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Survival Outcomes after Cardiac Arrest in Community-Dwelling Adults Receiving Home Care versus Nursing Home Residents Compared With Unsupported Individuals

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Abstract

To assess the 30-day post–cardiac arrest survival outlook for individuals receiving home care services and for nursing home residents. We performed a retrospective, population-based cohort analysis involving community-dwelling adults (≥18 years) who were treated for cardiac arrest in Ontario, Canada, from 2006 to 2018. Population-level health databases were linked, using the Home Care Dataset to determine home care recipients and the Continuing Care Reporting System to identify nursing home residents. Both out-of-hospital and in-hospital arrests were included. Logistic regression was used to estimate crude and adjusted associations, with adjustments for age and sex. Relative effects were translated into absolute risk estimates. The cohort consisted of 86,836 participants. Most arrests (55.5%) occurred outside the hospital, with 9,316 individuals receiving home care and 2,394 living in a nursing home. Compared with people without support services, 30-day survival probabilities were lower among home care recipients (RD = −6.5; 95% CI = −7.5 to −5.0), with comparable findings in both out-of-hospital (RD = −6.7; 95% CI = −7.6 to −5.7) and in-hospital arrests (RD = −8.7; 95% CI = −10.6 to −7.3). Nursing home residents also showed reduced 30-day survival (RD = −7.2; 95% CI = −9.3 to −5.3), with similar patterns in out-of-hospital (RD = −8.6; 95% CI = −10.6 to −5.7) and in-hospital arrests (RD = −5.0; 95% CI = −7.8 to −2.1). Both home care recipients and nursing home residents demonstrated poorer short-term survival after cardiac arrest than individuals without pre-arrest support, underscoring two high-needs groups that may particularly benefit from advance care planning.

Keywords: Home care, Nursing home, Cardiac arrest, Prognosis, Survival

Introduction

Although advances in cardiac arrest treatment continue, one-year survival remains low—13% for in-hospital arrests and 8% for out-of-hospital cases [1, 2]. Those who do survive frequently experience long-term physical, cognitive, and psychological challenges, along with reduced quality of life [3-5]. Outcomes are generally poorer for older adults and people living with frailty [6, 7]. Home care clients and nursing home residents represent two aging, medically complex groups with substantial frailty and high use of emergency services [8-10]. Roughly 30% of older Canadians rely on publicly funded home care or live in nursing homes [11, 12]. Home care encompasses a broad set of personal and clinical supports—ranging from personal assistance and nursing care to rehabilitation and mental health services [13]. When needs exceed what home care can offer, individuals often transition to nursing homes, which provide continuous supervision and accommodation. Notably, around 20% of those in long-term care facilities in Canada could theoretically be supported in a home care environment due to their comparable care requirements and clinical characteristics [14].

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Given the elevated rates of cardiorespiratory disease and advanced illness in these groups, their risk of cardiac arrest is substantial [15], making early end-of-life planning especially relevant when services begin. Previous work comparing post-arrest survival in nursing home residents versus community-dwelling older adults has shown mixed results [16-20]. Evidence remains limited regarding cardiac arrest outcomes among home care recipients, a population that continues to grow and often faces unmet care needs [21]. Foundational prognostic research is necessary to determine disease burden and identify people who may derive the greatest benefit from advance care planning [22].

The primary aim of this study was to estimate the likelihood of 30-day survival following cardiac arrest among individuals receiving home care and among nursing home residents, compared with community-dwelling adults not using support services. We anticipated lower 30-day survival in both groups. Our secondary aim was to examine one-year survival and the frequency of death occurring at home. Absolute risk estimates are provided for both out-of-hospital and in-hospital cardiac arrest.

Methods

Study design and data sources

We carried out a retrospective cohort investigation at the population level by linking several anonymized administrative health databases maintained at ICES (formerly the Institute of Clinical and Evaluative Sciences). All individuals who received care for a cardiac arrest in any hospital across Ontario between January 1, 2006, and December 31, 2018, were identified. Arrests that happened after a patient was admitted were labeled in-hospital cases, whereas those occurring before arrival or treated initially in the emergency department were categorized as out-of-hospital events. Although the emergency department is part of the hospital, most cardiac arrests managed there originate outside the facility and are therefore classified as out-of-hospital [23, 24].

Long-term home care recipients (>60 days) and residents of nursing homes were identified using the Home Care Dataset and the Continuing Care Reporting System. Basic demographic variables such as sex and age were retrieved from the Registered Person Data Base. Information related to diagnoses, visit features, clinical procedures, and outcomes for out-of-hospital arrests came from the National Ambulatory Care Reporting System, while similar information for in-hospital arrests was obtained from the Discharge Abstract Database. Use of support devices such as mobility aids or sensory equipment was determined through the Assistive Devices Program dataset. Records of patients admitted for myocardial infarction before their arrest were located via the Ontario Myocardial Infarction Dataset. Details regarding death—timing, location, cause, and autopsy status—were acquired from the Vital Statistics and Death database. All databases included in the analysis undergo routine data quality checks and have been validated for population-based health research in Ontario and Canada [25, 26]. A waiver of ethics review was granted by the Hamilton Integrated Research Ethics Board, as individual consent is not necessary for this type of data according to Section 45 of Ontario's Personal Health Information Protection Act [27]. Study reporting conformed to the STROBE statement for observational research [28].

Cohort and exposures

We included all patients aged 18 years or older who received emergency department or inpatient care for a cardiac arrest at any hospital in Ontario. Follow-up extended for one year after the arrest. For in-hospital cardiac arrests, only those occurring within 72 hours of ED registration were retained. ED registration was used as the reference point because it marks the first encounter with hospital-based services. The 72-hour limit was intended to reduce the influence of clinical deterioration or other confounding factors that may arise later during hospitalization [29]. Prior evidence indicates that most in-hospital arrests take place within the first two days of admission [30]; accordingly, an additional 24-hour buffer was added for individuals waiting in the ED for an inpatient bed.

We identified cardiopulmonary resuscitation using Canadian Classification of Health Interventions codes (IHZ30JN, IHZ3OJY) and determined cardiac arrest events using ICD-10 codes (I46.1, I46.2, I46.8, I49.0, I49.01, I49.02, R96.0, R96.1, R98, R99) [23, 31, 32]. If a patient experienced more than one arrest during the study period, only the first was included because subsequent arrests are associated with markedly lower survival [33, 34] and could introduce correlated observations. Individuals who were not Ontario residents or who lacked a valid Ontario Health Insurance Plan number or date of birth were excluded. We also removed patients who underwent a surgical procedure within the 72-hour window prior to arrest to focus on arrests primarily driven by medical deterioration rather than postoperative or traumatic causes, which follow different pathways of care [30].

