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Adoption of new guidelines for the management of acute heart failure in the emergency department: An assessment on the quality of practice

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ABSTRACT

Background: Acute heart failure (AHF) is a disease with high incidence and mortality. Since 2016, new definitions were adopted for AHF requiring early management to improve prognosis. The aim of this study is to assess practices regarding the management of AHF before and after a standardized educational workshop, which was delivered to emergency physicians and nurses during work shifts.

Methods: 146 patients presenting AHF were selected in this prospective study. Patients were divided into three groups for three different periods, namely a first phase without educational workshops offered to emergency physicians and nurses, a second phase with educational workshops, and a third phase with an assessment of practices after a six-month interval.

Results: Systematic measurement of respiratory rare improved from 17% to 67% of cases. The acquirement of an echocardiography before the 24-h delay improved from 21% to 100% of cases. The administration of diuretics also improved from 79% to 84% of cases.

Conclusions: An improvement of diagnostic and therapeutic management was found. Educational workshops to emergency physicians and nurses improve the clinical recognition of AHF, reduces the delay of the acquirement of echocardiography, and treatment administration.

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Acute heart failure; dyspnea; education; emergency medicine; echocardiography

1. Introduction

Acute heart failure (AHF) is a common disease with increasing incidence in developed countries, with major impact in terms of morbidity and mortality, especially in the elderly, with an overall 10% in-patient mortality reported in large samples [1]. The European Society of Cardiology (ESC) published in 2016 a new definition and management guidelines for the AHF syndrome [2]: the newly defined syndrome is composed of six clinical phenotypes depending on the pathophysiological approach to different symptoms, namely acute hypertensive heart failure, decompensation of a chronic heart failure, cardiogenic shock, right heart failure, elevated cardiac output heart failure, and heart failure secondary to acute coronary syndrome. Key aspects of the management of AHF, such as the measurement of vital signs (respiratory rate, pulse oximetry, blood pressure, heart rate), acquirement of complementary investigations (pro-BNP measurement, ECG, early echocardiography), and treatment (diuretics).

It is not surprising that such a relevant reorganization of an important syndrome may reflect on patient outcome, especially in the emergency department: it is proved that a wrong diagnosis or inappropriate treatment is related to a higher mortality, at least in the case of AHF: 'time-to-therapy' is therefore essential, as in the case of the acute coronary syndrome [3]. The inclusion of new guidelines of a common disease in the professional practices of an emergency department may be understood as a common challenge for healthcare managers. Moreover, the process of adoption of new guidelines is seldom described in the literature [4], with a poor literature of methodological case studies.

These difficulties of the translation of guidelines from new research into daily professional practice and therefore changing physicians and nurses' behavior may be due to various reasons: the important amount of evidence with a meaningful clinical impact which is continuously generated on one hand, and lack of allocated 'learning' time of the personnel on the other hand. Among different strategies explored in recent literature to endorse new guidelines for professional clinical practice, such as study visits, audit, and feedback, one cost- and time-effective solution that can easily be adopted in all kinds of healthcare settings is the professional-led educational workshop, shown to have a positive impact of professional practices [5].

Expanding on this framework, we wanted to assess the impact of educational workshops for physicians and nurses on professional practices regarding AHF integrated into the everyday emergency department work shift.

The aim of this study is, therefore, to assess professional practices on the management of AHF in

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emergency settings before and after the administration of educational workshop in an emergency department from a Belgian hospital to answer the following question: 'Can the management of AHF be improved with an educational strategy directed to the emergency personnel?'.

2. Methods

2.1. Study design

This study uses prospective settings to assess professional practices on the management of AHF in the emergency department of the Saint Elisabeth Hospital in Brussels, Belgium; the study was approved by the ethical committee of the hospital, and consent forms were signed by patients admitted during the study periods to use their anonymized data.

We performed a departmental prospective study regarding the management of AHF. The primary objective of the study was to record and describe the management of patients presenting with AHF, namely the main features of clinical examination, such as the measurement of parameters as respiratory rate, the delay in the acquirement of complementary investigations, such as echocardiography, and the treatment that was administered, such as diuretics.

2.2. Study settings and data

Patients were included in the database for the study on two conditions: first, they were admitted based on dyspnea, and second, they were diagnosed with AHF after consulting with an emergency doctor. Patient inclusion went on from the start of the study until its end.

Data were collected on key aspects of the management of AHF, such as the measurement of vital signs (respiratory rate, pulse oximetry, blood pressure, heart rate), acquirement of complementary investigations (pro-BNP measurement, ECG, early echocardiography), and treatment (diuretics). To assess the quality of professional practices, we measured whether the above-mentioned key aspects were included in the management of each patient presenting with AHF: therefore, a binary variable 'present/absent': the more key aspects are performed, the better the quality of management. Because blood pressure, heart rate, and pulse oximetry were measured in all patients, these parameters were not included in this study. We did not report data that were collected on the administration of non-invasive ventilation and nitrates due to a lack of a minimum of positive measurements.

2.3. Study phases

To answer the main question of the study, we compared three periods of time ranging from 1 November 2016 to 9 September 2017. During the first period (period of reference, P1) from 1 November to 31 December 2016 patients were managed without any educational workshop to emergency professionals. During the second period (P2) from 1 January to 2 March 2017 emergency physicians and nurses received educational workshops on AHF at the start of their shift and continued to manage patients. In the third period (P3) from 8 September to 11 November, we compared professional practices 6 months after P2.

