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Patient Care Planning Discussions for Patients at the End of Life: An Evidence-Based Analysis

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Health Quality Ontario strives to promote health care that is supported by the best available scientific evidence. The Evidence Development and Standards branch works with expert advisory panels, clinical experts, scientific collaborators, and field evaluation partners to conduct evidence-based reviews that evaluate the effectiveness and cost-effectiveness of health interventions in Ontario.

Based on the evidence provided by Evidence Development and Standards and its partners, the Ontario Health Technology Advisory Committee—a standing advisory subcommittee of the Health Quality Ontario Board—makes recommendations about the uptake, diffusion, distribution, or removal of health interventions to Ontario's Ministry of Health and Long-Term Care, clinicians, health system leaders, and policymakers.

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To conduct its comprehensive analyses, Evidence Development and Standards and its research partners review the available scientific literature, making every effort to consider all relevant national and international research; collaborate with partners across relevant government branches; consult with expert advisory panels, clinical and other external experts, and developers of health technologies; and solicit any necessary supplemental information.

In addition, Evidence Development and Standards collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario add an important dimension to the review.

The Ontario Health Technology Advisory Committee uses a unique decision determinants framework when making recommendations to the Health Quality Ontario Board. The framework takes into account clinical benefits, value for money, societal and ethical considerations, and the economic feasibility of the health care intervention in Ontario. Draft Ontario Health Technology Advisory Committee recommendations and evidence-based reviews are posted for 21 days on the Health Quality Ontario website, giving individuals and organizations an opportunity to provide comments prior to publication. For more information, please visit: http://www.hqontario.ca/evidence/evidence-process/evidence-review-process/professional-and-public-engagement-and-consultation.

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This report was prepared by the Evidence Development and Standards branch at Health Quality Ontario or one of its research partners for the Ontario Health Technology Advisory Committee and was developed from analysis, interpretation, and comparison of scientific research. It also incorporates, when available, Ontario data and information provided by experts and applicants to Health Quality Ontario. The analysis may not have captured every relevant publication and relevant scientific findings may have been reported since the development of this recommendation. This report may be superseded by an updated publication on the same topic. Please check the Health Quality Ontario website for a list of all publications: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations.

Abstract

Background

Ontario spends about 9% of its health budget on care for people at the end of life (EoL), most of whom die from chronic, prolonged conditions. For many people, patient care planning discussions (PCPDs) can improve the quality and reduce the cost of care.

Objectives

This evidence-based analysis aimed to examine the effectiveness of PCPDs in achieving better patient-centred outcomes for people at the EoL.

Data Sources

A systematic literature search was conducted in MEDLINE, Embase, CINAHL, and EBM Reviews to identify relevant literature published between January 1, 2004, and October 9, 2013.

Review Methods

Peer-reviewed reports from randomized controlled trials (RCTs) and observational studies were examined. Outcomes included quality of life (QoL), satisfaction, concordance, advance care planning (ACP), and health care use. Quality of evidence was assessed using GRADE.

Results

While the effects of PCPDs on QoL are unclear, single-provider PCPDs were associated with family members being very satisfied with EoL care (odds ratio [OR]: 5.17 [95% CI: 1.52, 17.58]), improved concordance between patients' and families' wishes (OR: 4.32, $P < 0.001$), fewer episodes of hospital care (mean difference [MD]: −0.21, $P = 0.04$), spending fewer days in hospital (MD: −1.8, $P = 0.03$), and receiving hospice care (OR: 5.17 [95% CI: 2.03, 13.17]). Team-based PCPDs were associated with greater patient satisfaction (standardized mean difference [SMD]: 0.39 [95% CI: 0.17, 0.60]) and fewer outpatient visits (MD: −5.20 [95% CI: −9.70, −0.70]). Overall, PCPDs were associated with more ACP and more optimal health care use.

Limitations

Most of the RCTs were unblinded, intervention was measured or described inadequately in some studies, and the term "usual care" was often undefined.

Conclusions

Patients at the EoL and their families benefited from PCPDs. Furthermore, PCPDs occurring earlier in the course of illness were associated with better outcomes than those occurring later.

Plain Language Summary

In 2009–2010, about 88,000 people in Ontario were near the end of their lives; nearly all of these people were adults who died from chronic illnesses such as cancer, heart disease, stroke, diabetes, and Alzheimer's disease. Providing better-quality health care for people at the end of life has become a priority and research suggests that the quality of care can be improved by patient care planning discussions among health care providers, patients, and families. These discussions focus on designing care for a particular patient on the basis of disease progress, treatment options, preferences, goals, values, and other related considerations. This review was conducted to examine the effects of patient care planning discussions on the quality of care provided and the use of health care resources at the end of life.

This review found that patient care planning discussions with a team of providers from multiple professions were beneficial for patients and their families. High-quality evidence indicates that discussions with a single provider can improve families' satisfaction with care at the end of a loved one's life and increase agreement between the wishes of the patient and his or her family. These discussions can also reduce the likelihood that patients will need care in hospital and reduce the number of days a patient spends in hospital. Finally, discussions with a single provider increased care planning and the use of hospice services. Moderate- to high-quality evidence shows that patient care planning discussions with a team of providers from multiple professions led to increases in care planning, fewer days in intensive care, and fewer visits for outpatient services.

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List of Abbreviations

ACP	Advance care planning
CARENET	Canadian Researchers at the End of Life Network
CI	Confidence interval
CINAHL	Cumulative Index to Nursing & Allied Health Literature
EBA	Evidence-based analysis
EoL	End of life
GRADE	Grading of Recommendations Assessment, Development, and Evaluation
HQO	Health Quality Ontario
OR	Odds ratio
PCPD	Patient care planning discussion
QODD	Quality of dying and death
QoL	Quality of life
RCT	Randomized controlled trial
SR	Systematic review

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

This evidence-based analysis (EBA) aimed to examine the effectiveness of patient care planning discussions (PCPDs) in achieving better patient-centred outcomes for people at the end of life (EoL). This EBA is particularly focused on the effectiveness of having a discussion that includes a single health care provider, having a discussion that includes an interprofessional team of health care providers, and the timing of discussions about EoL care. This EBA is part of a mega-analysis focused on EoL care.

Clinical Need and Target Population

End-of-Life Population

It is difficult to know in advance when patients are definitely at the EoL; hence, EoL is defined on the basis of assumptions about a person's risk of dying. These assumptions tend to be related: the period in which the person is expected to die; eligibility for certain health services (e.g., hospice care, palliative

care); or the part of life in which patients, family members, informal caregivers, and health care providers struggle with the implications of a chronic illness that has progressed to advanced stages. (1)

Because each of the commonly used definitions of EoL is quite narrow, this EBA and the mega-analysis aimed to be inclusive by defining EoL broadly. Thus, the EoL population was defined as adult patients with advanced disease not expected to recover from their condition or stabilize. This population included people who were seriously or terminally ill, those whom clinicians believed were at the EoL, and those receiving palliative care. This definition aims to incorporate the 3 approaches to identifying patients at the EoL.

From 2007 to 2009, the 3 most recent years for which complete data were available, 264,503 persons died in Ontario. Of these, 261,135 persons (98.7%) were adults aged 18 and older, and chronic, prolonged conditions accounted for most deaths in this group. In Ontario, the top 10 causes of death in 2009 were cancer (29.5%), diseases of the heart (20.9%), cerebrovascular diseases (6.2%), accidents (4.4%), chronic lower respiratory illnesses (4.2%), diabetes mellitus (3.2%), Alzheimer's disease (2.5%), influenza and pneumonia (2.4%), kidney-related diseases (1.4%), and suicide (1.4%). (2) Most of these are advanced chronic conditions, so the above definition is appropriate for identifying the EoL population in Ontario.

Quality of End-of-Life Care and Communication

Quality of EoL care is a domain of the multidimensional quality of dying and death construct (QODD). The QODD consists of 7 broad and overlapping domains: physical, psychological, social, spiritual or existential, nature of health care, life course and death preparation, and circumstances of death. The quality of EoL care depends on the extent to which the health care patients receive affects outcomes in those domains. (3) Additionally, good-quality EoL care must be informed by the best available evidence when appropriate. (4) The health care received should thus be related to a plan of care; the patient's and family's goals, values, needs, and so forth; receiving services that are consistent with the care plan; and applying the best available evidence, among other things. (4)

Open and honest communication between patients, families, and health care providers is essential for achieving good-quality EoL care. Communication exchanges information between patients and providers, (5) and it can help to inform patients about their condition, prognosis, and treatment options as well as elicit patients' goals, values, and preferences. Given that PCPDs include advance care planning (ACP) and goals of care discussions, this type of intervention can help to improve communication about EoL care. They are important for obtaining informed consent and for sharing decision-making.

Ontario law specifies that, even when an advanced care plan or do-not-resuscitate (DNR) order is in place, decisions about treatments cannot be made without informed consent, which requires health care providers to discuss care options with patients or their substitute decision makers. (6) Patient care planning discussions are thus a necessary and important component of decision-making in health care. Advance care plans and DNR orders are outputs from the PCPDs, and they should be updated if a patient's wishes, values, or beliefs related to care change in any way. More recent expressions of care preferences take precedence over older ones, even if the older ones are written and the more recent ones are verbal. Communication about EoL care has thus become an area of focus for the Canadian Researchers at the End of Life Network (CARENET), a group focused on improving palliative and EoL care. Their conceptual model for improving communication about EoL care is presented in Figure 1.

Results from recent systematic reviews show that these discussions can be beneficial. For instance, family meetings are associated with lower health care use, and palliative care teams are associated with better use of health care. (7) Palliative care consultations and conferences are associated with increased family satisfaction, improved decision making, and reduced health care use. (8) Ethics consultations also show benefits, because they lead to improved health care use. (7;8) Last, ACP interventions are associated with

an increase in ACP documentation, a reduction in the use of health care services, and an increase in hospice use. (9) This evidence indicates PCPDs have the potential to improve the quality of EoL care and reduce health care costs for the province.

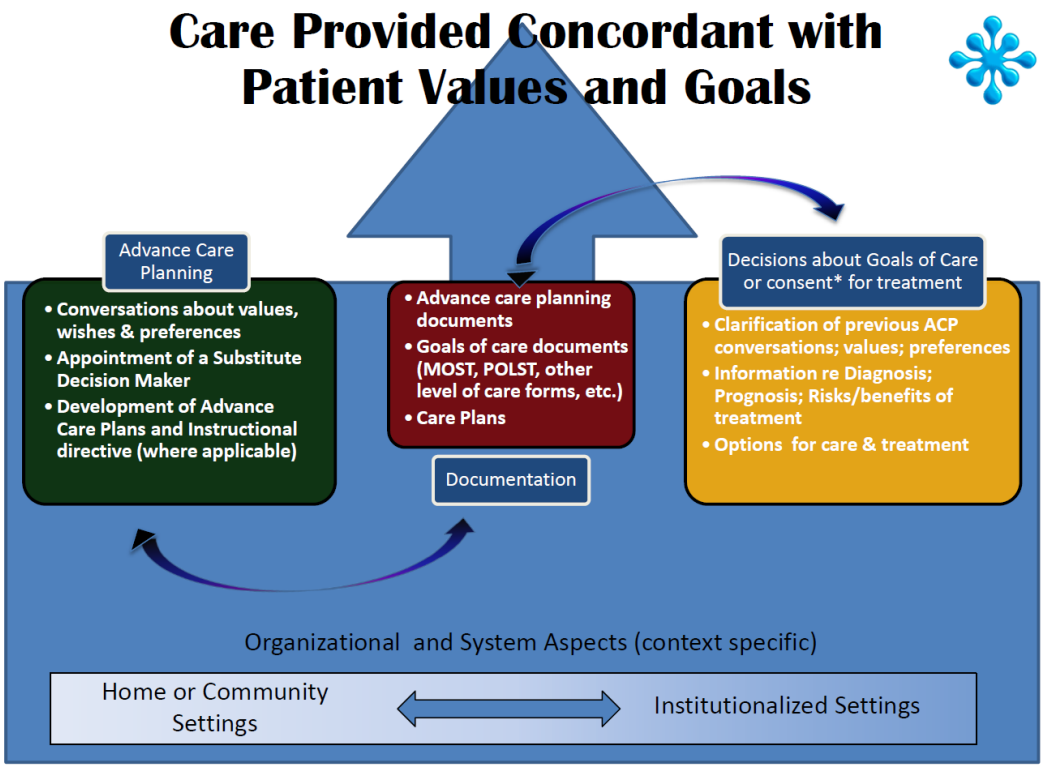


Figure 1: CARENET's Model for Improving Communication about End-of-Life Care

Abbreviations: ACP, advance care planning; CARENET, Canadian Researchers at the End of Life Network; MOST, medical orders on scope of treatment; POLST, physician orders for life-sustaining treatment.

Ontario Context

No population-based estimates for the prevalence of PCPDs in Ontario were located, but estimates from 2 hospital-based studies conducted in Canada might provide some insight. A study published in 2013 was conducted with a convenience sample of hospital inpatients in Ontario and 3 other provinces. All patients in the sample had chronic diseases or were aged 80 years or older. Within the sample, 20.1% of 278 patients and 33.2% of 224 family members indicated that they had ever discussed the patient's prognosis and remaining time to live with their physicians. Further, 47.9% of patients and 52.2% of family members indicated that they or their loved one had written documents specifying their treatment preferences; and only 11.9% of patients and 14.7% of family members preferred to receive aggressive care at the EoL. (10) In another study published in 2009, 25.5% (24/108 in Kingston and 13/37 in Toronto) of Ontarians in the sample reported having had a discussion about their prognosis with a physician. This was a multicentre study with a convenience sample of 412 Canadians in 5 tertiary care teaching hospitals. Within the sample as a whole, 18.0% (74/412) of participants had reported having these discussions. The study also showed that people who had prognostic discussions with physicians had higher scores for overall satisfaction and satisfaction with communication and decision making. Their families reported higher overall satisfaction and higher satisfaction with communication and decision making and social support. (11) Although these estimates are based on convenience samples, they are consistent in suggesting that fewer than 30% of Canadians, including Ontarians, are having PCPDs.

Patient care planning discussions also have the potential to meaningfully reduce health care costs in Ontario. Care at the EoL is quite costly for Ontarians, and these costs are expected in increase as the population ages. In 2009–2010, Ontario's health budget was approximately $44.8 billion. The province spends an estimated 9% of its health budget on EoL care. (Ba' Pham, personal communication, March 19, 2014) Additionally, a report from the Canadian Institute for Health Information states that care for seniors older than 65 years accounted for 44.0% of average health care spending at the national level in 2000 and 45.0% in 2011. This was because of the high cost of EoL care and because health care use for chronic conditions increases with age. (12)

Technology/Technique

"Patient care planning discussions" is an umbrella term used to describe discussions that usually lead to a written medical and nursing care program specifically designed for a particular patient. It encompasses advance care planning or goals of care conversations (i.e., discussions with patients and/or their substitute decision makers about the goals and desired direction of their care). (13) There are many interventions for patient care planning, but this EBA focuses on discussion interventions for reasons described above.

