

# BMJ Open Quality Development and assessment of an educational intervention to improve the recognition of frailty on an acute care respiratory ward

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**To cite:** Leblanc A, Diab N, Backman C, *et al*. Development and assessment of an educational intervention to improve the recognition of frailty on an acute care respiratory ward. *BMJ Open Quality* 2022;**11**:e001935. doi:10.1136/bmjopen-2022-001935

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-001935>).

Received 11 April 2022  
Accepted 21 July 2022



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## ABSTRACT

**Background** Frailty is a robust predictor of poor outcomes among patients with chronic obstructive pulmonary disease yet is not measured in routine practice. We determined barriers and facilitators to measuring frailty in a hospital setting, designed and implemented a frailty-focused education intervention, and measured accuracy of frailty screening before and after education.

**Methods** We conducted a pilot cross-sectional mixed-methods study on an inpatient respiratory ward over 6 months. We recruited registered nurses (RNs) with experience using the Clinical Frailty Scale (CFS). RNs evaluated 10 clinical vignettes and assigned a frailty score using the CFS. A structured frailty-focused education intervention was delivered to small groups. RNs reassigned frailty scores to vignettes 1 week after education. Outcomes included barriers and facilitators to assessing frailty in hospital, and percent agreement of CFS scores between RNs and a gold standard (determined by geriatricians) before and after education.

**Results** Among 26 RNs, the median (IQR) duration of experience using the CFS was 1.5 (1–4) months. Barriers to assessing frailty included the lack of clinical directives to measure frailty and large acute workloads. Having collateral history from family members was the strongest perceived facilitator for frailty assessment. The median (IQR) percent agreement with the gold-standard frailty score across all cases was 55.8% (47.2%–60.6%) prior to the educational intervention, and 57.2% (44.1%–70.2%) afterwards. The largest increase in agreement occurred in the ‘mildly frail’ category, 65.4%–81% agreement.

**Conclusions** Barriers to assessing frailty in the hospital setting are external to the measurement tool itself. Accuracy of frailty assessment among acute care RNs was low, and frailty-focused rater training may improve accuracy. Subsequent work should focus on health system approaches to empower health providers to assess frailty, and on testing the effectiveness of frailty-focused education in large real-world settings.

## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a progressive, incurable, chronic lung disease caused by tobacco smoke exposure.<sup>1 2</sup> Approximately 25%–50% of

### WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Frailty is a robust predictor of poor clinical outcomes among patients with chronic obstructive pulmonary disease yet is not measured in routine clinical practice.

### WHAT THIS STUDY ADDS

⇒ This study demonstrates that barriers to assessing frailty, such as large acute workloads and lack of widespread clinical directives in hospital, are external to the measurement tool itself, and the accuracy of frailty assessments is low. A structured frailty-focused educational intervention has the potential to improve the accuracy of frailty assessments among hospitalised patients but requires testing in larger real-world samples.

### HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Introducing routine patient frailty assessments to improve patient-centred care models for hospitalised patients first requires system-wide approaches to empower frontline staff with resources including clinical directives and targeted frailty-focused education to ensure accurate measurements.

individuals with COPD live with some degree of frailty, defined as a multidimensional state of increased vulnerability to health stressors that is caused by accumulation of health deficits across multiple domains.<sup>3–6</sup> Frailty among individuals with COPD is associated with frequent hospitalisation, longer hospital stays, increased costs, increased mortality and poor quality of life.<sup>4 5 7–10</sup>

Multiple validated instruments can reliably identify an individual’s degree of frailty.<sup>3</sup> The Clinical Frailty Scale (CFS) is a practical, validated bedside tool for clinicians, which relies on the clinical history from patients, and is scored from 1 (very fit) to 9 (terminally ill).<sup>6</sup> Compared with the 80-item Frailty Index, the CFS explains 80% of the variation in frailty

index scores while taking less than a minute to administer.<sup>6 11</sup> Increasing degrees of frailty on the CFS correlate with increasing risk of death and future need for long-term care among adults over 65 years of age.<sup>6</sup> Progressive degrees of frailty are defined by increasing limitations in performing activities of daily living (ADLs) and Instrumental ADLs (online supplemental appendix B).<sup>6</sup> Given the prevalence and prognostic value of frailty among patients with chronic lung disease, it is important for healthcare providers to *accurately* recognise and assess the degree of frailty, to facilitate appropriate treatments, medical decisions and care plans to meet individual patient needs.<sup>12 13</sup>

Previous studies have evaluated the accuracy of frailty assessments among junior medical residents as well as multidisciplinary clinical staff who are experienced in the practice of geriatric medicine.<sup>14</sup> However, there is no evidence regarding the reliability of frailty assessments when performed by respiratory clinicians with little prior experience performing frailty assessment, especially using instruments that rely on subjective clinical data. Experts advocate that frailty assessments be incorporated into clinical pathways and programmes to provide risk stratification, yet there is currently no standardised educational process among respiratory healthcare staff to facilitate this change in practice.<sup>12 15</sup>

The aims of this study were to identify perceived barriers and facilitators to assessing frailty for respiratory patients in the acute care setting, and to design and implement a frailty-focused education intervention centred on common rater biases to educate acute care respiratory registered nurses (RNs). We sought to determine the degree of agreement between RNs and a gold-standard frailty measurement before and after education. If implementation of this educational intervention is successful, we hypothesise that frailty-specific rater training will improve the accuracy of frailty assessments between RNs and a gold-standard frailty assessment performed by geriatricians in the future.

