

Clinical and demographic characteristics of patients admitted to Canadian hospitals with COVID-19: A report from the Canadian Immunization Research Network Serious Outcomes Surveillance Network

Andrew, Melissa K.; Godin, Judith; LeBlanc, Jason; Boivin, Guy; Valiquette, Louis; McGeer, Allison; McElhaney, Janet E.; Smith, Stephanie; Hatchette, Todd F.; EISherif, May; McKinnon-Cameron, Donna; Wilson, Kevin; Ambrose, Ardith; Trottier, Sylvie; Loeb, Mark; Katz, Kevin; McCarthy, Anne; McNeil, Shelly A.

Background

- The CIRN SOS Network has been conducting active surveillance for influenza since 2009
- Originally established to support Canada's pandemic preparedness
- Influenza surveillance studies burden of disease, outcomes, and Vaccine Effectiveness (VE)
- This established infrastructure was pivoted to perform COVID-19 surveillance to inform Canada's COVID-19 response

The CIRN SOS COVID-19 Network:
11 hospitals in 4 provinces, c.6000 beds



Methods

- Active surveillance for COVID-19 illness in adults (≥ 16 years of age) was conducted starting in March 2020; all 2020 enrollments are reported here
- NP swab obtained from all patients with an admitting diagnosis of COVID-19, CAP, exacerbation of COPD/asthma, unexplained sepsis, any respiratory diagnosis or symptom
 - All NP swabs tested for SARS-CoV-2 using PCR
 - Other clinical and demographic information was also collected, including information about comorbidities, medications, and frailty (Clinical Frailty Scale)
- Independent samples t-tests for comparisons of continuous variables and chi-squared tests of independents were used to compare groups on categorical variables.
- Separate logistic regressions were conducted for each predictor to assess associations with ICU admission, mechanical ventilation, and mortality, adjusted for age, sex, and frailty.

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Results

Table 1: Clinical characteristics of COVID-19 cases enrolled in 2020

Characteristics	Full sample N=2031	Age <65 N=651	Age ≥ 65 N=1378	p value
Age	71.0 (17.4)	50.2 (11.6)	80.9 (8.9)	<.001
Sex, female	928 (45.7%)	280 (43.0%)	646 (46.9%)	.10
Caucasian ethnicity	1033 (79.8%)	302 (65.2%)	830 (86.9%)	<.001
Province:				
Alberta	130 (6.4%)	62 (9.5%)	68 (4.9%)	
Ontario	1003 (49.4%)	341 (52.4%)	661 (48.0%)	
Quebec	868 (42.7%)	230 (35.3%)	637 (46.2%)	
Nova Scotia	30 (1.5%)	18 (2.8%)	12 (0.9%)	
Housing:				<.001
Private dwelling	1072 (65.6%)	484 (86.6%)	588 (54.1%)	
Assisted Living Facility	381 (23.3%)	11 (2.0%)	369 (34.0%)	
Long Term Care Facility	131 (8.0%)	16 (2.9%)	115 (10.6%)	
Homeless/shelter	28 (1.7%)	One group <5		
Other	21 (1.3%)	9 (1.6%)	12 (1.1%)	
Healthcare worker	61 (4.7%)	56 (13.9%)	5 (0.5%)	<.001
Travel history	68 (4.6%)	26 (5.3%)	42 (4.3%)	.40
Known direct exposure	409 (50.5%)	157 (51.5%)	251 (49.8%)	.64
Obesity (BMI>=30 or on chart)	414 (28.8%)	194 (39.5%)	220 (23.3%)	<.001
Comorbidities: None	267 (16.9%)	179 (36.0)	88 (8.1)	<.001
Cardiovascular	1195 (75.4%)	251 (50.4%)	943 (86.9%)	<.001
Respiratory	508 (32.1%)	134 (27.0%)	374 (34.5%)	<.01
Immunosuppressed	96 (6.1%)	36 (7.2%)	60 (5.5%)	.19
Immunocompromized	21 (1.3%)	One group <5		

*Proportions are among patients with known information for that variable, missing values were excluded

Figure 1. Epidemic curve, colour coded by site

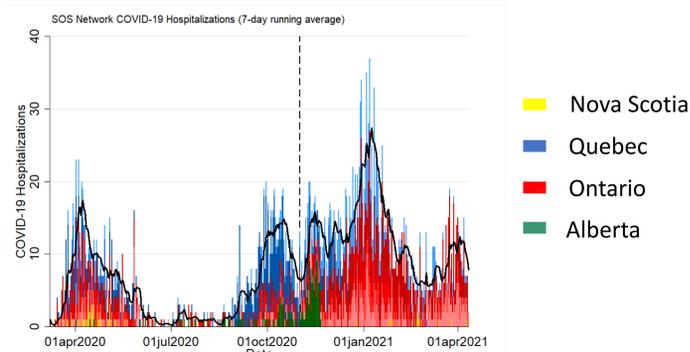
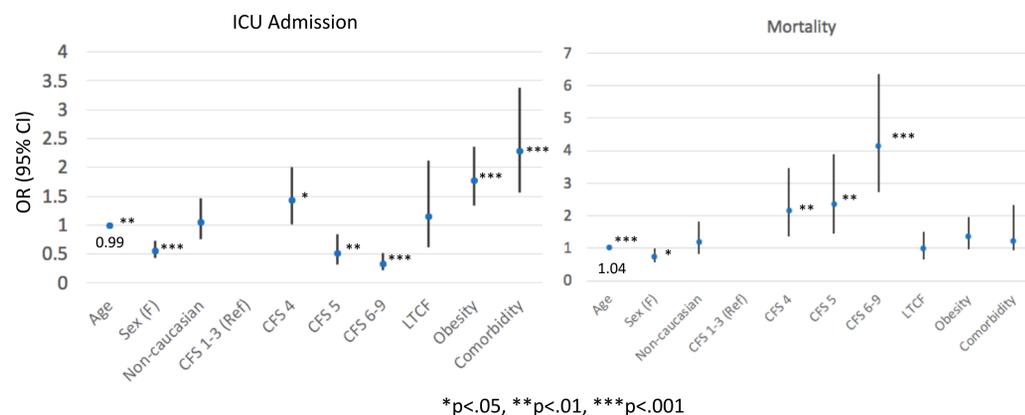


