

Review Article

A Systematic Review and Gap Analysis of Advance Care Planning Intervention Components and Outcomes Among Cancer Patients Using the Transtheoretical Model of Health Behavior Change



Kristin Levoy, PhD(c), MSN, RN, OCN, CNE, Deborah A. Salani, DNP, PMHNP-BC, APRN, NE-BC, and Harleah Buck, PhD, RN, FPCN, FAAN

University of Miami School of Nursing and Health Studies (K.L.), Coral Gables, Florida; University of Miami School of Nursing and Health Studies (D.A.S.), Coral Gables, Florida; and University of South Florida College of Nursing (H.B.), Tampa, Florida, USA

Abstract

Context. Despite the benefits of advance care planning (ACP), cancer patients rarely engage in ACP. ACP is a process that parallels health behavior change. This makes the Transtheoretical Model of Health Behavior Change (TTM) an important framework for understanding how to increase ACP among cancer patients.

Objectives. This study aimed to systematically review ACP interventions for cancer patients by 1) categorizing ACP intervention components according to the stages and processes of behavior change in the TTM, 2) conducting a gap analysis among the categorized components, and 3) identifying patterns between the categorized intervention components and the intervention outcomes.

Methods. PubMed, CINAHL Plus, MEDLINE, Cochrane Library, and Web of Science databases were searched for articles related to ACP and cancer. ACP intervention components were abstracted, assessed for theoretical relevance, organized according to the stages and process of change in the TTM, and then synthesized.

Results. The search produced 4604 articles, with 25 meeting criteria for review. Most intervention components targeted the precontemplation and contemplation stages of change, with fewer targeting preparation, action, or maintenance. Multiple processes of change were not addressed. Interventions that resulted in ACP engagement tended to take an interdisciplinary approach to implementation and consisted of multiple consultations staged over time.

Conclusion. ACP likely requires “high touch” interventions to induce behavior change. ACP interventions that are stage-matched, use diverse mechanisms to engage ACP (i.e., processes of change), address ACP as a process, and monitor engagement across the illness trajectory are needed for cancers patients and their caregivers. *J Pain Symptom Manage* 2019;57:118–139. © 2018 American Academy of Hospice and Palliative Medicine. Published by Elsevier Inc. All rights reserved.

Key Words

Advance care planning, advance directive, behavior change, cancer, end-of-life discussions, intervention

Introduction

Advance care planning (ACP) is as an essential aspect of providing patient-centered care to those with an advanced serious illness, such as cancer.¹ ACP has three main components: completing a living

will, designating a health care surrogate, and participating in end-of-life (EOL) discussions.² Living wills and health care surrogate designations are collectively referred to as advance directives (ADs). As with all care planning, ACP is not a one-time event, but rather a

Address correspondence to: Kristin Levoy, PhD(c), MSN, RN, OCN, CNE, University of Miami School of Nursing and Health Studies, 5030 Brunson Dr., Coral Gables, FL 33146, USA. E-mail: kn117@miami.edu

Accepted for publication: October 19, 2018.

process that evolves over the patient's illness trajectory to match care to the patient's goals and values.³ Ideally, ACP should be initiated early in the illness trajectory and routinely reviewed when changes in the patient's condition or transitions of care occur.^{4,5} The often protracted illness trajectory of cancer provides a context in which ACP can occur in its ideal state. Yet, ACP, if initiated at all in oncology practice, tends to occur in the late stages of the cancer illness trajectory and is rarely reviewed afterward.^{6,7}

As a patient-centered planning process, ACP confers many benefits for patients and informal caregivers. ACP has been associated with preference-matched care at the EOL, patient and caregiver satisfaction with care, caregiver satisfaction with the quality of the death, increased out-of-hospital care (i.e., care focused on quality of life), greater hospice referrals, and reductions in aggressive (e.g., mechanical ventilation) and potentially futile treatment interventions at the EOL.⁷⁻⁹ Despite these benefits, cancer patients' engagement in ACP is relatively modest. Completion of AD forms among cancer patients ranges from 35% to 62%^{6,9,10} and engagement in EOL discussions ranges from 37% to 62%.^{9,11} Recent trends show that although cancer patients are increasingly designating health care surrogates, there have been minimal changes in completing living wills or participating in EOL discussions over a 12-year period.⁹ Addressing this modest and uneven engagement in ACP among cancer patients may benefit from a theoretical examination of interventions designed to improve engagement.

EOL research, particularly intervention studies, is not typically guided by behavioral theory.¹² Using behavioral theories in EOL research provides a framework for understanding how to engage patients in the behaviors that improve the quality of EOL care, like ACP.¹² This allows for patient-centered predictors of behavior change to be more readily identified and incorporated into personalized approaches to EOL care.¹² Thus, behavioral theory has the potential to increase the effectiveness of EOL interventions by focusing the intervention on patient-centered mechanisms of behavior change, rather than practice-centered mechanisms.¹²

The transtheoretical model of health behavior change (TTM) is one such theory that provides a framework for understanding behavior change. The TTM includes the core constructs of stages of change and embedded in these stages are processes of change.¹³ The six stages of change in the TTM are as follows: 1) precontemplation, 2) contemplation, 3) preparation, 4) action, 5) maintenance, and 6) termination. Each of the stages has a unique set of processes of change that enable a patient to move from stage to stage toward behavior change.¹³ The

model also includes the constructs of decisional balance (i.e., weighing the pros and cons of the change) and self-efficacy (i.e., confidence in ability to cope with the change without relapse), which contribute to a patient's progression along the continuum of change.¹³ But, the processes of change, in particular, have been identified as important guides for health promotion intervention design because these processes function as the driving factors that actually result in the health behavior change.¹³

ACP has been conceptualized as an activity that parallels the process of health behavior change, making the TTM an important theoretical foundation for understanding ACP behaviors and designing interventions that address ACP engagement.¹⁴⁻¹⁸ Patients demonstrate a wide range of behaviors when thinking about or actually engaging in ACP.^{17,18} These behaviors are emblematic of the TTM constructs and include the following: 1) a range of readiness to participate in ACP, which is consistent with the stages of change, 2) a range of strategies to overcome challenges in ACP, which is consistent with the processes of change and self-efficacy, and 3) a range of perceived barriers and benefits of ACP, which is consistent with decisional balance.^{17,18} In the context of ACP, the processes of change (e.g., consciousness raising, self-reevaluation, helping relationships) have been identified as the explanatory mechanisms for how patients progress across the stages of change, from not even thinking about ACP to actually engaging in ACP.¹⁹ Furthermore, psychometric testing supports the notion that stage-specific processes of change are essential in advancing patients from one stage of change to the next.²⁰ Thus, by applying the TTM framework to ACP interventions, the design of ACP interventions can be critically analyzed and ways to increase engagement or address uneven engagement in ACP can be potentially identified.

No systematic review, to our knowledge, has analyzed ACP intervention components and outcomes using a behavior change theory, although others have systematically reviewed perceptions and experiences of ACP^{21,22}; preferences for content, style, timing of EOL discussions²³; efficacy of interventions to increase AD completion²⁴; interventions targeting EOL communication²⁵; and clinical tools and practices that address ACP.²⁶ Identifying and then reviewing evidence for effective models for implementing and monitoring ACP interventions is needed.^{27,28} To move the ACP intervention science forward, this study systematically reviewed ACP interventions for cancer patients, with aims to 1) categorize ACP intervention components according to the stages and processes of behavior change in the TTM, 2) conduct a gap analysis among the behavior change categorized intervention components, and 3) identify patterns between the

behavior change categorized intervention components and successful behavior change (i.e., ACP engagement).

Methods

Eligibility Criteria

Inclusion criteria were studies that 1) conducted a patient-centered intervention that addressed engagement in ACP (inclusive of any of its three components) or complex interventions (e.g., palliative care) with embedded ACP components, 2) were published in English, 3) included an adult sample of exclusively cancer patients, and 4) had an experimental, a quasi-experimental, or a quality improvement/program evaluation design. Exclusion criteria consisted of 1) studies without an intervention, 2) studies with a non-adult population (i.e., pediatric or adolescent), 3) studies with a non-patient population (i.e., health care providers), and 4) studies including non-cancer disease groups in the sample (e.g., end-stage renal disease).

Information Sources

The PubMed, CINAHL Plus, MEDLINE (EBSCO), Cochrane Library, and Web of Science databases were used to conduct the search. The original search

was conducted in February 2017. That search was updated in both June 2017 and September 2018 to identify any additional articles published since the original search.

Search

ACP-related terms were combined with cancer-related terms in each database. The time limitation of 1990 to present was applied to each search as the Patient Self Determination Act of 1990 formalized the role of ACP in the delivery of quality health care services. Intervention-specific terms were not used in the search strategy to ensure the search captured the full breadth of ACP studies in the cancer patient population. Rather, intervention-specific terminology was used as a means of screening after the completed search. The search strategy according to each database is detailed in [Appendix A](#). The search results were compiled and managed using EndNote Reference Manager (<https://endnote.com/>).