Some of the preliminary results of this study have been previously reported in the form of an abstract.<sup>16</sup>

## METHODS

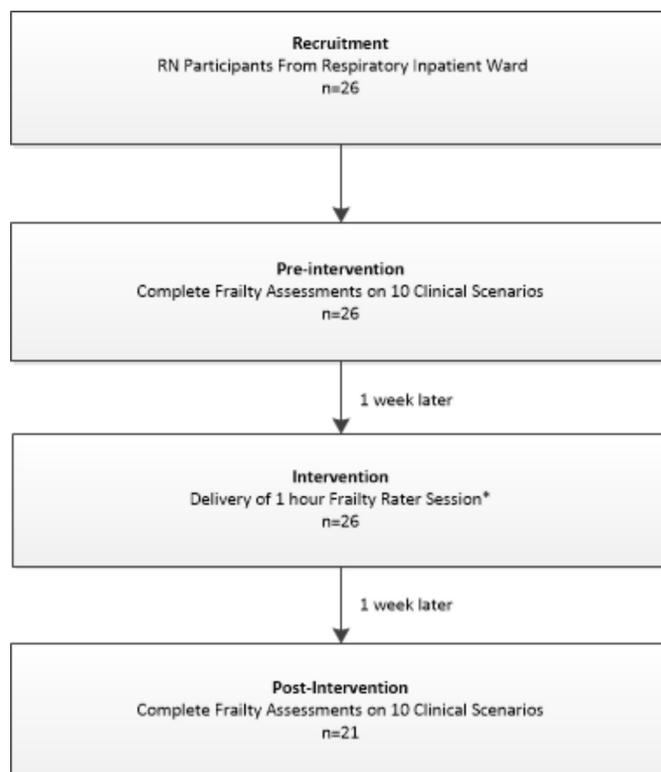
### Study design

We conducted a pilot cross-sectional mixed-methods study on an inpatient respiratory hospital ward over 6 months in 2017. **Figure 1** describes the study process.

The study consisted of: (1) a focus group among experienced RNs to identify barriers and facilitators that influence the current practices of RNs when rating frailty in hospital; (2) development and implementation of a new education intervention designed to address rater biases; and (3) measurements of agreement between RN and gold-standard frailty ratings before and after the educational intervention.

### Setting

The study was conducted at The Ottawa Hospital (TOH) on the acute inpatient respiratory ward. TOH



**Figure 1** Participant recruitment and study procedures. \*Intervention delivered to small groups (six to eight participants) in 1-hour sessions. RN, registered nurse.

is a quaternary care academic hospital with approximately 1200 inpatient beds, serving a local population of >1 million individuals.<sup>17</sup>

### Participants

We recruited RNs working on the acute inpatient respiratory ward at TOH who had experience using a new hospital-based COPD care model that incorporated the CFS instrument to assess frailty within a clinical pathway. RN participants were selected by purposive sampling based on guidance from the nursing clinical leads.

### Focus group: barriers and facilitators to rating clinical frailty

We first conducted a focus group with six of the most experienced (>5 years in practice) RNs on the inpatient respiratory ward to identify nursing perceptions of the CFS instrument, perceived barriers and facilitators to using the CFS in a busy clinical setting, and to determine whether a rater training course would be perceived as useful (online supplemental appendix A). Verbal consent was obtained prior to participation in the focus group. A recording of the focus group discussion was independently reviewed by two study authors (AL, SM), to identify the emerging themes. The final themes were determined by consensus.

### Educational intervention design

We developed a novel, structured, rater training, frailty-focused education intervention to review and overcome known rater biases for frontline healthcare workers.<sup>18-20</sup>

**Table 1** Components of the rater training education intervention to assist with recognition and assessment of frailty

Educational section	Delivery method	Components
Concept of frailty	Lecture	The concept of frailty Use of the Clinical Frailty Scale Prevalence of frailty in COPD Impact of frailty on COPD outcomes (mortality, exacerbation, hospitalisation, etc)
Frame of reference training	Facilitated group discussion	Independent frailty ratings by participants of a clinical example Participants supported their ratings by citing specific patient factors
Rater error training	Facilitated group discussion	Examples of common rating errors (leniency, halo, central tendency, primacy) were provided Four clinical vignettes with rating errors were then presented Participants were encouraged to identify and discuss the rating errors present in the four clinical vignettes
Performance dimension training	Small and facilitated group discussion	Groups of 2–3 discussed and provided a rating for 1–2 clinical vignettes Each group was provided different vignettes A summary and rating were presented by a spokesperson of each group Group discussion to probe for supporting evidence and develop consensus was encouraged by the facilitator

COPD, chronic obstructive pulmonary disease.

The course content was adapted from previous rater training concepts and included four key components: (1) introduction to the frailty concept, (2) frame of reference training, (3) rater error training and (4) performance dimension training (table 1).<sup>18–24</sup> *Frame of reference* training was presented using a clinical example of an older patient with comorbidities who was hospitalised with acute exacerbation of COPD. Following independent frailty ratings, participants openly discussed specific patient factors that determined their rating. *Rater error* training was presented with an explanation of four common rating biases (leniency effect, halo effect, central tendency effect and primacy effect). Four clinical vignettes were presented along with a corresponding frailty rating and reasoning given by a fictitious rater to highlight each rating bias. In a facilitated group discussion, participants were asked to identify the rater bias present, and tips to avoid common rating biases were discussed. *Performance dimension* training involved a review of the CFS instrument degrees of frailty (online supplemental appendix B). Participants were separated into small groups (two to three members) and asked to rate the degree of frailty in two clinical vignettes of older patients admitted for acute exacerbation of COPD. After discussion, one spokesperson from each group presented a summary of the case as well as their suggested frailty rating. Questions and disagreement were encouraged and facilitated, and each rating was challenged by the facilitator to probe the participants' underlying reasoning for the rating assigned. The goal was to reach a group consensus for each of the four vignettes discussed.

### Education intervention delivery

The education intervention was delivered to groups of six to eight RN participants over four separate 1-hour small group sessions, facilitated by the study team members

with training and experience in medical education and rater training (AL, SM).