Discussions are complex interventions, because their multiple components can affect their efficacy. Although they can take different forms depending on the context, they adhere to an underlying structure. (14) These interventions can vary by setting, health care personnel, frequency, topics discussed, intensity, structure, and so forth, and therefore must be broken into their constituent parts when they are being evaluated, and each part must be assessed separately. This EBA has deconstructed PCPDs to assess the number of providers involved and the timing of discussions.

Evidence-Based Analysis

Research Question

Which approaches to patient care planning discussions (PCPDs) optimize the quality of end-of-life (EoL) care for patients with advanced disease, informal caregivers, and providers?

Research Methods

Literature Search Strategy

A literature search was performed on October 9, 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 October 9, 2013. (Appendix 1 provides details of the search strategies.) 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
- published between January 1, 2004, and October 9, 2013
- randomized controlled trials (RCTs), systematic reviews (SRs), meta-analyses, and observational studies
- adult patients (aged 18 and older) with advanced disease or who are seriously ill and whose health is likely to continue to deteriorate
- adult patients at the EoL
- communication between providers and patients
- communication between providers and families
- communication between patients and their families
- goals of care or PCPDs, conferences, conversations, or consultations

Exclusion Criteria

- related to sudden or violent death
- non-SRs, case reports, editorials, letters, comments, conference abstracts
- include children only (younger than 18 years)
- most participants are children

Outcomes of Interest

- primary outcome is quality of life (QoL)
- secondary outcomes are the following:
  - patient satisfaction
  - family satisfaction

- concordance between patient's wishes and care received
- concordance between patient's wishes and family's or substitute decision maker's wishes
- completion of advance care planning processes or documentation
- health care use

Statistical Analysis

Data Extraction

Data were extracted from the studies with a standardized data form. The form collected information about the following:

- Source (i.e., citation information, contact details, study type);
- Methods (i.e., study design, study duration and years, participant allocation, allocation sequence concealment, blinding, reporting of missing data, reporting of outcomes, and whether or not the study compared 2 or more groups);
- Outcomes (i.e., outcomes measured, number of participants for each outcome, number of participants missing for each outcome, outcome definition and source of information, unit of measurement, upper and lower limits [for scales], and time points at which the outcome was assessed);
- Participants (i.e., number of participants, population, diseases and conditions represented, setting, country, age, sex, proportion of racial minorities, proportion of immigrants, proportion of Canadian Aboriginals, marital status, education level, and income or poverty status);
- Intervention (number of intervention groups, type of intervention, individuals and professional groups present for the discussions, number of participants in each arm of the study, initiator of the discussion, use of a communication tool to facilitate the discussion, structure of the discussion, timing of the discussion, content of the discussion, and frequency of discussions);
- Results (i.e., summary data for each intervention group, effect estimates, and confidence intervals or *P* values for each effect estimate); and
- Other information (i.e., funding source, key conclusions, other information to guide the review, and whether the study's authors needed to be contacted).

Authors of the studies were contacted to provide unpublished data when required for comparisons and meta-analysis.

Assessment of Risk of Bias in Included Primary Studies

The risk of bias assessment was guided by a modified version of the tool in the *Cochrane Handbook for Systematic Reviews of Interventions.* (15) For randomized controlled trials, bias assessment considered selection bias (i.e., allocation concealment), performance bias (i.e., blinding of participants and health care providers), attrition bias (i.e., incomplete outcome data), reporting bias (i.e., selective outcome reporting), and other limitations (e.g., related to study design). For observational studies, the tool considered selection bias (i.e., appropriate eligibility criteria, adequate control for confounding), measurement bias (i.e., appropriate measurement of exposures and outcomes), and attrition bias (i.e., incomplete follow-up). The results of bias assessment are presented in Appendix 2 and were used to assess the overall quality of evidence for each outcome.

Assessment of Publication Bias

Funnel plots were used to assess potential publication biases, and the results of these assessments were used to rate the quality of the evidence for each outcome (Appendix 2).

Data Synthesis

The studies were divided into 2 subgroups on the basis of whether or not they included patient care planning discussions (PCPDs) with one provider (single-provider) or an interprofessional team of providers working in a coordinated way (team-based). Within the subgroups, studies were pooled if they employed the same study design and used (or did not use) a tool to facilitate discussions.

The EoL population was defined broadly, and this systematic review is concerned with the average effectiveness of PCPDs on EoL care, so a great deal of heterogeneity in the results was expected given the diversity in the EoL population. Hence, while the I^2 statistic was used to assess heterogeneity in the meta-analyses, it was not used to determine whether or not the results should be pooled. According to the *Cochrane Handbook for Systematic Reviews of Interventions*, heterogeneity of 0–40% may not be important, heterogeneity between 30% and 60% is moderate, heterogeneity from 50% to 90% is substantial, and heterogeneity between 75% and 100% is considerable. (15) Notably, the importance of I^2 in assessing heterogeneity depends on the magnitude and direction of the effect estimates and the strength of the evidence for heterogeneity. Given the diversity in the population, certain judgments needed to be made about heterogeneity.

Results were pooled only when the confidence intervals for their effect estimates overlapped. If the I^2 statistic was greater than 50% and the confidence intervals overlapped, then a random effects model was used to pool the estimates. If the I^2 statistic was greater than 50% and the confidence intervals did not overlap, the estimates were not pooled. Additional, steps were taken to explain potential reasons for heterogeneity in the studies. For instance, the diseases and conditions in the population, the country and setting, the outcomes measured, and the demographic characteristics of the samples were considered.

Quality of Evidence

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. (16) 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. Limitations in these areas resulted in downgrading the quality of evidence. Finally, 3 main factors that can raise the quality of evidence from observation studies were considered: large magnitude of effect, dose-response gradient, and accounting for all residual confounding factors. (16) For more detailed information, please refer to the latest series of GRADE articles. (16)

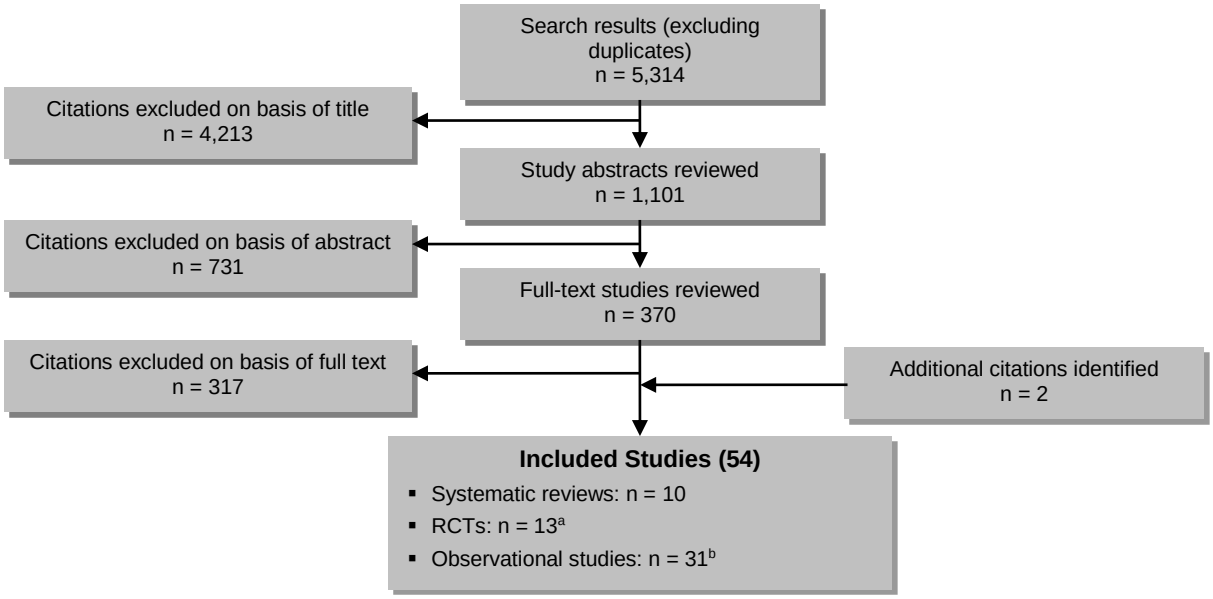
As stated by the GRADE Working Group, the final quality score can be interpreted using the following definitions:

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 5,314 citations published between January 1, 2004, and October 9, 2013 (with duplicates removed). Articles were excluded on the basis of information in the title and abstract. The full texts of potentially relevant articles were obtained for further assessment. Figure 2 shows the breakdown of when and for what reason citations were excluded from the analysis.

Fifty-two studies (10 systematic reviews, 13 RCTs, and 29 observational studies) met the inclusion criteria. The reference lists of these studies were hand-searched to identify other relevant studies, and 2 additional citations (2 observational studies) were included, for a total of 54.



Reasons for exclusion

Abstract review: Excluded nonhuman population (n = 0); related to sudden or violent death (n = 1); healthy or well population (n = 9); not about EoL care (n = 7); about death trajectories (n = 5); study type (n = 612); not about care discussions (n = 73); includes children only (n = 20); most participants are children (n = 4)

Full-text review: Excluded non-English (n = 2); duplicate publication (n = 2); topic not relevant or unrelated to care discussions (n = 211); noninterventional (n = 97); outcomes of interest not reported (n = 12); qualitative study (n = 3)

[a]Two reports were from the same study. Includes 1 cluster RCT.

[b]Includes non-RCTs.

Figure 2: Citation Flow Chart

Abbreviations: EoL, end of life; RCT, randomized controlled trial.

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. (17)

Table 1: Body of Evidence Examined According to Study Design

Study Design	Number of Eligible Studies
RCTs	
Systematic review of RCTs	1
Large RCT	10[a]
Small RCT	3
Observational Studies	
Systematic review of non-RCTs with contemporaneous controls	3
Non-RCT with contemporaneous controls	11
Systematic review of non-RCTs with historical controls	6
Non-RCT with historical controls	3
Database, registry, or cross-sectional study	3
Case series	
Retrospective review, modelling	14
Studies presented at international conference	
Expert opinion	
Total	**54**

Abbreviation: RCT, randomized controlled trial.
[a]Two reports were from the same study. Includes one cluster RCT.

Systematic reviews and observational studies with low-quality designs were excluded from the analyses for this EBA. As mentioned previously, the search for this EBA identified 10 systematic reviews. While these systematic reviews were used to provide background information about the topic, they were not included in the analyses, because none included the populations, (7;8) interventions, (9;18-22) and outcomes (23) that were the focus of this EBA. Further, 1 of the systematic reviews was an overview of other systematic reviews. (24) Studies with the lowest-quality designs, as assessed through Goodman's hierarchy in Table 1, were excluded from further analyses. Some of these studies were retrospective and based on data collected from chart reviews; (25-34) the rest did not provide unadjusted estimates. (35-38)

Description of Included Studies

The analyses for this EBA used data from 30 studies, and details about their characteristics and participants are presented in Table 2. Nine of the 13 RCTs had more than 50 participants in each intervention arm. (39-47) Eight of the RCTs were conducted in the United States, (40-43;46-50) 2 were conducted in the United Kingdom, (51;52) 2 were conducted in Australia, (39;44) and 1 was conducted in France. (45) They all included older adults who had a variety of diseases and conditions, such as cancer, chronic heart failure, chronic obstructive pulmonary disease, and dementia. The RCTs included men and women, and although most participants were white, they included ethno-racial minorities as well.

The EBA includes a total of 17 observational studies. Eleven of the observational studies had contemporaneous controls, (53-63) and like the RCTS, most of these studies had more than 50 participants in each intervention arm. (53;55;56;58-61) The participants in these observational studies also tended to be older, had a variety of diseases and conditions, and were ethno-racially diverse. All of these studies were conducted in the United States. Another 3 observational studies from the United States

had historical controls, (64-66) and 2 had more than 50 participants in each intervention arm. (65;66) They all included older adults and had mixed disease populations, and most participants were white. Last, there were 3 cross-sectional studies, (11;67;68) 2 of which had more than 50 people in each intervention arm. (67;68) Two of the cross-sectional studies were disease-specific and from the United States, (67;68) but one was conducted in Canada with a mixed disease population. (11)

Table 2: Description of Included Studies

Author, Year	Country, Setting	Study Design	Length of Study	Sample Size, Intervention/ Control	Diseases and Conditions	Age, Intervention/ Control	Gender, Intervention/ Control	Ethnicity, Intervention/ Control
RCTs								
Kirchhoff et al, 2012; (40) **Kirchhoff et al, 2010** (41)	United States, multiple outpatient clinics	Multicentre RCT	3 years, 7 months	*Patients* 160/153 *Surrogates* 160/153	CHF, ESRD	Mean (SD): *Patients* 71.4 (12.2)/ 70.6 (11.6) *Surrogates* 59.5 (13.9)/ 57.4 (13.6)	*Patients* 96 (60%) male/ 89 (58%) male *Surrogates* 43 (27%) male/ 41 (27%) male	*Patients* 149 (93%) white/ 146 (95%) white *Surrogates* 153 (96%) white/ 147 (96%) white
Au et al, 2012 (42)	United States, hospital	Clustered RCT	3 years, 11 months	194/182	COPD	Mean (SD): 69.4 (10.0)/ 69.4 (10.0)	98% male/ 96% male[a]	85% white/ 87% white[a]
Sampson et al, 2011 (51)	United Kingdom, palliative care unit in hospital	RCT	6 months	*Patients* 22/10 *Carers* 22/10	Dementia	Mean (SD): *Patients* 87 (6.1)/ 85 (6.6) *Carers* 60 (13.0)/ 57 (12.0)	*Patients* 5 (23%) male/ 1 (10%) male *Carers* 14 (64%) male/ 3 (30%) male	*Patients* 20 (91%) white/ 7 (78%) white *Carers* 20 (91%) white/ 8 (80%) white
Detering et al, 2010 (39)	Australia, multiple medical units in hospital	RCT	8 months	154/155	Mixed	Median (IQR): 85 (82-88)/ 84 (81-87)	83 (54%) male/ 64 (41%) male	Includes minorities[a]
Gade et al, 2008 (43)	United States, hospitals	Multicentre RCT	1 year, 7 months	275/237	Mixed	Mean (SD): 73.6 (12.6)/ 73.1 (13.2)	113 (41%) male/ 116 (49%) male	NA

