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# Advance care planning for frail elderly: Are we passing on a golden opportunity? A mixed-method systematic review and meta-analysis

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# Title page

**Title of the article:** Advance care planning for frail elderly: Are we passing on a golden opportunity? A mixed-method systematic review and meta-analysis

**Author details:**

**Author 1**

Xin-Ying Wang, College of Nursing, University of South China, Hengyang, China.,

Email: 741021586@qq.com

OCCID: https://orcid.org/0000-0002-2006-0815

**Author 2**

Xin-Lin Huang, College of Nursing, University of South China, Hengyang, China

Email: xinlin.huang@stu.usc.edu.cn

OCCID: https://orcid.org/0000-0002-2405-5896

**Author 3**

Wei-Jia Wang, College of Nursing, University of South China, Hengyang, China

Email: 972482148@qq.com

**Corresponding Author**

Li-Liao, College of Nursing, University of South China, Hengyang, China

Email: 254251558@qq.com

OCCID: https://orcid.org/0000-0001-7450-0444

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**Strengths and limitations of this study：**

- The advantage of this study is that using MMSR to give a comprehensive and in-depth analysis of the quantitative and qualitative data already available to explain the effects and experiences of ACP in the frail elderly.
- We defined ‘the frail elderly’ as the elderly who do not live in the stage of terminal condition or dementia; thus, the applicability of findings to patients with significant medical issues is unclear.

# Advance care planning for frail elderly: Are we passing on a golden opportunity? A mixed-method systematic review and meta-analysis

## ABSTRACT

**Introduction**: As the frail elderly increase, they need a channel to express their hospice preferences, which may present an opportunity for advance care planning (ACP). Previous reviews only used a single approach to examine the ACP effect in the frail elderly but did not synthesize quantitative and qualitative evidence. We reviewed the literature on quantitative and qualitative data to assess the effect and acceptance of ACP in the frail elderly. **Design:** Two independent reviewers undertook screening, data extraction, and quality assessment. We synthesized and pooling of the data for meta-analysis or meta-aggregation. **Data sources:** An electronic search of MEDLINE, CINAHL, Embase, PubMed, PsycINFO, and Cochrane Library databases from January 2003 to April 2022. **Results:** There were 12158 articles found, and 17 of them matched the inclusion criteria. Six of the ten articles in the quantitative study were rated low quality, the others being moderate quality. Of the eight qualitative studies, four were rated to be of moderate quality, the others to be of low quality. The meta-findings analyses demonstrate that provoking the elderly to consider death through intervention may effectively promote ACP completion. The meta-aggregated showed that the ACP is acceptable, and the participants reported that it offers a dependable channel to express their preferences.

**Conclusions:** ACP may offer an opportunity to encourage fragile elderly to have end-of-life conversations to improve their outcomes. More well-designed randomized controlled trials evaluating the effectiveness of ACP in frail elderly are needed in the future.

**PROSPERO registration number CRD42022329615**

# INTRODUCTION

As the world's aging population is coming, traditional healthcare systems are under more strain with the increasing prevalence of chronic and aging-related disorders in elderly persons who commonly require continuous monitoring and long-term care.[1–4] According to previous research, aging is also related to frailty,[5] which may render the elderly more susceptible to negative impacts.[6–11] Frailty has consequently caused a significant worldwide health burden and effects on clinical practice and public health.[2]

Frailty is a clinical condition in which an individual's exposure to stressors increases their vulnerability and thus their risk of adverse health outcomes, such as falls, unexpected disability, hospitalization, and mortality.[5,12] It is a dynamic process that increases with age and often spirals downward, increasing the likelihood of adverse outcomes.[5,13,14] A recent meta-analysis of the prevalence of frailty in 62 countries around the world showed a prevalence of 31% in Oceania, 25% in Asia, 23% in the Americas, 22% in Africa, and 8% in Europe.[15] Two studies found that frail elderly were more likely to desire comfort care when they approached the end of their lives, but these demands were not accurately recorded, resulting in receiving treatment or care against their preferences.[16,17]

Advance care planning（ACP）is planning to help patients receive medical care aligned with their preferences, especially in severe illness or as the end-of-life approaches.[18] It involves various activities, including appointing surrogate decisions, completing or reviewing advance directives(AD), and discussing end-of-life wishes with family members or healthcare professionals.[19] ACP has been demonstrated to enhance patient quality of life, family communication, and care satisfaction, significantly relieving the burden on patients and families.[20–24] However, there are still challenges in implementing ACP for people's low awareness of ACP and cultural conflicts.[25–27] The absence of opportunity for conversation on end-of-life desires to elicit their reflection is a major contributing factor to this dilemma.[28] Frailty is a common clinical symptom in older adults, who commonly have lower AD completion rates.[2,5,29] Therefore, ACP may provide an opportunity for it to express its preference. Applying appropriate interventions to trigger their thoughts about death to increase ACP readiness may be an effective way to increase ACP engagement. Most earlier systematic reviews contained only a single research method to examine the ACP effectiveness,[30–32] and no systematic review synthesized quantitative and qualitative evidence to support the impact and acceptance of ACP in frail elderly.[33–36] Consequently, in this study, we designed to utilize a mixed-methods systematic review (MMSR) to combine all relevant information from several research methods because the validity and acceptance of ACP are equally significant.[37] The quantitative component attempts to incorporate a broader study design. The qualitative component aids in comprehending the participant's experience with ACP and its efficacy. A final synthesis of quantitative and qualitative evidence will be produced to support the implementation and promotion of ACP.

## METHODS

This review was performed following the Joanna Briggs Institute (JBI) methodology for MMSRs to address the review question, data synthesis, and integration.[37,38] The review was registered on PROSPERO (CRD42022329615).

### *Search strategy*

Six databases, including MEDLINE, CINAHL, Embase, PubMed, PsycINFO, and Cochrane

Library, were searched from January 2003 to April 2022. Because the term "advance care planning" was first used in 2003, this cut-off period was chosen. The search terms include appropriate subject headings and wildcards of “advance care planning,” “end of life,” “advance directive,” and “frail elderly” or “pre-frailty.” The completed search techniques are presented in Appendix 1.

***Study selection***

Because there were insufficient resources for translation, articles in non-English languages will be deleted. Table 1 lists the inclusion and exclusion standards in detail. After searching for and removing duplicate entries, all records were sent to reference manager software (Zotero). Two reviewers independently evaluated titles and abstracts to out irrelevant research and keep papers that met the inclusion criteria. Abstracts and titles will be classified as "certainly not relevant" or "possibly relevant." Take note of the reason for exclusion. If there was any uncertainty or dispute, it was resolved with the assistance of a third review author.

***Data extraction***

One reviewer used standardized JBI data extraction methods to extract quantitative and qualitative data from the included papers and discussed those findings with the second reviewer.[38] Authors, year, participant, setting, design, intervention, result, and outcome were the quantitative information extracted. The retrieved qualitative information encompassed the population, method, setting, cultural knowledge, study objectives-related data analysis, and specifics regarding the phenomena of interest. The author's interpretations of the qualitative data analysis, which included topics and subtopics, were also obtained. Two reviewers independently evaluated these extractions' level of "confidence" (defined as clear, believable, and unsupported) using illustrations (i.e., direct citation of participant voices, field observation records, or other data).[38]

**Table 1.** Eligibility criteria of studies

| | Inclusion | | Exclusion |
|---|---|---|---|
| | Quantitative component | Qualitative component | Quantitative and Qualitative components |
| Types of participants | Health status is focused on pre-frailty or frailness. Adult (≥50 years old) regardless of gender and geographical location. | | Mean age < 50 years. Focus on a disease-specific terminal condition or dementia. |
| Types of interventions | Interventions that adopted any tools or methods to promote ACP or communication of AD.<br>Any comparator or no comparator. | | Interventions to help develop resuscitation assisted euthanasia or suicide. |
| Outcomes/ Phenomena of interest | Advance care planning outcomes<br>-ACP process outcomes, such as knowledge, and readiness , quality of life<br>-Action outcomes, such as ACP Engagement, completion of ACP<br>-Care Outcomes, such as mood or health care expenditures | Experiences with the interventions. | |
| Context | The community, hospital settings, clinics, nursing homes, or homes. | | Intensive care unit |
| Types of studies | (1) Various types of experimental studies, such as RCTs, non-RCTs, and observational analysis/descriptive studies (prospective and retrospective cohort studies and cross-sectional studies).<br>(2) Mixed methods studies are only considered when data and findings for quantitative components are reported and can be extracted. | (1) Various types of experimental qualitative studies<br>(2) Mixed-methods studies are only considered when data and findings for qualitative components are reported and can be extracted. | Opinion pieces, guidelines, individual case reports, study proposals/protocols, conference abstracts, Ph.D. theses, grey literature, and non-peer-reviewed journals. |

### *Quality appraisal*

Two independent reviewers used the JBI Critical Appraisal tools,[38] comprising checklists for randomized controlled trials (RCT), quasi-experimental studies, non-randomized experimental research (NRCT), and qualitative research to evaluate the quality of the included papers. The checklist only accepts answers in the form of "Yes," "No," or "Unclear." All "Yes" responses indicate high quality, one or two "Unclear" or "No" responses indicate moderate quality, and more than two "Unclear" or "No" responses indicate low quality. This method rates the literature as low, moderate, and high quality. Any disagreements in the research were discussed until an agreement was reached.

### *Data synthesis and integration*

This study used a convergent segregated approach to synthesize and integrate quantitative and qualitative data because the review examined different dimensions of a phenomenon of interest.[37,39] A statistical meta-analysis of quantitative data was performed using the Cochrane Collaboration's Review Manager 5.4 program to obtain a summary estimate of the effect. Using I-square statistic and Chi-square test to evaluate heterogeneity. The results were presented in narrative summaries when it could not do statistical pooling. The JBI Handbook's meta-aggregation technique was used to combine qualitative data.[38] The extract findings (Level 1) were compiled into statements. Then, these findings with similar (at least two findings per category) are combined to create the categorization (Level 2). Finally, a comprehensive set of synthesized findings for evidence-based practice was developed by synthesizing these categories (at least two for each synthesized finding) (Level 3).[38]

### *Patient and public involvement*

Patients and public were not involved in the development of this study.

## RESULT

### *Study selection*

A total of 12,158 articles were retrieved. There were 1934 duplicate articles removed, and 9617 papers were deleted based on title and abstract. The full text of the 90 articles screened was reviewed, and 17 articles were finally included. (Figure 1)

### *Methodological quality*

The methodological quality evaluation of the included studies is shown in Appendix 2. Only five were rated moderate quality for the included quantitative studies (n = 10), while the others were rated low quality. There were four RCTs, all of which lacked information on participant blinding[40–43] and three on treatment assignment blinding.[41–43] The remaining six studies were categorized into three quasi-experimental studies, one mixed study, one NRCT, and one cross-section survey. Four studies were unclear whether participants received similar treatment or care besides the exposure or intervention of interest.[44–46,48] Two studies lack information regarding study methodologies, control groups, and multiple outcomes measurements.[24–47]

Four studies were rated as moderate quality and others as low quality for the qualitative component of the included studies (n = 8). The main reason is that the researcher's theoretical and cultural orientations are not mentioned, along with the researcher's potential influence on the research[25–27,47,49,50–52] Four studies lacked study objectives, clearly stated data collection and analysis procedures, and participant ethical review guidelines.[25,26,49,52]

***Study characteristics***

Tables 2 and table 3 summarize the characteristics of the included studies. Seventeen articles published between 2007 and 2022 were included for review. The study design included two-arm RCT (n = 4),[40–43] two-arm NRCT (n = 1),[24] two-arm quantitative quasi-experimental study (n = 3),[44–46] mixed method design with a single group pretest-posttest design and a qualitative component (n = 1),[47] a cross-sectional study (n = 1)[48] and a qualitative study (n = 7).[25–27,47,49–52] There were 3312 participants in this study whose mean age ranged from 63 to 88 years. Sample sizes ranged from 10 to 986 from nursing homes, communities, hospitals, clinics, and senior centers.

***Synthesis of quantitative evidence***

A meta-analysis was performed to examine the effect of interventions on ACP completion, as several studies were available for statistical pooling.[41–43,45] The forest graph is shown in Figure 2. Other outcomes, including quality of life concerns, ACP engagement, surrogate decision-maker appointment, knowledge, healthcare utilization, behavioral intention, readiness, preferences for end-of-life care, the certainty of end-of-life care, and AD-relative outcomes, are not available for statistical aggregation and are therefore presented through narrative synthesis.

### *ACP completion*

A pooled analysis of these four studies showed that the intervention significantly improved ACP document completion (MD 1.49 [95% Cl 1.17-1.91], P = 0.33, $I^2 = 12\%$]).[41–43,45]

### *Quality of life concerns*

Three studies used End-of-Life Questionnaire(QOLC-E) to measure participants' quality of life concerns.[45,46,48] One result exhibited no statistically significant improvement in the QOLC-E sub-scores ($p > 0.05$);[45] but another demonstrated significant differences in the value of subscale of the mQOLC-E ($p = 0.012$).[46] Moreover, the mean score of the frail group was significantly lower than the non-frail group ($p < 0.001$).[48] One using the 12-item Short-Form Health Survey (SF-12) found no significant distinction in participants' quality of life scores ($p > 0.05$);[40] however, using the Comprehensive Quality of Life Outcome (COQOLO) scale found that Comprehensive QOL was significantly higher in the intervention group than in the control group.[24]

### *ACP Engagement*

Two studies investigating patients' ACP engagement using a self-reported tool revealed that 98.1% of participants reported ACP engagement significantly improved after the intervention;[41] in another study, the score increased considerably (p = 0.02).[43]

