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RESEARCH

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# Factors influencing prescribing by critical care physicians to heart failure patients in Egypt: a cross-sectional survey

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## Abstract

**Background:** Heart failure (HF) guideline-led prescribing improves patient outcomes; however, little is known about the factors influencing guideline-led prescribing in critical care settings. This study used a cross-sectional survey to assess the factors that influence physicians when prescribing to heart failure patients in a critical care setting in Egypt.

**Results:** The response rate was 54.8%. The international HF guidelines were the primary source of prescribing information for 84.2% of respondents. Staff were more familiar with the latest guideline recommendations than associate staff (86.7% vs 36.8%,  $p = 0.012$ ) and considered patient's perspectives more often (86.7% vs 26.3%,  $p = 0.036$ ). Renal function was the clinical factor that most frequently influenced the prescribing of loop diuretics or renin-angiotensin-aldosterone system inhibitors. Pulmonary function influenced beta-blockers prescription. The most frequently cited barrier to guideline-led prescribing was the absence of locally drafted guidelines. A majority of prescribers agreed that implementation of clinical pharmacy services, physician education and electronic reminders may improve the implementation of guideline-led prescribing.

**Conclusions:** Although experienced physicians are familiar with and use international guidelines, physicians would welcome local guidance on HF prescribing and greater clinical pharmacist input.

**Keywords:** Heart failure, Critical care, Guideline-directed medical therapy, Pharmacist, Egypt

## Background

Heart failure (HF) guidelines provide an evidence-based tool intended in part to guide the prescribing decisions of physicians [1]. In HF, guideline-led prescribing improves the quality of clinical decisions and promotes consistent and standardised care [1, 2] as well as leading to beneficial clinical outcomes in terms of mortality, morbidity, and quality of life [2, 3]. However, international reports suggest that prescribers do not optimally adhere to the recommended HF guideline-led prescribing at discharge from certain clinical settings [2, 4]. In one study, more

than one-third of eligible HF patients was not prescribed the full list of the recommended HF disease-modifying therapies at discharge [2]

Many physicians report poor awareness of the recommendations of the guidelines [5, 6]. A national survey in the UK showed that 27% of cardiologists do not use the HF guidelines in managing the disease [7]. In the SHAPE survey, just 34% of the European cardiologists reported the use of HF guidelines in their daily prescriptions, indicating that guidelines have a modest influence on physicians' prescribing decisions [8].

Guideline-led prescribing in heart failure may be challenging due to patients' age [9], gender [10], low blood pressure [11], renal impairment [11], presence of pulmonary disease [12] and the complexity of medication regimens [13]. Women and the elderly are generally under-represented in clinical trials, which may lead to

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physician uncertainty as to the applicability and safety of guideline-led prescribing to these patients [14, 15]. The high risk of medication-related adverse events and contraindications to medications also represent major barriers to guideline-led prescribing [8, 15]. Furthermore, lack of resources and the geographical location may impede the affordability and applicability of prescribing the full list of HF disease-modifying therapies [6, 16, 17]. For instance, the prescription rates of disease-modifying therapies range from 85% in Germany to 50% in Brazil and to 30% in Egypt [18–20]. In Egypt, HF patients are cared for in the acute setting such as in a critical care unit. When patients are stabilised, they may be discharged with limited follow-up plans. Therefore, the medications prescribed during the acute inpatient phase are key to ensuring optimal medications in the longer term.

### Aim of the study

This study aims to assess the behaviours and perspectives of Egyptian physicians towards prescribing to HF patients in the acute phase, to investigate the potential barriers, and to identify the possible solutions to improve HF guideline-led prescribing in a critical care setting.

### Ethics approval

The Research and Ethics Committee of Future University in Egypt granted ethics approval for the study (Serial number REC—FPSPI—11/76). The management board of the Critical Care Medicine Department, Cairo University Hospitals granted permission for the work to proceed in the department. Written information about the study was provided prior to participation, and all participants provided informed consent prior to questionnaire completion.