Study Selection

The combined searches produced 4604 articles with 2548 unique articles for title and abstract review after removing duplicates ([Fig. 1](#)). The focus of the initial title and abstract review was to be as inclusive as possible. For example, if abstracts were not available, the article was kept for full-text review or if there was

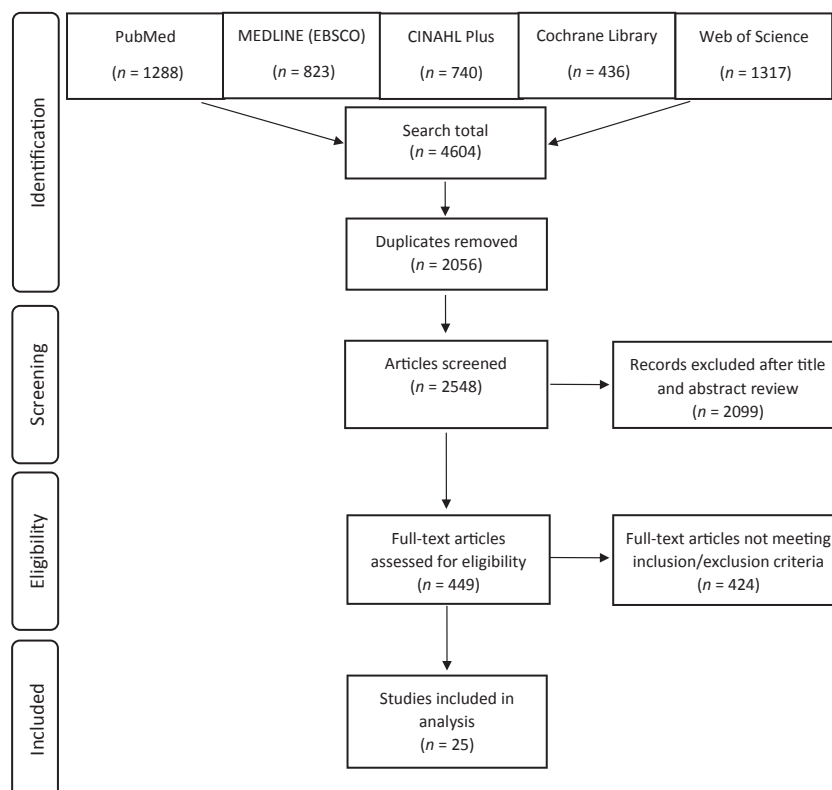


Fig. 1. PRISMA flow diagram. Adapted from Moher, Liberati, Tetzlaff, and Altman (2009).

any ambiguity in applying the inclusion and exclusion criteria, the article was kept for full-text review. Primary reasons for exclusion of articles during both title/abstract and full-text review included study design (i.e., nonexperimental designs including case studies, literature reviews, qualitative studies) or population (i.e., non-cancer patients) mismatches.

Data Collection and Items

Data abstraction was guided by the aims of this study. Data relevant to the study designs, countries conducted, type of ACP engaged by the intervention, intervention components, intervention contexts, participant characteristics, and ACP-specific outcomes were abstracted. Intervention component abstraction and categorization comprised the majority of the data collection process. Two abstractors (the first and second authors) conducted the initial abstraction and categorization of the intervention components with the third abstractor (the third author) retained for a confirmatory step. The first and second authors independently abstracted and categorized ACP intervention components into a stage of change and process of change in the TTM. A categorization guide with the standard definitions of the TTM constructs and ACP-specific examples cited in the literature guided this process^{13,17,18,20} (Supplemental Table 1). In this first step, a total of 103 intervention components were initially identified. Comparison of the two independent intervention component categorizations revealed some discrepancies. These discrepancies largely occurred owing to the multifaceted nature of the abstracted components, requiring the components to be teased apart, treated as individual components, and recategorized. All discrepancies were discussed until consensus was achieved resulting in: 1) a final list of 125 intervention components across the ACP intervention studies and 2) a preliminary component categorization according to a stage of change and process of change in the TTM.

In the confirmatory step, the third abstractor was then provided with a list of the 125 intervention components across the studies in the review. This abstractor identified one redundant intervention component in the list. This was collapsed into existing categories resulting in a final list of 124 intervention components. Using the same categorization guide, the third abstractor independently categorized the 125 intervention components and this was compared with the previous categorization schema completed by the first two abstractors. Once again, discrepancies were discussed until consensus achieved by using the categorization guide and a set of decision rules. This stepped process culminated in the final categorization of the ACP intervention components according to the stages and processes of change in the TTM.

Risk of Bias

A risk of bias tool that has been previously described in other systematic reviews was used to assess risk of bias in each study.²⁹ The studies were adjudicated as low quality (4 or less “low risk of bias” indicators), moderate quality (5–8 indicators), or high quality (9 or more indicators) based on 12 indicators. These indicators included such things as evidence of random sequence generation, baseline characteristic similarity between groups, and evidence that the intervention was independent of other changes. Finally, studies were examined to identify patterns between these quality assessments and the outcome of the intervention.

Synthesis of Results

The data abstracted from the individual studies were synthesized using a realist approach.³⁰ First, the theoretically guided intervention component categorization was totaled across each stage of change and each process of change (Aim 1). If interventions contained multiple components for a single stage of change, they were only counted once toward that particular stage of change total. Similarly, when the processes of change were summed, interventions that contained multiple components for a single process of change were only counted once. Second, the distribution of the intervention components across stages of change and processes of change was then examined for gaps and redundancies (Aim 2). Third, outcome data were synthesized by using a three-tiered coding system (change, neutral, no change) to indicate the overall study results with respect to ACP behavior change (i.e., whether the intervention resulted in ACP engagement) (Box 1). For post-test-only designs, reference ranges were derived from the literature: AD completion rates between 35% and 62%^{6,9,10} and engagement in EOL discussions between 37% and 62%.^{9,11} When outcomes were reported according to the different components of ACP, the coding system was applied to each component individually. As long as at least one of the components met the coding criteria for “change,” the overall intervention was considered to induce change. The overall ACP behavior change outcome of each intervention was then appraised in relation to the pattern of the intervention components across the stages and processes of behavior change (Aim 3).

Results

ACP Intervention Study Characteristics

The search yielded a total of 4604 articles with 2548 unique articles after duplicates were removed. After title and abstract review, 449 articles were eligible for

Box 1

Three-Tiered Behavior Change Coding System

-
- If significance reported in study
 - Coded as “change” if the ACP outcome was statistically significant
 - Coded as “no change” if nonsignificant
 - If significance not reported in study
 - Pretest/post-test design
 - Coded as “change” if post-test results exceed pretest results
 - Coded as “no change” if results similar
 - Post-test-only design
 - Coded as “change” if results exceed reported range of ACP among cancer patients
 - Coded as “neutral” if results within reported range
 - Coded as “no change” if results below reported range
-

full-text review. Of these, 25 articles met criteria for this systematic review (Fig. 1). See Table 1, for the characteristics of each of these ACP intervention studies. In general, interventions were conducted in the U.S. ($n = 18$; 72%), in an outpatient setting ($n = 20$; 80%), and addressed “whole ACP” ($n = 14$; 56%), that is, all three components of ACP (completing a living will, designating a health care surrogate, and participating in EOL discussions). Intervention approaches to increase ACP engagement included consultation-based interactions ($n = 14$, 56%), technology-based interactions ($n = 5$, 20%), and other interactions (e.g., interventions centered on exploring values and preferences for care or providing ACP education) ($n = 6$, 24%). None of the intervention approaches were informed by the TTM and eight (32%) explicitly reported theoretical underpinnings or were adaptations of theoretically grounded interventions.^{31–38} After conducting the risk of bias analysis, all studies in this review were rated with either a low quality (i.e., high risk of bias) ($n = 13$, 52%) or moderate quality ($n = 12$, 48%) assessment (Supplemental Table 2).

A total of 2653 patients (sample sizes ranged from 17 to 491; mean ages ranged from 54–72 years) and 409 caregivers were included across the studies. Six interventions had some level of caregiver involvement yet actual numbers of caregivers were not reported.^{34,39–43} Interventions targeted cancer patients from the new diagnosis of cancer^{33,44} to the EOL.^{32,34–39,41,45–47} The majority of interventions ($n = 16$; 64%) included patients with advanced stage cancer (Stage III or IV), progressive cancer, or patients with an estimated survival of less than one year.

ACP Intervention Component Categorization and Gap Analysis

Stages of Change. Categorization of intervention components according to the stages of change in the TTM revealed most interventions targeted the

precontemplation ($n = 23$; 92%) and contemplation ($n = 22$; 88%) stages of change (Fig. 2). Percentages sum to greater than 100% because interventions could address multiple stages of change. When the gap analysis was conducted, we found that fewer studies used intervention components that targeted the preparation ($n = 12$; 48%), action ($n = 14$; 56%), or maintenance ($n = 1$; 4%) stages of change (Fig. 2).

Processes of Change. Categorization of intervention components according to the processes of change in the TTM found that consciousness raising ($n = 24$; 96%), self-reevaluation ($n = 19$; 76%), and helping relationships ($n = 13$; 52%) were common mechanisms used across interventions to move patients to engage in ACP (Table 2). When the gap analysis was conducted, there were fewer studies that used intervention components that targeted the dramatic relief ($n = 5$; 20%), environmental reevaluation ($n = 6$; 24%), self-liberation ($n = 12$; 48%), stimulus control ($n = 4$; 16%), and contingency management ($n = 2$; 8%) processes of change (Table 2). None of the categorized intervention components were consistent with the counterconditioning process of change.

ACP Intervention Outcome Pattern Identification

How ACP-specific outcomes (e.g., completion of an AD) were measured and reported was inconsistent across the studies (Table 2). Despite having included components of ACP, five (20%) intervention studies lacked any ACP-specific outcomes.^{35,37,41,45,48} Instead, these studies reported outcomes such as ACP knowledge,^{41,45} preferences for EOL care,^{41,45} patients' perceived likelihood of ACP engagement,³⁵ decisional conflict,³⁷ uncertainty,⁴⁵ anxiety,^{37,48} depression,³⁷ distress,³⁷ and satisfaction.⁴⁸ In addition, ACP-specific outcome monitoring was incomplete across studies. For example, among the 14 interventions that fully engaged the three components of ACP (i.e., “Whole ACP”), 10 did not report EOL discussion frequency,^{33,36,39,43,44,46,49–52} one did not report living will completion nor health care surrogate designation status,³⁴ and two generally reported an “advance care planning” outcome without a clear definition of how ACP was operationalized in the intervention.^{53,54}

A minority of studies in this review conducted power analyses ($n = 8$; 32%).^{33–35,37,39,45,51,55} Among these power analyses, only four were actually conducted with respect to the ACP behavior change outcome. Of these four, three were underpowered to detect ACP behavior change^{33,34,39} and one was powered to detect ACP behavior change.⁵⁵

When outcomes were coded (change, neutral, no change) among the 20 interventions that did report