**Table 2.** Summary of characteristics of quantitative results of included studies

| Author, year | Participants, setting | Design | Intervention | Results | Outcome measures |
|---|---|---|---|---|---|
| Rebecca L. Sudore et al.(2018) | Volunteers(N=986)<br>Primary care clinic | RCT | Online PREPARE Program plus AD, 15 months | ACP Behavior Change and Action scores increased significantly (p < 0.001) | ACP Engagement |
| Anouk Overbeek et al. (2018) | Volunteers (N=201)<br>Care home and community | RCT | Adjusted Respecting Choices ACP program,12 months | There were no statistically significant differences between the intervention and control group in change scores. Of intervention group participants, 93% completed an AD, and 94% appointed a decision-maker. Of control participants, 34% completed an AD, and 67% appointed a decision maker (p < 0.001). | Change in quality of life<br>AD completion<br>Surrogate decision-maker appointment |
| Huei-Chuan Sung et al.(2019) | Older residents (N=57)<br>Care institution | Experimental design | Group patient education, (duration 30-min),6 months | At post-test, the experimental group had greater knowledge (p = 0.014), as well as more positive attitudes overall (p = 0.025) | Knowledge and attitude scales. |
| Wallace Chi Ho Chan et al.(2021) | Volunteers(N=304)<br>Residential care home | Experimental design | Six sessions per week (6–8 participants/ group; mean duration 90-min), 21 months | No significant improvement in QOLC-E sub-scores following the ACP intervention (p > 0.05). No significant difference was found in other outcomes. AD-related outcomes: the ACP group enhanced participants' awareness of AD and more willing to complete AD, and more participants communicated with family members about AD | QOLC<br>Preferences for EOL care<br>AD-related outcomes |
| Li-Hwa Lin et al.(2021) | Patients(N=82)<br>Medical center | RCT | 2-week video-supported nurse-led(5-min), 6 days | ACP knowledge and behavioral intentions: the intervention group showed a significantly higher ACP knowledge score (p = 0.01) The rate of AD signing was 33.3% in the intervention group and 9.3% in the control group (p = 0.01). | The signing of AD forms<br>Knowledge of ACP<br>Behavioral intention |
| Hillary D.Lum et al.(2020) | Patients(N=110)<br>Seniors Clinic | RCT | Talks group visits,2 sessions (8–10 participants/ group; mean duration 120-min) ,6 months | At 6 months, 71% of ENACT participants had an ACP document in the EHR compared with 45% of control arm participants (p < 0.001), which is a 26% difference. ENACT participants trended toward higher readiness to engage in ACP compared with control at 6 months. | ACP Engagement<br>ACP Documents<br>Readiness |
| Renli Deng et al.(2020) | Older adults (N=74)<br>Nursing homes | Experimental design | 2 sessions per month (duration 60 min) ,2 months | There was a significant difference in the care and support subscale (p = 0.016) and the value of life subscale of mQOLC-E (p = 0.012) There were no differences in the use of healthcare services and preference for EOL care between the two groups (p > 0.05) | Preferences for EOL care<br>QOLC<br>Healthcare utilization<br>Certainty of EOL care |
| Debra K.Litzelman et al. (2017) | Patients(N=117)<br>Hospital | Mixed method | ACP educational Intervention, 1 year | Those who started goal setting had decreased risk of an inpatient stay compared to those with no goal setting | Healthcare utilization |
| Hiroko Okada et al. (2022) | Older adults (N=200)<br>Hospital | NRCT | One-on-one meetings for ACP discussions(60-min), 6-month | There was only a small change in knowledge scores before and after the intervention, with no significant difference between the two groups. ACP engagement and readiness was significantly higher in the intervention group than in the control group at 6 months (p < 0.05). Comprehensive QOL was significantly higher in the intervention group than in the control group (P<0.001). | Knowledge<br>ACP engagement<br>QOLC<br>Readiness |
| Helen YL Chan et al. (2007) | Older residents (N=287)<br>Long-term care homes | a cross-sectional survey | NG | The mean QOLC-E score of the vulnerable group was significantly lower than the non-vulnerable group (P<0.001). Considerable numbers were uncertain about their end-of-life care preferences and they preferred their physician to be their surrogate. | QOLC<br>Preferences for EOL care |

ACP, advance care planning; AD, advance directive; RCT, randomized controlled trial; QOL, quality of life concerns; EOL, End-of-life

**Table 3.** Summary of characteristics of qualitative results of included studies

| Author, year, | Participants, setting | Methodology/ methods | Phenomenon of interest | Theme |
|---|---|---|---|---|
| Francesca Ingravallo et al. (2018) | Older adults (N=30) and 10 family members<br>Nursing homes | Qualitative, face-to-face interviews | This study explored the attitudes of NH residents and family members toward ACP and their opinions as to the right time to broach the subject, how it should be approached, and the content of ACP | Three themes: (1) Life in the NH (2) plans and attitudes toward ACP (3) Contents and manner of ACP |
| Sheng-Yu Fan et al. (2019) | Older adults (N=28)<br>A long-term care institution | Thematic analysis, in person-to-person interviews, using an ACP booklet | To explore the experiences and processes of ACP discussions in older residents of a long-term care institution | Three themes: (1) A way to gain a good death (2) Uncertainty in decision-making (3) The role of families in the ACP decisions |
| Sarah Combes et al. (2021) | Frail elders (N=10) and 8 family members<br>Community | Thematic analysis, in-depth interviews | To explore the barriers and enablers to ACP engagement with frail elders | Four themes: (1) Advance care planning is unclear (2) Lack of relevance (3) Importance of family, relationships, and home<br>(4) Engagement strategies |
| Carrie Bernard et al. (2020) | Volunteers (N=439)<br>Group clinics | Thematic analysis , questionnaire | This study aimed to better understand the barriers faced by older patients regarding talking to their family members and family physicians about ACP | Eight themes: (1) They were too young for ACP (2) The topic is too emotional (3) ACP is the MD's responsibility (4) Fear of negative impact on the relationship with MD (5) Not enough time in appointments (6) Concern about family dynamics (7) It is not a priority (8) A lack of knowledge about ACP |
| Sok Shin Yap et al. (2018) | Older adults(N=30)<br>Community | Thematic analysis,<br>semi-structured interview | The purpose of this study was to identify factors that influence the engagement of Chinese Australians with ACP | Three themes: (1) Knowledge (2) Attitudes (3) Needs |
| Jeanine Yonashiro-Cho et al. (2016) | Older adults(N=34)<br>A large urban area | Grounded theory,3 focus groups | The purpose of this study is to explore the knowledge, attitudes, and preferences of older Chinese Americans toward ACP | Three themes: (1) Knowledge of advance directives (2) Health as a factor in end-of-life decision-making and communication<br>(3) Communication of end-of-life care preferences |
| Jolien J. Glaudemans et al. (2020) | Older adults (N=22) and 8 family members<br>Nursing homes | Grounded theory,<br>semi-structured interview | To explore older people's and their families' experiences with ACP in primary care | Three themes: (1) Openness and trust (2) Timing and topics<br>(3) Roles of family |
| Debra K.Litzelman et al. (2017) | Patients (N=86)<br>Hospital | Thematic analysis,<br>semi-structured interview | The purpose of these interviews was to explore patient experiences with an emphasis on the discussions patients may have had with CCAs that were focused on ACP and the designation of healthcare representatives | Three themes: (1) The importance of ACP conversations and how their CCA facilitated these conversations<br>(2) The usability of the GW cards<br>(3) Their feelings towards their CCA |

NH, nursing home; MD, The Medical Doctor; ACP, advance care planning; CCAs, The Care Coordinator Assistants; GW cards, Go Wish card

### *Surrogate decision-maker appointment*

One study that used oral counseling to investigate patient surrogate decision-maker appointments discovered that the intervention group (94%) appointed more surrogate decision-makers than the control group (67%) ($p<0.001$).[40]

### *Knowledge*

One study used a standardized scale of palliative care knowledge and attitudes to measure palliative care knowledge and attitudes in participants and found that the experimental group had a higher level of knowledge ($p = 0.014$) after an intervention.[44] Of the two studies that used a self-developed instrument to assess participants' knowledge scores about ACP, one study showed no significant between-group differences before and after the experiment ($p > 0.01$),[24] while another indicated that the intervention group scored significantly higher than the control group.[42]

### *Healthcare utilization*

One study found that patients who signed up for AD had a lower risk of hospitalization in the last two years.[47] However, another study found that current ACP interventions did not reduce healthcare utilization.[46]

### *Behavioral intention*

A study using a self-developed behavioral intention scale to assess patients' behavioral changes in ACP found that the intervention group showed significantly higher ACP behavioral intention scores.[42]

### *Readiness*

Two studies used the 15-item version of the Advance Care Planning Engagement Survey, developed by Sudore *et al.*, was used to assess participants' ACP readiness and discovered that the experimental group ACP engagement scores were higher than the control group, and the effect of increased readiness differed significantly between the two groups ($p < 0.05$).[24,43] Additionally, there was a statistically significant relationship between ACP participation survey scores and the presence of ACP discussion ($P = 0.044$).[24]

***Preferences for End-of-Life Care***

Two studies used a self-developed questionnaire to assess patients' preference for end-of-life care and found no statistically significant difference between the two groups for life-sustaining treatment outcomes ($P > 0.05$),[45–48] while the frail group was more willing to involve their physicians and families in hospice preferences,[48] However, other studies indicated that experimental group more wished to receive cardiopulmonary resuscitation (CPR), mechanical ventilation (MV), and artificial feeding items at the end of life because they hope for recovery through medical treatments.[46]

***Certainty of End-of-Life Care***

One study used the SURE test (Sure of myself; Understand information; Risk-benefit ratio; Encouragement) to measure the certainty of participants' end-of-life care and found that all scores in the experimental group were much higher than the control group.[46]

***AD-related outcome**s*

A study using a self-developed questionnaire to examine AD-relative outcomes (awareness of AD, willingness to complete AD, and communication with family members about AD) found that after the intervention, the experimental group was more likely to be aware of AD ($p < 0.001$), and the number of people willing to complete AD increased from 46.2% to 78.6%, and the communication with family members on AD increased from 21% to 41%.[45]

### *Synthesis of qualitative evidence*

Three themes emerged from qualitative evidence through a meta-aggregation process: positive impact, low engagement, and high acceptance. Gain advantages and raising consciousness are the two identified subthemes within the issue of positive impact. Barriers to ACP and awareness of ACP are the two identified subthemes within the issue of low engagement. Roles of families and engagement strategies are two subthemes in the high acceptance (Table 4).

### *Gain advantages*

Participants thought the ACP could supply an open channel for discussing end-of-life issues, allowing them to express their dying wishes and provide guidance.[25,27,51,52] Some participants claimed that using ACP not only helped them undergo death more comfortably and with less pain but also significantly reduced unnecessary healthcare costs, which benefited them and their families.[26,51,52]

### *Raise consciousness*

Some participants stated that joining the ACP at the right time was tremendously useful because it allowed them to act appropriately.[25,26,52] Additionally, some participants expressed a positive attitude toward the ACP; on the one hand, it allowed them to choose they want surrogate decision-maker; on the other hand, it inspired them to use comprehensive contemplation regarding hospice care.[25,26,52]

**Table 4.** Meta-aggregation of qualitative findings

| Findings (Level 1) | Categories (Level 2) | Synthesized findings (Level 3) |
|---|---|---|
| Residents are willing to talk about the ACP because it allows them to express their opinions (U)[25] | Gain advantages | Positive impact |
| Think that ACP can help with a comfortable death and lessen the pain (U)[49] | | |
| They were comfortable with discussions about ACP and could see the benefit of planning and documenting their wishes (U)[49] | | |
| To complete ACP was because they wanted to reduce the burden on their family and suffering for themselves (U)[26] | | |
| Sharing information on end-of-life preferences will promote their autonomy at the end of life (U)[27] | | |
| Engaging in ACP appeared to increase trust (U)[52] | | |
| ACP can prevent sudden situations in the future (U)[52] | | |
| They were positive about the attention they received during these conversations, felt heard and more at ease, and felt they could trust their GP or nurse more after the ACP discussion (U)[52] | | |
| ACP can reduce the burden on your family and your pain(U)[26] | | |
| Think it is important to do ACP at the right time (C)[25] | Raise consciousness | |
| Believed that the appointment of a proxy was a good idea (U)[25] | | |
| Most participants reported positive attitudes towards ACP (U)[26] | | |
| Respondents were satisfied with the timing of ACP (U)[52] | | |
| Respondents have a positive attitude towards the topic discussed (U)[52] | | |
| These conversations stimulated systematic thinking about various issues about end-of-life care, death, and issues beyond death(U)[53] | | |
| They were comfortable with discussions about ACP and could see the benefit of planning and documenting their wishes(C)[26] | | |
| Participant cognitive impairment or low education is a major obstacle to ACP (U)[25] | Barriers to ACP | Low engagement |
| Uncertainty and lack of information created difficult barriers (U)[49] | | |
| Death is a taboo topic difficult to discuss with family (C)[26,27,50] | | |
| Participants described feeling too young or too healthy to be thinking about ACP (U)[51] | | |
| The topic is too emotional for discussions (U)[51] | | |
| Believing that ACP is the Medical Doctor's responsibility (U)[51] | | |
| Participants were concerned that having an ACP discussion might adversely affect the relationship with the doctor (U)[51] | | |
| Insufficient time in appointments with family physicians emerged as a barrier to ACP discussions (U)[51] | | |
| The language was identified as the largest barrier to overcome to increase advance care planning awareness (C)[26] | | |
| There was low awareness of advance care planning amongst the participants and some confusion regarding the concept (U)[26] | Awareness of ACP | |
| I don't know enough about ACP (U)[51] | | |
| Participants expressed concern about how an ACP discussion may affect family dynamics (U)[51] | Roles of family | High Acceptance |
| Family relationships played an important role in the ACP decisions (C)[49] | | |
| Relationships were important to frail elders and impacted decision-making (U)[50] | | |
| The quality of ACP appeared to improve if the family was involved in ACP (U)[52] | | |
| The quality and accessibility of ACP may improve if GPs and nurses include family members in discussions about ACP (U)[52] | Engagement strategies | |
| Participants believed the best way to engage frail elders with advance care planning was by using the right approach and preparing individuals for advance care planning conversations (U)[50] | | |
| In-language materials and key support networks including GPs, family, and Chinese community groups were identified as ideal forums for the promotion of advance care planning(C)[26] | | |
| These networks were also important in helping participants who spoke little or no English cope with the language barrier when accessing healthcare (U)[26] | | |
| Health as a Factor in the timing of ACP and Communication (U)[27] | | |
| Quality of ACP seemed to improve if respondents 'views on their current life and future, a few specific future care scenarios and expectations and responsibilities regarding ACP were discussed (U)[52] | | |
| ACP is unclear, some confusion remained (U)[50] | Unclear questions | |
| Lack of understanding and clarity about advance directives (C)[27] | | |

he U and C represent the levels of credibility for the findings: U represents "unequivocal" evidence, C represents "credible" evidence, and N represents "not supported" evidence.

### *Barriers to ACP*

Participants often do not have the chance to begin discussions about ACP or end-of-life care due to a lack of relevant information and comprehension, particularly when they think they are too young or in good health.[25,49,51] Others were concerned that discussing or disputing end-of-life options with a family doctor would harm their benefit, and many also claimed that owing to cultural differences, they could not discuss death with their families.[26,27,49,50] Only one study claims that language is the most significant barrier to increasing awareness of ACP.[26]

### *Awareness of ACP*

Some participants showed low ACP awareness because they frequently confused it with other ideas, like wills and euthanasia, and some even claimed they were unaware of it, arguing that family members should make end-of-life decisions rather than themselves.[26,49]

### *Roles of family*

Participants were concerned that their ACP conversations would impact the relationship between families, which could affect the ACP operates and even makes decisions.[50,51] Family relationships were meaningful when making ACP decisions, according to some participants, and it was even possible that family involvement could have a positive effect and enhance the quality of ACP.[49,52]

### *Engagement strategies*

Participants believed the best way to engage frail elders with ACP was by using the right approach and preparing individuals for ACP conversations.[50,52] Therefore, in addition to general practitioners (GPs), nurses, and family, the Chinese community and networking can be included to enhance the quality and accessibility of the ACP, as some participants felt this

could help overcome current language barriers.[26,52] A minor participant believed that communication time for ACP was related to health because they thought they did not require it when they were healthy.[27]

### *Unclear questions*

There was still some uncertainty during the process when interviewees were unclear about the meaning of ACP.[27,50] They point out that ambiguous documentation, terminology, and professional language may undermine the motivation of frail elderly to engage in ACP and their trust in professionals while enhancing the ambiguity of ACP language.[27,50]

### *Integration of quantitative and qualitative evidence*

The quantitative and qualitative evidence synthesis results were generally consistent, and the three pieces of evidence aggregated are detailed below (Table5). Participants' positive perceptions of ACP in qualitative evidence help explain the significant improvement in various outcomes of ACP reported in quantitative evidence.

