

# A Cross-Sectional Descriptive Study Using Health Administrative Data to Examine the Characteristics of Older Adults Incurring Delayed Discharge Days for Non-Clinical Reasons During the COVID-19 Pandemic in Alberta, Canada



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## ABSTRACT

### Background

Our study strived to 1) describe the characteristics of older adults incurring delayed discharge days in Alberta from Apr 01, 2019 to March 31, 2022; 2) examine the prevalence and length of delayed discharge days during the COVID-19 pandemic.

### Method

We conducted a cross-sectional descriptive study using provincial health administrative data. We included adults  $\geq 65$  discharged from hospital from Apr 01, 2019–Mar 31, 2022 in Alberta and whose hospital stay included at least one delayed discharge day. The demographic characteristics of participants were reported in proportions or mean/median. Study period was divided into pandemic waves (pre-pandemic: Apr 1, 2019–Jan 31, 2020; Wave 1: Feb 1, 2020–Aug 31, 2020; Wave 2: Sept 1, 2020–Feb 14, 2021; Wave 3 and beyond: Feb 15, 2021–Mar 31, 2022). Prevalence of delayed discharge in each wave and their median length of stay (IQR) were reported.

### Results

From Apr 01, 2019 to Mar 31, 2022, there were 367,912 hospitalizations among older adults living in Alberta. 3.73% ( $n=13,717$ ) contained at least one delayed discharge day. The percentage of delayed discharge prior to COVID-19 and during each wave stayed consistent. Wave 3 had the shortest median length of stay (29, IQR 15–51). Wave 2 (45.2%) and Wave 3 (45.3%) had higher proportion of patients requiring maximal assistance on the Activities of Daily Living (ADLs). From pre-COVID to Wave 3, there were increases in the proportions of patients discharged to long term care (36.4% in pre-COVID to 40.8% by Wave 3).

## Conclusions

Frequency of delayed discharge hospitalizations was consistent across the pandemic waves. Wave 3 had shorter length of delayed discharge hospitalization. The proportion of patients who were discharged to LTC increased over the course of the pandemic.

**Key words:** older adults, delayed discharge, alternative level of care days, geriatrics, COVID-19, health administrative data

## INTRODUCTION

Delayed discharge days for non-clinical reasons, or delayed discharge, is defined as any length of hospital stay where a patient occupying a bed does not require the level of care/resources provided in an acute care facility but cannot be discharged for non-medical reasons.<sup>(1)</sup> From 2020 to 2021, 5.4% of hospitalizations in Canada included at least one delayed discharge day, and of those, delayed discharge accounted for 16.9% of total length of stay for these stays.<sup>(2)</sup> Older adults are more likely to incur delayed discharge days than other age groups, with disposition planning being the most common reason for delayed discharge.<sup>(3,4)</sup> As many as 60% of delayed discharge patients are estimated to be waiting for long-term care (LTC) placement from the hospital.<sup>(3)</sup> The risks associated with prolonged hospitalization among older adults, including nosocomial infections and loss of independence for Activities of Daily Living (ADLs), have been well documented.<sup>(3–5)</sup> Others have demonstrated that delayed discharge during hospitalization increases risk for readmission and mortality.<sup>(6)</sup> These alarming statistics highlight the importance of understanding delayed discharge so that clinicians and decision makers can implement strategies to mitigate their deleterious effects on older adults.

In addition to the risks to individual patients, delayed discharges pose risks to the health-care system. Inpatient beds filled with patients who cannot be discharged creates a bottleneck that results in patients waiting for admission in emergency department spaces and, consequently, longer emergency department wait times. The effects of delayed discharges on health system capacity become more relevant during big surge events, such as the COVID-19 pandemic. The COVID-19 pandemic had a disproportionate effect on older adults. Between March 2020 and mid-May 2021, 93% of the deaths attributed to COVID-19 were among adults 65 and over.<sup>(7)</sup> Due to pandemic-related restrictions, home care referral and assessment drastically decreased compared to pre-pandemic levels.<sup>(8)</sup> Unmet care needs that resulted from decreased access to medical services, home care supports, and increased caregiver stress and burnout could have increased the risk for hospitalization.<sup>(9,10)</sup> These factors, combined with various isolation requirements for LTC admission and residents, potentially created additional delayed discharge pressures. Currently, there is limited research on the impact of the pandemic on delayed discharge. While a single retrospective cohort study from a single UK hospital did not observe a difference in hospital length of stay between pre-pandemic and pandemic era among non-COVID patients, it is unclear if differences in health-care delivery and policies would yield similar results in Canada.<sup>(11)</sup>

The current study strives to address the knowledge gaps that exist in our understanding of delayed discharge during the COVID-19 pandemic. The goal is to generate rich descriptive statistics on the demographic information of older adult patients incurring delayed discharge days. In addition, the relationship between delayed discharge and the COVID-19 pandemic will be examined to see if there is any difference across the different waves of the pandemic.