Table 1
ACP Intervention Study Characteristics

Authors/Publication Year	Study	Intervention	Participants
Clayton et al. (2007)	Experimental Australia Sample size: 174 patients 92 intervention 82 control 123 caregivers	<i>Approach:</i> Other—question prompt list <i>ACP type:</i> End-of-life discussion <i>Delivery:</i> Outpatient palliative care clinic <i>Timing:</i> Within three consultations of the initial contact with the palliative care physician	<i>Mean age:</i> 66 intervention 65 control <i>% Male:</i> 61 intervention 60 control <i>Cancer types:</i> Breast, GI, prostate, respiratory system, skin <i>Cancer severity:</i> 73% with >12 weeks physician estimated survival in intervention 77% with >12 weeks physician estimated survival in control
Pautex et al. (2008)	Quasi-experimental Switzerland Sample size: 53 patients 53 caregivers	<i>Approach:</i> Other—education based <i>ACP type:</i> Advance directive <i>Delivery:</i> Inpatient palliative care unit <i>Timing:</i> During hospitalization	<i>Mean age:</i> 72 overall <i>% Male:</i> 42 overall <i>Cancer types:</i> Breast, hematologic, GI, GU, respiratory system <i>Cancer severity:</i> Estimated life expectancy of less than six months
El-Jawahri et al. (2010)	Experimental U.S. Sample size: 59 patients 23 intervention 27 control	<i>Approach:</i> Technology—video based <i>ACP type:</i> End-of-life discussion <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> During clinic visit	<i>Mean age:</i> 54 overall 56 intervention 51 control <i>% Male:</i> 56 overall 61 intervention 52 control <i>Cancer types:</i> Brain <i>Cancer severity:</i> Poor prognosis
Jones et al. (2011)	Experimental United Kingdom Sample size: 77 patients 36 preference-matched arm 41 randomized arm NR caregivers	<i>Approach:</i> Consultation—staged <i>ACP type:</i> End-of-life discussion and living will <i>Delivery:</i> Outpatient oncology clinic and a hospice center <i>Timing:</i> Baseline measures collected at clinic visit with up to three subsequent appointments to receive intervention	<i>Mean age:</i> 62 overall <i>% Male:</i> 51 overall <i>Cancer types:</i> Brain, breast, GI, GYN, hematologic, multiple sites, neuroendocrine, prostate, renal, respiratory system, skin <i>Cancer severity:</i> Participants had completed primary course of treatment for cancer and had evidence of active, progressive disease
Dyar et al. (2012)	Experimental U.S. Sample size: 26 participants 12 intervention 14 control 26 caregivers	<i>Approach:</i> Consultation—staged <i>ACP type:</i> Whole ACP <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> Intervention at the baseline clinic visit and one month later	<i>Mean age:</i> 66 overall 67 intervention 65 control <i>% Male:</i> 31 overall 25 intervention 36 control <i>Cancer types:</i> Breast, prostate, respiratory system <i>Cancer severity:</i> Physician estimated hospice referral likely within 12 months of enrollment
Volandes et al. (2012)	Quasi-experimental U.S. Sample size: 80 participants NR caregivers	<i>Approach:</i> Technology—video based <i>ACP type:</i> End-of-life discussion <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> During the clinic visit	<i>Mean age:</i> 65 overall <i>% Male:</i> 73 overall <i>Cancer types:</i> Breast, hematologic, leiomyosarcoma, pancreatic, prostate, skin <i>Cancer severity:</i> Physician judgment that the patient had terminal, progressive cancer with a palliative treatment intent

(Continued)

Table 1
Continued

Authors/Publication Year	Study	Intervention	Participants
Epstein et al. (2013)	Experimental U.S. Sample size: 57 participants 30 intervention 26 control NR caregivers	<i>Approach:</i> Technology—video based <i>ACP type:</i> Whole ACP <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> During clinic visit	<i>Mean age:</i> 65 intervention 66 control <i>% Male:</i> 50 intervention 54 control <i>Cancer types:</i> GI <i>Cancer severity:</i> Physician estimated life expectancy of less than one year
Vogel et al. (2013)	Experimental U.S. Sample size: 35 participants 20 intervention 15 control 6 caregivers	<i>Approach:</i> Technology—computer based <i>ACP type:</i> Whole ACP <i>Delivery:</i> Online <i>Timing:</i> 60-day trial of ACP web site with expectation of accessing the web site two to three times weekly	<i>Mean age:</i> 58 overall 60 intervention 56 control <i>% Male:</i> None <i>Cancer types:</i> GYN <i>Cancer severity:</i> Participants with a new diagnosis, in remission, or experiencing a first or multiple recurrence
Kuntz et al. (2014)	Program evaluation U.S. Sample size: 85 patients	<i>Approach:</i> Other—embedded ACP in oncology medical home project <i>ACP type:</i> Whole ACP <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> Within 60 days of initiating cancer treatment	<i>Mean age:</i> NR <i>% Male:</i> NR <i>Cancer types:</i> Breast, colon, respiratory system <i>Cancer severity:</i> Participants undergoing a new chemotherapy start
Obel et al. (2014)	Quality improvement U.S. Sample size: 48 patients	<i>Approach:</i> Consultation—staged <i>ACP type:</i> Whole ACP <i>Delivery:</i> Outpatient oncology practice <i>Timing:</i> Starting at initial patient consultation and continuing through the third visit	<i>Mean age:</i> NR <i>% Male:</i> NR <i>Cancer types:</i> GI, respiratory system <i>Cancer severity:</i> New diagnosis Stage IV cancer
Trarieux-Signol et al. (2014)	Program evaluation France Sample size: 197 patients	<i>Approach:</i> Other—updated ACP procedure <i>ACP type:</i> Whole ACP <i>Delivery:</i> Inpatient hospital <i>Timing:</i> During admission	<i>Mean age:</i> 64 overall <i>% Male:</i> 56 overall <i>Cancer types:</i> Hematologic <i>Cancer severity:</i> 78% of the sample had a two-year survival rate
Yeh et al. (2014)	Quasi-experimental U.S. Sample size: 30 patients	<i>Approach:</i> Other—question prompt list <i>ACP type:</i> End-of-life discussion <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> Before a new patient consultation	<i>Mean age:</i> 57 overall <i>% Male:</i> 67 overall <i>Cancer types:</i> Head and neck <i>Cancer severity:</i> Advanced or metastatic Stage III or IV cancer
Ferrell et al. (2015)	Quasi-experimental U.S. Sample size: 491 patients 272 intervention 219 control	<i>Approach:</i> Consultation—embedded ACP in staged palliative care consultations <i>ACP type:</i> Whole ACP <i>Delivery:</i> Outpatient oncology clinic and over the phone <i>Timing:</i> Baseline assessment and interdisciplinary palliative care meeting followed by four educational sessions	<i>Mean age:</i> 65 yrs and older overall, mean not reported <i>% Male:</i> 36 intervention 41 control <i>Cancer types:</i> Respiratory system <i>Cancer severity:</i> Stage I–IV cancer

Green et al. (2015)	Experimental U.S. Sample size: 200 patients 99 intervention 101 control	<i>Approach:</i> Technology—computer based <i>ACP type:</i> Advance directive <i>Delivery:</i> Outpatient oncology clinic, research center, and online <i>Timing:</i> During one study visit	<i>Mean age:</i> 61 intervention 60 control <i>% Male:</i> 59 intervention 60 control <i>Cancer types:</i> Brain, GI, hematologic, respiratory system <i>Cancer severity:</i> Anticipated life expectancy of two or less years
Michael et al. (2015)	Quasi-experimental Australia Sample size: 30 patients 26 caregivers	<i>Approach:</i> Consultation—single consultation with clinical case vignettes <i>ACP type:</i> Whole ACP <i>Delivery:</i> Outpatient oncology clinic or participant home <i>Timing:</i> During study visit	<i>Mean age:</i> 62 patients 58 caregivers <i>% Male:</i> 63 patients 31 caregivers <i>Cancer types:</i> GI, GU, head and neck, respiratory system, sarcoma <i>Cancer severity:</i> Stage III or IV cancer Prognosis of more than six weeks
Schenker et al. (2015)	Quasi-experimental U.S. Sample size: 23 patients 19 caregivers	<i>Approach:</i> Consultation—embedded ACP in staged palliative care consultations <i>ACP type:</i> Whole ACP <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> Before or after regularly scheduled clinic visits occurring at least once monthly for three months	<i>Mean age:</i> 67 patients 57 caregivers <i>% Male:</i> 48 patients 11 caregivers <i>Cancer types:</i> Breast, cervical, GI, neuroendocrine, ovarian, pancreatic, prostate, respiratory system <i>Cancer severity:</i> Physician judgment that patient likely to be admitted to the ICU or die in the next year
Ma et al. (2016)	Quasi-experimental U.S. Sample size: 34 patients 34 caregivers	<i>Approach:</i> Consultation—single <i>ACP type:</i> Whole ACP <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> During clinic visit	<i>Mean age:</i> NR <i>% Male:</i> NR <i>Cancer types:</i> NR <i>Cancer severity:</i> Prognosis of less than one year
Brohard (2017)	Quasi-experimental U.S. Sample size: 50 patients 25 intervention 25 control	<i>Approach:</i> Consultation—single <i>ACP type:</i> End-of-life discussion <i>Delivery:</i> Participant's home <i>Timing:</i> During a study visit	<i>Mean age:</i> 71 intervention 69 control <i>% Male:</i> 60 intervention 52 control <i>Cancer types:</i> Breast, GI, GYN, prostate, respiratory system <i>Cancer severity:</i> Terminal cancer with recent hospice enrollment
Peltier et al. (2017)	Program evaluation U.S. Sample size: 69 patients 24 intervention 45 historical control	<i>Approach:</i> Consultation—staged <i>ACP type:</i> Whole ACP <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> During clinic visit with subsequent intervention visits as desired by patient over a four-month period	<i>Mean age:</i> NR <i>% Male:</i> NR <i>Cancer types:</i> NR <i>Cancer severity:</i> NR
Rodenbach et al. (2017)	Experimental U.S. Sample size: 170 patients 84 intervention 86 control 122 caregivers 63 intervention 59 control	<i>Approach:</i> Other—question prompt list <i>ACP type:</i> End-of-life discussion <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> During clinic visit or up to three days before clinic visit	<i>Mean age:</i> NR <i>% Male:</i> 40 intervention 41 control <i>Cancer types:</i> Stage III or IV nonhematologic cancer <i>Cancer severity:</i> Physician judgment that patient likely to die in the next year

(Continued)