### *Sense of control*

Quantitative and qualitative research has consistently demonstrated that appropriate interventions promote ACP behavior readiness. Quantitative results show that interventions significantly increase participants' knowledge of ACP and end-of-life issues while also enhancing their engagement in ACP,[24,40–45] which may enhance participants' quality of life at the end of their lives. Because after the intervention, a significant proportion of individuals were willing to discuss hospice care preferences with family members or clinicians and complete AD.[40,42,43,45,46,48] Qualitative research suggests that ACP can allow people to systematically think about their hospice preference, voice their opinions about death, and

**Table 5.** Integration of quantitative evidence and qualitative evidence

| Quantitative results | Qualitative finding (categories) | Aggregation |
|---|---|---|
| ACP completion | Gain advantages | Sense of control |
| In intervention group participants, 93% completed AD[40] | Raise consciousness | |
| The intervention resulted in a higher rate of ACP documentation [42] | | |
| Slight increase in AD completions[45] | | |
| The rate of advance directive signing was 33.3% in the intervention group[43] | | |
| The number of new ACP documents at 6 months was significantly different[41] | | |
| Quality of life concerns | | |
| Quality of life scores did not change significantly before and after the intervention[40] | | |
| There was no statistically significant improvement in QOL-E sub-scores following the ACP intervention[45] | | |
| Regarding QOL concerns, the ACP intervention interviews had a positive effect on physical discomfort and food-related concerns and a short-term effect on decreasing existential distress[46] | | |
| Comprehensive QOL was significantly higher in the intervention group than in the control group[24] | | |
| The mean QOLC-E score of the frail group was significantly lower than that of the non-frail group[48] | | |
| Surrogate decision-maker appointment | | |
| 94% appointed a decision-maker[40] | | |
| Behavioral intention | | |
| Significantly higher ACP behavioral intention scores[43] | | |
| The AD sign-up rate was 33.3%[43] | | |
| AD-related outcomes | | |
| Willingness to complete AD increased from 46.2% to 78.6%[45] | | |
| ACP Engagement | | |
| The intervention resulted in higher self-reported increased ACP engagement scores[42] | | |
| The ACP engagement score increased significantly from baseline to 6-month follow-up, with a 22.5% increase in score[41] | | |
| The scores tended to be higher in the intervention group than in the control group.[24] | | |
| Healthcare utilization | | |
| The current ACP intervention did not decrease healthcare utilization[46] | | |
| ACP had a reduced risk of hospitalization[47] | | |
| Readiness | | |
| The increase in readiness over time was significantly different[41] | | |
| Knowledge | | |
| Significant positive effects of the ACP program on knowledge[44] | | |
| The intervention group had significantly higher scores in knowledge[43] | | |
| There was only a small change in knowledge scores[24] | | |
| / | Engagement strategies | Obstacles and facilitators |
| | Barriers to ACP | |
| Preferences for End-of-Life Care | Roles of family | Impact of intervention |
| There was no statistically significant difference in preference for end-of-life care between the two groups[45] | Awareness of ACP | |
| Respondents in the vulnerable group were more willing to involve their physicians and families in end-of-life care preferences[48] | Unclear questions | |
| AD-related outcomes | | |
| All scores in the experimental group were much higher than those in the control group[46] | | |
| Awareness of AD increased from 23.6% to 76%[45] | | |
| Communicated with family members about AD increased from 21% to 41%[45] | | |

ensure they pass away comfortably,[25,27,47,51,52] relieving the strain on their loved ones and their suffering.[25,27,52] In addition, a positive attitude toward the issue of palliative care may empower them to make behavioral changes.

### *Obstacles and facilitators*

Qualitative data highlighted facilitators and barriers in the process of ACP engagement.[25–27,49–52] The primary obstacles to ACP awareness improvement were cognitive impairment, educational attainment,[25] and language communication;[26] participants also mentioned that discussing death with family members was taboo due to cultural differences.[26,27,49–51] The optimal way to involve frail elderly in ACP is through the appropriate strategy and preparation of individuals for ACP discussions.[50] Additionally, using the web as a medium while engaging GPs, nurses, and families in ACP discussions may all increase the quality of ACP.[26,27,52] However, extracting facilitators and hindrances from qualitative results is not investigated in quantitative data.

### *Impact of intervention*

Quantitative and qualitative studies show that family relationships influence participants' ACP decisions.[45,49–52] Qualitative findings also revealed that some participants' awareness of the definition of ACP is still unclear.[26,49] Quantitative data mean that participants' awareness of ACP improved after the intervention, improving patients' quality of life in the dying.[46,48] Although the qualitative data revealed that some questions were confusing to the participants,[27,50] was not reflected in the quantitative data. The differences underscore the need to ascertain the clarity of the ACP to the participants.

## DISCUSSION

### *Main findings*

This review synthesizes evidence from the effects and experiences of frail elderly who have participated in ACP discussions. We followed JBI's MMSR guidance by integrating quantitative and qualitative evidence to comprehensively understand ACP's effectiveness and participants' opinions of ACP.[37] One of the ten included quantitative studies utilized online education interventions,[41] and the others used video, conference, or questionnaire interventions to direct participants to ACP discussion.[24,42–47] In the included qualitative studies, four were assessed as moderate quality, while others were rated low quality because these reviews supplied insufficient methodological information. The quality of the quantitative studies was fair in general. A significant reason is that most studies have an intervention group and a control group. The assessment tools employed in this review to evaluate quantitative research also apply to the study design of the control group, improving the validity of the findings.

The aggregated findings from configurative analysis demonstrate that the quantitative and qualitative synthesis were complementary and coherent to support that ACP is an effective and acceptable strategy to facilitate frail elderly to express their preferences at the end of life. Participants generally agreed that the ACP provided an excellent way to complete the AD that fits their preferences by having frank discussions about end-of-life issues with family members or medical staff. These aggregations are consistent with the main elements of the theory of planned behavior (TPB) in the behavioral change model of healthy behavior, where attitude, subjective norm, and perceived behavior control three elements that shape an individual's behavior intention and actual behavior.53 Thus, these aggregates help to explain that behaviors that improve ACP practice can promote engagement and completion of ACP and thus improve end-of-life care quality.

### *Strengths and limitations*

The advantage of this study is that using MMSR to give a comprehensive and in-depth analysis of the quantitative and qualitative data already available to explain the effects and experiences of ACP. Given the insufficiency of research in this field, all identified studies were included in this review. The aggregation of the quantitative and qualitative evidence reached a coherent consensus that enhanced the credibility of the findings on the effectiveness and acceptance of ACP.

We are aware of the limitations of this review. First, even though we thoroughly searched the current literature, it is possible to miss relevant studies because we only included English language papers, and a grey literature search was not undertaken. Second, few studies have explicitly looked at ACP with frail elderly who are cognitively normal and do not have a specific terminal condition, nor have any studies that have used an operational measure of frailty. Therefore, the prevalence and degree of frailty in the research included in this systematic review are unknown; nonetheless, the results can be applied to the elderly without significant medical issues in the community or institutional settings. Third, because most of the studies included in this analysis were not blinded, people who received ACP were likelier to accept to participate in ACP-related investigations, potentially risk participation bias. However, most studies had a reasonable response rate, which is beneficial for reducing this risk.

***What this review adds***

The field of ACP is still in its infancy. Therefore, we contained quantitative and qualitative information in our analysis to fully understand the state of the sciences. The findings show that provoking the elderly to consider death through intervention may effectively promote their engagement and completion of ACP. The meta-analysis showed that the completion rate of ACP improved after the intervention despite heterogeneity in the data. Even though most participants view ACP positively, some elderly persons are still hesitant. So that we need to be aware of what factors obstacle older adults from engaging in the discussion of end of life and adopt practical measures to resolve it. Although there are no comparable qualitative data to support quantitative evidence on behavioral changes in ACP directly, the ACP offers patients a dependable and comfortable way to have end-of-life discussions.

More extensive and rigorous research is required to ascertain ACP's effects on fragile elderly. A more thorough study can be used to comprehend interesting phenomena we are interested including group effects, behavioral changes in the aged, and changes in health care costs. Additionally, as the ACP incorporates more than just legal and medical knowledge, Special consideration should also be given to participants' understanding of these issues. Using trained volunteers or staff from health facilities to conduct ACP discussions has been shown in studies to enhance the communication's quality and advantages further.

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approval: WXY, HXL, WWJ, LL.

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**Figure1 PRISMA flow diagram of the study selection process**

**Figure2 Forest plot of pooled results for ACP completion**

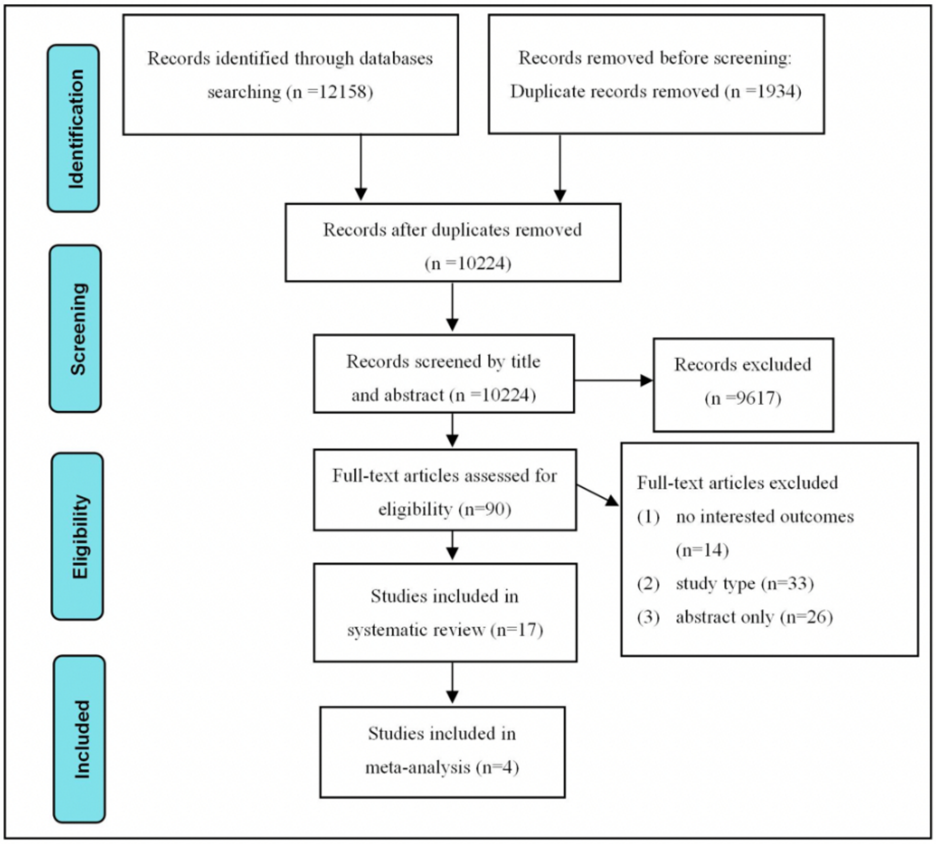
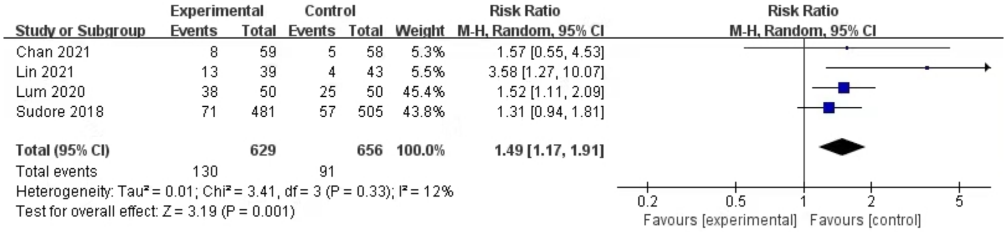


**Figure1 PRISMA flow diagram of the study selection process.**

PRISMA flow diagram of the study selection process

173x155mm (144 x 144 DPI)



| Study or Subgroup | Experimental Events | Experimental Total | Control Events | Control Total | Weight | Risk Ratio M-H, Random, 95% CI |
|---|---|---|---|---|---|---|
| Chan 2021 | 8 | 59 | 5 | 58 | 5.3% | 1.57 [0.55, 4.53] |
| Lin 2021 | 13 | 39 | 4 | 43 | 5.5% | 3.58 [1.27, 10.07] |
| Lum 2020 | 38 | 50 | 25 | 50 | 45.4% | 1.52 [1.11, 2.09] |
| Sudore 2018 | 71 | 481 | 57 | 505 | 43.8% | 1.31 [0.94, 1.81] |
| **Total (95% CI)** |  | **629** |  | **656** | **100.0%** | **1.49 [1.17, 1.91]** |
| Total events | 130 |  | 91 |  |  |  |

Heterogeneity: Tau² = 0.01; Chi² = 3.41, df = 3 (P = 0.33); I² = 12%
Test for overall effect: Z = 3.19 (P = 0.001)

Forest plot of pooled results for ACP completion.

