE Grading of Recommendations Assessment, Development and Evaluation
HF heart failure
HFpEF heart failure with preserved ejection fraction
HFrEF heart failure with reduced ejection fraction
LVEF left ventricular ejection fraction
NEWS National Early Warning Score
NOVICA-3 De novo Insuficiencia Cardiaca Aguda 3
NT-proBNP N-terminal pro-B-type natriuretic peptide
OPTIMIZE-HF Organized Program To Initiate Lifesaving Treatment In Hospitalized Patients With Heart Failure
PE pulmonary embolism
PICO population, intervention, comparison, outcomes
PPV positive predictive value
PROTECT study Placebo-Controlled Randomized Study of the Selective A1 Adenosine Receptor Antagonist Rolofylline for Patients Hospitalized With Acute Decompensated Heart Failure and Volume Overload to Assess Treatment Effect on Congestion and Renal Function
SFGG Société française de gériatrie et gérontologie
SFMU Société française de médecine d'urgence
TTE transthoracic echocardiography

2. Background

Acute heart failure (AHF) is a complex, multifactorial syndromic condition that, until now, did not have a consensual definition [1,2]. The difficulties in agreeing on a consensual definition of AHF also apply to research, since depending on the application of the field of investigation, the target populations concerned and the therapeutic goals or pathophysiological knowledge sought, the elements defining heart failure (HF) vary, especially among older patients. Thus, although the advent of echocardiography has made it possible to characterize disturbances in myocardial relaxation and altered ventricular filling, marking the birth of the concept of HF with preserved ejection fraction (HFpEF) versus HF with reduced ejection fraction (HFrEF), the different clinical presentations do not always make it possible to determine whether myocardial failure corresponds to a disease of ventricular filling of vascular origin [3].

AHF is most often characterized by dyspnoea, lower limb oedema and/or intense asthenia. It is a common presentation in emergency departments (EDs) and has become a major public health problem as its incidence and prevalence rise in line with an aging population in all developed countries. AHF represents a growing medico-economic burden and is associated with high morbidity and mortality [4]. Currently, AHF is the main reason for hospital admissions in patients aged > 65 years and acute cardiogenic pulmonary oedema accounts for approximately 1% of ED visits [3,4], involving approximately 200,000 patients per year in France (including 5% of the French population aged 75–85 years and 10% of those aged > 85 years) [5]. HF is a progressive pathology linked to aging, with mortality rising by 10% each year [6]. Indeed, the mortality rate remains appalling, reaching up to 12% during the hospital stay, 8–20% in the 2 months following hospitalization for an episode of AHF, and reaching 25–50% in the first 5 years after initial diagnosis. Moreover, mortality is increased in the presence of associated comorbidities such as anaemia, hypercholesterolemia or renal dysfunction, all of which become more frequent with age [3,4,6,7].

3. Methods

A group of 29 experts from the Société française de médecine d'urgence (SFMU; French Society of Emergency Medicine), the Groupe insuffisance cardiaque et cardiomyopathies de la Société française de cardiologie (GICC-SFC; Group of Heart Failure and Cardiomyopathy of the French Society of Cardiology) and the Société française de gériatrie et gérontologie (SFGG; French Society of Geriatrics and Gerontology) was convened. The main objective of the expert panel was to provide recommendations on the emergency management of AHF in older patients (aged > 75 years). The authors used the Grading of Recommendations Assessment, Development and Evaluation (GRADE) method to assess the level of evidence in the literature with grading from "No recommendation" to "Expert opinion" to "Moderate recommendation (G1)", and "Strong recommendation (G2)" and with level of evidence scaling from "Low (−)" to "High (+)" [8]. The potential drawbacks of making strong recommendations in the presence of only low-level evidence were highlighted and some recommendations with insufficient evidence were not graded. Five areas were discussed: prehospital management, diagnosis of AHF, therapeutics, pathway of care and ethics, of which the first two are included herein. For each area, the expert panel formulated questions according to the population, intervention, comparison, outcomes (PICO) model [9] and an extensive literature search was performed. The analysis of the literature and the formulation of recommendations were conducted according to the GRADE method [8].

4. Prehospital management of AHF in older patients

4.1. Question 1

In the prehospital emergency setting, is there any prognostic or diagnostic score that can help to manage older patients with AHF?

4.1.1. Rationale

Dyspnoea is a frequent reason for emergency calls, and AHF is one of the main causes requiring prehospital emergency care. Whatever the prehospital emergency care system, emergency

medical services with paramedics or on-board emergency physicians, numerous studies and guidelines have suggested that accurate, early diagnosis can improve patient prognosis [1,2,10]. Indeed, survival is increased in patients who receive early treatment (odds ratio [OR] 2.51, 95% confidence interval [CI] 1.37–4.55; $P < 0.01$) [11], but mortality is raised in patients with inappropriate treatment, and could double in older adults [12–14].

Aetiological scores are recommended by the European Society of Cardiology (ESC) [1,2]. The GASP4Ar score incorporates age and requires N-terminal prohormone-B-type natriuretic peptide (NT-proBNP) measurement, which limits its use in prehospital settings [15]. The National Early Warning Score (NEWS), a clinical score based on vital parameters only, has not been evaluated in diagnostic terms [16]. The Brest score, based on 11 simple and readily available variables, aims to determine the diagnostic probability of AHF causing dyspnoea, but has yet to be validated in an independent cohort, and has never been validated in the prehospital setting [17].

4.1.2. Experts' answer

There is insufficient evidence to recommend the use of diagnostic or prognostic scores in the prehospital setting for older patients with suspected AHF.

4.1.3. Experts' recommendation

None.

4.2. Question 2

Can telemedicine be used to reduce the need to transport older patients with AHF to hospital?

4.2.1. Rationale

Telemedicine encompasses several entities: teleconsultation, tele-expertise, remote medical monitoring and tele-counselling. The use of telemedicine platforms has risen considerably with the development of outpatient care for patients with HF. The literature on telemedicine in HF is very heterogeneous and focuses mainly on patients' cardiology follow-up who do not require emergency care. Compared with the usual care pathway involving several care providers (nurses, general practitioners, cardiologists, etc.), the telemedicine-based pathway of care includes the monitoring of acute decompensation and emergency care of patients with HF. According to a meta-analysis by Lin et al. [18], telemonitoring may be associated with a reduction in-hospital admission rates and mortality. In a meta-analysis by Zhu et al. [19], telemonitoring was associated with a reduction in the total number of all-cause hospitalizations (OR 0.82, 95% CI 0.73–0.91; $P = 0.0004$) and cardiac hospitalizations (OR 0.83, 95% CI 0.72–0.95; $P = 0.007$). Remote monitoring resulted in a statistically significant reduction in the risk of all-cause mortality (OR 0.75, 95% CI 0.62–0.90; $P = 0.003$) [19]. However, the odds of HF-related mortality did not differ significantly from that of conventional healthcare (OR 0.84, 95% CI 0.61–1.16, $P = 0.28$). Furthermore, although it seems that telemedicine can make a positive contribution to the early identification of acute decompensation in patients with HF in these meta-analysis [18,19], there are still few studies specific to the elderly. In 2020, a randomized controlled trial assesses the effect of a telemonitoring programme versus standard care in preventing all-cause death or unplanned hospitalization at 18 months and found no difference between the two groups (rate ratio 0.97, 95% CI 0.77–1.23; $P = 0.80$) [20].

4.2.2. Experts' answer

The experts suggest using a telemedicine device to detect and assess emergency situations in older patients with AHF.

4.2.3. Experts' opinion

Strong agreement.

5. Diagnosis of AHF in older patients

5.1. Question 1

In older patients with AHF, should we systematically look for triggering factors?

5.1.1. Rationale

Triggering factors for AHF are found in 45–75% of cases [21–25]. In a cohort of over 15,000 patients suffering from AHF, precipitating factors were identified in 8784 patients (55%) [21]. A single trigger was identified in 7764 patients (49%), while in 1020 patients (6%), a combination of two or more triggers was identified [21]. In the OPTIMIZE-HF (Organized Program To Initiate Lifesaving Treatment In Hospitalized Patients With Heart Failure) study, which included almost 50,000 patients, the three most frequently identified triggers were pulmonary infections (15%), myocardial ischaemia (15%) and arrhythmia (14%) [22]. The authors emphasized the need to determine a precipitating factor during hospitalization [22] as in the NOVICA-3 (De novo Insuficiencia Cardiaca Aguda 3) cohort study, Miró et al. [23] showed that detection of AHF triggers is feasible on admission to the ED.