Author, Year	Country, Setting	Study Design	Length of Study	Sample Size, Intervention/ Control	Diseases and Conditions	Age, Intervention/ Control	Gender, Intervention/ Control	Ethnicity, Intervention/ Control
Clayton et al, 2007 (44)	Australia, multiple out-patient palliative care clinics	Multicentre RCT	1 year, 11 months	92/82	Cancer	Mean (SD): 65.5 (12.6)/ 64.6 (14.1)	56 (61%) male/ 49 (60%) male	NA
Lautrette et al, 2007 (45)	France, ICU in hospital	RCT	9 months	*Patients* 63/63 *Surrogates* 63/63	Mixed	Median (IQR): *Patients* 74 (56–80)/ 68 (56–76) *Surrogates* 54 (47–58)/ 54 (46–64)	*Patients* 33 (52%) male/ 37 (59%) male *Surrogates* 17 (30%) male/ 12 (23%) male	*Patients* French descent: 58 (92%)/ 56 (89%) *Surrogates* French descent: 48 (86%)/ 46 (88%)
Gilmer et al, 2005 (46)	United States, ICUs in multiple hospitals	Multicentre RCT	2 years, 2 months	252/247	Mixed	Mean (SD): 67.7 (17.5)/ 68.5 (17.3)	133 (53%) male/ 135 (55%) male	155 (62%) white/ 157 (62%) white
Casarett et al, 2005 (48)	United States, nursing home	RCT	1 year, 1 month	*Patients* 107/98 *Surrogates* 88/85	Mixed	Mean (range): *Patients* 84 (66–102)/ 83 (54–101) *Surrogates* 59 (29–88)/ 57 (23–91)	*Patients* 27 (25%) male/ 25 (26%) male *Surrogates* 22 (25%) male/ 25 (29%) male	*Patients* 78 (73%) white/ 74 (76%) white *Surrogates* 64 (73%) white/ 59 (69%) white
Song et al, 2005 (49)	United States, cardiac surgery clinic	RCT	1 year	*Patients* 16/16 *Surrogates* 16/16	Cardiac disease	Mean (SD): *Patients* 69.8 (8.6)/ 68.0 (8.0) *Surrogates* 64.4 (11.6)[b]	*Patients* 8 (50%) male/ 9 (56%) male *Surrogates* 34% male[b]	*Patients* 100% white/ 100% white *Surrogates* 100% white/ 100% white

Author, Year	Country, Setting	Study Design	Length of Study	Sample Size, Intervention/ Control	Diseases and Conditions	Age, Intervention/ Control	Gender, Intervention/ Control	Ethnicity, Intervention/ Control
Nicolasora et al, 2006 (47)	United States, medical unit in hospital	RCT	3 months	136/161	Mixed	Median: 65/69	54% male/ 46% male[a]	77% white/ 70% white[a]
Dyar et al, 2012 (50)	United States, hospital	RCT	9 months	12/14	Cancer	Mean (SD): 66.7 (16.3)/ 64.9 (7.5)	25% male/ 36% male	NA
Jones et al, 2011 (52)	United States, multiple outpatient clinics	Multicentre RCT	1 year, 9 months	*Preference cohort* 21/14 *Randomized cohort* 22/20	Cancer	Mean (SD): *Preference cohort* 62.0 (11.0)/ 67.7 (7.9) *Randomized cohort* 58.6 (8.1)/ 60.2 (13.3)	*Preference cohort* 48% male/ 50% male[a] *Randomized cohort* 57% male/ 50% male	*Preference cohort* 95% white/ 93% white[a] *Randomized cohort* 86% white/ 95% white[a]
Observational with contemporaneous controls								
Evangelista et al, 2012 (54)	United States, hospital	Prospective case-control	5 months	36/36	Mixed	Mean (SD): 53.9 (8.3)/ 53.3 (8.7)	26 (72%) male/ 25 (69%) male	22 (61%) white/ 22 (61%) white
Jacobsen et al, 2011 (55)	United States, hospital	Non-RCT	7 months	517/382	NA	Mean: 62.9/63.5	308 (60%) male/ 217 (57%) male	NA
Engelhardt et al, 2009 (56)	United States, health insurance network	Multicentre non-RCT	NA	*Patients* 198/205 *Informal Caregivers* 100/85	Mixed	Mean (SD): *Patients* 66.0 (12.1)/ 68.4 (12.1) *Informal Caregivers,* 59.9 (14.6)/ 63.8 (13.1)	*Patients* 63 (32%) male/ 108 (53%) male *Informal Caregivers* 40 (41%) male/ 9 (12%) male	*Patients* 167 (85%) white/ 183 (91%) white *Informal Caregivers* NA

Author, Year	Country, Setting	Study Design	Length of Study	Sample Size, Intervention/ Control	Diseases and Conditions	Age, Intervention/ Control	Gender, Intervention/ Control	Ethnicity, Intervention/ Control
Rabow et al, 2004 (57)	United States, home and community	Non-RCT	NA	50/40	Cancer, COPD, advanced CHF	Mean (SD): 67.9 (13.9)/ 69.4 (11.2)	13 (26%) male/ 19 (47%) male	22 (44%) white/ 26 (65%) white
Mack et al, 2012 (58)	United States, health insurance networks and Veterans Affairs health network	Multicentre prospective cohort	2 years	1,231[b]	Lung or colorectal cancer	Range: No. (%) 21–54: 172 (14%)[b] 55–59: 149 (12%)[b] 60–64: 157 (13%)[b] ≥65: 753 (61%)[b]	766 (62%) male[b]	935 (76%) white[b]
Mack et al, 2010 (59)	United States, multiple hospital sites	Multicentre prospective cohort	5 years	332[b]	Cancer	Mean (SD): Stratified by race[b] *Black:* 55.6 (11.1) *White:* 60.5 (11.9)	185 (56%) male[b]	261 (79%) white[b]
Wright et al, 2008 (60)	United States, outpatient cancer clinics	Multicentre prospective cohort	5 years, 6 months	123/ 209	Cancer	Mean (SD): 57.5 (12.0)/ 58.0 (12.3)	66 (54%) male/ 117 (56%) male	84 (68%) white/ 128 (61%) white
Casarett et al, 2008 (61)	United States, Veterans Affairs health network	Multicentre retrospective cohort	10 months	296/228	Mixed	Mean (range): 72 (27–93)/ 72 (26–100)	99% male/ 97% male[a]	77% white/ 74% white[a]
Morrison et al, 2005 (62)	United States, nursing home	Non-RCT	1 year, 10 months	43/96	Mixed	Mean (range): 87 (75–100)/ 86 (65–102)	16% male/ 16% male[a]	67% white/ 77% white[a]

Author, Year	Country, Setting	Study Design	Length of Study	Sample Size, Intervention/ Control	Diseases and Conditions	Age, Intervention/ Control	Gender, Intervention/ Control	Ethnicity, Intervention/ Control
Zhang et al, 2009 (53)	United States, multiple hospitals	Multicentre prospective cohort	5 years, 4 months	188/415	Cancer	Mean (SD): 59.8 (12.9)/ 58.6 (13.2)	51% male/ 51% male[a]	74% white/ 70% white[a]
Briggs et al, 2004 (63)	United States, multiple units in a hospital	Non-RCT	NA	*Patients* 13/14 *Surrogates* 13/14	Heart failure, renal failure	Mean (SD): *Patients* 68.7 (9.2)[b] *Surrogates* 50 (14.8)[b]	*Patients* 39% male/ 79% male[a] *Surrogates* 23% male/ 29% male[a]	NA
Observational with historical controls								
Lamba et al, 2012 (64)	United States, surgical ICU in hospital	Prospective before and after	1 year, 1 month; 1 year, 3 months	31/21	Mixed	Mean: 54/46	19 (61%) male/ 12 (57%) male	NA
Norton et al, 2007 (65)	United States, medical ICU in hospital	Prospective before and after	1 year, 1 month	126/65	Mixed	Mean (SD): 66.3 (16.3)/ 68.8 (15.4)	57 (45%) male/ 33 (51%) male	95 (75%) white/ 51 (79%) white
Lindner et al, 2007 (66)	United States, nursing home	Prospective before and after	6 months	107/117	Mixed	Mean (SD): 72 (12.2)/ 71 (12.3)	91% male/ 89% male[a]	70% white/ 57% white[a]
Cross-sectional								
Leung et al, 2012 (67)	United States, Veterans Affairs health network	Multicentre cross-sectional	2 years, 2 months	55/321	COPD	Mean: 70.9/69.1	52 (95%) male/ 313 (98%) male	44 (80%) white/ 247 (77%) white

Author, Year	Country, Setting	Study Design	Length of Study	Sample Size, Intervention/ Control	Diseases and Conditions	Age, Intervention/ Control	Gender, Intervention/ Control	Ethnicity, Intervention/ Control
Mori et al, 2013 (68)	United States, hospital	Cross-sectional	2 years	20/29	Cancer	Mean (SD): 60.1 (9.8)/ 67.5 (11.7)	10 (50%) male/ 14 (48%) male	NA
Heyland et al, 2009 (11)	Canada, multiple hospitals	Multicentre cross-sectional	NA	*Patients* 74/338 *Family members* 46/107	Mixed	Mean (SD): *Patients* 67.6 (7.2)/ 71.9 (9.4) *Family members* 56.6 (14.0)/ 57.4 (13.5)	*Patients* 51% male/ 51% male[a] *Family members* 40% male/ 34% male[a]	NA

Abbreviations: CHF, chronic heart failure; COPD, chronic obstructive pulmonary disease; ESRD, end-stage renal disease; ICU, intensive care unit; IQR, interquartile range; NA, not available; RCT, randomized controlled trial; SD, standard deviation.

[a]Disaggregated information was not provided.

[b]Data for the intervention and control arms were not provided separately.

Description of Interventions

The interventions from each study are described in detail in Table 3. As the table shows, each intervention was unique. Only 7 of the interventions were team-based, (43;45;46;57;61;64;65) and 16 of the interventions included the use of a tool to facilitate patient care planning discussions (PCPDs). (39-49;51;55;56;62;63;66) These tools included, but were not limited to, automated forms, frameworks, models, question prompt lists, mnemonics, and structured questionnaires. In 7 of the studies, (11;53;58-60;67;68) the intervention was compared with having no discussions; and in the rest of the studies, (39-52;54-57;61-66) the intervention was compared with usual care.

The single-provider PCPD interventions were performed by a variety of providers. In some cases, the intervention was delivered by a provider from one of several specified professional groups; (40;41;52;54-56;63) in other cases, the intervention was delivered by a provider from only 1 specific professional group. Medical doctors were included in 10 single-provider PCPD interventions, (42;44;47;48;52-55;66;67) nurses were included in 8, (39-41;49;51;52;54;55;63) and social workers were included in 5. (40;41;55;56;62;63) Chaplains were included in 2, (40;41;63) and nurse practitioners (50) and health educators (56) were each included in 1 of the single-provider PCPD interventions. In 5 studies, the profession of the provider was not specified. (11;58-60;68)

The team-based PCPDs included at least 2 providers from various professional groups. Six of the PCPD teams included physicians, (43;45;57;61;64;65) 4 included nurses, (43;57;61;64) 4 included chaplains, (43;57;61;65) 3 included social workers, (43;57;61) 2 included psychologists, (57;65) and 2 included nurse practitioners. (61;65) Each of the following professions were included in only one intervention: ethicist, (46) pharmacist, (57) art therapist, (57) volunteer coordinator, (57) volunteer, (61) counsellor, (64) interfaith pastor, (64) music therapist, (65) and massage therapist. (65) Three studies did not specify which professional groups were included in their interventions. (45;46;61) Additionally, the sizes of the interprofessional teams varied. In one study, the intervention had 2 parts—the first part included 2 professional groups, and the second part included 4 professions. (64) Another intervention had a 4-member team, (43) and 3 interventions had 6-member teams. (57;61;65) In 2 studies, the size of the intervention team was not specified but was dependent on the patient's needs. (45;46)

In most of the studies, the length and frequency of the PCPDs were not specified. However, in studies that reported this information, the PCPDs lasted from 10 minutes to 3 hours and 20 minutes. (39-41;45;54;63) Most discussions lasted between 30 and 60 minutes, however. In most studies, the discussion took place once, but in some, (51;54;57) they took place over multiple sessions.

The discussions covered a variety of topics. The 4 most frequently covered topics were advance care planning (ACP), (39-41;43;47-49;51;52;54-56;58;62-64;66;67) treatment options (including resuscitation), (40;41;44;47-49;54-56;58;63;64;66) patients' preferences, (40-42;46;47;50;51;53-55;63;66) and patients' goals. (39;43;48;54;55;62;64;66) Other commonly covered topics included prognosis, physical or medical needs, patient and surrogate understanding and knowledge, social support and needs, palliative services, and patients' values.

Table 3: Description of Interventions and Outcomes

Author, Year	Interventions	Comparisons	Outcomes of Interest
Randomized controlled trials (RCTs)			
Kirchhoff et al, 2012; (40) **Kirchhoff et al, 2010** (41)	• Tool: facilitation tool • Type: single-provider; nurse, social worker, or chaplain who was trained to deliver the intervention • Duration: 1.0−1.5 hours • Frequency: NA • Topics: patient and surrogate understanding, information about treatment, assistance with documentation of care preferences, surrogate understanding of patient preferences, preparing surrogate to make decisions that honour patient preferences; completion of STP	Usual care: standard AD counseling, assessment of AD on admission, question whether patient wanted more information, referrals according to institutional protocol	• Concordance between patient wishes and care received • Concordance between patient's and surrogate's wishes
Au et al, 2012 (42)	• Tool: automated form • Type: single-provider; physician • Duration: NA • Frequency: NA • Topics: barriers and facilitators to EoL communication, patient preferences	Usual care[a]	Completion of ACP documents and processes
Sampson et al, 2011 (51)	• Tool: framework • Type: single-provider; nurse • Duration: NA • Frequency: up to 4 consultations at least 5 days apart • Topics: knowledge; illness severity and prognosis; patient's physical needs; social situation and social support; previous care preferences; cultural, spiritual, health, social, financial needs; role of palliative care; ACP • Other: included a needs assessment, discussion with carers and family, summary of discussion in a standard form	Usual care[a]	• Informal caregiver's QoL • Carer and family's satisfaction with care
Detering et al, 2010 (39)	• Tool: Respecting Patient Choices model • Type: single-provider; nurse who was trained to deliver the intervention; a physician was sometimes included • Duration: Median length of discussion was 60 minutes (range 10−200 minutes) • Frequency: NA • Topics: prognosis, goals, values, beliefs, discuss and document choices for future health care, ACP • Other: offered on top of usual care	Usual care: no ACP unless specifically requested	• Patient's satisfaction with care • Informal caregiver's and family's satisfaction with care • Completion of ACP documents and processes

