Emergency Department Management of Heart Failure and COPD: A National Survey of Attitudes and Practice

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ABSTRACT

Objectives: The Ottawa Heart Failure Risk Scale (OHFRS) and the Ottawa COPD Risk Scale (OCRS) were developed in order to estimate medical risk and to help guide disposition decisions for patients presenting to the ED with acute exacerbations of heart failure (HF) and COPD. We sought to determine physician attitudes towards these two new risk scales and to identify potential barriers to their ED implementation.

Methods: Two self-administered online surveys were distributed to the Canadian Association of Emergency Physicians. The surveys each consisted of 16 questions relating to the OHFRS and OCRS. The primary outcome measures were the overall physician rating of the two risk scales. Secondary outcome measures assessed the likelihood of risk scale implementation into Canadian EDs, as well as the perceived barriers to such implementation. Descriptive statistics were used.

Results: For the OHFRS survey, we received responses from 195 emergency physicians (35.7%). Overall, 74.4% approved of the risk scale based on a Likert rating of 4 or 5 and 66.7% believed that the risk scale would be implemented at their hospital. For the OCRS survey, we received responses from 208 emergency physicians (38.1%). Overall, 76.9% approved of the risk scale based on a Likert rating of 4 or 5 and 70.2% believed that the risk scale would be implemented at their hospital.

Conclusions: Canadian emergency physicians are very supportive of the new OHFRS and OCRS. We believe these risk scales will assist physicians with making safe and efficient disposition decisions and improve outcomes for patients suffering from HF and COPD.

RÉSUMÉ

Objectifs: L'échelle Ottawa Heart Failure Risk Scale (OHFRS) et l'échelle Ottawa COPD Risk Scale (OCRS) ont toutes deux été élaborées dans le but de faciliter l'évaluation du risque médical et les prises de décision quant aux suites à donner chez les patients atteints d'insuffisance cardiaque (IC) aiguë et d'une exacerbation de bronchopneumopathie chronique obstructive (BPCO). L'étude visait donc à déterminer les attitudes des médecins à l'égard de ces deux nouvelles échelles de risque et à cerner les obstacles possibles à leur mise en œuvre au service des urgences (SU).

Méthode: Deux questionnaires d'enquête en ligne, à remplir soi-même ont été envoyés aux membres de l'Association canadienne des médecins d'urgence; chacun comptait 16 questions sur l'OHFRS et sur l'OCRS. Le principal critère d'évaluation consistait en l'appréciation globale des deux échelles de risque par les médecins. Les critères d'évaluation secondaires portaient sur les probabilités de mise en œuvre de ces échelles de risque dans les SU au Canada ainsi que sur les obstacles perçus à leur mise en œuvre. Ont été utilisées à ces fins des statistiques descriptives.

Résultats: Le taux de réponse à l'enquête sur l'OHFRS a atteint 35,7 % (195 médecins d'urgence). Dans l'ensemble, 74,4 % des répondants étaient d'accord sur le fait que l'échelle de risque repose sur une échelle de Likert en 4 ou 5 points, et 66,7 % étaient d'avis que l'échelle de risque serait mise en œuvre dans leur établissement.Le taux de réponse à l'enquête sur l'OCRS a atteint 38,1 % (208 médecins d'urgence). Dans l'ensemble, 76,9 % des répondants étaient d'accord sur le fait que l'échelle de risque repose sur une échelle de Likert en 4 ou 5 points, et 70,2 % étaient d'avis que l'échelle de risque serait mise en œuvre dans leur établissement.

Conclusions: Les médecins d'urgence au Canada se sont montrés très favorables à l'égard des deux nouvelles échelles de risque, soit l'OHFRS et l'OCRS. Les auteurs sont d'avis que ces échelles de risque aideront les médecins à prendre des décisions quant aux suites à donner, qui ne mettent pas en péril la sécurité des patients tout en étant efficientes, et amélioreront les résultats cliniques chez les patients souffrant d'IC et d'une BPCO.

