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Research

Emergency department utilization and hospital admissions for ambulatory care sensitive conditions among people seeking a primary care provider during the COVID-19 pandemic

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Abstract

Background: Primary care attachment improves health care access and health outcomes, but many Canadians are unattached, seeking a provider via provincial wait-lists. This Nova Scotia–wide cohort study compares emergency department utilization and hospital admission associated with insufficient primary care management among patients on and off a provincial primary care wait-list, before and during the first waves of the COVID-19 pandemic.

Methods: We linked wait-list and Nova Scotian administrative health data to describe people on and off wait-list, by quarter, between Jan. 1, 2017, and Dec. 24, 2020. We quantified emergency department utilization and ambulatory care sensitive condition (ACSC) hospital admission rates by wait-list status from physician claims and hospital admission data. We compared relative differences during the COVID-19 first and second waves with the previous year.

Results: During the study period, 100 867 people in Nova Scotia (10.1% of the provincial population) were on the wait-list. Those on the wait-list had higher emergency department utilization and ACSC hospital admission. Emergency department utilization was higher overall for individuals aged 65 years and older, and females; lowest during the first 2 COVID-19 waves; and differed more by wait-list status for those younger than 65 years. Emergency department contacts and ACSC hospital admissions decreased during the COVID-19 pandemic relative to the previous year, and for emergency department utilization, this difference was more pronounced for those on the wait-list.

Interpretation: People in Nova Scotia seeking primary care attachment via the provincial wait-list use hospital-based services more frequently than those not on the wait-list. Although both groups have had lower utilization during COVID-19, existing challenges to primary care access for those actively seeking a provider were further exacerbated during the initial waves of the pandemic. The degree to which forgone services produces downstream health burden remains in question.

In Canada, having a regular primary care provider is essential for efficiently accessing many publicly funded health services.[1,2] Having a regular provider is also associated with more effective preventive care, disease management and coordination of care across systems, leading to better health outcomes.[2–4] Unfortunately, in 2020, roughly 10% of Canadians reported being "unattached" (i.e., not having a regular primary care provider or practice), which was among the worst when compared with peer countries.[5] About 10% of people in Nova Scotia, which has a population of more than 1 million, are unattached. The province is home to an older-than-national-average population who report more difficulty accessing after-hours care other than emergency departments.[4,6] To address this ongoing issue of access to care for unattached patients, several provinces have created centralized primary care wait-lists.[2] In Nova Scotia, the Nova Scotia Health Need a Family Practice Registry performs this role.[7] Throughout the COVID-19 pandemic, the publicly reported number of registrants on the centralized wait-list has continued to grow.[8]

Having a substantial proportion of unattached patients in the population has implications across the health care system.

Competing interests: See the end of the article.

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With limited alternatives, unattached patients seek care from walk-in clinics and visit emergency departments for health concerns that are normally addressed within a primary care setting.[3,9] Inadequate access to primary care can lead to preventable hospital admissions, particularly for certain previously identified conditions, known as ambulatory care sensitive conditions (ACSCs).[4] Low-acuity emergency department visits and hospital admissions for ACSCs are an inefficient use of health system resources and result in poorer patient and system outcomes.[4,10,11]

During a pandemic, emergency department utilization is expected to differ from usual patterns owing to changes in health system policy, public safety concerns and emerging health issues related to the pandemic. Patients may avoid visiting the emergency department out of fear of infectious disease transmission[12] or, alternatively, may seek primary care in the emergency department or experience ACSC hospital admissions owing to restricted access to community-based primary care providers.[13] As such, it is important to understand whether emergency department utilization and ACSC hospital admission rates differ for people both actively and not actively seeking a primary care provider, particularly during the COVID-19 pandemic. The objectives of this study were to describe and compare emergency department utilization and ACSC hospital admissions among people in Nova Scotia on and off the centralized provider wait-list (hereafter referred to as "on wait-list" or "off wait-list"), as a marker of primary care need, and assess how utilization of primary care–dependent health services changed during the first and second waves of the COVID-19 pandemic.

Methods

This study uses a descriptive cohort design to estimate population-based rates of emergency department utilization and ACSC hospital admissions among people in Nova Scotia identified as either formally seeking or not seeking a primary care provider based on updated quarterly on– or off–wait-list status. The target underlying cohort comprises all publicly insured people in Nova Scotia aged 5 years as of Apr. 1, 2016. The study period spans Jan. 1, 2017, through Dec. 24, 2020. Participants are considered on wait-list if they have 1 or more days of enrolment within a calendar quarter.

This work is part of the Problems Coordinating and Accessing Primary Care for Attached and Unattached Patients in a Pandemic Year (PUPPY) study, funded by the Canadian Institutes of Health Research. The complete protocol for this study was published previously.[6]

Data sources

This study used a novel linkage between centralized primary care provider wait-list data and Health Data Nova Scotia's (HDNS) Insured Patient Registry. Linkage was performed using a single person-level unique identifier (i.e., health card number) at HDNS. Linked administrative data holdings comprise the HDNS Insured Patient Registry, which identifies all publicly insured people in Nova Scotia who are eligible to receive primary care and contains demographic data such as age and sex, physician billings, and the Canadian Institute for Health Information Discharge Abstract Database (DAD).