## Method

### Study design and measurements

A descriptive questionnaire was designed in line with the Academy of Critical Care: Development, Evaluation, and Methodology recommendations [21]. The questionnaire was developed based on (i) the class I recommendations of the European Society of Cardiology Guidelines for the Diagnosis and Treatment of Acute and Chronic Heart Failure [1] and (ii) the literature on HF guideline-led prescribing [4, 6, 12, 22]. The questionnaire wording was agreed by the research team (SEH, NB, SB, ED, MB). The face validity of the questionnaire was tested using a convenience sample of two physicians working in the Critical Care Medicine Department. Minor modifications were then made to some of the questions to improve clarity. A native English speaker (MB) reviewed the questionnaire

for grammar, meaning, and clarity and all authors approved the final questionnaire.

The questionnaire consisted of 11 questions with some questions containing multiple Likert scale items (Additional file 1). Therefore, in total the questionnaire contained 43 items. The first question examined participant experience and qualifications. Question 2 concerned information sources used by prescribers and was informed by practice in an Egyptian setting. Questions 3 and 4 concerned familiarity and compliance with the ESC guidelines. Questions 5–7 asked prescribers which patient related clinical factors they consider when prescribing a loop diuretic, a renin–angiotensin–aldosterone system inhibitor (RAASi), and a beta-blocker. A RAASi was defined as an ACE inhibitor, angiotensin receptor blocker, or mineralocorticoid receptor antagonist. The list was informed by the patient-monitoring requirements, cautions, and contraindications associated with each of the three medication classes. The same list of patient factors was given for each medication class to identify where prescribers may be withholding medications based on inaccurate understanding of the guidelines for each medicine. Question 8 concerned the involvement of patients in prescribing decisions, as recommended in the ESC Guidelines. Questions 9 and 10 explored barriers and facilitators to guideline-directed prescribing. Questions 3–9 used a Likert scale. In Question 3, the Likert scale was anchored by ‘*Completely Unfamiliar*’ and ‘*Very Familiar*’. In Questions 4–9, the Likert scale was anchored by ‘*Never*’ and ‘*Always*’. The final question was an open question, and this question was optional for respondents.

### Setting

The setting of the questionnaire was the Critical Care Medicine Department in Cairo University Hospitals. The Critical Care Unit (CCU) is a 53-bed unit that cares for patients presenting to the hospital with serious illness requiring acute care. Physicians in the CCU may be (i) associate staff who are junior residents and senior residents and (ii) staff who are specialists (Master’s degree) and consultants (Doctor of Medicine degree) in critical care medicine. Typically, patients are discharged directly from the CCU to home once they are deemed medically stable.

### Data collection

All 62 physicians working in the Critical Care Medicine Department were invited to complete the questionnaire. The questionnaire was disseminated in hardcopy and electronically in July and August 2018. The hardcopy of the questionnaire was distributed to staff at the monthly departmental clinical meeting and to associate

staff during their scheduled morning shifts. An identical electronic version of the questionnaire was hosted on the Survey Monkey website ([www.surveymonkey.com](http://www.surveymonkey.com)), and a link to this version was distributed via the institutional email addresses and the LinkedIn ([www.linkedin.com](http://www.linkedin.com)) profiles (where available) of the 62 physicians. The electronic questionnaire was open to receiving responses from July to November 2018. One reminder message was sent via the institutional email system. All responses were recorded anonymously. No incentive was offered to respondents to participate in the study.

### Data analysis

Data were analysed using SPSS® version 22.0 for Microsoft Windows 10. Continuous variables were presented as mean  $\pm$  standard deviation (SD) and categorical variables as frequencies (percentage). The study population was subdivided based on the physician's position as staff or associate staff. Categorical data were compared using the Chi-square test or Fischer's exact test. All statistical tests were exact two-tailed tests, and a point  $p$ -value  $< 0.05$  was regarded as statistically significant. In order to assess content reliability, Cronbach's alpha was calculated for questions 5, 6 and 7 of the survey. These questions used a repetitive Likert scale to assess HF prescribing behaviour.