Infections, particularly pulmonary infections, are the most frequent cause of AHF. Early and correct detection of infection in AHF is difficult, as the typical symptoms of dyspnoea and fatigue can be explained by both aetiologies. In AHF, biomarkers with an infectious spectrum (including C-reactive protein and procalcitonin) do not appear to improve diagnostic sensitivity [26,27].

Myocardial ischaemia can be a trigger for AHF, just as acute coronary syndromes (ACS) can be complicated by AHF, the combination of the two being associated with a poor prognosis [8]. The diagnosis of ACS as the cause of AHF is difficult to distinguish from myocardial damage resulting from AHF [28]. In the event of suspected ACS with a non-qualifying electrocardiogram (ECG), a troponin assay should be performed (see Question 5).

Atrial fibrillation and AHF can exacerbate each other. When atrial fibrillation is the cause of AHF, the outcome appears to be more favourable than in the presence of other contributing factors such as ACS or infection [2,21,29].

Pulmonary embolism (PE) can be a trigger for AHF but, to date, no study has reliably determined the prevalence of PE in patients with AHF. In 2005, Darze et al. [30] conducted a prospective study to assess the prevalence of PE using a systematic diagnostic approach. Of the 198 patients with HF recruited in this study, 18 (9%) were diagnosed with PE. Given the incidence of PE in patients with AHF, it is suggested that PE should be investigated according to clinical probability.

Anaemia is present in approximately 30% of patients with HF [31,32]. Although not strictly speaking a triggering factor, the presence of anaemia worsens the morbidity and mortality of patients with HF. The presence of anaemia should therefore be systematically sought in the ED [1,2,32]. Associated deficiencies should be investigated during hospitalization [1,2].

In the OPTIMIZE-HF study, worsening renal function was associated with higher mortality [22]. Based on daily creatinine measurements, the PROTECT study (Placebo-Controlled Randomized Study of the Selective A1 Adenosine Receptor Antagonist Rolofylline for Patients Hospitalized With Acute Decompensated Heart Failure and Volume Overload to Assess Treatment Effect

on Congestion and Renal Function) also found that a creatinine increase of 26.4 μmol/L (0.3 mg/dL) between two measurements was associated with a poorer prognosis [33]. This notion is even truer is patients aged ≥ 80 years, where a rise in creatinine is strongly associated with prognosis, even in the absence of residual congestive signs [34].

Older patients, particularly women, are more likely to present with HFpEF, with elevated vascular resistance and consequent acute cardiogenic pulmonary oedema in the context of severely elevated blood pressure [35]. Moreover, high blood pressure is associated with a greater probability of HFpEF [36]. Regular monitoring of blood pressure in the ED is therefore essential [10].

ESC recommendations suggest that thyroid function (i.e. thyroid-stimulating hormone level) should be assessed in all HF patients [1,2]. However, this test should not be performed in the ED. In fact, thyroid function testing is part of the initial systematic hospital work-up for HF [2,37].

Non-adherence to pharmacological treatment or a low-salt diet is reported to be a cause of hospitalization in 5–20% of cases [38–41]. A systematic search for such non-adherence enables educational information to be adapted during hospitalization.

5.1.2. Experts' answer 1

Triggering factors such as the presence of an infectious focus, hypertension, ACS, arrhythmia, anaemia, renal failure or non-adherence to treatment should probably be systematically investigated.

5.1.3. Grade

G2+.

5.1.4. Experts' answer 2

The experts suggest that PE should not be systematically investigated.

5.1.5. Experts' opinion

Strong agreement.

5.1.6. Experts' answer 3

The experts suggest that dysthyroidism should not be systematically sought in the ED. This search should be carried out as part of the HF patient's healthcare journey.

5.1.7. Experts' opinion

Strong agreement.

5.2. Question 2

In older patients with AHF, does repeating the ECG or cardiac monitoring improve the diagnosis of the triggering factor?

5.2.1. Rationale

ECG on admission is a key element in the management of older patients with AHF. It helps exclude the diagnosis of ST-segment elevation myocardial infarction or arrhythmias potentially responsible for this condition [28,42]. AHF is a risk factor for the development of atrial and ventricular arrhythmias, and some treatments have significant pro-arrhythmogenic properties. Furthermore, in the older patient population, there is an increased risk of abnormal ECG on admission regardless of its origin [43]. In 2007, a retrospective study that analysed 9315 ECGs from patients with AHF aged 71 ± 13 years found that < 2% had a normal ECG [43]. In a post-hoc analysis, Benza et al. [44] analysed the occurrence of arrhythmias in 949 patients (median age 65 years) hospitalized for AHF. Six percent of patients presented with a cardiac rhythm disorder, of which 49% were atrial fibrillation or atrial flutter, 32% sustained ventricular tachycardia and 19% ventricular fibrillation [44]. Unfortunately, there are no good-quality studies comparing the value of systematic ECG monitoring versus no monitoring after an initial non-pathological ECG in older patients. Recently, a prospective study by Sweda et al. [45] analysed the ECGs of 1915 patients presenting to the ED with a chief complaint of acute dyspnoea. They found that the median (interquartile range) angle between the QRS axis and the T-wave axis (QRS-T angle) was significantly higher in patients with AHF than in patients with acute dyspnoea of extra-cardiac origin (110° [46–156°] vs. 33° [15–57°]; $P < 0.001$) [45]. However, the area under the curve in the population of patients aged > 75 years was only 0.71 (95% CI 0.67–0.74) [45].

5.2.2. Experts' answer 1

The experts suggest systematically performing an ECG on admission to the ED and repeating it in the event of an intercurrent event.

5.2.3. Experts' opinion

Strong agreement.

5.2.4. Experts' answer 2

The experts suggest performing a second ECG if the patient is hospitalized, on admission into the medical ward and/or before the patient returns home from the ED.

5.2.5. Experts' opinion

Strong agreement.

5.2.6. Experts' answer 3

The experts suggest that older patients with established AHF should not be systematically monitored by electrocardioscope in the ED.

5.2.7. Experts' opinion

Strong agreement.

5.3. Question 3

In the dyspnoeic emergency patient, does natriuretic peptide (B-type natriuretic peptide [BNP] or NT-proBNP) measurement improve the diagnosis of AHF?

5.3.1. Rationale

The diagnosis of AHF in older patients is challenging, particularly due to their heterogeneous symptoms, comorbidities and polypathological nature. In this context, the use of biomarkers to confirm or refute the diagnosis is tempting. In a French study in 26 EDs, Chouihed et al. [6] found that biomarkers were used in > 90% of patients with suspected AHF. Threshold values for BNP (< 100 ng/L) and NT-proBNP (< 400 ng/L) in young and middle-aged patients are often used to exclude HF. However, in older patients, there are many confounding factors that raise the baseline level, including age, but also comorbidities (hypertension, cardiac pathologies, renal or chronic respiratory failure) and triggering factors such as ACS or atrial fibrillation [2,8,21,28,29,46]. While the ability to exclude a diagnosis of AHF for patients with BNP or NT-proBNP values below the defined thresholds seems to be preserved in studies [46–51], the probability that values in older patients are below these thresholds seems low [47]. More generally, the threshold values used in this population have not been established. As long ago as 2004, Maisel et al. [48] reported an age-related difference in BNP levels in a study of 1586 patients without being able to define a precise threshold beyond the age of 70 years. As there was a risk of not recognizing HF, the authors recommended that the threshold should not be modified. Zaphiriou et al. [49] studied

306 patients (mean age 74 years), 104 of whom were diagnosed with HF. They found negative predictive values between 0.87 and 0.97 for BNP and NT-proBNP at the defined thresholds, but positive predictive values (PPVs) of 0.44 and 0.59 respectively [49]. In 2005, Ray et al. [50] reported a moderate discriminatory capacity of BNP at the usual threshold of 100 ng/L for the diagnosis of HF in patients aged > 65 years (PPV = 0.65). At higher thresholds, sensitivity ranged from 0.63 to 0.81 [50]. A study by Plichart et al. [51] focused on patients aged > 80 years who were hospitalized for dyspnoea or desaturation. All patients underwent a BNP assay and a cardiologist who was blinded to the results established a diagnosis according to the recommendations of the ESC. In this study of 383 patients (including 238 with HF), the BNP assay was not discriminatory for the aetiological diagnosis [51]. Furthermore, due to the particularity of its pharmacological action, patients with HF who are taking an angiotensin-receptor neprilysin inhibitor will have an elevated BNP level irrespective of treatment efficacy, and any biological monitoring will need to be carried out using NT-proBNP [1,2].

