

Prevalence of Frailty Among Hospitalized Older Adults in New Brunswick, Canada: an Administrative Data Population-Based Study



Molly Ann Gallibois, MSc¹, Kyle Rogers, MSc², Chris Folkins, PhD, BScPhM², Pamela Jarrett, MD, FRCPC³, Sandra Magalhaes, PhD²

¹Cardiometabolic, Exercise, and Lifestyle Laboratory, Faculty of Kinesiology, University of New Brunswick; ²New Brunswick Institute for Research, Data and Training, University of New Brunswick, Fredericton; ³Dalhousie Medicine New Brunswick, Horizon Health Network, Saint John, NB

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ABSTRACT

Background

Characterizing the prevalence and distribution of frailty within a population can help guide decision-making and policy development by identifying health service resource needs. Here we describe the prevalence of frailty among hospitalized older adults in New Brunswick (NB), Canada.

Methods

NB administrative hospital claims data were used to identify hospitalized older adults aged 65 or older between April 1, 2017 and March 31, 2019. Frailty was quantified using the Hospital Frailty Risk Score (HFRS), a validated frailty tool derived from claims data. Individuals with a HFRS ranked as intermediate or high were categorized as frail. The distribution of frailty across sex and age are described. Crude prevalence estimates and corresponding 95% confidence intervals are presented.

Results

A total of 55,675 older adults (52% females) were hospitalized. The overall prevalence of frailty was 21.2% (95%CI: 20.9–21.6). Prevalence increased with age: 12.7% (95%CI: 12.3–13.1) in the 65–74 age group, 24.7% (95%CI: 24.1–25.3) in the 75–84 age group and 41.6% (95%CI: 40.6–42.7) for those aged 85 and over ($p < .001$).

Discussion/Conclusion

The distribution of frailty is in line with that reported in other jurisdictions. We demonstrate the feasibility of the HFRS to identify and characterize frailty in a large sample of older adults who were hospitalized, using administrative data.

Key words: frailty, administrative data, hospital frailty risk score, prevalence, epidemiology

INTRODUCTION

Background Rationale

Frailty is a complex condition characterized by low physiological reserve and reduced ability to cope with minor stresses.⁽¹⁾ It is a strong predictor of adverse outcomes such as falls, hospitalization, disability, and death.⁽²⁾ Describing the prevalence of frailty at a population level can help guide health-care planning and resource allocation, yet there lacks a gold standard measure.⁽³⁾ Two common approaches to characterizing frailty are the frailty phenotype and the deficit accumulation models.⁽³⁾ The phenotype model assesses frailty based on five clinical domains: weight-loss, weakness, exhaustion, slow gait speed, and low physical activity levels.⁽⁴⁾ The deficit accumulation approach characterizes frailty according to the number of health deficits using a frailty index.⁽⁵⁾ Both approaches commonly rely on subjective and objective measures derived from questionnaires or in-person assessments, which can be time- and resource-intensive.

Recently, frailty measurement tools created using administrative data have emerged as a valid and cost-effective approach to quantify frailty in population-based samples.⁽⁶⁾ They allow for routinely collected electronic health data to be repurposed to compute a frailty score.⁽⁷⁾ The Hospital Frailty Risk Score (HFRS) is a validated frailty assessment tool whose strong predictive power for adverse outcomes has been described in the literature.^(6,7) The use of administrative data to describe the prevalence of frailty in New Brunswick (NB) has not been explored.

The objective of this study was to characterize the prevalence of frailty among hospitalized older adults in New Brunswick.

METHODS

Study Design

This was a population-based descriptive epidemiology study using a cross-sectional design developed from routinely collected administrative hospital data in New Brunswick, Canada.

Study Population

Individuals were included in the analysis if they were: a resident eligible to receive Medicare living in New Brunswick; hospitalized between April 1, 2017 and March 31, 2019; and aged 65 years or older at the beginning of the two-year study period.

Data Sources

Administrative data were accessed at the New Brunswick Institute for Research, Data and Training. Residency and age eligibility were determined using the Citizen Database, a provincial registry that captures basic demographics and residential information for individuals that have applied for a provincial health care card.⁽⁸⁾ Hospitalizations were identified using the Discharge Abstract Data (DAD), which contains information on inpatient discharge from acute care and rehabilitation hospitalization, including patient diagnoses, birth, and discharge dates.⁽⁹⁾ Patient diagnoses in DAD records are coded using the International Statistical Classification of Diseases and Related Health Problems, 10th Revision in Canada (ICD-10-CA) codes.⁽¹⁰⁾ The ICD-10-CA was developed by the Canadian Institute for Health Information for morbidity classifications in Canada, and resembles the ICD coding found in other countries.⁽¹⁰⁾

Variables

Descriptive Variables

Age and sex were taken from Citizen Database to describe the population. Age was a derived variable representing age at the beginning of the study period, calculated using birth date. Sex was coded as male or female.