Keywords: Heart failure, COPD, Decision tool, Emergency medicine

INTRODUCTION

Heart failure and chronic obstructive pulmonary disease (COPD) are two serious conditions that result in high rates of morbidity and mortality across Canada.[1-3] Respiratory distress, often associated with

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the decompensation of these conditions, is a common clinical presentation faced by Canadian emergency physicians. Many patients presenting to the emergency department (ED) with acute shortness of breath will respond to ED therapy and are discharged home.[4] Nevertheless, a small but important proportion of such patients will require hospital admission. Making the appropriate disposition decision for such patients is often a challenging task. Physicians in the Unites States resolve this problem by admitting 80% of patients who present to the ED with decompensated heart failure.[4] This is not a feasible approach in Canada where there is a notable hospital bed shortage and significant pressure to discharge. A recent study performed by our group found that only 38% of patients with acute decompensated heart failure were admitted to Canadian hospitals.[4] Moreover, of the 65 serious adverse events reported in this study, 48% occurred in the cohort of patients who were discharged from the ED.[4] In another recent study addressing COPD, it was found that 35% of COPD patients discharged from Canadian academic EDs returned to hospital within 30 days because of worsening respiratory symptoms.[5] Taken together, these studies suggest that a need exists for a set of evidence-based decision tools to assist clinicians with making safe disposition decisions in these patient groups.

The Ottawa Heart Failure Risk Scale (OHFRS) and the Ottawa COPD Risk Scale (OCRS) were developed in order to fill this gap in clinical practice (Figures 1 and 2). The risk scales consist of seven and 10 items respectively, and include elements from a patient's history, physical examination, and laboratory investigations. Patients are risk stratified based on their overall score to assist physicians in identifying the likelihood of patients experiencing a serious adverse event, with the ultimate goal of helping to guide physician disposition decisions. Each scale was developed through large multi-centre prospective cohort studies that analyzed dozens of different patient variables.[4,6] The scales were then further refined by rigorous prospective validation studies, ultimately resulting in two unique decision tools that are both simple and predictive. The purpose of these risk scales was not to replace physician judgment or to serve as a threshold at which a clinician must act. Rather, it was to provide physicians with an accurate means of identifying which patients are at greatest risk for serious adverse events. This information can then be applied in the context of the greater clinical picture in order to facilitate safe patient disposition.

The primary objectives of the present study were to determine emergency physicians' attitudes towards the OHFRS and OCRS and as to identify any barriers that may delay their implementation in Canadian EDs. Secondarily, we were interested in learning about what additional factors Canadian emergency physicians currently rely on to make disposition decisions in these patient groups. The data obtained from this study were anticipated to assist in the process of improving the OHFRS and OCRS so that they are clinically sensible and acceptable to physicians. This, in turn, should help ensure widespread uptake and implementation of these decision tools, improving patient outcomes in EDs across the country.

Items	Points
Initial Assessment	
1. **Patient on anti-arrhythmic** *(amiodorone, sotalol, propafenone)*	2
2. **Heart rate on ED arrival ≥110**	1
3. **IV nitrates given in 1st hour**	3
Investigations	
4. **Acute coronary syndrome**	4
i. *ECG has acute ischemic changes, initial or repeat,* **OR**	
ii. *Troponin >0.25 ug/L, initial or repeat*	
5. **$pCO_2 \geq 60$mmHg or Serum $CO_2 \geq 35$ mmol/L**	3
6. **Urea ≥ 12 mmol/L**	2
Reassessment	
7. **Fails reassessment after ED treatment (2-6 hours)**	1
i. *Resting vital signs abnormal (SaO_2 <90% on room air or usual O_2, or HR ≥ 110, or RR ≥28)* **OR**	
ii. *Unable to start or complete 3-minute walk test (vital signs become abnormal during walk)*	

Total Score	Risk	Category
0	6.4%	Low
1	9.3%	Medium
2	13.4%	High
3	18.9%	High
4	26.0%	High
5	34.7%	Very High
6	44.5%	Very High
7	54.7%	Very High
8	64.6%	Very High
9	73.3%	Very High
10	80.6%	Very High
11	86.2%	Very High

Figure 1. The Revised Ottawa Heart Failure Risk Scale.