Age was analyzed as a categorical variable (18–49, 50–64, 65–74, 75–84, and 85+ years) due to ICES privacy requirements. Triage urgency at ED presentation was assessed using the Canadian Triage Acuity Scale, which ranges from level one (highest acuity) to level five [35]. Pre-arrest disease burden was assigned using ICD-10 morbidity codes.

Outcomes

The chief endpoint for this work was survival 30 days after a cardiac arrest event. This interval was selected because it aligns closely with discharge survival and is consistent with recommendations outlined in the Utstein guidance documents [36, 37]. We additionally assessed one-year survival and whether death occurred at home. A death was categorized as "in-home" when it happened outside any medical or institutional care environment (for example, hospitals, rehabilitation facilities, or long-term care homes). Both survival metrics and place of death are emphasized as outcomes that matter to patients and are prioritized in the COSCA framework and by the ICHOM Older Person Working Group [38, 39].

Analysis

Descriptive summaries include counts and measures of central tendency. Logistic regression was used to generate odds ratios and 95% confidence intervals, which were then converted to absolute risk estimates following recommendations from the PROGRESS and GRADE prognosis groups [22, 40].

Age and sex were incorporated into multivariable adjustments because these factors are consistently linked to variations in health trajectories, recovery after arrest, and patterns of bystander action in out-of-hospital arrests [41, 42]. Analyses of death location excluded nursing home residents due to the inability to determine the precise institution where death occurred. Prognostic estimates were produced for the full sample and separately for in-hospital and out-of-hospital arrests. Missing data were minimal (<0.1%) and removed within each relevant analysis. All data handling and statistical procedures were conducted using R version 3.6.0.

Results

A total of 86,836 adults with either in-hospital or out-of-hospital cardiac arrest were included. Of these, 47,226 (55.5%) arrests took place in hospitals, while 39,610 (45.5%) occurred out-of-hospital; 7,207 (18.1%) of the latter group showed no signs of life on arrival despite attempted resuscitation. Most individuals were not receiving any support services before arrest (85.9%), were male (60.3%), arrived by ambulance (83.3%), and reached the hospital during daytime periods (60.2%). **Figure 1** presents the inclusion pathway and survival distribution. Additional pre-arrest characteristics, proportions, and risk estimates stratified by support status, age, and arrest setting are provided in Supplemental **Tables 1–3**.

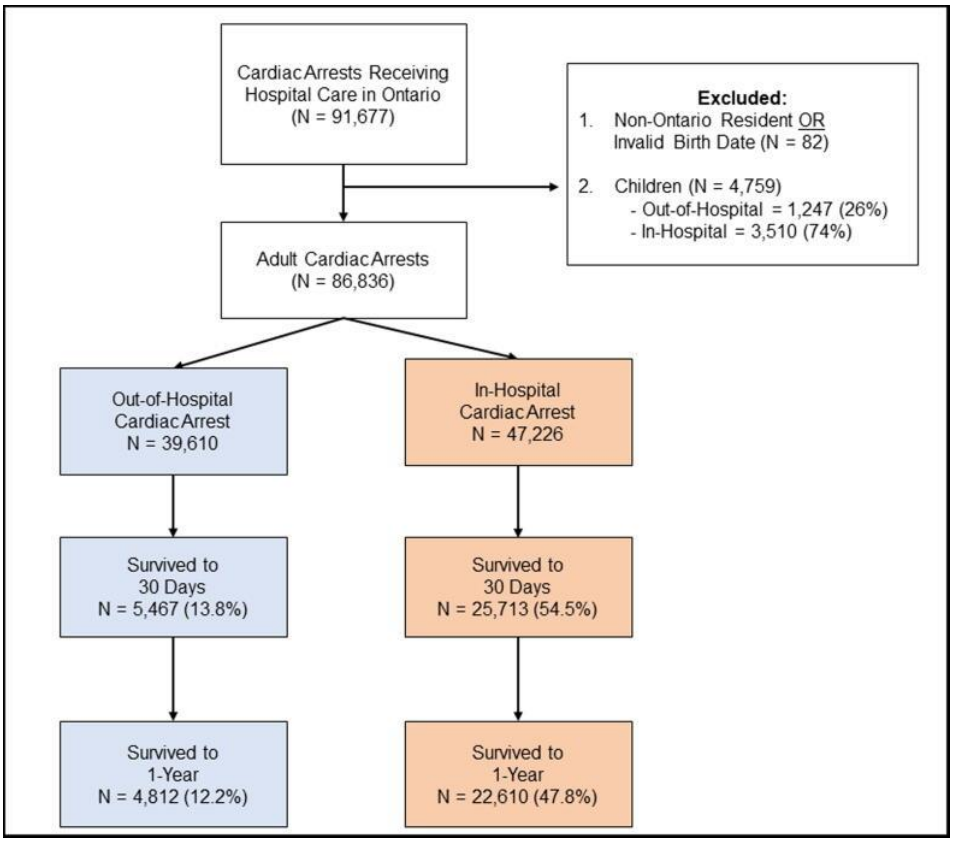

Figure 1. Flow Diagram of Patient Inclusion and Survival

Pre-arrest characteristics associated with support service use

Table 1 summarizes pre-arrest features across those enrolled in home care, residents of nursing homes, and individuals without support. **Figure 2** shows the absolute risk differences for requiring these services. Older age strongly correlated with support service use; those aged 85+ had the highest estimated risk (RD = 38.7; 95% CI = 37.9–39.4) compared with adults aged 18–49. Compared with individuals not using services, those in home care or nursing homes more frequently had congestive heart failure (50.8% vs. 29.3%), COPD (49.7% vs. 35.5%), and dementia (37.5% vs. 8.3%). Respiratory illnesses—including COPD exacerbations (RD = 8.1; 95% CI = 6.4–10.2) and pneumonia (RD = 8.8; 95% CI = 6.9–10.9)—were also more commonly listed as causes of death in these groups.