## METHODS

### Study Cohort

In the current study, we included all adults  $\geq 65$  discharged from hospital between April 1, 2019 and March 31, 2022 in Alberta, Canada, and whose hospital stay included at least one day designated as delayed discharge. The Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD) includes items that indicate any time designated as delayed discharge, as well as the number of days designated as delayed discharge during each hospitalization. Individuals were excluded if 1) they did not have an active Alberta health card number at the time of hospital discharge; 2) sex or date of birth were missing; or 3) they were older than 105 years old.

### Study Design and Data Source

This is a retrospective cohort study using health administrative data from the province of Alberta, Canada. In Alberta, all hospitals participate in the collection of the CIHI-DAD.<sup>(12)</sup> The CIHI-DAD was used to ascertain all hospital discharges in Alberta during the study period. The CIHI-DAD is a standardized chart abstraction that is completed on all inpatient

hospitalizations at the time of discharge, and it includes data on the timing of, causes for, and services provided during the hospitalization. It is mandated for completion by all hospitals in Alberta and has been regularly used for research purposes.<sup>(13)</sup> In Alberta, patients who are not expected to be discharged home received the Resident Assessment Instrument–Home Care (RAI–HC) assessment by the inpatient transition coordinator. The RAI–HC contains questions pertaining to the patient’s baseline demographic information (e.g., age, gender, marital status), as well as pre-hospitalization functional status (e.g., ADLs), caregiver arrangement, and certain recent health service utilization (e.g., recent ER presentation, recent hospitalization). Provincial health registry data were used to ensure an active health card. All data were linked using unique identifiers. Data were held and analyzed within the secure Alberta Health Services (AHS) Data Enterprise Warehouse and accessed via the Alberta SPOR SUPPORT Unit ([www.absporu.ca](http://www.absporu.ca)).

### Study Variables

Basic demographic information for the patient, such as age and gender, were obtained from the CIHI–DAD. Linkage to the RAI–HC provided additional demographic variables, such as marital status, pre-admission living arrangement, primary caregiver status, as well as the disposition destination, and frequency of hospitalization and emergency room visits in the 90 days prior to admission. The RAI–HC also contains items used to derive variables that represent the patient’s cognitive status and functional status. Cognitive performance was measured using the Cognitive Performance Scale (CPS), which is derived from four embedded variables and categorized from 0 (intact) to 6 (very severe impairment).<sup>(14)</sup> The Activities of Daily Living (ADLs) were measured based on the patient’s independence with eating, locomotion, toilet use and personal hygiene and were categorized from 1 (supervision) to 6 (total dependence).<sup>(15)</sup> These data characterize clinical status prior to admission. These variables were all expressed as categorical or ordinal variables.

### COVID-19 Pandemic Periods

To examine the impact of the COVID-19 pandemic on the prevalence and the length of delayed discharge, a categorical variable that defined each pandemic wave was created. Currently, there is little scientific consensus on how to define pandemic waves. In the current study, the pandemic wave was defined per a Canada Communicable Disease Report published by the Government of Canada.<sup>(16)</sup> Wave 1 was defined as February 1, 2020 to August 31, 2020; Wave 2 was defined as September 1, 2020 to February 14, 2021; Wave 3 and beyond was defined as February 15, 2021 to March 31, 2022. We also created a pre-pandemic period from April 1, 2019 until January 31, 2020.

### Statistical Analysis

Descriptive statistics were used to characterize the cohort according to demographic and functional data. Baseline

demographic statistics were tabulated for hospitalized patients with delayed discharge, with nominal and ordinal data summarized in proportions and continuous data expressed as median (inter quantile range, IQR) or mean (standard deviation, SD), depending on its distribution. To examine the impact of the COVID-19 pandemic on the delayed discharge, the study period was divided by COVID-19 pandemic Waves, and the median case numbers with their IQR were tabulated and compared. Analyses were conducted using SAS 9.4 (SAS Institute Inc., Cary, NC, USA).

