

The Determinants of Place of Death: An Evidence-Based Analysis

V Costa

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Abstract

Background

According to a conceptual model described in this analysis, place of death is determined by an interplay of factors associated with the illness, the individual, and the environment.

Objectives

Our objective was to evaluate the determinants of place of death for adult patients who have been diagnosed with an advanced, life-limiting condition and are not expected to stabilize or improve.

Data Sources

A literature search was performed using Ovid MEDLINE, Ovid MEDLINE In-Process and Other Non-Indexed Citations, Ovid Embase, EBSCO Cumulative Index to Nursing & Allied Health Literature (CINAHL), and EBM Reviews, for studies published from January 1, 2004, to September 24, 2013.

Review Methods

Different places of death are considered in this analysis—home, nursing home, inpatient hospice, and inpatient palliative care unit, compared with hospital. We selected factors to evaluate from a list of possible predictors—i.e., determinants—of death. We extracted the adjusted odds ratios and 95% confidence intervals of each determinant, performed a meta-analysis if appropriate, and conducted a stratified analysis if substantial heterogeneity was observed.

Results

From a literature search yielding 5,899 citations, we included 2 systematic reviews and 29 observational studies. Factors that increased the likelihood of home death included multidisciplinary home palliative care, patient preference, having an informal caregiver, and the caregiver's ability to cope. Factors increasing the likelihood of a nursing home death included the availability of palliative care in the nursing home and the existence of advance directives. A cancer diagnosis and the involvement of home care services increased the likelihood of dying in an inpatient palliative care unit. A cancer diagnosis and a longer time between referral to palliative care and death increased the likelihood of inpatient hospice death. The quality of the evidence was considered low.

Limitations

Our results are based on those of retrospective observational studies.

Conclusions

The results obtained were consistent with previously published systematic reviews. The analysis identified several factors that are associated with place of death.

Plain Language Summary

Where a person will die depends on an interplay of factors that are known as “determinants of place of death.” This analysis set out to identify these determinants for adult patients who have been diagnosed with an advanced, life-limiting condition and are not expected to stabilize or improve. We searched the literature and found evidence that we deemed to be low quality, either because of limitations in the type of study that was done or in how the study was conducted. However, it is the best evidence available on the subject at the present time.

The evidence identified several determinants that increased the likelihood of a death at home. These included:

- multidisciplinary palliative care that could be provided in the patient’s home;
- an early referral to palliative care (a month or more before death);
- the patient’s disease (for example, patients with cancer were more likely to die at home);
- few or no hospitalizations during the end-of-life period;
- living with someone, instead of alone;
- the patient’s preference for a home death;
- family members’ preference for a home death;
- the presence of an informal caregiver; and, especially, of one with a strong ability to cope.

Determinants that affected a patient’s likelihood of dying in a nursing home, on the other hand, included the type of disease, and whether the patient preferred to die there. The type of disease was also a factor in a patient’s likelihood of dying in an inpatient palliative care unit or an inpatient hospice. The availability of palliative care was a factor for each of the 4 places of death that were considered in this analysis. If palliative care could be provided in any of these places—at home, in a nursing home, in an inpatient palliative care unit, or in an inpatient hospice—this increased a patient’s likelihood of dying there instead of in hospital. An earlier referral to palliative care (a month or more before death) also increased the likelihood of dying in an inpatient hospice instead of in hospital.

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List of Abbreviations

AMSTAR	Assessment of Multiple Systematic Reviews
CI	Confidence interval
GRADE	Grading of Recommendations Assessment, Development, and Evaluation
OR	Odds ratio
OHTAC	Ontario Health Technology Advisory Committee
RCT	Randomized controlled trial
SD	Standard deviation

Background

In July 2013, the Evidence Development and Standards (EDS) branch of Health Quality Ontario (HQO) began work on developing an evidentiary framework for end of life care. The focus was on adults with advanced disease who are not expected to recover from their condition. This project emerged from a request by the Ministry of Health and Long-Term Care that HQO provide them with an evidentiary platform on strategies to optimize the care for patients with advanced disease, their caregivers (including family members), and providers.

After an initial review of research on end-of-life care, consultation with experts, and presentation to the Ontario Health Technology Advisory Committee (OHTAC), the evidentiary framework was produced to focus on quality of care in both the inpatient and the outpatient (community) settings to reflect the reality that the best end-of-life care setting will differ with the circumstances and preferences of each client. HQO identified the following topics for analysis: determinants of place of death, patient care planning discussions, cardiopulmonary resuscitation, patient, informal caregiver and healthcare provider education, and team-based models of care. Evidence-based analyses were prepared for each of these topics.

HQO partnered with the Toronto Health Economics and Technology Assessment (THETA) Collaborative to evaluate the cost-effectiveness of the selected interventions in Ontario populations. The economic models used administrative data to identify an end-of-life population and estimate costs and savings for interventions with significant estimates of effect. For more information on the economic analysis, please contact Murray Krahn at murray.krahn@theta.utoronto.ca.

The End-of-Life mega-analysis series is made up of the following reports, which can be publicly accessed at <http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/ohtas-reports-and-ohtac-recommendations>.

- End-of-Life Health Care in Ontario: OHTAC Recommendation
- Health Care for People Approaching the End of Life: An Evidentiary Framework
- Effect of Supportive Interventions on Informal Caregivers of People at the End of Life: A Rapid Review
- Cardiopulmonary Resuscitation in Patients with Terminal Illness: An Evidence-Based Analysis
- The Determinants of Place of Death: An Evidence-Based Analysis
- Educational Intervention in End-of-Life Care: An Evidence-Based Analysis
- End-of-Life Care Interventions: An Economic Analysis
- Patient Care Planning Discussions for Patients at the End of Life: An Evidence-Based Analysis
- Team-Based Models for End-of-Life Care: An Evidence-Based Analysis

Objective of Analysis

The objective of this analysis was to evaluate the determinants of place of death in adult patients who have been diagnosed with an advanced, life-limiting condition and are not expected to improve or stabilize.

Clinical Need and Target Population

Description of Disease/Condition

The palliative or end-of-life care population can be defined as those with a life-threatening disease who are not expected to stabilize or improve. (1) The needs of terminally ill patients vary; therefore certain places of death may be more appropriate for some patients than others. (2)

Between 87,000 and 89,000 people died in Ontario each year from 2007 to 2011. (3) According to Statistics Canada, in 2011, 64.7% of deaths in Canada and 59.3% in Ontario occurred in hospitals. (3) In 2009, the main cause of death was cancer (29.8%), followed by heart diseases (20.7%), and cerebrovascular diseases (5.9%). (4)

According to a conceptual model developed by Gomes and Higginson (5), place of death results from an interplay of factors that can be grouped into 3 domains: illness, individual, and environment. Individual-related factors include sociodemographic characteristics and patient's preferences with regards to place of death. (5) Environment-related factors can be divided into health care input (home care, hospital bed availability, and hospital admissions); social support (living arrangements, patient's social support network, and caregiver coping); and macrosocial factors (historical trends, health care policy, and cultural factors). (5)

Ontario Context

An Ontario study of 214 home care recipients and their caregivers, published in 2005, showed that 63% of patients and 88% of caregivers preferred a home death. (2) Thirty-two percent of patients and 23% of caregivers reported no preference for place of death. (2)

Evidence-Based Analysis

Research Question

What are the determinants of place of death in adult patients who have been diagnosed with an advanced, life-limiting condition and are not expected to stabilize or improve?

Research Methods

Literature Search

Search Strategy

A literature search was performed on September 24, 2013 using Ovid MEDLINE, Ovid MEDLINE In-Process and Other Non-Indexed Citations, Ovid Embase, EBSCO Cumulative Index to Nursing & Allied Health Literature (CINAHL), and EBM Reviews, for studies published from January 1, 2004, to September 24, 2013. (Appendix 1 provides details of the search strategy.) Abstracts were reviewed by a single reviewer and, for those studies meeting the eligibility criteria, full-text articles were obtained. Reference lists were also examined for any additional relevant studies not identified through the search.

Inclusion Criteria

- English-language full-text publications
- including adult patients who have been diagnosed with an advanced, life-limiting condition and are not expected to stabilize or improve
- published between January 1, 2004, and September 24, 2013
- systematic reviews, health technology assessments, randomized controlled trials (RCTs), and observational studies
- where the evaluation of determinants of place of death was defined a priori
- evaluating at least 1 of the determinants of place of death specified (below) under outcomes of interest
- using multivariable analyses to adjust for potential confounders in the case of observational studies

Exclusion Criteria

- studies that did not report the adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for any of the determinants specified under outcomes of interest
- studies including adults and children where results specific to adult patients could not be extracted or where the majority of the population comprised children
- studies in which either of the 2 groups—control group, or the group under evaluation— included, within it, people who had died in different places, e.g., at home, in hospital, etc.

Outcomes of Interest

Place of death (dependent variable):

- home
- hospital
- nursing home
- inpatient hospice
- inpatient palliative care unit

Determinants of place of death (independent variable):

- type of disease
- hospital admissions
- functional status
- pain
- palliative care in the place of residence including home visits by physicians, nurses, or a multidisciplinary team
- availability of hospital and nursing home beds
- patient or family preference for place of death, including congruence between patient and family preference, if known
- marital status or living arrangements
- support for caregiver
- caregiver's ability to care for patient

Statistical Analysis

The study design, patients' baseline characteristics, and study results are presented in tables. The adjusted ORs and 95% CIs for each determinant, as presented in each study, were extracted. The odds ratios provided in the studies were inverted, if necessary, to ensure consistency of reporting.

Meta-analyses were performed if appropriate. Stratified analyses were performed for variables such as type of disease, setting, or country where the study was conducted, if deemed necessary to explain heterogeneity. Statistical heterogeneity was measured using the I^2 . Either a fixed or random effects model was used, depending on the degree of heterogeneity between studies. Meta-analyses were performed using Review Manager. (6)

Quality of Evidence

The Assessment of Multiple Systematic Reviews (AMSTAR) measurement tool was used to assess the methodological quality of systematic reviews. (7)

The quality of the body of evidence for each outcome was examined according to the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Working Group criteria. (8) The overall quality was determined to be high, moderate, low, or very low using a step-wise, structural methodology.

Study design was the first consideration; the starting assumption was that randomized controlled trials (RCTs) are high quality, whereas observational studies are low quality. Five additional factors—risk of bias, inconsistency, indirectness, imprecision, and publication bias—were then taken into account. Any limitations in these areas resulted in downgrading the quality of evidence. Finally, 3 main factors that may

raise the quality of evidence were considered: the large magnitude of effect, the dose response gradient, and any residual confounding factors. (8) For more detailed information, please refer to the latest series of GRADE articles. (8)

As stated by the GRADE Working Group, the final quality score can be interpreted using the following definitions:

High	High confidence in the effect estimate—the true effect lies close to the estimate of the effect
Moderate	Moderate confidence in the effect estimate—the true effect is likely to be close to the estimate of the effect, but may be substantially different
Low	Low confidence in the effect estimate—the true effect may be substantially different from the estimate of the effect
Very Low	Very low confidence in the effect estimate—the true effect is likely to be substantially different from the estimate of effect

Results of Evidence-Based Analysis

The database search yielded 5,899 citations published between January 1, 2004, and September 24, 2013, (with duplicates removed). Articles were excluded based on information in the title and abstract. The full texts of potentially relevant articles were obtained for further assessment. Figure 1 shows the breakdown of when and for what reason citations were excluded from the analysis.

Thirty studies (2 systematic reviews and 28 observational studies) met the inclusion criteria. An additional observational study was included because it provided information specific to Ontario patients. The reference lists of the included studies were hand-searched to identify other relevant studies but no additional publication was identified.

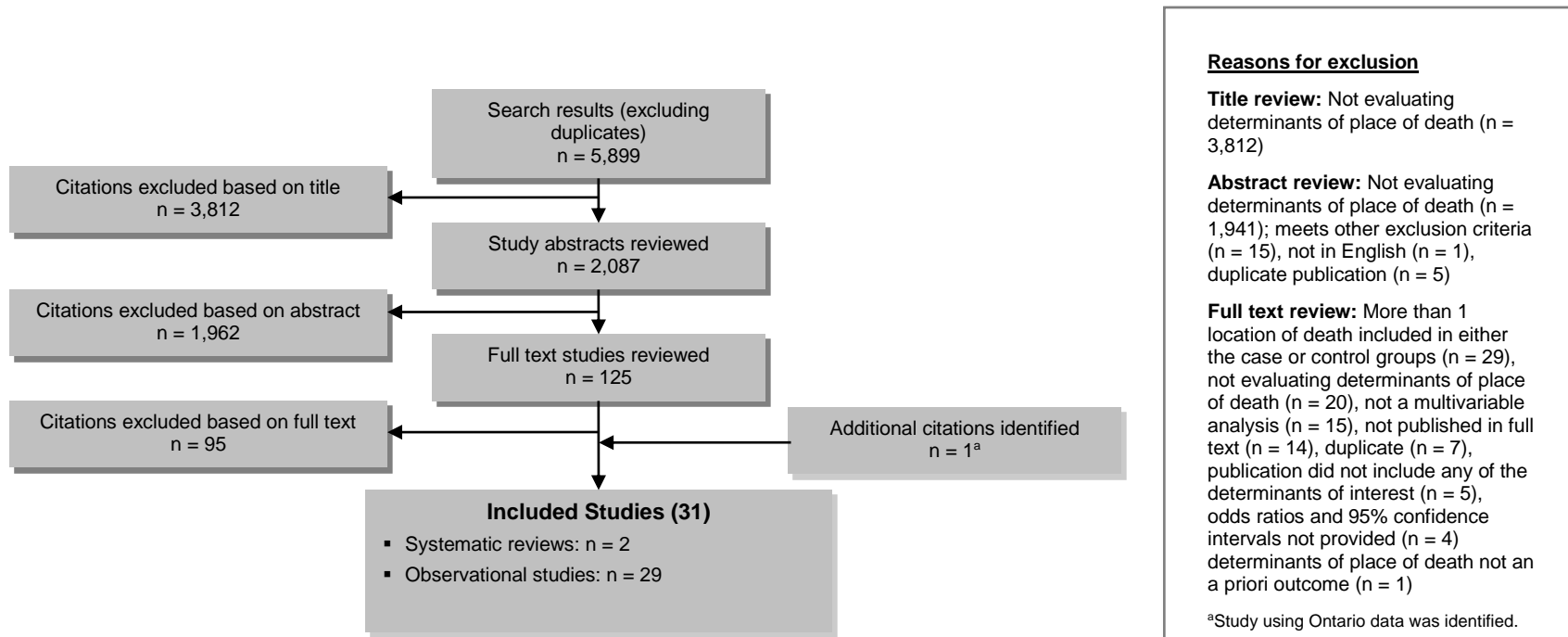


Figure 1: Citation Flow Chart

Abbreviation: n, number of studies.

For each included study, the study design was identified and is summarized below in Table 1, a modified version of a hierarchy of study design by Goodman, 1996. (9)

Table 1: Body of Evidence Examined According to Study Design

Study Design	Number of Eligible Studies
RCTs	
Systematic review of RCTs	
Large RCT	
Small RCT	
Observational Studies	
Systematic review of non-RCTs with contemporaneous controls	2
Non-RCT with contemporaneous controls	29
Systematic review of non-RCTs with historical controls	
Non-RCT with historical controls	
Database, registry, or cross-sectional study	
Case series	
Retrospective review, modelling	
Studies presented at an international conference	
Expert opinion	
Total	31

Abbreviation: RCT, randomized controlled trial.

Determinants of Home Death

Two systematic reviews (5, 10) and 23 observational studies using multivariable analyses evaluated the determinants of home death. (2, 11-32) Hospital death was the most common comparator.

The 2006 systematic review by Gomes and Higginson (5) evaluated the determinants of home death in adult patients with cancer. Sixty-one observational studies were included in the review. (5) The authors identified strong evidence for 17 determinants of home death, the most important being low functional status, preference for home death, home care, intensity of home care, living with relatives, and extended family support. (5)

The systematic review by Howell et al compared the likelihood of home death for patients with solid versus non-solid tumours. The odds ratios reported in their meta-analysis, which included 17 observational studies, showed that patients with solid tumours were more likely to die at home (OR, 2.25; 95% CI, 2.07–2.44). (10)

Of the 23 observational studies included in our analysis that identified determinants of home death, 17 (74%) were retrospective cohort studies based on previously collected data from administrative databases or chart reviews (11-14, 17-19, 21, 23, 24, 26-32). The remaining studies were based on surveys whose data was provided by either the patient and/or a family member or by health care personnel.

The sample sizes ranged from 92 to 4,175 patients in the survey-based studies, and from 270 to 1,402,167 in the studies based on databases or chart reviews. In studies where patient non-participation was reported, the rate ranged from 8% to 49%.

The studies originated in various countries and/or regions: 3 in Canada (2, 28, 32); 9 in Asia (12, 15-17, 21-24, 31); 7 in Europe (11, 13, 14, 19, 26, 29, 30); 2 in the United States (25, 27); 1 in Mexico (20); and 1 in New Zealand. (18)

Eight studies (35%) were specific to cancer patients (11, 15, 16, 21-23, 26, 31) and 9 studies (39%) were restricted to patients receiving palliative home care. (2, 15-18, 22, 24, 31, 32) The remainder were not specific to a disease or setting. The majority of patients included in the studies were older than 65 years; the male/female breakdown was approximately 50/50. The rate of home death ranged from 20% to 66% (not provided in 4 studies). (2, 11, 12, 14-27, 29, 31) Five studies reported the patient and/or family preference for place of death. (2, 13, 15, 16, 22) Of those who stated a preference, 40% to 85% of patients preferred a home death, as did 42% to 65% of family members.