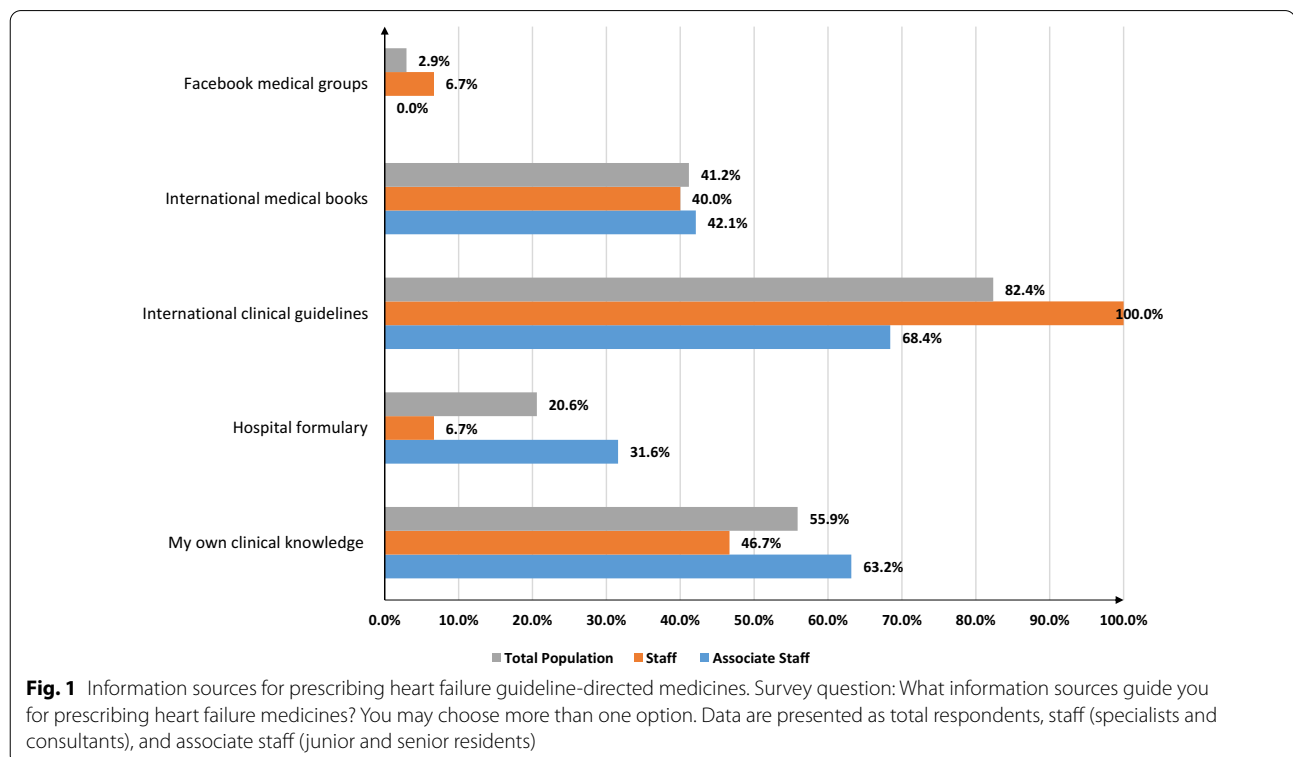
## Results

### Completion and response rates

The questionnaire was returned by 34 of the 62 physicians in the CCU giving a response rate of 54.8%. All medical grades were represented among the respondents with 15 staff (44.2%) and 19 associate staff (55.8%) completing the questionnaire. The breakdown of the respondents was as follows: junior residents,  $n = 8$ ; senior residents,  $n = 11$ ; specialists,  $n = 4$ ; and consultants,  $n = 11$ . The electronic questionnaire was responded to by 13 participants; the remainder of responses were collected via the hardcopy. All respondents completed the questionnaire in full.

### Information sources for prescribing heart failure medicines

International clinical guidelines were the most frequently used sources of information, with 82.4% of respondents reporting using these guidelines. Half of the respondents stated that they rely on their own clinical knowledge. A minority (2.9%) of the respondents reported that they used informal information sources such as *Facebook* medical groups; however, no respondent reported accessing information in the Egyptian National Formulary or the informal local medical books. More than one source of prescribing information was chosen by 64.7% of respondents (Fig. 1).