We used physician billings and the DAD to estimate the Charlson Comorbidity Index.[14] We obtained additional demographic measures, including after-tax household income, rurality of residence and the Canadian Index of Multiple Deprivation (CIMD),[15] by postal code–linked Census (2016 Canadian Census) data (Appendix 1, available at www.cmajopen.ca/content/11/3/E527/suppl/DC1).

Key measures

We captured emergency department contacts from physician billing records that coded the emergency department as the hospital unit where the service was provided. Where identified, we enumerated multiple records per date per patient in the analyses. From the initial admission date and throughout the duration of hospitalization, we identified ACSCs using *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* diagnostic codes for 7 condition clusters: epilepsy, chronic obstructive pulmonary disease, asthma, diabetes, heart failure and pulmonary edema, hypertension and angina. These comprise the core set of conditions identified by the Canadian Institute for Health Information[16] for which hospital admissions were deemed avoidable given provision of timely and effective outpatient care, either by avoiding condition onset, controlling the illness episode, or chronic disease management (Appendix 1).[17]

We selected age, sex, rurality, household income, the CIMD summary score and Charlson Comorbidity Index as covariables for purposes of describing differences in sociodemographic characteristics, overall deprivation and medical complexity, respectively, between people in Nova Scotia who were on and off wait-list and for confounder adjustment in multivariable models. Access to primary care, and therefore measures of health service utilization driven by primary care deficiencies, has been associated with variation in these factors in the Canadian context.[18–21] The Charlson Comorbidity Index is derived by the weighted summation of specific comorbid conditions and was originally used to predict 1-year inpatient mortality risk.[14] It has been adapted and weighted for use with Canadian administrative health data,[22] for outpatient populations,[23] and validated for comorbidity adjustment.[24] We estimated rurality and after-tax household income using postal code–linked 2016 Canadian Census data contained in the Canada Post Postal Code Conversion File Plus.[25] We inferred rurality from a community size of less than 10 000 people. The CIMD measures deprivation and marginalization across 4 dimensions: residential instability, economic dependency, ethnocultural composition and situational vulnerability. We created factor analysis–derived dimension-specific indices from selected Canadian Community Health Survey items; these provide national and regional scores (i.e., Atlantic region used for this study). Scores are provided at the level of the Census dissemination area using 2016 Canadian Census Data. We summed CIMD scores and divided them by 4 to produce an overall summary score.[26]

Analysis

We calculated means and standard deviations for age, and proportions for all demographic measures, for the entire Nova Scotia primary care–eligible population, and by ever and never on wait-list status. We used χ^2 tests to identify statistically significant differences in proportions across those ever on and off wait-list. We calculated quarterly on and off wait-list emergency department utilization and ACSC hospital admission rates. On– and off–wait-list status was time dependent, whereby individuals could change status each quarter. We used unadjusted negative binomial regression to assess relative differences in emergency department and ACSC hospital admission rates across those on and off wait-list by quarter. We estimated corresponding unadjusted and multivariable-adjusted rate ratios using negative binomial regression comparing emergency department and ACSC hospital admission rates, by wait-list status, for calendar quarters corresponding to COVID-19 wave 1, and emergency department rates for quarters corresponding to wave 2 (ACSC rates for wave 2 were unavailable owing to hospital admission data access to July 2020). Additionally, rate ratios compared emergency department utilization and ACSC hospital admissions between COVID-19 waves and analogous prior year periods whereby Q2 2020 (i.e., corresponding to the first COVID-19 wave in Nova Scotia) was compared with Q2 2019 for emergency department utilization and ACSC hospital admissions; and Q4 2020 (second COVID-19 wave in Nova Scotia) to Q4 2019 for emergency department utilization only. For this second analysis, we estimated rate ratios using generalized estimating equation approximations to negative binomial regression assuming an exchangeable correlation structure (to accommodate participants contributing to both intervals comprising comparison). Multivariable models included observations with complete data for all covariables. We conducted all analyses using SAS software (version 9.4).

Ethics approval

Ethical approval to conduct this study was granted in Nova Scotia (Nova Scotia Health Research Ethics Board, file no. 1024979).

Results

Table 1 describes the characteristics for the overall study population and by ever on–wait-list status. We identified 990 655 people in Nova Scotia aged 5 years or older as of Apr. 1, 2016, from the HDNS Registered Persons Database. Of these, 100 867 people were identifiable as ever on wait-list and were enrolled at least 1 day between Jan. 1, 2017, and Dec. 24, 2020. Proportions of individuals aged 49 years or younger and 80 years or older were smaller for people ever on wait-list, and the proportion of females ever on wait-list was greater than the proportion of males. A nonzero Charlson Comorbidity Index score, indicating at least 1 eligible comorbid condition, was more frequent among people on wait-list. People in rural Nova Scotia and those among the lower 4 aggregated household income categories were more frequently on wait-list. In contrast, people with the lowest level of deprivation were "on Registry" less frequently (above differences in proportions statistically significant at an α level of < 0.0001).