5.3.2. Experts' answer

In the absence of a validated threshold in this population, BNP and NT-proBNP assays should probably not be used routinely to diagnose AHF in dyspnoeic older emergency patients.

5.3.3. Grade

G2−.

5.4. Question 4

In the dyspnoeic emergency patient, does natriuretic peptide (BNP or NT-proBNP) measurement improve the prognosis of AHF?

5.4.1. Rationale

Results on the use of natriuretic peptide level as a prognostic marker in the ED are not unequivocal. A study of 11,679 patients found a modest predictive effect (HR 1.07, 95% CI 1.05–1.08) of a 30% increase in natriuretic peptide level in older patients (≥ 65 years) who presented to the ED with AHF without atrial fibrillation [52]. The discrepancies surrounding the prognostic properties of this assay are possibly heightened by the variability in the choice of event measured (re-hospitalization, death, time to onset), the timing of the assay (in the ED or in the hospital ward) and – above all – the threshold used, which differs from one study to another and increases with age [53–56]. It should be noted that natriuretic peptide has been included in prognostic models in several studies, with interesting results [57,58]. In contrast to its measurement on admission, its prognostic value at discharge and during follow-up is well established [2].

5.4.2. Experts' answer

Natriuretic peptide measured in the ED should probably not be used as a prognostic factor in older patients consulting for AHF.

5.4.3. Grade

G2−.

5.5. Question 5

Do troponin assays (high-sensitivity cardiac troponin T and high-sensitivity cardiac troponin I) improve diagnosis in older patients with AHF?

5.5.1. Rationale

Numerous studies have shown that elevated troponin levels are associated with increased morbidity and mortality, whether from cardiovascular or other causes. A meta-analysis by Aimo et al. [59] that included 10 studies with a total of 9289 patients aged 66 ± 12 years with HF and elevated troponin levels found increases in all-cause mortality (hazard ratio [HR] 1.48, 95% CI 1.41–1.45), cardiovascular mortality (HR 1.40, 95% CI 1.33–1.48) and cardiovascular hospitalizations (HR 1.42, 95% CI 1.36–1.49) over a mean follow-up of 2.4 years. Troponin measurement in older patients presenting to the ED with AHF also has a goal in the aetiological diagnosis. Indeed, the clinical presentation of an ACS is more likely to be atypical in older patients, with dyspnoea as the main symptom [60]. In this context, the experts reiterate that troponin assays cannot be interpreted independently of ECG analysis, but many factors are likely to raise baseline troponin levels [2,59]. Thus, in a 2012 prospective cohort study, Santhanakrishnan et al. [61] showed, in a small cohort of 51 patients, that those with HFpEF or HFrEF had higher high-sensitivity troponin T levels than the general population (23.7 or 35.6 pg/mL vs. 3.7 pg/mL, respectively) [61]. Furthermore, in a 2013 cohort study of 1514 patients with AHF and renal failure, Pfortmueller et al. [62] found that 382 patients (25%) with moderate to severe renal failure had significantly higher high-sensitivity troponin T levels than patients without impaired renal function (0.028 vs. 0.009 mg/L, $P < 0.0001$). Regarding the confounding factors that may elevate troponin according to the 2020 ESC recommendations [2], age and renal function are considered the most important, with variations of up to 300%. More recently, in a post-hoc study involving a cohort of 46,435 patients who underwent troponin testing in the ED, Lowry et al. [63] found that the specificity and PPV of troponin testing fell sharply with age. Inpatients aged ≥ 75 years, specificity and PPV were 82.6% (95% CI 81.9–83.4%) and 51.6% (95% CI 49.8–53.2%), respectively, much lower than among those aged 50–74 years: 95.5% (95% CI 95.2–95.8%) and 70.1% (95% CI 68.5–71.8%), respectively [63]. These results suggest that two consecutive measurements should be performed to detect real myocardial damage, rather than age-related variability. Overall, troponin measurement in older patients with AHF in the ED appears to be recommended solely for the purpose of aetiological diagnosis, and always in correlation with clinical and ECG analysis [2]. If there is a strong suspicion of ischaemia, and specific management is possible or envisaged, this assay should be repeated once to take account of inter-individual variability and a baseline level that is probably different in this population.

5.5.2. Experts' answer

Older patients with AHF should probably have a troponin assay performed in the ED. This assay is intended for aetiological diagnosis but should always be correlated with clinical findings and ECG analysis and may be repeated only once.

5.5.3. Grade

G2+.

5.6. Question 6

In an older dyspnoeic patient presenting to the ED, does a point-of-care thoracic ultrasound improve the diagnosis of AHF?

5.6.1. Rationale

Numerous studies and three meta-analyses have demonstrated that the presence of a bilateral B-line profile on lung ultrasound, which is more or less associated with impaired left ventricular systolic function, performs very well in the diagnosis of AHF (sensitivity 73–94%, specificity 83–94%), particularly in the congestive state [64–68]. The role of point-of-care thoracic ultrasound could be even more important in an older population, in whom the clinical presentation is sometimes atypical and the biology (NT-proBNP) less specific [69].

The experts highlight three key points:

- the bilateral B-line profile makes the diagnosis of bilateral interstitial lung disease without determining the aetiology (particularly AHF versus bilateral pneumopathy). The clinician must therefore interpret it in the light of the complete clinical picture, and prospective studies are still needed to identify the exact diagnostic thresholds in this population;
- the finding of impaired systolic function on point-of-care thoracic ultrasound, in addition to the bilateral B-line profile, reinforces the probability of AHF. However, the finding of normal left ventricular systolic function does not invalidate this diagnosis, as a significant proportion of AHF patients, particularly older patients, have HFpEF;
- the only way to diagnose AHF without considering left ventricular ejection fraction (LVEF) is to approach left ventricular filling pressures by assessment of the E/e' ratio. Indeed, a simple protocol combining lung ultrasound with measurement of the E/e' ratio offers excellent performance [70]. However, it can only be used by clinicians who have been trained in this practice.

5.6.2. Experts' answer

Clinical point-of-care thoracic ultrasound (pulmonary and cardiac) is probably required to diagnose AHF in older patients with dyspnoea in the ED.

5.6.3. Grade

G2+.

5.7. Question 7

In an older patient presenting to the ED with AHF, does transthoracic echocardiography (TTE) by a cardiologist modify therapeutic management?

5.7.1. Rationale

AHF can occur in the setting of HFpEF or HFrEF. TTE is an important diagnostic tool in the management of patients with AHF. The ESC recommends this examination as Class I and level of evidence C [1,2]. It should be performed on all patients presenting with AHF, on admission and during hospitalization. TTE can be used to assess LVEF and right ventricular function, the size of the heart chambers, the presence of diastolic dysfunction and/or to detect the presence of underlying heart disease such as dilated cardiomyopathy or valvular damage [70–72]. The prognostic value of ultrasound parameters varies between studies, but LVEF, the severity of tricuspid leakage and right ventricular dysfunction are the most important prognostic elements for the occurrence of events at 1 month at the start of hospitalization [73–76]. No parameter other than LVEF appears to be predictive of in-hospital outcome [73]. Although TTE can be used to monitor response to treatment, no study has been carried out to determine the value and timing of repeated TTE, except in the event of a major change in the clinical picture. After in-hospital admission, full cardiac TTE should be performed during hospitalization, when the patient is able to maintain decubitus [71].

5.7.2. Experts' answer

The experts suggest performing a TTE during hospitalization as soon as the patient is able to maintain a decubitus position.

5.7.3. Experts' opinion

Strong agreement.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.acvd.2024.08.002.