Additional details about study and patient characteristics are presented in Appendix 3.

All 23 studies adjusted for illness-related factors; all but 1 adjusted for sociodemographic factors; (24) and all but 2 adjusted for health care service availability factors. (21, 25) Additionally, 5 studies (19%) included patient and/or family preference for place of death in their multivariable model. (2, 13, 15, 16, 22) Eleven studies (48%) restricted the data collection to the last year of the patient's life. (2, 11, 13, 15, 18, 20, 23, 26, 28, 30, 32) The remainder did not specify the study time frame.

Table 2 summarizes the adjusted ORs of home versus hospital death, originating from multivariable analyses; we performed a meta-analysis if deemed appropriate. Factors that were associated with an increased likelihood of home death included nurse and physician home visits, multidisciplinary home palliative care, patient and family preference for home death, type of disease, not living alone, presence of an informal caregiver, and caregiver coping. On the other hand, factors that decreased the likelihood of home death included hospital admissions in the last year of life, admission to a hospital with palliative care services, and some diseases. Details about study results are provided in Appendix 3. The quality of the evidence was considered low to very low (see Appendix 2).

Table 2: Determinants of Home Versus Hospital Death—Results of Observational Studies

Determinant	Number of Studies	Adjusted OR (95% CI)	I ² , if meta-analysis performed
Nurse Home Visits			
Nurse home visits to home care recipients (vs. no visits)	1 study (24)	3.13 (1.08–6.21)	N/A
Increase in nurse home visits to home care recipients (≥ 2–3/week vs. < 2–3/week)	2 studies (15, 22)	1.31 (0.87–1.98)	0
Nurse home visits to general end-of-life population (vs. no visits)	1 study (11)	2.78 (2.01–3.85)	N/A
Increase in nurse home visits to general end-of-life population	1 study (26)	Reference: no visits 1–3 visits: 3.13 4–12 visits: 8.77 ^a > 12 visits: 14.20 ^a	N/A
Family Physician Home Visits			
Family physician home visits to home care recipients (vs. no visits)	2 studies (2, 15)	2.01 (1.30–3.12)	57%

Determinant	Number of Studies	Adjusted OR (95% CI)	I ² , if meta-analysis performed
Increase in family physician home visits to home care recipients (≥ 2.6 /week vs. < 2.6 /week)	1 study (22)	2.70 (0.95–7.70)	N/A
Family physician home visits to general end-of-life population (vs. no visits)	1 study (11)	12.50 (9.37–16.68)	N/A
Rate of family physician home visits to general end-of-life population during the last 3 months of life	1 study (11)	Reference: no visits 0.6–1 visit: 9.10 (5.90–14.30) 1–2 visits: 14.30 (1.0–20.0) 2–4 visits: 16.70 (12.80–25.0) > 4 visits: 20.0 (12.5–33.30)	N/A
Home Care Teams			
Multidisciplinary home care team (vs. usual care or no multidisciplinary home care team)	2 studies (13, 32)	2.56 (2.31–2.83) 8.40 (4.67–15.09)	N/A
In-Hospital Palliative Care			
In-hospital palliative support team or hospice unit (yes vs. no)	2 studies (13, 23)	0.54 (0.33–0.89)	18%
Preference for Home Death			
Patient preference for home death vs. no patient preference for home death (general end-of-life population)	2 studies (2, 16)	2.13 (1.58–2.87)	0
Patient preference for home death vs. no patient preference for home death (home care recipients)	1 study (2, 13, 16)	14.20 (9.43–21.38)	N/A
Family preference for home death vs. no family preference for home death (non-cancer patients)	1 study (16)	11.51 (8.28–15.99)	N/A
Family preference for home death vs. no family preference for home death (cancer patients)	1 study (16)	20.07 (12.24–32.88)	N/A
Congruence between patient and family preference (non-cancer patients), vs. no preference congruence	1 study (16)	12.33 (9.50–16.00)	N/A
Congruence between patient and family preference (cancer patients), vs. no congruence	1 study (16)	57.00 (38.74–83.86)	N/A
Disease-Related			
Cancer (vs. other diseases)	11 studies (14, 17–21, 24, 25, 27, 28, 30)	1.93 (1.52–2.44)	99%
Hematological cancer (vs. non-hematological cancer)	3 studies (11, 21, 23)	0.68 (0.53–0.87)	83%
Cardiovascular disease (vs. other diseases)	2 studies (20, 27)	0.64 (0.63–0.65)	0
Major acute condition (vs. other diseases)	1 study (28)	0.29 (0.26–0.33)	N/A

Determinant	Number of Studies	Adjusted OR (95% CI)	I ² , if meta-analysis performed
Timing of Referral to Palliative Care			
Time from referral to palliative care to death (≥ 1 vs. < 1 month)	1 study (17)	2.21 (1.33–3.67)	N/A
Functional Status			
Worse functional status or bedridden (vs. better functional status or not bedridden)	2 studies (15, 30)	2.05 (1.33–3.15)	0
Prior Hospital Admission			
ICU admission in the last year of life (vs. no ICU admission)	1 study (23)	0.82 (0.81–0.83)	N/A
≥ 1 hospital admission during the last year of life (vs. no admission)	1 study (20)	0.15 (0.07–0.30)	N/A
Decision not to re-hospitalize in the event of a crisis (vs. no)	1 study (31)	40.11 (11.81–136.26)	N/A
Informal Caregiver-Related			
Informal caregiver satisfaction with support from family physician (vs. dissatisfaction)	1 study (2)	1.62 (0.30–8.62)	N/A
Low informal caregiver psychological distress during stable phase (vs. high distress)	1 study (31)	5.41 (1.13–25.92)	N/A
Informal caregiver health (excellent/very good vs. fair/poor)	1 study (2)	0.64 (0.21–1.99)	N/A
Informal care (often vs. none or sometimes)	1 study (13)	2.30 (1.15–4.60)	N/A
Hospital Bed Availability			
Unit increase/1,000 population	3 studies (13, 19, 28)	0.88 (0.84–0.92)	66%
≥ 65 vs. < 65/10,000 population	1 study (12)	0.75 (0.74–0.76)	N/A
≥ 6.75 vs. < 6.75/1,000 population	1 study (29)	0.89 (0.83–0.95)	N/A
bed availability in 4 th vs. 1 st –3 rd quarter	1 study (23)	0.79 (0.61–1.03)	N/A
Living Arrangements			
Married (vs. not married)	6 studies (11, 17, 18, 20, 23, 27)	1.22 (1.11–1.33)	71%
Not living alone (vs. living alone)	4 studies (2, 19, 29, 30)	2.09 (1.68–2.59)	76%

Abbreviations: CI, confidence interval; ICU, intensive care unit; N/A, not applicable; OR, odds ratio; vs., versus.
^aStatistically significant as per graph. *P* for trend not provided.

Determinants of Nursing Home Death

Ten observational studies evaluated the determinants of nursing home death. (13, 14, 19, 25, 28, 33–37) Hospital death was the most common comparator. These were retrospective cohort studies based on previously collected data from administrative databases or chart reviews. They originated in various countries and regions: 1 in Canada (28); 3 in Europe (13, 14, 19); 4 in the United States; (25, 34–36) and 2 in Japan. (16, 37) None of the studies were disease-specific; 5 (42%) were restricted to nursing home residents. (33–37)

The sample sizes ranged from 86 to 181,238 patients. The non-participation rate was low in the only 2 studies that provided such data: 1% (37) and 2% (28).

Most patients were older than 65 years of age and between 27% and 100% were male. The rate of nursing home death ranged from 47% to 87% in the studies restricted to nursing home residents (19, 33-37) and from 13% to 26% in the studies of general end-of-life population. (13, 14, 25, 28)

Additional details about study and patient characteristics are presented in Appendix 4.

All 10 studies adjusted for illness-related factors and health care services availability. Eight studies (80%) adjusted for sociodemographic factors. (13, 14, 19, 25, 28, 35-37) Additionally, 5 studies (50%) included patient and/or family preference for place of death in their multivariable model. (13, 33-35, 37) Three studies (30%) restricted the data collection to the last year of the patient’s life. (13, 28, 36) The remainder did not specify the study time frame.

Table 3 summarizes the adjusted ORs of nursing home versus hospital death originating from multivariable analyses; meta-analyses using a random effects model were performed if deemed appropriate. Factors that were associated with an increased likelihood of nursing home death included palliative care services available in the nursing home, admission to a hospital-based nursing home, preference for nursing home death, having an advance directive completed, type of disease, functional status, a longer duration of stay at the nursing home, and nursing home bed availability. Details about the study results are provided in Appendix 4. The quality of the evidence was considered low to very low (see Appendix 2).

Table 3: Determinants of Nursing Home vs. Hospital Death—Results of Observational Studies

Determinant	Number of Studies	Adjusted OR (95% CI)	I ² , if meta-analysis performed
End-of-Life, Palliative or Hospice Care in the Nursing Home			
End-of-Life care	1 study (33)	1.57 (1.14–2.16)	N/A
Hospice care	2 studies (34, 36)	15.16 (9.30–24.73)	71%
Palliative care personnel	1 study (13)	9.40 (3.31–26.73)	N/A
Advance Directives			
Any advance directive	1 study (34)	1.57 (1.35–1.82)	N/A
Do-not-resuscitate order	1 study (35)	3.33 (3.22–3.45)	N/A
Do-not-hospitalize order	1 study (35)	5.26 (4.71–5.88)	N/A
Preference for Nursing Home Death			
Patient preference	1 study (13)	10.40 (4.40–24.90)	N/A
Family preference	1 study (33)	16.62 (11.38–24.27)	N/A
Disease-Related			

Determinant	Number of Studies	Adjusted OR (95% CI)	I ² , if meta-analysis performed
Cancer	8 studies (1 study with 2 different estimates) (13, 14, 19, 25, 28, 34-36)	0.74 (0.70–0.78)	N/A
		0.79 (0.77–0.81)	
		0.90 (0.86–0.94)	
		0.92 (0.88–0.96)	
		1.58 (0.80–3.12)	
		1.75 (1.68–1.82)	
		2.04 (1.79–2.33)	
		2.10 (1.65–2.67)	
2.50 (1.06–5.90)			
End-stage disease	1 study (34)	3.90 (2.78–5.47)	N/A
Dementia	3 studies (25, 28, 36)	2.94 (2.76–3.13)	17%
Stroke	2 studies (25, 35)	1.12 (1.06–1.18)	N/A
		4.76 (2.49–9.09)	
Heart Failure	1 study (34)	0.75 (0.64–0.88)	N/A
Diabetes	2 studies (34, 35)	0.70 (0.61–0.81)	N/A
		0.90 (0.87–0.93)	
Functional Status			
Worse functional status or bedridden (vs. better functional status or not bedridden)	2 studies (35, 37)	2.22 (2.07–2.38)	0
Nursing Home Characteristics			
Hospital-based nursing home	1 study (35)	1.21 (1.15-1.25)	N/A
Full-time physician presence	1 study (33)	3.74 (1.03–13.63)	N/A
Nursing Home Bed Availability			
Unit increase/1,000 population	2 studies (14, 19)	1.04 (1.01–1.07)	97%
Nursing Home Stay			
1-month increment	1 study (34)	1.01 (1.01–1.01)	N/A
≥ 3 vs. < 3 months	1 study (36)	1.45 (1.39–1.52)	N/A

Abbreviations: CI, confidence interval; N/A, not applicable; OR, odds ratio; vs., versus.

Determinants of Inpatient Palliative Care Unit Death

An observational study from Belgium evaluated the determinants of inpatient palliative care unit death compared with hospital death. (13) This retrospective cohort study was based on data from a national study on palliative care services in the last 3 months of life. (13) It included 577 patients; the non-participation rate was not reported. (13) Most patients were older than 65 years of age; half were male and half were female. (13) The study adjusted for sociodemographic, illness-related, and health care system-related factors. It found that a cancer diagnosis and home care involvement increased a patient's likelihood of dying in an inpatient palliative care unit (see Table 4). Additional details can be found in Appendix 5. The quality of the evidence was considered low (see Appendix 2).

Table 4: Determinants of Inpatient Palliative Care Unit vs. Hospital Death—Results of Observational Studies

Determinant	Number of Studies	Adjusted OR (95% CI)
Cancer	1 study (13)	6.50 (3.88–10.90)
Home care involvement in the last 3 months of life	1 study (13)	2.20 (1.38–3.50)
Multidisciplinary home care team involvement	1 study (13)	2.90 (1.53–5.50)

Abbreviations: CI, confidence interval; OR, odds ratio.

Determinants of Inpatient Hospice Death

Two observational studies from Singapore evaluated the determinants of inpatient hospice death versus hospital death. (17, 21) Both were retrospective cohort studies based on data from administrative databases. The studies had large sample sizes, 842 and 52,120, respectively. (17, 21) The non-participation rate, in the 1 study that reported it, was 11%. (17) Most patients were older than 65 years of age; half were male and half were female. Both studies adjusted for sociodemographic and illness-related factors and 1 study (17) was restricted to patients admitted to a hospital-based integrated palliative care service. The quality of the evidence was considered low. Additional details are provided in Appendix 6. The quality of the evidence was considered low (see Appendix 2).

Table 5: Determinants of Inpatient Hospice vs. Hospital Death—Results of Observational Studies

Determinant	Number of Studies	Adjusted OR (95% CI)
Cancer	1 study (21)	20.07 (16.05–25.09)
Time from referral to palliative care to death (≥ 1 vs. < 1 month)	1 study (17)	2.0 (1.13–3.60)

Abbreviations: CI, confidence interval; OR, odds ratio.

Limitations

Of the 29 observational studies identified, 23 (80%) were retrospective studies based mostly on data from administrative databases. The data originated in various countries and regions, which may have contributed to the considerable heterogeneity in some of the meta-analyses undertaken. However, despite this heterogeneity, the direction of the effect was consistent across the studies. We attempted to explain the cause of the heterogeneity by performing subgroup analyses.

Two systematic reviews evaluating the determinants of home death, published in 2004 and 2010, also informed this analysis. However, these reviews were specific to cancer patients.

None of the 31 studies provided data on the effects of pain on place of death.

Conclusions

The results obtained were consistent with previously published systematic reviews.

Based on low quality evidence several factors were identified as determinants of place of death.

Determinants that increased the likelihood of a death at home included:

- interprofessional home end-of-life/palliative care
- an earlier referral to end-of-life/palliative care services (a month or more before death)
- type of underlying disease (for example, patients with cancer were more likely to die at home)
- worse functional status
- fewer hospitalizations during the last year of life
- living arrangements such as living with someone
- presence of an informal caregiver
- informal caregiver coping
- patient or family preference for a home death

Determinants that affected a patient's likelihood of dying in a nursing home included the type of disease, a worse functional status, the availability of palliative/end-of-life services in the nursing home, having completed an advance directive, a longer duration of stay in the nursing home, nursing home bed availability, and whether the patient preferred to die there. The type of disease was also a factor in a patient's likelihood of dying in an inpatient palliative care unit or an inpatient hospice.

The availability of palliative care was a factor for each of the 4 places of death that were considered in this analysis. If palliative care could be provided in any of these places—at home, in a nursing home, in an inpatient palliative care unit, or in an inpatient hospice—this increased a patient's likelihood of dying there instead of in hospital. On the other hand, the availability of end-of-life/palliative care in the hospital increased the likelihood of hospital compared to home death. An earlier referral to palliative care (a month or more before death) also increased the likelihood of dying in an inpatient hospice instead of in hospital.

The availability of resources to support the patient's physical and psychological needs in the place of residence during the end-of-life period also affects where a person may die.