Table 1. Patient Features Compared Between Pre-Arrest Support Status in 86,836 Adults Who Experienced Cardiac Arrest

Characteristic	No Formal Support N (%)	Home Care Services N (%)	Nursing Home Resident N (%)	Total Cardiac Arrest Cases N (%)
Total Patients	74,586 (85.9)	9,316 (10.7)	2,934 (3.4)	86,836 (100)
Age Group (Years)				
85 and older	7,466 (10.0)	2,831 (30.4)	1,160 (39.5)	11,457 (13.2)
75 – 84	15,301 (20.5)	3,021 (32.4)	1,033 (35.2)	19,355 (22.3)
65 – 74	15,697 (21.0)	1,769 (18.9)	439 (15.0)	17,905 (20.6)
50 – 64	20,039 (26.9)	1,257 (13.4)	264 (9.0)	21,506 (24.8)
18 – 49	16,083 (21.6)	438 (4.7)	38 (1.3)	16,559 (19.1)
Female Sex	27,983 (37.5)	4,822 (51.7)	1,640 (55.9)	34,466 (39.7)
Arrest Occurred In-Hospital	40,526 (54.3)	5,240 (56.2)	1,460 (49.7)	47,226 (55.4)
Arrived by Walking In	13,254 (17.8)	1,146 (12.3)	113 (3.9)	14,513 (16.7)
Presented During Daytime Hours*	44,474 (59.6)	5,995 (64.3)	1,796 (61.2)	52,265 (60.2)
Triage Level (Canadian Triage and Acuity Scale - CTAS)				
I (Resuscitation)	44,429 (59.6)	5,061 (54.3)	1,505 (51.2)	50,995 (58.9)
II (Emergent)	19,868 (26.6)	2,564 (27.5)	960 (33.7)	23,392 (27.0)
III (Urgent)	8,616 (11.6)	1,468 (15.8)	405 (13.8)	10,489 (12.1)
IV (Less Urgent)	1,057 (1.4)	143 (1.5)	30 (1.0)	1,230 (1.4)
V (Non-Urgent)	422 (0.6)	59 (0.6)	25 (0.9)	506 (0.6)
Lives in Rural Area	10,569 (14.2)	997 (10.7)	245 (8.4)	11,811 (13.6)
Selected Comorbidities				
Congestive Heart Failure	21,902 (29.4)	4,840 (52.0)	1,379 (47.0)	28,121 (32.4)
Chronic Obstructive Pulmonary Disease (COPD)	26,468 (35.5)	4,716 (50.7)	1,366 (46.6)	32,550 (37.5)
Dementia	6,195 (8.3)	2,579 (27.7)	2,020 (68.8)	10,794 (12.4)
Diabetes Mellitus	26,178 (35.1)	4,607 (49.5)	1,433 (48.8)	32,218 (37.1)
Hypertension	48,688 (65.3)	7,813 (84.0)	2,506 (85.4)	59,007 (67.9)
Previous Myocardial Infarction	7,566 (10.0)	1,556 (16.2)	385 (12.9)	10,866 (10.7)
Approved for Home Care Devices/Aids				
Mobility/Locomotion Aids	2,270 (3.0)	1,546 (16.6)	537 (18.3)	44,353 (5.0)
Sensory & Communication Aids	1,381 (1.8)	299 (3.2)	73 (2.4)	1,753 (2.0)
Autopsy Performed	1,423 (3.0)	81 (1.1)	17 (0.7)	1,521 (2.6)
Primary Cause of Death				
Atherosclerotic Cardiovascular Disease	6,552 (13.4)	870 (11.3)	233 (9.2)	7,655 (13.0)
Acute Myocardial Infarction	6,410 (13.2)	763 (9.9)	209 (8.3)	7,382 (12.5)
COPD Exacerbation	1,138 (2.3)	335 (4.4)	79 (3.1)	1,552 (2.6)
Pneumonia	1,137 (2.3)	290 (3.7)	141 (5.6)	1,568 (2.7)
Diabetes-Related	1,128 (2.3)	232 (3.0)	68 (2.7)	1,428 (2.4)

Daytime presentation: typically 07:00–22:59 CI = Confidence Interval; COPD = Chronic Obstructive Pulmonary Disease; CTAS = Canadian Triage and Acuity Scale

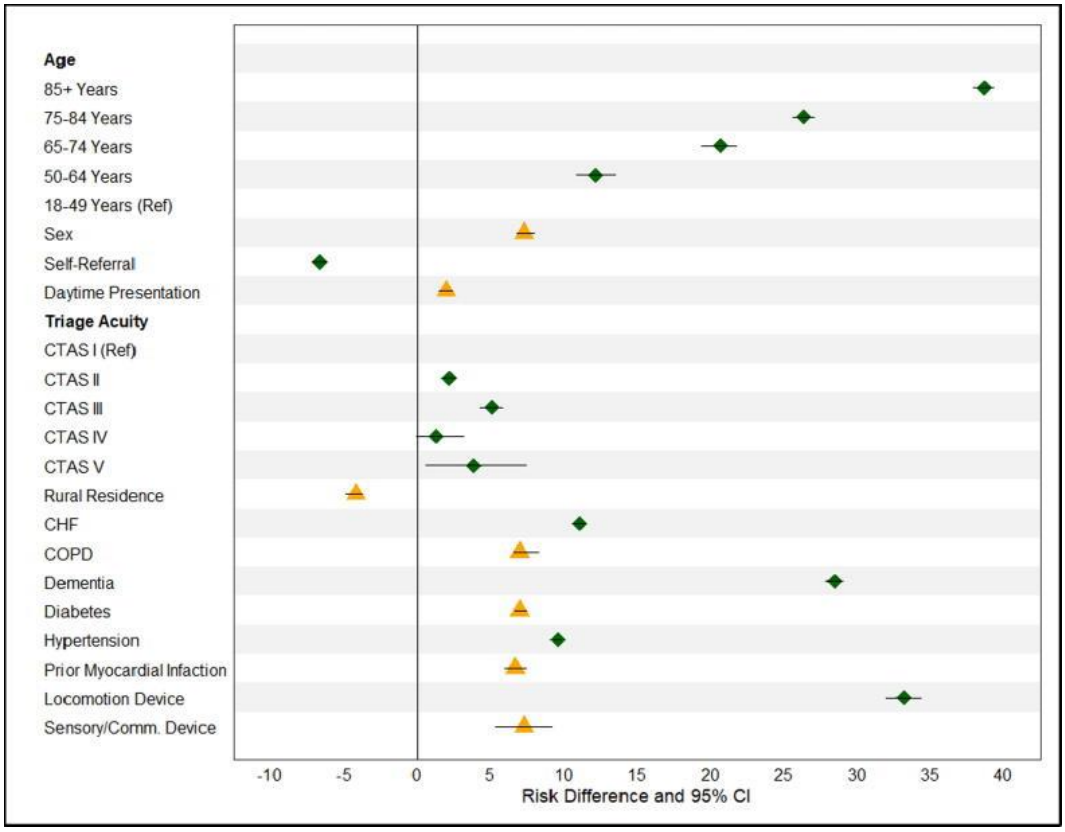

Figure 2. Patient Features Associated with Enrollment in Pre-Arrest Support Services Among 86,836 Individuals Who Experienced Cardiac Arrest in Ontario, Canada

Pre-arrest features across arrest locations

Table 2 contrasts characteristics present before arrest between individuals experiencing out-of-hospital and in-hospital events. Adults aged 85 and above had the highest likelihood of sustaining an arrest outside the hospital when compared with those younger than 50 (RD = −17.7; 95% CI = −18.9 to −16.8). In contrast, people with serious chronic conditions—such as congestive heart failure (RD = 5.6; 95% CI = 4.9–6.3), COPD (RD = 11.2; 95% CI = 10.6–11.7), and dementia (RD = 7.2; 95% CI = 6.3–8.1)—tended to experience arrest in-hospital. Arrests inside the hospital were also more common among women (RD = 8.9; 95% CI = 8.4–9.5) and were more likely to occur during daytime hours between 07:00 and 19:00 (RD = 21.3; 95% CI = 21.3–22.5).