Disclosure of interest

N.P. has received consulting fees from VYGON SA (CPAP-Boussignac), symposia lecture fees and congress invitations from Fisher & Paykel Healthcare SAS (Optiflow), and is involved in an independent clinical research programme for Roche Diagnostics (no fee or grant) and a fundamental research programme for Boehringer Ingelheim GMBH (no fee or grant).

C.D. has received congress invitations from Boehringer, consulting, lecture fee and research grant from Abott, consulting and lecture fees from Abiomed and Satelia, and consulting fees from AstraZeneca.

A.B. has received consultancy fees from Pfizer, Vifor Pharma, Boehringer and AstraZeneca and been involved in symposia for Novartis and Vifor Pharma.

M.P. has received lecture fees from Bristol Myers Squibb, consultancy fees from AstraZeneca and a congress invitation from Novartis.

N.G. has received honoraria from AstraZeneca, Bayer, Boehringer Ingelheim, Lilly, Novonordisk, Novartis, NP Medical, Roche diagnostics and Echosens.

F. Roca has been involved in oral communications for Pfizer, Bayer and Sanofi, consulting and congress invitation from Novartis.

P.J. has received honoraria from AstraZeneca, Bayer, Novonordisk, Novartis, NP medical, Boehringer Ingelheim amd Pfizer.

F.M. has received honoraria from Novartis, Pfizer, Vifor, Boehringer and Bristol Myers Squibb.

T.C. has been involved in consulting for Novartis.

All other authors declare that they have no competing interest.

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Guidelines

2023 SFMU/GICC-SFC/SFGG expert recommendations for the emergency management of older patients with acute heart failure. Part 2: Therapeutics, pathway of care and ethics☆

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1. Abbreviations

ACE	angiotensin-converting enzyme
AHF	acute heart failure
ARB	angiotensin II receptor blocker
ARNI	angiotensin receptor-neprilysin inhibitor
CI	confidence interval
ED	emergency department
ESC	European Society of Cardiology
GRADE	Grading of Recommendations Assessment, Development and Evaluation
HFrEF	heart failure with reduced ejection fraction
HR	hazard ratio
MRA	mineralocorticoid receptor antagonist
NIV	non-invasive ventilation
NSTACS	non-ST-segment elevation acute coronary syndrome
OR	odds ratio
RR	risk ratio
SBP	systolic blood pressure
SGLT2	sodium-glucose cotransporter-2
SpO_2	oxygen saturation

2. Background

Acute heart failure (AHF) is a complex, multifactorial, syndromic condition with various therapeutic options in the emergency setting and during the hospital stay [1,2]. Managing older patients with AHF involves several critical steps, including therapeutic interventions, pathway of care and ethical considerations [3]. Rapid diagnosis through symptoms such as dyspnoea, orthopnoea and oedema, initial assessment of symptoms and stabilization of major vital functions are the keys to therapeutic management [1–3]. Medical interventions include diuretics to relieve congestion and achieve optimal fluid status to manage fluid overload [4], vasodilators for patients with hypertension-induced AHF to reduce cardiac workload and non-invasive ventilation in patients with respiratory failure [5]. In addition, pharmacological treatments may include inotropic agents for patients with low cardiac output [1,2]. In older patients with AHF, the pathway of care often starts in the emergency department (ED) [6]. AHF management includes risk stratification to assess severity and co-morbidities, to determine the appropriate level of care, and early therapeutic intervention to initiate guideline-directed medical therapies before discharge from the ED [3,6]. After hospital admission, there is monitoring of vital signs, fluid balance and response to treatment. A multidisciplinary approach, involving cardiologists, geriatricians and other specialists, ensures close follow-up to prepare postdischarge care and prevent rehospitalization [6,7]. Managing older patients with AHF requires a comprehensive approach that integrates rapid therapeutic interventions, a structured pathway of care and ethical considerations to ensure the best possible outcomes. Furthermore, it requires balancing of aggressive treatment with the patient's quality of life, and consideration of palliative care options when appropriate [1,2,6,7]. Indeed, resource allocation involves making ethical decisions regarding the use of limited resources, especially in emergency settings. Physicians and caregivers involved in the pathway of care should educate patients and caregivers on medication adherence and lifestyle modifications [7]. Ethical considerations should ensure that patients understand their condition and treatment options by informed consent, to respect patient autonomy in decision-making.

3. Methods

A group of 29 experts from the *Société française de médecine d'urgence* (SFMU; French Society of Emergency Medicine), the *Groupe insuffisance cardiaque et cardiomyopathies de la Société française de cardiologie* (GICC-SFC; Group of Heart Failure and Cardiomyopathy of the French Society of Cardiology) and the *Société française de gériatrie et gérontologie* (SFGG; French Society of Geriatrics and Gerontology) was convened (Appendix 1). The main objective of the expert panel was to provide recommendations on the emergency management of AHF in older patients (aged > 75 years). The authors used the Grading of Recommendations Assessment, Development and Evaluation (GRADE) method to assess the level of evidence in the literature, with grading from "No recommendation" to "Expert opinion" to "Moderate recommendation (G1)" and "Strong recommendation (G2)", and with level of evidence scaling from "Low (–)" to "High (+)" [8]. The potential drawbacks of making strong recommendations in the presence of only low-level evidence were highlighted, and some recommendations with insufficient evidence were not graded. Five areas were discussed: prehospital management, diagnosis of AHF, therapeutics, pathway of care, and ethics, of which the last three are included herein. For each area, the expert panel formulated questions according to the population, intervention, comparison, outcomes (PICO) model, and an extensive literature search was performed [9]. The analysis of the literature and the formulation of recommendations were conducted according to the GRADE method [8].

4. Therapeutics in older patients with AHF

4.1. Question 1

In older patients with AHF, does a low-dose bolus of diuretic reduce the length of hospital stay or symptomatology on discharge from the ED?

4.1.1. Rationale

For 40 years, loop diuretics have been one of the key treatments for AHF. However, the effectiveness and benefit of diuretics are not clearly established in the older population, as no substantial study has been performed exclusively in this patient subgroup with AHF [1]. Nevertheless, the DOSE study compared high-dose diuretic therapy (2.5 times the daily dose) with low-dose therapy (daily dose equivalent) in hospitalized patients with AHF with a mean age of 66 years, and showed no difference between the two modalities in terms of the primary endpoint [10]. Recommendations published in 2019 by the Heart Failure Association of the European Society of Cardiology (ESC) propose a pragmatic approach, by giving an intravenous dose similar to the usual daily dose taken orally if the patients with AHF is already being treated with furosemide, or 20–40 mg intravenously if the patient is furosemide naïve. The diuretic dose is adjusted every 6 h according to diuresis, until decongestion is achieved. Diuresis > 100–150 mL/hour is considered satisfactory. For patients on long-term diuretic therapy, the initial dose is the equivalent of their daily dosage [11]. The maximum dose of furosemide not to be exceeded in 24 h is generally 400–600 mg, i.e. 100–150 mg every 6 h. However, in cases of renal insufficiency or diuretic resistance, up to 1000 mg may be administered intravenously over 24 h, and other diuretics (hydrochlorothiazide, spironolactone, acetazolamide, sodium-glucose cotransporter-2 [SGLT2] inhibitors or bumetanide) may be combined [1,12,13].

4.1.2. Experts' answer

Furosemide should be administered as an intravenous bolus in the event of congestion in older patients with AHF in the emergency setting, with the dosage adapted to the presence or absence of long-term diuretic treatment.

4.1.3. Grade

G1+.

4.2. Question 2

In older patients with AHF, does continuous intravenous infusion of diuretics during the first 48 h reduce the length of hospital stay or improve symptoms on discharge from the ED?

4.2.1. Rationale

There are no specific data about the effectiveness and benefit of diuretic administration in the first 48 h in the older population, as no specific evaluation has been done in this subgroup of patients with AHF. However, the DOSE study compared continuous infusion and repeated boluses of furosemide every 12 h in patients hospitalized for AHF (mean age 66 years). In this trial, continuous infusion offered no benefit compared with repeated boluses (area under the curve for global visual analogue scale [VAS] score 4236 ± 1440 vs 4373 ± 1404, respectively; $P = 0.47$) [10].

4.2.2. Experts' answer

It is probably advisable to use an intravenous bolus rather than continuous infusion of furosemide in the older patient with AHF, with repeated doses every 6 h.