Figure 1 displays the identified Nova Scotia primary care–eligible cohort on wait-list over the study period, enumerated monthly. Enrolment surpassed 10 000 during the first quarter (Q1 2017), then increased through Q4 2018, peaking at just over 43 000 in November. Registrations then declined from May 2019 to just under 35 000 by the end of Q2 2020, in line with the end of the first wave of active cases of COVID-19.

Figure 2A shows overall rates of emergency department contacts. Aggregated over the entire 16-quarter study period, there were 155.9 and 105.3 emergency department contacts per 1000 population among people on and off wait-list, respectively. Individuals both on and off wait-list had lowest rates during Q2 and Q4 of 2020, corresponding with Nova Scotia's first and second waves of COVID-19 ("COVID-19 wave 1" and "wave 2," respectively), and utilization was consistently lower for those off wait-list. People aged 65 years and older had higher emergency department utilization rates (Figure 2B), although the difference between individuals on and off wait-list was more pronounced among those younger than 65 years (Figure 2C). Although emergency department utilization was slightly higher for females (Figure 2D), both males (Figure 2E) and females on wait-list had higher utilization, reaching a nadir during the first and second waves of COVID-19.

Overall, ACSC hospital admission rates were higher for those on wait-list for most quarters (statistically significantly for 6; Figure 3A). As with emergency department utilization, the lowest overall ACSC hospital admission rate (8.7 per 10 000 population) was observed during the COVID-19 wave 1 (Q2 2020) for those off wait-list. The highest ACSC hospital admission rates for people on wait-list occurred a year earlier, in Q2 of 2019 (20.6 per 10 000 population).

Figure 3B shows quarterly ACSC hospital admission rates for those aged 65 years and older. Rates did not differ statistically by wait-list status for any quarter. Figure 3C shows ACSC hospital admissions for those younger than 65 years. Rates for those on wait-list were higher for most quarters (statistically significantly for 6), including COVID-19 wave 1, although there were relatively few ACSC hospital admissions among younger people in Nova Scotia. For females (Figure 3D), differences across wait-list status were relatively attenuated. Relative to males off wait-list, those on wait-list frequently had higher ACSC hospital admission rates from Q3 2017 onward (statistically significantly for 7; Figure 3E), including during COVID-19 wave 1.

Relative to those off wait-list, people in Nova Scotia on wait-list had higher rates of emergency department contacts and ACSC hospital admissions during the initial COVID-19 waves and analogous prior year calendar quarters (Table 2). A possible exception was observed for Q2 of 2019 with ACSC hospital admissions. Although crude rates were higher for those on wait-list, as corroborated by Figure 3A, the multivariable-adjusted relative increase was not statistically significant (incidence rate ratio [IRR] 1.12, 95% confidence interval [CI] 0.91–1.38).

Table 1: Description of Nova Scotia "primary care user–eligible" cohort: overall; ever on or never on the Nova Scotia Need a Family Practice Registry centralized primary care provider wait-list (Jan. 1, 2017–Dec. 24, 2020)

Characteristic	No. (%)* of people in primary care population in Nova Scotia	No. (%)* of people ever on Registry	No. (%)* of people never on Registry
Overall	990 655 (100)	100 867	889 788
Age, yr, mean ± SD	45.5 ± 22.1	46.7 ± 20.9	45.3 ± 22.2
Age, yr			
5–18	136 542 (13.78)	11 899 (11.80)	124 643 (14.01)
19–49	411 216 (41.51)	39 371 (39.03)	371 845 (41.79)
50–59	165 820 (16.74)	19 138 (18.97)	146 682 (16.49)
60–64	73 735 (7.44)	9358 (9.28)	64 377 (7.24)
65–69	67 155 (6.78)	8389 (8.32)	58 766 (6.60)
70–74	47 562 (4.80)	5654 (5.61)	41 908 (4.71)
75–79	34 111 (3.44)	3701 (3.67)	30 410 (3.42)
≥ 80	54 514 (5.50)	3357 (3.33)	51 157 (5.75)
Sex			
Female	50 3699 (50.85)	54 726 (54.26)	448 973 (50.46)
Male	48 6956 (49.15)	46 141 (45.74)	440 815 (49.54)
Charlson Comorbidity Index score			
0	639 744 (64.58)	57 886 (57.39)	581 858 (65.39)
1	206 328 (20.83)	26 142 (25.92)	180 186 (20.25)
2	71 375 (7.20)	8560 (8.49)	62 815 (7.06)
3	30 296 (3.06)	3676 (3.64)	26 620 (2.99)
≥ 4	42 912 (4.33)	4603 (4.56)	38 309 (4.31)
Rurality†			
Nonrural	632 745 (63.87)	58 256 (57.76)	574 489 (64.56)
Rural	331 228 (33.44)	41 794 (41.43)	289 434 (32.53)
Missing	26 682 (2.69)	817 (0.81)	25 865 (2.91)
Household income quintile†			
Q1 (lowest)	191 293 (19.31)	20 712 (20.53)	170 581 (19.17)
Q2	193 994 (19.58)	20 990 (20.81)	173 004 (19.44)
Q3	186 475 (18.82)	19 833 (19.66)	166 642 (18.73)
Q4	195 222 (19.71)	20 452 (20.28)	174 770 (19.64)
Q5 (highest)	196 989 (19.88)	18 063 (17.91)	178 926 (20.11)
Missing	26 682 (2.69)	817 (0.81)	25 865 (2.91)
CIMD: overall score‡			
1–2	109 464 (11.05)	8877 (8.80)	100 587 (11.30)
> 2–3	380 107 (38.37)	38 929 (38.59)	341 178 (38.34)
> 3–4	415 015 (41.89)	45 530 (45.14)	369 485 (41.53)
> 4–5	58 419 (5.90)	6686 (6.63)	51 733 (5.81)
Missing	27 650 (2.79)	845 (0.84)	26 805 (3.01)

