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ABSTRACT

Background

Palliative care (PC) has been shown to improve outcomes for individuals at the end of life. Despite this, many Canadians do not receive PC prior to death. The present study examines the receipt of inpatient PC and its association with location of death, as well as with admission to intensive care units (ICUs) and use of alternate level of care (ALC) beds in hospital in the last 30 days of life.

Data and methods

The study sample is a retrospective cohort of adult Canadians (aged 19 and older) who died between April 1, 2010, and December 31, 2014. Deaths were ascertained from the Canadian Vital Statistics Database and linked to hospitalizations records in the Discharge Abstract Database to identify the receipt of inpatient PC.

Results

More than half (57.7%) of Canadian adults died in hospital, with only 12.6% receiving any inpatient PC in the year prior to death, and 1.7% receiving a pre-terminal PC designation (i.e., PC initiated prior to the last 30 days of life). In the adjusted analyses, receipt of any inpatient PC was associated with a higher likelihood of death in hospital but lower odds of ICU admission. Pre-terminal PC was associated with lower odds of death in hospital, ICU admission and ALC bed use.

Interpretation

This study offers new insights into the association between inpatient PC and outcomes at the end of life among Canadians. Future studies could expand on these observations to further understanding of the role of inpatient PC in the end-of-life experience for different populations in Canada.

Keywords

palliative care, end of life, administrative data, health outcomes, record linkage

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What is already known on the subject?

- While most Canadians die of causes with predictable trajectories, many do not receive palliative care or adequate support prior to death.
- Receipt of palliative care has been associated with beneficial end-of-life outcomes, including lower health care costs, acute care use and improved patient satisfaction with care.
- Hospitalizations are common as individuals approach death, and could serve as a care inflection point and an opportunity to initiate palliative care for Canadians in their last year of life.

What does this study add?

- Decedents' location of death (i.e., in hospital or outside of hospital) and receipt of inpatient palliative care varied greatly across provinces.
- Few Canadians receive palliative care in inpatient settings prior to their terminal hospitalization (i.e., the inpatient care episode in which the patient died).
- In adjusted analyses, receipt of any inpatient palliative care was associated with a higher likelihood of death in hospital but lower odds of an intensive care admission. However, receipt of pre-terminal palliative care (i.e., receipt of inpatient care prior to the last 30 days of life) was associated with lower odds of death in hospital, intensive care admission and alternate level of care bed use.

Canada continues to have a hospital-centric care system for those who are dying, despite the preference of most individuals to die in their community and other home-like settings.[1] In 2015, 58% of decedents in Canada were hospitalized more than once in their last year of life and 61% of Canadians died in hospital.[2] Under a hospital-centric system, the health care costs associated with dying are high.[3-6] Despite the prominence of hospital care near the end of life, little is known about the characteristics of those who are admitted to hospital during this period and the types of inpatient care being provided. Hospitalizations in the final year of life may provide an opportunity to initiate palliative care (PC) or continue a PC treatment plan established prior to hospitalization.

While most Canadians die of causes with predictable trajectories, many do not receive PC or adequate support prior to death.[2,7,8] The impacts of receiving community-based PC on end-of-life outcomes are well-documented, including lower health care costs, acute care use (e.g., emergency room [ER] visits, hospitalizations with and without intensive care unit [ICU] admissions) and improved patient satisfaction with care.[9-15] Yet, according to the Canadian Institute for Health Information (CIHI), of the two-thirds of decedents in Alberta and Ontario who used home care in their final year of life, only half received formal end-of-life support prior to death.[2] Although non-palliative home care services include a wide range of valuable in-home assistance, formal identification of PC needs and an end-of-life designation are often associated with increased hours of services provided and improved patient and health system outcomes, including fewer days in hospital, death outside of acute care settings and lower cost to the health care system.[16,17] Similar challenges may be observed in the acute care sector, where conversations about PC and advance care planning often happen late in a patient's dying trajectory, with nearly half (44%) of patients who died in hospital receiving a designation for PC only after their symptoms worsened or when curative treatments were terminated.[2]

Not everyone wants to die at home and sometimes patients who cannot be safely cared for at home remain in alternate level of care (ALC) in hospitals while awaiting transfer to a more appropriate care setting. Residential hospices, which provide around-the-clock PC support in a home-like setting, and PCUs are alternatives to end-of-life home care for patients with complex needs. Unfortunately, there is a shortage or absence of residential hospices where Canadians in the final days of their life could receive care. Therefore, it is unsurprising that nearly half (47%) of patients who were hospitalized primarily for PC died in an ALC bed while waiting to be discharged to a more appropriate setting.[2]

There is evidence suggesting that early identification of PC needs, regardless of setting, could improve patients' dying experience.[9,18,19] However, there are few population-level studies examining the delivery of PC in hospitals and the outcomes associated with the receipt of care in this setting published in Canada. In its recent report, CIHI demonstrated that the receipt of any PC through home and community care, long-term care facilities, hospitals, and complex continuing care (i.e., subacute care) settings prior to the last 30 days of life was associated with a 6% reduction in the proportion of decedents who experienced two or more ER visits in the last 30 days of life, and a 19% reduction in the proportion of decedents with an ICU stay compared with decedents without any record of PC.[2] However, in their analysis, CIHI examined deaths in Ontario and Alberta only—primarily because of limitations in data availability—and without adjusting for potential confounders, such as the patient's age, sex and comorbid health conditions.