4.2.3. Grade

G2+.

4.3. Question 3

Does bolus administration of nitrates in the ED improve morbidity in older patients with AHF?

4.3.1. Rationale

Studies are discordant on the usefulness of nitrates in the medium-to-long term, and there are very few studies in AHF comparing bolus administration of nitrates with continuous intravenous administration in the emergency setting [14–16]. Still, according to the ESC recommendations, the use of nitrates can be considered in patients with AHF with a systolic blood pressure (SBP) ≥ 110 mmHg (Grade IIb) [1,2]. Moreover, compared with the actual guidelines' recommendations, nitrates are underused in the ED in AHF (around 30%) [17,18]. However, in compliance with the ESC guidelines' recommended therapies, a French multicentre study by Freund et al., carried out in older patients with AHF in the ED found no significant difference compared with standard management in terms of overall mortality, cardiovascular mortality, readmission, median length of stay or renal dysfunction [19]. A 2013 Cochrane meta-analysis found no effect on speed of symptom improvement (mean fixed-effect difference at 1 hour–0.20, 95% confidence interval [CI]–0.65 to 0.25). However, the studies analysed included different populations, which may have included patients with ischaemic heart disease [20]. A multicentre registry of 8863 patients in cardiac intensive care by Shiraishi et al. found no significant difference in in-hospital mortality (7.5% with nitrates vs 8.8% without nitrates; $P = 0.098$), intensive care unit length of stay or length of hospital stay [21]. Nevertheless, more recently, a post-hoc analysis of a prospective multicentre registry showed that the use of nitrates with a target SBP reduction of < 25% was associated with a better diuretic response and lower mortality (adjusted hazard ratio [HR] 0.74, 95% CI 0.57–0.96) compared with the absence of vasodilators or the use of nitrates with a target SBP reduction > 25% [16]. Nitrates also appeared to be more effective in patients with elevated SBP (> 180 mmHg; odds ratio [OR] 0.25, 95% CI 0.10–0.75) and in patients without atrial fibrillation on the admission electrocardiogram (OR 0.70, 95% CI 0.60–0.90) [21].

The ESC guidelines propose continuing intravenous titration until clinical improvement and blood pressure control are achieved [1,2]. Indeed, regarding the method of administration, in small cohort studies, the use of a bolus appears safer than continuous infusion, with no significant difference in mortality, but a difference in the occurrence of myocardial infarction in the first 24 h after admission and in the use of mechanical ventilation [14,15]. A larger registry study comparing bolus, continuous infusion and a combination of the two found a reduction in length of hospital stay and intensive care unit admission in the bolus group [16]. These treatments administered in intravenous boluses are well tolerated, even at high doses [22]. In a retrospective study of 136 older patients in the emergency setting, there was no more hypotension in the group treated with bolus nitrates than in the group not treated with nitrates [23]. Nitrates are also well tolerated in patients with severe aortic stenosis [24].

4.3.2. Experts' answer

It is probably advisable to give preference to bolus administration of nitrates in older patients with AHF with SBP > 110 mmHg in the ED.

4.3.3. Grade

G2+.

4.4. Question 4

Does the use of opiates reduce morbidity and mortality in the older patient with AHF?

4.4.1. Rationale

Morphine has been proposed for the symptomatic treatment of pain and dyspnoea in AHF, and was still listed as Class II Grade B

in the 2016 ESC guidelines [2], but was no longer recommended in the 2021 guidelines [1]. Cohort studies show conflicting results in terms of mortality, improvement in dyspnoea and use of mechanical ventilation. In an ancillary study of 1052 patients with AHF, Gray et al. found no difference in mortality or improvement in respiratory distress in the 541 patients treated with morphine [25]. The same was true of a multivariable propensity score analysis in a cohort of 2336 patients [26]. By contrast, Caspi et al. demonstrated an increased risk of mortality (OR 1.43, 95% CI 1.05–1.98), use of non-invasive positive pressure ventilation (OR 2.78, 95% CI 1.95–3.96) and acute renal failure (OR 1.81, 95% CI 1.39–2.36) [27]. This morphine-related excess mortality risk was also found in a retrospective analysis of 147,000 patients (13% vs 2.4%) [28], and in another cohort of 6516 patients for 30-day mortality [29]. Recent literature reviews and meta-analyses have also found conflicting results on short- and long-term mortality, as well as on the use of mechanical ventilation. However, these meta-analyses are based on studies with low levels of evidence, or even unpublished studies [30–32]. Taken together, these data underline the absence of randomized controlled trials to answer the question posed. The results, although sometimes discordant, tend to show an unfavourable association between morphine use and prognosis [33].

4.4.2. Experts' answer

Morphine should probably not be used for the specific therapeutic management of AHF in older patients.

4.4.3. Grade

G2–.

4.5. Question 5

In older patients with AHF, does stopping beta-blockers at the initial management stage reduce morbidity and mortality?

4.5.1. Rationale

A meta-analysis published in 2015 by Prins et al. ($n = 3143$), incorporating five observational studies and one randomized trial, favours the continuation of beta-blocker therapy in patients hospitalized for AHF; two of these studies showed a significant increase in the risk of in-hospital mortality (OR 3.72, 95% CI 1.51–9.14), whereas four showed a reduction in a composite criterion combining early mortality and readmission (OR 1.59, 95% CI 1.03–2.45) [34]. More recently, Mirò et al. published a prospective observational study from a Spanish multicentre registry (1990 patients with a mean age of 78.1 years), showing a significant rise in in-hospital and 30-day mortality in the group of patients with discontinuation of beta-blocker therapy (OR 1.89, 95% CI 1.09–3.26 and OR 2.01, 95% CI 1.28–3.15, respectively) [35]. In addition, a Japanese registry study published in 2021 confirmed these findings in a population of the elderly with a mean age of 81 (interquartile range 72–86) years, specifying that patients receiving beta-blocker treatment on admission to hospital for AHF, compared with those not receiving treatment on admission, had a lower incidence of early cardiac or all-cause mortality [36]. Finally, using a prospective multicentre registry ($n = 5005$), Abi Khalil et al. confirmed the beneficial effect on early mortality of continuing beta-blocker treatment during hospitalization. However, the effects on medium-term mortality (at 3 and 12 months) and on the risk of in-hospital readmission were not demonstrated [37].

4.5.2. Experts' answer

Beta-blockers should probably not be discontinued in older patients admitted to the ED for AHF with heart failure with reduced ejection fraction (HFrEF). If this treatment needs to be suspended (i.e. bradycardia, low output, etc.), it should be resumed before the patient is discharged.

4.5.3. Grade

G2–.

4.6. Question 6

In older patients with AHF, does discontinuing angiotensin-converting enzyme (ACE) inhibitors/angiotensin II receptor blockers (ARBs) during initial management in the ED reduce morbidity and mortality?

4.6.1. Rationale

In the aftermath of an AHF episode, the question arises as to the effectiveness on morbidity and mortality of the early introduction of heart failure disease-modifying therapies, particularly in the older patient, where management is often suboptimal [38].