Note: CIMD = Canadian Index of Multiple Deprivation, SD = standard deviation.
*Unless otherwise specified.
†We defined rurality and household income quintile using the CSIZE and QAATIPPE variables, respectively, from the Postal Code Conversion File Plus.[25] We defined rurality as living in a Census dissemination area corresponding to a community size of ≤ 10 000.
‡We derived CIMD overall score categories by adding up Atlantic Canada–weighted component quintiles (residential instability, economic dependency, ethnocultural composition, situational vulnerability) and dividing by 4. A higher score relates to higher deprivation. Component quintiles are assigned at the level of the Census dissemination area.[26]

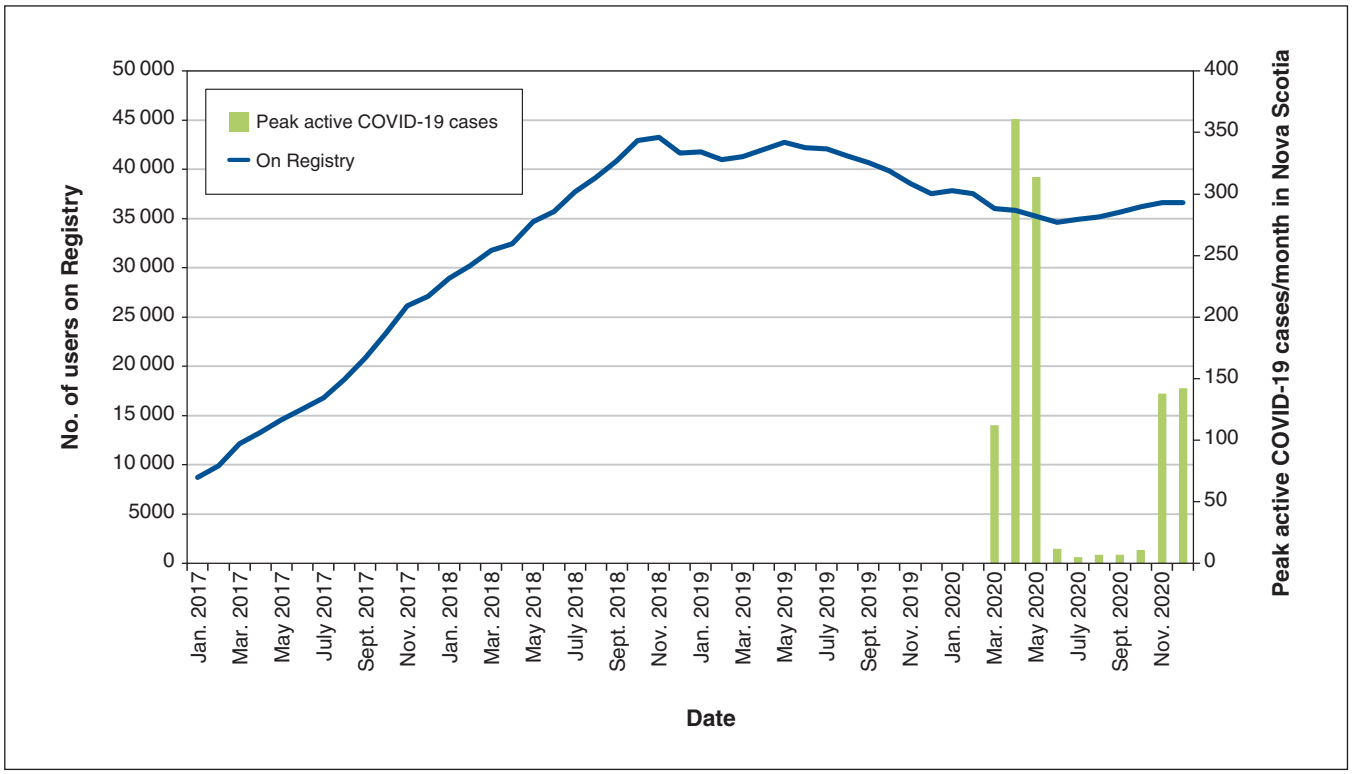

Figure 1: Number of users on Registry by month (Jan. 2017–Dec. 2020).