283x67mm (72 x 72 DPI)

## Appendix 1

**Search date: 20/04/2022**

**[Search strategy for MEDLINE / EMBASE / PsycINFO/ CINAHL via OvidSP]**

1. exp Frailty/
2. frailty.mp.
3. exp Frail Elderly/
4. Frail Elderly.sh,kf.
5. Frail Older People.mp.
6. Frailty syndrome.mp.
7. (Frailty adj2 syndrome).mp.
8. (Frail* or geriatric syndrome* or geriatric disorder*).ti,ab.
9. ((elder* or old* or senior* or geriatric*) adj4 function* adj4 (declin* or impair*)).af.
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11. exp Advance Care Planning/
12. (advance* care adj plan*).tw.
13. (advance* adj (medical plan* or statement*)).tw.
14. acp.tw.
15. Statement of wishes.tw.
16. Terminal Care/
17. terminal care.tw.
18. ((end of life or EOL) adj5 (care or discuss* or decision* or plan* or preference*)).tw.
19. Living Wills/
20. living will*.tw.
21. 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20
22. 10 and 21
23. limit 22 to (english language and yr="2003 - 2022" and "all aged (50 and over)")

**PubMed**

(((Frail Elderly[MeSH Terms]) OR (Elderly, Frail[Title/Abstract] OR Frail Elders[Title/Abstract] OR Elder, Frail[Title/Abstract] OR Elders, Frail[Title/Abstract] OR Frail Elder[Title/Abstract] OR Functionally-Impaired Elderly[Title/Abstract] OR Elderly, Functionally-Impaired[Title/Abstract] OR Functionally Impaired Elderly[Title/Abstract] OR Frail Older Adults[Title/Abstract] OR Adult, Frail Older[Title/Abstract] OR Adults, Frail Older[Title/Abstract] OR Frail Older Adult[Title/Abstract] OR Older Adult, Frail[Title/Abstract] OR Older Adults, Frail[Title/Abstract])) AND (Advance Care Planning[MeSH Terms])) OR (Advance Health Care Planning[Title/Abstract] OR Advance Medical Planning[Title/Abstract] OR Medical Planning, Advance[Title/Abstract] OR Planning, Advance Medical[Title/Abstract] OR Advance Directives[Title/Abstract] OR Living Wills[Title/Abstract] OR Terminal Care[Title/Abstract]) AND ((aged[Filter]) AND (2003:2022[pdat]))

**Cochrane library**

#1 (advance care planning):ti,ab,kw OR (Advance Directive):ti,ab,kw OR (Living will):ti,ab,kw OR (advance* NEAR/3 plan*):ti,ab,kw OR (future care planning):ti,ab,kw
#2 (Anticipatory care plan*):ti,ab,kw OR (end of life NEXT (discuss* or conversation* or decision* or plan* or preference*)):ti,ab,kw OR (Medical treatment order):ti,ab,kw OR (Statement of wishes):ti,ab,kw OR (Medical directive):ti,ab,kw
#3 (advance* NEXT (medical plan* or statement*)):ti,ab,kw
#4 advance care planning
#5 Advance Directive
#6 Living will
#7 (Frail Elderly):ti,ab,kw OR (Frail):ti,ab,kw OR (Elderly):ti,ab,kw OR (Frailty syndrome):ti,ab,kw
#8 #1 or #2 or #3 or #4 or #5 or #6

#9 #8 and #7

**CINAHL complete**

S1 "advance* care plan*"
S2 "Anticipatory care plan*"
S3 "future care planning"
S4 (MH "Advance Care Planning")
S5 "Advance Care Planning"
S6 "Living Wills"
S7 (MH "Advance Directives+") OR (MH "Living Wills")
S8 "Advance Directives"
S9 "Resuscitation Orders"
S10 "Medical treatment order"
S11 "Statement of wishes"
S12 "Medical directive"
S13 "end of life discuss*"
S14 "end of life conversation*"
S15 "end of life decision*"
S16 "end of life plan*"
S17 "end of life preference*"
S18 "advance* medical plan*"
S19 "advance* statement*"
S20 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19
S21 (MH "Frailty") OR (MH "Frail Elderly")
S22 " frailty"
S23 "Frailty syndrome"
S24 "Frail Older People"
S25 S21 OR S22 OR S23 OR S24
S26 S20 AND S25
S27 (AG "50 and over") AND (DT "2003 - 2022") AND (ZL "English")
S28 S26 AND S27

## Appendix 2

### Table 2a. Methodological quality of included randomized controlled trial

| | Rebecca L et al, 2018 | Anouk Overbeek et al, 2019 | Li-Hwa Lin et al, 2021 | Hillary D. Lum et al, 2020 |
|---|---|---|---|---|
| 1. Was true randomization used for assignment of participants to treatment groups? | Yes | Yes | Yes | Yes |
| 2. Was allocation to treatment groups concealed? | Yes | No | Unclear | Unclear |
| 3. Were treatment groups similar at the baseline? | Yes | Yes | Yes | Yes |
| 4. Were participants blind to treatment assignment? | No | No | Unclear | No |
| 5. Were those delivering treatment blind to treatment assignment? | Yes | No | Unclear | No |
| 6. Were outcomes assessors blind to treatment assignment? | Yes | No | Unclear | No |
| 7. Were treatment groups treated identically other than the intervention of interest? | Yes | Yes | Yes | Yes |
| 8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed? | Yes | Yes | Yes | Yes |
| 9. Were participants analyzed in the groups to which they were randomized? | Yes | Yes | Yes | Yes |
| 10. Were outcomes measured in the same way for treatment groups? | Yes | Yes | Yes | Yes |
| 11. Were outcomes measured in a reliable way? | Yes | Yes | Yes | Yes |
| 12. Was appropriate statistical analysis used? | Yes | Yes | Yes | Yes |
| 13. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial? | Yes | Yes | Yes | Yes |
| Overall quality | Moderate | Low | Low | Low |

### Table 2b. Critical appraisal results for included quasi-experimental studies or mixed methods studies or no randomized controlled trial

| | Huei-Chuan Sung et al, 2019 | Wallace Chi Ho Chan et al, 2021 | Renli Deng et al, 2020 | Debra K.Litzelman et al, 2017 | Hiroko Okada et al, 2022 |
|---|---|---|---|---|---|
| 1. Is it clear in the study what is the 'cause' and what is the 'effect' (i.e. there is no confusion about which variable comes first)? | Yes | Yes | Yes | Yes | Yes |
| 2. Were the participants included in any comparisons similar? | Yes | Yes | Yes | Yes | Yes |
| 3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest? | No | No | No | No | No |
| 4. Was there a control group? | Yes | Yes | Yes | No | No |
| 5.Were there multiple measurements of the outcome both pre and post the intervention/exposure? | Yes | Yes | Yes | No | No |

| | | | | | |
|---|---|---|---|---|---|
| 6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed? | Yes | Yes | No | Unclear | Yes |
| 7. Were the outcomes of participants included in any comparisons measured in the same way? | Yes | Yes | Yes | Yes | Yes |
| 8. Were outcomes measured in a reliable way? | Yes | Yes | Yes | Yes | Yes |
| 9. Was appropriate statistical analysis used? | Yes | Yes | Yes | Yes | Yes |
| Overall quality | Moderate | Moderate | Moderate | Low | Low |

**Table 2c. Critical appraisal results for included qualitative studies**

| | Francesca Ingravallo et al, 2018 | Sheng-Yu Fan et al, 2019 | Sarah Combes et al, 2021 | Carrie Bernard et al, 2020 | Sok Shin Yap et al, 2021 | Jeanine Yonashiro-Cho et al, 2016 | Jolien J. Glaudemans et al, 2020 | Debra K.Litzelman et al, 2017 |
|---|---|---|---|---|---|---|---|---|
| 1. Is there congruity between the stated philosophical perspective and the research methodology? | Unclear | Unclear | Yes | No | Unclear | Yes | Yes | Yes |
| 2. Is there congruity between the research methodology and the research question or objectives? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 3. Is there congruity between the research methodology and the methods used to collect data? | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes |
| 4. Is there congruity between the research methodology and the representation and analysis of data? | Yes | Yes | Yes | Unclear | Yes | Yes | Unclear | Yes |
| 5. Is there congruity between the research methodology and the interpretation of results? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 6. Is there a statement locating the researcher culturally or theoretically? | No | No | No | Unclear | No | No | No | No |
| 7. Is the influence of the researcher on the research, and vice- versa, addressed? | Unclear | Yes | Yes | Unclear | Unclear | Unclear | Unclear | Unclear |
| 8. Are participants, and their voices, adequately represented? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body? | Yes | Yes | Yes | Yes | No | Yes | No | Yes |
| 10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Overall quality | Low | Moderate | Moderate | Low | Low | Moderate | Low | Moderate |

**Table 2d. Critical appraisal results for included cross sectional studies**

| | Helen YL Chan et al, 2007 |
|---|---|
| 1. Were the criteria for inclusion in the sample clearly defined? | Yes |
| 2. Were the study subjects and the setting described in detail? | Yes |
| 3. Was the exposure measured in a valid and reliable way? | Yes |
| 4. Were objective, standard criteria used for measurement of the condition? | Yes |
| 5. Were confounding factors identified? | Unclear |
| 6. Were strategies to deal with confounding factors stated? | No |
| 7. Were the outcomes measured in a valid and reliable way? | Yes |
| 8. Was appropriate statistical analysis used? | Yes |
| Overall quality | Moderate |

# PRISMA 2020 Checklist

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| **TITLE** | | | |
| Title | 1 | Identify the report as a systematic review. | Page 1 |
| **ABSTRACT** | | | |
| Abstract | 2 | See the PRISMA 2020 for Abstracts checklist. | Page 1 |
| **INTRODUCTION** | | | |
| Rationale | 3 | Describe the rationale for the review in the context of existing knowledge. | Page 2 and 3 |
| Objectives | 4 | Provide an explicit statement of the objective(s) or question(s) the review addresses. | Page 2 and 3 |
| **METHODS** | | | |
| Eligibility criteria | 5 | Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses. | Page 4 |
| Information sources | 6 | Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted. | Page 4 |
| Search strategy | 7 | Present the full search strategies for all databases, registers and websites, including any filters and limits used. | Page 4 and supplementary material 2 |
| Selection process | 8 | Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process. | Page 4 |
| Data collection process | 9 | Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process. | Page 4 |
| Data items | 10a | List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect. | Table 2 and Table 3 |
| | 10b | List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information. | Table 2 and Table 3 |
| Study risk of bias assessment | 11 | Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process. | Page 5 |
| Effect measures | 12 | Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results. | |
| Synthesis methods | 13a | Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)). | Page 5 and 6 |
| | 13b | Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions. | Page 5 and 6 |
| | 13c | Describe any methods used to tabulate or visually display results of individual studies and syntheses. | Page 5 and 6 |
| | 13d | Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used. | Page 5 and 6 |
| | 13e | Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression). | |
| | 13f | Describe any sensitivity analyses conducted to assess robustness of the synthesized results. | |
| Reporting bias assessment | 14 | Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases). | |

## PRISMA 2020 Checklist

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| Certainty assessment | 15 | Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. | |
| **RESULTS** | | | |
| Study selection | 16a | Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram. | Page 7 |
| | 16b | Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded. | Page 7 |
| Study characteristics | 17 | Cite each included study and present its characteristics. | Page 8 |
| Risk of bias in studies | 18 | Present assessments of risk of bias for each included study. | Supplementary material |
| Results of individual studies | 19 | For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots. | Figure 2 |
| Results of syntheses | 20a | For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies. | |
| | 20b | Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect. | Pages 7 to 14 |
| | 20c | Present results of all investigations of possible causes of heterogeneity among study results. | |
| | 20d | Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results. | |
| Reporting biases | 21 | Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed. | |
| Certainty of evidence | 22 | Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed. | |
| **DISCUSSION** | | | |
| Discussion | 23a | Provide a general interpretation of the results in the context of other evidence. | Pages 14 |
| | 23b | Discuss any limitations of the evidence included in the review. | Pages 15 |
| | 23c | Discuss any limitations of the review processes used. | Pages 14 |
| | 23d | Discuss implications of the results for practice, policy, and future research. | |
| **OTHER INFORMATION** | | | |
| Registration and protocol | 24a | Provide registration information for the review, including register name and registration number, or state that the review was not registered. | Pages 4 |
| | 24b | Indicate where the review protocol can be accessed, or state that a protocol was not prepared. | |
| | 24c | Describe and explain any amendments to information provided at registration or in the protocol. | |
| Support | 25 | Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review. | |
| Competing interests | 26 | Declare any competing interests of review authors. | Title page |
| Availability of data, code and other materials | 27 | Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review. | Title page |

# PRISMA 2020 Checklist

*From:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.org/

BMJ Open

# Advance care planning for frail elderly: Are we missing a golden opportunity? A mixed-method systematic review and meta-analysis

| | |
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# Title page

**Title of the article:** Advance care planning for frail elderly: Are we missing a golden opportunity? A mixed-method systematic review and meta-analysis

**Author details:**

**Author 1**

Xin-Ying Wang, School of Nursing, University of South China, Hengyang, Hunan Province, China

Email: 741021586@qq.com

OCCID: https://orcid.org/0000-0002-2006-0815

**Author 2**

Xin-Lin Huang, School of Nursing, University of South China, Hengyang, Hunan Province, China

Email: xinlin.huang@stu.usc.edu.cn

OCCID: https://orcid.org/0000-0002-2405-5896

**Author 3**

Wei-Jia Wang, School of Nursing, University of South China, Hengyang, Hunan Province, China

Email: 972482148@qq.com

**Corresponding Author**

Li-Liao, School of Nursing, University of South China, Hengyang, Hunan Province, China

Email: 254251558@qq.com

OCCID: https://orcid.org/0000-0001-7450-0444

**Word count:**4168 words

**Strengths and limitations of this study :**

- To our knowledge, this study is the first to use MMSR to synthesize quantitative and qualitative evidence to illustrate the role and experience of ACP in frail elderly people.
- In the preliminary review process, no potential studies were discovered that identified patients using objective measures of frailty, so we based previous systematic reviews on designing the inclusion criteria for frail older adults.
- We defined 'the frail elderly' as the elderly who do not live in the stage of a terminal condition or dementia; thus, the applicability of findings to patients with significant medical issues is unclear.

# Advance care planning for frail elderly: Are we missing a golden opportunity? A mixed-method systematic review and meta-analysis

## ABSTRACT

**Objective**: The aim is to integrate quantitative and qualitative evidence to understand the effectiveness and experience of ACP for frail elderly. **Design**: A mixed-methods systematic review and meta-analysis was conducted. Quality evaluation was conducted using critical appraisal tools from the Joanna Briggs Institute. Data were synthesized and pooled for meta-analysis or meta-aggregation as needed. **Data sources**: An electronic search of MEDLINE, CINAHL, Embase, PubMed, PsycINFO, and Cochrane Library databases from January 2003 to April 2022. **Eligibility criteria for selecting studies**: We included experimental and mixed methods studies. The quantitative component attempts to incorporate a broader study design. The qualitative component aids in comprehending the participant's experience with ACP and its efficacy. **Data extraction and synthesis**: Two independent reviewers undertook screening, data extraction, and quality assessment. The quantitative and qualitative data were synthesized and integrated using a convergent segregated approach. **Results**: There were 12158 articles found, and 17 matched the inclusion criteria. The quality of the quantitative component of most included studies (6/10) was rated as low, and the qualitative component of half included studies (4/8) was rated as moderate. The meta-analysis showed that the intervention of ACP for frail elderly effectively increases readiness, knowledge, and process of ACP behaviors. The meta-aggregation showed that the participants hold a positive attitude toward ACP and think it facilitates expressing their preferences for the medical decision. **Conclusion**: ACP is an effective and feasible strategy to facilitate frail elderly to express their healthcare wishes timely and improve their outcomes. More well-designed randomized controlled trials evaluating the most effective ACP interventions and tools are needed for the frail elderly population.

**PROSPERO registration number CRD42022329615**

## INTRODUCTION

As the world's aging population is coming, traditional healthcare systems are under more strain with the increasing prevalence of chronic and aging-related disorders in elderly persons who commonly require continuous monitoring and long-term care.[1–4] According to previous research, aging is also related to frailty,[5] which may make the elderly more susceptible to negative impacts.[6–11] Frailty has consequently caused a significant worldwide health burden and effects on clinical practice and public health.[2]

Frailty is a clinical condition in which an individual's exposure to stressors increases their vulnerability and thus their risk of adverse health outcomes, such as falls, unexpected disability, hospitalization, and mortality.[5,12] It is a dynamic process that increases with age and often spirals downward, increasing the likelihood of adverse outcomes.[5,13,14] A recent meta-analysis of the prevalence of frailty in 62 countries around the world showed a prevalence of

31% in Oceania, 25% in Asia, 23% in the Americas, 22% in Africa, and 8% in Europe.[15] Two studies found that frail elderly were more likely to desire comfort care when they approached the end of their lives, but these demands were not accurately recorded, resulting in receiving treatment or care against their preferences.[16,17]

Advance care planning (ACP) is planning to help patients receive medical care aligned with their preferences, especially in severe illness or as the end-of-life approaches.[18] It involves various activities, including appointing surrogate decisions, completing or reviewing advance directives (AD), and discussing end-of-life wishes with family members or healthcare professionals.[19] ACP has been demonstrated to enhance patient quality of life, family communication, and care satisfaction, significantly relieving the burden on patients and families.[20–24] Recent systematic reviews have investigated how ACP affects senior citizens in certain facilities like hospitals[25] and nursing homes.[26] Others have studied older people's perceptions and experiences with ACP using qualitative evidence-synthesized techniques.[27] Others have investigated the efficiency of various interventions in promoting ACP, but it is unclear which strategy is most beneficial.[28] However, there are still challenges in implementing ACP for people's low awareness of ACP and cultural conflicts.[29–31] The absence of opportunity for conversation on end-of-life desires to elicit their reflection is a major contributing factor to this dilemma.[32] Frailty is a common clinical symptom in older adults,[33–34] who commonly have lower AD completion rates.[2,5] Therefore, ACP may provide an opportunity for it to express its preference.