Table 1
Continued

Authors/Publication Year	Study	Intervention	Participants
Walczak et al. (2017)	Experimental Australia Sample size: 110 patients 61 intervention 49 control NR caregivers	<i>Approach:</i> Consultation—staged <i>ACP type:</i> Whole ACP <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> During study visit occurring one week before clinic visit with follow-up phone call one to two weeks after the clinic visit	<i>Mean age:</i> 64 overall 64 intervention 66 control <i>% Male:</i> 66 overall 62 intervention 69 control <i>Cancer types:</i> Bladder, bone, breast, GI, GU, GYN, head and neck, hematologic, prostate, respiratory system, soft tissue, testicular <i>Cancer severity:</i> Physician estimated two- to 12-month life expectancy
Xing et al. (2017)	Quasi-experimental China Sample size: 412 patients NR caregivers	<i>Approach:</i> Other—education based <i>ACP type:</i> Advance directive <i>Delivery:</i> Inpatient hospital <i>Timing:</i> While undergoing cancer treatment	<i>Mean age:</i> 57 in the group that was accepting of an advance directive 55 in the group that was not accepting of an advance directive <i>% Male:</i> 60 in the group that was accepting of an advance directive 57 in the group that was not accepting of an advance directive <i>Cancer types:</i> NR <i>Cancer severity:</i> NR
Bekelman et al. (2018)	Quasi-experimental U.S. Sample size: 17 patients	<i>Approach:</i> Consultation—embedded ACP in staged palliative care peer navigation visits <i>ACP type:</i> Whole ACP <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> Five planned visits occurring during a clinic visit or over the phone spanning approximately three months	<i>Mean age:</i> 67.4 <i>% Male:</i> 94% <i>Cancer types:</i> Central nervous system, GI, GU, hematologic, respiratory system <i>Cancer severity:</i> Physician judgment that patient likely to die in the next year
Epstein et al. (2018)	Experimental U.S. Sample size: 91 patients 33 intervention arm 1 43 intervention arm 2 23 control	<i>Approach:</i> Consultation—staged, utilized technology <i>ACP type:</i> End-of-life discussion <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> During clinic visit with a one-month follow-up visit	<i>Mean age:</i> 61 in intervention arm 1 (video + values interview) 63 in intervention arm 2 (video only) 59 in usual care <i>% Male:</i> 61 in intervention arm 1 64 in intervention arm 2 66 in usual care <i>Cancer types:</i> GI <i>Cancer severity:</i> Physician estimated one- to 12-month life expectancy
Rabow et al. (2018)	Quasi-experimental U.S. Sample size: 35 patients NR caregivers	<i>Approach:</i> Consultation—staged, group workshop format <i>ACP type:</i> Whole ACP <i>Delivery:</i> Outpatient oncology clinic <i>Timing:</i> During two study visits occurring two weeks apart	<i>Median age:</i> 58 <i>% Male:</i> NR <i>Cancer types:</i> Brain, GI, GU, GYN, hematologic, prostate <i>Cancer severity:</i> NR

ACP = advance care planning; GI = gastrointestinal; GU = genitourinary; NR = not reported; GYN = gynecologic.

<u>TTM Stages of Change</u>	<u>TTM Processes of Change</u>
Precontemplation <i>n</i> = 23 (92%)	• Consciousness-raising = 21/23 (91%) • Environmental reevaluation = 3/23 (13%) • Dramatic relief = 3/23 (13%)
Contemplation <i>n</i> = 22 (88%)	• Self-reevaluation = 19/22 (86%) • Consciousness raising = 6/22 (27%) • Dramatic relief = 2/22 (9%) • Environmental reevaluation = 3/22 (14%)
Preparation <i>n</i> = 12 (48%)	• Self-liberation = 12/12 (100%)
Action <i>n</i> = 14 (56%)	• Helping relationships = 13/14 (93%) • Stimulus control = 3/14 (21%) • Contingency management = 1/14 (7%) • Counterconditioning = None
Maintenance <i>n</i> = 1 (4%)	• Stimulus control = 1/1 (100%) • Contingency management = 1/1 (100%) • Counterconditioning = None • Helping relationships = None

Fig. 2. ACP intervention component gap analysis. Processes of change numbers represent within stage proportions, rather than across study proportions. ACP = advance care planning; TTM = transtheoretical model of health behavior change.

ACP-specific outcomes, 14 (70%) resulted in at least some behavior change among the ACP components (i.e., ACP engagement), one (5%) was neutral in behavior change, and five (25%) did not result in behavior change. No distinct pattern between the number of stages or processes of change engaged by each intervention and the outcome of the intervention was identified (Table 2). In addition, no distinct pattern between the quality assessment of each study (i.e., risk of bias) and the outcome of the intervention was identified.

However, several trends in the nature of the intervention were identified among the interventions that successfully engaged in ACP. Among the 14 interventions that resulted in behavior change, 12 (86%) used either an interdisciplinary approach (*n* = 7) or a nonphysician ACP facilitator (*n* = 5). Seven of these also included multiple, interactive face-to-face or phone-based consultations staged over time and five included active involvement of the patient's caregiver in the intervention.

Discussion

This is the first systematic review of ACP interventions that used the TTM to categorize intervention

components, conduct a gap analysis, and identify outcome patterns. Categorization of the intervention components using the TTM revealed potentially important gaps in ACP intervention design that may explain the mixed outcomes in the studies analyzed, but more importantly the less than robust ACP engagement among cancer patients.

ACP Intervention Study Characteristics

Despite evidence to support the personalization of ACP interventions using the TTM framework,^{14–18} none of the ACP interventions in this systematic review were informed by the TTM. In one instance, participant reported stages of change were collected as an outcome of the intervention, rather than being used to personalize the intervention.³³ More meaningful clinical interactions may occur by stage-matching interventions. Stage-matched interventions using the TTM have theoretically and empirically been shown to improve the acceptability of interventions and increase behavior change.¹³ TTM-specific tools to assess stages of change are available and warrant incorporation in future ACP intervention designs for cancer patients.^{20,56}

Stage-matched ACP interventions have recently been studied among individuals in the general public,

Table 2
 Categorization of ACP Intervention Components According to the TTM

Authors/Intervention Objective	Stages of Change					ACP Type: Outcome
	Precontemplation	Contemplation	Preparation	Action	Maintenance	
ACP-Centered Interventions						
Pautex et al. (2008) Role of physician-facilitated advance directive information in advance directive completion and satisfaction with end-of-life care	<i>Consciousness-raising:</i> Senior physician—led information on AD <i>Consciousness raising:</i> Senior physician encouragement to complete AD	<i>Consciousness raising:</i> Unit staff—led oral information for patient’s expressing interest		<i>Helping relationships:</i> HCP-led writing assistance after commitment	AD: change	
El-Jawahri et al. (2010) Role of a levels-of-care video in patient preferences for end-of-life care and uncertainty in decision-making versus verbal narrative alone control	<i>Consciousness-raising:</i> Physician-led introduction to ADs, end-of-life planning, and goals-of-care during screening <i>Consciousness-raising:</i> Baseline knowledge assessment of levels of medical care <i>Consciousness-raising:</i> Verbal narrative of three levels of medical care	<i>Self-reevaluation:</i> Baseline assessment of patient preferences for CPR in advanced cancer	<i>Self-liberation:</i> Six-minute video with images of three levels of medical care: life prolonging, basic, and comfort care	<i>Helping relationships:</i> Post-assessment of patient preferences for CPR in advanced cancer <i>Helping relationships:</i> Post-assessment of patient preferred level of care in advanced cancer	NR	
Jones et al. (2011) Role of an ACP discussion session with an independent facilitator in subsequent end-of-life discussions versus usual care control	<i>Consciousness- raising:</i> Patient chose to receive the ACP discussion in addition to usual care, continue with usual care only, or be randomized	<i>Self-reevaluation:</i> Up to three ACP facilitator-led discussions using a checklist of topic domains that explored the patient’s perceptions of the cancer, future concerns/decisions, and HCP and family communication	<i>Self-liberation:</i> Option to complete a living will		EOLD: no change ^a	
Volandes et al. (2012) Role of a goals-of-care video in preferences for and knowledge of end-of-life care	<i>Consciousness-raising:</i> Baseline and post knowledge assessment of levels of medical care <i>Consciousness-raising:</i> Verbal narrative of three levels of medical care in advance cancer	<i>Self-reevaluation:</i> Baseline assessment of patient preferences for CPR or mechanical ventilation	<i>Self-liberation:</i> Six-minute video with images of three levels of medical care: life prolonging, basic, and comfort care	<i>Helping relationships:</i> Post-assessment of patient preferred level of care after verbal narrative <i>Helping relationships:</i> Post-assessment of patient preferred level of care after video <i>Helping relationships:</i> Post-assessment of patient preferences for CPR or mechanical ventilation	NR	

Epstein et al. (2013) Role of a CPR video in ACP documentation, ACP knowledge, and preference for cardiopulmonary resuscitation/ventilation versus a CPR control	<i>Consciousness-raising:</i> Physician-led introduction to ACP <i>Consciousness-raising:</i> Baseline and post knowledge assessment of ACP <i>Consciousness-raising:</i> Video- or narrative-based education on CPR and mechanical ventilation <i>Dramatic relief:</i> Video images of CPR and mechanical ventilation	<i>Self-reevaluation:</i> Baseline assessment of patient preferences for CPR or mechanical ventilation	<i>Helping relationships:</i> Post-assessment of patient preferences for CPR or mechanical ventilation		AD: No change ^a
Vogel et al. (2013) Role of website in AD completion and participation in a palliative care consultation versus control website with usual care information documents	<i>Consciousness-raising/ environmental reevaluation:</i> Separate patient and caregiver websites <i>Consciousness-raising:</i> Educational materials on decision-making <i>Consciousness-raising:</i> Suggested reading based on cancer stage <i>Consciousness-raising:</i> three levels of education available <i>Environmental reevaluation:</i> Discussions with caregivers/HCPs encouraged	<i>Dramatic relief:</i> Social media features (i.e., shared journal, discussion forum) <i>Self-reevaluation:</i> Feature to record questions to ask HCPs <i>Self-reevaluation:</i> Interactive medical decision guide	<i>Self-liberation:</i> AD form on website		AD: no change ^a
Obel et al. (2014) Role of a pilot ACP intervention in ACP completion versus historical controls	<i>Consciousness-raising:</i> At first visit, physician review of nurse assessed ACP information and physician encouraged ACP <i>Consciousness-raising:</i> At first visit, ACP guidebook provided <i>Consciousness-raising:</i> At second visit, nurse-led ACP education if indicated by physician <i>Environmental reevaluation:</i> Social work consultation if difficulty with ACP	<i>Self-reevaluation:</i> Nurse-led ACP assessment at first visit using four standardized questions <i>Self-reevaluation:</i> At second visit, nurse-led ACP guidebook review to explore patient goals, beliefs, and end-of-life views	<i>Helping relationships:</i> At third visit, physician discussed goals of care with the patient	<i>Contingency management/ stimulus control:</i> If disease progression, an algorithm directed the HCP to revisit goals of care and discuss treatment options with a corresponding AD note documented if changes	AD: change
Trarieux-Signol et al. (2014) Role of a program to inform patient's	<i>Consciousness-raising:</i> Two educational posters for patient's and caregivers <i>Consciousness-raising:</i>	<i>Self-liberation:</i> Welcome procedure provided option to designate a health care surrogate,			Living will: no change HCS: change