Compared with the same quarter during the previous year (Table 3), emergency department utilization during the first wave of active COVID-19 cases in Nova Scotia was moderately lower for both those on and off wait-list (multivariable-adjusted on–wait-list IRR 0.86, 95% CI 0.81–0.92; off–wait-list IRR 0.89, 95% CI 0.87–0.90); however, this relative difference was more pronounced during COVID-19 wave 2 (multivariable-adjusted on–wait-list IRR 0.72, 95% CI 0.68–0.77; off–wait-list IRR 0.83, 95% CI 0.82–0.85). Rates of ACSC hospital admission were lower during the COVID-19 wave 1 compared with the same quarter in the previous year. However, for those on wait-list, this relative difference was not statistically significant (multivariable-adjusted on–wait-list IRR 0.78, 95% CI 0.54–1.12; off–wait-list IRR 0.67, 95% CI 0.60–0.74).

Interpretation

Since the beginning of 2017, individuals on wait-list had substantially higher emergency department use than those off wait-list. Rates of ACSC hospital admissions were also higher for those on wait-list for multiple quarters. We observed a larger discrepancy in emergency department utilization between those on and off wait-list among individuals younger than 65 years. Females had slightly higher rates of emergency department utilization, although differences by wait-list status did not differ materially by sex. Males who were on wait-list had somewhat higher rates of ACSC hospital admissions, while females exhibited minimal differences by wait-list status.

With the exception of the multivariable-adjusted effect for ACSC hospital admissions, those on wait-list had statistically significantly higher rates of these outcomes during COVID-19 waves and analogous prior year periods compared with individuals not on the wait-list. Over the 3-year study period, rates of emergency department use and ACSC hospital admissions were lowest during COVID-19 waves for both those on and off wait-list. Compared with the analogous quarter a year earlier, emergency department utilization and ACSC hospital admissions were reduced during COVID-19 waves, although not statistically significantly in the multivariable analysis for ACSC hospital admissions among those on wait-list. The year-over-year reduction in emergency department utilization was more pronounced during wave 2.

This is the first province-wide study to link centralized primary care provider wait-list and administrative health data to estimate variation in hospital-based care across those actively and not actively seeking a provider. Although we cannot draw definitive conclusions about the rationale for decreased emergency department use during the COVID-19 pandemic, it might have been because patients were hesitant to use emergency department services out of fear of exposure, or were forgoing or receiving care elsewhere to reduce burden on emergency departments.[12,27] Instances of forgone care will have corresponding impacts on downstream service use. Further, although the degree of reduction from relocating nonurgent emergency-department care to less intense settings is debated,[9] higher acute care use among people in Nova Scotia on wait-list implies higher