Despite the availability of studies on ACP for frail elderly, there is a scarcity of literature to synthesize quantitative and qualitative evidence to investigate this topic. Consequently, this study aims to utilize a mixed-methods systematic review (MMSR) to integrate the quantitative and qualitative evidence to answer the question "What is the effectiveness and experience of ACP for frail elderly?", which can provide up-to-date evidence for the dissemination of ACP and the promulgation of relevant policies.[35] The quantitative component attempts to incorporate a broader study design. The qualitative component aids in comprehending the participant's experience with ACP and its efficacy. A final synthesis of quantitative and qualitative evidence will be produced to support the implementation and promotion of ACP.

## METHODS

This review was performed following the Joanna Briggs Institute (JBI) methodology for MMSRs to address the review question, data synthesis, and integration.[35,36] The review was registered on PROSPERO (CRD42022329615).

### *Search strategy*

Six databases, including MEDLINE, CINAHL, Embase, PubMed, PsycINFO, and Cochrane Library, were searched from January 2003 to April 2022. Because the term "advance care planning" was first used in 2003, this cut-off period was chosen. The search terms include appropriate subject headings and wildcards of “advance care planning,” “end of life,” “advance directive,” and “frail elderly” or “pre-frailty.” The completed search techniques are presented in Appendix 1.

### *Study selection*

Based on the initial scoping review, no potential studies were discovered that identified patients using objective measures of frailty. Given this, this study designs inclusion and exclusion criteria that use an operational definition of frailty[37] and draw from previous systematic reviews[25] to capture frail patients in a diverse population. A mean age criterion of 50 years was chosen because frailty is a geriatric syndrome associated with aging (prior studies indicate that it may manifest before age 65),[15] and this was combined with the absence of focus on a disease-specific terminal condition or dementia. Research of interventions focusing on developing resuscitation-assisted euthanasia or suicide was excluded, but studies of interventions promoting the ACP or communicating AD were included. ACP is considered an interactive process, so the relevant results (such as ACP process outcomes, action outcomes, and care outcomes) should be included in the standard.[38] ICU patients were not included because they could not make plans for the future in most cases.[39] Because there were insufficient resources for translation, articles in non-English languages were deleted. Table 1 lists the inclusion and exclusion standards in detail. After searching for and removing duplicate entries, all records were sent to reference manager software (Zotero). Two reviewers independently evaluated titles and abstracts to out irrelevant research and keep papers that met the inclusion criteria. Abstracts and titles will be classified as "certainly not relevant" or "possibly relevant." Take note of the reason for exclusion. If there was any uncertainty or dispute, it was resolved with the assistance of a third review author.

### *Data extraction*

One reviewer used standardized JBI data extraction methods to extract quantitative and qualitative data from the included papers and discussed those findings with the second reviewer.[40] Authors, year, participant, setting, design, intervention, result, and outcome were the quantitative information extracted. The retrieved qualitative information encompassed the population, method, setting, cultural knowledge, study objectives-related data analysis, and specifics regarding the phenomena of interest. The author's interpretations of the qualitative data analysis, which included topics and subtopics, were also obtained. Two reviewers independently evaluated these extractions' level of "confidence" (defined as clear, believable, and unsupported) using illustrations (i.e., direct citation of participant voices, field observation records, or other data).[40]

### *Quality appraisal*

Two independent reviewers used the JBI Critical Appraisal tools,[40] comprising checklists for randomized controlled trials (RCT), quasi-experimental studies, non-randomized experimental research (NRCT), and qualitative research to evaluate the quality of the included papers. The checklist only accepts answers in the form of “Yes,” “No,” or “Unclear.” All “Yes” responses indicate high quality, one or two “Unclear” or “No” responses indicate moderate quality, and more than two “Unclear” or “No” responses indicate low quality. This method rates the literature as low, moderate, and high quality. Any disagreements in the research were discussed until an agreement was reached.

**Table 1.** Eligibility criteria of studies

| | Inclusion | | Exclusion |
|---|---|---|---|
| | Quantitative component | Qualitative component | Quantitative and Qualitative components |
| Types of participants | Health status is focused on pre-frailty or frailness. Adult (≥50 years old) regardless of gender and geographical location. | | Mean age < 50 years. Focus on a disease-specific terminal condition or dementia. |
| Types of interventions | Interventions that adopted any tools or methods to promote ACP or communication of AD.<br>Any comparator or no comparator. | | Interventions to help develop resuscitation assisted euthanasia or suicide. |
| Outcomes/ Phenomena of interest | Advance care planning outcomes<br>-ACP process outcomes, such as knowledge, and readiness , quality of life<br>-Action outcomes, such as ACP Engagement, completion of ACP<br>-Care Outcomes, such as mood or health care expenditures | Experiences with the interventions. | |
| Context | The community, hospital settings, clinics, nursing homes, or homes. | | Intensive care unit |

| | | | |
|---|---|---|---|
| Types of studies | (1) Various types of experimental studies, such as RCTs, non-RCTs, and observational analysis/descriptive studies (prospective and retrospective cohort studies and cross-sectional studies).<br>(2) Mixed methods studies are only considered when data and findings for quantitative components are reported and can be extracted. | (1) Various types of experimental qualitative studies<br>(2) Mixed-methods studies are only considered when data and findings for qualitative components are reported and can be extracted. | Opinion pieces, guidelines, individual case reports, study proposals/protocols, conference abstracts, Ph.D. theses, grey literature, and non-peer-reviewed journals. |

### *Data synthesis and integration*

This study used a convergent segregated approach to synthesize and integrate quantitative and qualitative data because the review examined different dimensions of a phenomenon of interest.[41,42] A statistical meta-analysis of quantitative data was performed using the Cochrane Collaboration's Review Manager 5.4 program to obtain a summary estimate of the effect. Using I-square statistic and Chi-square test to evaluate heterogeneity. The results were presented in narrative summaries when it could not do statistical pooling. Qualitative research findings were gathered using the meta-aggregation approach based on the JBI methodology.[40] The extract findings (Level 1) were compiled into statements. Then, these findings with similar (at least two findings per category) are combined to create the categorization (Level 2). Finally, a comprehensive set of synthesized findings for evidence-based practice was developed by synthesizing these categories (at least two for each synthesized finding) (Level 3).[40]

### *Patient and public involvement*

Patients and the public were not involved in the development of this study.

## RESULT

### *Study selection*

A total of 12,158 articles were retrieved. There were 1934 duplicate articles removed, and 9617 papers were deleted based on title and abstract. The full text of the 90 articles screened was reviewed, and 17 were finally included. (Figure 1)

### *Methodological quality*

The methodological quality evaluation of the included studies is shown in Appendix 2. Only five were rated moderate quality for the included quantitative studies (n = 10), while the others were rated low quality. There were four RCTs, all of which lacked information on participant blinding[43–46] and three on treatment assignment blinding.[44–46] The remaining six studies were categorized into three quasi-experimental studies, one mixed study, one NRCT, and one cross-section survey. Four studies were unclear on whether participants received similar treatment or care besides the exposure or intervention of interest.[47–49,50] Two studies lack information regarding study methodologies, control groups, and multiple outcome measurements.[24,51] Four studies were rated as moderate quality and others as low quality for the qualitative component of the included studies (n = 8). The main reason is that the researcher's theoretical and cultural orientations are not mentioned, along with the researcher's potential influence on the research.[29–31,51–55] Four studies lacked study objectives, clearly stated data collection and analysis procedures, and participant ethical review guidelines.[29,30,52,55]

### *Study characteristics*

Tables 2 and table 3 summarize the characteristics of the included studies. Seventeen articles published between 2007 and 2022 were included for review. The study design included two-arm RCT (n = 4),[43–46] two-arm NRCT (n = 1),[24] two-arm quantitative quasi-experimental study (n = 3),[47–49] mixed method design with a single group pretest-posttest design and a qualitative component (n = 1),[51] a cross-sectional study (n = 1)[50] and a qualitative study (n = 7).[28–30,51–55] There were 3312 participants in this study whose mean age ranged from

63 to 88 years. Sample sizes ranged from 10 to 986 from nursing homes, communities, hospitals, clinics, and senior centers.

### *Synthesis of quantitative evidence*

A meta-analysis was performed to examine the effect of interventions on ACP completion, as several studies were available for statistical pooling.[44–46,48] The forest graph is shown in Figure 2. Other outcomes, including quality of life concerns, ACP engagement, surrogate decision-maker appointment, knowledge, healthcare utilization, behavioral intention, readiness, preferences for end-of-life care, the certainty of end-of-life care, and AD-relative outcomes, are not available for statistical aggregation and are therefore presented through narrative synthesis.

### *ACP completion*

A pooled analysis of these four studies showed that the intervention significantly improved ACP document completion (MD 1.49 [95% Cl 1.17-1.91], $P = 0.33$, $I^2 = 12\%$]).[44–46,48]

### *Quality of life concerns*

Three studies used End-of-Life Questionnaire (QOLC-E) to measure participants' quality of life concerns.[48,49,50] One result exhibited no statistically significant improvement in the QOLC-E sub-scores ($p > 0.05$) after the ACP intervention;[48] but another demonstrated significant differences in the care and support subscale ($p = 0.016$) and the value of life subscale of mQOLC-E ($p = 0.012$).[49] In addition, the average score of frail group is significantly lower than that of the non-frail group ($p < 0.001$), and all groups agree that existential distress, food-related concerns and value of life are the most undesirable subscales.[50] One using the 12-item Short-Form Health Survey (SF-12) found no significant distinction in participants' quality of life scores ($p > 0.05$);[43] however, another using the Comprehensive Quality of Life Outcome scale found a statistically significant association between the change in comprehensive QOL and the presence of ACP discussions ($p = 0.01$).[24]

### *ACP Engagement*

One study used a validated ACP Engagement Survey to measure engagement in the ACP process.[44] This study revealed that ACP Behavior Change and Action scores increased significantly ($p < 0.001$), and 98.1% of experiment participant groups reported that ACP participation (behavior change or action) scores increased over time, compared with 89.5% in the control group only.[44]

### *Surrogate decision-maker appointment*

One study that used oral counseling to investigate patient surrogate decision-maker appointments discovered that the intervention group (94%) appointed more surrogate decision-makers than the control group (67%) ($p < 0.001$).[43]

### *Knowledge*

One study used a standardized scale of palliative care knowledge and attitudes to measure palliative care knowledge and attitudes in participants and found that the experimental group had a higher level of knowledge ($p = 0.014$) after an intervention.[47] Of the two studies that used a self-developed instrument to assess participants' knowledge scores about ACP, one study observed no significant association between the change in knowledge score and the presence of ACP discussion ($p > 0.01$);[24] while in another study, the intervention group was much more likely to correctly answer six of the eight knowledge items, suggesting the intervention group scored significantly higher than the control group ($p = 0.01$).[45]

### *Healthcare utilization*

One study found a significant difference ($p = 0.026$) between the level of goal setting and the time to a first inpatient stay.[50] Specifically, those who began goal setting had a lower risk of an inpatient stay than those who did not start goal setting, while there was no difference between those who completed goal setting and those who did not begin goal setting.[50] Another study discovered that current ACP interventions did not reduce the use of healthcare ($p > 0.05$).[49] The participants in the experimental group reported that 91.2% had visited the emergency department, 93.0% had been hospitalized, and 84.2% had visited the outpatient department.[49]

### *Behavioral intention*

A study using a self-developed behavioral intention scale to assess patients' behavioral changes in ACP.[45] This research found that the intervention group had a significantly higher behavioral intention in three out of the four behavioral intention items, suggesting that the intervention group showed substantially higher ACP behavioral intention scores than the control group.[45]

### *Readiness*

Two studies using a validated tool to examine participants' ACP readiness discovered that the intervention group's readiness has improved.[24,46] One study reported that the readiness score was significantly associated with ACP discussions ($p = 0.01$).[24] Another study found that the increase in readiness over time was significantly different between the two groups ($p = 0.0056$).[46]

### *Preferences for End-of-Life Care*

Two studies used a self-developed questionnaire to assess patients' preference for end-of-life care and found no statistically significant difference between the two groups for life-sustaining treatment outcomes ($p > 0.05$),[49,50] while the frail group was more willing to involve their physicians and families in hospice preferences,[50] However, other studies indicated that experimental group more wished to receive cardiopulmonary resuscitation (CPR), mechanical ventilation (MV), and artificial feeding items at the end of life because they hope for recovery through medical treatments.[48]

### *Certainty of End-of-Life Care*

One study used the SURE test (Sure of myself; Understand information; Risk-benefit ratio; Encouragement) to measure the certainty of participants' end-of-life care and found that all scores in the experimental group were much higher than the control group.[49]

### *AD-related outcome*s

A study using a self-developed questionnaire to examine AD-relative outcomes (awareness of AD, willingness to complete AD, and communication with family members about AD) found that after the intervention, the experimental group was more likely to be aware of AD ($p < 0.001$), and the number of people willing to complete AD increased from 46.2% to 78.6%, and the communication with family members on AD increased from 21% to 41%.[48]