### Assessing clinical frailty ratings

Based on the authors' clinical experience with patients admitted to the respiratory medicine ward, the CFS category 'very fit' (score=1) was not included in the study, as hospitalised patients with COPD at our centre generally did not meet criteria for 'very fit'.<sup>25</sup> For the purposes of this study, frailty categories studied ranged from 'well' (rating of 1) and final category was 'terminally ill' (rating of 8) (online supplemental appendix B).

### Pre-intervention

One week prior to the rater training course, RN participants completed a structured questionnaire of baseline demographic questions, number of months of experience on the acute respiratory ward and the number of times the participant had used the CFS in clinical practice. Questions regarding barriers and facilitators to using the CFS were based on the responses provided by the initial focus group of experienced RNs (n=6), in addition to factors the study team deemed relevant. Participants were asked to rank eight potential barriers to using the CFS: from 1 (most important barrier) to 8 (least important barrier) (online supplemental appendix C). Participants were asked to select all items from a standardised list that they felt would facilitate the use of the CFS.

The second portion of the structured questionnaire presented 10 fictional clinical vignettes describing hospitalised patients with acute exacerbation of COPD (online supplemental appendix D). The clinical vignettes were developed, edited and reviewed by study authors (physicians and nurses) with experience in assessing and treating hospitalised patients with COPD (AL, ND, CB, SM). The information presented in each vignette

simulated the degree of information received upon a standard admission history and chart review by an RN. All cases were reviewed by two of the study authors (AL, SM) to standardise the presentation of the cases. There was one case for each CFS category, with two cases each for the 'vulnerable' (rating of 3) and 'moderately frail' (rating of 5) categories. RN participants were asked to provide a frailty rating using the CFS for the patient described in each clinical vignette. Ratings were based on the description of the baseline functional status of the patient (at 2 weeks prior to hospitalisation). Participants were required to complete the questionnaire and frailty rating exercise to participate in the rater training educational course.

### Post-intervention

One week following the rater training course, all participants were asked to complete a second questionnaire. RNs were asked to assign frailty ratings to the same 10 clinical vignettes, presented in random order to reduce the potential for recall bias.

### Gold-standard frailty assessments

The clinical vignettes used in the questionnaires were distributed to a geriatrician (SH) and advance practice geriatrics nurse (TP) who each assigned a frailty assessment to each vignette. This geriatrics team had extensive experience in using the CFS instrument in routine clinical settings. Any disagreements in the ratings between the geriatrics team and authors of the vignettes were resolved by consensus.

### Outcomes

The primary outcomes were the identification of barriers and facilitators to assessing frailty in the acute care setting, and the degree of agreement between RNs and the gold-standard frailty rating prior to the education intervention. Secondary outcomes included the per cent agreement between RNs and the gold-standard frailty after the educational intervention.

### Statistical analysis

Demographic data of the RN participants were described using means ( $\pm$ SD) and proportions. Barriers to using the CFS were ordered from most important (lowest score) to least important (highest score), by calculating the sum of each participant's ranking, where the lowest sum indicated the most important perceived barrier. Facilitators were described by the proportion of RNs who indicated their importance.

The agreement between RNs and the gold-standard frailty rating was assessed for each case using the percentage of agreement (number of RNs who agreed with the gold standard/total number of RNs), before and after the education intervention. McNemar's test was used to compare the degrees of agreement before and after the education intervention.

## RESULTS

### Initial focus group with experienced RNs to explore frailty assessment in acute care

Two main themes emerged from the focus group of six experienced acute care RNs; (1) the RNs found that the CFS instrument was straightforward to use, and (2) the barriers to using the frailty scale are external to the frailty scale itself, with *time* to assess and perform the rating being the most significant perceived barrier. Other barriers identified were included in the standardised questionnaire for RN study participants (online supplemental appendix C). The CFS was recognised as being important for patient care; however, RNs found their opportunity to perform frailty assessments was infrequent.

### RN participant demographics

Among 26 participating RNs, a range of nursing experience was observed with a median (IQR) of 15 (15.5–105) months. The median (IQR) duration of prior use of the CFS instrument was minimal at 1.5 (1–4) months. A total of five RNs were lost to follow-up at the end of the study.

### Barriers and facilitators to using the CFS in a clinical setting

Table 2 describes the perceived barriers and facilitators to using the CFS instrument at the time of hospitalisation. The most important barriers to using the CFS on an acute care respiratory ward were having a lack of clinical directive, lack of collateral patient history to assign the frailty score and high inpatient workload at the time that frailty rating was required. Understanding the CFS and timely completion of the CFS were not highly ranked barriers to use. The most frequently identified facilitators to using the CFS included the presence of family members at the bedside to provide additional history at the time of patient admission (n=21, 78%), increasing the flexibility in the time window to complete the CFS (ie, to complete within first 24 hours of admission) (n=19, 70%) and more education on how to use the CFS (n=14, 52%).

### RNs' agreement with gold-standard frailty assessment

The median (IQR) overall per cent agreement across all cases was 55.8% (47.2%–60.6%) prior to the education intervention, and 57.2% (44.1%–70.2%) afterwards.

Following the education intervention, there was an increased degree of agreement with gold-standard frailty ratings for all frailty categories (table 3), although none were statistically significant by the McNemar's test p value cut-off of <0.05.

The largest increase in agreement occurred within the 'mildly frail' category, 65.4%–81% agreement after the educational intervention.