Outcome Variable

Frailty was assessed according to the HFRS,⁽⁷⁾ a validated frailty tool derived using ICD-10 codes in DAD records and used to quantify frailty risk in older adults.^(6,7,11) A total of 109 ICD-10 codes are used to construct the HFRS, each weighted according to its association with frailty.⁽⁷⁾ A higher score indicates an increased risk of frailty. Scores of less than 5 are defined as low frailty risk, scores of 5–15 as intermediate, and above 15 as high frailty risk.⁽⁷⁾ For each individual, a HFRS was calculated for the two-year study period, as previously described.⁽⁷⁾ For the purposes of this study, individuals defined as intermediate and high risk by HFRS were categorized as frail.

Statistical Methods

The distribution of age, sex, and frailty risk were summarized using descriptive statistics including frequency per cent, mean

(standard deviation (SD)), and median (inter-quartile range [IQR]). Crude prevalence estimates are reported with 95% confidence intervals (CI). Raw count numbers were randomly rounded to end with 0 or 5 to protect individual privacy. Differences in frailty prevalence by age and sex were analyzed using chi-square statistics. Heat maps were also created to illustrate the distribution of frailty across age groups within the full sample and by sex.

RESULTS

We identified 154,235 NB residents who were aged 65 or older at the beginning of the two-year study period (April 2017 to March 2019), of which 55,675 were hospitalized at least once during this period. Approximately half were female (n=28,875; 52.0%), and half of individuals (either sex) were between the ages of 65 and 74 years (n=28,465; 51.2%). The mean (SD) and median (IQR) age was 75.7 (7.9) and 74 (69–81) years, and HFRS was 3.0 (4.9) and 0.7 (0–4.1), respectively (Table 1). The overall prevalence of frailty (HFRS \geq 5) was 21.2% (95%CI: 20.9–21.6) in adults aged 65 and over, and 30.2% (95%CI: 29.7–30.6) in those aged 75 and over. Prevalence and mean HFRS increased with age: 12.7% (95%CI: 12.3–13.1) and 1.9 (3.8) in the 65–74 age group; 24.7% (95%CI: 24.1–25.3) and 3.5 (5.2) in the 75–84 age group; and 41.6% (95%CI: 40.6–42.7) and 5.5 (6.1) for those aged 85 and over (Figure 1). In the full sample, frailty prevalence was higher among females (22.8%, 95%CI: 22.3–23.3) than males (19.6%, 95%CI: 19.1–20.1), $p < .001$.

DISCUSSION

This study demonstrates the utility of using hospital-based administrative data to describe the prevalence of frailty in a Canadian setting. The prevalence of frailty in NB and other Canadian provinces is an important consideration, given the growing proportion of older adults.^(11,12,13) We found that 21% of older adults (65 or older) who were hospitalized in a two-year period in NB were frail, with prevalence increasing with age (30% in those aged 75+ and 41% in those aged 85+).

Our findings are similar to those from other studies. For example, a recent study validated the HFRS in adults over age 75 living in Ontario, Canada and found that 25.9% were frail,⁽¹⁴⁾ which is similar to our estimated 30.2% for the same age group. We also found that frailty was slightly more prevalent among females, which is consistent with findings in previous research.⁽¹⁵⁾ In the NB population specifically, to date, frailty has only been described within a community-based sample using health survey data.⁽¹⁵⁾ A frailty index developed using data from the 2009/2010 Canadian Community Health Survey (CCHS) estimated a 27.5% (95%CI: 24.2–30.8) prevalence of frailty in NB residents age 65 years or older. Although our own analysis focused on hospitalized NB residents, our estimate of 21.2% frailty in the 65+ age group was nevertheless similar to the CCHS-derived estimate from a community-based sample.

Although this similarity suggests that HFRS-based frailty estimates may approximate frailty prevalence in the community, there are inherent limitations associated with generalizing hospitalization-based estimates to the population level. For example, frail individuals may be over-represented in the hospitalized population compared to the general population, as they are more likely to be admitted to hospital.⁽¹⁶⁾ Based on this, one might expect our frailty estimate to be higher than that derived from the community-based sample; however, it is important to note that additional discrepancies may exist owing to key differences in the conceptualizations of frailty between HFRS and the CCHS index. Namely,

the CCHS frailty index includes psychological and social variables such as self-perceived health and emotional health that are not captured in the HFRS. The inclusion of these additional domains of frailty in the CCHS index may explain, in part, the higher estimates of frailty within the community-based sample.

A limitation to the HFRS is the potential for variation in ICD coding which may lead to improper or missing diagnoses.⁽¹⁷⁾ Additionally, in line with the methodologies used in constructing the original HFRS, our study excluded patients admitted to psychiatric care, which may have omitted some frail older adults from our estimates.⁽¹⁸⁾