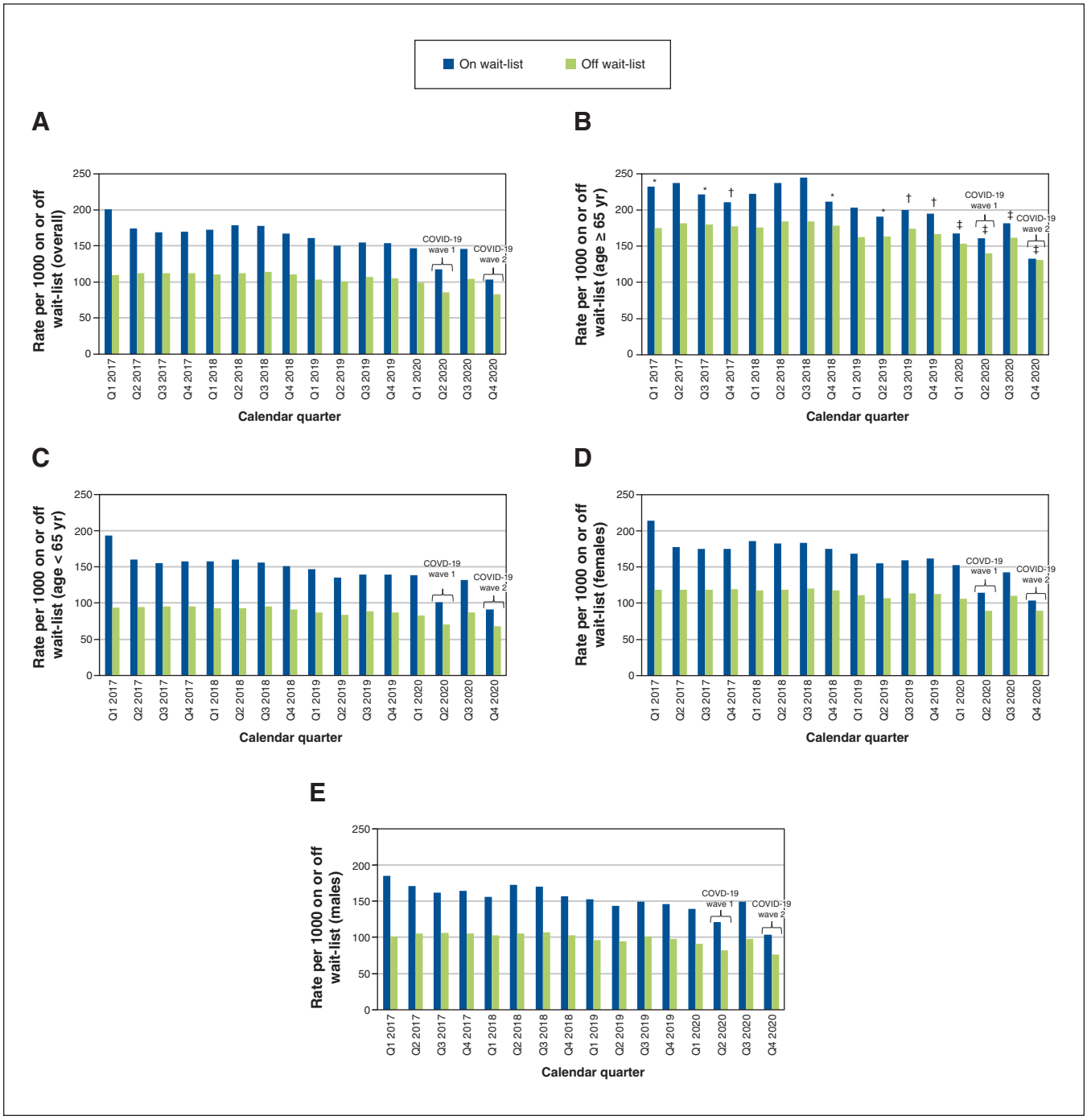

Figure 2: Emergency department utilization rate (number of encounters), (A) overall; (B) age ≥ 65 years; (C) age < 65 years; (D) females; (E) males. Note: Relative differences in rates are statistically significant at $p \leq 0.001$ unless otherwise specified; $p \leq 0.01$ (*); $p \leq 0.05$ (†); $p > 0.05$ (‡).

health care costs that could be mitigated by improved access to primary care.[28] Regarding sex-based differences, females tend to use health services more than males,[29,30] which may contribute to moderately higher emergency department use among females, if primary care services were being sought within the emergency department. Regardless, multiple Canadian studies have found that females are more likely to be frequent users of emergency departments.[31–33] Consistent with our findings, Canadian data indicate that males and older people have a greater number of ACSC hospital admissions than females and younger people, respectively.[34–36] This was particularly evident for older people on and off wait-list in our data, suggesting that current primary care models may be less effective in avoiding these types of