Acknowledgements

Editorial Staff

Sue MacLeod, BA

Medical Information Services

Corinne Holubowich, BEd, MLIS

Kellee Kaulback, BA(H), MIST

Health Quality Ontario's Expert Advisory Panel on End-of-Life Care

Panel Member	Affiliation(s)	Appointment(s)
Panel Co-Chairs		
Dr Robert Fowler	Sunnybrook Research Institute University of Toronto	Senior Scientist Associate Professor
Shirlee Sharkey	St. Elizabeth Health Care Centre	President and CEO
Professional Organizations Representation		
Dr Scott Wooder	Ontario Medical Association	President
Health Care System Representation		
Dr Douglas Manuel	Ottawa Hospital Research Institute University of Ottawa	Senior Scientist Associate Professor
Primary/ Palliative Care		
Dr Russell Goldman	Mount Sinai Hospital, Tammy Latner Centre for Palliative Care	Director
Dr Sandy Buchman	Mount Sinai Hospital, Tammy Latner Centre for Palliative Care Cancer Care Ontario University of Toronto	Educational Lead Clinical Lead QI Assistant Professor
Dr Mary Anne Huggins	Mississauga Halton Palliative Care Network; Dorothy Ley Hospice	Medical Director
Dr Cathy Faulds	London Family Health Team	Lead Physician
Dr José Pereira	The Ottawa Hospital University of Ottawa	Professor, and Chief of the Palliative Care program at The Ottawa Hospital
Dean Walters	Central East Community Care Access Centre	Nurse Practitioner
Critical Care		
Dr Daren Heyland	Clinical Evaluation Research Unit Kingston General Hospital	Scientific Director
Oncology		
Dr Craig Earle	Ontario Institute for Cancer Research Cancer Care Ontario	Director of Health Services Research Program
Internal Medicine		

Panel Member	Affiliation(s)	Appointment(s)
Dr John You	McMaster University	Associate Professor
Geriatrics		
Dr Daphna Grossman	Baycrest Health Sciences	Deputy Head Palliative Care
Social Work		
Mary-Lou Kelley	School of Social Work and Northern Ontario School of Medicine Lakehead University	Professor
Emergency Medicine		
Dr Barry McLellan	Sunnybrook Health Sciences Centre	President and Chief Executive Officer
Bioethics		
Robert Sibbald	London Health Sciences Centre University of Western Ontario	Professor
Nursing		
Vicki Lejambe	Saint Elizabeth Health Care	Advanced Practice Consultant
Tracey DasGupta	Sunnybrook Health Sciences Centre	Director, Interprofessional Practice
Mary Jane Esplen	De Souza Institute University of Toronto	Director Clinician Scientist

Appendices

Appendix 1: Literature Search Strategies

Search date: September 24, 2013

Databases searched: Ovid MEDLINE, Ovid MEDLINE In-Process, Embase, All EBM Databases (see below), CINAHL

Limits: 2004-current; English

Filters: none

Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to August 2013>, EBM Reviews - ACP Journal Club <1991 to September 2013>, EBM Reviews - Database of Abstracts of Reviews of Effects <3rd Quarter 2013>, EBM Reviews - Cochrane Central Register of Controlled Trials <August 2013>, EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012>, EBM Reviews - Health Technology Assessment <3rd Quarter 2013>, EBM Reviews - NHS Economic Evaluation Database <3rd Quarter 2013>, Embase <1980 to 2013 Week 38>, Ovid MEDLINE(R) <1946 to September Week 2 2013>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <September 23, 2013>

Search Strategy:

#	Searches	Results
1	exp Terminal Care/	85970
2	exp Palliative Care/ use mesz,acp,cctr,coch,clcmr,dare,clhta,cleed	41033
3	exp palliative therapy/ use emez	60645
4	exp Terminally Ill/ use mesz,acp,cctr,coch,clcmr,dare,clhta,cleed	5617
5	exp terminally ill patient/ use emez	5877
6	exp terminal disease/ use emez	4477
7	exp dying/ use emez	5616
8	((End adj2 life adj2 care) or EOL care or (terminal* adj2 (care or caring or ill* or disease*)) or palliat* or dying or (Advanced adj3 (disease* or illness*)) or end stage*).ti,ab.	335051
9	or/1-8	428351
10	exp Hospices/ use mesz,acp,cctr,coch,clcmr,dare,clhta,cleed	4349
11	exp hospice/ use emez	6967
12	exp Home Care Services/ use mesz,acp,cctr,coch,clcmr,dare,clhta,cleed	41659
13	exp Home Care Agencies/ use mesz,acp,cctr,coch,clcmr,dare,clhta,cleed	1216
14	exp home care/ use emez	51971

15 exp Hospitalization/	367600
16 exp Long-Term Care/ use mesz,acp,cctr,coch,clcmr,dare,clhta,cleed	22720
17 exp Nursing Homes/ use mesz,acp,cctr,coch,clcmr,dare,clhta,cleed	32849
18 exp nursing home/ use emez	37834
19 exp Homes for the Aged/ use mesz,acp,cctr,coch,clcmr,dare,clhta,cleed	11419
20 exp home for the aged/ use emez	8622
21 ((home or domicil* or communit*) adj2 (visit* or care or caring or caregiver* or health?care or assist* or aid* or agenc* or service* or rehabilitation)).ti,ab.	105277
22 (hospice* or hospital* or in?hospital or long term care facilit*).ti,ab.	1938041
23 or/10-22	2266328
24 9 and 23	70404
25 (((place or location or site) adj2 death) or ((death or dying or die) adj2 (home* or nursing home* or hospice* or hospital*))).ti,ab.	21749
26 24 or 25	88242
27 exp Health Services Accessibility/ use mesz,acp,cctr,coch,clcmr,dare,clhta,cleed	85297
28 exp Attitude to Death/	22572
29 exp Decision Making/	258108
30 exp Patient Satisfaction/	152037
31 income/	58245
32 (((determin* or factor* or indicator* or predict* or prefer*) adj2 (death or dying or die or palliative care* or terminal* ill*)) or (access* adj2 (health care or health service*))).ti,ab.	41641
33 ((determin* or factor* or indicator* or predict* or prefer* or influence*) adj4 (end of life or place of death)).ti,ab.	1956
34 or/27-33	597430
35 26 and 34	10309
36 limit 35 to english language [Limit not valid in CDSR,ACP Journal Club,DARE,CCTR,CLCMR; records were retained]	9427
37 limit 36 to yr="2004 -Current" [Limit not valid in DARE; records were retained]	5681
38 remove duplicates from 37	3870

CINAHL

#	Query	Results
S1	(MH "Terminal Care+")	38,863
S2	(MH "Palliative Care")	19,643
S3	(MH "Terminally Ill Patients+")	7,655
S4	((End N2 life N2 care) or EOL care or (terminal* N2 (care or caring or ill* or disease*)) or palliat* or dying or (advanced N3 (disease* or illness*)) or end stage*)	52,080
S5	S1 OR S2 OR S3 OR S4	60,054
S6	(MH "Hospices")	2,462
S7	(MH "Home Health Care+")	32,531
S8	(MH "Home Health Agencies")	4,471
S9	(MH "Hospitalization+")	51,856

S10	(MH "Long Term Care")	18,249
S11	(MH "Nursing Homes+")	19,063
S12	((home or domicil* or communit*) N2 (visit* or care or caring or caregiver* or health care or assist* or aid* or agenc* or service* or rehabilitation))	71,862
S13	(hospice* or hospital* or in?hospital or long term care facilit*)	266,641
S14	S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13	387,139
S15	S5 AND S14	19,811
S16	((place or location or site) N2 death) or ((death or dying or die) N2 (home* or nursing home* or hospice* or hospital*))	3,092
S17	S15 OR S16	21,726
S18	(MH "Health Services Accessibility+")	47,527
S19	(MH "Attitude to Death+")	7,819
S20	(MH "Decision Making+")	62,594
S21	(MH "Patient Satisfaction")	30,524
S22	(MH "Income")	9,908
S23	((determin* or factor* or indicator* or predict* or prefer*) N2 (death or dying or die or palliative care* or terminal* ill*)) or (access* N2 (health care or health service*))	57,923
S24	((determin* or factor* or indicator* or predict* or prefer* or influence*) N4 (end of life or place of death))	913
S25	S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24	162,112
S26	S17 AND S25	5,003
S27	S17 AND S25 Limiters - Published Date: 20040101-20131231; English Language	3,295

Appendix 2: Evidence Quality Assessment

Table A1: AMSTAR Scores of Included Systematic Reviews

Author, Year	AMSTAR Score ^a	(1) Provided Study Design	(2) Duplicate Study Selection	(3) Broad Literature Search	(4) Considered Status of Publication	(5) Listed Excluded Studies	(6) Provided Characteristics of Studies	(7) Assessed Scientific Quality	(8) Considered Quality in Report	(9) Methods to Combine Appropriate	(10) Assessed Publication Bias	(11) Stated Conflict of Interest
Gomes and Higginson, 2006 (5)	8	✓	X	✓	✓	X	✓	✓	✓	✓	X	✓
Howell et al, 2010 (10)	5	✓	✓	X	X	X	✓	X	X	✓	X	✓

^aMaximum possible score is 11. Details of AMSTAR score are described in Shea et al. (7)

Regarding risk of bias, no serious risks were observed in the observational studies included. No limitations were identified in the eligibility criteria and no serious limitations were observed in the definition of the determinants of place of death or in the completeness of follow up. All observational studies performed multivariable analyses, adjusting for factors that had previously been identified as affecting place of death.

Table A2: GRADE Evidence Profile for Included Observational Studies on the Determinants of Home Versus Hospital Death

Number of Studies	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Increase in nurse home visits in home care recipients (general end-of-life population)							
2	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Nurse home visits in home care recipients							
1	No serious limitations	N/A	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Increase in nurse home visits (general end-of-life population)							
1	No serious limitations	N/A	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Nurse home visits (general end-of-life population)							
1	No serious limitations	N/A	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Increase in physician home visits in home care recipients							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low

Number of Studies	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Physician home visits in home care recipients							
2	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Physician home visits (general end-of-life population)							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Increase in physician home visits (general end-of-life population)							
1	No serious limitations	N/A	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Multidisciplinary home care team							
2	No serious limitations	N/A	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
In-hospital palliative support team or hospice unit							
2	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Patient preference for home death							
3	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Family preference for home death							
1	No serious limitations	N/A	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Congruence between patient and family preference							
1	No serious limitations	N/A	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Longer time from referral to palliative care to death							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Cancer							
12	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Hematological cancer							
3	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low

Number of Studies	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Cardiovascular disease							
2	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Major acute condition							
2	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Functional status							
2	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
ICU admissions in the last year of life							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Hospital admissions in the last year of life							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Decision not to hospitalize in the event of a crisis							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Informal caregiver satisfaction with support from family physician							
1	No serious limitations	No serious limitations	No serious limitations	Serious limitation ^b	Undetected		⊕ Very Low
Informal caregiver psychological distress during stable phase							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Informal caregiver health							
1	No serious limitations	No serious limitations	No serious limitations	Serious limitation ^b	Undetected		⊕ Very Low
Informal caregiver presence							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Hospital bed availability							
7	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low

Number of Studies	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Living arrangements							
10	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation; N/A, not applicable.

^bSubstantial imprecision in the study results.

Table A3: GRADE Evidence Profile for Included Observational Studies on the Determinants of Nursing Home Versus Hospital Death

Number of Studies	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
End-of-life care in the nursing home							
4	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Preference for nursing home death							
2	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Advance directives							
2	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Cancer							
9	No serious limitations	Serious limitation ^b	No serious limitations	No serious limitations	Undetected		⊕ Very Low (inconsistency)
Dementia							
3	No serious limitations	Serious limitation ^b	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
End-stage disease							
1	No serious limitations	Serious limitation ^b	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Stroke							
2	No serious limitations	Serious limitation ^b	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Functional status							
2	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low

Number of Studies	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Family preference for home death							
1	No serious limitations	N/A	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Full-time physician presence in the nursing home							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Hospital-based nursing home							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Nursing home bed availability							
3	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Length of stay in nursing home							
2	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation; N/A, not applicable.

^bSubstantial inconsistency across studies.

Table A4: GRADE Evidence Profile for Included Observational Studies on the Determinants of Inpatient Palliative Care Unit Versus Hospital Death

Number of Studies	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Disease type (cancer)							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Home or multidisciplinary care							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation.

Table A5: GRADE Evidence Profile for Included Observational Studies on the Determinants of Inpatient Hospice Versus Hospital Death

Number of Studies	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Disease type							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low
Time from referral-to-death							
1	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected		⊕⊕ Low

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation.

Appendix 3: Studies Evaluating the Determinants of Home Death

Table A6: Study Characteristics and Adjustment Factors—Included Observational Studies on Determinants of Home vs. Hospital Death

Author, Year Country Sample Size	Study Design Data Source Time Frame	Population	Sociodemographic Factors	Illness-Related Factors	Health Services Availability	Patient or Family Preference for Place of Death
Study Characteristics			Adjustment Factors			
Poulose et al, 2013 (17) Singapore N = 842	<ul style="list-style-type: none"> Retrospective cohort Hospital database Not specified 	<ul style="list-style-type: none"> Adults Hospital-based palliative care team Referred in 2007 	<ul style="list-style-type: none"> Age Sex Marital status Ethnicity 	<ul style="list-style-type: none"> Type of disease Referral-to-death interval 	<ul style="list-style-type: none"> Restricted to patients referred to hospital-based integrated palliative care 	Not included
Seow, 2013 (32) Canada N = 6,218	<ul style="list-style-type: none"> Retrospective cohort Administered databases Last year of life 	<ul style="list-style-type: none"> Adults Residents of Ontario Deaths 2009–2011 	<ul style="list-style-type: none"> Age^a Sex^a 	<ul style="list-style-type: none"> Cancer^a Comorbidities^a 	<ul style="list-style-type: none"> Restricted to home care recipients Time in home care^a Hospital admissions^a 	Not included
Houttekier et al, 2011 (19) Belgium N = 189,884	<ul style="list-style-type: none"> Retrospective cohort Death certificates Not specified 	<ul style="list-style-type: none"> ≥ 65 years Non-sudden deaths Deaths 1998–2007 Eligible for palliative care 	<ul style="list-style-type: none"> Age Urbanization Living alone 	<ul style="list-style-type: none"> Cause of death 	<ul style="list-style-type: none"> Bed availability in hospital and care homes 	Not included
Taylor et al, 2011 (18) New Zealand N = 1,268	<ul style="list-style-type: none"> Retrospective cohort Chart review Last 12 months of life 	<ul style="list-style-type: none"> ≥ 15 years Life-limiting disease Hospice care recipients Deaths 2006–2008 	<ul style="list-style-type: none"> Age Sex Marital status Ethnicity 	<ul style="list-style-type: none"> Type of disease 	<ul style="list-style-type: none"> Restricted to recipients of hospice service in the community 	Not included
Ikezaki et al, 2011 (16) Japan N = 4,175	<ul style="list-style-type: none"> Retrospective cohort Retrospective data collected from nurses Not specified 	<ul style="list-style-type: none"> ≥20 years Deaths in 2004 Patients receiving home visits by nurses 	<ul style="list-style-type: none"> Age Sex 	<ul style="list-style-type: none"> Stratified by cancer/non-cancer Daily living activities 	<ul style="list-style-type: none"> Restricted to nurse home visits Physician-based Duration of home nursing service 	<ul style="list-style-type: none"> Patient Family Congruence patient-family

Author, Year Country Sample Size	Study Design Data Source Time Frame	Population	Sociodemographic Factors	Illness-Related Factors	Health Services Availability	Patient or Family Preference for Place of Death
Study Characteristics			Adjustment Factors			
Fukui et al, 2011 (15) Japan N = 568	<ul style="list-style-type: none"> Retrospective cohort Retrospective data collected from nurses Last 6 months of life 	<ul style="list-style-type: none"> Adults Cancer patients Receiving home visits by nurses < 6 months expected survival Discharged from hospital to receive palliative care 	<ul style="list-style-type: none"> Type of caregiver 	<ul style="list-style-type: none"> Restricted to cancer Functional status Unrelieved symptoms Home treatment requirement 	<ul style="list-style-type: none"> Restricted to home palliative care recipients Nurse visits Home team affiliated with hospital 	<ul style="list-style-type: none"> Patient Family
Hong et al, 2011 (21) Singapore N = 52,120	<ul style="list-style-type: none"> Retrospective cohort Cancer registry Not specified 	<ul style="list-style-type: none"> Adults Cancer Death 2000–2009 	<ul style="list-style-type: none"> Age Sex Ethnicity 	<ul style="list-style-type: none"> Restricted to cancer Type of cancer Time between diagnosis and death Cause of death 	Not included	Not included
Cardenas-Turanza et al, 2011 (20) Mexico N = 473	<ul style="list-style-type: none"> Retrospective cohort Cross-sectional survey answered by patients and family members < last 2 years of life 	<ul style="list-style-type: none"> ≥ 50 years Death 2001–2003 	<ul style="list-style-type: none"> Age Marital status Education Size of city 	<ul style="list-style-type: none"> Cause of death Hospital stay in the last year of life 	<ul style="list-style-type: none"> Health care insurance coverage 	Not included
Hayashi et al, 2011 (24) Japan N = 99	<ul style="list-style-type: none"> Retrospective cohort Chart review Not specified 	<ul style="list-style-type: none"> Elderly Home care service recipients Death 2007–2010 	Not included	<ul style="list-style-type: none"> Type of disease 	<ul style="list-style-type: none"> Restricted to home care services Home nursing visits 	Not included