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Items	Points
History	
1. Coronary bypass graft	1
2. Peripheral vascular disease intervention	1
3. Intubation for respiratory distress	2
Examination	
4. Heart rate on ED arrival ≥110	2
5. Too ill to do walk test after treatment in ED (SaO_2 <90% or heart rate ≥120/min)	2
Investigations	
6. Acute ischemic changes on ECG	2
7. Pulmonary congestion evident on chest radiography	1
8. Hemoglobin <100 g/L	3
9. Urea ≥ 12 mmol/L	1
10. Serum CO_2 ≥ 35 mmol/L	1

Total Score	Risk	Category
0	2.2%	Low
1	4.0%	Medium
2	7.2%	Medium
3	12.5%	High
4	20.9%	High
5	32.9%	Very High
6	47.5%	Very High
7	62.6%	Very High
8	75.6%	Very High
9	NA	Very High
10	91.4%	Very High
>10	NA	Very High

Figure 2. The Revised Ottawa COPD Risk Scale.

METHODS

Study design and population

In this cross-sectional study, two self-administered online surveys were distributed to all 1,110 physician members of the Canadian Association of Emergency Physicians (CAEP) who had granted the organization permission to contact them with prospective research. Residents and medical students were excluded. On our behalf, CAEP randomly assigned half of the study population to receive the heart failure survey and the other half to receive the COPD survey. The surveys were distributed using the modified Dillman's tailored design method,[7] which consisted of a pre-notification email informing respondents about the goals of the study, a subsequent email containing the survey link, and three follow-up emails. Each email was spaced by a one-week time interval. This research was conducted by the University of Ottawa's Department of Emergency Medicine and the Clinical Epidemiology Program of the Ottawa Hospital Research Institute between May and September of 2014. Approval was obtained from the Ottawa Health Science Network Research Ethics Board.

Survey design

The content of our surveys was informed through conducting individual interviews with five emergency physicians from the Ottawa Hospital with backgrounds in clinical research. Qualitative responses were recorded and analyzed. Themes were identified and ultimately used to develop the questions for our online surveys. In their final versions, each survey consisted of 16 questions that contained both open and closed-ended elements. The closed-ended questions were displayed in the format of a five-point Likert scale that required participants to rate the usefulness of the respective risk scales and their component criteria. These were mandatory fields. The open-ended questions were not mandatory and sought to identify potential barriers to risk scale implementation. They also attempted to determine what additional disposition factors respondents believed to be important when deciding upon patient disposition.

Outcome measures

The primary outcome measures were the overall participant ratings of the two risk scales and their component criteria in terms of their usefulness at helping to predict serious adverse events in patients with heart failure and COPD. Secondary outcomes included the likelihood of risk scale implementation into Canadian EDs, as well as the perceived barriers to such implementation.

Data analysis

Standard descriptive statistics were applied. Microsoft Excel (2011) was used for all calculations as well as for the creation of tables and graphical figures.

RESULTS

In total, 403 of the 1,092 sampled Canadian EPs responded to our surveys, resulting in an aggregate

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response rate of 36.9%. The numerator represents all completed surveys, while the denominator represents all surveys sent, less those returned because surveys were undeliverable (n = 18). Of the 403 completed surveys, 195 addressed the OHFRS and 208 addressed the OCRS.

Physician demographic, professional, and practice setting characteristics are summarized in Table 1. For both surveys, the majority of respondents were male, had at least one emergency medicine credential, and worked at either a community teaching hospital or major academic centre. The median years of practice was 15 and the majority of respondents worked in large-volume EDs that saw over 60,000 patients per year.