Author, Year	Interventions	Comparisons	Outcomes of Interest
Gade et al, 2008 (43)	• Tool: Weismann's palliative care components • Type: team-based; physician, nurse, social worker, and chaplain • Duration: NA • Frequency: NA • Topics: symptom management, psychosocial and spiritual support, EoL planning, posthospital care, diagnosis, prognosis, goals of care, ACP	Usual care[a]	• Patient's QoL • Patient's satisfaction with care • Completion of ACP documents and processes • Hospital LOS
Clayton et al, 2007 (44)	• Tool: question prompt list with 112 potential questions that was reviewed 20–30 minutes before the consultation • Type: single-provider; physician • Duration: NA • Frequency: NA • Topics: palliative care, physical symptoms, treatment, lifestyle and QoL, prognosis, support, EoL issues	Usual care: routine consultation	Patient's satisfaction with care
Lautrette et al, 2007 (45)	• Tool: VALUE mnemonic, a brochure, and detailed procedures • Type: team-based; physician and other professionals • Duration: Median length of discussion was 30 minutes (range 19–45 minutes) • Frequency: NA • Topics: NA	Usual care: EoL family conference	ICU LOS
Gilmer et al, 2005 (46)	• Tool: process model • Type: team-based; ethicist consultant and other professionals • Duration: NA • Frequency: NA • Topics: ethical issues, hospital policy, ethical consensus statements, statutes, laws, measures to improve communication, medical factors, patient preferences and values, QoL, context	Usual care: no ethics consultation was offered	• Hospital LOS • ICU LOS
Casarett et al, 2005 (48)	• Tool: structured interview questionnaire • Type: single-provider; physician • Duration: NA • Frequency: NA • Topics: goals of care, life-sustaining treatment, symptoms, palliative care needs (i.e., comfort care, nursing support, practical support, ACP, emotional support, bereavement support, spiritual support, address loneliness)	Usual care: assessment by research assistant	• Family's satisfaction with care • Hospital care • Hospital LOS

Author, Year	Interventions	Comparisons	Outcomes of Interest
Song et al, 2005 (49)	• Tool: Representational Approach model • Type: single-provider; nurse • Duration: NA • Frequency: NA • Topics: ACP, illness experiences, misconceptions and concerns, informed choices about medical care, treatment, complications, benefits • Other: offered in addition to usual care	Usual care: information cards and a booklet if more information was desired	Concordance between patient's and surrogate's wishes
Nicolasora et al, 2006 (47)	• Tools: script that provides detailed information about life-sustaining treatments and ADs • Type: single-provider; physician • Duration: NA • Frequency: NA • Topics: completion of ACP, CPR status, patient wishes for change, AD creation	Usual care: not approached by physician	Completion of ACP documents and processes
Dyar et al, 2012 (50)	• Tool: none • Type: single-provider; nurse practitioner • Duration: NA • Frequency: NA • Topics: Five Wishes (a living will), information about hospices, needs assessment	Usual care[a]	Patient's QoL
Jones et al, 2011 (52)	• Tool: none • Type: single-provider; nurse or physician who was trained to deliver the intervention • Duration: NA • Frequency: NA • Topics: patient perceptions, communication with providers and family, hopes and fears for future, health care decision-making • Other: family members were not invited to the first consultation, but they were included in subsequent sessions	Usual care[a]	Patient's satisfaction with care
Observational with contemporaneous controls			
Evangelista et al, 2012 (54)	• Tool: none • Type: single-provider; nurse or physician • Duration: 50–120 minutes • Frequency: NA • Topics: patient's values, goals, preferences; areas where patient perceived the need for support (e.g., physical, symptom control, emotional support, illness understanding, treatment goals, ACP); establish treatment plan	Usual care: no palliative care consultation	Patient's QoL

Author, Year	Interventions	Comparisons	Outcomes of Interest
Jacobsen et al, 2011 (55)	• Tool: cognitive model for ACP • Type: single-provider; physician, nurse, or social worker • Duration: NA • Frequency: NA • Topics: information sharing ACP meetings, understanding, values, goals, preferences, selection of surrogate, prognosis, hopes, worries, CPR, place of death	Usual care[a]	Completion of ACP documents and processes
Engelhardt et al, 2009 (56)	• Tool: checklist • Type: single-provider; social worker or health educator • Duration: NA • Frequency: took place over 6 sessions • Topics: understanding, treatment, symptoms, prognosis, communication with providers, ACP, coping, existential issues, caregiving concerns, long-term care planning, home environmental modifications, etc. • Other: in-person discussion followed by phone contact	Usual care[a]	• Patient's QoL • Completion of ACP documents and processes • Hospital care • Emergency department visits • Home health visits • Outpatient services
Rabow et al, 2004 (57)	• Tool: none • Type: team-based; social worker, nurse, chaplain, pharmacist, psychologist, art therapist, volunteer coordinator, and 3 physicians • Duration: NA • Frequency: took place over 3 sessions • Topics: NA • Other: provided in addition to usual care	Usual care[a]	• Patient's QoL • Patient's satisfaction with care • Completion of ACP documents and processes • Hospital care • Hospital LOS • Emergency department visits • Urgent care visits • Outpatient services
Mack et al, 2012 (58)	• Tool: none • Type: single-provider; 40% of discussions included a physician • Duration: NA • Frequency: NA • Topics: ACP (i.e., do not resuscitate, hospices, palliative care, or not otherwise specified), venue of dying	No discussion[a]	• Chemotherapy • Hospital care • ICU admission • Hospice care
Mack et al, 2010 (59)[a]	• Tool: none (assumed) • Type: single-provider (assumed) • Duration: NA • Frequency: NA • Topics: NA	No discussion[a]	• Concordance between patient's wishes and care received • Hospice care

Author, Year	Interventions	Comparisons	Outcomes of Interest
Wright et al, 2008 (60)[a]	• Tool: none (assumed) • Type: single-provider (assumed) • Duration: NA • Frequency: NA • Topics: NA	No discussion[a]	• Chemotherapy • Hospice care
Casarett et al, 2008 (61)	Palliative care consultation • Tool: none • Type: team-based; physician, nurse practitioner, or both; social worker; nurse; chaplain; volunteers; and other professionals as needed • Duration: NA • Frequency: NA • Topics: NA	Usual care[a]	Patient's QoL
Morrison et al, 2005 (62)	• Tool: aid to structure discussions • Type: single-provider; social worker trained to deliver intervention • Duration: NA • Frequency: NA • Topics: patient's decisional capacity, information on how to appoint proxies, communication with proxies, ACP, goals of care, feedback to physicians on congruence	Usual care[a]	Concordance between patient's wishes and care received
Zhang et al, 2009 (53)[a]	• Tool: none (assumed) • Type: single-provider; physician • Duration: NA • Frequency: NA • Topics: preferences[a]	No discussion[a]	• Patient's satisfaction • Chemotherapy • Resuscitation • ICU admission • Hospice care
Briggs et al, 2004 (63)	• Tool: aid to structure discussions • Type: single-provider; nurse, chaplain, or social worker who was trained to deliver the intervention • Duration: 1 hour • Frequency: NA • Topics: patient and surrogate understanding, information about treatment, assistance with ACP documentation, surrogate's understanding of patient's preferences, preparing surrogate to make decisions that honour patient preferences, complete STP	Usual care: ACP literature, referral to trained ACP facilitator	Concordance between patient's and surrogate's wishes
Observational with historical controls			

Author, Year	Interventions	Comparisons	Outcomes of Interest
Lamba et al, 2012 (64)	• Tool: none • Type: team-based; Part I (physician and nurse), Part II (physician, nurse, counsellor, and interfaith pastor) • Duration: NA • Frequency: NA • Topics: Part I (prognosis, ADs, family support, surrogate decision-maker, pain, other symptoms), Part II (likely patient outcomes; treatment options; goals of care; assessment of content on goals of care discussion, family understanding, issues of conflict)	Usual care[a]	• Completion of ACP documents and processes • Hospital LOS • ICU LOS
Norton et al, 2007 (65)	• Tool: none • Type: team-based; nurse practitioner, physician, chaplain, music therapist, massage therapist, and psychologist • Duration: NA • Frequency: NA • Topics: medical history and physical exam, palliative care, involvement with team and family, other providers	Usual care: physician makes a palliative care referral	• Hospital LOS • ICU LOS
Lindner et al, 2007 (66)	• Tool: electronic medical record note • Type: single-provider; physician • Duration: NA • Frequency: NA • Topics: information about surrogates, dates and content of prior written ADs, values, preferences, goals of care, wishes regarding resuscitation, artificial nutrition, hydration, hospital transfer, autopsy	Usual care[a]	• Concordance between patient's wishes and care received • Completion of ACP documents and processes
Cross-sectional			
Leung et al, 2012 (67)[a]	• Tool: none (assumed) • Type: single-provider; physician • Duration: NA • Frequency: NA • Topics: care planning[a]	No discussion[a]	Patient's satisfaction with care
Mori et al, 2013 (68)[a]	• Tool: none (assumed) • Type: single-provider; health care provider • Duration: NA • Frequency: NA • Topics: NA	No discussion[a]	Family's satisfaction with care

Author, Year	Interventions	Comparisons	Outcomes of Interest
Heyland et al, 2009 (11)[a]	• Tool: none (assumed) • Type: single-provider; health care provider • Duration: NA • Frequency: NA • Topics: NA	No discussion[a]	• Patient's satisfaction with care • Family's satisfaction with care

Abbreviations: ACP, advance care planning; AD, advance directive; CPR, cardiopulmonary resuscitation; EoL, end of life; ICU, intensive care unit; LOS, length of stay; NA, not available; QoL, quality of life; RCT, randomized controlled trial; STP, statement of treatment preferences; VALUE, value comments made by the family, acknowledge family emotions, listen, understand the patient as a person, elicit family questions..

[a]Additional information was not provided.

Quality of Life

Table 4 provides details about the relationship between PCPDs and quality of life (QoL) for patients at the EoL. Compared with the controls, single-provider PCPDs could have had a small effect on QoL (GRADE: very low). In 1 small randomized RCT that used 2 instruments to measure QoL, patients in the intervention arm reported higher QoL than those in the control arm, but the differences were not statistically significant. (50) One observational study showed that patients receiving single-provider PCPDs had higher QoL than control patients, (54) and another showed that the intervention had no effect on patients' QoL. (56) In one of the original articles, the *P* value for the effect showed that the difference observed was significant. It is likely that the conservative estimate of the confidence interval in Table 4 produced the discrepancy between the statistical significance of the results. Similarly, the highest-quality evidence from a large RCT could not demonstrate that team-based PCPDs affected patients' QoL, either (GRADE: moderate). (43)

One observational study of a team-based PCPD found that, after adjusting for other covariates, earlier discussions were associated with greater well-being for patients ($\beta = 0.003$, $P = 0.006$; GRADE: low). (61) In that study, the timing of PCPDs had little effect on QoL. While the effect was statistically significant, it might not have been clinically significant. The study's report did not present unadjusted estimates of the effect.

Table 4: Effect of Patient Care Planning Discussions on Patient's Quality of Life

Author, Year Instrument Range	Study Design	Tool Used?	Results Intervention	Results Control	Difference in Means (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for highest-quality evidence: Very low**					
Highest-quality evidence					
Dyar et al, 2012 (50) FACT-G (0–108)	Small RCT	No	Mean change in FACT-G score from baseline (SD): 1.2 (12.5)	Mean change in FACT-G score from baseline (SD): −3.9 (5.0)	5.10 (−3.98, 14.18) SMD: 0.47 (−0.58, 1.52)
Dyar et al, 2012 (50) LASA (12–120)	Small RCT	No	Mean change in LASA score from baseline (SD): 2.0 (25.7)	Mean change in LASA score from baseline (SD): −8.8 (21.7)	10.80 (−11.10, 32.70) SMD: 0.44 (−0.52, 1.37)
Evangelista et al, 2012 (54) [a] MLHFQ (0–105)	Obs-cont	No	Mean change in MLHFQ score from baseline: 9.9 (17.3)[b]	Mean change in MLHFQ score from baseline: 4.3 (15.6)[b]	5.60 (−2.01, 13.21)[b,c,d] SMD: 0.34 (−0.13, 0.80)[b]
Engelhardt et al, 2009 (56) McGill Quality of Life Questionnaire (0–10)	Obs-cont	Yes	Mean change in score from baseline: 0.1 (1.2)[b]	Mean change in score from baseline: 0.1 (1.5)[b]	0.01 (−0.25, 0.27)[b] SMD: 0.01 (−0.19, 0.20)[b]
Team-Based Discussion vs. Usual Care or No Discussion **GRADE for highest-quality evidence: Moderate** **GRADE for all evidence: Very low**					
Highest-quality evidence					

Author, Year Instrument Range	Study Design	Tool Used?	Results Intervention	Results Control	Difference in Means (95% CI)
Gade et al, 2008 (43) 11-point Likert scale (0–10)	Large RCT	Yes	Mean change in score from baseline: 2.3 (3.7)[b]	Mean change in score from baseline: 2.2 (3.5)[b]	0.10 (−0.61, 0.81) SMD: 0.03 (−0.17, 0.23)
Lower-quality evidence					
Rabow et al, 2004 (57) Multidimensional Quality of Life Scale—Cancer Version (0–100)	Obs-cont	No	Mean change in score from baseline: −0.4	Mean change in score from baseline: 2.3	−2.7, $P = 0.43$[e]
Casarett et al, 2008 (61) FATE (0–100)	Obs-cont	No	Mean FATE score: 64	Mean FATE score: 54	10, $P < 0.001$[d,e]

Abbreviations: CI, confidence interval; FACT-G, Functional Assessment of Cancer Therapy–General; FATE, Family Assessment of Treatment at End-of-Life; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; LASA, Linear Analogue Self-Assessment Scale; MLHFQ, Minnesota Living with Heart Failure Questionnaire; Obs-cont, observational study with contemporaneous control; QoL, quality of life; RCT, randomized controlled trial; SD, standard deviation; SMD, standardized mean difference.

[d]Statistically significant at $P \leq 0.05$.

[a]Lower scores indicated higher QoL in the original scale, so the results were multiplied by −1 to make the signs for the differences consistent with the results from other studies.

[b]Standard deviations and CIs are conservatively estimated because information about the correlation between the estimates was not provided.

[c]The effect estimate was statistically significant in the original article, but was not significant here because of the conservative estimation of the confidence interval.

[e]Confidence interval could not be calculated given the information provided.

One study, a small randomized controlled trial (RCT), assessed the effect of a single-provider PCPD on informal caregivers' QoL. (51) The study suffered from high attrition, which resulted in only 11 informal caregivers completing the 6-month follow-up and 4 informal caregivers completing the post-bereavement follow-up. Because of the small sample size, statistical comparisons of the intervention and control arms were not performed. Overall, the evidence did not indicate whether or not the intervention was associated with greater QoL for informal caregivers (GRADE: very low). See Table 5 for details.