Table 2. Comparison of Pre-Arrest Features Between 39,610 (45.5%) Out-of-Hospital Arrests and 47,226 (55.5%) In-Hospital Arrests in Ontario, Canada

Characteristic	Out-of-Hospital Cardiac Arrest N (%)	In-Hospital Cardiac Arrest N (%)	Total Cardiac Arrests N (%)
Total Cases	39,610 (100)	47,226 (100)	86,836 (100)
Age Group (Years)			
85 and older	6,131 (15.5)	5,326 (11.3)	11,457 (13.2)
75 – 84	9,078 (22.9)	10,277 (21.8)	19,355 (22.3)
65 – 74	8,331 (21.0)	9,574 (20.3)	17,905 (20.6)
50 – 64	10,020 (25.3)	11,540 (24.4)	21,560 (24.8)
18 – 49	6,050 (15.3)	10,509 (22.3)	16,559 (19.1)
Female Sex	13,662 (34.5)	20,804 (44.1)	34,466 (39.7)
Arrived as Walk-In (vs. ambulance/other)	3,618 (9.1)	10,895 (23.1)	14,513 (16.7)
Daytime Presentation (07:00–22:59)	23,581 (59.5)	28,684 (60.7)	52,265 (60.2)
Triage Acuity Level (CTAS)			
I – Resuscitation	32,936 (83.4)	18,059 (38.3)	50,995 (58.9)
II – Emergent	4,355 (11.0)	19,037 (40.4)	23,392 (27.0)
III – Urgent	1,640 (4.1)	8,849 (18.7)	10,489 (12.1)
IV – Less Urgent	186 (0.4)	1,044 (2.2)	1,230 (1.4)
V – Non-Urgent	357 (0.9)	149 (0.3)	506 (0.6)
Rural Residence	5,899 (14.9)	5,912 (12.5)	11,811 (13.6)

Comorbid Conditions			
Congestive Heart Failure	11,703 (29.5)	16,418 (34.8)	28,121 (32.4)
Chronic Obstructive Pulmonary Disease (COPD)	12,297 (31.0)	20,253 (42.9)	32,550 (37.5)
Dementia	4,225 (10.7)	6,569 (13.9)	10,794 (12.4)
Diabetes Mellitus	14,105 (35.6)	18,113 (38.4)	32,218 (37.1)
Hypertension	26,825 (67.7)	32,182 (68.1)	59,007 (67.9)
Previous Myocardial Infarction	6,011 (15.2)	3,496 (7.4)	9,507 (10.9)
Pre-Arrest Support Level			
Receiving Home Care	4,076 (10.3)	5,240 (11.1)	9,316 (10.7)
Living in Nursing Home	1,474 (3.7)	1,460 (3.1)	2,934 (3.4)
No Formal Support	34,060 (86.0)	40,526 (85.8)	74,586 (85.9)
Approved Home Health Aids/Devices			
Mobility/Locomotion Aids	1,890 (4.8)	2,463 (5.2)	4,353 (5.0)
Sensory & Communication Aids	806 (2.0)	947 (2.0)	1,753 (2.0)
Autopsy Performed	997 (2.9)	524 (2.1)	1,521 (2.6)
Primary Underlying Cause of Death			
Atherosclerotic Cardiovascular Disease	6,434 (18.4)	1,312 (5.4)	7,746 (13.1)
Acute Myocardial Infarction	5,698 (16.5)	1,684 (6.9)	7,382 (12.5)
COPD Exacerbation	566 (1.6)	989 (4.1)	1,555 (2.6)
Pneumonia	401 (1.2)	1,167 (4.8)	1,568 (2.7)
Diabetes-Related Complications	1,126 (3.3)	302 (1.3)	1,428 (2.4)

Daytime defined as 07:00–22:59 COPD = Chronic Obstructive Pulmonary Disease CTAS = Canadian Triage and Acuity Scale

Post–cardiac arrest survival

Adjusted odds ratios and confidence intervals for the full sample and for the two arrest settings appear in Supplemental **Tables 4–6**.

30-day survival

A total of 31,180 individuals (36.0%) remained alive 30 days after arrest. Most deaths occurred beyond the first week (61.9%). After accounting for age and sex, those receiving home care (RD = −6.5; 95% CI = −7.5 to −5.0) and those living in nursing homes (RD = −7.2; 95% CI = −9.3 to −5.3) had lower 30-day survival compared with people without pre-arrest support.

Home care users showed reduced 30-day survival in both out-of-hospital arrests (RD = −6.7; 95% CI = −7.6 to −5.7) and in-hospital arrests (RD = −8.7; 95% CI = −10.6 to −7.3). Nursing home residents demonstrated comparable deficits in out-of-hospital arrests (RD = −8.6; 95% CI = −10.6 to −5.7) and in in-hospital arrests (RD = −5.0; 95% CI = −7.8 to −2.1).

Figure 3 illustrates one-month survival probabilities for the three groups (home care, nursing home, and those without services). **Figure 4** presents adjusted absolute risk differences for 30-day and 1-year survival relative to support status.