The study received approval from the Research Ethics Board at the University of Alberta (Pro00124869). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines were followed for study reporting.<sup>(17)</sup> In addition, we used the REporting of studies Conducted using Observational Routinely collected health Data (RECORD) statement checklist to ensure transparency in the reporting of our methods and results.<sup>(18)</sup>

**RESULTS**

From April 01, 2019 to March 31, 2022, there were 367,912 hospitalizations among older adults living in Alberta. Of these, 3.73% (n=13,717) contained at least one delayed discharge day. The proportions of delayed discharge hospitalization across different COVID-19 wave periods were summarized in Table 1.

Table 2 summarized the median length of delayed discharge stays across different COVID-19 waves. The median delayed discharge length of stay was 32 days (IQR 17, 57)

TABLE 1.  
Proportions of delayed discharge hospitalizations across different COVID-19 wave periods (n=367,912)

	<i>Delayed Discharge Hospitalizations</i>	<i>Total Hospitalizations</i>	<i>Percentage (%)</i>
Pre-COVID	3,946	109,308	3.61
Wave 1	2,540	65,516	3.88
Wave 2	2,014	54,243	3.71
Wave 3	5,217	138,845	3.76
Total	13,717	367,912	3.73

TABLE 2.  
Median length of stay in days for delayed discharge hospitalizations across COVID-19 wave periods (n=13,717)

	<i>Median (25<sup>th</sup>, 75<sup>th</sup>)</i>
Pre-COVID (n=3,946)	35 (19, 64)
Wave 1 (n=2,540)	31 (17, 58)
Wave 2 (n=2,014)	38 (21, 63)
Wave 3 (n=5,217)	29 (16, 51)
Total (n=13,713)	32 (17, 57)

across the study period. The median length of delayed discharge varied across time periods but showed no consistent pattern; the shortest median delayed discharge length of stay was 29 days (IQR:15-51) during Wave 3, while the longest median delayed discharge length of stay was 38 days (IQR: 21-63 days) during Wave 2.

Table 3 summarized the baseline characteristics of patients incurring delayed discharge days during each of the study time periods. Mean age of patients in the pre-COVID period was 83.3 (SD 8.3) years, 55.7% were women, 35.5% were married, and 62.0% reported a child or child-in-law as the primary caregiver. These demographics were largely consistent during each of the pandemic periods. In terms of baseline functional status, nearly 60% of patients were reported to have moderate cognitive impairment across all study periods. Compared to delayed discharge patients in pre-COVID (39.3%) and Wave 1 (40.8%), delayed discharge patients during Wave 2 (45.2%) and Wave 3 (45.3%) had a higher frequency requiring maximal assistance for—or were fully dependent on—ADLs. From pre-COVID to Wave 3, the frequency of patients discharged to long term care increased from 36.4% to 40.8%. At each time point, approximately 5% of patients died during the hospital stay, except during Wave 2 when this peaked at 7.5%. Other discharge dispositions were combined with death number due to very small cell size.

Table 4 reported the median length of delayed discharge stays in hospital by discharge destination and by COVID-19 wave. Pre-COVID, patients discharged to supportive living/group housing had the longest median delayed discharge length of stay (46 days, IQR 22-83), but this fluctuated over the pandemic waves. Among patients discharged to LTC, the pre-COVID median delayed discharge length of stay was 34 days (IQR: 20-56 days); while this dipped during Wave 1 (30 days; IQR: 17-52) and Wave 3 (29 days; IQR: 16-48), it peaked at 38 days (IQR: 22-60) during Wave 2. With the exception of those who were being discharged home, Wave 2 also seemed to have longer length of stay compared to other waves for different disposition locations. Wave 3 also had the shortest length of stay across different discharge destinations compared to the other waves.

**DISCUSSION**

The current study observed similar frequencies of hospitalizations with delayed discharge days before and across the pandemic waves. We noted the length of delayed discharge stays during Wave 3 seemed to be shorter compared to other pandemic waves. In addition, we also noted the proportion of delayed discharge patients requiring maximal assistance/dependence in ADLs increased over the course of the pandemic, and this trend was also observed among patients discharged to LTC.