**Table 2.** Summary of characteristics of quantitative results of included studies

| Author, year | Participants, setting | Design | Intervention | Results | Outcome measures |
|---|---|---|---|---|---|
| Rebecca L. Sudore et al.(2018) | Volunteers(N=986)<br>Primary care clinic | RCT | Online PREPARE Program plus AD, 15 months | ACP Behavior Change and Action scores increased significantly (p < 0.001) | ACP Engagement |
| Anouk Overbeek et al. (2018) | Volunteers (N=201)<br>Care home and community | RCT | Adjusted Respecting Choices ACP program,12 months | There were no statistically significant differences between the intervention and control group in change scores. Of intervention group participants, 93% completed an AD, and 94% appointed a decision-maker. Of control participants, 34% completed an AD, and 67% appointed a decision maker (p < 0.001). | Change in quality of life<br>AD completion<br>Surrogate decision-maker appointment |
| Huei-Chuan Sung et al.(2019) | Older residents (N=57)<br>Care institution | Experimental design | Group patient education, (duration 30-min),6 months | At post-test, the experimental group had greater knowledge (p = 0.014), as well as more positive attitudes overall (p = 0.025) | Knowledge and attitude scales. |
| Wallace Chi Ho Chan et al.(2021) | Volunteers(N=304)<br>Residential care home | Experimental design | Six sessions per week (6–8 participants/ group; mean duration 90-min), 21 months | No significant improvement in QOLC-E sub-scores following the ACP intervention (p > 0.05). No significant difference was found in other outcomes. AD-related outcomes: the ACP group enhanced participants' awareness of AD and more willing to complete AD, and more participants communicated with family members about AD | QOLC<br>Preferences for EOL care<br>AD-related outcomes |
| Li-Hwa Lin et al.(2021) | Patients(N=82)<br>Medical center | RCT | 2-week video-supported nurse-led(5-min), 6 days | ACP knowledge and behavioral intentions: the intervention group showed a significantly higher ACP knowledge score (p = 0.01) The rate of AD signing was 33.3% in the intervention group and 9.3% in the control group (p = 0.01). | The signing of AD forms<br>Knowledge of ACP<br>Behavioral intention |
| Hillary D.Lum et al.(2020) | Patients(N=110)<br>Seniors Clinic | RCT | Talks group visits,2 sessions (8–10 participants/ group; mean duration 120-min) ,6 months | At 6 months, 71% of ENACT participants had an ACP document in the EHR compared with 45% of control arm participants (p < 0.001), which is a 26% difference. ENACT participants trended toward higher readiness to engage in ACP compared with control at 6 months. | ACP Documents<br>Readiness |
| Renli Deng et al.(2020) | Older adults (N=74)<br>Nursing homes | Experimental design | 2 sessions per month (duration 60 min) ,2 months | There was a significant difference in the care and support subscale (p = 0.016) and the value of life subscale of mQOLC-E (p = 0.012) There were no differences in the use of healthcare services and preference for EOL care between the two groups (p > 0.05) | Preferences for EOL care<br>QOLC<br>Healthcare utilization<br>Certainty of EOL care |
| Debra K.Litzelman et al. (2017) | Patients(N=117)<br>Hospital | Mixed method | ACP educational Intervention, 1 year | Those who started goal setting had decreased risk of an inpatient stay compared to those with no goal setting | Healthcare utilization |
| Hiroko Okada et al. (2022) | Older adults (N=200)<br>Hospital | NRCT | One-on-one meetings for ACP discussions(60-min), 6-month | There was only a small change in knowledge scores before and after the intervention, with no significant difference between the two groups. ACP engagement and readiness was significantly higher in the intervention group than in the control group at 6 months (p < 0.05). Comprehensive QOL was significantly higher in the intervention group than in the control group (P<0.001). | Knowledge<br>QOLC<br>Readiness |
| Helen YL Chan et al. (2007) | Older residents (N=287)<br>Long-term care homes | a cross-sectional survey | NG | The mean QOLC-E score of the vulnerable group was significantly lower than the non-vulnerable group (P<0.001). Considerable numbers were uncertain about their end-of-life care preferences and they preferred their physician to be their surrogate. | QOLC<br>Preferences for EOL care |

ACP, advance care planning; AD, advance directive; RCT, randomized controlled trial; QOL, quality of life concerns; EOL, End-of-life

**Table 3.** Summary of characteristics of qualitative results of included studies

| Author, year, | Participants, setting | Methodology/ methods | Phenomenon of interest | Theme |
|---|---|---|---|---|
| Francesca Ingravallo et al. (2018) | Older adults (N=30) and 10 family members<br>Nursing homes | Qualitative,<br>face-to-face interviews | This study explored the attitudes of NH residents and family members toward ACP and their opinions as to the right time to broach the subject, how it should be approached, and the content of ACP | Three themes: (1) Life in the NH (2) plans and attitudes toward ACP (3) Contents and manner of ACP |
| Sheng-Yu Fan et al. (2019) | Older adults (N=28)<br>A long-term care institution | Thematic analysis,<br>in person-to-person interviews, using an ACP booklet | To explore the experiences and processes of ACP discussions in older residents of a long-term care institution | Three themes: (1) A way to gain a good death (2) Uncertainty in decision-making (3) The role of families in the ACP decisions |
| Sarah Combes et al. (2021) | Frail elders (N=10) and 8 family members<br>Community | Thematic analysis,<br>in-depth interviews | To explore the barriers and enablers to ACP engagement with frail elders | Four themes: (1) Advance care planning is unclear (2) Lack of relevance (3) Importance of family, relationships, and home<br>(4) Engagement strategies |
| Carrie Bernard et al. (2020) | Volunteers (N=439)<br>Group clinics | Thematic analysis,<br>questionnaire | This study aimed to better understand the barriers faced by older patients regarding talking to their family members and family physicians about ACP | Eight themes: (1) They were too young for ACP (2) The topic is too emotional (3) ACP is the MD's responsibility (4) Fear of negative impact on the relationship with MD (5) Not enough time in appointments (6) Concern about family dynamics (7) It is not a priority (8) A lack of knowledge about ACP |
| Sok Shin Yap et al. (2018) | Older adults(N=30)<br>Community | Thematic analysis,<br>semi-structured interview | The purpose of this study was to identify factors that influence the engagement of Chinese Australians with ACP | Three themes: (1) Knowledge (2) Attitudes (3) Needs |
| Jeanine Yonashiro-Cho et al. (2016) | Older adults(N=34)<br>A large urban area | Grounded theory,<br>3 focus groups | The purpose of this study is to explore the knowledge, attitudes, and preferences of older Chinese Americans toward ACP | Three themes: (1) Knowledge of advance directives (2) Health as a factor in end-of-life decision-making and communication<br>(3) Communication of end-of-life care preferences |
| Jolien J. Glaudemans et al. (2020) | Older adults (N=22) and 8 family members<br>Nursing homes | Grounded theory,<br>semi-structured interview | To explore older people's and their families' experiences with ACP in primary care | Three themes: (1) Openness and trust (2) Timing and topics<br>(3) Roles of family |
| Debra K.Litzelman et al. (2017) | Patients (N=86)<br>Hospital | Thematic analysis,<br>semi-structured interview | The purpose of these interviews was to explore patient experiences with an emphasis on the discussions patients may have had with CCAs that were focused on ACP and the designation of healthcare representatives | Three themes: (1) The importance of ACP conversations and how their CCA facilitated these conversations<br>(2) The usability of the GW cards<br>(3) Their feelings towards their CCA |

NH, nursing home; MD, The Medical Doctor; ACP, advance care planning; CCAs, The Care Coordinator Assistants; GW cards, Go Wish card

### Synthesis of qualitative evidence

Three themes emerged from qualitative evidence through a meta-aggregation process: positive impact, low engagement, and high acceptance. Gain advantages and raising consciousness are the two identified subthemes within the issue of positive impact. Barriers to ACP and awareness of ACP are the two identified subthemes within the issue of low engagement. Roles of families and engagement strategies are two subthemes in the high acceptance (Table 4).

### Gain advantages

Participants thought the ACP could supply an open channel for discussing end-of-life issues, allowing them to express their dying wishes and provide guidance.[29,31,54,55] Some participants claimed that using ACP not only helped them undergo death more comfortably and with less pain but also significantly reduced unnecessary healthcare costs, which benefited them and their families.[30,54,55]

### Raise consciousness

Some participants stated that joining the ACP at the right time was tremendously useful because it allowed them to act appropriately.[29,30,55] Additionally, some participants expressed a positive attitude toward the ACP; on the one hand, it allowed them to choose they want surrogate decision-maker; on the other hand, it inspired them to use comprehensive contemplation regarding hospice care.[29,30,55]

**Table 4.** Meta-aggregation of qualitative findings

| Findings (Level 1) | Categories (Level 2) | Synthesized findings (Level 3) |
|---|---|---|
| Residents are willing to talk about the ACP because it allows them to express their opinions (U)[29] | Gain advantages | Positive impact |
| Think that ACP can help with a comfortable death and lessen the pain (U) [52] | | |
| They were comfortable with discussions about ACP and could see the benefit of planning and documenting their wishes (U)[52] | | |
| To complete ACP was because they wanted to reduce the burden on their family and suffering for themselves (U)[30] | | |
| Sharing information on end-of-life preferences will promote their autonomy at the end of life (U)[31] | | |
| Engaging in ACP appeared to increase trust (U)[55] | | |
| ACP can prevent sudden situations in the future (U)[55] | | |
| They were positive about the attention they received during these conversations, felt heard and more at ease, and felt they could trust their GP or nurse more after the ACP discussion (U)[55] | | |
| ACP can reduce the burden on your family and your pain(U)[30] | | |
| Think it is important to do ACP at the right time (C)[29] | Raise consciousness | |
| Believed that the appointment of a proxy was a good idea (U)[29] | | |
| Most participants reported positive attitudes towards ACP (U)[30] | | |
| Respondents were satisfied with the timing of ACP (U)[55] | | |
| Respondents have a positive attitude towards the topic discussed (U)[55] | | |
| These conversations stimulated systematic thinking about various issues about end-of-life care, death, and issues beyond death(U)[55] | | |
| They were comfortable with discussions about ACP and could see the benefit of planning and documenting their wishes(C)[30] | | |
| Participant cognitive impairment or low education is a major obstacle to ACP (U)[29] | Barriers to ACP | Low engagement |
| Uncertainty and lack of information created difficult barriers (U)[52] | | |
| Death is a taboo topic difficult to discuss with family (C)[30,31,53] | | |
| Participants described feeling too young or too healthy to be thinking about ACP (U)[54] | | |
| The topic is too emotional for discussions (U)[54] | | |
| Believing that ACP is the Medical Doctor's responsibility (U)[54] | | |
| Participants were concerned that having an ACP discussion might adversely affect the relationship with the doctor (U)[54] | | |
| Insufficient time in appointments with family physicians emerged as a barrier to ACP discussions (U)[54] | | |
| The language was identified as the largest barrier to overcome to increase advance care planning awareness (C)[30] | | |
| There was low awareness of advance care planning amongst the participants and some confusion regarding the concept (U)[30] | Awareness of ACP | |
| I don't know enough about ACP (U)[54] | | |
| Participants expressed concern about how an ACP discussion may affect family dynamics (U)[54] | Roles of family | High Acceptance |
| Family relationships played an important role in the ACP decisions (C)[52] | | |
| Relationships were important to frail elders and impacted decision-making (U)[53] | | |
| The quality of ACP appeared to improve if the family was involved in ACP (U)[55] | | |
| The quality and accessibility of ACP may improve if GPs and nurses include family members in discussions about ACP (U)[55] | Engagement strategies | |
| Participants believed the best way to engage frail elders with advance care planning was by using the right approach and preparing individuals for advance care planning conversations (U)[53] | | |
| In-language materials and key support networks including GPs, family, and Chinese community groups were identified as ideal forums for the promotion of advance care planning(C)[30] | | |
| These networks were also important in helping participants who spoke little or no English cope with the language barrier when accessing healthcare (U)[30] | | |
| Health as a Factor in the timing of ACP and Communication (U)[31] | | |
| Quality of ACP seemed to improve if respondents 'views on their current life and future, a few specific future care scenarios and expectations and responsibilities regarding ACP were discussed (U)[55] | | |
| ACP is unclear, some confusion remained (U)[53] | Unclear questions | |
| Lack of understanding and clarity about advance directives (C)[31] | | |

The U and C represent the levels of credibility for the findings: U represents "unequivocal" evidence, C represents "credible" evidence, and N represents "not supported" evidence.

***Barriers to ACP***

Participants often do not have the chance to begin discussions about ACP or end-of-life care due to a lack of relevant information and comprehension, particularly when they think they are too young or in good health.[29,52,54] Others were concerned that discussing or disputing end-of-life options with a family doctor would harm their benefit, and many also claimed that owing to cultural differences, they could not discuss death with their families.[30,31,52,53] Only one study claims that language is the most significant barrier to increasing awareness of ACP.[30]

***Awareness of ACP***

Some participants showed low ACP awareness because they frequently confused it with other ideas, like wills and euthanasia, and some even claimed they were unaware of it, arguing that family members should make end-of-life decisions rather than themselves.[30,52]

***Roles of family***

Participants were concerned that their ACP conversations would impact the relationship between families, which could affect the ACP operates and even makes decisions.[53,54] Family relationships were meaningful when making ACP decisions, according to some participants, and it was even possible that family involvement could have a positive effect and enhance the quality of ACP.[52,55]

***Engagement strategies***

Participants believed the best way to engage frail elders with ACP was by using the right approach and preparing individuals for ACP conversations.[53,55] Therefore, in addition to general practitioners (GPs), nurses, and family, the Chinese community and networking can be included to enhance the quality and accessibility of the ACP, as some participants felt this

could help overcome current language barriers.[30,55] A minor participant believed that communication time for ACP was related to health because they thought they did not require it when they were healthy.[31]

### *Unclear questions*

There was still some uncertainty during the process when interviewees were unclear about the meaning of ACP.[31,53] They point out that ambiguous documentation, terminology, and professional language may undermine the motivation of frail elderly to engage in ACP and their trust in professionals while enhancing the ambiguity of ACP language.[31,53]

### *Integration of quantitative and qualitative evidence*

The quantitative and qualitative evidence synthesis results were generally consistent, and the three pieces of evidence aggregated are detailed below (Table5). Participants' positive perceptions of ACP in qualitative evidence help explain the significant improvement in various outcomes of ACP reported in quantitative evidence.

**Table 5.** Integration of quantitative evidence and qualitative evidence

| Quantitative results | Qualitative finding (categories) | Aggregation |
|---|---|---|
| ACP completion | Gain advantages | Sense of control |
| In intervention group participants, 93% completed AD[43] | Raise consciousness | |
| The intervention resulted in a higher rate of ACP documentation[45] | | |
| Slight increase in AD completions[48] | | |
| The rate of advance directive signing was 33.3% in the intervention group[46] | | |
| The number of new ACP documents at 6 months was significantly different[44] | | |
| Quality of life concerns | | |
| Quality of life scores did not change significantly before and after the intervention[43] | | |
| There was no statistically significant improvement in QOL-E sub-scores following the ACP intervention[48] | | |
| Regarding QOL concerns, the ACP intervention interviews had a positive effect on physical discomfort and food-related concerns and a short-term effect on decreasing existential distress[47] | | |
| Comprehensive QOL was significantly higher in the intervention group than in the control group[24] | | |
| The mean QOLC-E score of the frail group was significantly lower than that of the non-frail group[50] | | |
| Surrogate decision-maker appointment | | |
| 94% appointed a decision-maker[43] | | |
| Behavioral intention | | |
| Significantly higher ACP behavioral intention scores[46] | | |
| The AD sign-up rate was 33.3%[46] | | |
| AD-related outcomes | | |
| Willingness to complete AD increased from 46.2% to 78.6%[48] | | |
| ACP Engagement | | |
| The intervention resulted in higher self-reported increased ACP engagement scores[45] | | |
| The ACP engagement score increased significantly from baseline to 6-month follow-up, with a 22.5% increase in score[44] | | |
| The scores tended to be higher in the intervention group than in the control group.[24] | | |
| Healthcare utilization | | |
| The current ACP intervention did not decrease healthcare utilization[47] | | |
| ACP had a reduced risk of hospitalization[50] | | |
| Readiness | | |
| The increase in readiness over time was significantly different[44] | | |
| Knowledge | | |
| Significant positive effects of the ACP program on knowledge[47] | | |
| The intervention group had significantly higher scores in knowledge[46] | | |
| There was only a small change in knowledge scores[24] | | |
| / | Engagement strategies | Obstacles and facilitators |
| | Barriers to ACP | |
| Preferences for End-of-Life Care | Roles of family | Impact of intervention |
| There was no statistically significant difference in preference for end-of-life care between the two groups[48] | Awareness of ACP | |
| Respondents in the vulnerable group were more willing to involve their physicians and families in end-of-life care preferences[50] | Unclear questions | |
| AD-related outcomes | | |
| All scores in the experimental group were much higher than those in the control group[47] | | |
| Awareness of AD increased from 23.6% to 76%[48] | | |
| Communicated with family members about AD increased from 21% to 41%[48] | | |

### *Sense of control*

Quantitative and qualitative research has consistently demonstrated that appropriate interventions promote ACP behavior readiness. Quantitative results show that interventions significantly increase participants' knowledge of ACP and end-of-life issues while also enhancing their engagement in ACP,[24,43–48] which may enhance participants' quality of life at the end of their lives. Because after the intervention, a significant proportion of individuals were willing to discuss hospice care preferences with family members or clinicians and complete AD.[43,45,46,48,49,50] Qualitative research suggests that ACP can allow people to systematically think about their hospice preference, voice their opinions about death, and ensure they pass away comfortably,[29,31,51,54,55] relieving the strain on their loved ones and their suffering.[29,31,55] In addition, a positive attitude toward the issue of palliative care may empower them to make behavioral changes.