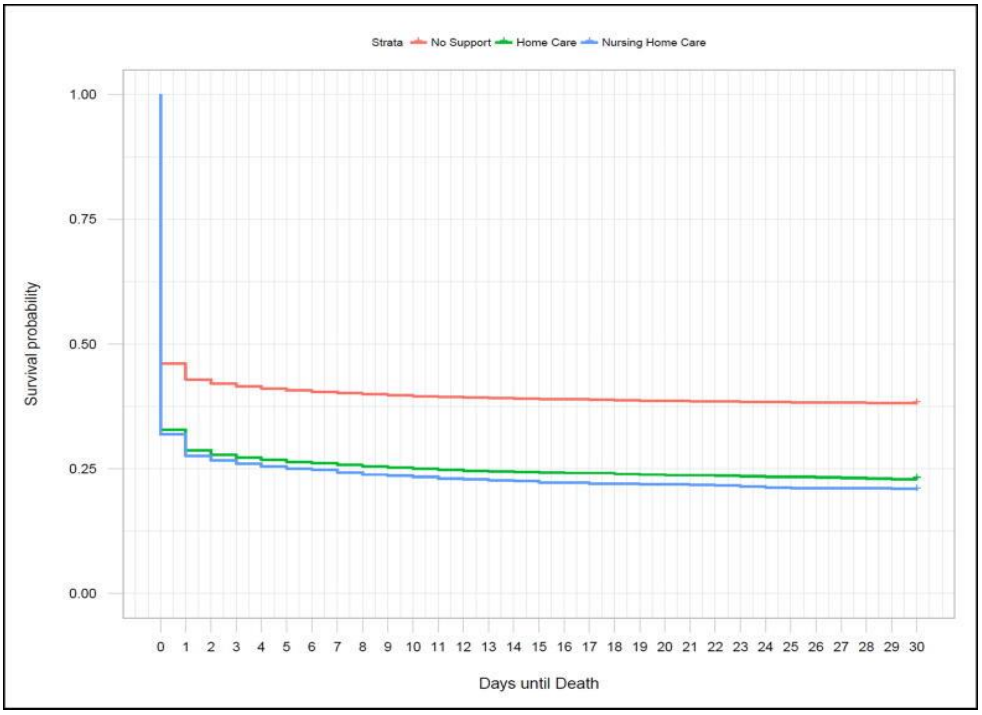

Figure 3. Probability of Survival to 30 Days Post–Cardiac Arrest in 86,836 Individuals in Ontario, Canada

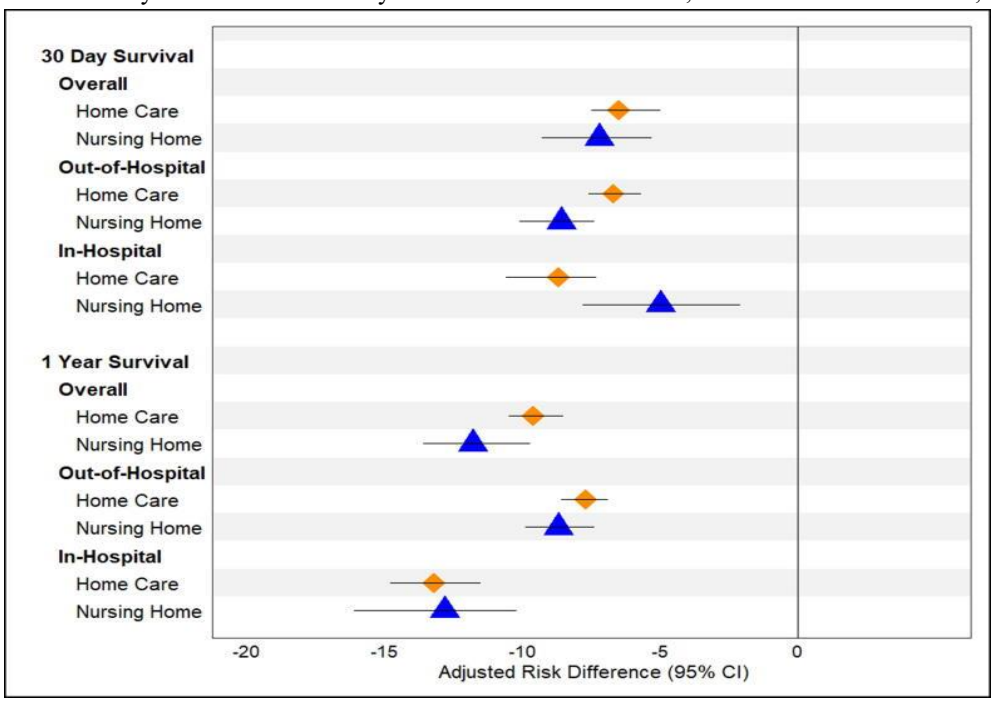

Figure 4. Forest Plot of Adjusted Risk Differences for 30-Day and 1-Year Survival Across Pre-Arrest Support Categories (N = 86,836)

One-year survival

Roughly one-third (31.6%) were alive at one year. After adjusting for age and sex, home care recipients (RD = −9.6; 95% CI = −10.5 to −8.5) and nursing home residents (RD = −11.8; 95% CI = −13.6 to −9.7) again showed poorer outcomes than those without support needs. For one-year survival, home care users had worse absolute risks in both out-of-hospital (RD = −7.7; 95% CI = −8.6 to −6.9) and in-hospital arrests (RD = −13.2; 95% CI = −14.8 to −11.5). Similar patterns were observed among nursing home residents in out-of-hospital arrests (RD = −8.7; 95% CI = −9.9 to −7.4) and in-hospital arrests (RD = −12.8; 95% CI = −16.1 to −10.2).

In-home death

After removing nursing home residents from this analysis, only 4,586 individuals (7.8%) died in a home setting. Among out-of-hospital arrests, people receiving home care were less likely to die at home within a year (RD = −1.3; 95% CI = −2.2 to −0.05). Older age groups displayed a progressively lower probability of home death. Rates of pre-hospital death were nearly equivalent for those who ultimately died at home (13.9%) and those who did not (12.1%).

Discussion

We found that individuals relying on home care or residing in nursing homes had lower 30-day survival following cardiac arrest than those without pre-arrest support services. This pattern held both overall and within out-of-hospital and in-hospital arrest subgroups. Younger adults showed more favorable survival trajectories and had a higher likelihood of dying at home; moreover, home care recipients were more likely to die at home if their arrest occurred outside the hospital.

Comparison to prior research

Limited evidence exists regarding cardiac arrest outcomes among home care clients, but our findings align with previous work showing poorer survival among nursing home residents compared with community-dwelling older adults [13, 15, 16]. This study contributes population-level comparisons across three cohorts in Ontario—home care users, nursing home residents, and adults without support services. The results reinforce earlier observations that age is a strong prognostic indicator inversely linked with survival after both out-of-hospital and in-hospital arrests [7, 43].

Clinical and policy implications

Individuals receiving home care or living in nursing homes showed lower chances of surviving to both 30 days and one year after cardiac arrest. Among those who were arrested outside the hospital, home care users were more likely to die in their own homes. These outcomes—survival and place of death—are meaningful to patients and should be incorporated into advance care planning discussions for home care and long-term care populations [39]. Because these groups tend to be older and experience higher burdens of advanced chronic illness, clinicians can quickly identify pre-arrest support needs and use them to guide shared decision-making about end-of-life priorities and directives.