(Continued)

Table 2
Continued

Authors/Intervention Objective	Stages of Change					ACP Type: Outcome
	Precontemplation	Contemplation	Preparation	Action	Maintenance	
about ADs and encourage discussion of end-of-life preferences in the documentation of health care surrogates and living wills	Welcome handout with patient information form and description of the "Patients Rights and End-of-Life Care" Act in France <i>Consciousness-raising:</i> Trained HCPs presented concepts of HCS and living will to patient		complete a living will, and/or meet with a religious representative <i>Self-liberation:</i> AD form with few instructions to encourage patient expression of desires			
Yeh et al. (2014) Role of a question prompt list in use of question prompt list, patient anxiety, and patient satisfaction	<i>Consciousness-raising:</i> One-page question prompt list provided before physician consultation and encouragement to use it					NR
Green et al. (2015) Role of "Making Your Wishes Known" online decision aid in hope and anxiety versus control with online AD and educational materials	<i>Consciousness-raising:</i> Education components about conditions that lead to loss of decision-making capacity and medical treatments at the end of life	<i>Self-reevaluation:</i> Prompts to articulate values, goals, and preferences for medical care		<i>Stimulus control:</i> Advance directive generated using the patient's responses to decision aid		AD: change
Michael et al. (2015) Role of a nurse-led ACP intervention using vignette technique in ACP knowledge, satisfaction, and decision conflict	<i>Consciousness-raising:</i> Baseline and post knowledge assessment of ACP <i>Consciousness-raising:</i> Nurse-led ACP education <i>Dramatic relief:</i> Nurse-led presentation of case vignettes regarding role of ACP in decision-making	<i>Self-reevaluation:</i> Nurse tailored intervention discussion to patient-caregiver decision-making needs <i>Self-reevaluation:</i> Assessment of need for support from social workers, psychologists, or pastoral care	<i>Self-liberation:</i> Nurse encouraged patient and caregiver to discuss values related to end of life and complete ACP documents	<i>Helping relationships:</i> Nurse offered opportunity to complete ACP documents or have further conversations with caregivers/HCPs		AD: change
Ma et al. (2016) Role of a social worker-led ACP intervention in generating an informed health care surrogate and AD completion	<i>Consciousness-raising:</i> Social worker encouragement to complete an AD			<i>Helping relationships:</i> Social worker—led conversation with the patient and health care surrogate exploring end-of-life preferences <i>Helping relationships:</i> Confirmation that health care surrogate understood the stated preferences		AD: change ^a

Brohard (2017) Role of a nurse-led autobiographic memory intervention and ACP survey in patient perceived likelihood of ACP decision-making and communication versus ACP survey—only control	<i>Consciousness-raising:</i> Completion of ACP survey before interview	<i>Dramatic relief:</i> Patient recollection of a loved one who died of cancer and the person's ACP/end-of-life decisions <i>Self-reevaluation:</i> Patients compare memories to their current situation <i>Consciousness-raising:</i> Completion of ACP survey after interview <i>Consciousness-raising:</i> Nurse-led summary of interview		NR
Peltier et al. (2017) Role of an ACP facilitator—led ACP intervention in ACP completion and health care utilization versus usual care control	<i>Consciousness-raising:</i> Mailed letter outlining pilot program and benefits of ACP before appointment	<i>Self-reevaluation:</i> At appointment, ACP questions regarding past conversations, documents, and desire to meet to revisit and/or explore future decision-making <i>Consciousness-raising:</i> Coaching on how to ask the physician questions or express concerns <i>Self-reevaluation:</i> Review of a question prompt list booklet with the patient/caregiver <i>Self-reevaluation/environmental reevaluation:</i> Patient/caregiver identification and prioritization of two to three topics of interest from question prompt list	<i>Helping relationships:</i> If desire to meet regarding ACP, discussions scheduled and carried out	ACP: no change ^a
Rodenbach et al. (2017) Role of a one-hour social worker—led coaching session in the number and nature of topics discussed with the physician versus usual care control				EOLD: change ^a
Walczak et al. (2017) Role of a nurse-led communication support program in end-of-life discussions versus usual care control	<i>Consciousness-raising:</i> DVD with ACP education provided to patient	<i>Self-reevaluation:</i> Nurse-led 45-minute consultation reviewing a question prompt list one week before the physician appointment <i>Self-reevaluation:</i> Patient prompted to choose one to three questions to ask at the physician appointment	<i>Self-liberation:</i> Nurse-led 15-minute booster telephone call one to two weeks after the consultation to reinforce content and prepare for discussions in future consultations	EOLD: change ^a
Xing et al. (2017) Role of an AD intervention in the acceptance of an AD	<i>Consciousness-raising:</i> Physician informally introduced AD to patient's main decision	<i>Consciousness-raising:</i> Physician officially recommended AD when treatment was	<i>Self-liberation:</i> Physician systematically reviewed AD choices if desire to complete expressed	Living will: neutral

(Continued)

Table 2
Continued

Authors/Intervention Objective	Stages of Change					ACP Type: Outcome
	Precontemplation	Contemplation	Preparation	Action	Maintenance	
and AD completion	maker while patient was receiving treatment	terminated or if a high risk of sudden death				
Epstein et al. (2018) Role of a research assistant–led values-based advance care planning on decisional conflict and well-being versus a goals-of-care video control and a usual care control		<i>Self-reevaluation:</i> At first follow-up after values interview, one-page summary of values interview reviewed and corrected by patient <i>Environmental reevaluation:</i> Corrected one-page summary of values interview given to patient to keep and patient encouraged to share with loved ones	<i>Self-liberation:</i> Six-minute video with images and accompanying narration of three levels of medical care: life prolonging, limited care, and comfort care	<i>Helping relationships:</i> Research assistant–led patient values interview with 11 questions related to goals, care goals video, concerns, and sources of support <i>Helping relationships:</i> Post-assessment of changes in ACP values at one-month follow-up		NR
Rabow et al. (2018) Role of a nurse-led ACP workshop in ACP readiness and AD completion	<i>Dramatic relief:</i> Poem reading when workshop began <i>Dramatic relief:</i> Introductions with personal reasons for attending workshop and sharing of diagnosis <i>Consciousness-raising:</i> ACP information packets <i>Consciousness-raising:</i> Patients heard about care in hospital and hospice as well as choosing a health care surrogate	<i>Self-reevaluation:</i> At the end of first session, patients were prompted to either write or talk about the meaning of quality of life and the meaning of and personal criteria for starting/stopping life support <i>Environmental reevaluation:</i> At the end of first session, patients asked to play “Go Wish” with their family	<i>Self-liberation:</i> At the end of first session, patients were asked to name a health care surrogate, discuss their wishes with that person, and document their wishes using the “Five Wishes” form over the next two weeks	<i>Helping relationships:</i> Patients shared stories with the group about their ACP process over the last two weeks <i>Stimulus control:</i> Patients and caregivers reviewed the “Five Wishes” form and asked questions <i>Helping relationships:</i> At the second session, notary public present to notarize forms		AD: change
Interventions with Embedded ACP						
Clayton et al. (2007) Role of a question prompt list in questions and discussion of end-of-life topics in a palliative care consultation versus routine palliative care consultation control	<i>Consciousness-raising:</i> Physician endorsed and referred to question prompt list during consultation	<i>Self-reevaluation:</i> Question prompt list provided to patient and caregiver 20–30 minutes before the consultation to explore questions they desired to ask the physician				EOLD: change ^a
Dyar et al. (2012) Role of a discussion-based palliative care intervention with a nurse practitioner in quality of life, hospice knowledge, and hospice use	<i>Consciousness-raising:</i> Nurse-led education on hospice	<i>Consciousness-raising:</i> Nurse assessed physical, psychological, cognitive, social, and spiritual needs		<i>Helping relationships:</i> Nurse-led assistance filling out “Five Wishes” documents and living will forms		AD: change

Kuntz et al. (2014) Role of an oncology medical home model in standardization of treatment/symptom management and early ACP versus historical control	<i>Consciousness-raising:</i> Patient portal with educational materials	<i>Self-reevaluation:</i> Program features to help patient's define their preferences for the end of life within 60 days of initiating treatment			ACP: no change
Ferrell et al. (2015) Role of an interdisciplinary palliative care intervention in quality of life, symptom management, and psychological distress versus usual care control	<i>Consciousness-raising:</i> Four nurse-led educational sessions according to four quality of life domains (~36 minutes/each) <i>Consciousness-raising:</i> Weekly interdisciplinary palliative care team meetings to discuss nurse assessment (~20 minutes/each); recommendations shared with patient	<i>Consciousness raising:</i> Comprehensive baseline nurse assessment of quality of life, symptoms, and psychological distress <i>Self-reevaluation:</i> Patient-driven discussion during educational sessions based on quality of life topics of interest			AD: change ^a
Schenker et al. (2015) Role of a nurse-led care management approach to a primary palliative care intervention in symptom assessment, emotional support, ACP, and care coordination	<i>Consciousness-raising:</i> Information sheet given during recruitment <i>Consciousness-raising:</i> Nurse-led assessment of patient views of illness and coping <i>Environmental reevaluation:</i> Patients identified a primary caregiver <i>Environmental reevaluation:</i> Patient/caregiver involvement in ACP using shared care plan	<i>Self-reevaluation:</i> Nurse-led discussions on treatment preferences and future goals during the second and third visit <i>Self-reevaluation:</i> Nurse-led follow-up phone call to assess for additional needs within one week of visits	<i>Self-liberation:</i> Copy of "Five Wishes" Document provided at first visit <i>Self-liberation:</i> The first of the three nurse-led encounters focused on choosing a health care surrogate	<i>Helping relationships:</i> Completion of "Five Wishes" document at third visit	EOLD: neutral AD: change
Bekelman et al. (2018) Role of a peer navigator and social worker-led palliative care intervention in quality of life and AD documentation	<i>Consciousness-raising:</i> Peer navigator-led education on three palliative care domains (ACP, pain and symptom management, hospice) across all visits	<i>Self-reevaluation:</i> Peer navigator-led assistance in completing a goals/values history <i>Self-reevaluation:</i> If high distress rating at visit assessment, social worker-led psychosocial assessment with psychotherapy modules (e.g., social supports, ACP, living with a life-threatening illness) and handouts	<i>Self-liberation:</i> Blank copy of AD provided	<i>Helping relationships:</i> Peer navigator-led assistance completing AD <i>Helping relationships:</i> Peer navigator-led discussion of goals/values history <i>Contingency management:</i> Reinforcement of benefits and limitations of ACP <i>Stimulus control:</i> Review of AD documents	AD: change

ACP = advance care planning; TTM = transtheoretical model of health behavior change; TMBC = transtheoretical model of behavior change; AD = advance directive; HCP = health care provider; CPR = cardiopulmonary resuscitation; NR = not reported; EOLD = end-of-life discussion; DVD = digital versatile disk.