## DISCUSSION

In this pilot study, the most important barriers to assessing patient frailty in the acute care respiratory setting were external to the CFS instrument itself and included a perceived lack of time due to large workloads, lack of collateral clinical history from caregivers and a lack of

**Table 2** Barriers and facilitators to using the CFS in hospital (most to least important) among 26 acute care respiratory RNs

Barriers*	Median rank† (IQR)
No clinical directive to use CFS	1 (1–2.5)
High workload at time when CFS assessment required	3 (3–4.5)
Lack of collateral history from caregivers/family members	3 (3–4)
Patient too ill to provide information	4 (2.5–5.5)
Communication barrier with patient	4 (2.5–6.5)
Takes too long to use the CFS	6 (5–7)
CFS is difficult to understand	6 (5–7)
CFS is not practical	6 (5–8)
Facilitators‡	Number (%)
Family present at bedside	21 (77.8)
More flexible time window to complete rating	19 (70.0)
More education on how to use the scale	14 (51.9)
Providing the rating at time of admission to hospital	12 (44.4)
Discuss the rating with clinical colleagues	9 (33.3)
Other§	5 (18.5)

\*Data missing from four participants. Barriers ranked from 1 to 8; 1 indicating most important barrier, 8 indicating least important barrier.  
 †Median score represents the median rank, with lower scores being the *most important* barriers.  
 ‡Facilitators were selected from a standardised list and presented as the number (%) of RNs who selected the item.  
 §Other (open-ended) items participants felt would facilitate the use of the CFS.  
 CFS, Clinical Frailty Scale; RNs, registered nurses.

clinical directives to routinely perform frailty assessments on hospitalised patients. Further, half (51%) of our sample of RNs felt that frailty-focused education would facilitate the application of the CFS instrument in the hospital setting. At baseline, there was low agreement (56%) between RNs and a gold-standard frailty rating and following a structured rater training education intervention, there was a non-significant increase in agreement in all categories of frailty.

Advocates for person-centred care emphasise the benefits of using frailty assessments as a risk stratification tool to treat, prognosticate and support patients with chronic

disease, calling frailty ‘a new vital sign’.<sup>12 13 15</sup> Our study demonstrates that real barriers do exist to measuring frailty in the acute care setting and these must be addressed at a health system level before frailty assessments can be integrated into standard care processes for patients with chronic lung disease. Our findings among respiratory RNs are echoed in qualitative interviews with emergency, anaesthesia and surgery providers in Singapore, which identified the need for frailty-focused educational programmes for both patients and providers, an integrated approach to frailty screening, and hospital-wide adoption of a common frailty screening tool.<sup>26</sup>

**Table 3** Per cent agreement between RN and gold-standard frailty ratings before and after the frailty education intervention

Gold-standard CFS rating	Prior to education (n=26) % agreement	Post-education (n=21)* % agreement	P value†
Well and managing well (case 1, case 4)	63.5	71.4	0.55
Vulnerable (case 6, case 10)	51.9	52.4	0.61
Mildly frail (case 2)	65.4	81.0	0.34
Moderately frail, severely frail, very severely frail and terminally ill (cases 3, 7, 9, 8, 5)	45.4	50.5	0.88

\*After the educational intervention, five RNs were lost to follow-up and did not rate clinical vignettes.  
 †McNemar’s test used to compare % agreement before and after educational intervention with n=21 subjects. Categories of ‘vulnerable’ and ‘moderately frail, severely frail, very severely frail and terminally ill’ compared 20 subjects due to missing data points from one subject.  
 CFS, Clinical Frailty Scale; RNs, registered nurses.

Data from European health policy providers identified that widespread implementation of frailty screening and management requires a 'culture shift' and redeployment of health resources to facilitate an integrated and multi-disciplinary care approach.<sup>27</sup> Empowering other members of the healthcare team (allied health professionals) and patients and caregivers to participate in the frailty assessment in early stages of the hospitalisation may address important barriers to performing frailty assessments in acute care settings. Further, targeted education on potential interventions that can be applied for progressive degrees of frailty may increase the drive to perform frailty assessments in acute care.

While systemic change in health systems is needed to incorporate patient frailty assessment, prevention and supportive intervention, accurate identification of frailty is also essential. In our small pilot study, only half of participating RNs agreed with the gold-standard frailty assessment, and modest non-significant improvement occurred after further education. This is in contrast to data from the critical care literature which suggest that agreements in frailty assessment using the CFS instrument were 'good' with a kappa score of 0.64 (0.4–0.87,  $p < 0.0001$ ) between medical students and critical care attendings.<sup>28</sup>

A larger critical care study also found adequate reliability of frailty measurements between research coordinators, occupational therapists and geriatric medicine trainees.<sup>29</sup> Robust data supporting the reliability of frailty assessments among lung health practitioners are lacking, and our pilot study identified a clear desire among RNs for frailty-focused training. The increase in cognitive load of a busy medical inpatient unit may increase the risk of rating error and bias.<sup>30 31</sup> In the context of frailty assessment in hospitalised patients, there is a risk of both halo and primacy effects, where the rater may be biased by the patient's clinical or functional state in the moment of their acute illness. Targeting such common and context-specific rating errors may decrease rater bias and improve accuracy of assessments. Given the small sample sizes and observational nature of this study, the observed increases in agreement of frailty scores between participants and the gold standard cannot be solely attributed to the educational intervention and must be further studied with larger samples and with real-world patients.

To our knowledge, this pilot study is the first to describe barriers to frailty assessment in the acute care respiratory setting and to design and implement a structured rater training educational intervention targeted at improving frailty assessments among frontline nursing staff in an acute care hospital. Strengths of this study include the components of the educational intervention, which were developed and rooted in standardised rater training literature and the qualitative feedback elicited from frontline healthcare staff in an acute care clinical setting. Limitations of our study include the small sample size and the use of 10 standardised clinical vignettes as opposed to an authentic clinical setting with real-world patients. Other limitations include the potential for recall bias among

RNs, given the same clinical vignettes were used before and after the intervention (in scrambled order). However, we attempted to minimise the effect of recall bias by allowing a 1-week interval delay before RNs rescored the vignettes in sporadic order.