Through an initiative to link national death registry data (the Canadian Vital Statistics Database [CVSD]) with hospitalization data (CIHI's Discharge Abstract Database [DAD]), there is an opportunity to examine the impact of exposure to PC consultation in an inpatient setting on the end-of-life experience of Canadians. Within this broad context, a designation of PC represents when (1) a patient has received a PC consultation leading up to the initiation of a PC treatment plan, or when (2) a physician determines that their patient has PC needs.[20] This national data linkage allows for analysis that can inform a critical point in a patient's end-of-life trajectory

Table 1
Demographic characteristics and cause of death of decedents in Canadian provinces (excluding Quebec), by location of death, 2010 to 2014

	Hospital			Non-hospital, other or unknown			
	Number	Row (percent)	Column (percent)	Number	Row (percent)	Column (percent)	All
Overall	**508,170**	**57.7**	**100.0**	**372,255**	**42.3**	**100.0**	**880,425**
Year of death							
2010	78,775	59.1	15.5	54,495	40.9	14.6	133,270
2011	106,665	58.7	21.0	74,920	41.3	20.1	181,585
2012	105,690	57.6	20.8	77,865	42.4	20.9	183,550
2013	107,800	57.1	21.2	80,930	42.9	21.7	188,730
2014	109,240	56.5	21.5	84,050	43.5	22.6	193,290
Province							
Newfoundland and Labrador	14,255	64.5	2.8	7,845	35.5	2.1	22,100
Prince Edward Island	3,015	52.7	0.6	2,710	47.3	0.7	5,725
Nova Scotia	23,830	58.7	4.7	16,735	41.3	4.5	40,565
New Brunswick	19,445	62.9	3.8	11,470	37.1	3.1	30,915
Ontario	250,530	57.9	49.3	182,045	42.1	48.9	432,575
Manitoba	40,730	85.1	8.0	7,150	14.9	1.9	47,880
Saskatchewan	22,975	52.9	4.5	20,430	47.1	5.5	43,405
Alberta	59,595	57.7	11.7	43,660	42.3	11.7	103,255
British Columbia	73,800	47.9	14.5	80,210	52.1	21.5	154,010
Age group							
19 to 29 years	4,070	37.7	0.8	6,735	62.3	1.8	10,805
30 to 39 years	5,730	45.0	1.1	7,000	55.0	1.9	12,730
40 to 49 years	15,550	52.5	3.1	14,100	47.6	3.8	29,645
50 to 59 years	42,035	57.6	8.3	30,950	42.4	8.3	72,985
60 to 69 years	77,455	63.2	15.2	45,185	36.8	12.1	122,640
70 to 79 years	116,990	64.8	23.0	63,615	35.2	17.1	180,605
80 to 89 years	167,115	59.1	32.9	115,840	40.9	31.1	282,955
90 years and older	79,230	47.1	15.6	88,830	52.9	23.9	168,060
Sex							
Male	266,950	59.9	52.5	178,855	40.1	48.0	445,805
Female	241,220	55.5	47.5	193,400	44.5	52.0	434,620
Marital status							
Single	48,125	50.6	9.5	46,940	49.4	12.6	95,070
Married	230,195	64.2	45.3	128,600	35.8	34.5	358,790
Widowed	171,745	53.3	33.8	150,510	46.7	40.4	322,255
Divorced	40,855	55.0	8.0	33,470	45.0	9.0	74,325
Separated	2,745	54.1	0.5	2,320	45.8	0.6	5,070
Unknown	14,505	58.2	2.9	10,415	41.8	2.8	24,915
Neighbourhood income quintile							
Lowest quintile	115,475	57.4	22.7	85,660	42.6	23.0	201,135
Medium-low quintile	107,000	59.1	21.1	74,015	40.9	19.9	181,015
Middle quintile	98,625	58.2	19.4	70,725	41.8	19.0	169,350
Medium-high quintile	94,025	57.4	18.5	69,825	42.6	18.8	163,850
Highest quintile	85,095	56.4	16.7	65,675	43.6	17.6	150,770
Missing	7,955	55.6	1.6	6,350	44.4	1.7	14,305
Rurality							
Rural	113,895	60.0	22.4	76,000	40.0	20.4	189,900
Urban	389,240	57.1	76.6	292,180	42.9	78.5	681,420
Other, missing or unknown	5,030	55.2	1.0	4,075	44.8	1.1	9,105
Underlying cause of death							
Terminal illness	172,170	63.3	33.9	99,675	36.7	26.8	271,845
Frailty	117,015	46.3	23.0	135,650	53.7	36.4	252,665
Organ failure	179,170	65.0	35.3	96,610	35.0	26.0	275,785
Other	12,005	29.4	2.4	28,865	70.6	7.8	40,870
Sudden death	27,810	70.8	5.5	11,450	29.2	3.1	39,260

Note: Because of rounding, rows may not sum to the total.
Source: Canadian Vital Statistics Death Database, excluding decedents in Quebec and the territories, 2010 to 2014.

where intervention could alter their dying experience. The objective of this analysis is to examine the association between the receipt of inpatient PC and subsequent acute care outcomes (i.e., ICU admission, use of ALC beds and location of death).