^aChange determination made based on significance testing with a $P < 0.05$.

including a sample of diverse, older adults residing in the community⁵⁷ and a sample of adults from faith-based organizations in the community.⁵⁸ These stage-matched interventions in non-cancer populations helped to promote engagement in the ACP behaviors (i.e., processes) that progress participants along the stages of change⁵⁷ and in the actual completion and revision of ADs.⁵⁸ By stage-matching interventions, a more nuanced picture of ACP is elucidated, in that, ACP engagement can be captured beyond just the overt completion of an AD to being able to capture the more subtle, incremental improvements in ACP, like engagement in the processes that incite a transition to a higher stage of change.⁵⁷ Moreover, when compared to other intervention strategies, stage-matched interventions have the potential for more robust outcomes, particularly when the outcomes are examined longitudinally.¹³ This presents a pressing need for stage-matched ACP interventions for cancer patients, particularly when considering the length of the cancer illness trajectory.

ACP Intervention Component Categorization and Gap Analysis

Stages of Change. Nearly all the ACP interventions reviewed addressed the precontemplation and contemplation stages of change; fewer addressed preparation and action; and only one addressed maintenance. This distribution highlighted gaps relevant to the maintenance stage of change, which focuses on maintaining the health behavior over time. It is in the maintenance stage of change, where treating ACP as a process comes into play. In this stage, both partial engagers in ACP can be encouraged to fully engage in the process and full engagers prompted to revisit ACP and update documents given new context. Cancer patients recognize their preferences for care may change throughout the illness trajectory,²¹ but the studies in this review largely implemented ACP as a one-time event rather than a process evolving throughout the patient's illness. Preserving ACP as a process in the context of ACP interventions is particularly important for cancer patients given the often-protracted illness trajectory. In this way, the maintenance phase may be the most important stage of change relative to ACP in cancer as it motivates continued behavior over time. Fluctuations, such as relapsed or progressive disease, may cause cancer patients to reevaluate their desires for medical treatment at the EOL. These fluctuations could trigger ongoing discussions, where ACP documents could be updated to reflect any changed desires for care given the new disease context. In addition, illness fluctuations could serve as a means to motivate patients who have not yet completed ACP to do so. Little is known about the maintenance phase of ACP, and further research in

this area could offer ways to understand the optimal time points for ACP throughout the illness trajectory, how to address uneven ACP engagement, and the nature in which preferences might change over time.

The distribution of the stages of change addressed by the ACP interventions in this systematic review also highlights persistent one-size-fits-all approaches to ACP intervention design. In particular, the heavy emphasis on precontemplation and contemplation stages of change among the reviewed interventions may not match the needs of cancer patients. These stages of change focus on raising awareness and educating about ACP, but a high percentage of cancer patients already possess ACP knowledge (70%–97%).^{6,59} Although the precontemplation and contemplation stages of change should not be abandoned in ACP intervention design for cancer patients,⁶⁰ these findings suggest that ACP interventions for cancer patients should also use processes that engage patients at stages further along the continuum of change, like that of the action and maintenance stages.

Processes of Change. Intervention components were largely consistent with the processes of change involving consciousness raising, self-reevaluation, and helping relationships, but dramatic relief, environmental reevaluation, self-liberation, stimulus control, contingency management, and counterconditioning were infrequently used. For example, the dramatic relief process of change, which is intended to evoke an emotional response that incites change (e.g., storytelling), was only used in three of the interventions^{33,39,50} and was commonly implemented using web-, video-, or vignette-based techniques. This process of change seems particularly useful in exploring preferences for care but should be paired with other processes of change in ACP interventions to promote more action-oriented ACP behaviors.

Environmental reevaluation was not used in 19 of the studies. This process of change is particularly relevant to ACP because it challenges patients to consider the effect of a behavior on their loved ones.¹³ Inclusion of informal caregivers in ACP interventions allows patients to consider how ACP impacts their loved one and increases open communication about prognosis and desires for care at the EOL among not only the patient-caregiver dyad but also the patient–caregiver–health care provider triad.⁶¹ Informal caregivers were involved in the ACP intervention using environmental reevaluation in three studies,^{32,33,44} which took the form of the involving caregivers in education and dialogue about ACP. Caregivers' desires for early inclusion in the ACP process have been documented,^{62,63} and early caregiver involvement has been shown to result in an informed caregiver.⁴⁶ Informed caregivers

are particularly needed given the majority of patients lack decision-making capacity at the EOL,⁶⁴ with cancer patients having demonstrated deficits in their understanding of the information needed to inform decisions at the EOL and their ability to weigh the pros and cons of those decisions.⁶⁵ ACP interventions should formally engage both patients and their caregivers in ACP by using environmental reevaluation. Doing so may engender stronger commitment to behavior change as well as engage caregivers in the processes needed to inform later decision-making that is matched with the patient's preferences.

Less than half of the studies contained intervention components that engaged the self-liberation process of change. Self-liberation involves presenting patients with three action choices.¹³ ACP consists of three distinct components; therefore, ACP interventions lend themselves to this process of change. Yet conceptualizations of ACP were inconsistent across studies and not representative of its three distinct components. For example, one study reported participants "received ACP" as a part of an oncology medical home program, but a clear definition of what constituted "received ACP" was not offered.⁵⁴ Furthermore, some interventions solely focused on the documentation components of ACP (living will or health care surrogate), whereas others focused on the communication component (EOL discussions). Disparate approaches like these may further engender uneven ACP engagement. The studies in this review also took more passive approaches to providing choices, such as website-based ACP documents²⁶ and invitations to complete AD documentation.^{40,49,50} Clearly stated, specific choices to engage in ACP are more likely to result in actual action, especially when offered during an in-person clinical interaction.

ACP Intervention Outcome Pattern Identification

Although most intervention outcomes were coded as an ACP behavior change, the majority of the interventions were of low to moderate quality, that is, the studies possessed a high to moderate risk of bias. This suggests that further research is needed to understand the actual impact interventions have on ACP behavior change among cancer patients, particularly when the interventions are informed by the TTM. In addition, the majority of studies were not sufficiently powered to detect change. This is a serious impediment to building an evidence base for ACP intervention design. When studies do not have sufficient power to detect real change in ACP behaviors, questions remain about whether the intervention was actually unsuccessful or whether more subjects were needed. Well-designed, TTM-informed ACP intervention studies that are fully powered are needed among cancer patients.

Overall, no obvious patterns emerged between the outcome of the intervention (i.e., whether the intervention resulted in behavior change, no behavior change, or was neutral) and the number of stages or processes engaged. Inconsistencies between what was actually received in the intervention and what was reported as an outcome created challenges in drawing definitive conclusions about the compilation of theoretically categorized intervention components needed to optimize ACP behavior change. For example, although several interventions primarily addressed EOL discussions, the intervention components also addressed completing a living will or designating a health care surrogate, but outcomes pertaining to these components were lacking.^{34,40} In addition, several studies reported proximal outcomes of interventions (e.g., preferences for care), rather than concrete evidence of behavior change (i.e., ACP engagement).^{35,41,45} In another instance, ACP was revisited over time, but resulting changes in ACP engagement were not reported.⁴⁴ The studies in this review as well as others without an exclusive focus on cancer populations⁶⁶ demonstrate the ability of ACP interventions to impact behavior change with respect to each of its three components, thus outcome evaluation should be targeted in this way. An organizing framework for the more comprehensive and standardized measurement of ACP outcomes has been described and should be considered in future ACP intervention studies.⁶⁷

Despite these outcome measurement inconsistencies, all interventions, no matter their outcome, were composed of components that addressed multiple stages and processes of change. This suggests that the particular number or variety of the processes of change used may not impact the outcome. This may be due to the a posteriori categorization of intervention components or it may suggest that we do not yet understand behavior change in challenging areas like expressing and documenting preferences for EOL care. However, if the selection of ACP intervention components had been informed by the TTM at study outset, more clear distinctions might have been made between which combinations of the stages and processes of change resulted in better outcomes.

Further examination of the components also suggested that it might be the quality rather than the particular components that had impact. For example, the majority of interventions that resulted in no behavior change lacked in-depth, in-person clinical interaction. Rather, they used videos, websites, patient portals, or mailed letters geared toward ACP education and exploration of preferences for EOL care.^{33,39,53,54} Although video-based ACP interventions have been shown to increase ACP knowledge and preferences for less aggressive therapies at the EOL, their

influence on actual ACP engagement is still unclear.⁶⁸ Furthermore, in another intervention that did not result in ACP behavior change, patients were intended to receive up to three one-to-one clinical interactions with the ACP facilitator; however, 73% of the participants completed only one discussion.⁴⁰ Taken as a whole, ACP appears to need “high touch” solutions. As our health care system moves to greater use of technology, this may result in lower ACP engagement.