Table 2 provides disposition factors not included in the risk scales that respondents identified as being important. Patient's cognitive status, comorbidities, and current living situation were the disposition factors most frequently identified in both surveys.

Table 3 provides physician-identified barriers that could potentially prevent the risk scales from being implemented into Canadian EDs. Issues with individual criteria or point allocation, and issues with scale complexity/accessibility were the two most frequently reported barriers in both surveys.

Figure 3 illustrates physician approval of the OHFRS and its component criteria, as well as the perceived likelihood of risk scale implementation into Canadian EDs. Overall, 74.4% of respondents rated the scale as being "useful" or "somewhat useful." The only component criteria that did not achieve an approval rating of above 70% were *patient use of anti-arrhythmics* (54.9%) and *urea ≥12 mmol/L* (51.3%). Based on a Likert scale rating of four or five, 66.7% of respondents believed that the risk scale would be implemented into Canadian EDs.

Figure 4 illustrates physician approval of the OCRS and its component criteria, as well as the perceived likelihood of risk scale implementation into Canadian EDs. Overall, 76.9% of respondents rated the scale as being "useful" or "somewhat useful." The component criteria that were rated the highest include *history of intubation for respiratory distress* (99.5%), *acute ischemic changes on ECG* (96.6%), *heart rate ≥110* (90.9%), *failure to perform walk test* (97.6%), and *pulmonary congestion on chest x-ray* (93.3%). The only criteria that achieved an approval rating of below 70% were *history of coronary bypass graft* (51.4%), *history of peripheral vascular disease intervention* (45.7%), and again, *urea ≥12 mmol/L* (51.9%). Based on a Likert scale rating of four or five, 70.2% of respondents believed that the risk scale would be implemented into Canadian EDs.

Figure 5 provides physicians' response to a request to rate the importance of three specific disposition factors that were identified to be important in pre-survey qualitative data collection, but that were not included in the risk scales. Respondents in both survey groups strongly agreed that these

Table 1. Demographic and work characteristics of the 403 responding emergency physicians

Demographics	HF Survey (n = 195)	COPD Survey (n = 208)
Male (%)	67.9%	76.0%
Median Years of Practice (quartile range)	15 (10-24)	15 (9-24.5)
Median Hours Worked in ED Each Week (quartile range)	28 (20-32)	25 (20-32)
Emergency Medicine Credentials (%)		
FRCP*	25.0%	33.3%
CCFPEM**	68.5%	58.6%
CCFP***	6.5%	8.1%
Hospital Setting (%)		
Major Academic Centre	47.9%	47.6%
Community Teaching Hospital	44.3%	46.6%
Non-Teaching Hospital	7.7%	5.8%
Annual ED Visits (%)		
<30,000	8.3%	6.2%
30,000–60,000	39.5%	39.7%
>60,000	52.2%	54.1%

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Table 2. Physician-identified disposition factors not included in risk scales

Disposition Factors	HF Survey (count) (n = 111)	COPD Survey (count) (n = 112)
Patient's cognitive function, understanding, and ability to comply with management	52	40
Presence of comorbidities	35	17
Access to home supports and ability to return to hospital if condition worsens	30	22
Access to follow-up	19	15
Course of illness	17	23
Patient's baseline functional status	14	11
Persistent dyspnea, hypoxia or new O2 requirements	14	17
Renal function	8	-
Goals of care	7	5
Precipitating event	7	1
Response to ED treatment	7	12
Age	5	3
Subjective well-being of patient	-	10
Smoking or substance abuse	-	10
Presence of infection	-	8
Availability of home oxygen	-	7
Ability to afford treatment	1	6
Family concerns and opinions	2	2

Table 3. Physician-identified barriers to risk scale implementation into Canadian EDs

Barriers to Implementation	HF Risk Scale (count) (n = 84)	COPD Risk Scale (count) (n = 95)
Issues with scale point-allocation or component criteria	39	26
Issues with scale accessibility, complexity, memorization	34	45
No better than physician gestalt	17	13
Insufficient hospital resources	13	8
Scale omitting important disposition factors	9	14
Resistance from admitting services	9	9
Lack of familiarity with scale	5	2
Scale validation	5	14
Timely availability of results	4	3
Not helpful for disposition	2	1
Scale will lead to overadmission	1	1
Other	4	8

factors were important when deciding upon patient disposition.