Data and methods

Study population

This is a retrospective cohort study of adult Canadians (aged 19 and older) who died between April 1, 2010, and December 31, 2014. Decedents from Quebec were excluded from analysis

Table 2
Receipt of any inpatient palliative care and pre-terminal (prior to last 30 days of life) inpatient palliative care among decedents in Canadian provinces (excluding Quebec), overall and among decendents who were hospitalized in the last year of life, 2010 to 2014

	Last year of life				Prior to last 30 days of life				
	Hospitalized		Any inpatient palliative care		Hospitalized		Pre-terminal palliative care		
	Number	Percent cohort	Number	Percent hospitalized cohort	Number	Percent cohort	Number	Percent hospitalized cohort	Percent any inpatient palliative care cohort hospitalized pre-terminally
Overall	**592,800**	**67.3**	**111,145**	**18.7**	**364,350**	**41.4**	**14,865**	**4.1**	**21.7**
Year of death									
2010	89,040	66.8	17,100	19.2	53,670	40.3	2,455	4.6	23.3
2011	122,400	67.4	23,290	19.0	74,425	41.0	3,245	4.4	22.5
2012	123,705	67.4	22,995	18.6	76,090	41.5	2,985	3.9	21.2
2013	127,780	67.7	23,785	18.6	79,330	42.0	3,100	3.9	21.2
2014	129,880	67.2	23,970	18.5	80,825	41.8	3,085	3.8	20.9
Province									
Newfoundland and Labrador	14,120	63.9	3,320	23.5	8,320	37.6	385	4.6	19.2
Prince Edward Island	3,580	62.5	860	24.0	2,310	40.3	140	6.1	24.8
Nova Scotia	26,945	66.4	8,255	30.6	15,355	37.9	1,055	6.9	22.4
New Brunswick	21,965	71.0	6,050	27.5	13,495	43.7	625	4.6	16.1
Ontario	294,795	68.1	49,695	16.9	178,910	41.4	5,970	3.3	20.3
Manitoba	29,125	60.8	7,190	24.7	17,265	36.1	720	4.2	17.1
Saskatchewan	28,655	66.0	6,035	21.1	18,830	43.4	980	5.2	23.4
Alberta	69,175	67.0	10,570	15.3	44,595	43.2	1,515	3.4	21.5
British Columbia	104,440	67.8	19,170	18.4	65,265	42.4	3,480	5.3	28.1
Age group									
19 to 29 years	3,155	29.2	340	10.8	1,995	18.5	65	3.3	24.1
30 to 39 years	5,400	42.4	895	16.6	3,680	28.9	195	5.3	27.1
40 to 49 years	16,030	54.1	3,555	22.2	10,815	36.5	665	6.1	25.0
50 to 59 years	46,465	63.7	11,585	24.9	30,710	42.1	2,120	6.9	26.1
60 to 69 years	88,400	72.1	21,510	24.3	57,345	46.8	3,370	5.9	23.1
70 to 79 years	136,455	75.6	28,215	20.7	85,140	47.1	3,880	4.6	21.7
80 to 89 years	200,305	70.8	31,935	15.9	119,485	42.2	3,455	2.9	19.2
90 years and older	96,595	57.5	13,110	13.6	55,180	32.8	1,110	2.0	18.2
Sex									
Male	305,220	68.5	55,545	18.2	188,075	42.2	6,995	3.7	20.0
Female	287,580	66.2	55,595	19.3	176,275	40.6	7,870	4.5	23.5
Marital status									
Single	50,780	53.4	8,575	16.9	31,225	32.8	1,360	4.4	25.0
Married	266,945	74.4	56,250	21.1	166,010	46.3	7,570	4.6	21.0
Widowed	206,960	64.2	33,005	15.9	123,470	38.3	3,750	3.0	20.6
Divorced	48,740	65.6	9,355	19.2	31,195	42.0	1,550	5.0	25.4
Separated	3,255	64.2	725	22.3	2,115	41.7	120	5.7	24.5
Unknown	16,125	64.7	3,235	20.1	10,340	41.5	520	5.0	23.7
Neighbourhood income quintile									
Lowest quintile	133,500	66.4	24,430	18.3	82,340	40.9	3,280	4.0	21.8
Medium-low quintile	124,140	68.6	23,520	18.9	75,770	41.9	3,045	4.0	21.1
Middle quintile	115,330	68.1	21,930	19.0	70,695	41.7	2,930	4.1	21.7
Medium-high quintile	111,030	67.8	21,140	19.0	68,585	41.9	2,865	4.2	21.9
Highest quintile	101,030	67.0	18,915	18.7	62,155	41.2	2,585	4.2	22.3
Missing	7,775	54.4	1,205	15.5	4,800	33.6	160	3.3	21.6
Rurality									
Rural	122,675	64.6	25,860	21.1	78,155	41.2	3,330	4.3	19.8
Urban	465,660	68.3	84,605	18.2	283,560	41.6	11,435	4.0	22.3
Missing	4,465	49.0	675	15.1	2,635	28.9	95	3.6	24.7
Underlying cause of death									
Terminal illness	228,395	84.0	78,450	34.3	153,045	56.3	13,055	8.5	25.2
Frailty	131,410	52.0	9,880	7.5	78,875	31.2	640	0.8	13.0
Organ failure	192,800	69.9	19,715	10.2	111,855	40.6	1,065	1.0	10.3
Other	28,340	72.2	2,735	9.7	13,645	34.8	95	0.7	7.8
Sudden death	11,860	29.0	365	3.1	6,925	16.9	15	0.2	8.8

Note: Because of rounding, rows may not sum to the total.
Sources: Canadian Vital Statistics Deaths Database, excluding decedents in Quebec and the territories, 2011 to 2014; Discharge Abstract Database, fiscal years 2010 to 2014.

because DAD data were unavailable, and decedents from the territories were excluded because only a small number received inpatient PC.