ACE inhibitors or ARBs are well established as beneficial long-term treatments in older patients with HFrEF, improving survival and reducing the risk of hospitalization for AHF [39]. In addition, numerous studies have shown that initiation or resumption of ACE inhibitor/ARB therapy before hospital discharge is associated with better short- and long-term survival, and with a lower risk of rehospitalization [40]. However, no high-level studies have evaluated the effect of interrupting ACE inhibitors/ARBs in AHF on short- or long-term morbidity and mortality. In an observational study, based on the GWTG-HF multicentre registry ($n = 16,052$; mean age 78.3 ± 7 years), Gilstrap et al. showed a lower 30-day mortality in patients with HFrEF hospitalized for AHF if ACE inhibitor/ARB treatment was continued at discharge (3.5%) compared with discontinuation of treatment (8.8%) [40]. In addition, adjusted survival analysis showed a significantly raised risk of mortality in patients whose ACE inhibitor/ARB therapy was discontinued (HR 1.92. 95% CI 1.32–2.81; $P < 0.001$). Moreover, the hospital readmission rate at 30 days and the 1- year mortality rate were raised significantly in patients whose ACE inhibitor/ARB therapy had been discontinued. Similarly, a study by Sanam et al. (477 propensity-matched patient pairs; mean age 76 ± 10 years) found a lower readmission rate and lower 30-day and 1-year mortality rates for patients who received an introduction of an ACE inhibitor/ARB during hospitalization, compared with those who did not (HR 0.74, 95% CI 0.56–0.97; HR 0.56, 95% CI 0.33–0.98; and HR 0.77, 95% CI 0.62–0.96, respectively) [41]. In-hospital mortality was also lower in patients receiving ACE inhibitor/ARB therapy in a retrospective study by Iglesias et al. [42]. In a retrospective study of 174 relatively young patients, Kane et al. showed that the length of hospital stay for patients who received a continuation/increase of ACE inhibitor/ARB treatment (mean age 66 ± 13 years) was shorter than that for patients for whom a suspension/decrease was proposed (mean age 62 ± 13 years) ($P = 0.009$). Still, the 30-day readmission rate did not differ between groups. In this study, the main reasons for suspension/diminution of ACE inhibitor/ARB therapy were acute renal failure (56.7%), hypotension (23.3%) or hyperkalaemia (10%) [43]. In a post-hoc analysis of a prospective cohort ($n = 900$; mean age 74 ± 14 years), Yoshioka et al. showed that the introduction of ACE inhibitors/ARBs within the first 48 h of hospitalization for AHF was associated with lower 1-year mortality (HR 1.99, 95% CI 1.11–3.56), without raising in-hospital mortality or length of hospital stay, and without worsening renal function [44]. Finally, in a retrospective study of the subpopulation of patients with AHF and type 1 cardiorenal syndrome (with a mean age of 66.3 ± 12.6 years), Ilges et al. found no difference in in-hospital mortality, length of hospital stay or change in creatinine concentrations between patients who continued or stopped ACE inhibitors/ARBs [45]. Despite this, another study showed that patients with AHF associated with renal failure

(with a mean age of 68.9 ± 11.2 and 69.7 ± 10.8 years in patients who continued or stopped ACE inhibitors/ARBs, respectively) were less likely to receive ACE inhibitor/ARB therapy, whereas the 30-day readmission rate and 1-year mortality were significantly improved when these therapies were continued in the event of hospitalization [46].

4.6.2. Experts' answer 1

It is probably advisable not to discontinue ACE inhibitors or ARBs in older patients admitted to the ED with AHF.

4.6.3. Grade

G2–.

4.6.4. Experts' answer 2

The experts suggest early resumption of ACE inhibitor/ARB therapy (ideally within the first 48 h, and at the latest before discharge from hospital) at the maximum tolerated dose if it has been suspended.

4.6.5. Experts' opinion

Strong agreement.

4.7. Question 7

In older patients who have responded to treatment for AHF, does the early introduction of ACE inhibitors/ARBs and/or beta-blockers and/or mineralocorticoid receptor antagonists (MRAs) reduce morbidity and mortality?

4.7.1. Rationale

ACE inhibitors/ARBs are the cornerstone of heart failure treatment, particularly in patients with HFrEF. However, no matter how early the initiation of these therapeutic classes in AHF, the level of evidence is low, particularly in the older population [38,44,47]. Although ACE inhibitors/ARBs are well established as beneficial long-term treatments in older patients with HFrEF, the lack of evidence concerning acute phase management to improve survival and reduce the risk of hospitalization for AHF is still challenging [38,39].

MRAs are used in HFrEF. In an AHF episode, high doses of spironolactone (100 mg) offer no benefit compared with more modest doses (25 mg) [48]. Several studies have shown that the administration of an MRA is associated with a reduction in events (death, hospitalization for all causes or for congestive heart failure) in the months following hospitalization, irrespective of left ventricular ejection fraction. The only randomized study evaluating early initiation of eplerenone was inconclusive, because of a lack of statistical power [49]. Two other studies have shown that the use of an MRA is associated with a reduction in mortality in the months following hospitalization in patients with HFrEF [50,51].

The use of beta-blockers as standard therapy for congestive heart failure before hospital admission confirms a lower mortality rate in older patients with AHF [36,38]. Furthermore, beta-blockers should not be discontinued in the event of AHF (except in cases of cardiogenic shock or severe bradycardia) [52]. Despite a beneficial effect on early mortality of continuing the treatment [34–38], beta-blockers are often not introduced during hospitalization because of fear of their negative inotropic effect and of haemodynamic failure, especially in the older population [6,7,17,19]. According to the current guidelines' recommendations, beta-blockers should be initiated during hospitalization in naïve patients with AHF [1,5].

Angiotensin receptor-neprilysin inhibitors (ARNIs; e.g. sacubitril valsartan) are frequently used in symptomatic HFrEF. The only two randomized studies evaluating the use of ARNIs in patients with AHF have non-clinical endpoints. However, several observational studies have shown an association between the initiation of ARNIs and a reduction in clinical events [53,54].

Selective inhibitors of SGLT2 (e.g. gliflozins) are recent molecules that have been widely used in congestive heart failure, as they reduce cardiovascular mortality and hospitalization for AHF [55]. A very recent study confirmed the benefit of early gliflozin introduction in AHF, irrespective of left ventricular ejection fraction, the age of patients included and the level of underlying frailty, and without the occurrence of notable adverse effects [56].

4.7.2. Experts' answer 1

In HFrEF, it is recommended to introduce early during hospitalization:

- an ACE inhibitor (preferentially to an ARB);
- a beta-blocker as soon as haemodynamic stability is achieved.

4.7.3. Grade

G1+.

4.7.4. Experts' answer 2

In HFrEF, in a patient already on an ACE inhibitor/ARB, the experts suggest that in post AHF care an ARNI could be initiated early as a replacement for an ACE inhibitor or an ARB, at a minimal initial dose, with monitoring of clinical (blood pressure) and biological (renal function) tolerance.

4.7.5. Experts' opinion

Strong agreement.

4.7.6. Experts' answer 3

In heart failure with preserved ejection fraction (left ventricular ejection fraction > 40%) there is currently insufficient evidence to recommend initiation of treatment with an ACE inhibitor/ARB or a beta-blocker.

4.7.7. Experts' recommendation

None.

4.7.8. Experts' answer 4

Regardless of left ventricular ejection fraction, the experts suggest considering the early introduction of:

- an MRA, at a minimal initial dose, with monitoring of clinical (blood pressure) and biological (renal function and kalaemia) tolerance;
- a selective inhibitor of SGLT2 (e.g. a gliflozin).

4.7.9. Experts' opinion

Strong agreement.

4.8. Question 8

In older patients hospitalized for AHF, can the use of a urinary catheter limit urinary incontinence?

4.8.1. Rationale

There are no studies on the real benefit of precise diuresis monitoring in older patients with AHF. On the other hand, numerous studies have identified potential side effects of urinary catheterization in the general population, as urinary tract infections account for 40% of healthcare-associated infections, up to 80% of which are related to the use of urinary catheters [57]. Nevertheless, this risk is reduced in patients with AHF (HR 0.75, 95% CI 0.64–0.89; $P < 0.001$) [58]. More specifically, in older patients, a 2018 retrospective study

of two groups of 100 patients (aged 73 ± 13 years) hospitalized in cardiac intensive care for AHF, found in the urinary catheter group a longer length of hospital stay (9 vs 7 days), more frequent intrahospital urinary complications (haematuria, urinary symptoms, intrahospital urinary infections) (24 vs 5%), with a risk depending on the duration of urinary catheterization (the risk increased 5-fold when catheterization lasted > 6 days), and a more frequent rate of urinary infection at 1 year (17 vs 6%; HR 3.145, 95% CI 1.240–7.978; $P < 0.05$ for all). Furthermore, there was no difference in the rate of rehospitalization at 1 month or in cardiac co-morbidity at 1 year between the two groups [59]. Another prospective observational study from 2020 ($n = 497$; mean age 79 ± 7 years) found that invasive procedures, such as urinary catheterization, were predictive of the onset of delirium (OR 3.965, 95% CI 1.757–8.947) [60]. The indication for urinary catheterization is based on diuresis monitoring, but other collection techniques are possible, with fewer side effects. A randomized controlled trial, involving a total of 75 older patients, looked at the side effects of urinary catheters versus penile sheaths. This study found a non-significant trend towards fewer urinary tract infections in the penile sheath group, with patients describing less pain ($P = 0.02$) and greater comfort in the same group ($P = 0.02$) [61]. Furthermore, in the same study, patients without cognitive disorders were almost 5 times more likely to suffer complications (asymptomatic bacteriuria, urinary tract infection or death) in the urinary catheter group than in the penile sleeve group (HR 4.84, 95% CI 1.46–16.02; $P = 0.01$) [61]. Other alternatives for monitoring the efficacy of diuretic treatment may be proposed (weighing of pads, etc.), but no matter how they are assessed, we have not found any articles. Similarly, no articles were found on the risk of de novo incontinence as a consequence of inadequate catheterization. If a urinary catheter has been placed on admission, it is advisable to remove it as soon as possible to prevent the risk of infection and dysuria. A recent Cochrane review suggests that removal, preferably late in the evening, limits the risk of recatheterization [62].