Author, Year Country Sample Size	Study Design Data Source Time Frame	Population	Sociodemographic Factors	Illness-Related Factors	Health Services Availability	Patient or Family Preference for Place of Death
Study Characteristics			Adjustment Factors			
Houttekier et al, 2010 (13) Belgium N = 1,690	<ul style="list-style-type: none"> Retrospective cohort Retrospective data based on previous study Last 3 months of life 	<ul style="list-style-type: none"> Adults and children Deaths 2005–2006 	<ul style="list-style-type: none"> Age^a Sex^a Income Informal care during last 3 months of life Place of residence^a 	<ul style="list-style-type: none"> Cause of death^a 	<ul style="list-style-type: none"> Hospital bed availability Care home beds^a Family physician involvement^a Home care involvement^a Palliative home care team 	<ul style="list-style-type: none"> Patient
Houttekier et al, 2010 (14) Belgium – included in separate publication (19) N = 56,341 (Netherlands) N = 181,238 (England)	<ul style="list-style-type: none"> Retrospective cohort Death certificate database Not specified 	<ul style="list-style-type: none"> Adults Deaths in 2003 	<ul style="list-style-type: none"> Age Sex Living arrangements^a Urban residence Income^a 	<ul style="list-style-type: none"> Disease type 	<ul style="list-style-type: none"> Hospital bed availability Nursing home bed availability 	Not included
Nakamura et al, 2010 (22) Japan N = 92	<ul style="list-style-type: none"> Retrospective cohort Prospective data collected from patient or proxy Not specified 	<ul style="list-style-type: none"> Adults Receiving home care and home nursing visits Terminal stage cancer Death 2005–2006 	<ul style="list-style-type: none"> Age Sex Living arrangements 	<ul style="list-style-type: none"> Restricted to cancer 	<ul style="list-style-type: none"> Restricted to home care and nurse home visits Family physician visits Home care nurse 	Not included

Author, Year Country Sample Size	Study Design Data Source Time Frame	Population	Sociodemographic Factors	Illness-Related Factors	Health Services Availability	Patient or Family Preference for Place of Death
Study Characteristics			Adjustment Factors			
Tang et al, 2010 (23) Taiwan N = 201,252	<ul style="list-style-type: none"> Retrospective cohort Administrative databases Last year of life 	<ul style="list-style-type: none"> Adults and children Cancer Deaths 2001–2006 	<ul style="list-style-type: none"> Age Sex Marital status 	<ul style="list-style-type: none"> Restricted to cancer Type of cancer Metastasis Comorbidities Diagnosis-to-death interval 	<ul style="list-style-type: none"> Hospital beds Hospice care Health services in the last month of life 	Not included
Bell et al, 2009 (25) United States N = 1,352	<ul style="list-style-type: none"> Retrospective cohort Prospective cohort study Not specified 	<ul style="list-style-type: none"> Adults Death 1991–1999 Japanese-American men 	<ul style="list-style-type: none"> Age^a Restricted to men Restricted to Japanese-American 	<ul style="list-style-type: none"> Cause of death Cognitive impairment^a Functional measures^a Last examination-to-death period^a 	Not included	Not included
Saugo et al, 2008 (26) Italy N = 350	<ul style="list-style-type: none"> Retrospective cohort Death certificates Last 3 months of life 	<ul style="list-style-type: none"> > 50 years Cancer Home or hospital death 	<ul style="list-style-type: none"> Age^a Sex^a Living arrangements 	<ul style="list-style-type: none"> Restricted to cancer Type of cancer Comorbidities 	<ul style="list-style-type: none"> Family physician home visits (last 3 months of life) Nurse home visits (last 3 months of life) 	Not included
Lin et al, 2007 (12) Taiwan N = 697,814	<ul style="list-style-type: none"> Retrospective cohort Health care databases Not specified 	<ul style="list-style-type: none"> ≥ 65 years Deaths 1995–2004 	<ul style="list-style-type: none"> Age Sex Marital status Urbanization Geographic location 	<ul style="list-style-type: none"> Type of disease Cause of death 	<ul style="list-style-type: none"> Bed availability 	Not included

Author, Year Country Sample Size	Study Design Data Source Time Frame	Population	Sociodemographic Factors	Illness-Related Factors	Health Services Availability	Patient or Family Preference for Place of Death
Study Characteristics			Adjustment Factors			
Gruneir et al, 2007 (27) United States N = 1,402,167	<ul style="list-style-type: none"> Retrospective cohort Administrative databases Not specified 	<ul style="list-style-type: none"> Adults Deaths 1997 Excludes accidental deaths 	<ul style="list-style-type: none"> Age Sex Marital status Ethnicity Education Income Urban residence 	<ul style="list-style-type: none"> Cause of death 	<ul style="list-style-type: none"> Nursing home bed availability Hospital bed availability 	Not included
Motiwala et al, 2006 (28) Canada N = 58,689	<ul style="list-style-type: none"> Retrospective cohort Administrative databases Last year of life 	<ul style="list-style-type: none"> > 65 years Death 2001–2002 	<ul style="list-style-type: none"> Age^a Sex^a Social deprivation Immigration status 	<ul style="list-style-type: none"> Disease type Comorbidities Acute care conditions 	<ul style="list-style-type: none"> Hospital bed availability 	Not included
Cohen et al, 2006 (29) Belgium N = 55,759	<ul style="list-style-type: none"> Retrospective cohort Death certificates Not specified 	<ul style="list-style-type: none"> Adults Deaths in 2001 	<ul style="list-style-type: none"> Age Sex Education Living arrangement Urbanization 	<ul style="list-style-type: none"> Cause of death 	<ul style="list-style-type: none"> Hospital bed availability 	Not included
Klinkenberg et al, 2005 (30) Netherlands N = 270	<ul style="list-style-type: none"> Retrospective cohort Cohort study database Last 3 months of life 	<ul style="list-style-type: none"> 55–85 years Deaths: 1995–1999 	<ul style="list-style-type: none"> Age Sex Marital status Education Region 	<ul style="list-style-type: none"> Cause of death Cognitive decline Functional status 	<ul style="list-style-type: none"> Care arrangement 	Not included

Author, Year Country Sample Size	Study Design Data Source Time Frame	Population	Sociodemographic Factors	Illness-Related Factors	Health Services Availability	Patient or Family Preference for Place of Death
Study Characteristics			Adjustment Factors			
Brazil et al, 2005 (2) Canada N = 214	<ul style="list-style-type: none"> Retrospective cohort Retrospective caregiver survey Last month of life (some analyses) 	<ul style="list-style-type: none"> ≥ 50 years Home palliative care recipient Excludes nursing home residents Caregivers interviewed 2000–2002 	<ul style="list-style-type: none"> Urban residence Not living alone Caregiver age Caregiver health 	<ul style="list-style-type: none"> Cancer 	<ul style="list-style-type: none"> Restricted to home palliative care Family physician visits Caregiver satisfaction with help from family physician 	<ul style="list-style-type: none"> Patient
Aabom et al, 2005 (11) Denmark N = 4,092	<ul style="list-style-type: none"> Retrospective cohort Administrative databases Last 3 months of life 	<ul style="list-style-type: none"> Adults Deaths due to cancer 1996–1998 Excludes nursing home residents 	<ul style="list-style-type: none"> Age Sex Marital status Number of children Urban residence 	<ul style="list-style-type: none"> Restricted to cancer Type of cancer Time from diagnosis until death 	<ul style="list-style-type: none"> Restricted to those living at home Family physician home visits Contact with community nurses 	Not included
Fukui et al, 2004 (31) Japan N = 428 Only using the variables not included in a more recent publication (15)	<ul style="list-style-type: none"> Retrospective cohort Home care agency database Not specified 	<ul style="list-style-type: none"> Adults Cancer Expected survival < 6 months Home care recipient > 2 weeks 	<ul style="list-style-type: none"> Age Caregiver's distress 	<ul style="list-style-type: none"> Restricted to cancer Functional status Daily infusions 	<ul style="list-style-type: none"> Restricted to nurse home visits Hospitalization in the event of a crisis Nursing visits 	Not included

Abbreviations: N, number of patients included.

^aVariables included in the multivariate model but ORs not provided.

Table A7: Patient Characteristics in Included Observational Studies on the Determinants of Home Death

Author, Year Country Sample Size	Age (years) Sex	Setting	Type of Disease	Patient and Family Preference for Place of Death	Place of Death
Poulose et al, 2013 (17) Singapore N = 842	<ul style="list-style-type: none"> • ≥ 65: 475 (56%) • Male: 405 (48%) 	<ul style="list-style-type: none"> • Hospital-based palliative care 	<ul style="list-style-type: none"> • Cancer: 724 (86%) 	Not available	<ul style="list-style-type: none"> • Home: 241 (29%) • Hospital: 452 (54%) • Inpatient hospice: 149 (17%)
Seow, 2013 (32) Canada N = 6218	<ul style="list-style-type: none"> • Median (IQR): 75: (64–84) • Male: 3,209 (50%) 	<ul style="list-style-type: none"> • Home care recipients 	<ul style="list-style-type: none"> • Cancer: 4,950 (80%) 	Not available	Not available
Taylor et al, 2011 (18) New Zealand N = 1,268	<ul style="list-style-type: none"> • ≥ 55: 1,108 (88%) • Male: 603 (48%) 	<ul style="list-style-type: none"> • General 	<ul style="list-style-type: none"> • Cancer: 1,036 (82%) • CV: 54 (4%) • Respiratory: 45 (4%) 	Not available	<ul style="list-style-type: none"> • Home: 352 (28%) • Hospital: 675 (54%) • Nursing home: 203 (16%)
Houttekier et al, 2011 (19) Belgium 2007 data (N = 65,435)	<ul style="list-style-type: none"> • ≥ 65: 54, 312 (83%) • Male: 32,522 (50%) 	<ul style="list-style-type: none"> • General 	<ul style="list-style-type: none"> • Cancer: 18,322 (28%) • CV: 17,013 (26%) • Respiratory: 7,852 (12%) • Stroke: 5,235 (8%) • Other: 17,013 (26%) 	Not available	<ul style="list-style-type: none"> • Home: 14,726 (23%) • Hospital: 33,856 (52%) • Nursing home: 14,792 (23%) • Other: 2,061 (3%)
Ikezaki et al 2011 (16) Japan N=1,664 Cancer	<ul style="list-style-type: none"> • Mean: 76 ± 11 • Male: 993 (60%) 	<ul style="list-style-type: none"> • Home nursing care 	<ul style="list-style-type: none"> • Cancer: 100% 	<p>Patient (n = 1,017)</p> <ul style="list-style-type: none"> • Home: 810 (80%) • Hospital: 207 (20%) <p>Family (n = 1,334)</p> <ul style="list-style-type: none"> • Home: 700 (52%) • Hospital: 634 (48%) 	<ul style="list-style-type: none"> • Home: 701 (42%) • Hospital: 963 (58%)

Author, Year Country Sample Size	Age (years) Sex	Setting	Type of Disease	Patient and Family Preference for Place of Death	Place of Death
Ikezaki et al, 2011 (16) Japan N=2,511 Non-cancer	• Mean: 84 ±10 • Male: 1,199 (48%)	• Home nursing care	• Heart disease: 504 (20%) • Pneumonia: 481 (19%) • Stroke: 215 (9%) • Old age: 539 (22%) • Other: 772 (31%)	Patient (n = 988) • Home: 843 (85%) • Hospital: 145 (15%) Family (n = 1,651) • Home: 1,073 (65%) • Hospital: 578 (35%)	• Home: 1,229 (49%) • Hospital: 1,282 (51%)
Cardenas- Turanza et al, 2011 (20) Mexico N = 473	• Mean (SD): 74 (73) • Male: 235 (50%)	• General	Cause of death • Cancer: 91 (19%) • Cardiovascular disease: 104 (22%) • Diabetes: 71 (15%) • Stroke: 39 (8%)	Not available	• Home: 250 (53%) • Hospital: 223 (47%)
Fukui et al, 2011 (15) Japan N = 568	• Mean (SD): 73 (12) • Male: 339 (60%)	• Home palliative care	• Cancer: 100%	Patient • Home: 385 (68%) Family • Home: 258 (45%)	• Home: 312 (55%) • Hospital: 256 (45%)
Hong et al, 2011 (21) Singapore N = 52,120	• < 55: 8,867 (17%) • 55–64: 9,315 (18%) • ≥65: 33,938 (65%)	• General	• Cancer: 100%	Not reported	• Home: 15,801 (30%) • Hospital: 27,592 (53%) • Inpatient hospice: 5,592 (11%)
Houttekier et al, 2010 (13) Belgium N = 1,690	• ≥ 65: 1,462 (88%) • Male: 839 (50%)	• General	• Cancer: 725 (43%) • CV: 237 (14%) • Respiratory: 157 (9%) • Stroke: 121 (7%) • Other: 431 (26%)	Patient (n = 713) • Home: 416 (26%) • Nursing home: 220 (14%) • Other: 77 (5%)	Not available
Houttekier et al 2010 (14) Netherlands N = 56,341	• ≥ 70: 39,348 (70%) • Male: 29,635 (53%)	• General	Cause of death • Cancer: 39,854 (71%) • Heart failure: 6,127 (11%)	Not available	• Home: 21,352 (38%) • Hospital: 17,902 (32%) • Nursing home: 14,861 (26%)

Author, Year Country Sample Size	Age (years) Sex	Setting	Type of Disease	Patient and Family Preference for Place of Death	Place of Death
Houttekier et al, 2010 (14) England N = 181,238	<ul style="list-style-type: none"> • ≥ 70: 131,574 (73%) • Male: 90,619 (50%) 	<ul style="list-style-type: none"> • General 	Cause of death <ul style="list-style-type: none"> • Cancer: 130,491 (72%) • Heart failure: 11,599 (6.5%) 	Not available	<ul style="list-style-type: none"> • Home: 36,248 (20%) • Hospital: 96,499 (53%) • Nursing home: 24,395 (13%)
Nakamura et al, 2010 (22) Japan N = 92	<ul style="list-style-type: none"> • Mean (SD), years: 75 (10)^a • Male: 47 (51%) 	<ul style="list-style-type: none"> • Home palliative care 	<ul style="list-style-type: none"> • Cancer: 100% 	Patient <ul style="list-style-type: none"> • Home: 37 (40%) • Hospital: 18 (20%) • Neither of them: 37 (40%) Family (n=88) <ul style="list-style-type: none"> • Home: 37 (42%) • Hospital: 27 (31%) • Neither of them: 24 (27%) 	<ul style="list-style-type: none"> • Home: 60 (65%) • Hospital: 32 (35%)
Tang et al, 2010 (23) Taiwan N = 201,252	<ul style="list-style-type: none"> • ≥ 65: 119,690 (59%) • Male: 129,354 (64%) 	<ul style="list-style-type: none"> • General 	<ul style="list-style-type: none"> • Cancer: 100% 	Not available	<ul style="list-style-type: none"> • Home: 68,139 (34%)
Hayashi et al, 2011 (24) Japan N = 99	<ul style="list-style-type: none"> • Mean (SD): 78 (13) • Male: 49 (50%) 	<ul style="list-style-type: none"> • Recipients of home care services 	<ul style="list-style-type: none"> • Cancer: 38 (38%) • Ischemic heart disease: 19 (19%) • Stroke: 20 (20%) • Dementia: 17 (17%) • Respiratory: 17 (17%) 	Not available	<ul style="list-style-type: none"> • Home: 40 (40%) • Hospital: 59 (60%)

Author, Year Country Sample Size	Age (years) Sex	Setting	Type of Disease	Patient and Family Preference for Place of Death	Place of Death
Bell et al, 2009 (25) US N = 1,352	• Mean: 84 • Male: 100%	• General	• Cancer: 337 (25%) • Coronary heart disease: 181 (13%) • Stroke: 150 (11%) • Dementia: 109 (8%) • Respiratory: 54 (4%) • Other: 521 (39%)	Not available	• Home: 306 (23%) • Hospital: 800 (59%) • Nursing home: 246 (18%)
Saugo et al, 2008 (26) Italy N = 350	• ≥ 70: 225 (64%) • Male: 219 (63%)	• General	• Cancer: 100%	Not available	• Home: 87 (25%) • Hospital: 263 (75%)
Lin et al, 2007 (12) Taiwan N = 697,814	• ≥75: 423,552 (61%) • Male: 290,394 (42%)	• General	• Circulatory diseases: 185,679 (27%) • Respiratory system: 85,763 (12%) • Other: 426,372 (61%)	Not available	• Home; 459,005 (66%) • Hospital: 238,809 (34%)
Gruneir et al, 2007 (27) US N = 1,402,167	• ≥ 75: 810,453 (58%) • Male: 671,638 (48%)	• General	• Cancer: 351,944 (25%) • Heart disease: 427,661 (31%) • Stroke: 103,760 (7%)	Not available	• Home: 330,447 (24%) • Hospital: 740,405 (53%) • Nursing home: 331,315 (24%)
Motiwala et al, 2006 (28) Canada N = 58,689	• ≥75: 43,071 (73%) • Male: 27,749 (47%)	• General	• Cancer: 19,966 (34%) • Dementia: 16,267 (28%) • Others: 22,456 (58%)	Not available	Not available
Cohen et al, 2006 (29) Belgium N = 55,759	• ≥65: 46,271 (83%) • Male: 28,248 (51%)	• General	• Cancer: 15,008 (27%) • Cardiovascular: 15,846 (28%) • Stroke: 5,018 (9%)	Not available	• Home: 13,549 (24%) • Hospital: 29,943 (54%) • Nursing home: 11,041 (20%)

Author, Year Country Sample Size	Age (years) Sex	Setting	Type of Disease	Patient and Family Preference for Place of Death	Place of Death
Brazil et al, 2005 (2) Canada N = 214	<ul style="list-style-type: none"> • ≥50 yrs: 100% • Male: 142 (66%) 	<ul style="list-style-type: none"> • Home palliative care 	<ul style="list-style-type: none"> • Cancer: 207 (96%) 	Patient <ul style="list-style-type: none"> • No preference: 69 (32%) • Home: 135 (63%) • Hospital: 10 (5%) Family <ul style="list-style-type: none"> • No preference: 49 (23%) • Home: 136 (64%) • Hospital: 29 (14%) 	<ul style="list-style-type: none"> • Home: 120 (56%) • Institution: 94 (44%)
Klinkenberg et al, 2005 (30) Netherlands N = 270	<ul style="list-style-type: none"> • ≥ 80: 168 (62%) • Male: 167 (62%) 	<ul style="list-style-type: none"> • General 	<ul style="list-style-type: none"> • Cancer: 65 (24%) • Non-cancer: 201 (76%) 	Not available	Not available
Aabom et al, 2005 (11) Denmark N = 4,386	<ul style="list-style-type: none"> • ≥ 65: 2,979 (68%) • Male: 2,145 (49%) 	<ul style="list-style-type: none"> • General 	<ul style="list-style-type: none"> • Cancer: 100% 	Not available	<ul style="list-style-type: none"> • Home: 1,221 (28%) • Hospital: 2,412 (55%) • Nursing home: 702 (16%)
Fukui et al, 2004 (31) Japan N = 428	<ul style="list-style-type: none"> • Mean (SD), years: 76 (11) • Male: 240 (56%) 	<ul style="list-style-type: none"> • Home care 	<ul style="list-style-type: none"> • Cancer: 100% 	Not available	<ul style="list-style-type: none"> • Home: 285 (67%) • Hospital: 143 (33%)

Abbreviations: CD, cardiovascular; IQR, inter-quartile range; N, number of patients included; SD, standard deviation.