## CONCLUSIONS AND LESSONS LEARNT

This study demonstrates that barriers to assessing patient frailty, such as large acute workloads and lack of widespread clinical directives in hospital, are external to the measurement tool itself. Accuracy of frailty assessment among acute care RNs was low. Frailty-focused rater training was successfully implemented but did not statistically improve accuracy in this small pilot study. Our results support (1) the need for high-level health system planning and hospital-wide approaches to address barriers to incorporating patient frailty assessments in a meaningful way, and (2) expanding the rater training educational intervention to an iterative training process with larger sample sizes of real-world patients and scalable training formats to test its effectiveness in the acute care respiratory setting.

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**Acknowledgements** We gratefully acknowledge Jan Leahy, Sonia Joanise and Ley-Ann Mondor for their nursing leadership, assistance with study coordination and collaboration. We are highly appreciative of the nursing staff on the respiratory ward at The Ottawa Hospital who kindly agreed to participate in this study.

**Contributors** AL, ND, CB, SH, TP and SM conceived the initial study design and collected data. AL, SM and ND conducted the analysis. All authors (AL, ND, CB, SH, TP, MC, DK, DM, JL, AF, SM) contributed to the analysis or interpretation of the data/analysis and critical review and revision of the manuscript for intellectual content. SM accepts full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** The authors declare no financial or personal conflicts of interest related to this work.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not required.

**Ethics approval** This study involves human participants and was approved by The Ottawa Health Sciences Research Ethics Board (OHSN-REB) ID: 20170676-01. Participants gave informed consent to participate in the study before taking part.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** All data relevant to the study are included in the article or uploaded as supplemental information.

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## REFERENCES

- Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease, 2019
- O'Donnell DE, Aaron S, Bourbeau J, *et al*. Canadian thoracic Society recommendations for management of chronic obstructive pulmonary disease - 2007 update. *Can Respir J* 2007;14 Suppl B:5B-32.
- Clegg A, Young J, Iliffe S, *et al*. Frailty in elderly people. *Lancet* 2013;381:752-62.
- Lahousse L, Ziere G, Verlinden VJA, *et al*. Risk of frailty in elderly with COPD: a population-based study. *J Gerontol A Biol Sci Med Sci* 2016;71:689-95.
- Marengoni A, Vetrano DL, Manes-Gravina E, *et al*. The relationship between COPD and frailty: a systematic review and meta-analysis of observational studies. *Chest* 2018;154:21-40.
- Rockwood K, Song X, MacKnight C, *et al*. A global clinical measure of fitness and frailty in elderly people. *CMAJ* 2005;173:489-95.
- Bernabeu-Mora R, García-Guillamón G, Valera-Novella E, *et al*. Frailty is a predictive factor of readmission within 90 days of hospitalization for acute exacerbations of chronic obstructive pulmonary disease: a longitudinal study. *Ther Adv Respir Dis* 2017;11:383-92.
- Kennedy CC, Novotny PJ, LeBrasseur NK. Frailty and clinical outcomes in chronic obstructive pulmonary disease. *Ann Am Thorac Soc* 2018. doi:10.1513/AnnalsATS.201803-175OC
- Maddocks M, Kon SSC, Canavan JL, *et al*. Physical frailty and pulmonary rehabilitation in COPD: a prospective cohort study. *Thorax* 2016;71:988-95.
- Medina-Mirapeix F, Bernabeu-Mora R, García-Guillamón G, *et al*. Patterns, trajectories, and predictors of functional decline after hospitalization for acute exacerbations in men with moderate to severe chronic obstructive pulmonary disease: a longitudinal study. *PLoS One* 2016;11:e0157377.
- McIsaac DI, Taljaard M, Bryson GL, *et al*. Frailty as a predictor of death or new disability after surgery: a prospective cohort study. *Ann Surg* 2020;271:283-9.
- Sinha S, Mckee A, Dunning J. *We Can't Address What We Don't Measure Consistently: Building Consensus on Frailty in Canada*. Toronto, Ontario, 2018. <https://www.ryerson.ca/nia/white-papers/frailty-paper.pdf>
- Cicutto LC. Frailty: is this a new vital sign? *Chest* 2018;154:1-2.
- Gregorevic KJ, Hubbard RE, Lim WK, Katz B, *et al*. The clinical frailty scale predicts functional decline and mortality when used by junior medical staff: a prospective cohort study. *BMC Geriatr* 2016;16:117.
- Muscedere J, Andrew MK, Bagshaw SM, *et al*. Screening for frailty in Canada's health care system: a time for action. *Can J Aging* 2016;35:281-97.
- Diab N, Leblanc A, Backman C. Assessing an educational intervention to improve recognition of frailty in hospitalized patients with COPD. *European Respiratory Society* 2019:PA1476.
- The Ottawa Hospital annual report, 2021. Ottawa, Ontario, Canada
- Chafouleas SM, Kilgus SP, Riley-Tillman TC, *et al*. Preliminary evaluation of various training components on accuracy of direct behavior ratings. *J Sch Psychol* 2012;50:317-34.
- Cook DA, Dupras DM, Beckman TJ, *et al*. Effect of rater training on reliability and accuracy of mini-CEX scores: a randomized, controlled trial. *J Gen Intern Med* 2009;24:74-9.
- Holmboe ES, Hawkins RE, Huot SJ. Effects of training in direct observation of medical residents' clinical competence: a randomized trial. *Ann Intern Med* 2004;140:874-81.
- Holmboe ES. Direct Observation by Faculty. In: Holmboe ES, Hawkins RE, eds. *Practical guide to the evaluation of clinical competence*. Philadelphia: Mosby Elsevier, 2008: 119-29.
- Hansen T, Elholm Madsen E, Sørensen A. The effect of rater training on scoring performance and scale-specific expertise amongst occupational therapists participating in a multicentre study: a single-group pre-post-test study. *Disabil Rehabil* 2016;38:1216-26.
- Raj JM, Thorn PM. A faculty development program to reduce rater error on milestone-based assessments. *J Grad Med Educ* 2014;6:680-5.
- Swanwick T, Forrest K, O'Brien BC. *Understanding Medical Education: Evidence, Theory, and Practice*. 3rd ed. Hoboken, NJ: Wiley-Blackwell, 2018. <https://onlinelibrary.wiley.com/doi/pdf/10.1002/9781119414111.ch11>
- Chin M, Voduc N, Huang S, *et al*. Practical lessons in implementing frailty assessments for hospitalised patients with COPD. *BMJ Open Qual* 2020;9:e000782.
- Liu X, Le MK, Lim AYC, *et al*. Perspectives on frailty screening, management and its implementation among acute care providers in Singapore: a qualitative study. *BMC Geriatr* 2022;22:58.
- Gwyther H, Shaw R, Jaime Dauden E-A, *et al*. Understanding frailty: a qualitative study of European healthcare policy-makers' approaches to frailty screening and management. *BMJ Open* 2018;8:e018653.
- Pugh RJ, Thorpe CM, Subbe CP. A critical age: can we reliably measure frailty in critical care? *Crit Care* 2017;21:121.
- Shears M, Takaoka A, Rochweg B, *et al*. Assessing frailty in the intensive care unit: a reliability and validity study. *J Crit Care* 2018;45:197-203.
- Royce CS, Hayes MM, Schwartzstein RM. Teaching critical thinking: a case for instruction in cognitive biases to reduce diagnostic errors and improve patient safety. *Acad Med* 2019;94:187-94.
- O'Sullivan ED, Schofield SJ. Cognitive bias in clinical medicine. *J R Coll Physicians Edinb* 2018;48:225-32.