DISCUSSION

Interpretation of results

Emergency physicians were very accepting of the new OHFRS and OCRS, which received comparable overall approval ratings of 74.4% and 76.9%, respectively. Many respondents felt that the risk scales fulfilled an important clinical need by providing an evidence-based decision tool that effectively minimizes uncertainty. Others felt that the scales' main strength was that they provided a common language with which to discuss patient disposition with admitting services. Although physician response was generally positive, the newness of the risk scales potentially prevented an even more favourable outcome. As the scales are less than a year old, supporting literature has not yet fully permeated

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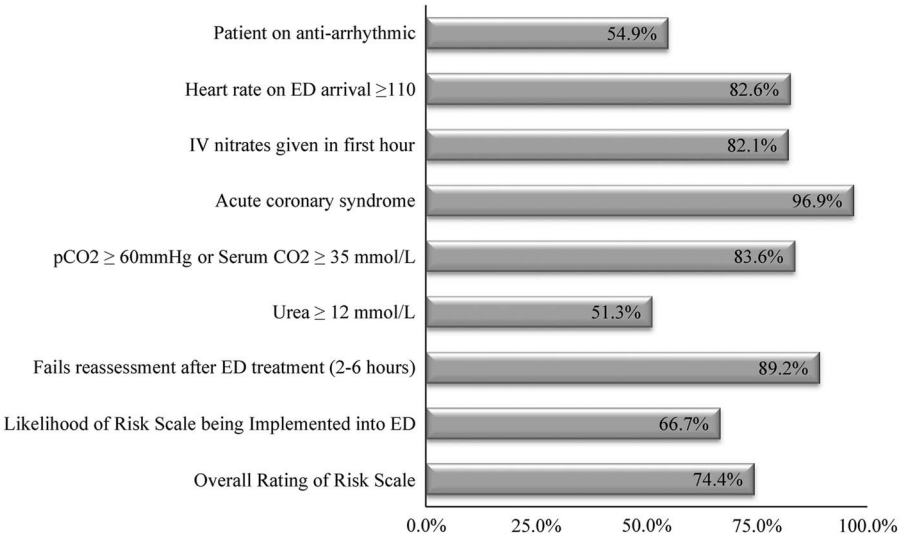

Figure 3. Overall approval of the Ottawa Heart Failure Risk Scale and component criteria (n = 195).