*Based on the group of patients who died at home.

Table A8: Results From Included Observational Studies on Determinants of Home Versus Hospital Death—Disease-Related Variables

Author, Year Country Sample Size	Disease Type or Cause of Death OR (95% CI)	Functional Status	Hospital Admission OR (95% CI)	Time-to-Death
Poulose et al, 2013 (17) Singapore N = 842	Disease Type <u>Reference: lung cancer</u> Males • Non-cancer: 0.78 (0.31–1.96)	Not available	Not available	Referral-to-death interval <u>Reference: < 30 days</u> Male • ≥ 30 days: 2.21 (1.34–3.67)
Fukui et al, 2011 (15) Japan N = 568	Not available	<u>Reference: not bedridden</u> • Totally bedridden: 2.22 (1.27–3.87)	Not available	Not available
Hong et al, 2011 (21) Singapore N = 52,120	Cause of Death <u>Reference: non-cancer</u> • Cancer: 2.97 (2.79–3.17) Disease Type <u>Reference: lung cancer</u> • Hematological: 0.58 (0.51–0.66)	Not available	Not available	Diagnosis-to-death interval <u>Reference: < 1 year</u> • 1–5 years: : 1.40 (1.34–1.48) • ≥ 6 years: : 1.40 (1.31–1.51)
Hayashi et al, 2011 (24) Japan N = 99	Disease Type <u>Reference: non- cancer</u> • Cancer: 2.18 (1.04–3.89)	Not available	Not available	Not available
Houttekier et al, 2011 (19) Belgium N = 189,884	Cause of Death <u>Reference: non-cancer</u> • Cancer: 1.16 (1.12–1.20)	Not available	Not available	Not available
Taylor et al, 2011 (18) New Zealand N = 1,268	Disease Type <u>Reference: non-cancer</u> • Cancer: 1.61 (0.88–2.94)	Not available	Not available	Not available

Author, Year Country Sample Size	Disease Type or Cause of Death OR (95% CI)	Functional Status	Hospital Admission OR (95% CI)	Time-to-Death
Cardenas-Turanza et al, 2011 (20) Mexico N = 10,561	Cause of death <u>Reference: absence of disease</u> • Cancer: 1.49 (0.81–2.78) • Cardiovascular disease: 0.68 (0.36–1.32) • Diabetes: 0.99 (0.51–1.92) • Stroke: 0.63 (0.27–1.45)	Not available	<u>Reference: no admission during last year of life</u> • ≥ 1 admission: 0.15 (0.07–0.30)	Not available
Houttekier et al (2010) (14) N = 56,341 (Netherlands) N = 181,238 (England)	Disease Type <u>Reference: non-cancer</u> Netherlands • Cancer: 2.22 (2.07–2.38) England • Cancer: 1.64 (1.59–1.69)	Not available	Not available	Not available
Tang et al, 2010 (23) Taiwan N = 201,252	Disease Type <u>Reference: lung cancer</u> • Hematological: 0.77 (0.70–0.85)	Not available	ICU admission (last month of life) <u>Reference: no admission</u> • 0.82 (0.72–0.93)	Diagnosis-to-death interval <u>Reference: 1–2 months</u> • 3–6: 1.07 (1.02–1.13) • 7–12: 1.06 (1.01–1.11) • 13–24: 1.05 (1.00–1.10) • ≥ 25: 1.10 (1.06–1.15)
Bell et al, 2009 (25) US N = 1,352	Cause of death <u>Reference: coronary heart disease</u> • Cancer: 4.54 (2.56–8.33) • Stroke: 0.94 (0.40–2.27) • Dementia: 2.00 (0.88–4.54)	Not available	Not available	Not available
Gruneir et al 2007 (27) US N = 1,402,167	Cause of death <u>Reference: cancer</u> • Stroke: 0.18 (0.17–0.19) • Congestive heart failure: 0.64 (0.63–0.65) • COPD: 0.39 (0.38–0.40)	Not available	Not available	Not available

Author, Year Country Sample Size	Disease Type or Cause of Death OR (95% CI)	Functional Status	Hospital Admission OR (95% CI)	Time-to-Death
Lin et al, 2007 (12) Taiwan N = 697,814	Cause of Death <u>Reference unclear</u> • Cancer: 0.70 (0.69–0.72)	Not available	Not available	Not available
Motiwala et al, 2006 (28) Canada N = 58,689	Disease Type <u>Reference: absence of disease</u> • Cancer: 1.92 (1.79–2.04) • Major acute condition: 0.29 (0.26–0.32)	Not available	Not available	Not available
Cohen et al, 2006 (29) Belgium N = 55,759	Cause of Death <u>Reference: acute LRTI</u> • Chronic LRTI: 4.56 (3.22–6.46) • Heart failure: 7.63 (5.26–11.09)	Not available	Not available	Not available
Klinkenberg et al, 2005 (30) Netherlands N = 186	Cause of death <u>Reference: non-cancer</u> • Cancer: 1.14 (0.59–2.22)	<u>Reference: higher functional status</u> • Lower: 1.82 (0.93–3.57)	Not available	Not available
Aabom et al, 2005 (11) Denmark N = 4,092	Disease Type <u>Reference: non-hematological cancer</u> • Hematological: 0.74 (0.40–1.35)	Not available	Not available	Diagnosis-to-death <u>Reference: > 1 month</u> • < 1 month: 0.44 (0.32–0.59)
Fukui et al, 2004 (31) Japan N = 428	Not available	Not available	Re-hospitalization in the event of a crisis <u>Reference: re-hospitalization</u> • 40.11 (11.81–136.26)	Not available

Abbreviations: CI, confidence interval; COPD, chronic obstructive pulmonary disease; ICU, intensive care unit; LRTI, lower respiratory tract infection; N, number of patients included; OR, odds ratio.

Table A9: Results From Included Observational Studies on Determinants of Home Versus Hospital Death—Health Care System-Related Variables

Author, Year Country Sample Size	Home Care Visits OR (95% CI)	Multidisciplinary Palliative Care Team in Hospital OR (95% CI)	Hospital Bed Availability OR (95% CI)
Seow, 2013 (32) Canada N = 6,218	Multidisciplinary home care team <u>Reference: usual home care</u> • 2.56 (2.31–2.83)	Not available	Not available
Hayashi et al, 2011 (24) Japan N = 99	Home care nursing service <u>Reference: no home care nursing service</u> • 3.13 (1.08–6.21)	Not available	Not available
Houttekier et al, 2011 (19) Belgium N = 189,884	Not available	Not available	<u>Reference: unit increase /1,000 population</u> • 0.90 (0.88–0.91)
Fukui et al, 2011 (15) Japan N = 568	Primary physician 24-hour support <u>Reference: no 24-hour primary physician support</u> • 1.74 (1.08–2.80) Nurse visits 1st week after discharge <u>Reference: < 3 visits</u> • ≥ 3: 1.20 (0.77–1.88)	Not available	Not available
Houttekier et al, 2010 Belgium (13) N = 750	Multidisciplinary home care team involvement <u>Reference: no multidisciplinary home care team involvement</u> • 8.40 (4.70–15.10)	<i>In patients with ≥ 1 hospital admission in last 3 months</i> • Yes: 0.34 (0.1–0.9)	<u>Reference: unit increase /1,000 population</u> • 0.80 (0.60–0.90)

Author, Year Country Sample Size	Home Care Visits OR (95% CI)	Multidisciplinary Palliative Care Team in Hospital OR (95% CI)	Hospital Bed Availability OR (95% CI)
Nakamura et al, 2010 (22) Japan N = 92	Family physician visits <u>Reference: < 2.6 times/week</u> • ≥ 2.6: 2.70 (0.95–7.70) Nurse visits <u>Reference: < 2.3 times/week</u> • ≥ 2.3: 2.13 (0.74–6.12)	Not available	Not available
Tang et al, 2010 (23) Taiwan N = 201,252	Not available	Inpatient hospice unit availability <u>Reference: no availability</u> • 0.62 (0.40–0.96)	<u>Reference: < 1st quarter</u> • > 3 rd quarter: 0.79 (0.61–1.03)
Gruneir et al, 2007 (27) US N = 1,402,167	Not available	Not available	<u>Unit increase /1,000 population</u> • 1.00 (0.99–1.00)
Cohen et al, 2006 (29) Belgium N = 55,759	Not available	Not available	<u>Reference: ≥ 6.75/1,000 population</u> • < 6.75/1,000: 1.12 (1.05–1.20)
Brazil et al, 2005 (2) Canada N = 214	Family physician (last month before death) visits <u>Reference: no visits</u> • 4.42 (1.46–13.36)	Not available	Not available

Author, Year Country Sample Size	Home Care Visits OR (95% CI)	Multidisciplinary Palliative Care Team in Hospital OR (95% CI)	Hospital Bed Availability OR (95% CI)
Aabom et al, 2005 (11) Danemark N = 4,092	<u>Reference: no visits</u> Family physician visits (last 3 months of life) <ul style="list-style-type: none"> • 12.50 (8.33–16.67) Visit rate <ul style="list-style-type: none"> • 0.6–1: 9.09 (5.88–14.28) • 1–2: 14.28 (1.00–20.00) • 2–4: 16.67 (12.50–25.00) • >4: 20.00 (12.50–33.33) Community nurse visits (last 3 months of life) <ul style="list-style-type: none"> • 2.78 (2.08–3.85) 	Not available	Not available
Saugo et al, 2008 (26) Italy N = 350	Nurse visits (last 3 months of life) <u>Reference: no visits</u> <ul style="list-style-type: none"> • 1–3: 3.13 • 4–12: 8.77^a • >12: 14.20^a 	Not available	Not available
Lin et al, 2007 (12) Taiwan N = 697,814	Not available	Not available	<u>Reference: ≤65/10,000</u> <ul style="list-style-type: none"> • > 65: 0.75 (0.74–0.76)

Abbreviations: CI, confidence interval; N, number of patients included; OR, odds ratio.

^aStatistically significant as per graph (CIs not provided).

Table A10: Results From Included Observational Studies on Determinants of Home Versus Hospital Death—Living Arrangements and Informal Caregiver-Related Variables

Author, Year Country Sample Size	Marital Status Living Alone or Not Living Alone OR (95% CI)	Informal Caregiver Availability OR (95% CI)	Informal Caregiver Support and Coping OR (95% CI)
Poulose et al, 2013 (17) Singapore N = 842	<u>Reference: not married</u> Males • Married: 1.87 (1.01–3.47) Females • Married: 1.09 (0.68–1.73)	Not available	Not available
Houttekier et al, 2011 (19) Belgium N = 189,884	<u>Reference: living alone</u> • Not living alone: 1.95 (1.89–2.01)	Not available	Not available
Taylor et al, 2011 (18) New Zealand N = 1,269	<u>Reference: not married</u> • Married: 1.15 (0.68–1.95)	Not available	Not available
Cardenas-Turanza et al, 2011 (20) Mexico N = 473	<u>Reference: not married</u> • Married: 1.04 (0.65–1.67)	Not available	Not available
Houttekier et al, 2010 (13) Belgium N = 750	Not available	<u>Reference: none or sometimes</u> • Often: 2.3 (1.2–4.6)	Not available
Lin et al, 2007 (12) Taiwan N = 697,814	<u>Reference: never married</u> • Married: 6.42 (6.27–6.58)	Not available	Not available
Tang et al, 2010 (23) Taiwan N = 201,252	<u>Reference: single</u> • Married: 1.22 (1.15–1.29)	Not available	Not available

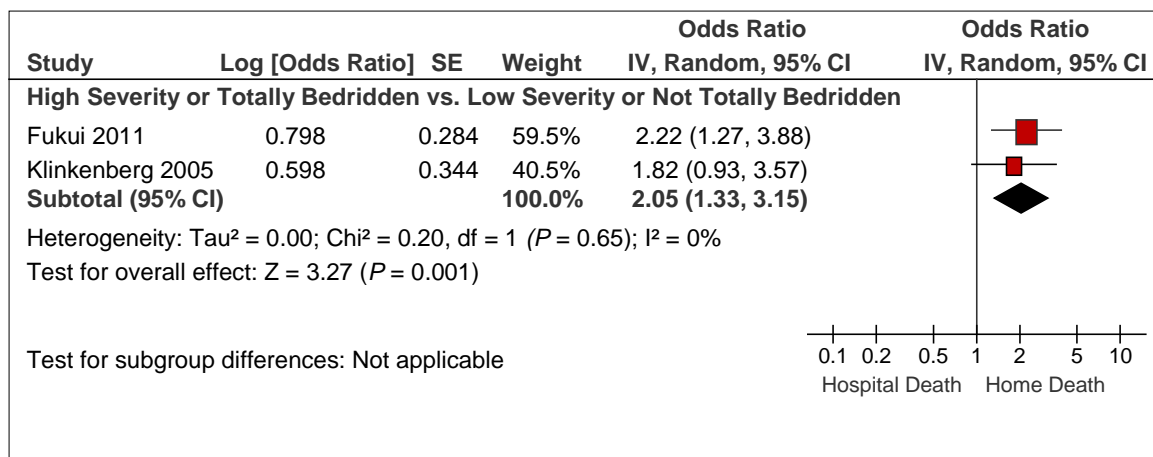
Author, Year Country Sample Size	Marital Status Living Alone or Not Living Alone OR (95% CI)	Informal Caregiver Availability OR (95% CI)	Informal Caregiver Support and Coping OR (95% CI)
Cohen et al, 2006 (29) Belgium N = 55,759	<u>Reference: living alone</u> • Not alone: 1.29 (1.18–1.41)	Not available	Not available
Brazil et al, 2005 (2) Canada N = 214	<u>Reference: not living with caregiver</u> • Living with caregiver: 1.70 (0.44–6.55)	Not available	Satisfaction with support from family physician <u>Reference: dissatisfied</u> • Satisfied: 1.62 (0.31–8.62) Caregiver health <u>Reference: fair/poor</u> • Excellent/very good: 0.64 (0.20–1.99)
Klinkenberg et al, 2005 (30) Netherlands N = 209	<u>Reference: no partner</u> • Partner: 1.37 (0.70–2.70)	Not available	Not available
Aabom et al, 2005 (11) Denmark N = 4,092	<u>Reference: not married</u> • Married: 1.47 (1.18–1.79)	Not available	Not available
Fukui et al, 2004 (31) Japan N = 428	Not available	Not available	Psychological distress during stable phase <u>Reference: high</u> • Low: 5.41 (1.13–25.92)

Abbreviations: CI, confidence interval; N, number of patients included; OR, odds ratio.