Our analysis showed that enrollment in support services before arrest was linked to poorer 30-day and one-year survival, with comparable absolute risks in the home care and nursing home cohorts (differences <3%). These similar results may indicate overlapping levels of frailty and medical complexity. The chronic shortage of long-term care beds may contribute to worsening health among home care users prior to long-term care admission. Although nursing home residents were older, home care clients more often had high-risk chronic conditions such as congestive heart failure and COPD. Arrests may have occurred among the least frail nursing home residents or, conversely, among the more medically vulnerable home care patients. Another explanation is that nursing home residents might experience more witnessed arrests and receive CPR more often because of constant access to nursing staff [17, 18].

Public expectations of cardiac arrest survival tend to be overly optimistic, partly due to media portrayals, highlighting the ongoing need for realistic conversations led by clinicians [44, 45]. Advance care planning is frequently delayed until severe illness arises [46], which can lead to choices that do not align with a patient's true preferences, particularly overtreatment [47]. Early and collaborative discussions about advance directives help patients better understand their prognosis and match their care goals to what is achievable [48, 49]. Home care and nursing home settings are well positioned for these conversations because of routine assessments and structured care processes. As these individuals age, the importance of such discussions increases; older adults are less likely to die at home and more likely to die in a hospital, which may contrast with their stated goals or directives [39, 50].

Strengths and limitations

This study offers a unique population-level assessment of survival following cardiac arrest and the likelihood of dying at home across categories of pre-arrest support, age, and sex. Population-wide datasets are suitable for examining cardiac arrest outcomes because the condition is relatively uncommon and requires large samples to inform health system planning [51].

For in-hospital cardiac arrests, our ability to determine overall prognosis was limited because data capture was restricted to events occurring within a 72-hour window. This likely contributed to inflated survival estimates, as clinical deterioration increases with extended hospitalization [52]. A further possible explanation is that many home care or nursing home residents may have do-not-resuscitate orders, meaning those who do undergo CPR may represent a healthier subset [53]. For arrests occurring in the community, we may have overlooked a small number of patients who were resuscitated but never transported to the hospital.

Reliance on ICD-10 administrative coding to identify comorbidities introduces uncertainties due to misclassification and transcription errors [54]. We could not distinguish whether deaths in institutions occurred in hospitals or nursing homes, which required excluding nursing home residents from the analysis of home death. Because of small cell sizes, age could not be treated as a continuous measure and had to be categorized, though multiple cut points were used to refine estimates. Finally, the absence of population-level information on multimorbidity and frailty—both important predictors—limited the depth of the analysis [55].

Conclusion

Home care users and nursing home residents exhibited poorer 30-day and one-year survival after cardiac arrest. Older individuals were also less likely to die at home. These findings reinforce the importance of early, structured discussions about end-of-life care during enrollment and routine follow-up in home care and long-term care environments.

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Ethics statement: None.

References

1. Schluep M, Gravesteijn BY, Stolker RJ, Endeman H, Hoeks SE. One-year survival after in-hospital cardiac arrest: a systematic review and meta-analysis. Resuscitation. 2018;132:90-100. Available from: http://dx.doi.org/10.1016/j.resuscitation.2018.09.001
2. Yan S, Gan Y, Jiang N, Wang R, Chen Y, Luo Z, et al. The global survival rate among adult out-of-hospital cardiac arrest patients who received cardiopulmonary resuscitation: a systematic review and meta-analysis. Crit Care. 2020;24:61. Available from: http://dx.doi.org/10.1186/s13054-020-2773-2
3. Green CR, Botha JA, Tiruvoipati R. Cognitive function, quality of life and mental health in survivors of our-of-hospital cardiac arrest: a review. Anaesth Intensive Care. 2015;43:568-76. Available from: http://dx.doi.org/10.1177/0310057X1504300504
4. Moulaert VRMP, Verbunt JA, van Heugten CM, Wade DT. Cognitive impairments in survivors of out-of-hospital cardiac arrest: a systematic review. Resuscitation. 2009;80:297-305. Available from: http://dx.doi.org/10.1016/j.resuscitation.2008.10.034
5. Elliott VJ, Rodgers DL, Brett SJ. Systematic review of quality of life and other patient-centred outcomes after cardiac arrest survival. Resuscitation. 2011;82:247-56. Available from: http://dx.doi.org/10.1016/j.resuscitation.2010.10.030
6. Mowbray FI, Manlongat D, Correia RH, Strum RP, Fernando SM, McIsaac D, et al. Prognostic association of frailty with post-arrest outcomes following cardiac arrest: a systematic review and meta-analysis. Resuscitation. 2021;167:242-50. Available from: http://dx.doi.org/10.1016/j.resuscitation.2021.06.009
7. Fernando SM, Tran A, Cheng W, Rochwerg B, Taljaard M, Vaillancourt C, et al. Pre-arrest and intra-arrest prognostic factors associated with survival after in-hospital cardiac arrest: systematic review and meta-analysis. BMJ. 2019;367. Available from: http://dx.doi.org/10.1136/bmj.l6373
8. Mowbray FI, Aryal K, Mercier E, Heckman G, Costa AP. Older emergency department patients: does baseline care status matter? Can Geriatr J. 2020;23:289-96. Available from: http://dx.doi.org/10.5770/cgj.23.421
9. Cegri F, Orfila F, Abellana RM, Pastor-Valero M. The impact of frailty on admission to home care services and nursing homes: eight-year follow-up of a community-dwelling, older adult, Spanish cohort. BMC Geriatr. 2020;20:281. Available from: http://dx.doi.org/10.1186/s12877-020-01683-9
10. Strum RP, Drennan IR, Mowbray FI, Mondoux S, Worster A, Babe G, et al. Increased demand for paramedic transports to the emergency department in Ontario, Canada: a population-level descriptive study from 2010 to 2019. CJEM. 2022. Available from: http://dx.doi.org/10.1007/s43678-022-00363-4
11. Milan AM. Living arrangements of seniors: situation des personnes âgées dans les ménages: familles, ménages et état matrimonial, type de construction résidentielle et logements collectifs, recensement de la population de 2020. 2020. Available from: https://policycommons.net/artifacts/1202350/living-arrangements-of-seniors/1755456/