### Familiarity with and adherence to guidelines

Respondents were asked to rate their familiarity with the most recent European HF guidelines (Fig. 2). The majority of respondents (55.9%) described themselves as 'Familiar' or 'Very Familiar' with these guidelines. Staff were more likely to be 'Familiar' or 'Very Familiar' with these guidelines than associate staff (80.0% vs. 36.8%,  $p=0.012$ ). Notably, 5.3% of associate staff reported that they are 'Completely Unfamiliar' with the latest European guidelines. However, when asked about compliance with the guidelines, 76.5% of respondents stated that they 'Always' or 'Often' comply with the guidelines recommendations. While no staff reported not complying with the guidelines, 10.5% of associate staff reported that they 'Rarely' or 'Never' comply with the guidelines.

### Patient clinical factors influencing heart failure prescribing

A majority of respondents identified renal function (88.2%) and serum potassium levels (85.3%) as the patient factors that influence them when prescribing a loop diuretic (Table 1). When prescribing a RAASi, the majority of respondents reported that they are influenced by serum potassium level (88.2%), renal function (85.3%), and blood pressure (79.4%). When prescribing a beta-blocker, heart rate (88.2%), blood pressure (82.4%), and pulmonary function (76.5%) were the patient factors most likely to influence prescribers. Gender was reported as a consideration when prescribing a beta-blocker by 29.4% of respondents. The only difference between staff

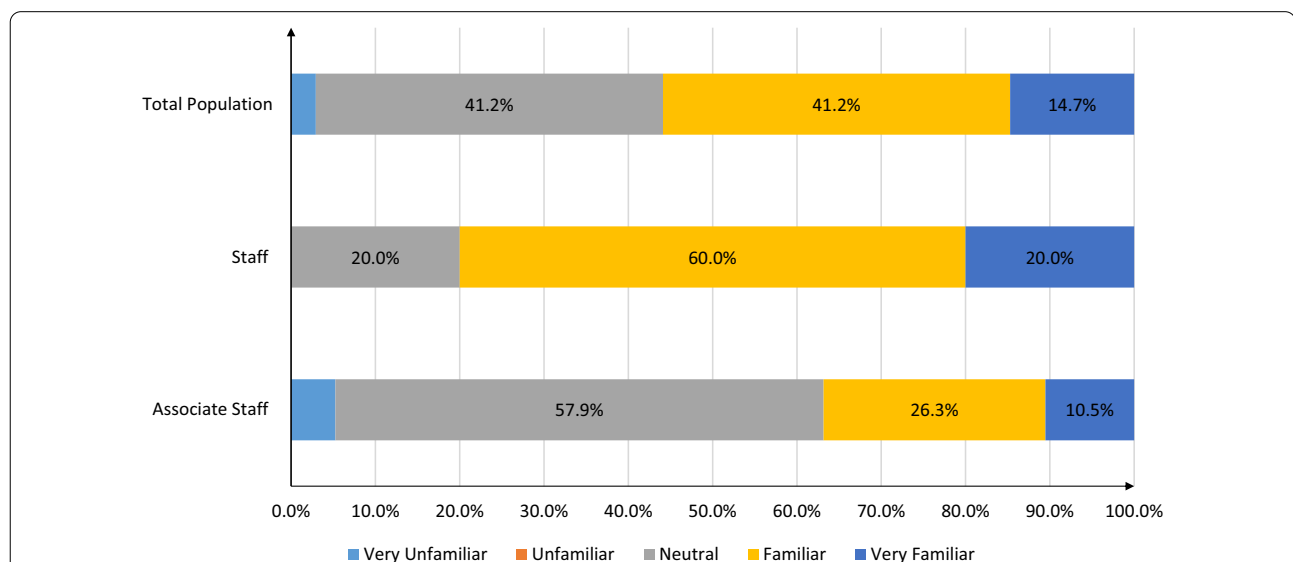
and associate staff was that associate staff were more likely to be influenced by the patient's pulmonary function when prescribing a loop diuretic (73.7% vs. 33.3%,  $p=0.036$ ).

### Patient involvement in medication decisions

Respondents were asked whether they discuss medication choice with their patients; 44.1% of respondents stated that they 'Always' or 'Often' do so. Staff were more likely to discuss medication choice with patients than associate staff (86.7% vs. 26.3%,  $p=0.036$ ).