**Appendix A:** Description of semi-structured focus group questions used among 6 experienced RNs to identify barriers and facilitators to using the Clinical Frailty Scale in an acute care setting.

<p><b>Section 1: Introduction</b></p>	<p>Thank you for agreeing to participate in this focus group.</p> <p><i>Introductions of interviewers and participants</i></p> <p>We have implemented a COPD pathway on 6NW, and this pathway includes the Clinical Frailty Scale rating for COPD patients admitted to respiratory. Our aim with this focus group is to explore the use of the frailty ratings specifically, and if you have any suggestions on how the rating process could be made easier or more understandable. This session should take roughly a half hour.</p> <p>Your participation in this focus group is entirely voluntary, and you can ask to leave at any time. We will be recording this session to analyze your responses in more depth after we have concluded the session.</p> <p><i>Ensure no one has any concerns with the use of the recording device.</i></p> <p>We will be using your responses to help draft a survey that we will be distributing to the other nurses on 6NW to explore their opinion. However, your individual responses and opinions will remain anonymous.</p> <p>Do you have any question before we get started?</p>
<p><b>Section 2: Demographic</b></p> <p><i>Our first set of questions will help us gain an understanding of your prior experience.</i></p>	<p>a) How long have you been working on 6NW? <i>Clarify that this is prior to the introduction of the pathway</i></p> <p>b) Does anyone have prior experience in frailty assessments or using the Rockwood Frailty scale other than on 6NW?</p>
<p><b>Section 3: Frailty Scale Use</b></p> <p><i>Our next set of questions will be related to the use of the COPD pathway, specifically the Frailty Scale rating</i></p>	<p>a) How do you find the Rockwood Frailty Scale rating?</p> <p>b) When do you find you are most often rating patients? <i>ie: time of shift, time following admission, etc.</i></p> <p>c) How often do you use the COPD pathway and the Rockwood Frailty scale? i) Do you perform this rating with every COPD admission? If not, why not?</p>
<p><b>Section 4: Barriers</b></p>	<p>a) Have you experienced any barriers to using the frailty scale? <i>ie: unclear directions, busy clinical unit, not enough information</i></p> <p>i) Do you have any specific examples?</p>

	<p>b) What would you say is the most significant barrier? Why?</p> <p>c) Is there anything you wish was clearer or easier to understand with regards to the frailty scale use?</p>
<b>Section 5: Facilitators</b>	<p>a) Is there anything that you have found that makes using the frailty scale easier?</p> <p>b) Do you have any suggestion on how we could make the frailty scale rating process easier?</p> <p><i>Educational programs and workshops can be used to help healthcare workings with the use of rating scales.</i></p> <p>c) What are your thoughts on participating in an educational session on how to use the Rockwood Frailty scale?</p>
<b>Conclusion</b>	<p>Those were the last of our questions. Does anyone have any questions or anything they would like to add before we finish?</p> <p>We want to make sure that we have understood your responses today. Once we have finished our analysis and summary of your responses, we will circulate our summary to all of you, and you will have the opportunity to provide us with feedback and to suggest any corrections or misunderstandings that we have made.</p> <p>I would like to thank you once again for your participation today.</p>

## Appendix B. The Clinical Frailty Scale (CFS) (Rockwood et al. CMAJ 2005)

### Clinical Frailty Scale\*

 **1 Very Fit** – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

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 **2 Well** – People who have **no active disease symptoms** but are less fit than category 1. Often, they exercise or are very **active occasionally**, e.g. seasonally.

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 **3 Managing Well** – People whose **medical problems are well controlled**, but are **not regularly active** beyond routine walking.

---

 **4 Vulnerable** – While **not dependent** on others for daily help, often **symptoms limit activities**. A common complaint is being “slowed up”, and/or being tired during the day.