Ascertainment of death and baseline characteristics

Death was ascertained from the CVSD, which is a census of all deaths occurring in Canada. CVSD information is obtained from death certificates and reported to Statistics Canada by provincial and territorial vital statistics registries. In addition to date of death, the following information was also derived from the CVSD: age at death (based on the decedent's birth date), sex, marital status, province where the death occurred, and site and cause of death (using the tenth version of the International Statistical Classification of Diseases [ICD-10]). Location of death was defined as in hospital or non-hospital, where the latter includes deaths occurring in private homes, hospices, other health care facilities (e.g., nursing homes, rehabilitation and psychiatric care facilities, and other long-term or chronic care facilities) or unspecified non-acute care locations. A breakdown of the location of death across provinces included in this study is provided in Appendix Table A.1. Causes of death were collapsed using the Lunney/Fassbender Cause of Death Trajectory Groupings (i.e., terminal illness, organ failure, frailty, sudden death and other), which has been adapted for the Canadian context.[21-23] Two variables were included to capture area-based health inequalities: the Statistical Area Classification (SAC) type, which is a measure of area-related health inequalities, and an income-related measure using the neighbourhood income quintile. The SAC type was dichotomized into urban (SAC type = 1, 2, 3) and rural or remote (SAC type = 4, 5, 6, 7, or 8) regions.[24] These area-based variables were obtained by applying the Postal Code Conversion File Plus (PCCF+) tool on decedents' residential postal codes reported in the CVSD. Neighbourhood income quintile was calculated at the level of census metropolitan area or census agglomeration.

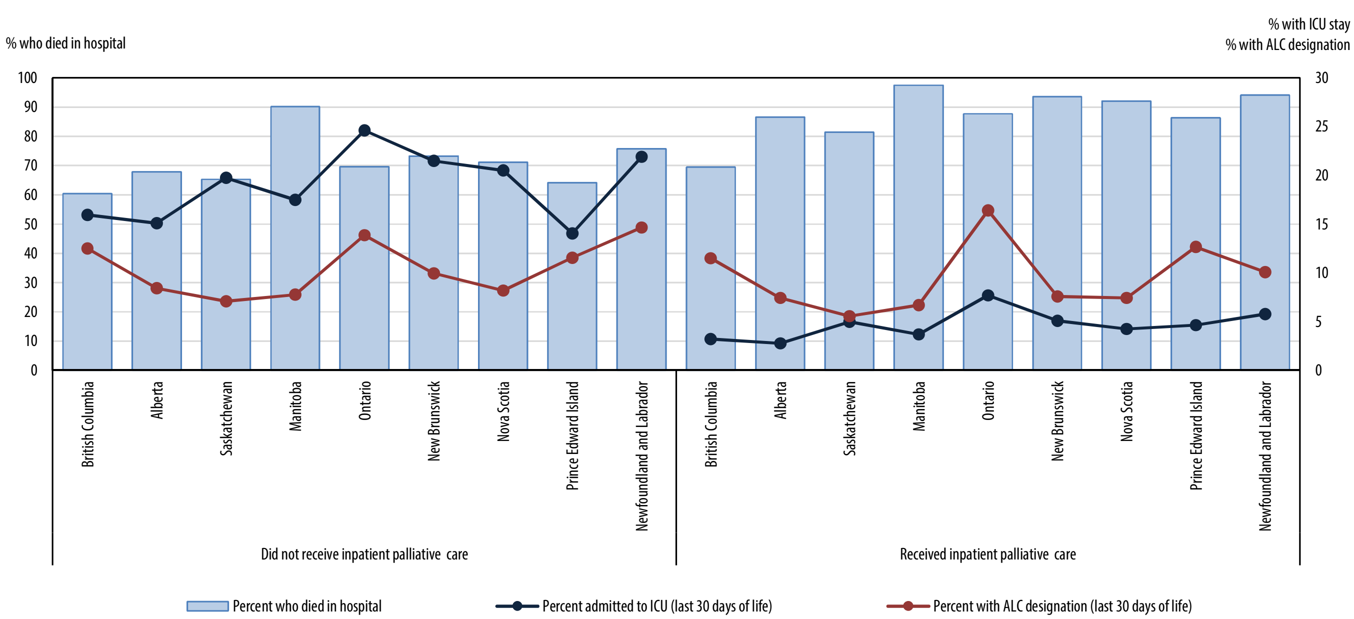
Palliative care consultation

The DAD contains detailed accounts of a patient's care in hospital from admission to discharge. Following definitions used in previous Canadian studies,[2,8] receipt of inpatient PC was defined using ICD-10 code Z51.5, where PC was considered the main reason for the patient's hospital admission within one year prior to death. Pre-terminal PC was defined as an inpatient PC consultation prior to the last 30 days of life.