### Barriers to prescribing guideline-directed medical therapies in a heart failure patient

Respondents were asked to what extent they consider certain issues to be a barrier or obstacle to prescribing guideline-directed medical therapies to HF patients (Fig. 3). The factors most frequently cited as "Always" or "Often" a barrier were the lack of hospital guidelines (79.4% combined *Always/Often*); medication cost (76.5% combined *Always/Often*); and lack of Egyptian national guidelines (67.6% combined *Always/Often*). The most frequently cited barriers for staff were the lack of Egyptian national guidelines and the lack of hospital guidelines (80.0% combined *Always/Often* for both) while associate staff most frequently cited medication cost as a barrier to guideline-led prescribing (84.2% combined *Always/Often*). Workload was deemed a barrier by associate staff more so than by staff (52.3% vs. 13.3%,  $p=0.026$ ). In the



**Fig. 2** Familiarity of respondents with the European Society of Cardiology Guidelines on the Management of Acute and Chronic Heart Failure [1]. Survey question: The European Society of Cardiology published a new guideline on Acute and Chronic Heart Failure in 2016. Please rate your familiarity with this guideline using the scale from 'Completely Unfamiliar' up to 'Very Familiar'. Data are presented as Total respondents, Staff members (specialists and consultants) and Associate Staff (junior and senior residents)

**Table 1** Patient clinical factors influencing the prescribing choices of heart failure guideline-directed medicines

Percentage of respondents who only chose 'Often' or 'Always'	Total (n = 34) N (%)	Associate staff (n = 19) N (%)	Staff (n = 15) N (%)	p-value
<b>Loop diuretic</b>				
Age	10 (29.4)	5 (26.3)	5 (33.3)	<i>0.718</i>
Blood pressure	22 (64.7)	10 (52.6)	12 (80.0)	<i>0.152</i>
Gender	2 (5.9)	2 (10.5)	0 (0.0)	<i>0.492</i>
Heart rate	12 (35.3)	8 (42.1)	4 (26.7)	<i>0.476</i>
Liver function	7 (20.6)	5 (26.3)	2 (13.3)	<i>0.426</i>
Pulmonary function	19 (55.9)	14 (73.7)	5 (33.3)	<i>0.036</i>
Renal function	30 (88.2)	16 (84.2)	14 (93.3)	<i>0.613</i>
Serum potassium	29 (85.3)	15 (78.9)	14 (93.3)	<i>0.355</i>
<b>Renin-angiotensin-aldosterone system inhibitor (RAAS)</b>				
Age	12 (35.3)	7 (36.8)	5 (33.3)	<i>0.832</i>
Blood pressure	27 (79.4)	13 (68.4)	14 (93.3)	<i>0.104</i>
Gender	3 (8.8)	3 (15.8)	0 (0.0)	<i>0.238</i>
Heart rate	9 (26.5)	7 (36.8)	2 (13.3)	<i>0.240</i>
Liver function	7 (20.6)	2 (10.5)	5 (33.3)	<i>0.199</i>
Pulmonary function	11 (32.4)	8 (42.1)	3 (20.0)	<i>0.217</i>
Renal function	29 (85.3)	15 (78.9)	14 (93.3)	<i>0.355</i>
Serum potassium	30 (88.2)	16 (84.2)	14 (93.3)	<i>0.613</i>
<b>Beta-blocker</b>				
Age	13 (38.2)	9 (47.4)	4 (26.7)	<i>0.296</i>
Blood pressure	28 (82.4)	17 (89.5)	11 (73.3)	<i>0.370</i>
Gender	10 (29.4)	5 (26.3)	5 (33.3)	<i>0.718</i>
Heart rate	30 (88.2)	18 (94.7)	12 (80.0)	<i>0.229</i>
Liver function	5 (14.7)	4 (21.1)	1 (6.7)	<i>0.355</i>
Pulmonary function	26 (76.5)	15 (78.9)	11 (73.3)	<i>1.000</i>
Renal function	5 (14.7)	4 (21.1)	1 (6.7)	<i>0.355</i>
Serum potassium	10 (29.4)	7 (36.8)	3 (20.0)	<i>0.451</i>

The *p*-value for each comparison is presented in italics

Survey question: When prescribing (i) a loop diuretic, (ii) renin-angiotensin-aldosterone system inhibitor, or (iii) beta-blocker to a heart failure patient, to what extent do the following patient factors influence your prescribing choices? Please use the scale from 'Never' to 'Always'