Table 5: Effect of Patient Care Planning Discussions on Informal Caregiver's Quality of Life

Author, Year Instrument Range	Study Design	Tool Used?	Results Intervention	Results Control	Difference in Means (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion					
GRADE for all evidence: Very low					
Sampson et al, 2011 (51)[a]	Small RCT	Yes	Score at baseline (SD): 69.8 (23.6)	Score at baseline (SD): 62.7 (37.5)	NA
EuroQoL EQ-5D (0–100)			Score at 6 wk (SD): 73.6 (11.1)	Score at 6 wk (SD): 79.8 (12.2)	
			Score at 6 mo (SD): 80.0 (6.1)	Score at 6 mo (SD): 80.8 (13.2)	
			Score post-death (SD): 69.3 (24.7)	Score post-death: 92.0 (1 person)	

Abbreviations: CI, confidence interval; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; QoL, quality of life; RCT, randomized controlled trial; SD, standard deviation.

[a]No statistical comparisons were performed in this study.

Satisfaction with End-of-Life Care

Results pertaining to the patient's satisfaction with EoL care (Table 6) seem to suggest that PCPDs, whether with single providers or with teams, were associated with greater satisfaction with EoL care. Results from 3 RCTs showed no evidence that single-provider PCPDs affected patients' overall satisfaction with care (GRADE: moderate). (39;44;52) However, results from 1 large RCT indicated that single-provider PCPDs were associated with patients being "very satisfied" with their EoL care. (39) One large RCT assessing a team-based PCPD found that the intervention was significantly associated with greater satisfaction with EoL care (GRADE: high). (43)

Table 6: Effect of Patient Care Planning Discussions on Patient's Satisfaction with End-of-Life Care

Author, Year Instrument Range	Study Design	Tool Used?	Results Intervention	Results Control	Effect Estimate (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion					
GRADE for highest-quality evidence: Moderate					
GRADE for all evidence: Very low					
Highest-quality evidence					
Detering et al, 2010 (39)	Large RCT	Yes	Very satisfied: 125/133 (94.0%)	Very satisfied: 91/139 (65.5%)	OR: 8.24 (3.72, 18.26)[a]
3-point Likert			Satisfied or very satisfied: 131/133 (98.5%)	Satisfied or very satisfied: 131/139 (94.2%)	OR: 4.00 (0.83, 19.19)
Clayton et al, 2007 (44)[b,c]	Large RCT	Yes	Mean score: 110.1	Mean score: 110.3	MD: −0.2 (−3.4, 2.9)
25-item scale (25–125)					

Author, Year Instrument Range	Study Design	Tool Used?	Results Intervention	Results Control	Effect Estimate (95% CI)
Jones et al, 2011 (52) 5-item scale (range not reported)	Small RCT	No	Mean change in score from baseline (SD): 0.6 (1.5)	Mean change in score from baseline (SD): 1.9 (1.1)	MD: −1.3 (−2.09, −0.51)[a] SMD: −0.96 (−1.61, −0.32)
Lower-quality evidence					
Zhang et al, 2009 (53)[d] 11-point Likert (0–10)	Obs-cont	No	Mean score (SD): 6.3 (2.7)	Mean score (SD): 5.7 (3.3)	MD: 0.60 (−0.39, 1.59) SMD: 0.20 (−0.13, 0.53)
Leung et al, 2012 (67) 5-point Likert dichotomized as very satisfied versus less satisfied	Cross-sectional	No	NA	NA	OR: 2.02 (1.16, 3.50)[a]
Heyland et al, 2009 (11) CARENET's Family Satisfaction Survey (1–100)	Cross-sectional	No	Mean score (SD): 76.1 (9.7)	Mean score (SD): 73.1 (10.6)	MD: 3.00 (0.53, 5.47)[a] SMD: 0.29 (0.03, 0.54)
Team-Based Discussion vs. Usual Care or No Discussion **GRADE for highest-quality evidence: High** **GRADE for all evidence: Low**					
Highest-quality evidence					
Gade et al, 2008 (43)[b] 11-point Likert (0–10)	Large RCT	Yes	Mean score (SD): 8.0 (1.4)	Mean score (SD): 7.4 (1.7)	MD: 0.60 (0.27, 0.93)[a] SMD: 0.39 (0.17, 0.60)
Lower-quality evidence					
Rabow et al, 2004 (57) Group Health Association of American Consumer Satisfaction Survey (20–100)	Obs-cont	No	Mean change in score between 6- and 12-month evaluations: 0.5[e]	Mean change in score between 6- and 12-month evaluations: −2.1[e]	MD: 2.6, $P = 0.26$[f]

Abbreviations: CARENET, Canadian Researchers at the End of Life Network; CI, confidence interval; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; MD, difference in means; NA, not available; Obs-cont, observational study with contemporaneous controls; OR, odds ratio; RCT, randomized controlled trial; SD, standard deviation; SMD, standardized mean difference.

[a]Statistically significant at $P \leq 0.05$.
[b]Assessed satisfaction with communication about care.
[c]Standardized MD could not be computed from the information provided.
[d]Assessed quality of death.
[e]Adjusted for baseline values.
[f]Confidence interval could not be calculated from the information provided.

Results from 3 RCTs showed that single-provider PCPDs were associated with greater satisfaction with EoL care among family members (GRADE: high). (39;48;51) As was seen when patients' satisfaction with EoL care was assessed, family members in the intervention arm were more likely to report being "very satisfied" with care than those in the control arm (OR [95% CI]: 5.17 [1.52, 17.58]). (39) These results are presented in detail in Table 7.

Table 7: Effect of Patient Care Planning Discussions on Family's Satisfaction with End-of-Life Care

Author, Year Instrument Range	Study Design	Tool Used?	Results Intervention	Results Control	Effect Estimate (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for highest-quality evidence: High** **GRADE for all evidence: Moderate**					
Highest-quality evidence					
Detering et al, 2010 (39)[a] 3-point Likert	Large RCT	Yes	Very satisfied: 24/29 (82.8%) Satisfied or very satisfied: 26/29 (89.7%)	Very satisfied: 13/27 (48.1%) Satisfied or very satisfied: 21/27 (77.8%)	OR: 5.17 (1.52, 17.58)[b] OR: 2.48 (0.55, 11.10)
Casarett et al, 2005 (48)[c] Toolkit Afterdeath Survey (1–5)	Large RCT	Yes	Mean score (SD): 4.3 (1.0)	Mean score (SD): 2.2 (1.5)	MD: 2.10 (1.75, 2.45)[b] SMD: 1.67 (1.35, 1.99)
Sampson et al, 2011 (51) Satisfaction with End-of-Life Care in Advanced Dementia Scale (10–40)	Small RCT	Yes	Mean score (SD): 27.6 (8.5)	Mean score (SD): 23.0 (1 person)	MD: 4.6[c]
Lower-quality evidence					
Mori et al, 2013 (68)[d] Toolkit of Instruments to Measure End-of-Life Care (0–10)	Cross-sectional	No	Mean score (SD): 9.7 (0.6)	Mean score (SD): 8.7 (1.4)	MD: 1.00 (0.42, 1.58)[b] SMD: 0.84 (0.24, 1.43)
Heyland et al, 2009 (11) CARENET's Family Satisfaction Survey (1–100)	Cross-sectional	No	Mean score (SD): 75.2 (13.3)	Mean score (SD): 70.4 (12.2)	MD: 4.89 (0.41, 9.37)[b] SMD: 0.39 (0.04, 0.74)
Pooled estimate (2 cross-sectional studies, FE), $I^2 = 39\%$					**SMD: 0.50 (0.20, 0.80)[b]**

Abbreviations: CARENET, Canadian Researchers at the End of Life Network; CI, confidence interval; FE, fixed effects; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; MD, difference in means; OR, odds ratio; RCT, randomized controlled trial; SD, standard deviation; SMD, standardized mean difference; RCT, randomized controlled trial.

[a]Assessed satisfaction with quality of death.

[b]Statistically significant at $P \leq 0.05$.

[c]CI cannot be calculated from information provided.

[d]Assessed quality of care.

Concordance

Evidence from a large RCT suggests that single-provider PCPDs did not significantly increase concordance between patient's wishes and the care they received (OR [95% CI]: 1.73 [0.76, 3.90]; GRADE: high). (40;41) However, despite not being significant, the point estimate suggests that the intervention was associated with greater concordance, as shown in Table 8.

Table 8: Effect of Patient Care Planning Discussions on Concordance Between Patient's Wishes and Care Received

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Odds Ratio (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for highest-quality evidence: High** **GRADE for all evidence: Moderate**					
Highest-quality evidence					
Kirchhoff et al, 2012; (40) **Kirchhoff et al, 2010** (41)	Large RCT	Yes	Concordant: 46/62 (74.2%)	Concordant: 30/48 (62.5%)	1.73 (0.76, 3.90)
Lower-quality evidence					
Mack et al, 2010 (59)[a]	Obs-cont	No	Concordant: 87/113 (77.0%)	Concordant: 137/219 (62.6%)	2.00 (1.19, 3.36)[b]
Morrison et al, 2005 (62)	Obs-cont	No	Concordant: 47/49 (95.9%)	Concordant: 79/96 (82.3%)	5.06 (1.12, 22.87)[b]
Pooled estimate (2 obs-cont studies, FE), $I^2 = 24\%$					**2.28 (1.41, 3.70)[b]**
Lindner et al, 2007 (66)	Obs-hist	Yes	Concordant: 39/40 (97.5%)	Concordant: 38/44 (86.4%)	6.16 (0.71, 53.59)

Abbreviations: CI, confidence interval; FE, fixed effects; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; Obs-cont, observational study with contemporaneous controls; Obs-hist, observational study with historical controls; RCT, randomized controlled trial.
[a]Raw numbers were not provided in the article and were therefore estimated using the odds ratio and algebraic formulas.
[b]Statistically significant at $P \leq 0.05$.

Also, Table 9 shows that single-provider PCPDs were associated with greater concordance between the patient's wishes and the family's wishes, and these effect estimates were fairly large and statistically significant (GRADE: high). (40;41;49)

Table 9: Effect of Patient Care Planning Discussions on Concordance between Patient's and Family's Wishes

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Effect Estimate (*P* value)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for highest-quality evidence: High** **GRADE for all evidence: Moderate**					
Highest-quality evidence					
Kirchhoff et al, 2012; (40) **Kirchhoff et al, 2010** (41)	Large RCT	Yes	Agreement on resuscitation, κ (95% CI): 0.74 (0.65, 0.83)	Agreement on resuscitation, κ (95% CI): 0.26 (0.14, 0.39)	OR: 4.32 (< 0.001)[a]
Song et al, 2005 (49)	Small RCT	Yes	Congruence, mean (SD): 2.8 (0.6)	Congruence, mean (SD): 1.4 (1.0)	MD: 1.4 (0.002)[a]
Lower-quality evidence					
Briggs et al, 2004 (63)	Obs-cont	Yes	Mean rank: 17.8	Mean rank: 9.9	Mann-Whitney U: 33.00 (< 0.01)[a]

Abbreviations: CI, confidence interval; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; MD, difference in means; Obs-cont, observational study with contemporaneous controls; OR, odds ratio; RCT, randomized controlled trial; SD, standard deviation.
[a]Statistically significant at $P \leq 0.05$.

Completion of Advance Care Planning Documents and Processes

Evidence shows that both single-provider and team-based PCPDs were associated with greater completion of advance care planning (ACP) documents and processes. Based on evidence from 1 large cluster RCT and 2 large RCTs, single-provider PCPDs were associated with a 13% to 77% (95% CIs ranged from 5% to 83%) increase in completion of ACP documents and processes (GRADE: high). (39;42;47) Notably, the results from the 2 RCTs were not pooled because the CIs did not overlap, and the I^2 was 99%. Both studies included mixed disease populations, so it is unlikely that the disease mix was the source of heterogeneity. The heterogeneity might have been related to the countries in which the studies were conducted (i.e., Australia versus the United States), the number of hospital units in which the studies were conducted (i.e., multiple versus one), the outcomes that were assessed (i.e., receiving ACP versus completing advance directives), and/or the age of patients included in the studies (i.e., older seniors versus younger seniors). (39;47) Results from a large RCT show that team-based PCPDs were associated with a 22% (95% CI: 15%, 30%) increase in the completion of ACP processes and documents (GRADE: high). (43) Table 10 provides further details about these results.

Table 10: Effect of Patient Care Planning Discussions on Completion of Advance Care Planning Documents and Processes

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Difference in Proportions (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for highest-quality evidence: High** **GRADE for all evidence: Moderate**					
Highest-quality evidence					
Au et al, 2012 (42)	Large cluster RCT	Yes	Change in proportion who discussed treatment preferences with clinician: 38.0%	Change in proportion who discussed treatment preferences with clinician: 13.4%	25% (17, 33)[a]
Detering et al, 2010 (39)	Large RCT	Yes	Received ACP: 119/154 (77.3%)	Received ACP: 1/155 (0.6%)	77% (70, 83)[a]
Nicolasora et al, 2006 (47)	Large RCT	Yes	Completed ADs: 13/102 (12.7%)	Completed ADs: 1/128 (0.8%)	13% (5, 19)[a]
Lower-quality evidence					
Jacobsen et al, 2011 (55)	Obs-cont	Yes	ACP preferences discussed and documented: 175/517 (33.8%)	ACP preferences discussed and documented: 81/382 (21.2%)	13% (7, 18)[a]
Engelhardt et al, 2009 (56)	Obs-cont	Yes	Completed Ads: 78/166 (47.0%)	Completed ADs: 41/194 (21.1%)	26% (16, 35)[a]
Pooled estimate (2 obs-cont studies, RE), I^2 = 82%					**19% (6, 32)[a]**
Lindner et al, 2007 (66)	Obs-hist	Yes	Physician completed AD note: 67/107 (62.6%)	Physician completed AD note: 5/117 (4.3%)	59% (48, 68)[a]
Team-Based Discussion vs. Usual Care or No Discussion **GRADE for highest-quality evidence: High** **GRADE for all evidence: Low**					
Highest-quality evidence					
Gade et al, 2008 (43)	Large RCT	Yes	Change in proportion who completed ADs: 37.7%	Change in proportion who completed ADs: 15.6%	22% (15, 30)[a]
Lower-quality evidence					
Rabow et al, 2004 (57)	Obs-cont	No	Durable powers of attorney since baseline: 12/22 (54.5%)	Durable powers of attorney since baseline: 5/18 (27.8%)	27% (−3, 56)
Lamba et al, 2012 (64)	Obs-hist	No	Completion of DNR status: 25/31 (80.6%)	Completion of DNR status: 11/21 (52.4%)	29% (3, 54)[a]

Abbreviations: ACP, advance care planning; AD, advance directive; CI, confidence interval; DNR, do not resuscitate; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; Obs-cont, observational study with contemporaneous controls; Obs-hist, observational study with historical controls; RCT, randomized controlled trial; RE, random effects.

[a]Statistically significant at $P \leq 0.05$.