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 **5 Mildly Frail** – These people often have **more evident slowing**, and need help in **high order IADLs** (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

---

 **6 Moderately Frail** – People need help with **all outside activities** and with **keeping house**. Inside, they often have problems with stairs and need **help with bathing** and might need minimal assistance (cuing, standby) with dressing.

 **7 Severely Frail** – **Completely dependent for personal care**, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

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 **8 Very Severely Frail** – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

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 **9. Terminally Ill** – Approaching the end of life. This category applies to people with **a life expectancy <6 months**, who are **not otherwise evidently frail**.

**Scoring frailty in people with dementia**

The degree of frailty corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In **severe dementia**, they cannot do personal care without help.

\* 1. Canadian Study on Health & Aging, Revised 2008.  
2. K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495.

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**Appendix C.** Questions asked to RN's to identify the barriers and facilitators of using the Clinical Frailty Scale (CFS) to assess frailty for hospitalized patients with COPD.

**What are the barriers to using the frailty scale to rate patients?**

**Please rank the following items, with "1" being the most important barrier and "8" being the least important barrier:**

- No order received to initiate the COPD pathway
- The rating scale is difficult to understand
- High workload (other paperwork, other admissions, etc.)
- The rating scale is not practical
- There is a language barrier present
- The patient is too sick to perform the rating scale
- Lack of collateral information
- It takes too long to use the frailty rating scale
- Other (please state): \_\_\_\_\_

**In your opinion, what would make the frailty rating process easier to do? Please check all that apply.**

- A more flexible time window to complete rating scale (*ie: rate within first 24 hours of admission*)
- Education session(s) on *how* to rate frailty
- Asking patient's family members for additional information
- Rating patients initially upon admission
- Discussing with colleagues to form a consensus on the frailty rating
- Other (please state): \_\_\_\_\_

## Appendix D. Clinical vignettes presented to study participants before and after the educational intervention.

### Case #1

70-year-old gentleman is admitted with an acute exacerbation of COPD. He has a 3-day history of shortness of breath, fever/chills, and cough with yellow sputum production. He has been started on prednisone, azithromycin, and tamiflu as well as straight ventolin and atrovent inhalers.

On examination, his vital signs are: Temp: 38.3 degrees C, HR 110, BP, 110/60 and SpO<sub>2</sub> of 91% on 4L via nasal cannula. The patient is in mild respiratory distress with increased work of breathing and accessory muscle use. There are diffuse expiratory wheezes are heard throughout all lung fields.

At his baseline, he does not complain of any shortness of breath, cough or sputum production. He has a past medical history of COPD and hypertension. He is an ex-smoker who quit 10 years ago after a 30-pack year history. He golfs during the summer, and he is able to walk to the grocery store 2 blocks away with absolutely no complaints of breathlessness.

**Frailty Rating:** \_\_\_\_\_

### Case #2

76-year-old gentleman is admitted with an acute exacerbation of COPD. He has had a 3-day history of cough and increased sputum production of thick yellow sputum. He has been started on prednisone, doxycycline and regular inhalers.

Upon initial assessment, his vital signs are BP 154/84, HR 114, RR 30, Temp 37.9 degrees C, and SpO<sub>2</sub> 90% on 1L of oxygen by nasal cannula. Decreased breath sounds with a mild expiratory wheeze are noted throughout all lung fields on auscultation.

He suffers from COPD, hypertension, impaired mobility, and mild cognitive impairment. He is prescribed 15 medications a day, although he admits that he often forgets to take some of them. He lives alone in a 5th floor one-bedroom apartment 5-storey apartment building with no elevators. In the last month, he has received regular visits from a close relative to help him with heavy housework, and to transport him to appointments. He also needs support with shopping and meal preparation. In the last two weeks, he started receiving 'meals on wheels' to ensure adequate nutrition.

**Frailty Rating:** \_\_\_\_\_

### Case #3

64-year-old lady with very severe COPD and frequent exacerbations presents to the emergency department with an acute exacerbation, caused by influenza. She is treated with antibiotics, tamiflu, bronchodilators and prednisone. She did not receive her influenza vaccine this year as the vaccine just became available this week. She quit smoking 6 months ago, and her only medical history is hypertension.

On examination in hospital, she is using 5L of oxygen by nasal prongs for saturations of 94%, HR is 110 beats per minute, BP is 136/90, RR is 20, and Temp is 38.5 degrees C. She appears underweight, and visibly short of breath with use of accessory muscles. She is currently able to speak in short sentences but has to stop intermittently to catch her breath.

At her baseline, she lives at home with her elderly husband who also has some health problems. She uses a 4-wheel-walker for ambulation outside the home. They have hired a service for regular housekeeping, and she also receives regular personal care via a home care service for assistance with bathing. She is able to dress and feed herself. In the last 1 year she has limited her outings due to shortness of breath, and is considering a move to assisted living with her husband in the near future.

**Frailty Rating:** \_\_\_\_\_

### Case #4

68-year-old gentleman, admitted with a diagnosis of an acute exacerbation of COPD. He has had a cough of thick yellow-green sputum for the past 3 days, as well as increased shortness of breath. He has been started on levofloxacin, prednisone, and scheduled ventolin and atrovent.

On examination, he appears irritable and anxious. There is note of decreased breath sounds, expiratory wheezes, and coarse crackles in both lower lobes anteriorly and posteriorly. His vital signs are BP 162/84, HR 124, RR 36, Temp 38.9 degrees C, and SpO2 88% on room air.

He has a past medical history of COPD, hypertension and type 2 diabetes. He has had pneumonia yearly for the past 3 years. He is a two-pack-a-day smoker for 38 years who quit 2 years ago.

At baseline, he complains of sleeping poorly and states that in the past two weeks, he has been feeling tired most of the time. He takes a short walk around the block every day. He lives alone, and is able to perform house cleaning, shopping, dressing, and bathing well. He can also manage his finances independently.