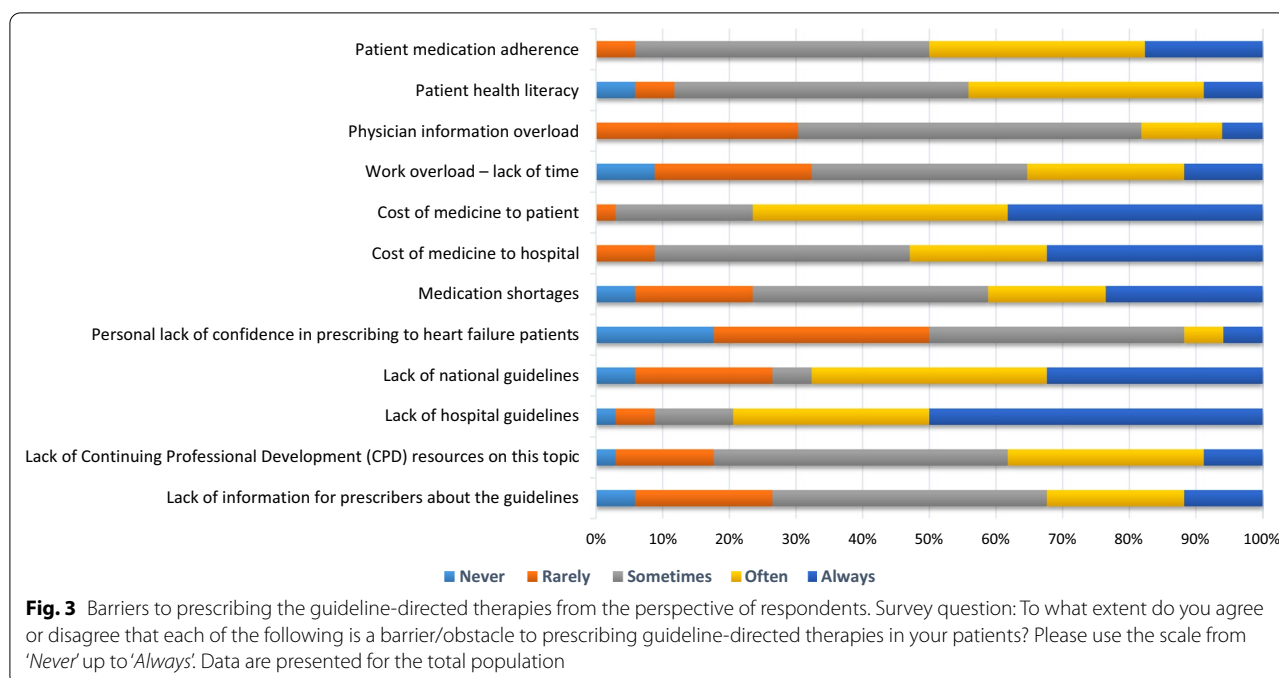
The proportion of respondents who indicated 'Often' or 'Always' in response to the question is given. Data are presented for the total population, associate staff and staff. The *p*-value presented is for the comparison between associate staff and staff

free-text section of this question, two respondents suggested the need for guidelines about the management of multi-morbid patients rather than a disease-specific guideline.

#### Potential facilitators to improve heart failure prescribing outcomes

Respondents were given four potential facilitators and were asked which of these they believed could be implemented to optimise guideline-led prescribing. Respondents could choose more than one option. Greater involvement of clinical pharmacists in HF patient care was chosen by 67.6% of respondents, while regular email bulletins about HF medicines was chosen by 64.7% of respondents. Differences emerged between

staff and associate staff preferences. Staff were supportive of clinical pharmacist involvement in patient care (73.3% chose this option) but were less supportive of receiving education from clinical pharmacists (53.3% chose this option). Associate staff were most supportive of receiving regular emails about HF medicines (68.4% chose this option) and least supportive of using the hospital IT system to receive prescribing recommendations for individual patients (42.1% chose this option). More than one facilitator option was chosen by 35.3% of respondents.



### Survey reliability

A Cronbach's  $\alpha = 0.805$  was calculated for items in questions 5, 6 and 7 of the survey, indicating strong reliability with the survey.