Health Care Use

Chemotherapy

Pooled results from 3 observational studies with contemporaneous controls (Table 11) indicate that single-provider PCPDs were associated with a lower likelihood of receiving chemotherapy at the EoL (OR [95% CI]: 0.50 [0.35, 0.72]; GRADE: low). (53;58;60) All of the studies had similar point estimates indicating a 50% reduction in the receipt of chemotherapy, but only 1 study, the largest, showed a difference that was statistically significant. (58)

Table 11: Effect of Patient Care Planning Discussions on Receiving Chemotherapy at End of Life

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Odds Ratio (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Low**					
Mack et al, 2012 (58)	Obs-cont	No	Received chemotherapy: 158/1082 (14.6%)	Received chemotherapy: 39/149 (26.2%)	0.48 (0.32, 0.72)[a]
Wright et al, 2008 (60)	Obs-cont	No	Received chemotherapy: 5/123 (4.1%)	Received chemotherapy: 14/209 (6.7%)	0.59 (0.21, 1.68)
Zhang et al, 2009 (53)	Obs-cont	No	Received chemotherapy: 4/75 (5.3%)	Received chemotherapy: 7/70 (10.0%)	0.51 (0.14, 1.81)
Pooled estimate (3 obs-cont studies, FE), I^2 = 0%					**0.50 (0.35, 0.72)[a]**

Abbreviations: CI, confidence interval; FE, fixed effects; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; Obs-cont, observational study with contemporaneous controls.
[a]Statistically significant at $P \leq 0.05$.

Table 12 presents evidence from a large observational study showing that patients who had single-provider PCPDs more than 30 days before their death were less likely to receive chemotherapy than patients who had these discussions within 30 days of death (χ^2 statistic: 17.057, $P < 0.001$; GRADE: low). (58)

Table 12: Effect of Timing of Patient Care Planning Discussions on Receiving Chemotherapy at End of Life

Author, Year	Study Design	Tool Used?	Results
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Low**			
Mack et al, 2012	Obs-cont	No	Proportion receiving chemotherapy in the last 14 days of life Days between first discussion and death: ≤ 30: 65/311 (20.9%) 31–60: 19/186 (10.2%) 61–90: 9/108 (8.3%) > 90: 23/189 (12.2%) χ^2: 17.057, *df*=3, *P* < 0.001[a]

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation; Obs-cont, observational study with contemporaneous control.
[a]Statistically significant at *P* ≤ 0.05.

Resuscitation

Pooled results from 2 observational studies presented in detail in Table 13 show that patients who received single-provider PCPDs were less likely to be resuscitated than those in the control arm (OR [95% CI]: 0.13 [0.03, 0.55]; GRADE: very low). (53;60) The effect was statistically significant, and its magnitude was large, which adds credibility to the result, despite the very low quality of the evidence.

Table 13: Effect of Patient Care Planning Discussions on Resuscitation

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Odds Ratio (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Very low**					
Wright et al, 2008 (60)	Obs-cont	No	1/123 (0.8%)	14/209 (6.7%)	0.11 (0.01, 0.88)[a]
Zhang et al, 2009 (53)	Obs-cont	No	1/75 (1.3%)	6/70 (8.6%)	0.14 (0.02, 1.23)
Pooled estimate (2 obs-cont studies, FE), I^2 = 0%					**0.13 (0.03, 0.55)[a]**

Abbreviations: CI, confidence interval; FE, fixed effects; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; Obs-cont, observational study with contemporaneous controls.
[a]Statistically significant at *P* ≤ 0.05.

Hospital Care

Evidence from a large RCT (Table 14) shows that, on average, patients who received single-provider PCPDs had 0.21 fewer episodes of hospital care than those in the control arm (*P* = 0.04; GRADE: high). (48) On the other hand, evidence from an observational study with contemporaneous controls suggests that, on average, patients who received team-based PCPDs had 0.40 more episodes of hospital care than those in the study's control arm (95% CI: −0.24, 1.04; GRADE: low). (57)

Table 14: Effect of Patient Care Planning Discussions on Receiving Hospital Care

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Effect Estimate (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for highest-quality evidence: High** **GRADE for all evidence: Moderate**					
Highest-quality evidence					
Casarett et al, 2005 (48)	Large RCT	Yes	Mean number of acute care admissions (range): 0.3 (0-4)	Mean number of acute care admissions (range): 0.5 (0-4)	MD: –0.21, *P* = 0.04[a]
Lower-quality evidence					
Engelhardt et al, 2009 (56)	Obs-cont	Yes	Mean change in number of inpatient admissions from baseline (SD): 0.5 (6.1)[b]	Mean change in number of inpatient admissions from baseline (SD): 2.1 (17.3)[b]	MD: –1.67 (–3.82, 0.48)[a, c]
Mack et al, 2012 (58)	Obs-cont	No	Received acute care at EoL: 424/1082 (39.2%)	Received acute care at EoL: 72/149 (48.3%)	OR: 0.69 (0.49, 0.97)[a]
Team-Based Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Low**					
Rabow et al, 2004 (57)	Obs-cont	No	Mean (SD): 1.2 (2.0)	Mean (SD): 0.8 (1.0)	MD: 0.40 (–0.24, 1.04)

Abbreviations: CI, confidence interval; EoL, end of life; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; MD, difference in means; Obs-cont, observational study with contemporaneous controls; OR, odds ratio; RCT, randomized controlled trial; SD, standard deviation.
[a]Statistically significant at $P \leq 0.05$.
[b]Standard deviations are slightly larger because information about the correlation between estimates was not provided.
[c]Significant difference was shown in the paper, but the difference was not significant in this estimate because the SDs for the MDs were estimated conservatively.

Furthermore, the evidence shows that earlier single-provider PCPDs were associated with a lower likelihood of receiving hospital care at the EoL (χ^2 statistic: 55.906, $P < 0.001$; GRADE: moderate). (58) As shown in Table 15, there was an apparent gradient between the timing of PCPDs and the likelihood of receiving hospital care.

Table 15: Effect of Timing of Patient Care Planning Discussions on Receiving Hospital Care

Author, Year	Study Design	Tool Used?	Results
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Moderate**			
Mack et al, 2012 (58)	Obs-cont	No	Proportion receiving acute care in the last 30 days of life Days between first discussion and death: ≤ 30: 180/311 (57.9%) 31–60: 76/186 (40.9%) 61–90: 35/108 (32.4%) > 90: 49/189 (25.9%) χ^2: 55.905, *df* = 3, $P < 0.001$[a]

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation; Obs-cont, observational study with contemporaneous control.
[a]Statistically significant at $P \leq 0.05$.

The results in Table 16 show that single-provider PCPDs were associated with spending 1.8 fewer days in hospital ($P = 0.03$; GRADE: high). (48) The evidence does not clearly indicate any relationship between team-based PCPDs and hospital length of stay, however. Results from 1 large multicentre RCT suggest that team-based PCPDs had no effect on the number of days spent in the hospital, (43) and results from another large multicentre RCT suggest that team-based PCPDs were associated with spending 3.00 fewer days in hospital (GRADE: low). (46) Both of these RCTs were conducted with mixed disease patient populations in hospitals in the United States, and the patients were of similar ages. However, 1 study focused on patients for whom death was imminent, (46) and the other did not. (43) Patients for whom death is imminent comprise a small but special EoL population. (Ba' Pham, personal communication, February 10, 2014).

Table 16: Effect of Patient Care Planning Discussions on Hospital Length of Stay

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Difference in Means (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for all evidence: High**					
Casarett et al, 2005 (48)	Large RCT	Yes	Mean (range): 1.2 (0–18)	Mean (range): 3.0 (0–29)	–1.8, $P = 0.03$[a]
Team-Based Discussion vs. Usual Care or No Discussion **GRADE for highest-quality evidence: Low** **GRADE for all evidence: Low**					
Highest-quality evidence					
Gade et al, 2008 (43)	Large RCT	Yes	Median (IQR): 7 (4–12)	Median (IQR): 7 (4–12)	0
Gilmer et al, 2005 (46)	Large RCT	Yes	Mean (SD): 8.3 (9.4)	Mean (SD): 11.3 (16.5)	–3.00 (–6.07, 0.07)[a, b]
Lower-quality evidence					
Rabow et al, 2004 (57)	Obs-cont	No	Mean (SD): 6.3 (12.4)	Mean (SD): 4.3 (9.0)	2.00 (–2.43, 6.43)
Lamba et al, 2012 (64)	Obs-hist	No	Mean (SD): 22.2 (23.1)	Mean (SD): 31.1 (26.9)	–8.90 (–22.99, 5.19)
Norton et al, 2007 (65)	Obs-hist	No	Mean (SD): 35.8 (50.2)	Mean (SD): 41.4 (58.4)	–5.63 (–22.32, 11.06)
Pooled estimate (2 obs-hist studies, FE), $I^2 = 0\%$					**–7.54 (–18.30, 3.23)**

Abbreviations: CI, confidence interval; FE, fixed effects; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; IQR, interquartile range; Obs-cont, observational study with contemporaneous controls; Obs-hist, observational study with historical controls; RCT, randomized controlled trial; SD, standard deviation.

[a]Statistically significant at $P \leq 0.05$.

[b]Significant difference was shown in the paper, but the difference was not significant in this estimate because the SDs for the mean differences were estimated conservatively.

Emergency Department Visits

The evidence from 1 observational study suggests that patients who received single-provider PCPDs tended to have fewer visits to the emergency department when compared with their controls (−1.27 [95% CI: −3.34, 0.80]; GRADE: low). (56) These results (Table 17) were not statistically significant, however. One observational study assessed the relationship between team-based PCPDs and emergency department visits. (57) That study did not provide evidence that team-based PCPDs were associated with the number

of times a patient visits emergency departments (difference in means [95% CI]: −0.10 [−1.16, 0.96]; GRADE: moderate). Table 17 provides additional details about these results.

Table 17: Effect of Patient Care Planning Discussions on Emergency Department Visits

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Difference in Means (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Low**					
Engelhardt et al, 2009 (56)	Obs-cont	Yes	Mean change from baseline (SD): 1.7 (6.8)[a]	Mean change from baseline (SD): 3.0 (13.5)[a]	–1.27 (–3.34, 0.80)
Team-Based Discussion vs. Usual Care or No Discussions **GRADE for all evidence: Moderate**					
Rabow et al, 2004 (57)	Obs-cont	No	Mean (SD): 1.6 (2.2)	Mean (SD): 1.7 (2.8)	–0.10 (–1.16, 0.96)

Abbreviations: CI, confidence interval; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; Obs-cont, observational study with contemporaneous controls; SD, standard deviation.
[a]Standard deviations are slightly larger because information about the correlation between estimates was not provided.

Care in Intensive Care Unit

The pooled estimate from 3 observational studies does not indicate that single-provider PCPDs were associated with the likelihood that a patient will receive care in the intensive care unit (ICU) (OR [95% CI]: 0.44 [0.13, 1.53]; GRADE: very low). (53;58;60) However, 2 of the 3 studies included in the pooled results showed that single-provider PCPDs were associated with less ICU care (Table 18). Notably, all 3 studies were multicentre prospective studies conducted in the United States with patients who had similar demographic characteristics. The patients were recruited from various settings, however.

Table 18: Effect of Patient Care Planning Discussions on Care in an Intensive Care Unit

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Odds Ratio (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Very low**					
Mack et al, 2012 (58)	Obs-cont	No	ICU care at EoL: 64/1082 (5.9%)	ICU care at EoL: 7/149 (4.7%)	1.28 (0.57, 2.84)
Wright et al, 2008 (60)	Obs-cont	No	ICU admission: 5/123 (4.1%)	ICU admission: 26/209 (12.4%)	0.30 (0.11, 0.80)[a]
Zhang et al, 2009 (53)	Obs-cont	No	ICU stay: 2/75 (2.7%)	ICU stay: 10/70 (14.3%)	0.16 (0.03, 0.78)[a]
Pooled estimate (3 obs-cont studies, RE), I^2 = 75%					**0.44 (0.13, 1.53)**

Abbreviations: CI, confidence interval; EoL, end of life; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; ICU, intensive care unit; Obs-cont, observational study with contemporaneous control; RE, random effects.
[a]Statistically significant at $P \leq 0.05$.

Table 19 shows that earlier single-provider PCPDs were associated with a lower likelihood of receiving ICU care at EoL (χ^2 statistic: 16.606, $P < 0.001$; GRADE: low). (58) The data were too sparse to indicate

whether or not a gradient was present, but the results showed that people who had single-provider PCPDs more than 30 days before death were less likely to receive ICU care at the EoL.

Table 19: Effect of Timing of Patient Care Planning Discussions on Care in an Intensive Care Unit

Author, Year	Study Design	Tool Used?	Results
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Low**			
Mack et al, 2012 (58)	Obs-cont	No	Receiving ICU care in the last 30 days of life Days between first discussion and death: ≤ 30: 37/311 (11.9%) 31–60: 9/186 (4.8%) 61–90: 6/108 (5.6%) > 90: 6/183 (3.3%) χ^2: 16.606, *df* = 3, *P* < 0.001[a]

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation; ICU, intensive care unit; Obs-cont, observational study with contemporaneous control.
[a]Statistically significant at *P* ≤ 0.05.

As shown in Table 20, patients in 2 large RCTs who received team-based PCPDs appeared to spend fewer days in the ICU, but none of the differences was statistically significant (GRADE: high). (46;58) While point estimates from both studies suggest that team-based PCPDs are associated with spending fewer days in the ICU, these differences could have also resulted from chance.

Table 20: Effect of Patient Care Planning Discussions on Length of Stay in Intensive Care Unit

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Difference in Means (95% CI)
Team-Based Discussion vs. Usual Care or No Discussion **GRADE for highest-quality evidence: High** **GRADE for all evidence: Moderate**					
Highest-quality evidence					
Lautrette et al, 2007 (45)	Large RCT	Yes	Median (IQR): 7 (4–14)	Median (IQR): 9 (5–20)	–2, *P* = 0.54[a]
Gilmer et al, 2005 (46)	Large RCT	Yes	Mean (SD): 6.0 (9.4)	Mean (SD): 7.5 (10.3)	–1.50 (–3.48, 0.48)
Lower-quality evidence					
Lamba et al, 2012 (64)	Obs-hist	No	Mean (SD): 14.6 (21.3)	Mean (SD): 17.2 (18.7)	–2.60 (–13.56, 8.36)
Norton et al, 2007 (65)	Obs-hist	No	Mean (SD): 9.0 (9.3)	Mean (SD): 16.3 (16.5)	–7.32 (–11.65, –2.99)[b]
Pooled estimate (2 obs-hist, FE), I^2 = 0%					**–6.68 (–10.71, –2.65)[b]**

Abbreviations: CI, confidence interval; FE, fixed effects; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; IQR, interquartile range; Obs-hist, observational study with historical controls; RCT, randomized controlled trial; SD, standard deviation.
[a]Information for calculating CI was not provided.
[b]Statistically significant at *P* ≤ 0.05.