Our study demonstrated that prior to the COVID-19 pandemic, 3.61% of hospitalizations in older adults incurred delayed discharge days during their hospitalization and that this showed little change across the first three pandemic waves

in Alberta, Canada. Overall, the demographic characteristics of patients who experienced delayed discharge did not differ before the pandemic or across the COVID-19 waves. Using health administrative data from the province of Ontario, Guilcher and colleagues similarly found little change in the rate of delayed discharge hospitalizations through Wave 1 and part of Wave 2 relative to pre-COVID.<sup>(19)</sup> The rationale behind the similarity in rate of delayed discharge was not clear

to us. We were uncertain if the criteria for delayed discharge definition changed in response to pandemic measures and restrictions, which could potentially introduce bias towards null results.

We found that Wave 2 had the longest median delayed discharge length of stay relative to the other time periods under study. Across Canada, the primary reason for delayed discharge designation, and in particular extended stays, is

TABLE 3.  
Baseline characteristics of patients incurring delayed discharge days across COVID-19 wave periods (n=13,717)

	<i>Pre-COVID</i> (n=3,946)	<i>Wave 1</i> (n=2,540)	<i>Wave 2</i> (n=2,014)	<i>Wave 3</i> (n=5,217)
Age (Mean, SD)	83.3 (8.2)	83.4 (8.2)	83.7 (8.2)	83.6 (8.3)
Female Gender (%)	2,198 (55.7)	1,385 (54.5)	1,134 (56.3)	2,936 (56.3)
Married/Common Law (%) <sup>a</sup>	515 (35.5)	310 (34.1)	248 (34.2)	638 (33.4)
Caregiver Status (%) <sup>b</sup>				
Child/Child in Law	2,392 (62.0)	1,536 (61.8)	1,209 (61.0)	3,120 (61.0)
Spouse	913 (23.7)	567 (22.8)	477 (24.1)	1185 (23.2)
Relative/Friend/Neighbor	556 (14.4)	381 (15.3)	296 (14.9)	810 (15.8)
Cognition (%)				
Intact	331 (8.4)	227 (8.9)	139 (6.9)	376 (7.2)
Mild	490 (12.4)	295 (11.6)	230 (11.4)	605 (11.6)
Moderate	2,299 (58.3)	1,513 (59.6)	1,166 (57.9)	3,122 (59.8)
Severe	826 (20.9)	505 (19.9)	479 (23.8)	1,114 (21.4)
ADLs (%)				
Independent/Supervision	775 (19.6)	460 (18.1)	350 (17.4)	929 (17.8)
Limited/Extensive	1,622 (41.1)	1,043 (41.1)	754 (37.4)	1,924 (36.9)
Maximal/dependent	1,549 (39.3)	1,037 (40.8)	910 (45.2)	2,364 (45.3)
Depression (%)	900 (22.8)	598 (23.5)	446 (22.1)	1,157 (22.2)
Hospitalization 90 days prior (%)	1,548 (39.2)	951 (37.4)	736 (36.5)	1,993 (38.2)
ER 90 days prior (%)	1,403 (35.6)	834 (32.8)	674 (33.5)	1,684 (32.3)
Disposition (%)				
Home w/wo Homecare	227 (5.8)	164 (6.5)	127 (6.3)	332 (6.4)
Supportive /Group home	929 (23.5)	612 (24.1)	430 (21.4)	1,184 (22.7)
Long Term Care	1,437 (36.4)	963 (37.9)	783 (38.9)	2,129 (40.8)
Hospital Care	1,109 (28.1)	658 (25.9)	523 (26.0)	1,284 (24.6)
Others, including death	244 (6.2)	143 (5.6)	151 (7.5)	288 (5.6)

<sup>a</sup>As compared to “divorced, separated, single, widowed, unknown”. (Missing: n=8718)

<sup>b</sup>(Missing: n=275)

TABLE 4.  
Median length of stay in days for delayed discharge hospitalizations base on their disposition destination (n=13,717)