By contrast, the majority of interventions that resulted in behavior change (i.e., ACP engagement) used either an interdisciplinary approach or a nonphysician ACP facilitator to deliver the intervention. Five of the interventions that resulted in ACP behavior change had ACP embedded in the palliative care model,^{32,36,51,52,55} with four that specifically used interdisciplinary members of the palliative care team to deliver intervention components.^{32,36,51,55} Similarly, other successful interventions outside of the palliative care context took an interdisciplinary approach by using a combination of physicians, nurses, and/or social workers^{44,47} to deliver the intervention. The sole use of a nonphysician facilitator was used in five ACP intervention studies, which included either a nurse-led^{34,43,50} or a social worker-led^{38,46} intervention. These approaches to ACP intervention delivery resemble the recommendations of a recent Delphi study, which endorse nonphysician facilitators as initiators of the ACP process and physician facilitators as guides in the ACP process by discussing prognosis and establishing realistic goals of care.⁶⁹ But while engaging ACP is a shared endeavor among health care providers, it may be nurses and social workers who are particularly adept at inciting ACP behavior change among cancer patients, as cancer patients who named nurse practitioners or social workers among the list of people with which they had an EOL discussion have been documented as more likely to complete an advance directive than cancer patients who did not name those health care providers.⁷⁰

Half of the ACP interventions that resulted in behavior change also involved multiple (two to five) clinical interactions over time.^{32,34,36,43,44,51,52} These clinical interactions typically began with an assessment of patient needs, followed by patient education on ACP, progressed to an exploration of values and preferences for care, and often culminated in an end-of life discussion and/or active involvement in completing an AD; thus, ACP was comprehensively addressed by these interventions. Time frames of the implementation were specifically cited in five studies—2 weeks,⁴³ 3 weeks,³⁴ 1 month,⁵² and 3 months^{32, 36}—and were unspecified in the other interventions. This stepped approach reflects that of the recommended approaches to ACP, where ACP occurs as a process evolving over time.^{3–5} Similarly,

person-to-person interaction combined with guided advance directive completion has been previously identified as a defining attribute of effective ACP interventions designed for varied populations (e.g., HIV patients, participants from faith communities).²⁴ These findings suggest that the involvement of a group of health care providers in an ongoing ACP process will result in a greater number of cancer patients making their EOL preferences known.

Limitations

Limitations of this systematic review must be considered. This review was limited to ACP interventions designed for an exclusively cancer patient sample. The need for ACP is not unique to cancer, and future reviews could explore ACP intervention design aspects when more diverse samples of patients are included. Categorizing the intervention components was a potentially subjective exercise. We addressed this by developing a theory-informed categorization guide. In addition, categorization was conducted independently by three nurse researchers with expertise in oncology or EOL care; therefore, nuanced discussions could be conducted to drive consensus in the categorization. In addition, as this review included intervention studies with varied designs, direct comparisons of effectiveness among the interventions could not be made. Inconsistencies in outcome reporting also made it difficult to have a more comprehensive understanding of the impact of the ACP interventions on engaging ACP as a whole, that is, engaging all three of its components. Despite these challenges, this analysis points a potential way forward for the science, but more importantly for clinical practice.

Conclusions

This systematic review was the first, to our knowledge, to use the TTM as a common lens to categorize ACP intervention components, identify gaps, and evaluate outcomes. We have suggested ways to improve future ACP interventions. First, stage-matched interventions that actively engage both the patient and their caregiver will avoid a one-size-fits-all approach to ACP intervention design and may lead to greater ACP engagement. Second, ACP interventions need to include longitudinal, process-oriented components. Third, we identified the need to further explore which processes of change have the greatest impact on ACP behaviors. Finally, careful, consistent conceptualizations of ACP across studies, comprehensive reporting of all ACP intervention components, and documenting changes in ACP outcomes over time given clinical or intervention factors are needed. ACP interventions that holistically address and document the ACP

process, are stage-matched, incorporate diverse mechanisms (i.e., process of change) to engage ACP, use an interdisciplinary group of health care providers to deliver intervention components, and capture ongoing ACP engagement across the illness trajectory offer meaningful ways forward in ACP intervention design for cancer patients and their caregivers.

Disclosures and Acknowledgments

Mrs. Levoy was funded, in part, by a Future of Nursing Scholars Award from the Robert Wood Johnson Foundation and a Doctoral Degree Scholarship in Cancer Nursing, 131753-DSCN-18-072-01-SCN, from the American Cancer Society during the conduct of this study. Dr. Salani has nothing to disclose. Dr. Buck has nothing to disclose.

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Appendix A

Search Strategy

Search Strategy Description

During the original search in February 2017, ACP-related terms were combined with the cancer related terms in the PubMed, CINAHL Plus, MEDLINE (EBSCO), Cochrane Library and Web of Science databases. For example, in the PubMed database, MeSH terms were used for the following search terms: advance care planning, advanced directives, cancer, neoplasm, oncology and malignancy. Additionally, key word searches in “all fields” were conducted for the search terms: advance care planning, advance directive, cancer, neoplasm, oncology, tumor, and malignancy. All ACP-related search terms were separated from the cancer-related search terms parenthetically. Within the two parenthetical phrases, search terms were combined using the “OR” Boolean operator. Between parenthetical phrases, the “AND” Boolean operator was used. The time limitation of January 1, 1990 to March 31, 2017 was then applied and the search conducted. The same search strategy was applied across the remainder of the databases.

The first updated search was conducted in June 2017 in two stages. First all the original search terms used in the initial search were entered into each database as before, with the exception of the time limiter, which was amended to March 1, 2017 to December 31, 2017. At the time of the updated search, inspection of the MeSH terms “advance care planning” and “advance directives” in the PubMed database revealed the concept of a living will was included in these MeSH terms, but the concept of the health care surrogate was not. To ensure no articles were missed due to healthcare surrogate-related terminology another step of the updated search was added. This search included the terms of “healthcare surrogate” or “health care surrogate” or “healthcare proxy” or “health care proxy” or “healthcare agent” or “health care agent” or “health proxy” or “power of attorney” combined with the original cancer-related search terms and the time limitation of January 1, 1990 to December 31, 2017.

The second updated search was conducted in September 2018. All of the search terms from the original search as well as those added in first updated search were entered into each database as before, with the exception of the time limiter, which was amended to June 1, 2017 to December 31, 2018. The detailed searches according to each stage of the search are listed below.

Initial Search – February 2017

PubMed

("advance care planning"[MeSH Terms] OR ("advance"[All Fields] AND "care"[All Fields] AND "planning"[All Fields]) OR "advance care planning"[All Fields]) OR ("advance directives"[MeSH Terms] OR ("advance"[All Fields] AND "directives"[All Fields]) OR "advance directives"[All Fields] OR ("advance"[All Fields] AND "directive"[All Fields]) OR "advance directive"[All Fields]) OR (advance[All Fields] AND care[All Fields] AND directive[All Fields])) AND (("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "cancer"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "neoplasm"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "oncology"[All Fields]) OR ("tumour"[All Fields] OR "neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "tumor"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "malignancy"[All Fields])) AND ("1990/01/01"[PDAT] : "2017/03/31"[PDAT])

Medline (EBSCO)

(advance care planning or advance directive or advance care directive) AND (cancer or neoplasms or oncology or tumour or malignancy); Limiters - Scholarly (Peer Reviewed) Journals; Publication Year: 1990-2017; Search modes - Boolean/Phrase

CINAHL Plus

(advance care planning or advance directive or advance care directive) AND (cancer or neoplasms or oncology or tumour or malignancy); Limiters - Scholarly (Peer Reviewed) Journals; Publication Year: 1990-2017; Search modes - Boolean/Phrase

Cochrane Library

MeSH descriptor: Advance Care Planning

Web of Science

Query: TOPIC: ("advance care planning" OR "advance* directive*" OR "advance care directive") AND TOPIC: (cancer OR neoplasm OR malignancy OR tumor OR oncology); Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCIS, CPCI-SSH, ESCI; Timespan=1990-2017

*Updated Search – June 2017***Stage 1***PubMed*

((("advance care planning"[MeSH Terms] OR ("advance"[All Fields] AND "care"[All Fields] AND "planning"[All Fields]) OR "advance care planning"[All Fields]) OR ("advance directives"[MeSH Terms] OR ("advance"[All Fields] AND "directives"[All Fields]) OR "advance directives"[All Fields] OR ("advance"[All Fields] AND "directive"[All Fields]) OR "advance directive"[All Fields]) OR (advance[All Fields] AND care[All Fields] AND directive[All Fields])) AND (("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "cancer"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "neoplasm"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "oncology"[All Fields]) OR ("tumour"[All Fields] OR "neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "tumor"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "malignancy"[All Fields])) AND ("2017/03/01"[PDAT] : "2017/12/31"[PDAT]))

Medline (EBSCO)

(advance care planning or advance directive or advance care directive) AND (cancer or neoplasms or oncology or tumor or malignancy); Limiters - English Language; Published Date: 20170101-20171231; Search modes - Boolean/Phrase

CINAHL Plus

(advance care planning or advance directive or advance care directive) AND (cancer or neoplasms or oncology or tumour or malignancy); Limiters - Published Date: 20170301- 20171231; Search modes – Boolean/Phrase

Cochrane Library

MeSH descriptor: Advance Care Planning

Web of Science

Query: TOPIC: ("advance care planning" OR "advance* directive*" OR "advance care directive") AND TOPIC:(cancer OR neoplasm OR malignancy OR tumor OR oncology); Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI; Timespan=2017

Stage 2*PubMed*

("healthcare surrogate"[All Fields] OR "health care surrogate"[All Fields] OR "health care proxy"[All Fields] OR "healthcare proxy"[All Fields] OR "health proxy"[All Fields] OR "health care agent"[All Fields] OR "healthcare agent"[All Fields] OR "power of attorney"[All Fields]) AND (("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "cancer"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "oncology"[All Fields]) OR ("tumour"[All Fields] OR "neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "tumor"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "malignancy"[All Fields])) AND ("1990/01/01"[PDAT] : "2017/12/31"[PDAT]))

Medline (EBSCO)

("healthcare surrogate" OR "health care surrogate" OR "health care proxy" OR "healthcare proxy" OR "health proxy" OR "health care agent" OR "healthcare agent" OR "power of attorney") AND (cancer or neoplasms or oncology or tumor or malignancy); Limiters - Published Date: 19900101-20171231; Search modes - Boolean/Phrase