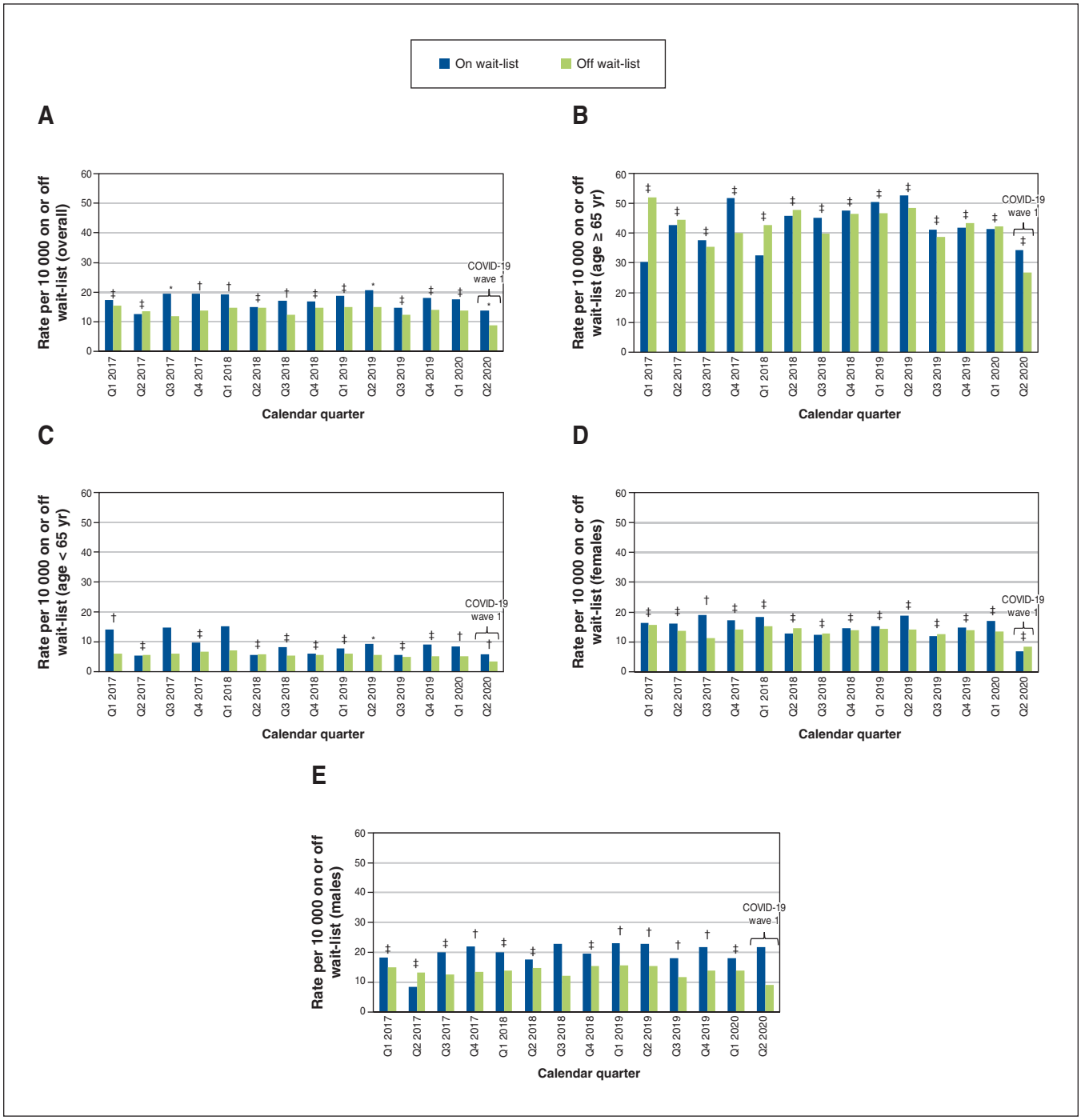

Figure 3: Ambulatory care sensitive condition hospital admission rate (number of encounters), (A) overall; (B) age ≥ 65 years; (C) age < 65 years; (D) females; (E) males. Note: Relative differences in rates are statistically significant at $p \leq 0.001$ unless otherwise specified; $p \leq 0.01$ (*); $p \leq 0.05$ (†); $p > 0.05$ (‡).

admissions, regardless of attachment status. People aged 65 years and older are likely to be living with a chronic condition;[37] thus, it is plausible that older people require more urgent care, make fewer "discretionary" emergency department visits and experience a higher number of ACSCs. There are relatively few ACSC hospital admissions among the younger cohort, limiting inference.

Although no studies have assessed health service utilization by attachment status or proxy for primary care need (i.e., wait-list status), our findings are consistent with other studies that have examined emergency department use and hospital admissions during the COVID-19 pandemic. These have shown marked decreases in emergency department use during waves of COVID-19.[38–40] In Alberta, emergency

Table 2: Emergency department utilization and admissions for ambulatory care sensitive conditions during COVID-19 waves 1 and 2, on versus off wait-list

Health care utilization rates by type	COVID-19 wave 1 (Q2 2020) IRR* (95% CI)	Comparison period (Q2 2019) IRR* (95% CI)	COVID-19 wave 2 (Q4 2020) IRR* (95% CI)	Comparison period (Q4 2019) IRR* (95% CI)
ED utilization				
Total sample, *n*	935 686	944 977	931 362	940 506
Rate on wait-list	117.9	150.1	103.6	154.4
Rate off wait-list	86.2	101.0	83.0	105.5
Analytical sample, *n*	908 911	918 104	904 622	913 672
Crude IRR	1.34 (1.26–1.42)	1.45 (1.38–1.53)	1.22 (1.15–1.30)	1.43 (1.36–1.50)
Age- or sex-adjusted IRR	1.34 (1.26–1.42)	1.45 (1.38–1.52)	1.22 (1.15–1.30)	1.42 (1.35–1.50)
Multivariable-adjusted† IRR	1.47 (1.38–1.56)	1.46 (1.39–1.53)	1.33 (1.25–1.41)	1.49 (1.42–1.57)
ACSC hospital admissions				
Total sample, *n*	935 686	944 977		
Rate for on wait-list	13.8	20.6		
Rate for off wait-list	8.7	14.8		
Analytical sample, *n*	908 911	918 104		
Crude IRR	1.55 (1.11–2.17)	1.36 (1.07–1.73)		
Age- or sex-adjusted IRR	1.55 (1.11–2.15)	1.37 (1.08–1.74)		
Multivariable-adjusted† IRR	1.34 (1.01–1.78)	1.12 (0.91–1.38)		

Note: ACSC = ambulatory care sensitive condition, CI = confidence interval, ED = emergency department, IRR = incidence rate ratio.
*Unless otherwise specified.
†Multivariable-adjusted: age, sex, Charlson Comorbidity Index, rurality, Census-level household income, Canadian Index of Multiple Deprivation composite index (rate per 1000 for ED contacts; rate per 10 000 for ACSC hospital admissions).

department visits for any reason decreased to 65% (IRR 0.65, 95% CI 0.62–0.67) and those for ACSCs to 75% (IRR 0.75, 95% CI 0.72–0.79) compared with the previous year period.[33] Our findings of consistently higher health service utilization for people on wait-list in Nova Scotia, juxtaposed with a greater relative decrease in emergency department utilization during the COVID-19 wave 2, suggest that while primary care gap–driven health service utilization is higher among those with perceived greater primary care access need (i.e., on wait-list), these individuals potentially face higher access restrictions owing to pandemic-associated barriers.