Acute care outcomes

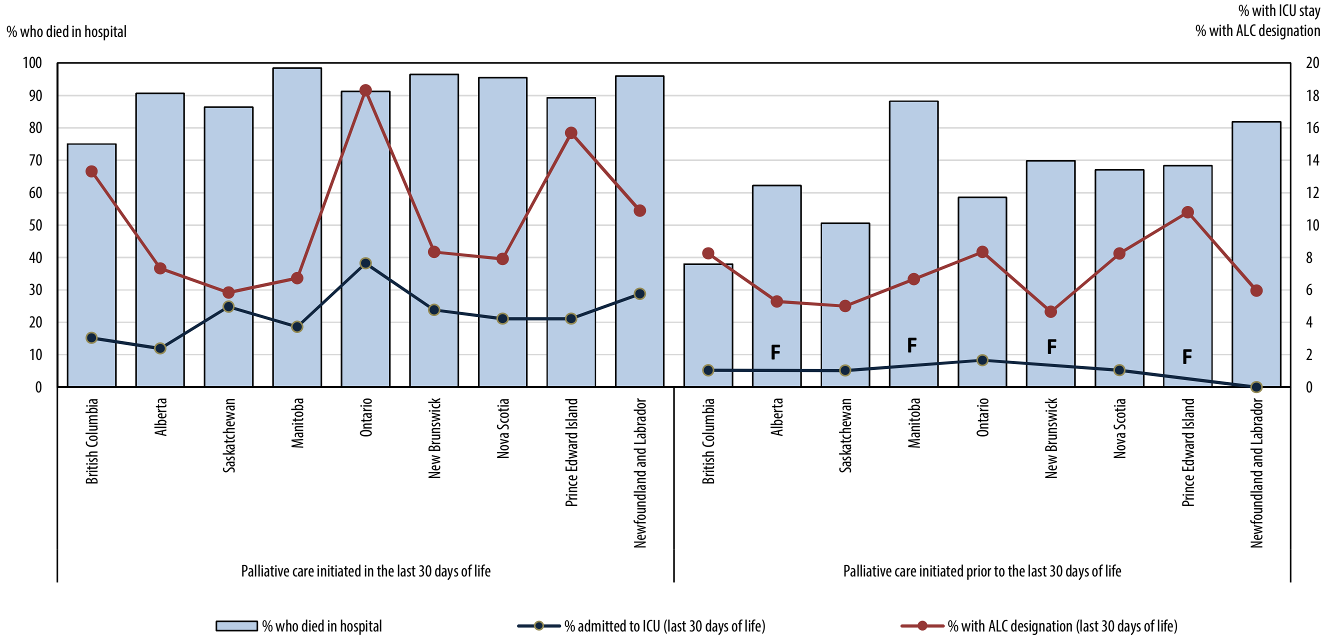
The primary outcomes of interest in this study were death in hospital and ICU admissions or ALC designation in the last 30 days of life. ICU admissions were derived from the receipt of care provided in a special care unit, such as medical, surgical and cardiac intensive care nursing units. ALC designations were

Figure 1
The proportion of decedents who died in hospital (light blue bars), were admitted to intensive care units in the last 30 days of life (dark blue lines with markers) or had any alternate level of care designation in the last 30 days of life (red lines with markers), by receipt of inpatient palliative care, among decedents who had at least one hospital stay in the last year of life, 2010 to 2014



Notes: ICU=intensive care unit; ALC=alternate level of care.
Sources: Canadian Vital Statistics Death Database, excluding decedents in Quebec and the territories, 2010 to 2014; Discharge Abstract Database, fiscal years 2009 to 2014.

Figure 2
The proportion of decedents who died in hospital (light blue bars), were admitted to intensive care units in the last 30 days of life (dark blue lines with markers) or had any alternate level of care designation in the last 30 days of life (red lines with markers), among decedents who received inpatient palliative care in the year prior to death, by receipt of inpatient palliative care prior to or after the last 30 days of life, 2010 to 2014



F too unreliable to be published
Notes: ICU=intensive care unit; ALC=alternate level of care.
Sources: Canadian Vital Statistics Deaths Database, excluding decedents in Quebec and the territories, 2010 to 2014; Discharge Abstract Database, fiscal years 2009 to 2014.

based on transfer records in the DAD, which reflect the reclassification of patients as ALC during their inpatient stay.

Statistical analysis

Location of death (i.e., in hospital vs. non-hospital) and receipt of PC (any or pre-terminal) was examined for a variety of cohort characteristics previously found to influence one's propensity for receiving PC,[7] including age, sex, province of residence, rurality, neighbourhood income, marital status, underlying cause of death and year of death. The association between receipt of inpatient PC and pre-terminal PC consultation with the odds of an in-hospital death or either an ICU admission or use of ALC beds in the last 30 days of life were examined using logistic regression, controlling for select characteristics listed above.

Results

There were 880,425 decedents aged 19 and older in the Canadian provinces (excluding Quebec) between April 1, 2010, and December 31, 2014. Among them, 592,800 (67.3%) had at least one hospitalization in their last year of life. Of those hospitalized, 111,145 (18.7%) had at least one PC hospitalization. Among decedents with an inpatient PC designation who were hospitalized at least once prior to their last 30 days of life, only 14,865 (21.8%) received a pre-terminal PC consultation.

Location of death

More than half (57.7%) of deaths occurred in hospital over the study period, although the trend indicated a decline over time from 59.1% in 2010 to 56.5% in 2014 (Table 1). The proportion of in-hospital deaths varied by province, with the lowest prevalence occurring in British Columbia (47.9%; Table 1). While Manitoba had the highest proportion of in-hospital deaths (85.1%), it should be noted that deaths in personal care homes are reported as in-hospital deaths in this province, which results in an over-estimation. With the exception of Manitoba, Newfoundland and Labrador (64.5%) and New Brunswick (62.9%) had the highest proportions of in-hospital deaths (Table 1).

Decedents who died in hospital were slightly younger than those who died outside of hospitals (76.5 ± 14.2 years vs. 77.4 ± 16.7 years) and were more likely to be male (52.5% vs. 48.0%), married (45.3% vs. 34.5%), in a rural region (22.4% vs. 20.4%), and to have died from organ failure (35.3% vs. 26.0%) or terminal illness (33.9% vs. 26.8%; Table 1).

Receipt of inpatient palliative care consultation

Among decedents who were hospitalized in their last year of life, 18.7% received inpatient PC consultation (Table 2). There was a small downward trend in the prevalence of inpatient PC consultation over the study period, from 19.2% in 2010 to 18.5% in 2014 (Table 2).