Figure 2. Associations with ICU admission and mortality, adjusted for age, sex and frailty



*p<.05, **p<.01, ***p<.001

Results: Age and Frailty

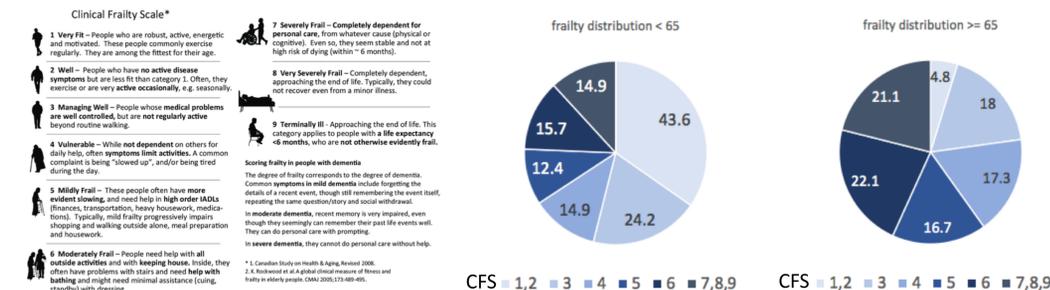


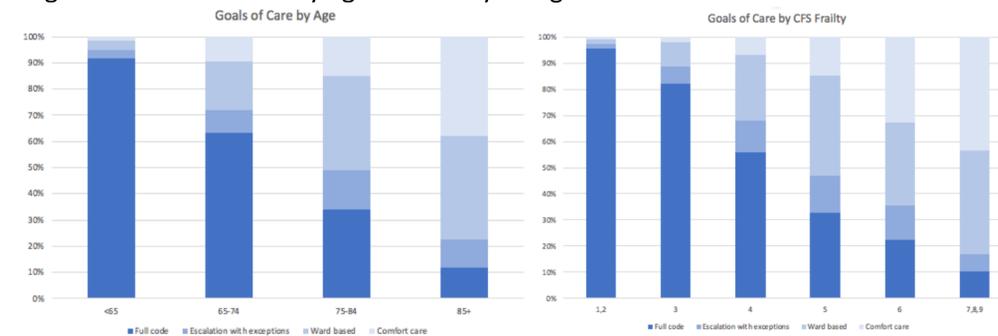
Table 2: Outcomes of COVID-19 positive cases stratified by age

Outcome	Age <65 N=651	Age 65-74 N=377	Age 75-84 N=493	Age 85+ N=508	p
Length of stay, days (IQR)	7 (4-14)	12 (6-26)	12 (6.75-25.25)	20 (8-33.5)	<.001
Admitted to ICU	169 (30.4%)	102 (32.6%)	69 (17.7%)	18 (4.6%)	<.001
Mechanically Ventilated	94 (16.9%)	22 (21.1%)	30 (7.7%)	7 (1.8%)	<.001
Died	29 (4.5%)	63 (16.7%)	100 (20.3%)	143 (28.1%)	<.001

Table 3: Outcomes of COVID-19 positive cases by frailty

Outcome	CLINICAL FRAILITY SCALE SCORE						p
	1-2 N=288	3 N=387	4 N=239	5 N=198	6 N=251	7-9 N=239	
Length of stay, days (IQR)	6 (4-10)	8 (4-16)	13 (7-25)	17 (7.75-30)	18 (10-40)	20 (10-36)	<.001
Admitted to ICU	72 (25.1%)	125 (32.4%)	78 (32.6%)	27 (13.7%)	27 (10.8%)	14 (5.9%)	<.001
Mechanically Ventilated	41 (14.3%)	74 (19.2%)	45 (18.8%)	14 (7.1%)	9 (3.6%)	7 (3.0%)	<.001
Died during this admission	10 (3.5%)	35 (9.0%)	46 (19.2%)	48 (24.2%)	73 (29.1%)	111 (46.4%)	<.001

Figure 3. Goals of Care by age and frailty categories



Conclusions, Challenges and Future Directions

- Wide range in frailty, age and comorbidities among patients admitted with COVID-19
- Older age, male sex and frailty were independently associated with higher odds of mortality
- Older age, female sex, and frailty were associated with lower odds of ICU admission
- Comorbidities and obesity were independently associated with ICU admission but not with mortality
- Notably, poor outcomes occurred across all ages and levels of frailty
- Conducting surveillance under pandemic condition, and the sheer volume of enrolments at some sites has been very challenging
- There are jurisdictional differences in policy (e.g. LTC residents being treated on site vs. admitted to hospital); these also evolve quickly
- Comparison of patient characteristics and outcomes in subsequent waves, including as SARS-CoV-2 variants of concern began to circulate, will be important
- Going forward, we will continue surveillance and add estimation of Vaccine Effectiveness
- Contribution to global surveillance efforts through the Global Influenza Hospital Surveillance Network is an important feature of our work