12. Statistics Canada. Table 1. number and percentage of seniors receiving home care, by selected characteristics, household population aged 65 or older, Canada, 2009. 2009. Available from: https://www150.statcan.gc.ca/n1/pub/82-003-x/2012004/article/11760/tbl/tbl1-eng.htm
13. Sinn CLJ, Sultan H, Turcotte LA, McArthur C, Hirdes JP. Patterns of home care assessment and service provision before and during the COVID-19 pandemic in Ontario, Canada. PLoS One. 2022;17:e0266160. Available from: http://dx.doi.org/10.1371/journal.pone.0266160
14. Canadian Institute for Health Information. Seniors in Transition: Exploring Pathways Across the Care Continuum. Available from: https://www.cihi.ca/en/seniors-in-transition-exploring-pathways-across-the-care-continuum
15. Costa AP, Hirdes JP, Bell CM, Bronskill SE, Heckman GA, Mitchell L, et al. Derivation and validation of the detection of indicators and vulnerabilities for emergency room trips scale for classifying the risk of emergency department use in frail community-dwelling older adults. J Am Geriatr Soc. 2015;63:763-9. Available from: http://dx.doi.org/10.1111/jgs.13336
16. Pape M, Rajan S, Hansen SM, Mortensen RN, Riddersholm S, Folke F, et al. Survival after out-of-hospital cardiac arrest in nursing homes - a nationwide study. Resuscitation. 2018;125:90-8. Available from: http://dx.doi.org/10.1016/j.resuscitation.2018.02.004
17. Shibahashi K, Sakurai S, Sugiyama K, Ishida T, Hamabe Y. Nursing home versus community resuscitation after cardiac arrest: comparative outcomes and risk factors. J Am Med Dir Assoc. 2022;23:1316-21. Available from: http://dx.doi.org/10.1016/j.jamda.2021.09.009
18. Benkendorf R, Swor RA, Jackson R, Rivera-Rivera EJ, Demrick A. Outcomes of cardiac arrest in the nursing home: destiny or futility? Prehosp Emerg Care. 1997;1:68-72. Available from: http://dx.doi.org/10.1080/10903129708958790
19. Vaux J, Lecarpentier E, Heidet M, Oubaya N, Hubert H, Baert V, et al. Management and outcomes of cardiac arrests at nursing homes: a French nationwide cohort study. Resuscitation. 2019;140:86-92. Available from: http://dx.doi.org/10.1016/j.resuscitation.2019.05.016
20. Shah MN, Fairbanks RJ, Lerner EB. Cardiac arrests in skilled nursing facilities: continuing room for improvement? J Am Med Dir Assoc. 2006;7:350-4. Available from: http://dx.doi.org/10.1016/j.jamda.2005.11.009
21. Costa AP, Schumacher C, Jones A, Dash D, Campbell G, Junek M, et al. DIVERT-Collaboration Action Research and Evaluation (CARE) Trial Protocol: a multiprovincial pragmatic cluster randomised trial of cardiorespiratory management in home care. BMJ Open. 2019;9:e030301. Available from: http://dx.doi.org/10.1136/bmjopen-2019-030301
22. Hemingway H, Croft P, Perel P, Hayden JA, Abrams K, Timmis A, et al. Prognosis research strategy (PROGRESS) 1: a framework for researching clinical outcomes. BMJ. 2013;346:e5595. Available from: http://dx.doi.org/10.1136/bmj.e5595
23. Wong MKY, Morrison LJ, Qiu F, Austin PC, Cheskes S, Dorian P, et al. Trends in short- and long-term survival among out-of-hospital cardiac arrest patients alive at hospital arrival. Circulation. 2014;130:1883-90. Available from: http://dx.doi.org/10.1161/CIRCULATIONAHA.114.010633
24. Shuvy M, Qiu F, Lau G, et al. Temporal trends in sudden cardiac death in Ontario. Canada. Resuscitation. 2019;136:1-7. Available from: http://dx.doi.org/10.1016/j.resuscitation.2019.01.010
25. Hogeveen SE, Chen J, Hirdes JP. Evaluation of data quality of interRAI assessments in home and community care. BMC Med Inform Decis Mak. 2017;17:150. Available from: http://dx.doi.org/10.1186/s12911-017-0547-9
26. Canadian Institute for Health Information. Data and information quality [Accessed: 2022 October 5]. Available from: https://www.cihi.ca/en/submit-data-and-view-standards/data-and-information-quality/previous-years?field_acronyms_databases_target_id=All&title=&page=1
27. Government of Ontario. Personal health information protection act, 2004, SO 2004, c. 3, Sched. A. 2014. Available from: https://www.ontario.ca/laws/statute/04p03#BK63
28. Vandenbroucke JP, von Elm E, Altman DG, et al. Strengthening the reporting of observational studies in epidemiology (STROBE): explanation and elaboration. Int J Surg. 2014;12:1500-24. Available from: http://dx.doi.org/10.1016/j.ijsu.2014.07.014
29. Covinsky KE, Pierluissi E, Johnston CB. Hospitalization-associated disability: "She was probably able to ambulate, but I'm not sure". JAMA. 2011;306:1782-93. Available from: http://dx.doi.org/10.1001/jama.2011.1556
30. Nolan JP, Soar J, Smith GB, Gwinnutt C, Parrott F, Power S, et al. Incidence and outcome of in-hospital cardiac arrest in the United Kingdom National Cardiac Arrest Audit. Resuscitation. 2014;85:987-92. Available from: http://dx.doi.org/10.1016/j.resuscitation.2014.04.002
31. Geri G, Dumas F, Bonnetain F, Bougouin W, Champigneulle B, Arnaout M, et al. Predictors of long-term functional outcome and health-related quality of life after out-of-hospital cardiac arrest. Resuscitation. 2017;113:77-82. Available from: http://dx.doi.org/10.1016/j.resuscitation.2017.01.028