Table A11: Results From Included Observational Studies on Determinants of Home Versus Hospital Death—Patient and Family Preferences

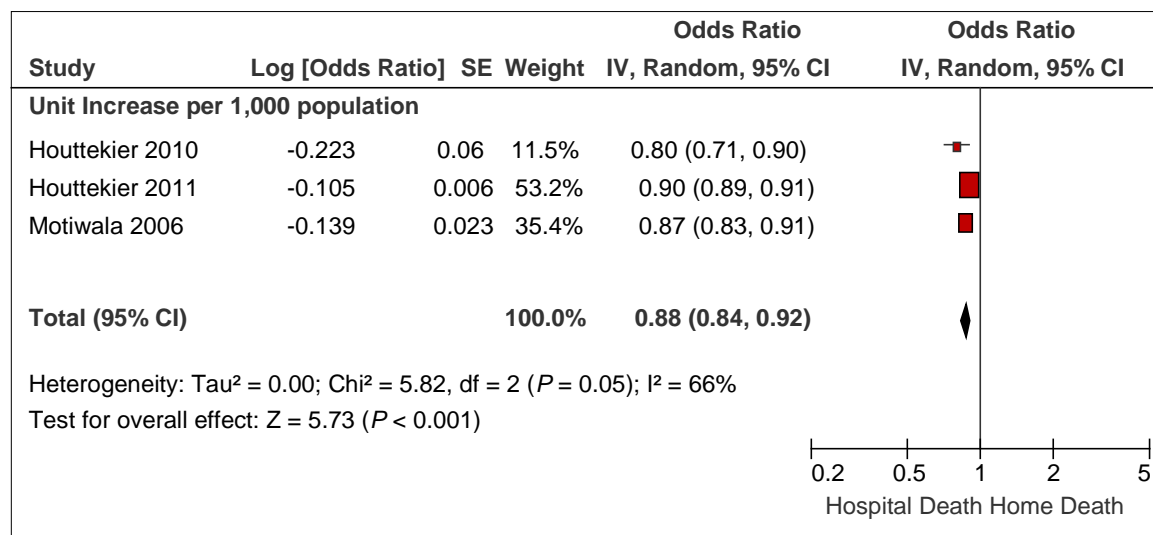
Author, Year Country Sample Size	Patient Preference OR (95% CI)	Family Preference OR (95% CI)	Congruence of Patient and Family Preference OR (95% CI)
Ikezaki et al, 2011 (16) Japan N = 4,175	<p><u>Reference: no preference for home death</u></p> <p>Cancer Patients</p> <ul style="list-style-type: none"> • Only patient prefers home: 4.69 (3.11–7.07) <p>Non-Cancer Patients</p> <ul style="list-style-type: none"> • Only patient prefers home: 2.04 (1.48–2.80) 	<p><u>Reference: no preference for home death</u></p> <p>Cancer Patients</p> <ul style="list-style-type: none"> • Only family prefers home: 20.07 (12.24–32.91) <p>Non-Cancer Patients</p> <ul style="list-style-type: none"> • Only family prefers home: 11.51 (8.56–15.99) 	<p><u>Reference: no congruence for home death</u></p> <p>Cancer Patients</p> <ul style="list-style-type: none"> • Congruence: 57.00 (38.79–83.76) <p>Non-Cancer Patients</p> <p>Congruence: 12.33 (9.51–15.99)</p>
Houttekier et al, 2010 (13) Belgium N = 1,283	<p><u>Reference: unknown or not home</u></p> <ul style="list-style-type: none"> • Home: 14.20 (9.50–21.40) 	Not available	Not available
Brazil et al, 2005 (2) Canada N = 214	<p><u>Reference: no stated preference</u></p> <ul style="list-style-type: none"> • Preference for home death: 2.92 (1.25–6.84) 	Not available	Not available

Abbreviations: CI, confidence interval; N, number of patients included; OR, odds ratio.



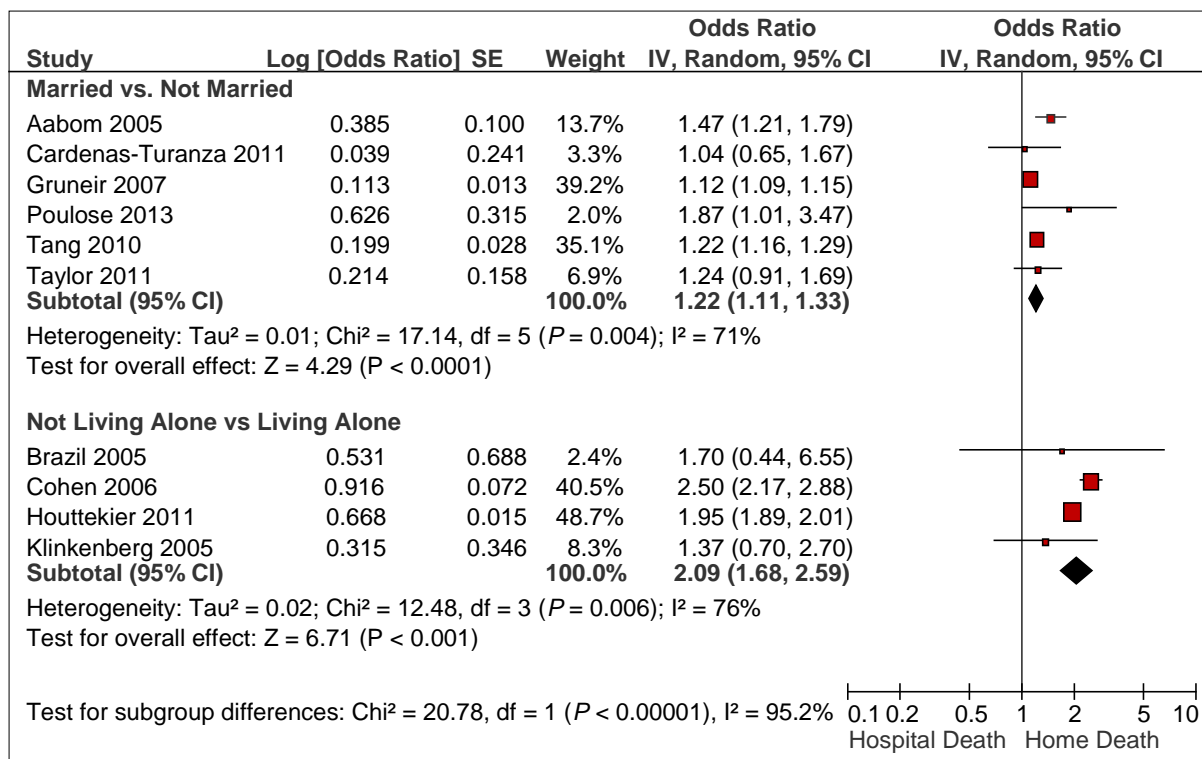
Abbreviations: CI, confidence interval; df, degrees of freedom; IV, inverse variance; SE, standard error.

Figure A1: Forest Plot of the Association Between Functional Status and Home Death



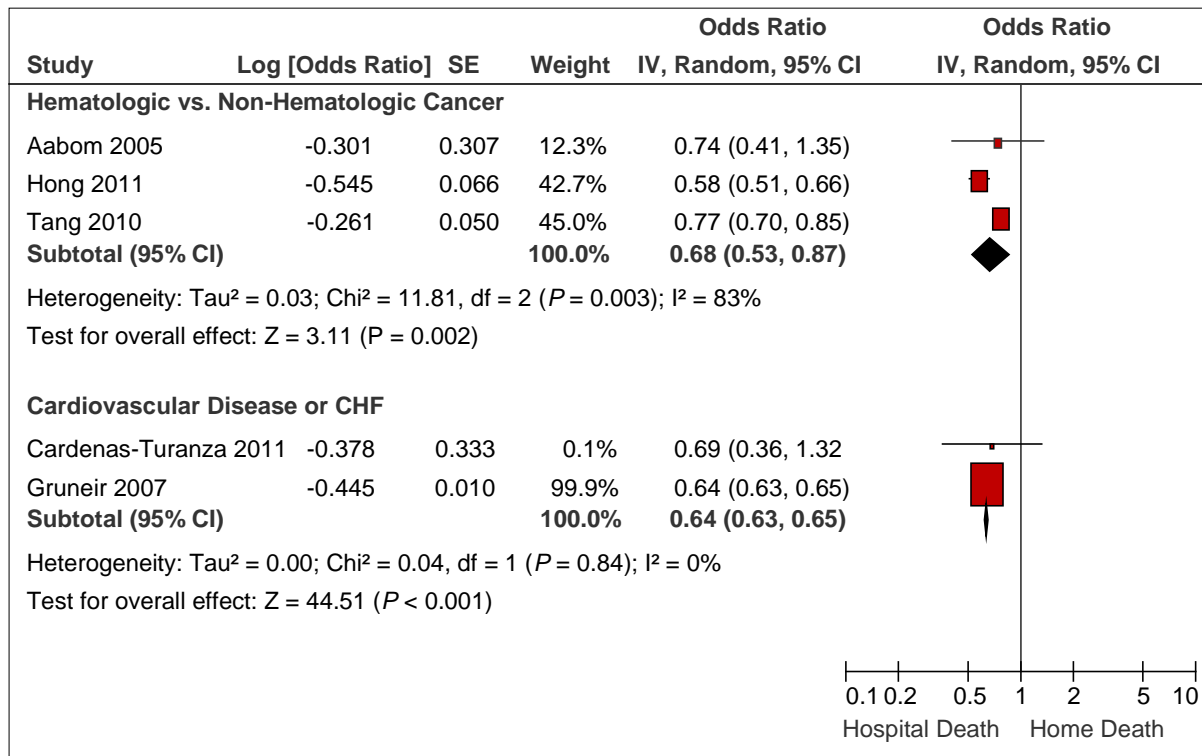
Abbreviations: CI, confidence interval; df, degrees of freedom; IV, inverse variance; SE, standard error.

Figure A2: Forest Plot of the Association Between Hospital Bed Availability and Home Death



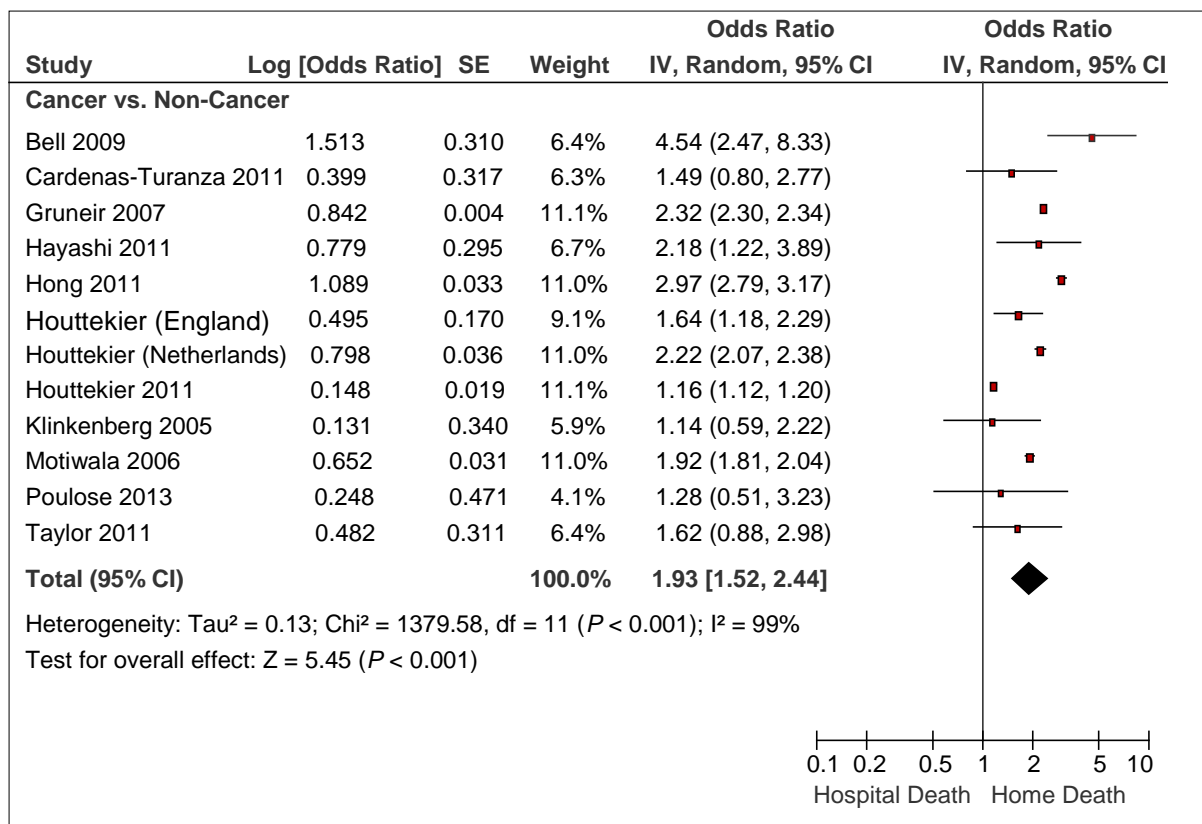
Abbreviations: CI, confidence interval; df, degrees of freedom; IV, inverse variance; SE, standard error.

Figure A3: Forest Plot of the Association Between Living Arrangements and Home Death



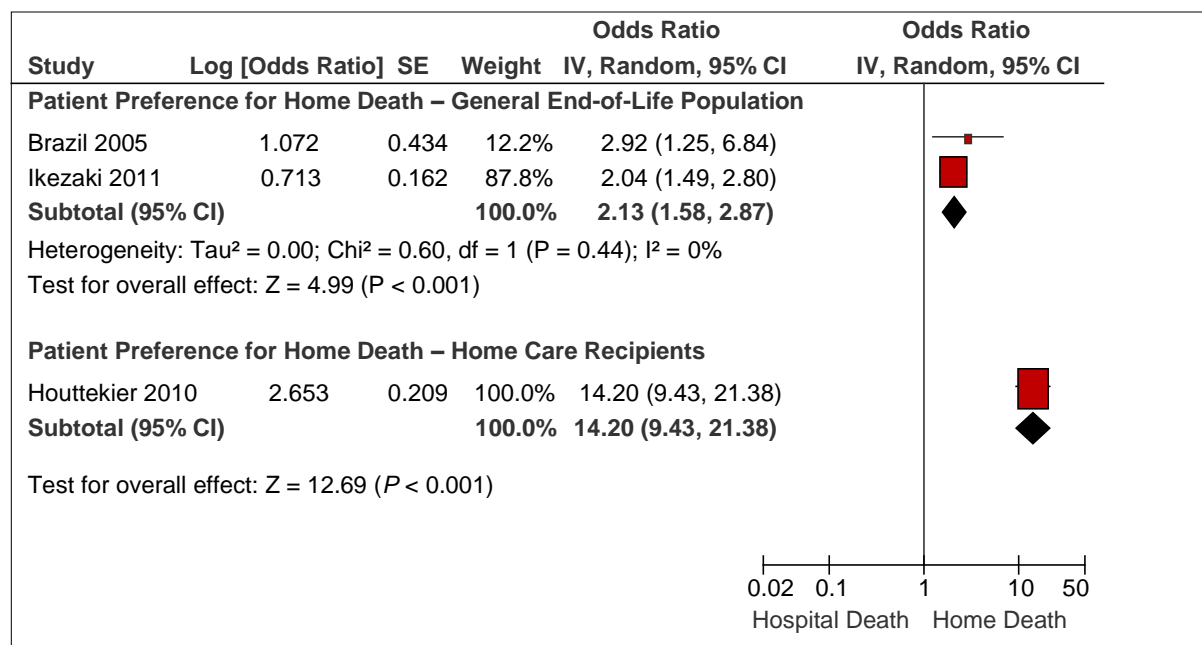
Abbreviations: CI, confidence interval; df, degrees of freedom; IV, inverse variance; SE, standard error.

Figure A4: Forest Plot of the Association Between Disease Type and Home Death



Abbreviations: CI, confidence interval; df, degrees of freedom; IV, inverse variance; SE, standard error.

Figure A5: Forest Plot of the Association Between Cancer and Home Death



Abbreviations: CI, confidence interval; df, degrees of freedom; IV, inverse variance; SE, standard error.