Across the provinces, rates of inpatient PC consultation ranged from 15.3% in Alberta to 30.6% in Nova Scotia (Table 2). Atlantic Provinces had higher rates of inpatient PC consultation than Ontario (16.9%), British Columbia (18.4%) and Alberta, which were the lowest in Canada.

Pre-terminal palliative care designation

Among those who received inpatient PC in their last year of life and who were hospitalized prior to their last 30 days of life, 21.8% received pre-terminal PC consultation, ranging from 16.1% in New Brunswick to 28.1% in British Columbia (Table 2). This percentage has trended downwards over time, from 23.3% in 2010 to 20.9% in 2014 (Table 2).

Acute care outcomes associated with a palliative care designation

Among those who were hospitalized in their last year of life, decedents with an inpatient PC consultation were more likely to die in hospital (85.6%) than those who did not receive inpatient PC (68.8%). Interestingly, provinces with the highest proportion of inpatient PC consultation (New Brunswick and Nova Scotia) also had some of the highest proportions of in-hospital deaths among those who received inpatient PC (93.6% and 92.0%, respectively; Figure 1, light blue bars). Decedents in British Columbia who received inpatient PC consultations in their last year of life were the least likely to experience in-hospital deaths (69.5%).

Despite a higher likelihood of dying in hospitals, decedents who received inpatient PC consultations were less likely to be admitted to ICUs in the last 30 days of life (5.6%) than those hospitalized but without a PC consultation (21.0%), which varied across provinces (Figure 1, dark blue lines). There were minimal observable differences in the use of ALC beds in the last 30 days of life between decedents who received inpatient PC and those who did not (Figure 1, red lines).

Acute care outcomes associated with pre-terminal palliative care designation

Contrary to the general trend in the receipt of any inpatient PC consultation, decedents who received pre-terminal inpatient PC were less likely to die in hospital than decedents who were hospitalized prior to their last 30 days of life, but for whom PC was only initiated in the terminal phase (i.e., last 30 days of life; Figure 2, light blue bars). Similar to the trend among those receiving any inpatient PC, those who received pre-terminal inpatient PC were less likely to be admitted into an ICU in the last 30 days of life (Figure 2, dark blue lines) and were less likely to use an ALC bed prior to death (Figure 2, red lines).

Adjusted effect of any and pre-terminal designation of palliative care in an inpatient setting

After controlling for age, sex, province, marital status, neighbourhood income quintile, rurality, underlying cause of death and year of death, the receipt of any inpatient PC consultation in the last year of life was significantly associated with increased odds of an in-hospital death (OR: 3.22, 95% CI: 3.16–3.28), but reduced odds of an ICU admission in the last 30 days of life (OR: 0.31, 95% CI: 0.31–0.32; Figure 3). However, it did not have a statistically significant effect on ALC designation.

In similar models (Figure 3), pre-terminal designation of PC was significantly associated with reduced odds of an in-hospital death (OR: 0.16, 95% CI: 0.15–0.17), an ICU admission in the last 30 days of life (OR: 0.28, 95% CI: 0.24–0.33) and ALC designation in the last 30 days of life (OR: 0.52, 95% CI: 0.49–0.56).

Discussion

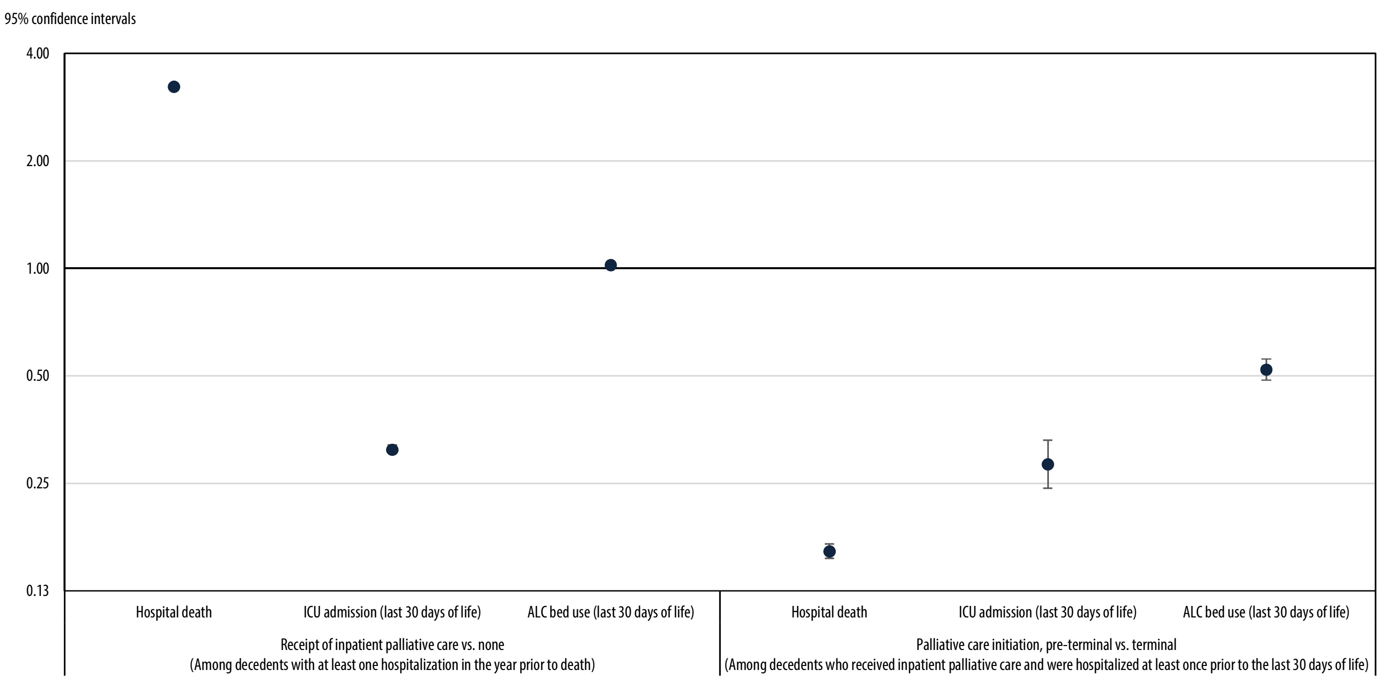
This study describes the prevalence of inpatient PC and outcomes associated with this designation in the last year of life. Overall, this study found that an increasing proportion of Canadians were dying outside of acute care settings. However, among Canadians who were hospitalized prior to death, the majority did not receive inpatient PC consultation during this time and fewer still received inpatient PC consultation prior to the last 30 days of life. This analysis also indicates that outcomes may be better among decedents who received earlier inpatient PC consultation prior to death, for example, lower odds of an ICU admission in the last month of life.