Our analyses quantify trends in emergency department use and ACSC hospital admissions; however, a qualitative inquiry may explain why these trends were found. Patient interviews in the next phase of the PUPPY study will contribute to understanding where patients accessed care during the pandemic and health implications associated with these decisions. During the pandemic, there were policy changes and innovations to help maintain primary care access for patients, including increases in the provision of virtual care.[41] Patients experienced delays accessing primary care,[42,43] influencing the need to visit the emergency department, regardless of attachment status. Future studies could explore the frequency of virtual care access by patient attachment status. We hope to replicate similar analysis across Canadian provinces to better understand the consequences of patient unattachment.

Limitations

Although the comparison of COVID-19 waves with analogous calendar periods the previous year may adjust for seasonality, there may be important unmeasured confounders for which we were unable to account. For one, the CIMD and household income may not fully capture important variation in sociodemographic drivers associated with perceived primary care need and measures of primary care gap–associated health service utilization. We did not adjust for time on wait-list, which may indicate increased need or deprivation of care. We included all centralized wait-list users identified in the HDNS Insured Patient Registry and have no reason to believe that our list was incomplete. As linkage was performed using an individual-level unique identifier (i.e., health card number) issued by the administrator of provincial Medical Services Insurance program, we are confident that linkage is accurate and complete. We were, however, unable to account for those unattached who were not on the Registry (e.g., individuals who do not have a provider and are not enrolled on the wait-list), warranting caution in the interpretation of wait-list status as an attachment proxy, rather than as a surrogate of perceived primary care need. We acknowledge the potential for misclassification bias arising from individuals whose enrolment on the wait-list may have been instigated by health conditions leading to hospital service utilization captured in our outcomes. That said, this

Table 3: Emergency department utilization and admissions for ambulatory care sensitive conditions in 2020 versus 2019

Health care utilization rates by type	COVID-19 wave 1 (Q2 2020) to Q2 2019		COVID-19 wave 2 (Q4 2020) to Q4 2019	
	On wait-list, IRR* (95% CI)	Off wait-list, IRR* (95% CI)	On wait-list, IRR* (95% CI)	Off wait-list, IRR* (95% CI)
ED utilization				
Total sample, *n*	61 676	921 415	57 724	915 800
Rate for Q2 or Q4 2020	117.9	86.2	103.6	83.0
Rate for Q2 or Q4 2019	150.1	101.0	154.4	105.5
Analytical sample, *n*	61 176	894 680	57 189	889 138
Crude IRR	0.79 (0.74–0.84)	0.86 (0.84–0.87)	0.67 (0.63–0.72)	0.79 (0.78–0.81)
Age- or sex-adjusted IRR	0.79 (0.74–0.84)	0.86 (0.84–0.87)	0.67 (0.62–0.71)	0.79 (0.78–0.81)
Multivariable-adjusted† IRR	0.86 (0.81–0.92)	0.89 (0.87–0.90)	0.72 (0.68–0.77)	0.83 (0.82–0.85)
ACSC hospital admissions				
Total sample, *n*	61 676	921 415		
Rate for Q2 2020	13.8	8.7		
Rate for Q2 2019	20.6	14.8		
Analytical sample, *n*	61 176	894 680		
Crude IRR	0.67 (0.46–0.96)	0.59 (0.54–0.65)		
Age- or sex-adjusted IRR	0.65 (0.45–0.93)	0.61 (0.56–0.68)		
Multivariable-adjusted† IRR	0.78 (0.54–1.12)	0.67 (0.60–0.74)		

Note: ACSC = ambulatory care sensitive condition, CI = confidence interval, ED = emergency department, IRR = incidence rate ratio.
*Unless otherwise specified.
†Multivariable-adjusted: age, sex, Charlson Comorbidity Index, rurality, Census-level household income, Canadian Index of Multiple Deprivation composite index (rate per 1000 for ED contacts; rate per 10 000 for ACSC hospital admissions).

bias should be minimal for the ACSC hospital admission outcomes, as these comprise admissions for conditions that are most associated with proximal lapses in primary care.[17]

Finally, this study may have been limited by use of a physician billing database to enumerate emergency department use. This database captures only emergency department visits where a physician assessed the patient and submitted a billing claim.

Conclusion

People in Nova Scotia actively seeking primary care attachment utilize noncritical hospital-based services more frequently. Although both those on and off wait-list had lower utilization of these services during some waves of the COVID-19 pandemic, the larger relative reduction in emergency department utilization during wave 2 for those on wait-list may indicate that those with greater perceived care need may be forgoing care more. The degree to which forgone services produce downstream health burden remains to be seen; the preliminary assessment of this is part of ongoing PUPPY study research.

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