Figure A6: Forest Plot of the Association Between Patient Preference for Home Death and Home Death

Appendix 4: Studies Evaluating the Determinants of Nursing Home Death

Table A12: Study Characteristics and Adjustment Factors—Included Observational Studies on the Determinants of Nursing Home Versus Hospital Death

Author, Year Country Sample Size	Study Design Data Source Time Frame	Population	Sociodemographic Factors	Illness-Related Factors	Health Services Availability	Patient or Family Preference for Place of Death
Study Characteristics			Adjustment Factors			
Ikegami et al, 2012 (33) Japan N = 1,160	<ul style="list-style-type: none"> Retrospective cohort Retrospective survey answered by nurses Not specified 	<ul style="list-style-type: none"> Nursing home residents 	<ul style="list-style-type: none"> Not included 	<ul style="list-style-type: none"> Cause of death 	<ul style="list-style-type: none"> Restricted to nursing home residents Physicians based in home care EoL care in facility 	<ul style="list-style-type: none"> Family preference Agreement among family members
Levy et al, 2012 (34) United States N = 7,408	<ul style="list-style-type: none"> Retrospective cohort Administrative data set Not specified 	<ul style="list-style-type: none"> Veterans Affairs nursing home residents Death 2005–2007 	<ul style="list-style-type: none"> Not included 	<ul style="list-style-type: none"> Type of disease End stage, not hospice Length of stay Cognitive function 	<ul style="list-style-type: none"> Restricted to Veterans Affairs nursing home residents Hospice care 	<ul style="list-style-type: none"> Advance directives
Houttekier et al, 2011 (19) Belgium N = 79,846	<ul style="list-style-type: none"> Retrospective cohort Death certificates Not specified 	<ul style="list-style-type: none"> Nursing home residents ≥ 65 years Non-sudden deaths 1998–2007 Eligible for palliative care 	<ul style="list-style-type: none"> Age Urbanization Living alone 	<ul style="list-style-type: none"> Cause of death 	<ul style="list-style-type: none"> Bed availability in hospital and care homes 	<ul style="list-style-type: none"> Not included

Author, Year Country Sample Size	Study Design Data Source Time Frame	Population	Sociodemographic Factors	Illness-Related Factors	Health Services Availability	Patient or Family Preference for Place of Death
Study Characteristics			Adjustment Factors			
Houttekier et al, 2010 (14) Results for Belgium included in separate publication (19) N = 56,341 (Netherlands) N = 181,238 (England)	<ul style="list-style-type: none"> Retrospective cohort Death certificates Not specified 	<ul style="list-style-type: none"> Adults Deaths in 2003 	<ul style="list-style-type: none"> Age Sex Living arrangements^a Urban residence Income^a 	<ul style="list-style-type: none"> Disease type 	<ul style="list-style-type: none"> Hospital beds Nursing home beds 	<ul style="list-style-type: none"> Not included
Houttekier et al, 2010 (13) Belgium N = 1,690	<ul style="list-style-type: none"> Retrospective cohort Retrospective data based on previous study Last 3 months of life 	<ul style="list-style-type: none"> Adults and pediatrics Deaths 2005–2006 	<ul style="list-style-type: none"> Age^a Sex^a Income Informal care during last 3 months of life Place of residence^a 	<ul style="list-style-type: none"> Cause of death^a 	<ul style="list-style-type: none"> Hospital beds Care home beds^a GP involvement^a Home care involvement^a Palliative home care team 	<ul style="list-style-type: none"> Patient preference
Bell et al, 2009 (25) United States N = 1,352	<ul style="list-style-type: none"> Retrospective cohort Prospective cohort study Not specified 	<ul style="list-style-type: none"> Adults Death 1991–1999 Japanese-American males 	<ul style="list-style-type: none"> Age^a Restricted to males Restricted to Japanese-American 	<ul style="list-style-type: none"> Cause of death Cognitive impairment^a Functional measures^a Interval between last examination and death^a 	<ul style="list-style-type: none"> Not included 	<ul style="list-style-type: none"> Not included

Author, Year Country Sample Size	Study Design Data Source Time Frame	Population	Sociodemographic Factors	Illness-Related Factors	Health Services Availability	Patient or Family Preference for Place of Death
Study Characteristics			Adjustment Factors			
Kwak et al, 2008 (36) United States N = 30,765	<ul style="list-style-type: none"> Retrospective cohort Administrative databases Last year of life 	<ul style="list-style-type: none"> ≥ 65 years Nursing home residents Eligible for both Medicare and Medicaid Death 2000–2002 Excludes traumatic and sudden deaths 	<ul style="list-style-type: none"> Age Sex Marital status Ethnicity Education Urban/rural residence 	<ul style="list-style-type: none"> Cause of death Nursing home stay 	<ul style="list-style-type: none"> Restricted to Medicare /Medicaid nursing home residents Hospice use 	<ul style="list-style-type: none"> Not included
Takezako et al, 2007 (37) Japan N = 86	<ul style="list-style-type: none"> Retrospective cohort Chart review Not specified 	<ul style="list-style-type: none"> Deaths: 1999–2004 Died at nursing home or after transfer to hospital Excludes sudden deaths 	<ul style="list-style-type: none"> Age Sex Marital status Living at home before nursing home 	<ul style="list-style-type: none"> Functional status 	<ul style="list-style-type: none"> Restricted to nursing home residents Full-time physician presence 	<ul style="list-style-type: none"> Family preference for nursing home care
Motiwala, et al 2006 (28) Canada N = 58,689	<ul style="list-style-type: none"> Retrospective cohort Health claims databases Last year of life 	<ul style="list-style-type: none"> >65 years Death 2001–2002 	<ul style="list-style-type: none"> Age^a Sex^a Social deprivation Immigration status 	<ul style="list-style-type: none"> Disease type Comorbidities Acute care conditions 	<ul style="list-style-type: none"> Hospital bed availability 	<ul style="list-style-type: none"> Not included
Levy et al, 2004 (35) United States N = 152,494	<ul style="list-style-type: none"> Retrospective cohort Administrative databases Not specified 	<ul style="list-style-type: none"> Adults Deaths at nursing home or hospital Medicare admissions to nursing homes in 2001 	<ul style="list-style-type: none"> Age Ethnicity Rural/urban residence 	<ul style="list-style-type: none"> Disease type Function Cognitive performance 	<ul style="list-style-type: none"> Restricted to Medicare nursing home residents Type of hospital (profit/non-profit) Size of hospital 	<ul style="list-style-type: none"> DNR order DNH order

Abbreviations: DNH, do-not-hospitalize; DNR, do-not-resuscitate; EoL, end-of-life; GP, general practitioner; N, number of patients included.

^aVariables included in the multivariate model but odds ratios not provided.

Table A13: Patient Characteristics in Included Observational Studies on the Determinants of Nursing Home Versus Hospital Death

Author, Year Country Sample Size	Age (years) Sex	Setting	Type of Disease	Patient and Family Preference for Place of Death	Place of Death
Ikegami et al, 2012 (33) Japan N = 1,160	<ul style="list-style-type: none"> • Mean (SD): 89 (8) • Male: 342 (30%) 	<ul style="list-style-type: none"> • Nursing home residents 	Cause of death <ul style="list-style-type: none"> • Cancer: 76 (7%) • Heart disease: 215 (18%) • Pneumonia: 237 (21%) • Stroke: 61 (5%) • Other: 570 (49%) 	Patient <ul style="list-style-type: none"> • Nursing home: 135 (12%) • Hospital: 30 (3%) • Did not know/no answer: 970 (84%) Family <ul style="list-style-type: none"> • Nursing home: 643 (56%) • Hospital: 185 (16%) • Did not know/no answer: 330 (29%) Agreement between patient and family <ul style="list-style-type: none"> • 736 (64%) 	<ul style="list-style-type: none"> • Home: 0 • Nursing home: 548 (47%) • Hospital: 610 (53%)
Levy et al, 2012 (34) United States N = 7,408	<ul style="list-style-type: none"> • Median (range): 78 (21–105) • Male: 7,224 (98%) 	<ul style="list-style-type: none"> • Veterans Affairs nursing home residents 	Not available	<ul style="list-style-type: none"> • DNR: 4,635 (63%) • DNH: 610 (8%) 	<ul style="list-style-type: none"> • Home: 0 • Hospital: 995 (13%) • Nursing home: 6,413 (87%)
Houttekier et al, 2011 (19) Belgium 2007 data (N = 65,435)	<ul style="list-style-type: none"> • ≥ 65: 54,312 (83%) • Male: 32,522 (50%) 	<ul style="list-style-type: none"> • General 	<ul style="list-style-type: none"> • Cancer: 18,322 (28%) • CV: 17,013 (26%) • Respiratory: 7,852 (12%) • Stroke: 5,235 (8%) • Other: 17,013 (26%) 	Not available	Among 16,097 care home residents <ul style="list-style-type: none"> • Nursing home: 12,121 (76%)
Houttekier et al, 2010 (13) Belgium N = 1,690	<ul style="list-style-type: none"> • ≥ 65: 1,462 (88%) • Male: 839 (50%) 	<ul style="list-style-type: none"> • General 	<ul style="list-style-type: none"> • Cancer: 725 (43%) • Cardiovascular: 237 (14%) • Respiratory: 157 (9%) • Stroke: 121 (7%) • Other: 431 (26%) 	Patient (n = 713) <ul style="list-style-type: none"> • Home: 416 (26%) • Nursing home: 220 (14%) • Other: 77 (5%) 	<ul style="list-style-type: none"> • Not available

Author, Year Country Sample Size	Age (years) Sex	Setting	Type of Disease	Patient and Family Preference for Place of Death	Place of Death
Houttekier et al, 2010 (14) Netherlands N = 56,341	<ul style="list-style-type: none"> • ≥ 70: 39,348 (70%) • Male: 29,635 (53%) 	• General	Cause of death <ul style="list-style-type: none"> • Cancer: 39,854 (71%) • Heart failure: 6,127 (11%) 	Not available	<ul style="list-style-type: none"> • Home: 21,352 (38%) • Hospital: 17,902 (32%) • Nursing home: 14,861 (26%)
Houttekier et al, 2010 (14) England N = 181,238	<ul style="list-style-type: none"> • ≥ 70: 131,574 (73%) • Male: 90,619 (50%) 	• General	Cause of death <ul style="list-style-type: none"> • Cancer: 130,491 (72%) • Heart failure: 11,599 (6.5%) 	Not available	<ul style="list-style-type: none"> • Home: 36,248 (20%) • Hospital: 96,499 (53%) • Nursing home: 24,395 (13%)
Bell et al, 2009 (25) United States N = 1,352	<ul style="list-style-type: none"> • Mean: 1,136 (84%) • Male: 100% 	• General	<ul style="list-style-type: none"> • Cancer: 337 (25%) • Coronary heart disease: 181 (13%) • Stroke: 150 (11%) • Dementia: 109 (8%) • Respiratory: 54 (4%) • Others: 521 (39%) 	Not available	<ul style="list-style-type: none"> • Home: 306 (23%) • Hospital: 800 (59%) • Nursing home: 246 (18%)
Kwak et al, 2008 (36) United States N = 30,765	<ul style="list-style-type: none"> • Mean (SD): 86 (8) • Male: 8,306 (27%) 	• Nursing home residents	<ul style="list-style-type: none"> • Cancer: 1,661 (5%) • Heart disease: 11,291 (37%) • Dementia: 4,584 (15%) • Other: 13,229 (43%) 	Not available	<ul style="list-style-type: none"> • Home: 461 (2%) • Hospital: 8,276 (27%) • Nursing home: 21,259 (69%) • Other: 769 (2%)
Takezako et al, 2007 (37) Japan N = 86	<ul style="list-style-type: none"> • ≥ 85: 53 (62%) • Male: 20 (23%) 	• Nursing home residents	<ul style="list-style-type: none"> • Cancer: 3 (4%) • Heart disease: 20 (23%) • Stroke: 35 (41%) • Dementia: 56 (65%) 	Patient (N = 16) <ul style="list-style-type: none"> • Nursing home: 12/16 (75%) • Hospital: 2 (13%) • Not decided: 2 (13%) Family (n = 84) <ul style="list-style-type: none"> • Nursing home: 52 (62%) • Hospital: 20 (24%) • Not decided: 9 (11%) 	<ul style="list-style-type: none"> • Nursing home: 43 (50%) • Hospital: 43 (50%)

Author, Year Country Sample Size	Age (years) Sex	Setting	Type of Disease	Patient and Family Preference for Place of Death	Place of Death
Motiwala et al, 2006 (28) Canada N = 58,689	<ul style="list-style-type: none"> • ≥75: 43,071 (73%) • Male: 27,749 (47%) 	<ul style="list-style-type: none"> • General 	<ul style="list-style-type: none"> • Cancer: 19,966 (34%) • Dementia: 16,267 (28%) • Others: 22,456 (58%) 	Not available	<ul style="list-style-type: none"> • Not available
Levy et al, 2004 (35) United States N = 152,494	<ul style="list-style-type: none"> • ≥ 65: 146,998 (96%) • Male: not reported 	<ul style="list-style-type: none"> • Medicare nursing home residents 	<ul style="list-style-type: none"> • Not available 	Not available	<ul style="list-style-type: none"> • Hospital: 51,187 (34%) • Nursing home: 101,307 (66%)

Abbreviations: CV, cardiovascular; DNH, do-not-hospitalize; DNR, do-not-resuscitate; N, number of patients included; SD, standard deviation.

Table A14: Results From Included Observational Studies on Determinants of Nursing Home Versus Hospital Death—Disease-Related Variables

Author, Year Country Sample Size	Disease Type or Cause of Death OR (95% CI)	Functional Status OR (95% CI)	Length of Stay OR (95% CI)
Ikegami et al, 2012 (33) Japan N = 1,160	Cause of death <u>Reference: other diseases</u> • Pneumonia: 0.22 (0.15–0.32)	Not available	Not available
Levy et al, 2012 (34) United States N = 7,408	Disease type <u>Reference: other diseases</u> • Heart failure: 0.75 (0.65–0.88) • Diabetes: 0.70 (0.61–0.81) • Cancer: 2.10 (1.65–2.67) • End-stage disease: 3.90 (2.78–5.47)	Not available	<u>Reference: unit increase (monthly)</u> • 1.01 (1.00-1.01)
Houttekier et al, 2011 (19) Belgium N = 79,846	Cause of death <u>Reference: non-cancer</u> • Cancer: 0.92 (0.87–0.96)	Not available	Not available
Houttekier et al, 2010 (13) Belgium N = 443	Cause of death <u>Reference: non-cancer</u> • Cancer: 2.50 (1.10–5.90)	Not available	Not available
Houttekier et al, 2010 (14) N = 56,341 (Netherlands) N = 181,238 (England)	Cause of death <u>Reference: non-cancer</u> Netherlands • Cancer: 0.74 (0.70–0.78) England • Cancer: 0.79 (0.77–0.81)	Not available	Not available
Bell et al, 2009 (25) United States N = 1,352	Cause of death <u>Reference: coronary heart disease</u> • Cancer: 1.58 (0.80–3.12) • Stroke: 4.76 (2.49–9.09) • Dementia: 2.50 (1.12–5.56) • Respiratory: 1.13 (0.31–4.15)	Not available	Not available

Author, Year Country Sample Size	Disease Type or Cause of Death OR (95% CI)	Functional Status OR (95% CI)	Length of Stay OR (95% CI)
Kwak et al, 2008 (36) United States N = 30,765	Cause of death <u>Reference: other causes</u> • Cancer: 2.04 (1.75–2.33) • Heart disease: 1.37 (1.30–1.47) • Dementia: 3.13 (2.78–3.45)	Not available	Not available
Motiwala et al, 2006 (28) Canada N = 58,689	Disease type <u>Reference: other diseases</u> • Dementia: 2.86 (2.70–3.03) • Cancer: 0.90 (0.86–0.94)	Not available	Not available
Takezako et al, 2007 (37) Japan N = 86	Not available	<u>Reference: not bedridden</u> • Bedridden: 2.80 (0.83–9.49)	Not available
Levy et al, 2004 (35) United States N = 152,494	Disease type <u>Reference: other diseases</u> • Stroke: 1.12 (1.06–1.18) • Diabetes: 0.90 (0.88–0.93) • Cancer: 1.75 (1.69–1.81)	<u>Reference: mild-to-no dependence</u> • Moderate: 1.35 (1.25–1.47) • Severe: 2.22 (2.04–2.38)	Not available

Abbreviations: CI, confidence interval; N, number of patients included; OR odds ratio.

Table A15: Results From Included Observational Studies on Determinants of Nursing Home Versus Hospital Death—Health Care System-Related Variables

Author, Year Country Sample Size	Palliative or End-of-Life Care in the Facility	Physician Visits	Bed Availability in Nursing Homes OR (95% CI)
Ikegami et al, 2012 (33) Japan N = 1,160	End-of-Life care <u>Reference: no end-of-life care</u> • 1.57 (1.13–2.16)	Full-time physician on-site <u>Reference: no full-time physician</u> • 2.05 (1.26–3.33)	Not available
Levy et al, 2012 (34) United States N = 7,408	Hospice care <u>Reference: no hospice care</u> • 20.94 (12.38–35.44)	Not available	Not available
Houttekier et al, 2011 (19) Belgium N = 79,846	Not available	Not available	<u>Reference: unit increase/1,000 population ≥ 65 years of age</u> • 1.01 (1.01–1.02)
Houttekier et al, 2010 (13) Belgium N = 443	Palliative care service involvement <u>Reference: no involvement</u> • 9.40 (3.30–26.70)	Not available	Not available
Houttekier et al, 2010 (14) N = 56,341 (Netherlands) N = 181,238 (England)	Not available	Not available	<u>Reference: unit increase/1000 population</u> Netherlands • 1.04 (1.02–1.05) England • 1.07 (1.06–1.08)
Kwak et al, 2008 (36) United States N = 30,765	Hospice care <u>Reference: no hospice care</u> • 12.5 (11.11–14.29)	Not available	Not available
Takezako et al, 2007 (37) Japan N = 86	Not available	Full-time physician presence <u>Reference: absence</u> • 3.74 (1.03–13.63)	Not available

Author, Year Country Sample Size	Palliative or End-of-Life Care in the Facility	Physician Visits	Bed Availability in Nursing Homes OR (95% CI)
Levy et al, 2004 (35) United States N = 152,494	Hospital-based nursing home <u>Reference: not hospital-based</u> • Yes: 1.20 (1.15–1.25)	Not available	Not available

Abbreviations: CI, confidence interval; N, number of patients included; OR, odds ratio.