Similar to others' findings, this study found that a high proportion of PC consultations occurred only in the final month of life.[2] While many prior studies have considered death in hospital to be an indicator of poor care quality and outcome,[1,10,11] death in specialized in-hospital PCUs may be considered an appropriate place of death because of its focus on providing comfort care and symptom (including pain, nausea and difficulty breathing) management to patients admitted to these units. Unfortunately, because of the lack of systematic data collection on PCUs and designated PC beds within hospitals in Canada, it was not possible to distinguish beds designated for PC (e.g., beds in a PCU) from general acute care beds in the DAD. As a result, it is not possible to infer whether admissions and PC consults that occurred in the final month of life mean that a patient received care in a PC setting or that PC was considered only after unsuccessful attempts at active interventions (e.g., mechanical ventilation, defibrillation, percutaneous coronary intervention, feeding tube, blood transfusion). Future research could focus on identifying and presenting results separately for known PCUs to ascertain the true prevalence of deaths in hospitals, as in one application using administrative databases in Manitoba.[4]

Outcomes were notably better for decedents who received a pre-terminal PC consultation—they were less likely to die in hospital, experience ICU admissions or be designated as an ALC patient in the final month of life. It is important to note that, while administrative data offer a breadth of data to study population-level trends on inpatient PC consultation, they lacks detail on the scope, intensity and quality of the PC being delivered in this setting. Nonetheless, although a causal relationship could not be established between the receipt of pre-terminal inpatient PC and subsequent end-of-life outcomes, these results are indicative of an association that could be explored in future studies, possibly through linkage with other administrative databases. For example, one could examine the effect of pre-terminal inpatient PC on subsequent receipt of community-based PC, or model the relationship between inpatient PC on end-of-life outcomes controlling for the confounding effect of the receipt of other health services. The trend toward an increasing proportion of non-hospital deaths over the study period could be an indication that improved supportive care in a community setting in recent years has contributed to the reduced reliance on hospital-based services toward the end of life.

Previous studies have shown that most people prefer to die in community or home-like settings.[1] However, sometimes discharge back into the community can be detrimental to medically complex patients, especially in rural and remote regions that have reduced capacity to provide complex medical care and symptom management in a community setting, and when family members or informal caregivers are unable to provide care or are overwhelmed by the burden of caring for a complex patient. Depending on availability, these patients may be discharged to other designated PC settings, such as residential hospices or PCUs, and may stay in an ALC bed in hospital while awaiting transfer. The use of ALC beds has long been considered an indicator of poor care. For example, CIHI reported that nearly half (47%) of palliative patients died while waiting to be discharged to a more appropriate setting.[2] This study found no observable difference in ALC bed use between decedents who received inpatient PC consultation and those who did not. This may reflect the general challenge of accessing appropriate community-based resources in Canada. For example, in Ontario—which has one of the highest proportions of decedents waiting to be placed in a more

Figure 3
Odds ratios (and 95% confidence intervals) of the adjusted effect of inpatient palliative care consultation and pre-terminal initiation palliative care on death in hospital, admission into intensive care units in the last 30 days of life and alternate level of care bed use in the last 30 days of life, decedents in Canadian provinces (excluding Quebec), 2010 to 2014



Notes: ICU=intensive care unit; ALC=alternate level of care.
Sources: Canadian Vital Statistics Death Database, excluding decedents in Quebec and the territories, 2010 to 2014; Discharge Abstract Database, fiscal years 2009 to 2014.

appropriate care setting in the last 30 days of life—the number and percentage of patients waiting in hospital to receive care elsewhere has increased from year to year.[25] However, pre-terminal PC consultation was associated with lower odds of being placed in an ALC bed in the present analysis, which may suggest that earlier recognition of patients' PC needs may be associated with better discharge planning and the receipt of appropriate supports in a community setting that mitigates downstream acute care use. This is consistent with the findings of a recent systematic review that found that inpatient PC consultations were associated with higher rates of discharge to community settings, greater provision of services post-discharge, improved coordination and lower rates of re-hospitalization.[19]

The results of this analysis indicate that the receipt of any inpatient PC consultation was associated with reduced odds of ICU admissions in the final month of life. Admission to ICU is considered a marker of poor-quality end-of-life care, given poor survival following ICU admission (particularly among frail patients) and its high cost to the health care system.[3,26] The present analysis further highlights the relevance of hospitalizations in the final year of life as an opportunity for initiating PC and its potential downstream impact on the dying experience of Canadians.