Home Health Visits

Results from one observational study showed that patients who received single-provider PCPDs tended to receive more home health visits than patients in the control arm (difference in means [95% CI]: 0.49 [−2.57, 3.55]; GRADE: very low). (56) It must be noted that this difference was not statistically significant, however.

Table 21: Effect of Patient Care Planning Discussions on Home Health Visits

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Difference in Means (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Very low**					
Engelhardt et al, 2009 (56)	Obs-cont	Yes	Mean change from baseline (SD): 1.8 (15.9)[a]	Mean change from baseline (SD): 1.3 (15.3)[a]	0.49 (–2.57, 3.55)

Abbreviations: CI, confidence interval; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; Obs-cont, observational study with contemporaneous controls; SD, standard deviation.
[a]Standard deviations are slightly larger because information about the correlation between estimates was not provided.

Urgent Care Visits

An observational study from the United States found that patients who received team-based PCPDs had fewer urgent care visits than those in the study's control arm (difference in means [95% CI]: −0.30 [−0.61, 0.01]; GRADE: moderate; Table 22). (57) As with some of the results discussed previously, the difference between the study's 2 arms was not statistically significant in the table below but was significant in the original study. It is worth noting that, in the United States, urgent care centres are similar to walk-in clinics that deliver ambulatory care. They are typically used for conditions that require urgent attention, but are not serious enough to warrant a visit to an emergency department.

Table 22: Effect of Patient Care Planning Discussions on Urgent Care Visits

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Difference in Means (95% CI)
Team-Based Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Moderate**					
Rabow et al, 2004 (57)	Obs-cont	No	Mean (SD): 0.3 (0.5)	Mean (SD): 0.6 (0.9)	–0.30 (–0.61, 0.01)[a, b]

Abbreviations: CI, confidence interval; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; Obs-cont, observational study with contemporaneous controls; SD, standard deviation.
[a]Statistically significant at $P \leq 0.05$.
[b]Significant difference was shown in the paper, but the difference was not significant in this estimate.

Other Outpatient Visits

The results in Table 23 show that patients who received single-provider PCPDs tended to have more outpatient visits than those in the control group (difference in means [95% CI]: 2.4 [−4.2, 9.0]; GRADE: low), but the difference was not statistically significant. (56) The results also show that team-based PCPDs were significantly associated with having fewer outpatient visits (differences in means [95% CI]: −5.2 [−9.7, −0.7]; GRADE: moderate). (57) While the 2 sets of results may seem contradictory, they are not entirely surprising, because patients who receive team-based PCPDs may have all of their needs met by the team that is delivering the intervention. Furthermore, the study from which the latter result was taken featured a team-based PCPD with a team that included a psychologist, a pharmacist, a nurse, and 3 physicians.

Table 23: Effect of Patient Care Planning Discussions on Other Outpatient Visits

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Difference in Means (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Low**					
Engelhardt et al, 2009 (56)	Obs-cont	Yes	Outpatient visits Mean change from baseline (SD): −0.4 (32.5)[a]	Outpatient visits Mean change from baseline (SD): −2.8 (34.8)[a]	2.39 (−4.18, 8.96)
Team-Based Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Moderate**					
Rabow et al, 2004 (57)	Obs-cont	No	Clinic and specialist visits combined Mean (SD): 12.4 (9.5)	Clinic and specialist visits combined Mean (SD): 17.6 (11.8)	−5.20 (−9.70, −0.70)[b]

Abbreviations: CI, confidence interval; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; Obs-cont, observational study with contemporaneous controls; SD, standard deviation.
[a]Standard deviations are slightly larger because information about the correlation between estimates was not provided.
[b]Statistically significant at $P \leq 0.05$.

Hospice Care

One large RCT showed that patients who received single-provider PCPDs were more likely to receive hospice care at the EoL when compared with their controls (OR [95% CI]: 5.17 [2.03, 13.17]; GRADE: high). (48) Further details about the results for this outcome are presented in Table 24.

Table 24: Effect of Patient Care Planning Discussions on Receiving Hospice Care

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Odds Ratio (95% CI)
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for highest-quality evidence: High** **GRADE for all evidence: Moderate**					
Highest-quality evidence					
Casarett et al, 2005 (48)	Large RCT	Yes	Hospice enrolment: 27/107 (25.2%)	Hospice enrolment: 6/98 (6.1%)	5.17 (2.03, 13.17)[a]
Lower-quality evidence					
Mack et al, 2012 (58)	Obs-cont	No	Any hospice care: 688/1082 (63.6%)	Any hospice care: 30/149 (20.1%)	6.93 (4.56, 10.53)[a]
Mack et al, 2010[b] (59)	Obs-cont	No	Hospice care for > 1 week: 79/113 (69.9%)	Hospice care for > 1 week: 115/219 (52.5%)	2.10 (1.30, 3.40)[a]
Wright et al, 2008 (60)	Obs-cont	No	Hospice care for > 1 week: 80/122 (65.6%)	Hospice care for > 1 week: 93/209 (44.5%)	2.38 (1.50, 3.77)[a]
Zhang et al, 2009 (53)	Obs-cont	No	Hospice care for > 1 week: 56/75 (74.7%)	Hospice care for > 1 week: 36/70 (51.4%)	2.78 (1.38, 5.61)[a]

Author, Year	Study Design	Tool Used?	Results Intervention	Results Control	Odds Ratio (95% CI)
Pooled estimate (3 obs-cont studies, FE), $I^2 = 0\%$					**2.33 (1.72, 3.15)[a]**

Abbreviations: CI, confidence interval; FE, fixed effects; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; Obs-cont, observational study with contemporaneous controls; RCT, randomized controlled trial; SD, standard deviation.
[a]Statistically significant at $P \leq 0.05$.
[b]Raw numbers were not provided in the article and were therefore estimated using the odds ratio and algebraic formulas.

As was seen with other results related to the timing of PCPDs, earlier PCPDs were associated with more optimal health service use at the EoL. An observational study with contemporaneous controls showed that earlier single-provider PCPDs were associated with a higher likelihood of receiving hospice care, as shown in Table 25 (χ^2 statistic: 50.756, $P < 0.001$; GRADE: moderate). (58)

Table 25: Effect of Timing of Patient Care Planning Discussions on Receiving Hospice Care

Author, Year	Study Design	Tool Used?	Results
Single-Provider Discussion vs. Usual Care or No Discussion **GRADE for all evidence: Moderate**			
Mack et al, 2012 (58)	Obs-cont	No	Receiving any hospice care Days between first discussion and death: ≤ 30: 152/311 (48.9%) 31–60: 126/186 (67.7%) 61–90: 80/108 (74.1%) > 90: 146/189 (77.2%) χ^2: 50.756, $df = 3$, $P < 0.001$[a]

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation; Obs-cont, observational study with contemporaneous control.
[a]Statistically significant at $P \leq 0.05$.

Summary of Findings

The findings from the highest-quality evidence for each outcome assessed in this EBA are summarized in Tables 26 and 27. While PCPDs might not have been associated with patients' QoL or satisfaction with care, they were associated with families' satisfaction with the care their loved ones received and with greater concordance between patients' wishes and those of their families. This concordance is one of the first steps in achieving optimal communication about EoL care, as is shown in CARENET's model (Figure 1). The next stage of the model focuses on the completion of ACP documents and processes; again, the results from the EBA indicate that PCPDs were associated with this stage of the process of communicating about EoL care. The last stage of the model focuses on the care patients receive. While the results from this EBA do not suggest that PCPDs improved concordance between patients' wishes and the care they received, PCPDs were associated with receiving less aggressive care at EoL, a lower likelihood of being resuscitated, and a greater likelihood of receiving hospice care. These health care use outcomes are consistent with patients' stated preference for less aggressive care at EoL. (10) Furthermore, the results from this analysis unequivocally show that earlier PCPDs lead to better outcomes than later discussions. Notably, however, all of the PCPDS in this study were provided to an EoL population (i.e., adults with life-threatening illnesses who are not expected to recover or stabilize).

Table 26: Summary of the Highest-Quality Evidence on Outcomes of Patient Care Planning Discussions

Outcome	Single-Provider Discussion vs. Usual Care or No Discussion		Team-Based Discussion vs. Usual Care or No Discussion	
	Effect Estimate (95% CI)	GRADE	Effect Estimate (95% CI)	GRADE
Patient's QoL	***SMD*** 0.47 (−0.58, 1.52) 0.44 (−0.52, 1.37) 0.34 (−0.13, 0.80)[a, b] 0.01 (−0.19, 0.20)	Very low	***SMD*** 0.03 (−0.17, 0.23)	Moderate
Informal caregiver's QoL	Estimates NA	Very low	NA	
Patient's satisfaction with EoL care	***OR*** Very satisfied: 8.24 (3.72, 18.26)[a] Satisfied or very satisfied: 4.00 (0.83, 19.19) ***MD*** −0.2 (−3.4, 2.9) ***SMD*** −0.96 (−1.61, −0.32)[a]	Moderate	***SMD*** 0.39 (0.17, 0.60)[a]	High
Family's satisfaction with EoL care	***OR*** Very satisfied: 5.17 (1.52, 17.58)[a] Satisfied or very satisfied: 2.48 (0.55, 11.10) ***MD*** 2.10 (1.75, 2.45)[a] 4.6	High	NA	
Concordance between patient's wishes and care received	***OR*** 1.73 (0.76, 3.90)	High	NA	
Concordance between patient's and family's wishes	***OR*** 4.32, $P < 0.001$[a] ***MD*** 1.4, $P = 0.002$[a]	High	NA	
Completion of ACP documents and processes	***Differences in Proportions*** 25% (17, 33)[a] 77% (70, 83)[a] 13% (5, 19)[a]	High	***Differences in Proportions*** 22% (15, 30)[a]	High
Receiving chemotherapy at EoL	***OR*** 0.50 (0.35, 0.72)[a]	Low	NA	
Resuscitation	***OR*** 0.13 (0.03, 0.55)[a]	Very low	NA	

Outcome	Single-Provider Discussion vs. Usual Care or No Discussion		Team-Based Discussion vs. Usual Care or No Discussion	
	Effect Estimate (95% CI)	**GRADE**	**Effect Estimate (95% CI)**	**GRADE**
Receiving hospital care	***MD*** −0.21, *P* = 0.04[a]	High	***MD*** 0.40 (−0.24, 1.04)[b]	Low
Hospital LOS	***MD*** −1.8, *P* = 0.03[a]	High	***MD*** 0 −3.00 (−6.07, 0.07)[a, b]	Low
ED visits	***MD*** −1.27 (−3.34, 0.80)	Low	***MD*** −0.10 (−1.16, 0.96)	Moderate
ICU care	***OR*** 0.44 (0.13, 1.53)	Very low	NA	
ICU LOS	NA		***MD*** −2 −1.50 (−3.48, 0.48)	High
Home health visits	***MD*** 0.49 (−2.57, 3.55)	Very low	NA	
Urgent care visits	NA		***MD*** −0.30 (−0.61, 0.01)[a, b]	Moderate
Other outpatient visits	***MD*** 2.39 (−4.18, 8.96)	Low	***MD*** −5.20 (−9.70, −0.70)[a]	Moderate
Receiving hospice care	***OR*** 5.17 (2.03, 13.17)[a]	High	NA	

Abbreviations: ACP, advance care planning; CI, confidence interval; ED, emergency department; EoL, end of life; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; ICU, intensive care unit; LOS, length of stay; MD, difference in means; NA, not available; OR, odds ratio; QoL, quality of life; SMD, standardized mean difference.

[a]Statistically significant at $P \leq 0.05$.

[b]Significant difference was shown in the paper, but the difference was not significant in this estimate because the standard deviations for the MDs were estimated conservatively.

Table 27: Summary of the Highest-Quality Evidence on Timing of Patient Care Planning Discussions

Outcome	Results	GRADE
Patient's QoL	Earlier discussions were associated with greater QoL adjusted $\beta = 0.003$, $P = 0.006$[a]	Low
Receiving chemotherapy at EoL	Earlier discussions were associated with lower receipt of chemotherapy in the last 14 days of life χ^2: 17.057, $P < 0.001$[a]	Low
Receiving hospital care	Earlier discussions were associated with less hospital care in the last 30 days of life χ^2: 55.905, $P < 0.001$[a]	Moderate
ICU care	Earlier discussions were associated with less ICU care in the last 30 days of life χ^2: 16.606, $P < 0.001$[a]	Low
Receiving hospice care	Earlier discussions were associated with receiving hospice care χ^2: 50.756, $P < 0.001$[a]	Moderate

Abbreviations: EoL, end of life; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; ICU, intensive care unit; QoL, quality of life.
[a]Statistically significant at $P \leq 0.05$.

Conclusions

Based on the best available evidence, it is clear that single-provider and team-based patient care planning discussions (PCPDs) provide benefits for patients at the end of life (EoL) and their families. These benefits can be observed in terms of patient-centred outcomes and the use of health care resources. Additionally, earlier PCPDs are associated with better patient-centred and utilization outcomes.

High-quality evidence with large magnitudes of effect lend moderate certainty to the conclusion that single-provider PCPDs:

- Improve families' satisfaction with EoL care and concordance between patients' and families' wishes.
- Reduce the likelihood of receiving hospital care and the number of days spent in hospital.
- Increase the completion of advance care planning (ACP) processes and documents and the likelihood of receiving hospice care.

Moderate- to high-quality evidence with large magnitudes of effect indicate, with moderate certainty, that team-based PCPDs:

- Increase patient satisfaction and the completion of ACP documents and processes.
- Reduce the number of days spent in intensive care and decrease the use of outpatient services.

Finally, moderate-quality evidence indicates that earlier PCPDs are associated with reduced hospital care and with increased hospice care.

The body of evidence used in this evidence-based analysis suffered from common limitations, described below.

- Some of the randomized controlled trials were unblinded, and in some cases blinding was done inappropriately or not reported. This could have led to an overestimation of the effect estimates.
- Most studies did not specify how missing data were handled. Because the patients included in the studies were at the EoL, and patients who died likely had a different EoL trajectory or prognosis than those who completed the studies, missing data could have introduced attrition bias. The direction in which this bias would have affected the results is unclear.
- In some observational studies, exposure to the intervention was measured on the basis of a patient's or family member's response to a single question about discussing EoL care plans with a health care provider. Furthermore, the interventions were often not described in enough detail. As a result, it was impossible to compare multiple components of each intervention or assess how well the intervention was delivered.
- Usual care was not defined in most studies, so it is possible that some effect estimates, especially those related to team-based PCPDs, were underestimated.
- Studies that measured satisfaction with care and quality of life used a variety of instruments that did not consistently assess the same components of the construct being measured, so their results, as part of an overall body of evidence for those outcomes, should be interpreted cautiously.

Acknowledgements

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Dr Scott Wooder	Ontario Medical Association	President
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Mary Jane Esplen	De Souza Institute University of Toronto	Director Clinician Scientist

Abbreviations: CEO, Chief Executive Officer; QI, Quality Improvement.