CINAHL Plus

("healthcare surrogate" OR "health care surrogate" OR "health care proxy" OR "healthcare proxy" OR "health proxy" OR "health care agent" OR "healthcare agent" OR "power of attorney") AND (cancer or neoplasms or oncology or tumor or malignancy); Limiters - English Language; Published Date: 19900101-20171231; Search modes - Boolean/Phrase

Web of Science

Query: TOPIC: ("healthcare surrogate" OR "health care surrogate" OR "health care proxy" OR "healthcare proxy" OR "health proxy" OR "health care agent" OR "healthcare agent" OR "power of attorney") AND TOPIC:(-cancer OR neoplasm OR malignancy OR tumor OR oncology); Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI; Timespan=1990-2017

*Updated Search – September 2018***PubMed**

("advance care planning"[All Fields] OR "advance directive"[All Fields] OR "advance care directive"[All Fields] OR "healthcare surrogate"[All Fields] OR "health care surrogate"[All Fields] OR "health care proxy"[All Fields] OR "healthcare proxy"[All Fields] OR "health proxy"[All Fields] OR "healthcare agent"[All Fields] OR "health care agent"[All Fields] OR "power of attorney"[All Fields]) AND (("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "cancer"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "oncology"[All Fields]) OR ("tumour"[All Fields] OR "neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "tumor"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "malignancy"[All Fields])) AND ("2017/06/01"[PDAT] : "2018/12/31"[PDAT])

MEDLINE (EBSCO)

("advance care planning" or "advance directive" or "advance care directive" or "healthcare surrogate" or "health care surrogate" or "health care proxy" or "healthcare proxy" or "health proxy" or "healthcare agent" or "health care agent" or "power of attorney") AND (cancer or neoplasms or oncology or tumor or malignancy) Limiters - Published Date: 20170601-20181231 Narrow by Language: - English Search modes - Boolean/Phrase

CINAHL Plus

("advance care planning" or "advance directive" or "advance care directive" or "healthcare surrogate" or "health care surrogate" or "health care proxy" or "healthcare proxy" or "health proxy" or "healthcare agent" or "health care agent" or "power of attorney") AND (cancer or neoplasms or oncology or tumor or malignancy) - Published Date: 20170601-20181231 - Boolean/Phrase

Web of Science

Query: TOPIC: (("advance care planning" or "advance directive" or "advance care directive" or "healthcare surrogate" or "health care surrogate" or "health care proxy" or "healthcare proxy" or "health proxy" or "healthcare agent" or "health care agent" or "power of attorney") AND (cancer or neoplasms or oncology or tumor or malignancy)) Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI; Timespan=2017-2018

Cochrane Library

"Advance Care Planning" in Title Abstract Keyword Search; Limiters - with Cochrane Library publication date between Jun 2017 and Dec 2018 (Word variations have been searched)

Supplemental Table 1
Definitions of the Stages and Processes of Change According to the TTM

Process of Change	Definition	General TTM Intervention Component Examples	ACP-Specific TTM Intervention Component Examples
Precontemplation—no intended action in the next six months^a → no thought about ACP; not ready for ACP^b			
Consciousness-raising	“... involves increased awareness of about the causes, consequences, and cures for a particular problem behavior.” (Prochaska & Velicer, 1997, p. 39)	Feedback, education, confrontation, interpretation, bibliotherapy ^a	Increased awareness of ACP ^c Receiving and contemplating information related to ACP ^c Talking to health care providers regarding life-sustaining treatment ^c
Dramatic relief	“... produces increased emotional experiences followed by reduced affect ...” (Prochaska & Velicer, 1997, p. 40)	Role playing, grieving, personal testimonies ^a	Learning of ACP behaviors of others (i.e. story-telling by health care providers or loved ones)
Environmental reevaluation	“combines both affective and cognitive assessments of how the presence or absence of a personal habit affects one’s social environment such as the effect of smoking on others.” (Prochaska & Velicer, 1997, p. 40)	Empathy training, family intervention ^a	Consideration of the impact of ACP on loved ones
Contemplation—intended change in the next 6 months^a → thought of engaging in ACP in the next 6 months^b			
Self-reevaluation (<i>in addition to the previous processes of consciousness raising, dramatic relief and, environmental reevaluation</i>)	“... combines both cognitive and affective assessments of one’s self-image with and without a particular unhealthy habit ...” (Prochaska & Velicer, 1997, p. 40)	Values clarification, healthy role models, imagery ^a	Reflecting on what it means to participate in ACP ^c Consideration of religious beliefs and their relationship to ACP ^c Evaluation of personal beliefs about the medical condition and their relationship to ACP ^c Consideration of the impact of ACP on loved ones ^c Discussing desires for life sustaining treatment and quantity vs. quality of life with loved ones ^c Reflecting on need for and susceptibility to ACP ^d Reflecting on the positive consequences of ACP ^d Reflecting on the experiences of others with ACP ^d
Preparation—intended action in the next month^a → thought of engaging in or planning to complete ACP documents in the next month^b			
Self-liberation	“... both the belief that one can change and the commitment and recommitment to act on that belief.” (Prochaska & Velicer, 1997, p. 40)	Provide action choices (three choices recommended) ^a	Personal commitment to participate in ACP ^c
Action—behavior change made within the last six months^a → engaged in ACP in the last six months^b			
Contingency management	“... provides consequences for taking step in a particular direction.” (Prochaska & Velicer, 1997, p. 40)	Reinforcement through positive self-statements or group recognition ^a	If only partial participation in ACP, reinforcement to complete other aspects of ACP
Helping relationships	“... combine caring, trust, openness, and acceptance as well as support for the health behavior change.” (Prochaska & Velicer, 1997, p. 40)	Rapport building, therapeutic alliance, counselor calls, buddy systems ^a	Receiving support from others to participate in ACP ^c Discussing desires for life-sustaining treatment with loved ones ^c
Counterconditioning	“... requires the learning of healthier behaviors that can substitute for problem behaviors.” (Prochaska & Velicer, 1997, p. 40)	Relaxation can counter stress and assertion can counter peer pressure ^a	
Stimulus control	“... removes cues for unhealthy habits and adds prompts for	Avoidance of unhealthy behavior, environmental	Review of ACP documents to confirm its contents ^c

(Continued)

Supplemental Table 1
Continued

Process of Change	Definition	General TTM Intervention Component Examples	ACP-Specific TTM Intervention Component Examples
	healthier alternatives.” (Prochaska & Velicer, 1997, p. 40)	reengineering, self-help ^a	Personal knowledge of the location of ACP documents ^c Providing copies of ACP documents to loved ones ^c
Maintenance—prevention of relapse in nonbehavior^a → engaged in ACP more than six months ago^b (same processes used in the action stage)			If only partial participation in ACP, reinforcement to complete other aspects of ACP Updating of ACP documents to reflect changed desires secondary to a change in medical condition Revisiting end-of-life discussions with health care provider or loved ones secondary to a change in medical condition

TTM = transtheoretical model of health behavior change; ACP = advance care planning.

^aProchaska & Velicer (1997).

^bFried et al. (2010).

^cFried et al. (2012).

^dFried, Bullock, Iannone, & O’Leary(2009).

Supplemental Table 2
Risk of Bias Analysis

Authors/ Publication Year	Random Sequence Generation	Allocation Concealment	Baseline Characteristics Similar	Baseline Outcome Similar	Confounding Unlikely	Appropriate Analysis	Intervention Independent of Other Changes	Intervention Integrity	Blinding of Participants and Personnel	Blinding of Outcome Assessment	Incomplete Outcome Data	Selective Reporting
Clayton et al. (2007)	✓	✓	✗	?	✓	✓	✓	?	✗	✗	?	✓
Pautex et al. (2008)	✗	✗	✗	✗	✗	✓	✗	✓	✗	✗	✗	✓
El-Jawahri et al. (2010)	✓	✓	✗	✓	✗	✗	✗	✗	✗	✗	✓	✓
Jones et al. (2011)	✓	✓	✗	?	✓	✓	✓	✗	✗	?	✗	✓
Dyar et al. (2012)	?	?	✓	?	✗	✓	✗	✗	✗	?	?	✓
Volandes et al. (2012)	✗	✗	✗	✗	✗	✓	✗	✓	✗	✗	✓	✓
Epstein et al. (2013)	✓	?	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓
Vogel et al. (2013)	✓	✓	✓	✗	✓	✓	✗	✗	?	✓	✗	✓
Kuntz et al. (2014)	✗	✗	?	?	✗	?	✗	✗	✗	✓	?	✓
Obel et al. (2014)	✗	✗	✗	✗	✗	?	✗	✗	✗	✓	?	✓
Trarieux-Signol et al. (2014)	✗	✗	✗	✗	✓	✓	✗	✗	✗	✓	✓	✓
Yeh et al. (2014)	✗	✗	✗	✗	✗	?	✓	✓	✗	✗	✓	✓
Ferrell et al. (2015)	✗	✗	✗	✓	✓	✓	✗	✓	✗	✗	✓	✓
Green et al. (2015)	✓	?	✗	✓	✓	✓	✗	✓	✓	✗	✓	✓
Michael et al. (2015)	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✓	✓
Schenker et al. (2015)	✗	✗	✗	✗	✗	✓	✗	✓	✗	?	✓	?
Ma et al. (2016)	✗	✗	✗	✗	✗	✗	?	?	?	?	✓	?
Brohard (2017)	✗	✗	✓	?	✓	✓	✗	✓	✗	✗	✓	✓
Peltier et al. (2017)	✗	✗	✗	?	✗	✗	✗	?	✗	✓	✗	✗
Rodenbach et al. (2017)	?	✗	✗	?	✓	✓	✗	✓	✗	✗	✓	✓
Walczak et al. (2017)	✓	✓	✗	?	✓	✓	✗	✓	✗	?	✗	✓
Xing et al. (2017)	✗	✗	✗	✗	✗	✗	✗	?	✗	✗	✓	✓
Bekelman et al. (2018)	✗	✗	✗	✗	✗	✗	✗	?	✗	✗	✗	✗
Epstein et al. (2018)	?	?	✓	✓	✓	✓	✗	?	✗	✗	✗	✓
Rabow et al. (2018)	✗	✗	✗	✗	✗	?	✗	?	✗	✗	✗	✓

✓ = Low risk of bias; ✗ = High risk of bias; ? = Unclear risk of bias.