**Frailty Rating:** \_\_\_\_\_

#### Case #5

74-year-old gentleman admitted with a COPD exacerbation. He has a 2-day history of worsening shortness of breath despite increasing his home oxygen. He was found to be more drowsy than usual by his family this morning. He has not responded to initial treatment with ventolin, atrovent and prednisone in the emergency department, and his family states that he has been too drowsy to communicate for the past hour.

On examination, he appears uncomfortable, and grimaces occasionally. He has a decreased level of consciousness and his only verbal response is groaning. Vital signs are as follows Temp: 36.3 degrees C, HR: 80, BP: 100/60 and SpO2 of 93% on 100% non-rebreather mask. There are decreased breath sounds are noted on lung auscultation.

At his baseline, he has had shortness of breath with minimal activity, and he has been spending most of the day in bed for the past 2 months. This is the patient's 4<sup>th</sup> admission this year for a COPD exacerbation. On his last admission, he stated that he would not want to receive CPR, defibrillation, intubation, or any BiPAP in the event of respiratory failure.

**Frailty Rating:** \_\_\_\_\_

#### Case #6

71 year-old year old lady living at home alone who is admitted for an acute exacerbation of COPD. She presented to the emergency department with a 2 day history of cough with increased thick yellow sputum, fevers and night sweats and extreme shortness of breath which prevented her from carrying out her routine daily activities.

On examination, the patient is on 7L of oxygen via nasal prongs saturating at 93% with a respiratory rate of 25-32. She has expiratory wheezing throughout both lung fields with coarse crackles in her right and left lower lobes. Her BP is 98/56, HR is 130 and Temp is 38.9 degrees C.

Her past medical history is significant for COPD, atrial fibrillation, hypertension, and dyslipidemia.

She has smoked a pack and a half since the age of 20 and continues to smoke today. She has an active social life and goes to bingo with her friends 3 times a week. She can ambulate independently and manage her own personal care, but lately has found herself more fatigued with her regular activities. She has 2 sons living in Ottawa and grandchildren who visit her regularly.

**Frailty Rating:** \_\_\_\_\_

#### Case #7

62-year old lady admitted with a COPD exacerbation. She has had a 1-day history of worsening shortness of breath and worsening cough with green sputum production.

On examination, her vital signs are as follows: Temp: 37.2 degrees C, HR: 90, BP: 120/75, and SpO2 of 90% on 1L oxygen via nasal cannula. On lung auscultation, there is expiratory wheezing heard throughout all lung fields.

She has a past medical history of coronary artery disease, hypertension, diabetes, osteoporosis and osteoarthritis.

At baseline, she has shortness of breath while dressing and needs help with bathing. She lives with her daughter and son-in law, who do all of the meal preparation, grocery shopping, and house cleaning. She has not left the house the past month due to excessive breathlessness and hip pain. She has required help dressing the past month due to excessive breathlessness.

**Frailty Rating:** \_\_\_\_\_

**Case #8**

82-year-old lady admitted for pneumonia and COPD exacerbation. She has had a five day history of worsening shortness of breath and cough as well as a two days history of fever and chills. She has been started on prednisone, ceftriaxone, azithromycin and regular inhalers with improvement in her breathlessness and oxygen requirements.

The patient appears uncomfortable, with increased work of breathing. Decreased breath sounds, expiratory wheezes, and coarse crackles are heard in both lower lobes. Her vital signs are BP 102/64, HR 52, RR 22, Temp 38.9 degrees C, and SpO2 of 91% on 5L of supplemental oxygen.

At her baseline, her past medical history is significant for COPD, hypertension, metastatic colon cancer, and type 2 diabetes. She lives in a retirement home where she had a fall 3 weeks ago. She is completely dependent for her activities of daily living including bathing, dressing, and feeding, and the healthcare personnel at the retirement home administer her medications.

**Frailty Rating:** \_\_\_\_\_

**Case #9**

An 87 year-old gentleman from a long term care facility is admitted to the respiratory ward for an acute COPD exacerbation. His past medical history is significant for Alzheimer's dementia, recurrent mechanical falls, three heart attacks with open heart surgery 20 years ago, and hypertension. He smoked 1 pack a day for 50 years. He has multiple admissions for falls every year, and during the last year he was admitted twice with pneumosepsis and COPD exacerbation.

On examination, patient is on 6L of oxygen via nasal mustache saturating at 92% with a respiratory rate of 24-27. He has both inspiratory and expiratory wheezing throughout both lung fields with coarse crackles in his right lower lobe, and decreased air entry in his left lower lobe. His BP is 102/56, HR is 110 and Temp is 38.5 degrees C.

His son who visits him 3 times per week in long term care states that his father has become more sedentary recently, where previously he was more willing to take short walks in the hallway with his 4 wheel walker. He now uses a wheelchair more frequently. He also reports that his father appears to be often short of breath and nurses have been giving him his puffers more frequently.

**Frailty Rating:** \_\_\_\_\_

**Case #10**

70-year-old gentleman with history of COPD presents to hospital with cough, fever, wheezing, and shortness of breath. He is diagnosed with a COPD exacerbation and started on inhaled bronchodilators, prednisone, and levaquin. His medical history also includes coronary artery disease and hypertension. He is an active smoker, smoking half a pack per day.

On examination, SpO2 is 94% on 2L of oxygen by nasal prongs, BP is 145/85, HR 95 and regular, RR 18, and Temp is 36.5 degrees C. He does not appear distressed at rest in the hospital bed.

He lives at home alone, and is able to manage his household activities by himself, including housework, grocery shopping, and finances. However, after a day of household errands he is tired and requires rest. He participates in an exercise class for seniors twice per week but notes that he is more short of breath than his peers during heavier exercise.

**Frailty Rating:** \_\_\_\_\_