Table A16: Results From Included Observational Studies on Determinants of Nursing Home Versus Hospital Death—Living Arrangements and Informal Caregiver-Related Variables

Author, Year Country Sample Size	Marital Status OR (95% CI)	Previous Residence OR (95% CI)
Takezako et al, 2007 (37) Japan N = 86	<u>Reference: married</u> • Not married: 2.87 (0.61–13.49)	Living at home before nursing home <u>Reference: not living at home</u> • Yes: 2.97 (0.87–10.19)

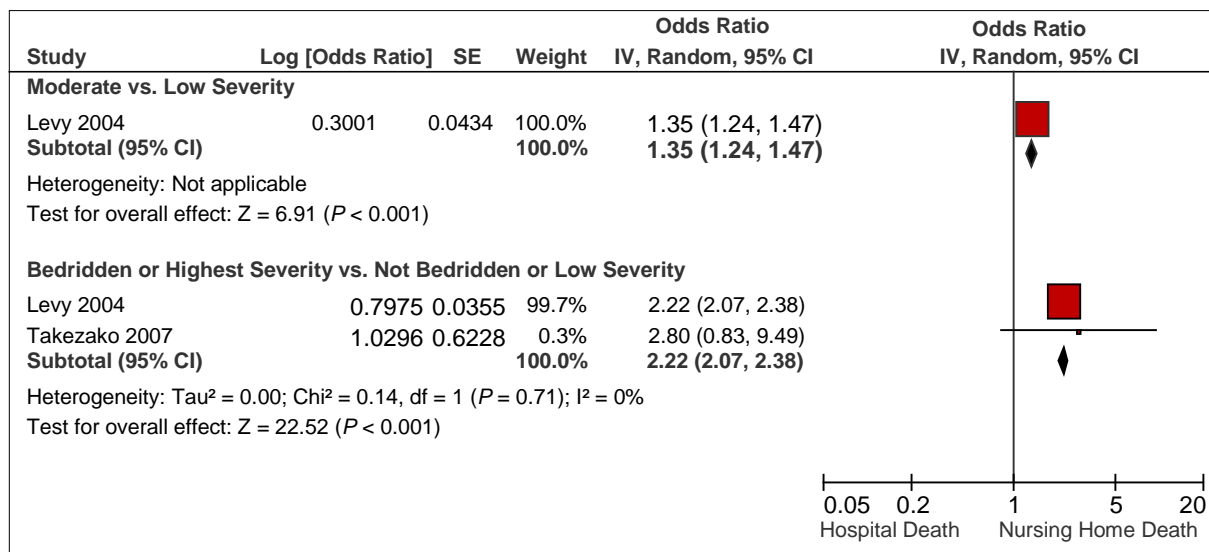
Abbreviations: CI, confidence interval; N, number of patients included; OR, odds ratio.

Table A17: Results From Included Observational Studies on Determinants of Nursing Home Versus Hospital Death—Patient and Family Preferences

Author, Year Country Sample Size	Patient Preference for Nursing Home Death OR (95% CI)	Family Preference for Nursing Home Death OR (95% CI)	Patient-Family Agreement OR (95% CI)	Advance Directives
Ikegami et al, 2012 (33) Japan N = 1,160	Not available	<u>Reference: no preference for nursing home death</u> • 16.62 (11.38–24.27)	<u>Reference: no agreement among family members</u> • 1.73 (1.18–2.52)	Not available
Levy et al, 2012 (34) United States N = 7,408	Not available	Not available	Not available	Any advance directive <u>Reference: none</u> • 1.57 (1.35–1.82)

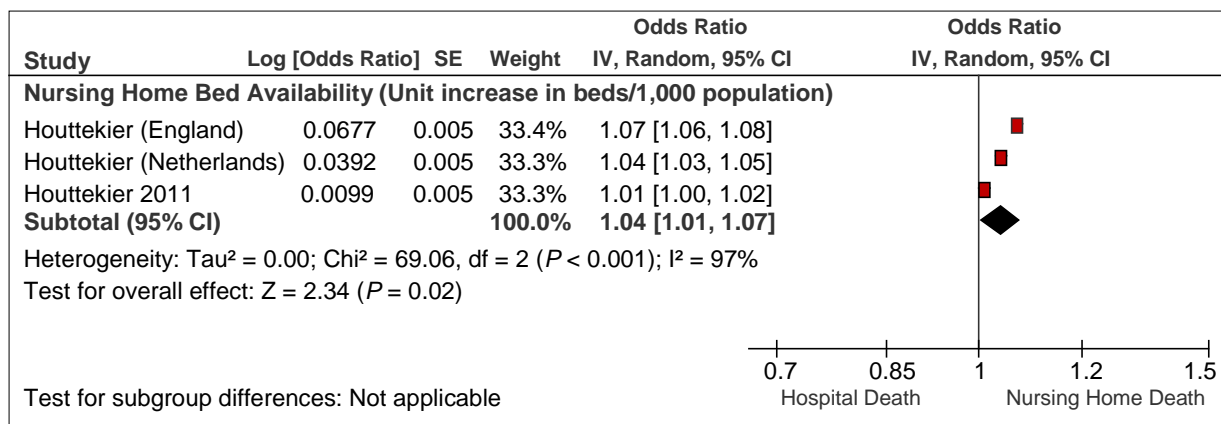
Author, Year Country Sample Size	Patient Preference for Nursing Home Death OR (95% CI)	Family Preference for Nursing Home Death OR (95% CI)	Patient-Family Agreement OR (95% CI)	Advance Directives
Houttekier et al, 2010 (13) Belgium N = 443	Reference: unknown or not nursing home • 10.40 (4.40–24.90)	Not available	Not available	Not available
Levy et al, 2004 (35) United States N = 152,494	Not available	Not available	Not available	Do-not-resuscitate (DNR) order Reference: no DNR • 3.33 (3.33–3.45) Do-not-hospitalize (DNH) order Reference: no DNH • 5.26 (4.76–5.88)

Abbreviations: CI, confidence interval; DNH, do-not-hospitalize; DNR, do-not-resuscitate; N, number of patients included; OR, odds ratio.



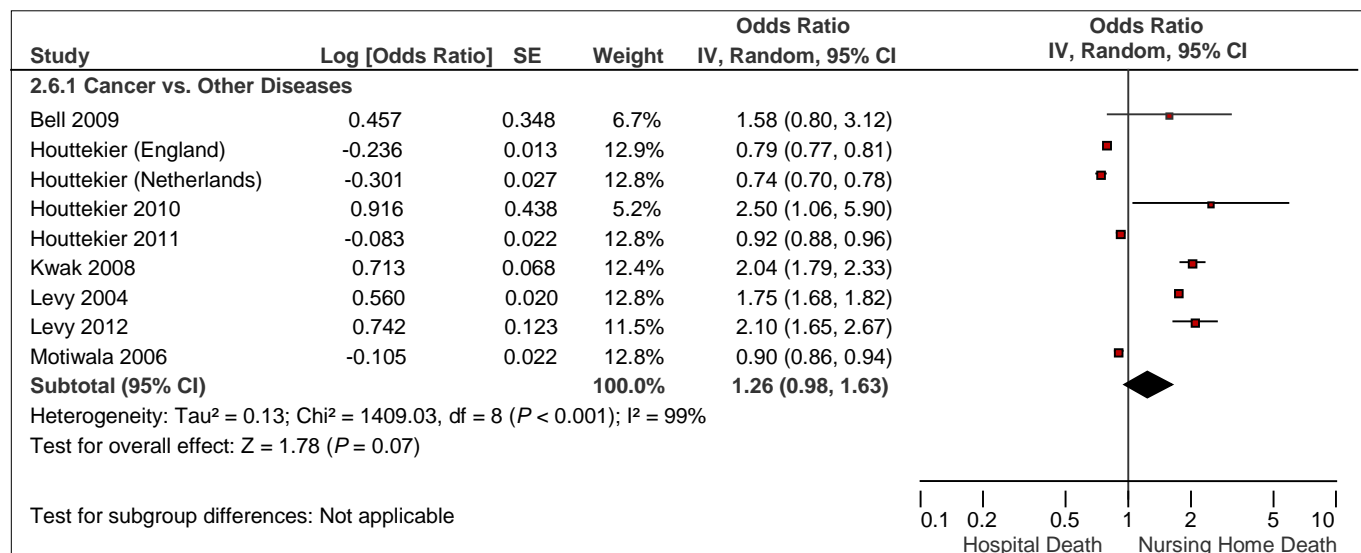
Abbreviations: CI, confidence interval; df, degrees of freedom; IV, inverse variance; SE, standard error.

Figure A7: Forest Plot of the Association Between Functional Status and Nursing Home Death



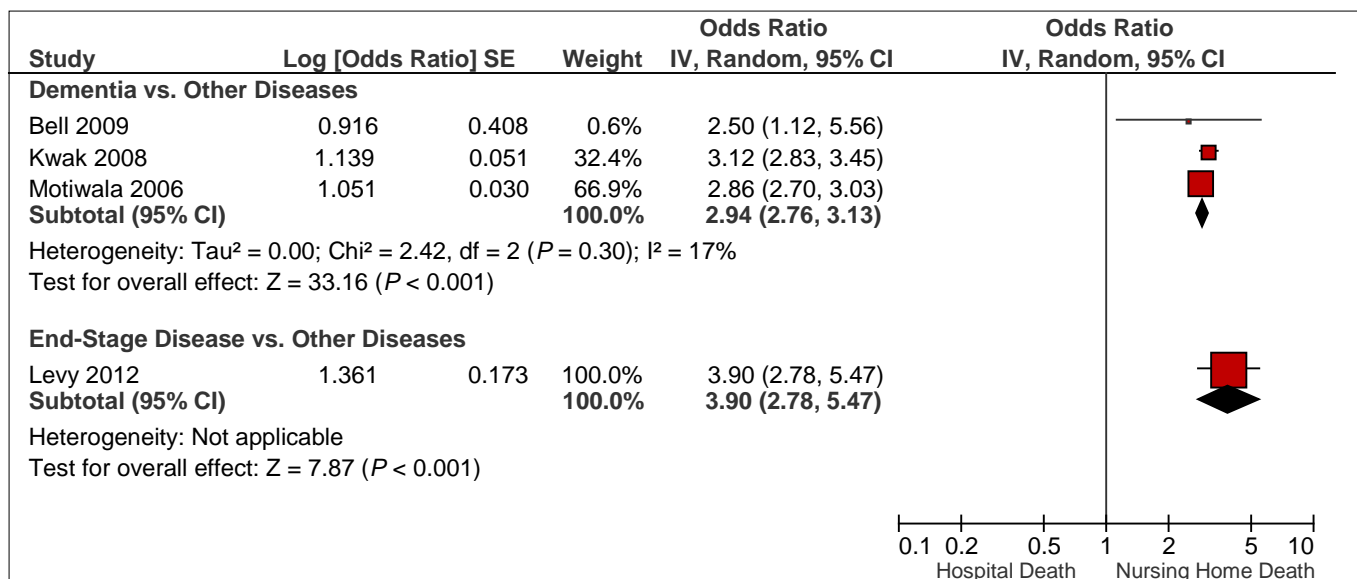
Abbreviations: CI, confidence interval; df, degrees of freedom; IV, inverse variance; SE, standard error.

Figure A8: Forest Plot of the Association Between Nursing Home Bed Availability and Nursing Home Death



Abbreviations: CI, confidence interval; df, degrees of freedom; IV, inverse variance; SE, standard error.

Figure A9: Forest Plot of the Association Between Cancer and Nursing Home Death



Abbreviations: CI, confidence interval; df, degrees of freedom; IV, inverse variance; SE, standard error.

Figure A10: Forest Plot of the Association Between Underlying Diseases and Nursing Home Death

Appendix 5: Studies Evaluating the Determinants of Inpatient Palliative Care Unit Death

Table A18: Study Characteristics and Adjustment Factors—Included Observational Studies on Determinants of Inpatient Palliative Care Unit Versus Hospital Death

Author, Year Country Sample Size	Study Design Data Source Time Frame	Population	Sociodemographic Factors	Illness-Related Factors	Health Services Availability	Patient or Family Preference for Place of Death
Study Characteristics			Adjustment Factors			
Houttekier et al, 2010 (13) Belgium N = 577	<ul style="list-style-type: none"> Retrospective cohort Retrospective data based on previous study Last 3 months of life 	<ul style="list-style-type: none"> Adults and pediatrics Deaths 2005–2006 	<ul style="list-style-type: none"> Age Sex Income Informal care 	<ul style="list-style-type: none"> Cause of death 	<ul style="list-style-type: none"> Hospital beds GP involvement Palliative home care involvement 	<ul style="list-style-type: none"> Patient preference

Abbreviations: GP, general practitioner; N, number of patients included.

Table A19: Patient Characteristics in Included Observational Studies on Determinants of Inpatient Palliative Care Unit Versus Hospital Death

Author, Year Country Sample Size	Age (years) Sex	Place of Care	Type of Disease	Patient and Family Preference for Place of Death	Place of Death
Houttekier et al, 2010 (13) Belgium N = 577	<ul style="list-style-type: none"> ≥ 65: 1,462 (88%) Male: 839 (50%) 	<ul style="list-style-type: none"> Different locations 	<ul style="list-style-type: none"> Cancer: 725 (43%) CV: 237 (14%) Respiratory: 157 (9%) 	Patient (n = 713) <ul style="list-style-type: none"> Home: 416 (26%) Nursing home: 220 (14%) 	<ul style="list-style-type: none"> Not available

Abbreviations: CV, cardiovascular; N, number of patients included.

Table A20: Results From Included Observational Studies on Determinants of Inpatient Palliative Care Unit Versus Hospital Death

Author, Year Country Sample Size	Cause of Death OR (95% CI)	Home Care OR (95% CI)
Houttekier et al, 2010 (13) Belgium N = 577	<u>Reference: non-cancer</u> • Cancer: 6.50 (3.80–10.90)	Home care involvement in last 3 months <u>Reference: none or sometimes</u> • Often: 2.20 (1.40–3.50) Multidisciplinary home care team involvement <u>Reference: no involvement</u> • 2.90 (1.60–5.50)

Abbreviations: CI, confidence interval; N, number of patients included; OR, odds ratio.

Appendix 6: Studies Evaluating the Determinants of Inpatient Hospice Death

Table A21: Study Characteristics and Adjustment Factors—Included Observational Studies on Determinants of Inpatient Hospice Versus Hospital Death

Author, Year Country Sample Size	Study Design Data Source Time Frame	Population	Sociodemographic Factors	Illness-Related Factors	Health Services Availability	Patient or Family Preference for Place of Death
Study Characteristics			Adjustment Factors			
Poulose et al, 2013 (17) Singapore N = 842	<ul style="list-style-type: none"> Retrospective cohort Hospital database Not specified 	<ul style="list-style-type: none"> Adults Hospital-based palliative care team Referred in 2007 	<ul style="list-style-type: none"> Age Sex Marital status Ethnicity 	<ul style="list-style-type: none"> Type of disease Referral-to-death interval 	<ul style="list-style-type: none"> Restricted to patients referred to hospital-based integrated palliative care 	<ul style="list-style-type: none"> Not included
Hong et al, 2011 (21) Singapore N = 52,120	<ul style="list-style-type: none"> Retrospective cohort Cancer registry Not specified 	<ul style="list-style-type: none"> Adults Cancer patients Death 2000–2009 	<ul style="list-style-type: none"> Age Sex Ethnicity 	<ul style="list-style-type: none"> Restricted to cancer Type of cancer Time between diagnosis and death Cause of death 	<ul style="list-style-type: none"> Not included 	<ul style="list-style-type: none"> Not included

Abbreviation: N, number of patients included.

Table A22: Patient Characteristics in Included Observational Studies on Determinants of Inpatient Hospice Versus Hospital Death

Author, Year Country Sample Size	Age (years) Sex	Setting	Type of Disease	Patient and Family Preference for Place of Death	Place of Death
Poulose et al, 2013 (17) Singapore N = 842	<ul style="list-style-type: none"> • ≥ 65: 475 (56%) • Male: 405 (48%) 	<ul style="list-style-type: none"> • Hospital-based palliative care service 	<ul style="list-style-type: none"> • Cancer: 724 (86%) • Non-cancer: 118 (14%) 	Not available	<ul style="list-style-type: none"> • Home: 241 (29%) • Hospital: 452 (54%) • Inpatient hospice: 149 (17%)
Hong et al, 2011 (21) Singapore N = 52,120	<ul style="list-style-type: none"> • ≥ 65: 33,938 (65%) 	<ul style="list-style-type: none"> • Different locations 	<ul style="list-style-type: none"> • Cancer: 100% 	Not available	<ul style="list-style-type: none"> • Home: 15,801 (30%) • Hospital: 27,592 (53%) • Hospice (inpatient): 5,592 (11%)

Abbreviation: N, number of patients included.

Table A23: Results From Included Observational Studies on Determinants of Inpatient Hospice Versus Hospital Death

Author, Year Country Sample Size	Disease OR (95% CI)	Time Between Referral to Palliative Care and Death OR (95% CI)
Poulose et al, 2013 (17) Singapore N = 842	<p>Disease Type</p> <p><u>Reference: lung cancer</u></p> <p>Males</p> <ul style="list-style-type: none"> • Non-cancer: 0.96 (0.37–2.47) <p>Females</p> <ul style="list-style-type: none"> • Non-cancer: 0.37 (0.10–1.32) 	<p><u>Reference: < 30 days</u></p> <p>Male</p> <ul style="list-style-type: none"> • ≥ 30 days: 2.02 (1.13–3.60) <p>Female</p> <ul style="list-style-type: none"> • ≥ 30 days: 2.69 (1.55–4.66)
Hong et al, 2011 (21) Singapore N = 52,120	<p><u>Reference: non-cancer</u></p> <ul style="list-style-type: none"> • Cancer: 20.07 (16.05–25.09) 	Not available

Abbreviations: CI, confidence interval; N, number of patients included; OR, odds ratio.

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Health Quality Ontario
130 Bloor Street West, 10th Floor
Toronto, Ontario
M5S 1N5
Tel: 416-323-6868
Toll Free: 1-866-623-6868
Fax: 416-323-9261
Email: EvidenceInfo@hqontario.ca
www.hqontario.ca

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