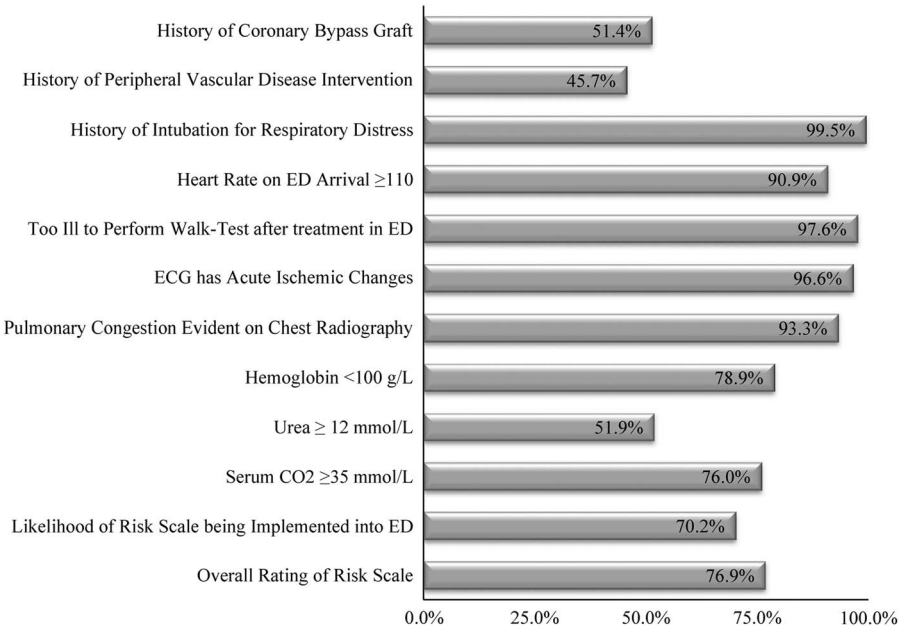

Figure 4. Overall approval of the Ottawa COPD Risk Scale and component criteria (n = 208).

the emergency medicine community.[4,6] This led to several concerns about risk scale validity and may have hindered a potentially more conclusive response.

Our secondary purpose was to identify any barriers that could prevent or delay risk scale implementation into Canadian EDs. While some respondents raised issues with individual criteria, others felt that there were some important disposition factors missing from the risk scales. With regard to the latter, patient comorbidities, ability to comply with management, access to home supports, ability to return to hospital, access to follow-up, and baseline functional status were all identified as important factors that were not addressed by the risk scales. Although each of these factors is arguably important when deciding upon definitive management, it is impossible for each of a patient's personal factors to be included into a succinct bedside decision tool. To date, most successful bedside decision tools, including the Ottawa Ankle Rules and the Canadian C-Spine Rule,[8-10] have aimed

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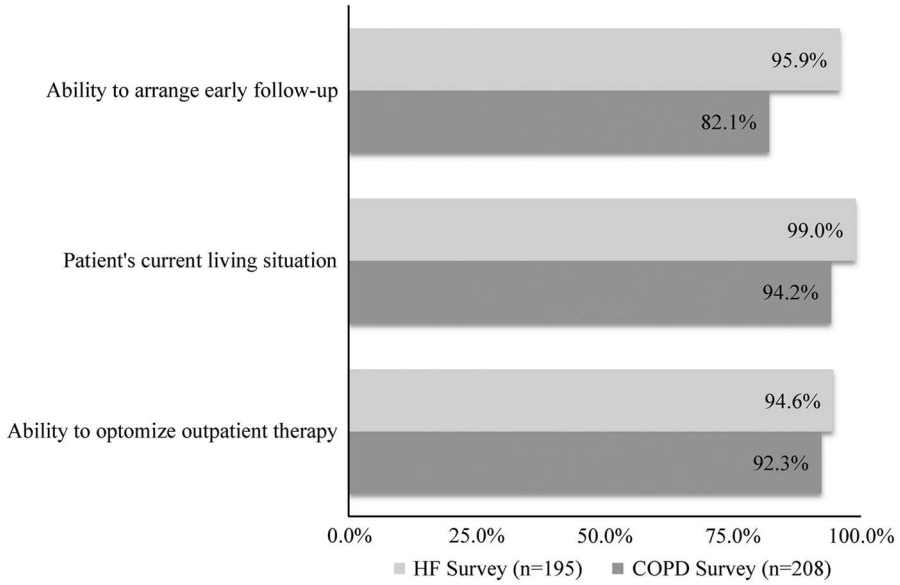

Figure 5. Physician rating of select disposition factors omitted from risk scales.

to provide concrete answers to straightforward clinical presentations with dichotomous problems. With the new OHFRS and OCRS, however, we are attempting to address much more complex clinical issues where the answers are not binary. As such, the ultimate goal of these risk scales is not to make a decision for a clinician, but rather to help them assess a concise set of clinical variables that have been proven to be most predictive of poor patient outcomes. It is then up to the clinician to take this new information and apply it to the overall clinical situation, including the social variables mentioned above, in order to make the safest possible disposition decision for the patient.