Appendices

Appendix 1: Literature Search Strategies

Search date: October 9, 2013
Databases searched: Ovid MEDLINE, Ovid MEDLINE In-Process, Embase, All EBM Databases (see below), CINAHL

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 <September 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 40>, Ovid MEDLINE(R) <1946 to September Week 4 2013>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <October 01, 2013

Search Strategy:

#	Searches	Results
1	exp Terminal Care/	86347
2	exp Palliative Care/ use mesz,acp,cctr,coch,clcmr,dare,clhta,cleed	41169
3	exp palliative therapy/ use emez	61505
4	exp Terminally Ill/ use mesz,acp,cctr,coch,clcmr,dare,clhta,cleed	5628
5	exp terminally ill patient/ use emez	5936
6	exp terminal disease/ use emez	4501
7	exp dying/ use emez	5665
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.	336689
9	or/1-8	430311
10	exp Patient Care Planning/	79710
11	((goal* adj2 care) or patient care plan* or advance care plan*).ti,ab.	5370
12	((communicat* or conversation* or conference* or discuss* or consult*) adj2 (strateg* or plan* or model* or intervention* or framework* or care or program* or process*)).ti,ab.	83458
13	or/10-12	165666
14	9 and 13	10891
15	limit 14 to english language [Limit not valid in CDSR,ACP Journal Club,DARE,CCTR,CLCMR; records were retained]	10171
16	limit 15 to yr="2004 -Current" [Limit not valid in DARE; records were retained]	6293
17	limit 16 to yr="2009 -Current" [Limit not valid in DARE; records were retained]	4023
18	remove duplicates from 17	2853
19	limit 16 to yr="2004 - 2008" [Limit not valid in DARE; records were retained]	2270
20	remove duplicates from 19	1473
21	18 or 20	4326

CINAHL

#	Query	Results
S1	(MH "Terminal Care+")	38,947
S2	(MH "Palliative Care")	19,702
S3	(MH "Terminally Ill Patients+")	7,636
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*)	52,178
S5	S1 OR S2 OR S3 OR S4	60,161
S6	(MH "Patient Care Plans+")	6,983
S7	((goal* N2 care) or patient care plan* or advance care plan*)	6,438
S8	((communicat* or conversation* or conference* or discuss* or consult*) N2 (strateg* or plan* or model* or intervention* or framework* or care or program* or process*))	19,731
S9	S6 OR S7 OR S8	29,515
S10	S5 AND S9	2,848
S11	S5 AND S9 Limiters - Published Date: 20040101-20131231; English Language	2,237

Appendix 2: Evidence Quality Assessment

Table A1: GRADE Evidence Profile for Comparison of Single-Provider Discussions and Usual Care or No Discussion

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Patient's Quality of Life							
1 (RCT) 2 (observational)	Serious limitations (–1)[a]	No serious limitations	No serious limitations	Serious limitations (–1)[b]	Undetected	Large magnitude of effect (+1)	⊕ Very low
Informal Caregiver's Quality of Life							
1 (RCT)	Very serious limitations (–2)[c]	No serious limitations	No serious limitations	Serious limitations (–1)[b]	Undetected	None	⊕ Very low
Patient's Satisfaction with End-of-Life Care							
3 (RCTs)	No serious limitations	Serious limitations (–1)[d]	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕ Moderate
Family's Satisfaction with End-of-Life Care							
3 (RCTs)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕⊕ High
Concordance Between Patient's Wishes and Care Received							
1 (RCT)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕⊕ High
Concordance Between Patient's and Family's Wishes							
2 (RCTs)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕⊕ High
Completion of Advance Care Planning Documents and Processes							
3 (RCTs)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕⊕ High
Receiving Chemotherapy at End of Life							
3 (observational)	Serious limitations (–1)[e,f]	No serious limitations	No serious limitations	No serious limitations	Undetected	Large magnitude of effect (+1)	⊕⊕ Low
Resuscitation							
2 (observational)	Serious limitations (–1)[e,f]	No serious limitations	No serious limitations	Serious limitations (–1)[b]	Undetected	Large magnitude of effect (+1)	⊕ Very low
Receiving Hospital Care							
1 (RCT)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕⊕ High

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Hospital Length of Stay							
1 (RCT)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕⊕ High
Emergency Department Visits							
1 (observational)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕ Low
Intensive Care Unit Care							
3 (observational)	Serious limitations (–1)[e,f]	Serious limitations (–1)[d]	No serious limitations	No serious limitations	Undetected	Large magnitude of effect (+1)	⊕ Very low
Home Health Visits							
1 (observational)	No serious limitations	No serious limitations	No serious limitations	Serious limitations (–1)[b]	Undetected	None	⊕ Very low
Other Outpatient Visits							
1 (observational)	No serious limitations	No serious limitations	No serious limitations	Serious limitations (–1)[b]	Undetected	Large magnitude of effect (+1)	⊕⊕ Low
Receiving Hospice Care							
1 (RCT)	No serious limitations	No serious limitations	No serious limitations	Serious limitations (–1)[b]	Undetected	None	⊕⊕⊕⊕ High

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation; RCT, randomized controlled trial.
[a]Randomized controlled trial has serious risk of bias because of concerns about allocation concealment and blinding, and 1 observational study did not adequately account for confounding.
[b]Wide confidence intervals.
[c]Very high level of attrition and uncertainty about who was blinded or how blinding was achieved.
[d]Results were inconsistent.
[e]Observational studies had some limitations related to how the exposure was assessed.
[f]Observational studies had limitations related to confounding.

Table A2: GRADE Evidence Profile for Comparison of Team-Based Discussions and Usual Care or No Discussion

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Patient's Quality of Life							
1 (RCT)	No serious limitations	No serious limitations	No serious limitations	Serious limitations (–1)[a]	Undetected	None	⊕⊕⊕ Moderate
Patient's Satisfaction with End-of-Life Care							
1 (RCT)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕⊕ High

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Completion of Advance Care Planning Documents and Processes							
1 (RCT)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕⊕ High
Receiving Hospital Care							
1 (observational)	No serious limitations	No serious limitations	No serious limitations	Serious limitations (–1)[a]	Undetected	All plausible confounding increases confidence in estimate (+1)	⊕⊕ Low
Hospital Length of Stay							
2 (RCT)	Serious limitations (–1)[b]	Serious limitations (–1)[c]	No serious limitations	No serious limitations	Undetected	None	⊕⊕ Low
Emergency Department Visits							
1 (observational)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	All plausible confounding increases confidence in estimate (+1)	⊕⊕⊕ Moderate
Intensive Care Unit Length of Stay							
2 (RCT)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕⊕ High
Urgent Care Visits							
1 (observational)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	All plausible confounding increases confidence in estimate (+1)	⊕⊕⊕ Moderate
Other Outpatient Visits							
1 (observational)	No serious limitations	No serious limitations	No serious limitations	Serious limitations (–1)[a]	Undetected	Large magnitude of effect (+1) All plausible confounding increases confidence in estimate (+1)	⊕⊕⊕ Moderate

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation; RCT, randomized controlled trial.
[a]Wide confidence intervals.
[b]RCTs suffer limitations because of blinding and allocation concealment.
[c]One study showed that the intervention had beneficial effects and the other showed no effect.

Table A3: GRADE Evidence Profile for Timing of Patient Care Planning Discussions

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Patient's Quality of Life							
1 (observational)	Serious limitations (–1)[a]	No serious limitations	No serious limitations	No serious limitations	Undetected	Dose-response gradient (+1)	⊕⊕ Low
Receiving Chemotherapy at End of Life							
1 (observational)	Serious limitations (–1)[b]	No serious limitations	No serious limitations	No serious limitations	Undetected	Large magnitude of effect (+1)	⊕⊕ Low
Receiving Hospital Care							
1 (observational)	Serious limitations (–1)[b]	No serious limitations	No serious limitations	No serious limitations	Undetected	Large magnitude of effect (+1) Dose-response gradient (+1)	⊕⊕⊕ Moderate
Intensive Care Unit Care							
1 (observational)	Serious limitations (–1)[b]	No serious limitations	No serious limitations	No serious limitations	Undetected	Large magnitude of effect (+1)	⊕⊕ Low
Receiving Hospice Care							
1 (observational)	Serious limitations (–1)[b]	No serious limitations	No serious limitations	No serious limitations	Undetected	Large magnitude of effect (+1) Dose-response gradient (+1)	⊕⊕⊕ Moderate

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation; RCT, randomized controlled trial.
[a]Information about what variables were adjusted for in the multivariable model was missing.
[b]Observational study suffered from limitations in how the exposure was measured and in confounding.

Table A4: Risk of Bias Among Randomized Controlled Trials for Comparison of Single-Provider Discussions and Usual Care or No Discussion

Author, Year	Allocation Concealment	Blinding	Complete Accounting of Patients and Outcome Events	Selective Reporting Bias	Other Limitations
Kirchhoff et al, 2012 (40); Kirchhoff et al 2010 (41)	No limitations	Limitations[a]	Limitations[b]	No limitations	No limitations
Au et al, 2012 (42)	No limitations	Limitations[c]	No limitations	No limitations	Limitations[d]
Sampson et al, 2011 (51)	No limitations	Unclear	Limitations[b]	No limitations	Limitations[e]
Detering et al, 2010 (39)	No limitations	Limitations[f]	Limitations[b]	No limitations	No limitations
Clayton et al, 2007 (44)	No limitations	No limitations	Limitations[b]	No limitations	No limitations
Casarett et al, 2005 (48)	No limitations	Limitations[g]	Limitations[b]	No limitations	No limitations
Song et al, 2005 (49)	No limitations	Limitations[h]	Limitations[b]	No limitations	No limitations
Nicolasora et al, 2006 (47)	No limitations	Unclear	Limitations[b]	No limitations	No limitations
Dyar et al, 2012 (50)	Unclear	Unclear	Limitations[b]	No limitations	Limitations[i]
Jones et al, 2011 (52)	No limitations	No limitations	Limitations[b]	No limitations	No limitations

Abbreviations: RCT, randomized controlled trial.
[a]Facilitators unblinded because nature of the intervention made blinding impossible.
[b]Excluded patients with missing data, which could have introduced bias because patients with missing data likely died during the course of the study and were different from those with complete data.
[c]Patients and providers were unblinded, because nature of the intervention made blinding impossible.
[d]Physicians were randomized, not patients, so patients were clustered by physician; individual-level estimates are therefore not completely independent.
[e]Very high attrition likely introduced selection bias.
[f]Researchers administering questionnaires were blinded initially, but some responses given by participants made patient allocation obvious.
[g]Study personnel were unblinded because of nature of the study, but patients were blinded.
[h]Patients and personnel were unblinded after baseline because of nature of the intervention.
[i]Stopped study when positive effect was found.

Table A5: Risk of Bias among Randomized Controlled Trials for Comparison of Team-Based Discussions and Usual Care or No Discussion

Author, Year	Allocation Concealment	Blinding	Complete Accounting of Patients and Outcome Events	Selective Reporting Bias	Other Limitations
Gade et al, 2008 (43)	No limitations	Unclear	Limitations[a]	No limitations	No limitations
Lautrette et al, 2007 (45)	No limitations	No limitations	Limitations[a]	No limitations	No limitations
Gilmer et al, 2005 (46)	Unclear	Unclear	Limitations[a]	No limitations	No limitations

[a]Excluded patients with missing data, which could have introduced bias because patients with missing data likely died during the course of the study and were different from those with complete data.

Table A6: Risk of Bias among Observational Trials for Comparison of Single-Provider Discussions and Usual Care or No Discussion

Author, Year	Appropriate Eligibility Criteria	Appropriate Measurement of Exposure	Appropriate Measurement of Outcome	Adequate Control for Confounding	Complete Follow-Up
Observational with Contemporaneous Controls					
Evangelista et al, 2012 (54)	No limitations	No limitations	No limitations	No limitations	No limitations
Jacobsen et al, 2011 (55)	No limitations	No limitations	No limitations	Limitations[a]	No limitations
Engelhardt et al, 2009 (56)	No limitations	No limitations	No limitations	Limitations[b]	No limitations
Mack et al, 2012 (58)	No limitations	Limitations[c]	No limitations	Unclear	No limitations
Mack et al, 2010 (59)	No limitations	Limitations[c]	No limitations	No limitations	No limitations
Wright et al, 2008 (60)	No limitations	Limitations[c]	No limitations	No limitations	No limitations
Morrison et al, 2005 (62)	No limitations	No limitations	No limitations	Limitations[d]	No limitations
Zhang et al, 2009 (53)	No limitations	Limitations[e]	No limitations	Limitations[d]	No limitations
Briggs et al, 2004 (63)	No limitations	No limitations	No limitations	Limitations[f]	No limitations
Observational with Historical Controls					
Lindner et al, 2007 (66)	No limitations	No limitations	No limitations	No limitations	No limitations
Cross-Sectional					
Leung et al, 2012 (67)	No limitations	Limitations[e]	Limitations[g]	No limitations	No limitations

Mori et al, 2013 (68)	No limitations	Limitations[e]	No limitations	No limitations	No limitations
Heyland et al, 2009 (11)	No limitations	Limitations[e]	Limitations[g]	Limitations[f]	No limitations

[a]Considered only differences in age and sex; other demographic factors and potential prognostic factors not accounted for.
[b]Participants in the 2 arms differed on the basis of age and sex, and surrogates in the 2 arms differed on the basis of sex; diagnosis was the only prognostic factor assessed.
[c]Exposure was assessed on basis of patient's medical record, not through observation of the intervention being administered.
[d]Participants in the 2 arms differed on a few prognostic factors, but not on demographic factors.
[e]Exposure was assessed on basis of patient's response to a single question about discussing wishes with the physician.
[f]Participants in the 2 arms differed on prognostic factors and demographic factors.
[g]Used Likert score instead of a validated scale.

Table A7: Risk of Bias Among Observational Trials for Comparison of Team-Based Discussions and Usual Care or No Discussion

Author, Year	Appropriate Eligibility Criteria	Appropriate Measurement of Exposure	Appropriate Measurement of Outcome	Adequate Control for Confounding	Complete Follow-Up
Observational with Contemporaneous Controls					
Rabow et al, 2004 (57)	No limitations	No limitations	No limitations	No limitations	No limitations
Casarett et al, 2008 (61)	No limitations	No limitations	No limitations	Limitations[a]	No limitations
Observational with Historical Controls					
Lamba et al, 2012 (64)	No limitations	No limitations	No limitations	Limitations[b]	No limitations
Norton et al, 2007 (65)	No limitations	No limitations	No limitations	No limitations	No limitations

[a]Participants in the 2 arms differed on a few demographic and prognostic factors, but were similar overall.
[b]Considered only differences in age and sex; other demographic factors and potential prognostic factors not accounted for.

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