### Discussion

This survey is a novel analysis in the HF literature quantifying the perspectives and behaviours of prescribers in a critical care setting regarding the evidence-practice mismatch in HF prescribing. The majority of respondents use the international guidelines, and over half are familiar with the most recent guidelines. However, over three-quarters of respondents identified the lack of locally drafted guidelines and the cost of medications to the patient as limiting their adherence to guideline-led prescribing practice. Furthermore, the respondents identified vital solutions to improve guideline-led prescribing, including enhancement of clinical pharmacist role and electronic interventions.

Clinical practice guidelines serve as a framework for clinicians managing HF patients [1]. The current European HF guidelines were identified as the most frequently used source of HF prescribing information in the present setting, particularly amongst staff. This suggests that greater postgraduate clinical experience changes prescribers practice and that more junior clinicians may continue to rely on knowledge gained in medical school where guideline-directed care may not be strongly emphasised [23]. This evidence-based knowledge of the staff members was positively translated into two prescribing practices

demonstrated in their responses. First, the staff members placed higher importance on discussing medications with their patients, which is strictly in line with the latest guidelines' recommendations [1]. Secondly, staff broadly supported the greater implementation of clinical pharmacy services and electronic updates. This support reflects an understanding of the important role of the multidisciplinary teamwork to offer a guideline-directed HF care [1, 24, 25].

Low prescribing rates of beta-blockers have been reported among Egyptian HF patients. In the present survey, 77% of respondents identified pulmonary function as a factor to consider prior to prescribing a beta-blocker. In the SHAPE survey, poor pulmonary function was identified by 68% of respondents as a reason for beta-blocker omission or discontinuation [8]. In a UK-based study, poor pulmonary function was reported as the major reason for omitting beta-blocker prescription in up to 11% of eligible ambulatory HF patients [12]. According to the HF guidelines [1], chronic obstructive lung disease or dyspnoea are not contraindications to beta-blocker therapy; however, it appears that there is ongoing clinician concern regarding the risk of beta-blocker-induced bronchospasm despite evidence of patient tolerance and confirmed safety of beta-blockers in pulmonary diseases [26, 27].

Clinicians reported that gender influenced the prescribing of beta-blockers but not the prescribing of RAASi or loop diuretics. An Egyptian HF registry found that compared to males, female HF patients were less

likely to receive guideline-recommended loop diuretics and RAASi due to their different comorbidity and cardiovascular risk factor profiles [10]. However, the same registry found a considerable underutilisation of beta-blockers regardless of gender. The discrepancy between the registry findings and the current survey results might reflect concerns related to the adverse drug reaction profile of beta-blockers [12]. The onset of HF occurs a decade younger in the Egypt population than in European or North American populations, and adverse events may exert a greater effect on the quality of life of these younger patients [18].

The survey inquired about the barriers to implementation of HF guidelines at the level of the patient, physician, and healthcare setting. The lack of local hospital-developed guidelines or nationally developed Egyptian guidelines was cited as a substantial barrier to guideline-led HF care by over 75% of respondents. The barriers identified in the current survey are similar to previous reports from Europe and the USA [7, 15, 22] where this has been reported as a barrier in primary care settings [7, 22]. Several reasons may explain this barrier in a hospital-based setting. First, the HF clinical trials are often highly selective and may not include patients whom physicians consider to be similar to the real-world patients [7, 14]. This disparity may lead to physician uncertainty about guidelines' applicability, particularly in an HF population who might be older, multi-morbid, or acutely ill [7, 8]. This perspective was commented on by two of the survey respondents who highlighted the need for guidelines for the management of multi-morbid patients rather than a disease-specific guideline [9, 11].

The evidence-practice mismatch is of particular importance in low-middle-income countries [6, 16, 17, 28]. International evidence illustrates the adverse effects of limited patient literacy and socio-economic status on HF clinical outcomes and management in terms of prescription of medications, use of device-based therapy, patient adherence, and even mortality [16, 17]. This may be why 50% of the survey respondents stated that they base their clinical decisions on their clinical experience rather than on guidelines. The setting of the survey in a middle-income country may also explain why respondents consider medication cost as an essential barrier to guideline-led prescribing. In this setting, costs to the patient or the healthcare provider may constrain the prescriber in the provision of some of the recommended long-term therapeutic strategies [6, 16, 17, 28]. In a European HF population, the prescription rates of the guideline-recommended therapies exceeded 85% [19], while the cost implications of some medications and the lack of standardised outpatient records may limit the prescription of

the full list of medications in some Egyptian settings [18, 28].