### *Obstacles and facilitators*

Qualitative data highlighted facilitators and barriers in the process of ACP engagement.[29–31,52–55] The primary obstacles to ACP awareness improvement were cognitive impairment, educational attainment,[29] and language communication;[30] participants also mentioned that discussing death with family members was taboo due to cultural differences.[30,31,52–54] The optimal way to involve frail elderly in ACP is through the appropriate strategy and preparation of individuals for ACP discussions.[53] Additionally, using the web as a medium while engaging GPs, nurses, and families in ACP discussions may increase the quality of ACP.[30,31,55] However, extracting facilitators and hindrances from qualitative results is not investigated in quantitative data.

### *Impact of intervention*

Quantitative and qualitative studies show that family relationships influence participants' ACP decisions.[48,52–55] Qualitative findings also revealed that some participants' awareness of the definition of ACP is still unclear.[30,52] Quantitative data mean that participants' awareness of ACP improved after the intervention, improving patients' quality of life in the dying.[49,50] Although the qualitative data revealed that some questions were confusing to the participants,[31,53] was not reflected in the quantitative data. The differences underscore the need to ascertain the clarity of the ACP to the participants.

## DISCUSSION

### *Main findings*

To answer the research question, we integrate quantitative and qualitative evidence by JBI's MMSR guidance to comprehensively understand ACP's effectiveness and the frail elderly' opinions of ACP.[41] The quality of the qualitative studies existential discrepancy because these reviews supplied insufficient methodological information. The quality of the quantitative studies was generally fair because most studies have control groups.

The meta-analysis showed that the intervention of ACP for frail elderly effectively increases readiness, knowledge, and process of ACP behaviors, thus promoting AD completion. The meta-aggregation demonstrates that participants generally have a positive attitude toward ACP, believe that it helps them express their preferences for the healthcare decision, and explain the variables that influence their participation in ACP. The aggregated findings from configurative analysis demonstrate that the quantitative and qualitative synthesis were complementary and coherent to support ACP as an effective and feasible strategy to facilitate frail elderly to express their healthcare wishes timely. In addition, participants generally believe that ACP provides a communication channel for frail elderly patients to frankly discuss hospice issues, understand relevant knowledge, and share views during participation. These aggregations are consistent with the main elements of the theory of planned behavior (TPB) in the behavioral change model of healthy behavior, where attitude, subjective norm, and perceived behavior control three elements that shape an individual's behavior intention and actual behavior.[56] Thus, these aggregates help to explain that behaviors that improve ACP practice can promote engagement and completion of ACP and thus improve end-of-life care quality.

### *Strengths and limitations*

The advantage of this study is that using MMSR to give a comprehensive and in-depth analysis of the quantitative and qualitative data already available to explain the effects and experiences of ACP. Given the insufficiency of research in this field, all identified studies were included in this review. The aggregation of the quantitative and qualitative evidence reached a coherent consensus that enhanced the credibility of the findings on the effectiveness and acceptance of ACP.

We are aware of the limitations of this review. First, even though we thoroughly searched the current literature, it is possible to miss relevant studies because we only included English language papers, and a grey literature search was not undertaken. Second, few studies have explicitly looked at ACP with frail elderly who are cognitively normal and do not have a specific terminal condition, nor have any studies that have used an operational measure of frailty. Therefore, the prevalence and degree of frailty in the research included in this systematic review are unknown; nonetheless, the results can be applied to the elderly without significant medical issues in the community or institutional settings. Third, because most of the studies included in this analysis were not blinded, people who received ACP were likelier to accept to participate in ACP-related investigations, potentially risking participation bias. However, most studies had a reasonable response rate, which is beneficial for reducing this risk.

### *Police and Practice Recommendations*

There is an obvious need to strengthen and coordinate activities to encourage the involvement of frail old persons and their families in the ACP process. As the research results show, there are contributing factors and obstacles to the participation of frail older adults in the ACP.[29–31,52–55] Therefore, when drafting relevant policies, such patients' actual constraints should be considered. For example, ACP's language and professional terms are improved according to local cultural characteristics, and new processes have been added to overcome cultural differences in different regions. Moreover, the results of the findings show that the ACP is an effective way to provoke discussion about death and hospice decision-making and promote AD completion.[29,31,51,54,55] The meta-analysis of four studies showed that the completion rate of ACP improved after the intervention despite heterogeneity in the data.[44–46,48] Therefore, to target the inclusion of this group of people in the ACP in the primary health care system, more in-depth conversation and assessment are required while also considering the variations in the complex legal frameworks among countries.

In clinical practice, because frailty is a dynamic process and difficult to define, frail elderly patients often lack the information and awareness to plan their future medical plans. Moreover, the research results show that there is still a need to provide special ACP tools suitable for the frail elderly, which can be used for people of different education in various settings. Therefore, to encourage patients to learn the pertinent information about ACP and increase their readiness, for instance, we can use movies or video games to facilitate the process of ACP and make the ACP knowledge easier to understand.

## CONCLUSION

Synthesizing the information from quantitative and qualitative research demonstrates that ACP is an effective and feasible strategy to facilitate frail elderly to express their healthcare wishes timely and improve their outcomes. Because the frail elderly usually lacks the opportunity to start ACP discussions, they will miss a golden opportunity to discuss it. Consequently, more extensive and rigorous research is required to improve the quality of research, especially randomized controlled trials to support the reported results, to ascertain the most effective and beneficial ACP interventions and tools for the frail elderly population.

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**Figure1 PRISMA flow diagram of the study selection process**

**Figure2 Forest plot of pooled results for ACP completion**

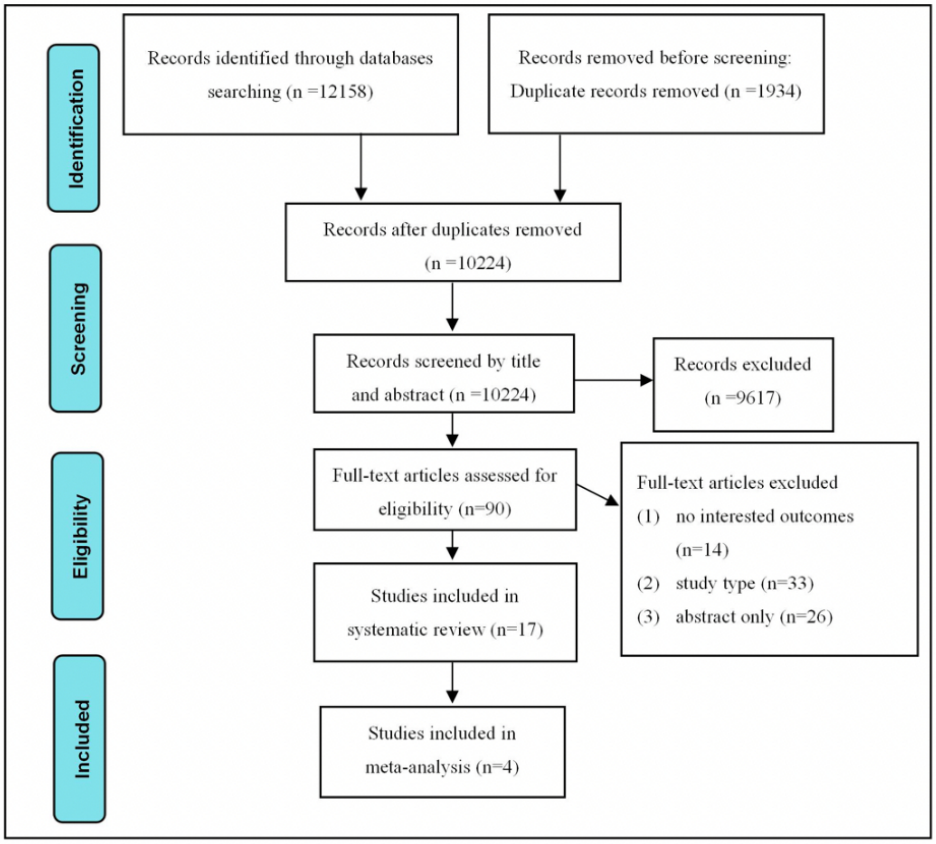
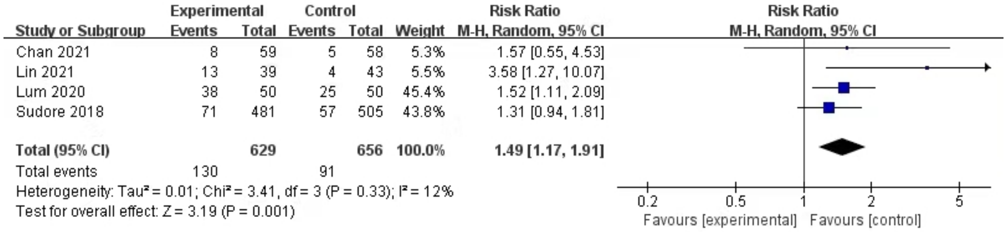


**Figure1 PRISMA flow diagram of the study selection process.**

PRISMA flow diagram of the study selection process

173x155mm (144 x 144 DPI)



| Study or Subgroup | Experimental Events | Experimental Total | Control Events | Control Total | Weight | Risk Ratio M-H, Random, 95% CI |
|---|---|---|---|---|---|---|
| Chan 2021 | 8 | 59 | 5 | 58 | 5.3% | 1.57 [0.55, 4.53] |
| Lin 2021 | 13 | 39 | 4 | 43 | 5.5% | 3.58 [1.27, 10.07] |
| Lum 2020 | 38 | 50 | 25 | 50 | 45.4% | 1.52 [1.11, 2.09] |
| Sudore 2018 | 71 | 481 | 57 | 505 | 43.8% | 1.31 [0.94, 1.81] |
| **Total (95% CI)** |  | **629** |  | **656** | **100.0%** | **1.49 [1.17, 1.91]** |
| Total events | 130 |  | 91 |  |  |  |

Heterogeneity: $\text{Tau}^2 = 0.01$; $\text{Chi}^2 = 3.41$, $df = 3$ ($P = 0.33$); $I^2 = 12\%$

Test for overall effect: $Z = 3.19$ ($P = 0.001$)

Forest plot of pooled results for ACP completion.

283x67mm (72 x 72 DPI)

### Appendix 1

**Search date: 20/04/2022**

**[Search strategy for MEDLINE / EMBASE / PsycINFO/ CINAHL via OvidSP]**

1. exp Frailty/
2. frailty.mp.
3. exp Frail Elderly/
4. Frail Elderly.sh,kf.
5. Frail Older People.mp.
6. Frailty syndrome.mp.
7. (Frailty adj2 syndrome).mp.
8. (Frail* or geriatric syndrome* or geriatric disorder*).ti,ab.
9. ((elder* or old* or senior* or geriatric*) adj4 function* adj4 (declin* or impair*)).af.
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11. exp Advance Care Planning/
12. (advance* care adj plan*).tw.
13. (advance* adj (medical plan* or statement*)).tw.
14. acp.tw.
15. Statement of wishes.tw.
16. Terminal Care/
17. terminal care.tw.
18. ((end of life or EOL) adj5 (care or discuss* or decision* or plan* or preference*)).tw.
19. Living Wills/
20. living will*.tw.
21. 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20
22. 10 and 21
23. limit 22 to (english language and yr="2003 - 2022" and "all aged (50 and over)")

**PubMed**

(((Frail Elderly[MeSH Terms]) OR (Elderly, Frail[Title/Abstract] OR Frail Elders[Title/Abstract] OR Elder, Frail[Title/Abstract] OR Elders, Frail[Title/Abstract] OR Frail Elder[Title/Abstract] OR Functionally-Impaired Elderly[Title/Abstract] OR Elderly, Functionally-Impaired[Title/Abstract] OR Functionally Impaired Elderly[Title/Abstract] OR Frail Older Adults[Title/Abstract] OR Adult, Frail Older[Title/Abstract] OR Adults, Frail Older[Title/Abstract] OR Frail Older Adult[Title/Abstract] OR Older Adult, Frail[Title/Abstract] OR Older Adults, Frail[Title/Abstract])) AND (Advance Care Planning[MeSH Terms])) OR (Advance Health Care Planning[Title/Abstract] OR Advance Medical Planning[Title/Abstract] OR Medical Planning, Advance[Title/Abstract] OR Planning, Advance Medical[Title/Abstract] OR Advance Directives[Title/Abstract] OR Living Wills[Title/Abstract] OR Terminal Care[Title/Abstract]) AND ((aged[Filter]) AND (2003:2022[pdat]))

**Cochrane library**

#1 (advance care planning):ti,ab,kw OR (Advance Directive):ti,ab,kw OR (Living will):ti,ab,kw OR (advance* NEAR/3 plan*):ti,ab,kw OR (future care planning):ti,ab,kw
#2 (Anticipatory care plan*):ti,ab,kw OR (end of life NEXT (discuss* or conversation* or decision* or plan* or preference*)):ti,ab,kw OR (Medical treatment order):ti,ab,kw OR (Statement of wishes):ti,ab,kw OR (Medical directive):ti,ab,kw
#3 (advance* NEXT (medical plan* or statement*)):ti,ab,kw
#4 advance care planning
#5 Advance Directive
#6 Living will
#7 (Frail Elderly):ti,ab,kw OR (Frail):ti,ab,kw OR (Elderly):ti,ab,kw OR (Frailty syndrome):ti,ab,kw
#8 #1 or #2 or #3 or #4 or #5 or #6

#9 #8 and #7

**CINAHL complete**

S1 "advance* care plan*"
S2 "Anticipatory care plan*"
S3 "future care planning"
S4 (MH "Advance Care Planning")
S5 "Advance Care Planning"
S6 "Living Wills"
S7 (MH "Advance Directives+") OR (MH "Living Wills")
S8 "Advance Directives"
S9 "Resuscitation Orders"
S10 "Medical treatment order"
S11 "Statement of wishes"
S12 "Medical directive"
S13 "end of life discuss*"
S14 "end of life conversation*"
S15 "end of life decision*"
S16 "end of life plan*"
S17 "end of life preference*"
S18 "advance* medical plan*"
S19 "advance* statement*"
S20 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19
S21 (MH "Frailty") OR (MH "Frail Elderly")
S22 " frailty"
S23 "Frailty syndrome"
S24 "Frail Older People"
S25 S21 OR S22 OR S23 OR S24
S26 S20 AND S25
S27 (AG "50 and over") AND (DT "2003 - 2022") AND (ZL "English")
S28 S26 AND S27