	<i>Total</i> <i>Median (25<sup>th</sup>, 75<sup>th</sup>)</i>	<i>Pre-COVID</i>	<i>Wave 1</i>	<i>Wave 2</i>	<i>Wave 3</i>
Home With/Without Homecare (n=850)	30 (15, 52)	34 (19, 60)	32 (18, 61)	33 (15, 52)	26 (13, 45)
Supportive Living/Group home (n=3155)	36 (19, 67)	46 (22, 83)	33 (17, 61)	38 (21, 68)	32 (17, 55)
Long Term Care (n=5314)	32 (18, 54)	34 (20, 56)	30 (17, 52)	38 (22, 60)	29 (16, 48)
Hospital Care (n=3574)	32 (16, 59)	32 (16, 58)	33 (16, 63)	38 (19, 68)	29 (15, 54)
Death (n=791)	32 (16, 58)	33 (16, 66)	28 (13, 61)	40 (21, 72)	30 (15, 51)
Others (n=35)	38 (22, 61)	33 (20, 47)	43 (9, 64)	38 (32, 71)	43 (29, 61)

waiting for a LTC bed.<sup>(3)</sup> Similar to findings from Europe and North America, Alberta's LTC facilities recorded high death rates during the COVID-19 pandemic, and this peaked during Wave 2 (15.7 deaths per 100,000 population).<sup>(20–22)</sup> Previous LTC policy reviews also noted the lack of basic supplies and physical infrastructure for social distancing and isolation in managing spread of COVID-19 in LTC.<sup>(23)</sup> In response to the likelihood of high transmission within LTC facilities and the vulnerability of the resident population, most LTC facilities implemented stringent isolation or quarantine requirement for patients returning from hospital.<sup>(24)</sup> This may explain why Wave 2 had the longest delayed discharge lengths of stay in the current study. Vaccination for COVID-19 was introduced in Dec 2020, and by Jan 2021 LTC residents were prioritized for vaccination. The requirements for returning to LTC were loosened over time, which may explain the shorter delayed discharge length of stay in Wave 3 and beyond. A review of responses and policies in LTC during the pandemic could provide insight into their impact on the acute care sector during Waves 2 and 3, as well as offer guidance on emergency planning to ensure more coherent cooperation across health-care sectors.

We also found that the proportion of delayed discharge patients who required maximal assistance or were completely dependent on all ADLs steadily increased over the course of pandemic. This is consistent with the findings that over time the proportion of delayed discharge patients with disposition to LTC also increased from 36% in pre-pandemic level to 40% by Wave 3. During the pandemic, primary care was largely switched to virtual from in-person care, which may have limited accessibility for some older adult patients. Some older adults relied on outpatient rehabilitation and/or social programs to maintain their physical and psychosocial well-being, and provided their caregivers with respite. These programs were cancelled or reduced during the pandemic.<sup>(10)</sup> Existing data also suggested that during the early pandemic, there were reductions in ER presentations and in comprehensive assessments for home care services.<sup>(25,26)</sup> In addition, given the adverse outcomes and high mortality rates experienced by LTC residents, patients and families who were considering higher level of care may have delayed their decision for placement till after the pandemic. This may have led to greater decline among older adults in the community, resulting in higher care needs at presentation to the hospital.

Our study has limitations to consider. Given the complex interplay between the social and health-care policies and restrictions across the pandemics, our study was not designed to support drawing any causal conclusions about the pandemic waves and their impact on delayed discharges. We created the pandemic waves as categorical variable as opposed to a continuous variable, as this would be more consistent with what was reported elsewhere among the literatures. However, we acknowledged that, due to the nature of the pandemic, the timing of its impact could differ depending on its geographic location. As such, further refinement for the definition of the wave periods maybe required. Finally, our study was descriptive in nature based on patient-level variables collected by

the health system. While patterns could be observed, we had little insights to how decisions related to delayed discharge were made or if there were any changes to services or staff that created these patterns observed. We could only speculate the causes of these patterns based on existing reports of the COVID-19 response and service changes during that time. At the same time, many inpatient research activities could have been halted due to isolation and restrictions. As health administrative data were passively collected in each hospitalization, they allowed for a glimpse of health service changes at a time when primary data collection was limited.

## CONCLUSION

Our study observed that the rate of delayed hospitalizations was similar across the pandemic waves. Wave 3 and beyond seemed to have shorter length of delayed discharge stays. Among the patients with delayed discharge, the proportion of them requiring maximal assistance/dependent in ADLs and who were discharged to LTC increased over the course of the pandemic.

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Not applicable.

## CONFLICT OF INTEREST DISCLOSURES

We have read and understood the *Canadian Geriatrics Journal's* policy on disclosing conflicts of interest and declare that we have none.

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