Respondents supported the greater implementation of clinical pharmacy services as a means to improve guideline-led prescribing. This solution was supported more strongly by staff than by associate staff. Several guideline authorities endorse the inclusion of clinical pharmacy services in the HF multidisciplinary team [1, 24, 29]. Clinical pharmacists in hospitals are uniquely positioned to manage prescribing problems encountered by prescribers in caring for complex and often multi-morbid HF patients [25, 30]. In Canada, the inclusion of a clinical pharmacist in an HF multidisciplinary team brought about a significant reduction in patient mortality over a four-year follow-up period [24]. Elsewhere, the inclusion of clinical pharmacy services in HF care reduced rehospitalisation rates by 20% [25, 30]. The acceptability of clinical pharmacy in the present study would seem at odds with previous reports from Egypt and other Middle East and North Africa countries that revealed prescribers' reluctance to alter a colleague's prescription despite the appropriate course of action recommended by the pharmacist [31, 32]. Staff were also in favour of electronic notifications about prescribing in individual HF patients, while associate staff preferred email updates about HF prescribing. While such interventions may be effective [33], it has been shown that multiple and repetitive electronic interventions can lead to a risk of alert fatigue and the prescriber may be less likely to accept the suggested interventions due to desensitisation or cognitive overload [34].

All respondents completed the survey in full, the response rate is over 50% and there is a balance of associate staff and staff responses. However, it is possible that survey non-responders may have expressed different perspectives to those expressed by respondents. To maximise response rates and minimise this risk of bias, we used a systematic method for following-up with the non-responders and made the study questionnaire available in both paper and online formats. Future research should aim to conduct this survey among a larger sample size, either at a national level within Egypt or as a multinational study of critical care physicians.

## Conclusions

Experienced physicians are familiar with and use international guidelines in their prescribing practice; however, they also rely on clinical experience to influence their prescribing decisions. The availability of hospital or national HF prescribing guidelines and increased input

from clinical pharmacy services may improve guideline-led prescribing in this setting.

#### Abbreviations

CCU: Critical care unit; HF: Heart failure; RAASi: Renin–angiotensin–aldosterone system inhibitor.

#### Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s43094-022-00429-1>.

**Additional file 1:** Survey instrument.

#### Acknowledgements

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#### Author contributions

Author (SEH) contributed to the study design, data collection, data analysis, report design and writing. Co-author (NB) was the responsible contact person in the hospital of data collection, data collection progress notes and head of Cairo University Hospitals Clinical Pharmacy Department. NB participated in study design, data interpretation and critical review of the manuscript. Co-author (SB) was the principal of the academic collaboration between University College Cork, Ireland, and Future University Egypt, and contributed to the research study design, supervision and critical review of the manuscript. Co-author (ED) was an academic supervisor of the primary author. ED also acted as the medical sector representative for this work as the target participants were all medical doctors. ED participated in study design, data interpretation, and critical review of the manuscript. Co-author (MB) contributed to the idea production, data visualisation and collection and final critical review of the manuscript. MB is a corresponding author of the work and acted as the academic supervisor of the author. All authors read and approved the final manuscript.

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The research was funded through an academic collaboration between University College Cork, Ireland, and Future University in Egypt. However, the funding had no role in the design of the study, collection, analysis, and interpretation of data or in writing the manuscript.

#### Availability of data and materials

Data are available and can be furnished upon reasonable request to the corresponding author (MB) and to the Pharmaceutical Care Research Group, School of Pharmacy, University College Cork, Ireland.

#### Declarations

##### Ethics approval and consent to participate

The Research and Ethics Committee of Future University in Egypt granted ethics approval for the study (Serial number REC—FPSPI—11/76). The management board of the Critical Care Medicine Department, Cairo University Hospitals granted permission for the work to proceed in the department. Written information about the study was provided prior to participation, and all participants provided informed consent prior to questionnaire completion. Informed consent was obtained from all individual participants included in the study.

##### Consent for publication

All authors confirm their approval to publish this manuscript. Patients or their legally authorised relatives signed informed consent regarding publishing their data.

##### Competing interests

The authors declare that they have no competing interests.

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