4.8.2. Experts' answer

Urinary catheters for diuresis monitoring should probably not be used in the management of older patients with AHF.

4.8.3. Grade

G2–.

4.9. Question 9

In older patients hospitalized for AHF, does placing them in a wheelchair and raising them to a standing position within 48 h reduce morbidity and mortality (loss of autonomy, length of hospital stay, serious adverse events or rehospitalization)?

4.9.1. Rationale

There is no randomized trial evaluating the effectiveness of an early mobilization strategy for older people admitted to the ED with AHF. However, some data exist in post ED care in haemodynamically stabilized patients. In a before-and-after study, early mobilization (< day 3) of patients hospitalized in cardiac intensive care ($n = 1489$; 13% with AHF) raised the rate of patients returning home (83.9% vs 78.3%; $P < 0.007$), and lowered the rate of in-hospital death (4.2% vs 6.8%; $P = 0.04$) and the rate of return to the ED within 30 days (13.5% vs 19.2%; $P = 0.003$) [63]. A randomized controlled trial in an acute postemergency geriatric ward found that an early (< 48 h) physical activity programme in 370 patients (30% hospitalized for heart failure) significantly improved functional capacity: mean difference between intervention group and standard care for Barthel score +6.9 95% CI 4.4–9.5; and for SPPB score +2.2, 95% CI 1.7–2.6 [64]. These results were confirmed in a multicentre study of 200 patients [65]. In all of these studies, implementation of an early mobilization programme was not associated with an increase in length of hospital stay or adverse events. The time between admission and mobilization could be one of the potential predictors of rehospitalization in older patients with heart failure. In a study including 190 patients, early mobilization within 3 days of admission was associated with a lower risk of rehospitalization for AHF [66]. Furthermore, a Japanese retrospective study, analysing data from over 400,000 patients, suggested a lower loss of autonomy in patients aged > 80 years benefiting from early cardiac rehabilitation within the first 48 h [67]. In this study, 306,826 patients were finally analysed, of whom 142,590 benefited from rehabilitation; of these, 45,428 received rehabilitation within the first 48 h. The literature also evaluated the factors limiting early access to this early rehabilitation. Thus, the factor most associated with early access is the existence of a pre-existing gait disorder before the AHF episode [68].

4.9.2. Experts' answer

Older patients managed in the ED for AHF should probably be offered early mobilization, or even an adapted exercise programme, in order to limit loss of functional autonomy.

4.9.3. Grade

G2+.

4.10. Question 10

In older patients presenting with AHF with respiratory distress, in prehospital or emergency care, does oxygenation with non-invasive ventilatory support reduce morbimortality?

4.10.1. Rationale

Pulmonary congestion is generally associated with raised afterload and/or left ventricular dysfunction, and can lead to hypoxaemia, which justifies oxygen therapy only if oxygen saturation (SpO_2) is < 90% or arterial oxygen pressure (PaO_2) is < 60 mmHg (Grade IC) [1]. Oxygen administration must avoid hyperoxia, which is also deleterious and increases acid-base imbalances [69]. In respiratory distress, i.e. hypoxia with SpO_2 < 90% associated with respiratory rate > 25 breaths/min, non-invasive ventilation (NIV), involving the delivery of oxygen into the lungs via positive pressure without the need for endotracheal intubation, should be introduced as soon as possible [70–72]. Indeed, the effect of NIV is an increase in oxygenation and a decrease in the work of breathing and, in the case of ventilatory support, an additional improvement in alveolar ventilation, with further decreases in carbon dioxide levels [70]. The literature shows that the introduction of NIV significantly reduces the rate of intubation in both inpatient and outpatient settings [70,71,73,74]. Therefore, NIV is proposed in case of respiratory distress associated with acute pulmonary oedema, especially in hypertensive AHF [70,71]. Nevertheless, NIV should be started only with initiation of urgent pharmacological therapies according to the recommendations, although the literature does not specify which sequence to initiate [1,2,71,72,74]. The effect on mortality remains more controversial, as the use of NIV does not reduce mortality in these patients [75,76]. Continuous positive airways pressure may be preferred for acute pulmonary oedema in the prehospital setting because of its ease of use and set-up. NIV with spontaneous ventilation with inspiratory support and positive expiratory pressure, sometimes mistakenly referred to as "bilevel positive airways pressure", should be preferred in intrahospital care for patients with persistent signs of respiratory exhaustion, but also for those with acidosis with hypercapnoea or a history of chronic obstructive pulmonary disease [70,72]. During NIV treatment, blood pressure should be monitored as it raises intrathoracic pressure, which in turn reduces venous return and thus right and

left ventricular preload. In fact, it can also lead to a reduction in cardiac output and blood pressure, and should therefore be used with caution in patients with reduced preload and hypotension. In addition, raised pulmonary vascular resistance and right ventricular afterload may also be deleterious in cases of right ventricular dysfunction. Under no circumstances should it prevent or delay recourse to intubation and mechanical ventilation in the event of failure or signs of exhaustion threatening the patient's vital prognosis [70]. Furthermore, at present, high-flow nasal oxygenation therapy has no indication in this clinical situation [77].

4.10.2. Experts' answer

Oxygenation by NIV should probably be initiated in older patients managed in the ED for AHF with respiratory distress in order to limit morbidity and mortality.

4.10.3. Grade

G2+.

5. Pathway of care for the older patient with AHF

5.1. Question 1

In older patients hospitalized for AHF, does cardiology ward management reduce morbidity and mortality?

5.1.1. Rationale

Regardless of age, hospitalization in a cardiac unit is associated with a better prognosis in the event of AHF [1,2,78–81]. In registry studies, older patients are statistically less likely to be admitted to cardiology units, and their management is less likely to follow recommendations [80,82,83]. As a result of lack of resources and the rising prevalence of heart failure, not all patients can be admitted to cardiology units [6,82,83]. In addition, the older patient often has associated acute or chronic pathologies, for which multidisciplinary management in the medical or geriatric sector is sometimes necessary [83–85]. For patients managed by a medical team, the punctual intervention of a cardiologist or a mobile team dedicated to the management of AHF is associated with a better prognosis [78,86,87]. In an American retrospective study of older people admitted with a primary diagnosis of AHF, collaboration between non-cardiologists and cardiologists was associated with a better prognosis than exclusive management by a cardiologist or non-cardiologist [88]. Compared with patients managed exclusively by a cardiologist or non-cardiologist, patients managed in the medical sector by a non-cardiologist with a cardiology consultation had significantly more assessments of left ventricular function, more discharge prescriptions, including an ACE inhibitor, and fewer 90-day rehospitalizations (adjusted OR 0.54, 95% CI 0.34–0.86) [88]. In a study from a Spanish registry, patients included in an AHF management and follow-up programme from the time of admission had a better prognosis than those not included [89]. In a systematic review, Kul et al. compiled the results of five studies investigating the effect of a AHF management programme from hospital admission; they noted a significant reduction in mortality, rehospitalization and length of hospital stay, without any additional cost [90]. Patient frailty, assessed using a validated geriatric scale (Clinical Frailty Scale), is associated with the prognosis of older patients with AHF [78,91–94]. Whereas the goals of care for non-frail older patients should be the same as for non-older patients, for frail patients, the goals of care should be tailored to each situation, considering the patient's co-morbidities, in addition to personalized AHF management [91]. Studies are awaited to assess the impact of this assessment on the patient's return home, quality of life, consumption of care and prognosis.