2.4. Educational workshops

Educational workshops were given every day in P2 at the beginning of the day during case transmissions. The most recent cases of AHF were shared by the chief of the emergency department and particular focus was given about the key aspects of management such as the measurement of parameters as respiratory rate, the delay in the acquirement of complementary investigations such as echocardiography, and the treatment that was administered, such as diuretics. A general discussion was made after the case with a more theoretical approach to AHF not necessarily specific to the cases at hand.

2.5. Participants

146 patients were enrolled in this study, over the three periods P1, P2, and P3. 24 patients were enrolled during P1, 76 patients during P2, and 46 patients during P3. Patients in P1 were 53–96 years old (median = 83 years old), patients in P2 were 60–99 years old (median = 83 years old), and patients in P3 were 70–95 years old (median = 85 years old).

2.6. Statistical analysis

Contingency tables of percentages were made to describe whether key aspects of AHF management were fulfilled. To compare percentages of measurement, investigations, or treatment adopted in patients, Mantel–Haenszel chi-square test [6] was used. Because this was an exploratory study, we did not adjust for multiple testing. The statistical analyses were carried out in R.

3. Results

3.1. Respiratory rate measurement during a clinical examination

Respiratory rate measurement improved from P1 to P3: it was measured in 17% of patients during P1, in 42% of patients in P2, and in 67% of patients in P3. When comparing pairs of periods, P2 and P3 are significantly different than P1 (respectively $P = 0.04$ and

Table 1. Management of acute heart failure in the emergency department.

AHF management	P1	P2	P3	*p* (P1–P3)
Respiratory rate	4/24 (17%)	32/76 (42%)	31/46 (67%)	<0.0001
Pro-BNP	15/24 (63%)	52/76 (68%)	29/46 (63%)	0.90
ECG	23/24 (96%)	68/76 (89%)	46/46 (100%)	0.23
Echocardiography	5/24 (21%)	37/76 (49%)	46/46 (100%)	<0.0001
Diuretics	19/24 (79%)	64/76 (84%)	44/46 (94%)	0.03

$P < 0.0001$), and P3 is significantly different than P2 (P=0.007) (Table 1).

3.2. Pro-BNP test

Pro-BNP testing was fairly stable from P1 to P3: it was tested in 63% of patients in P1 and P3, and in 68% of patients in P2.

3.3. ECG

An ECG was obtained in 96% of patients in P1, 89% of patients in P2, and in 100% of patients in P3; the rate of acquirement is therefore similar.

3.4. Echocardiography

An early echocardiography (in the 24 h after the patient's admission into the emergency department) was obtained in 21% of patients in P1, 49% of patients in P2, and 100% of patients in P3. The difference in the acquirement rate is statistically significant ($P <$ 0.0001).

3.5. Diuretics

Diuretics were administered in 79% P1 patients, 84% of P2 patients, and 94% of P3 patients. The difference between the administration rate in P1 and P3 is statistically significant ($P = 0.03$).

4. Discussion

Our study shows that educational workshops have an overall positive impact on the quality of practice of healthcare professionals in the emergency department.

A first improvement concerns the measurement of the respiratory rate; it is an accessible parameter and an excellent indicator of the severity of the clinical presentation of AHF and allows for the prediction of patient destination after care (intensive care unit, ward, or other) [7]. However, in the settings of the emergency department, because its measurement is manual (measurement of the frequency of inspirations in 30 s or a minute) in contrast to other parameters such as blood pressure, oxygen saturation, or heart rate, respiratory rate was not regularly measured in patients with AHF. In the context of the continuous education performed in the settings of this study, awareness was raised in emergency professionals, nurses, and physicians, on the importance of this clinical aspect.

A second improvement obtained through the educational program concerns the early acquirement of an echocardiography, before the 24-h delay after AHF patients were admitted to the emergency department. The early acquirement of echocardiography in emergency settings is beneficial to characterize and better define the clinical presentation of AHF, as well as key information on the hemodynamic status in a given patient, to determine whether organ failure is present: this determines the indication of transfer to the intensive care unit for further investigations and treatment [8].

A third improvement concerns the administration of a diuretic treatment to patients with AHF in the emergency department. Diuretics are a fundamental part of the pharmacological approach to patients with AHF [9,10].

Finally, it is noted that all the above-mentioned improvements representing a key aspect of the quality of management of AHF in emergency settings persisted six months after the educational program. This not only supports previous similar findings in other settings [5] but also highlights new information on potential long-term effects of regularly putting the spotlight on frequent and relatively complicated pathologies encountered by medical professionals. As a management strategy, holding educational workshops at the beginning of shifts has implications on the organization of the work: this strategy could be sustainable if workshops have long-lasting effects [11] on the improvement professional practices, and therefore, they take place in a limited time.

Our results must be met with a number of limitations.

First, study design and settings implied a selection bias for the periods P2 and P3 of our experiment: because healthcare professionals were better prepared to recognize and manage AHF, patient recruitment was more fruitful in P2 and P3; this can be observed with a more important number of participants in those periods, compared to P1. Second, because certain variables that were initially part of the study design were measured, obtained, or administered in a low number of patients, such as administration of non-invasive ventilation, we were unable to perform a meaningful statistical analysis to detect differences

among the three different study periods. Third, this is a monocentric and monodepartmental study, which is likely to limit the replicability of our findings.

Further studies may endeavor to replicate and confirm our findings in other settings and departments, as well as for the management of different kinds of diseases.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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