32. Shuvy M, Koh M, Qiu F, Brooks SC, Chan TCY, Cheskes S, et al. Health care utilization prior to out-of-hospital cardiac arrest: a population-based study. Resuscitation. 2019;141:158-65. Available from: http://dx.doi.org/10.1016/j.resuscitation.2019.04.033
33. Woo JH, Cho JS, Lee CA, Kim GW, Kim YJ, Moon HJ, et al. Survival and rearrest in out-of-hospital cardiac arrest patients with pre-hospital return of spontaneous circulation: a prospective multi-regional observational study. Prehosp Emerg Care. 2021;25:59-66. Available from: http://dx.doi.org/10.1080/10903127.2020.1733716
34. Jung YH, Jeung KW, Lee HY, Lee BK, Lee DH, Shin J, et al. Rearrest during hospitalisation in adult comatose out-of-hospital cardiac arrest patients: risk factors and prognostic impact, and predictors of favourable long-term outcomes. Resuscitation. 2022;170:150-9. Available from: http://dx.doi.org/10.1016/j.resuscitation.2021.11.037
35. Bullard MJ, Chan T, Brayman C, Warren D, Musgrave E, Unger B et al. Revisions to the Canadian Emergency Department Triage and Acuity Scale (CTAS) Guidelines. CJEM. 2014;16:485-9.
36. Perkins GD, Jacobs IG, Nadkarni VM, Berg RA, Bhanji F, Biarent D, et al. Cardiac arrest and cardiopulmonary resuscitation outcome reports: update of the Utstein resuscitation registry templates for out-of-hospital cardiac arrest: a statement for healthcare professionals from a task force of the International Liaison Committee on Resuscitation (American Heart Association, European Resuscitation Council, Australian and New Zealand Council on Resuscitation, Heart and Stroke Foundation of Canada, InterAmerican Heart Foundation, Resuscitation Council of Southern Africa, Resuscitation Council of Asia); and the American Heart Association Emergency Cardiovascular Care Committee and the Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation. Resuscitation. 2015;96:328-40. Available from: http://dx.doi.org/10.1016/j.resuscitation.2014.11.002
37. Majewski D, Ball S, Bailey P, Mckenzie N, Bray J, Morgan A, et al. Survival to hospital discharge is equivalent to 30-day survival as a primary survival outcome for out-of-hospital cardiac arrest studies. Resuscitation. 2021;166:43-8. Available from: http://dx.doi.org/10.1016/j.resuscitation.2021.07.023
38. Haywood K, Whitehead L, Nadkarni VM, Achana F, Beesems S, Böttiger BW, et al. COSCA (Core Outcome Set for Cardiac Arrest) in adults: an advisory statement from the International Liaison Committee on Resuscitation. Circulation. 2018;137:e783-801. Available from: http://dx.doi.org/10.1161/CIR.0000000000000562
39. Akpan A, Roberts C, Bandeen-Roche K, Batty B, Bausewein C, Bell D, et al. Standard set of health outcome measures for older persons. BMC Geriatr. 2018;18:36. Available from: http://dx.doi.org/10.1186/s12877-017-0701-3
40. Foroutan F, Iorio A, Thabane L, Guyatt G. Calculation of absolute risk for important outcomes in patients with and without a prognostic factor of interest. J Clin Epidemiol. 2020;117:46-51. Available from: http://dx.doi.org/10.1016/j.jclinepi.2019.08.012
41. Blewer AL, McGovern SK, Schmicker RH, May S, Morrison LJ, Aufderheide TP, et al. Gender disparities among adult recipients of bystander cardiopulmonary resuscitation in the public. Circ Cardiovasc Qual Outcomes. 2018;11:e004710. Available from: http://dx.doi.org/10.1161/CIRCOUTCOMES.118.004710
42. Mody P, Pandey A, Slutsky AS, Segar MW, Kiss A, Dorian P, et al. Gender-based differences in outcomes among resuscitated patients with out-of-hospital cardiac arrest. Circulation. 2021;143:641-9. Available from: http://dx.doi.org/10.1161/CIRCULATIONAHA.120.050427
43. Wissenberg M, Lippert FK, Folke F, Weeke P, Hansen CM, Christensen EF, et al. Association of national initiatives to improve cardiac arrest management with rates of bystander intervention and patient survival after out-of-hospital cardiac arrest. JAMA. 2013;310:1377-84. Available from: http://dx.doi.org/10.1001/jama.2013.278483
44. Bandolin NS, Huang W, Beckett L, Wintemute G. Perspectives of emergency department attendees on outcomes of resuscitation efforts: origins and impact on cardiopulmonary resuscitation preference. Emerg Med J. 2020;37:611-6. Available from: http://dx.doi.org/10.1136/emermed-2018-208084
45. Portanova J, Irvine K, Yi JY, Enguidanos S. It isn't like this on TV: revisiting CPR survival rates depicted on popular TV shows. Resuscitation. 2015;96:148-50. Available from: http://dx.doi.org/10.1016/j.resuscitation.2015.08.002
46. Pollock K, Wilson E. Care and communication between health professionals and patients affected by severe or chronic illness in community care settings: a qualitative study of care at the end of life. 2015. Available from: http://www.ncbi.nlm.nih.gov/books/NBK305818/
47. Heyland DK, Ilan R, Jiang X, You JJ, Dodek P. The prevalence of medical error related to end-of-life communication in Canadian hospitals: results of a multicentre observational study. BMJ Qual Saf. 2016;25:671-9. Available from: http://dx.doi.org/10.1136/bmjqs-2015-004567
48. Murphy DJ, Burrows D, Santilli S, Kemp AW, Tenner S, Kreling B, et al. The influence of the probability of survival on patients' preferences regarding cardiopulmonary resuscitation. N Engl J Med. 1994;330:545-9. Available from: http://dx.doi.org/10.1056/NEJM199402243300807

49. Kaldjian LC, Erekson ZD, Haberle TH, Curtis AE, Shinkunas LA, Cannon KT, et al. Code status discussions and goals of care among hospitalised adults. J Med Ethics. 2009;35:338-42. Available from: http://dx.doi.org/10.1136/jme.2008.027854
50. Higginson IJ, Sen-Gupta GJ. Place of care in advanced cancer: a qualitative systematic literature review of patient preferences. J Palliat Med. 2000;3:287-300. Available from: http://dx.doi.org/10.1089/jpm.2000.3.287
51. Morrato EH, Elias M, Gericke CA. Using population-based routine data for evidence-based health policy decisions: lessons from three examples of setting and evaluating national health policy in Australia, the UK and the USA. J Public Health. 2007;29:463-71. Available from: http://dx.doi.org/10.1093/pubmed/fdm065
52. Creditor MC. Hazards of hospitalization of the elderly. Ann Intern Med. 1993;118:219-23. Available from: http://dx.doi.org/10.7326/0003-4819-118-3-199302010-00011
53. Adekpedjou R, Heckman GA, Hébert PC, Costa AP, Hirdes J. Outcomes of advance care directives after admission to a long-term care home: DNR the DNH? BMC Geriatr. 2022;22:22. Available from: http://dx.doi.org/10.1186/s12877-021-02699-5
54. O'Malley KJ, Cook KF, Price MD, Wildes KR, Hurdle JF, Ashton CM. Measuring diagnoses: ICD code accuracy. Health Serv Res. 2005;40:1620-39. Available from: http://dx.doi.org/10.1111/j.1475-6773.2005.00444.x
55. Mowbray F. Examining frailty and multimorbidity in nursing research of older emergency department patients. Can J Emerg Nurs. 2021;44:5-7.