5.1.2. Experts' answer

Older patients with AHF should probably be hospitalized in a cardiology unit to improve their prognosis. Failing that, in case of co-morbidities or associated pathologies, multidisciplinary management, including a cardiologist and a geriatrician, is probably required, followed by referral to a care network to improve prognosis.

5.1.3. Grade

G2+.

5.2. Question 2

Does coronary angiography reduce morbidity and mortality in older patients hospitalized for AHF with non-ST-segment elevation acute coronary syndrome (NSTACS)?

5.2.1. Rationale

In the 2020 guidelines, the ESC specified that older patients with NSTACS should benefit from the same diagnostic and therapeutic strategies as younger patients [95]. A recent meta-analysis of 2323 older patients treated for NSTACS found no benefit in terms of mortality between 6 months and 5 years (risk ratio [RR] 0.85, 95% CI 0.7–1.04) after coronary angiography. On the other hand, there was a significant reduction in myocardial infarction recurrence (RR 0.59, 95% CI 0.49–0.71) and the need for emergency revascularization (RR 0.3, 95% CI 0.17–0.53), but an increased risk of bleeding (RR 2.12, 95% CI 1.21–3.74). There was no significant difference in the risk of stroke (RR 0.75, 95% CI 0.38–1.46) [96]. A 2012 randomized controlled trial of 313 patients aged > 75 years showed a benefit of invasive management only in patients with elevated troponin at initial management (HR 0.43, 95% CI 0.23–0.80), but not in those with normal troponin at admission (HR 1.67, 95% CI 0.75–3.70; $P = 0.03$) [97]. Another randomized study, involving 457 patients, showed a benefit for invasive management on a composite endpoint (acute coronary syndrome, need for emergency revascularization, stroke and mortality) after a median follow-up of 1.5 years (HR 0.53, 95% CI 0.41–0.69; $P = 0.0001$) [98]. However, in an ancillary study of the After Eighty trial, there was no evidence of an impact on quality of life at 1 year according to the 36-item Short-Form Survey (SF-36) [99]. An ancillary study of the TACTICS-TIMI 18 trial, involving 2220 older patients, showed a benefit for invasive management within 48 h on a 30-day composite criterion (mortality, acute coronary syndrome, rehospitalization, stroke and haemorrhage) (10.8% vs 21.6%; $P = 0.016$) and a relative 56% reduction in mortality and/or the occurrence of acute coronary syndrome at 6 months [100]. Furthermore, other methodologically weaker studies showed a benefit for early invasive management [101–104]. Medical intuition alone does not appear to be sufficient, as it raises the risk of mortality by a factor of 6 by reducing the use of appropriate management (OR 6.0, 95% CI 2.3–15.5; $P < 0.001$) [105]. Risk stratification therefore requires the use of validated scores. Among them, the GRACE score appears to be better than the TIMI risk score for stratifying 1-year mortality risk [106,107]. A study of 114 patients showed better risk assessment when several scores (GRACE, EuroSCORE, AMIS and SYNTAX) were used [108]. In addition, patient frailty should be assessed using the validated Clinical Frailty Scale [92]. The therapeutic decision will be weighed up against the ischaemic and haemorrhagic risk, co-morbidities and the existence of agitation, which could complicate the procedure.

5.2.2. Experts' answer

The experts suggest that older patients with AHF possibly linked to coronary pathology should be eligible for semi-emergency coronary angiography. This decision will be weighed according to the

patient's level of frailty and bleeding risk, as assessed by validated scores.

5.2.3. Experts' opinion

Strong agreement.

5.3. Question 3

In older patients initially treated for AHF, but not hospitalized, does cardiologist follow-up reduce morbidity and mortality?

5.3.1. Rationale

With regard to prevalence, prospective multicentre studies have found a non-hospitalization rate of between 20% and 35% for patients with AHF at the end of emergency care [109–112]. In addition, non-hospitalized patients appear to be at greater risk of return to the ED, and have a higher 7-day mortality rate [110]. The 2021 ESC recommendations suggest at least one visit between 1 and 2 weeks after discharge, without specifying whether it should be carried out by general practitioners or cardiologists; this would reduce the rate of 30-day rehospitalization. However, these recommendations are not based on prospective randomized controlled trials [1]. The majority of articles found studied follow-up after hospitalization for AHF. The first is a French single-centre randomized controlled trial of patients aged > 80 years, which studied the impact of scheduled follow-up at 3, 6 and 9 weeks and 3, 6, 9 and 12 months after hospital discharge. This study was stopped prematurely because quality of life was significantly improved at 6 months (primary endpoint on the Minnesota Living with Heart Failure Questionnaire), as was mortality [113]. A Canadian cohort study of over 10,000 patients, with a mean age > 75 years, investigated the benefit of postemergency follow-up for AHF by a general practitioner alone, a cardiologist alone, collaborative management or no management at all. Regardless of the type of follow-up, there was a benefit in terms of mortality. This benefit was even greater in the case of consultation by a cardiologist, and improved in case of multidisciplinary management. These results were confirmed on a composite criterion including mortality, reconsultations in the ED and heart failure rehospitalization [114].

5.3.2. Experts' answer

Patients with AHF who are not hospitalized at the end of their stay in the ED must be able to benefit from a short-term follow-up programme (within 7 days). This decision will be weighted according to the patient's level of frailty and autonomy.

5.3.3. Grade

G1+.

6. Ethics for the older patient with AHF

6.1. Question 1

Does palliative care improve the quality of life of a terminally ill older patient with AHF in the ED?

6.1.1. Rationale

End-stage heart failure is characterized by symptomatic patients remaining in stage IV of the New York Heart Association classification, despite full diagnostic investigation and optimal medical treatment. The integration of palliative care into the management of patients with end-stage heart failure is recommended by the ESC [1,2,115]. Indeed, a systematic review showed a modest improvement in quality of life and a reduction in hospitalization rates, with no influence on survival time [116]. Patients likely to benefit from palliative care can be identified by advanced age, coexistence with chronic obstructive pulmonary disease, persistent hypotension, worsening renal failure and ongoing symptoms [117]. The most common symptoms of end-stage heart failure are dyspnoea, oedema, thirst, pain, anxiety and depression. Therapeutic solutions can be tried in these patients. In this context, whereas oxygen has relatively no effect in long-term dyspnoea, morphine has an interesting effect [118]. Similarly, although non-invasive ventilation has not been specifically tested in this population, it probably has no place. Finally, for dependent patients living in care facilities, such as nursing homes, the relevance of transport to hospital may be questioned, particularly if palliative nursing care is available on site.

6.1.2. Experts' answer

Palliative care is recommended for patients with advanced heart failure presenting to the ED with AHF, as it improves quality of life without reducing survival time.

6.1.3. Grade

G1+.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.acvd.2024.09.004.

Disclosure of interest

N.P. has received consulting fees from VYGON SA (CPAP-Boussignac), symposia lecture fees and congress invitations from Fisher & Paykel Healthcare SAS (Optiflow), and is involved in an independent clinical research programme for Roche Diagnostics (no fee or grant) and a fundamental research programme for Boehringer Ingelheim GMBH (no fee or grant).

C.D. has received congress invitations from Boehringer, consulting, lecture fee and research grants from Abott, consulting and lecture fees from Abiomed and Satelia, and consulting fees from AstraZeneca.

A.B. has received consultancy fees from Pfizer, Vifor Pharma, Boehringer and AstraZeneca and has been involved in symposia for Novartis and Vifor Pharma.

M.P. has received lecture fees from Bristol Myers Squibb, consultancy fees from AstraZeneca and a congress invitation from Novartis.

N.G. has received honoraria from AstraZeneca, Bayer, Boehringer Ingelheim, Lilly, Novo Nordisk, Novartis, NP Medical, Roche Diagnostics and Echosens.

F. Roca has been involved in oral communications for Pfizer, Bayer and Sanofi and consulting for Novartis, and has received a congress invitation from Novartis.

P.J. has received honoraria from AstraZeneca, Bayer, Novo Nordisk, Novartis, NP Medical, Boehringer Ingelheim and Pfizer.

F.M. has received honoraria from Novartis, Pfizer, Vifor, Boehringer and Bristol Myers Squibb.

T.C. has been involved in consulting for Novartis.

The other authors declare that they have no competing interest.

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