TABLE 1.
Demographic characteristics of study population (n=55,675)

| Age Group (years) | Age Mean (SD) | Age Median (IQR) | HFRS Mean (SD) | HFRS Median (IQR) | Frail n (%) |
|-------------------------------|---------------|------------------|----------------|-------------------|--------------|
| Full Sample (n=55,675) | | | | | |
| 65–74 28,455 (51.2%) | 69.3 (2.8) | 69 (67–72) | 1.9 (3.8) | 0 (0–2.3) | 3,615 (12.7) |
| 75–84 18,390 (33.0%) | 79.1 (2.8) | 79 (77–81) | 3.5 (5.2) | 1.1 (0–4.9) | 4,540 (24.7) |
| 85+ 8,825 (15.8%) | 89.2 (3.6) | 88 (86–91) | 5.6 (6.1) | 3.8 (1.1–8.4) | 3,670 (41.6) |
| Females (n=28,895) | | | | | |
| 65–74 13,855 (48.0%) | 69.3 (2.8) | 69 (67–72) | 1.9 (3.9) | 0 (0–2.3) | 1,750 (12.6) |
| 75–84 9,495 (32.9%) | 79.1 (2.9) | 79 (77–82) | 3.6 (5.4) | 1.1 (0–5.2) | 2,450 (25.8) |
| 85+ 5,545 (19.1%) | 89.5 (3.7) | 89 (86–92) | 5.8 (6.2) | 4.1 (1.1–8.7) | 2,390 (43.1) |
| Males (n=26,780) | | | | | |
| 65–74 14,605 (54.5%) | 69.4 (2.8) | 69 (67–72) | 1.9 (3.7) | 0 (0–2.3) | 1,870 (12.8) |
| 75–84 8,900 (33.2%) | 79.0 (2.8) | 79 (76–81) | 3.3 (5.1) | 1.1 (0–4.6) | 2,090 (23.5) |
| 85+ 3,275 (12.3%) | 88.6 (3.3) | 88 (86–91) | 5.3 (5.9) | 3.3 (0.9–7.8) | 1,285 (39.2) |

SD = standard deviation; IQR = interquartile range.

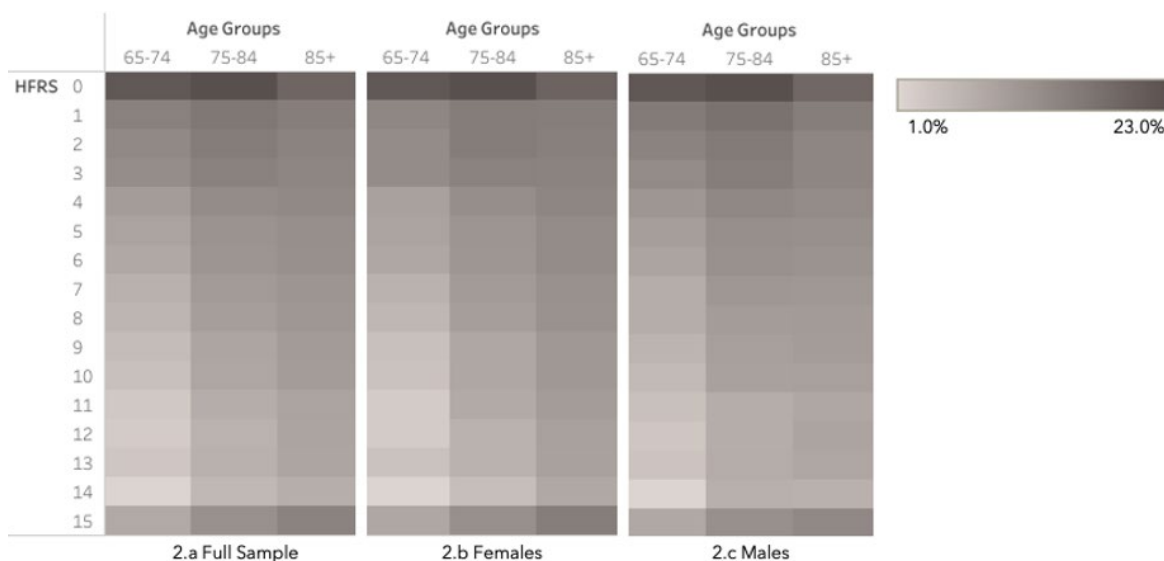


FIGURE 1. Distribution of HFRS among hospitalized older adults in New Brunswick by full sample (2a), females (2b), males (2c).

Our results demonstrate the potential of HFRS as a tool to characterize frailty among hospitalized older adults—an application which is valuable for clinical decision-making and health resource allocation in this setting. For instance, the HFRS has been used as a tool to predict adverse events post-surgery.^(19,20) Further, it is a strong predictor of hospital length of stay, which could aid in resource allocation.⁽⁷⁾

CONCLUSION

Our results demonstrate the utility of the HFRS as a convenient and efficient tool that can be used to identify and characterize frailty risk among hospitalized older adults using routinely collected administrative data.

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Not applicable.

CONFLICT OF INTEREST DISCLOSURES

We have read and understood the *Canadian Geriatrics Journal's* policy on conflicts of interest disclosure and declare no conflicts of interest.

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Correspondence to: Sandra Magalhaes, PhD, New Brunswick Institute for Research, Data & Training, University of New Brunswick, PO Box 4400, Room 304 Keirstead Hall, 38 Dineen Drive, Fredericton, NB E3B 5A3

Email: sandra.magalhaes@unb.ca