Uncertainty regarding risk scale superiority over physician gestalt was another potential barrier identified by respondents. Each of the respective risk scales contain criteria that are relatively intuitive and other criteria that are less so. The intuitive criteria, such as acute coronary syndrome or vital sign abnormalities, are undoubtedly very important when deciding on patient disposition, but there would be no need for a decision tool if all of the criteria of importance were this overtly obvious, as physician gestalt would be more than adequate. We believe one of the main strengths of the OHFRS and OCRS is that they include criteria that are not immediately obvious to most emergency physicians. For instance, in a prospective cohort study of 945 patients, it was found that for acute exacerbations of COPD, a hemoglobin value of below 100 g/L was the factor most predictive of a subsequent serious adverse event.[6] As it turns out, a low hemoglobin value was as important as both a significantly elevated heart rate and acute ischemic changes on electrocardiogram (ECG) combined.[6] The latter was of great surprise to us when developing the risk scales, and we can only assume that the same would hold true for most emergency physicians. Interestingly, it was the criteria that were the least intuitive that fared the poorest when physicians were asked to rate the respective risk scales. The reasons likely relate to another reported barrier to implementation: risk scale complexity. Respondents felt that because certain criteria were not intuitive, the scales were too difficult to memorize. Others felt that the accessibility of the decision tools would be an issue in a fast-paced ED. To address both of these issues, it is our intention to develop a user-friendly mobile application that will provide easy access to both risk scales.

STRENGTHS AND LIMITATIONS

We achieved an overall response rate of 36.9%, which is very reasonable for a physician survey. Our open-ended questions became saturated well before achieving this value and, as such, we do not feel that additional responses would have yielded any incremental value. This being said, a potential limitation to our study is sampling bias. It is possible that the EPs who decided to respond to our surveys were more interested or motivated by the topic. Risk scale approval may therefore

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have been inflated. Further, our findings are based on Canadian data and the results are not necessarily generalizable to other countries. For instance, the usefulness of the risk scales may be limited in the United States, as emergency physicians there are not faced with the same bed pressure and can readily admit a higher proportion of patients. Our scales may have more applicability in countries with medical systems more similar to our own, such as the UK or Australia, and physician acceptance in these regions may be an interesting area of future research. Finally, how we decided to code our open-ended questions could have influenced our results. Because we took multi-faceted ideas and placed them into discrete categories, certain responses could be weighted more or less heavily based on our subjective interpretation of the data.

Study implications

The OHFRS and OCRS are the first decision tools to address the important presentations of decompensated heart failure and COPD and have the potential to change clinical practice. The results of this study allow us to take another step towards achieving this goal. Despite the rigorous research that went into developing these risk scales, including both prospective cohort and validation studies, it is often difficult to predict how the finished products will resonate with intended users. The strong approval ratings found in this study give us confidence that emergency physicians are ready for a tool that will help guide disposition decisions for these two important conditions. By highlighting potential barriers, we will be able to make adjustments that will make the tools more clinically applicable. The information gained from this study will help set the stage for larger implementation studies that will act as the ultimate benchmark for the effectiveness of the OHFRS and OCRS risk scales.

CONCLUSION

Canadian emergency physicians are supportive of the new OHFRS and OCRS. Unlike previous decision rules, the goal of these new risk scales is not to provide dichotomous answers to complex clinical issues, but rather to help physicians assess a succinct list of evidence-based clinical variables to assist them with patient risk-stratification. Beyond this, it will remain up to the physician to use all of the information at their disposal to make safe disposition decisions. It is our belief that if utilized effectively, these new risk scales will help fill a gap in clinical practice and improve outcomes for patients suffering from heart failure and COPD.

Competing Interests: None declared.

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