Limitations

Limitations of this study include the lack of specificity in how certain variables are coded in administrative databases. For example, it has been estimated that approximately one-third of deaths reported in Manitoba as having occurred in hospital likely occurred in a personal care home.[2] This is supported by provincial estimates that 47% of Manitobans died in hospital between 2000 and 2001, with an additional 7% in one of Winnipeg's two hospital-based PCUs.[4] Though not possible in the present study, future linkage of the CVSD to other long-term care-related health care administration data sources (e.g., the Continuing Care Reporting System) could improve validation and data capture. Furthermore, while this analysis assumed that hospitals were not a preferred place of death, it should be recognized that certain patients may prefer hospital-based care at the end of life and, in some regions (e.g., rural and remote areas of Canada), acute care hospitals may be the only care setting in which patients can access PC.[2]

Administrative data are often limited by the organizational functions they were designed to serve. In this study, a DAD record with the most responsible diagnosis code Z51.5 was used to identify access to PC in an inpatient care setting. Opting for a specific definition of PC consultation, similar to previous analysis conducted by CIHI,[2] it is presumed that this is a close approximation of the receipt of PC in an inpatient setting. While the use of a more sensitive definition of PC exposure beyond the main diagnosis code may have provided a more comprehensive perspective on the access to any inpatient PC in Canada, there are concerns regarding the inclusion of secondary codes, as they are less likely to reflect true PC services being delivered, and more likely to merely recognize that the patient is nearing the end of life. According to CIHI's document on the coding standard for PC,[20] the use of the Z51.5 code may range from the initiation of a PC treatment plan to a physician's documentation of a "palliative situation" or an identification of the potential need for comfort, supportive or compassionate care. Nevertheless, despite the use of this more restrictive definition, it was still not possible to infer the range and intensity of services being delivered based on this diagnostic code alone. This study presents one application of diagnostic codes to examine the effectiveness of inpatient PC consultations. Future research could consider extending the scope to include secondary exposures (i.e., where PC may be recorded as one of the other 24 diagnosis codes noted in the discharge summary).

Following CIHI's report,[1] a cut-off of 30 days prior to death was used to define early (i.e., pre-terminal) identification of PC needs and we did not explore the effect associated with other timeframes. Because of the small proportion of decedents who received any PC consultation prior to the last 30 days of life and concerns about the generalizability of the findings (i.e., a bias toward patients with a terminal illness who have a more well-defined trajectory of decline and are more likely to receive an earlier designation of PC), there may be limited capacity for exploring the effect of pre-terminal PC when the DAD is the sole source of information. Future research with a prospective design and linkage to other community-based health care administration databases may be better positioned to adequately examine the effectiveness of pre-terminal PC interventions.

While the examination of PC services provided outside of inpatient care settings was beyond the scope of the current study, the receipt of home and community-based services is known to influence a patient's end-of-life outcomes. As a result, the association between pre-terminal inpatient PC consultations identified in this study may be the result of services received in the community. While it paints an incomplete picture of the care received by decedents, this study demonstrates the use of linked health care administration databases to deepen understanding of access to and outcomes of PC across health care settings in Canada. As the availability of data from home and community-based services grows, there may be opportunities for future studies to examine this at the national level and control for the confounding effects related to the receipt of other services.

Conclusion

This analysis is an example of an application using linked health care administration databases to examine the receipt and outcomes of inpatient PC consultation in the last year of life. Despite certain limitations, this study offers new insights into the association between inpatient PC designation and outcomes at the end-of-life among Canadians. This study found that end-of-life outcomes may be better among decedents who received inpatient PC consultation prior to death, including lower odds of dying in hospital, having an ICU admission in their last month of life or fewer days in ALC. Future studies could build from these observations to further understanding of the role of inpatient PC consultation in the end-of-life experience for different populations in Canada.

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Appendix

Table A.1
Distribution of location of death by province, 2010 to 2014

	Hospital		Private home		Other health care facility		Other or unknown		
	Number	Row (percent)	Number	Row (percent)	Number	Row (percent)	Number	Row (percent)	All
Newfoundland and Labrador	14,965	64.4	3,120	13.4	4,325	18.6	810	3.5	23,220
Prince Edward Island	3,180	52.8	770	12.8	1,940	32.2	125	2.1	6,020
Nova Scotia	25,060	58.8	7,925	18.6	8,325	19.5	1,340	3.1	42,650
New Brunswick	20,430	62.8	4,540	14.0	6,365	19.6	1,185	3.6	32,525
Ontario	264,180	58.0	81,165	17.8	86,280	18.9	23,765	5.2	455,390
Manitoba‡	42,790	85.1	6,280	12.5	170	0.3	1,035	2.1	50,275
Saskatchewan††	24,205	53.0	90	0.2	805	1.8	20,570	45.0	45,670
Alberta	62,635	57.8	16,580	15.3	20,000	18.5	9,105	8.4	108,325
British Columbia	77,745	48.0	26,795	16.6	52,600	32.5	4,715	2.9	161,850

‡ According to the Canadian Institute for Health Information, deaths in personal care homes in Manitoba are reported in the same category as deaths in hospital. As a result, the number of deaths in non-acute “other health care facilities” are under-reported. It has been estimated that approximately one-third of the deaths reported in Manitoba as having occurred in hospital likely occurred in a personal care home.

†† As of 2014, Saskatchewan no longer captures "private home" as a locality of death. These cases are now coded as "other specified locality."

Source: Canadian Vital Statistics Death Database, excluding decedents in Quebec and the territories, 2010 to 2014.

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