**Appendix 2**

**Table 2a. Methodological quality of included randomized controlled trial**

| | Rebecca L et al, 2018 | Anouk Overbeek et al, 2019 | Li-Hwa Lin et al, 2021 | Hillary D. Lum et al, 2020 |
|---|---|---|---|---|
| 1. Was true randomization used for assignment of participants to treatment groups? | Yes | Yes | Yes | Yes |
| 2. Was allocation to treatment groups concealed? | Yes | No | Unclear | Unclear |
| 3. Were treatment groups similar at the baseline? | Yes | Yes | Yes | Yes |
| 4. Were participants blind to treatment assignment? | No | No | Unclear | No |
| 5. Were those delivering treatment blind to treatment assignment? | Yes | No | Unclear | No |
| 6. Were outcomes assessors blind to treatment assignment? | Yes | No | Unclear | No |
| 7. Were treatment groups treated identically other than the intervention of interest? | Yes | Yes | Yes | Yes |
| 8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed? | Yes | Yes | Yes | Yes |
| 9. Were participants analyzed in the groups to which they were randomized? | Yes | Yes | Yes | Yes |
| 10. Were outcomes measured in the same way for treatment groups? | Yes | Yes | Yes | Yes |
| 11. Were outcomes measured in a reliable way? | Yes | Yes | Yes | Yes |
| 12. Was appropriate statistical analysis used? | Yes | Yes | Yes | Yes |
| 13. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial? | Yes | Yes | Yes | Yes |
| Overall quality | Moderate | Low | Low | Low |

**Table 2b. Critical appraisal results for included quasi-experimental studies or mixed methods studies or no randomized controlled trial**

| | Huei-Chuan Sung et al, 2019 | Wallace Chi Ho Chan et al, 2021 | Renli Deng et al, 2020 | Debra K.Litzelman et al, 2017 | Hiroko Okada et al, 2022 |
|---|---|---|---|---|---|
| 1. Is it clear in the study what is the ‘cause’ and what is the ‘effect’ (i.e. there is no confusion about which variable comes first)? | Yes | Yes | Yes | Yes | Yes |
| 2. Were the participants included in any comparisons similar? | Yes | Yes | Yes | Yes | Yes |
| 3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest? | No | No | No | No | No |
| 4. Was there a control group? | Yes | Yes | Yes | No | No |
| 5.Were there multiple measurements of the outcome both pre and post the intervention/exposure? | Yes | Yes | Yes | No | No |

| | | | | | |
|---|---|---|---|---|---|
| 6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed? | Yes | Yes | No | Unclear | Yes |
| 7. Were the outcomes of participants included in any comparisons measured in the same way? | Yes | Yes | Yes | Yes | Yes |
| 8. Were outcomes measured in a reliable way? | Yes | Yes | Yes | Yes | Yes |
| 9. Was appropriate statistical analysis used? | Yes | Yes | Yes | Yes | Yes |
| Overall quality | Moderate | Moderate | Moderate | Low | Low |

**Table 2c. Critical appraisal results for included qualitative studies**

| | Francesca Ingravallo et al, 2018 | Sheng-Yu Fan et al, 2019 | Sarah Combes et al, 2021 | Carrie Bernard et al, 2020 | Sok Shin Yap et al, 2021 | Jeanine Yonashiro-Cho et al, 2016 | Jolien J. Glaudemans et al, 2020 | Debra K.Litzelman et al, 2017 |
|---|---|---|---|---|---|---|---|---|
| 1. Is there congruity between the stated philosophical perspective and the research methodology? | Unclear | Unclear | Yes | No | Unclear | Yes | Yes | Yes |
| 2. Is there congruity between the research methodology and the research question or objectives? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 3. Is there congruity between the research methodology and the methods used to collect data? | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes |
| 4. Is there congruity between the research methodology and the representation and analysis of data? | Yes | Yes | Yes | Unclear | Yes | Yes | Unclear | Yes |
| 5. Is there congruity between the research methodology and the interpretation of results? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 6. Is there a statement locating the researcher culturally or theoretically? | No | No | No | Unclear | No | No | No | No |
| 7. Is the influence of the researcher on the research, and vice- versa, addressed? | Unclear | Yes | Yes | Unclear | Unclear | Unclear | Unclear | Unclear |
| 8. Are participants, and their voices, adequately represented? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body? | Yes | Yes | Yes | Yes | No | Yes | No | Yes |
| 10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Overall quality | Low | Moderate | Moderate | Low | Low | Moderate | Low | Moderate |

**Table 2d. Critical appraisal results for included cross sectional studies**

| | Helen YL Chan et al, 2007 |
|---|---|
| 1. Were the criteria for inclusion in the sample clearly defined? | Yes |
| 2. Were the study subjects and the setting described in detail? | Yes |
| 3. Was the exposure measured in a valid and reliable way? | Yes |
| 4. Were objective, standard criteria used for measurement of the condition? | Yes |
| 5. Were confounding factors identified? | Unclear |
| 6. Were strategies to deal with confounding factors stated? | No |
| 7. Were the outcomes measured in a valid and reliable way? | Yes |
| 8. Was appropriate statistical analysis used? | Yes |
| Overall quality | Moderate |

# PRISMA 2020 Checklist

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| **TITLE** | | | |
| Title | 1 | Identify the report as a systematic review. | Page 1 |
| **ABSTRACT** | | | |
| Abstract | 2 | See the PRISMA 2020 for Abstracts checklist. | Page 2 |
| **INTRODUCTION** | | | |
| Rationale | 3 | Describe the rationale for the review in the context of existing knowledge. | Pages 3-5 |
| Objectives | 4 | Provide an explicit statement of the objective(s) or question(s) the review addresses. | Pages 3-5 |
| **METHODS** | | | |
| Eligibility criteria | 5 | Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses. | table 1 |
| Information sources | 6 | Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted. | Page 5 |
| Search strategy | 7 | Present the full search strategies for all databases, registers and websites, including any filters and limits used. | Page 5 and supplementary material 2 |
| Selection process | 8 | Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process. | Page 5 |
| Data collection process | 9 | Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process. | Page 5 |
| Data items | 10a | List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect. | Table 2 and Table 3 |
| | 10b | List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information. | Table 2 and Table 3 |
| Study risk of bias assessment | 11 | Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process. | Page 5 |
| Effect measures | 12 | Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results. | |
| Synthesis methods | 13a | Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)). | Page 8 |
| | 13b | Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions. | Page 8 |
| | 13c | Describe any methods used to tabulate or visually display results of individual studies and syntheses. | Page 8 |
| | 13d | Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used. | Page 8 |
| | 13e | Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression). | |
| | 13f | Describe any sensitivity analyses conducted to assess robustness of the synthesized results. | |
| Reporting bias assessment | 14 | Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases). | |

# PRISMA 2020 Checklist

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| Certainty assessment | 15 | Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. | |
| **RESULTS** | | | |
| Study selection | 16a | Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram. | Pages 8-9 |
| | 16b | Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded. | Page 9-10 |
| Study characteristics | 17 | Cite each included study and present its characteristics. | Page 9-10 |
| Risk of bias in studies | 18 | Present assessments of risk of bias for each included study. | Supplementary material |
| Results of individual studies | 19 | For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots. | Figure 2 |
| Results of syntheses | 20a | For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies. | |
| | 20b | Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect. | Pages 10-14 |
| | 20c | Present results of all investigations of possible causes of heterogeneity among study results. | |
| | 20d | Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results. | |
| Reporting biases | 21 | Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed. | |
| Certainty of evidence | 22 | Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed. | |
| **DISCUSSION** | | | |
| Discussion | 23a | Provide a general interpretation of the results in the context of other evidence. | Pages 22-23 |
| | 23b | Discuss any limitations of the evidence included in the review. | Pages 23 |
| | 23c | Discuss any limitations of the review processes used. | Pages 23 |
| | 23d | Discuss implications of the results for practice, policy, and future research. | |
| **OTHER INFORMATION** | | | |
| Registration and protocol | 24a | Provide registration information for the review, including register name and registration number, or state that the review was not registered. | Pages 24-25 |
| | 24b | Indicate where the review protocol can be accessed, or state that a protocol was not prepared. | |
| | 24c | Describe and explain any amendments to information provided at registration or in the protocol. | |
| Support | 25 | Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review. | |
| Competing interests | 26 | Declare any competing interests of review authors. | Title page |
| Availability of data, code and other materials | 27 | Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review. | Title page |

# PRISMA 2020 Checklist

*From:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

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# Advance care planning for frail elderly: Are we missing a golden opportunity? A mixed-method systematic review and meta-analysis

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# Title page

**Title of the article:** Advance care planning for frail elderly: Are we missing a golden opportunity? A mixed-method systematic review and meta-analysis

**Author details:**

**Author 1**

Xin-Ying Wang, School of Nursing, University of South China, Hengyang, Hunan Province, China

Email: 741021586@qq.com

OCCID: https://orcid.org/0000-0002-2006-0815

**Author 2**

Xin-Lin Huang, School of Nursing, University of South China, Hengyang, Hunan Province, China

Email: xinlin.huang@stu.usc.edu.cn

OCCID: https://orcid.org/0000-0002-2405-5896

**Author 3**

Wei-Jia Wang, School of Nursing, University of South China, Hengyang, Hunan Province, China

Email: 972482148@qq.com

**Corresponding Author**

Li-Liao, School of Nursing, University of South China, Hengyang, Hunan Province, China

Email: 254251558@qq.com

OCCID: https://orcid.org/0000-0001-7450-0444

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## ABSTRACT

**Objective**: The aim is to integrate quantitative and qualitative evidence to understand the effectiveness and experience of advance care planning (ACP) for frail elderly. **Design**: A mixed-methods systematic review and meta-analysis was conducted. Quality evaluation was conducted using critical appraisal tools from the Joanna Briggs Institute. Data were synthesized and pooled for meta-analysis or meta-aggregation as needed. **Data sources**: An electronic search of MEDLINE, CINAHL, Embase, PubMed, PsycINFO, and Cochrane Library databases from January 2003 to April 2022. **Eligibility criteria for selecting studies**: We included experimental and mixed methods studies. The quantitative component attempts to incorporate a broader study design. The qualitative component aids in comprehending the participant's experience with ACP and its efficacy. **Data extraction and synthesis**: Two independent reviewers undertook screening, data extraction, and quality assessment. The quantitative and qualitative data were synthesized and integrated using a convergent segregated approach. **Results**: There were 12158 articles found, and 17 matched the inclusion criteria. The quality of the quantitative component of most included studies (6/10) was rated as low, and the qualitative component of half included studies (4/8) was rated as moderate. The meta-analysis showed that the intervention of ACP for frail elderly effectively increases readiness, knowledge, and process of ACP behaviors. The meta-aggregation showed that the participants hold a positive attitude toward ACP and think it facilitates expressing their preferences for the medical decision. **Conclusion**: ACP is an effective and feasible strategy to facilitate frail elderly to express their healthcare wishes timely and improve their outcomes. This study could provide proof for a better understanding of the subject and help direct future clinical practice. More well-designed

randomized controlled trials evaluating the most effective ACP interventions and tools are needed for the frail elderly population.

**PROSPERO registration number CRD42022329615**

**Strengths and limitations of this study：**

- To our knowledge, this study is the first to use mixed-methods systematic review (MMSR) to synthesize quantitative and qualitative evidence to illustrate the role and experience of advance care planning (ACP) in frail elderly people.
- In the preliminary review process, no potential studies were discovered that identified patients using objective measures of frailty, so we based previous systematic reviews on designing the inclusion criteria for frail older adults.
- We defined 'the frail elderly' as the elderly who do not live in the stage of a terminal condition or dementia; thus, the applicability of findings to patients with significant medical issues is unclear.

## INTRODUCTION

As the world's aging population is coming, traditional healthcare systems are under more strain with the increasing prevalence of chronic and aging-related disorders in elderly persons who commonly require continuous monitoring and long-term care.[1–4] According to previous research, aging is also related to frailty,[5] which may make the elderly more susceptible to negative impacts.[6–11] Frailty has consequently caused a significant worldwide health burden and effects on clinical practice and public health.[2]

Frailty is a clinical condition in which an individual's exposure to stressors increases their vulnerability and thus their risk of adverse health outcomes, such as falls, an unexpected disability, hospitalization, and mortality.[5,12] It is a dynamic process that increases with age and often spirals downward, increasing the likelihood of adverse outcomes.[5,13,14] A recent meta-analysis of the prevalence of frailty in 62 countries around the world showed a prevalence of 31% in Oceania, 25% in Asia, 23% in the Americas, 22% in Africa, and 8% in Europe.[15] Two studies found that frail elderly were more likely to desire comfort care when they approached the end of their lives, but these demands were not accurately recorded, resulting in receiving treatment or care against their preferences.[16,17]

Advance care planning (ACP) is planning to help patients receive medical care aligned with their preferences, especially in severe illness or as the end-of-life approaches.[18] It involves various activities, including appointing surrogate decisions, completing or reviewing advance directives (AD), and discussing end-of-life wishes with family members or healthcare professionals.[19] ACP has been demonstrated to enhance patient quality of life, family communication, and care satisfaction, significantly relieving the burden on patients and families.[20–24] Recent systematic reviews have investigated how ACP affects senior citizens in certain facilities like hospitals[25] and nursing homes.[26] Others have studied older people's perceptions and experiences with ACP using qualitative evidence-synthesized techniques.[27] Others have investigated the efficiency of various interventions in promoting ACP, but it is unclear which strategy is most beneficial.[28] However, there are still challenges in implementing ACP for people's low awareness of ACP and cultural conflicts.[29–31] The absence of opportunity for conversation on end-of-life desires to elicit their reflection is a major contributing factor to this dilemma.[32] Frailty is a common clinical symptom in older adults,[33–34] who commonly have lower AD completion rates.[2,5] Therefore, ACP may provide an opportunity for it to express its preference.

Despite the availability of studies on ACP for frail elderly, there is a scarcity of literature to synthesize quantitative and qualitative evidence to investigate this topic. Consequently, this study aims to utilize a mixed-methods systematic review (MMSR) to integrate the quantitative and qualitative evidence to answer the question "What is the effectiveness and experience of ACP for frail elderly?", which can provide up-to-date evidence for the dissemination of ACP and the promulgation of relevant policies.[35] The quantitative component attempts to incorporate a broader study design. The qualitative component aids in comprehending the participant's experience with ACP and its efficacy. A final synthesis of quantitative and qualitative evidence will be produced to support the implementation and promotion of ACP.

## METHODS

This review was performed following the Joanna Briggs Institute (JBI) methodology for MMSRs to address the review question, data synthesis, and integration.[35,36] The review was registered on PROSPERO (CRD42022329615).

### *Search strategy*

Six databases, including MEDLINE, CINAHL, Embase, PubMed, PsycINFO, and Cochrane Library, were searched from January 2003 to April 2022. Because the term "advance care planning" was first used in 2003, this cut-off period was chosen. The search terms include appropriate subject headings and wildcards of "advance care planning," "end of life," "advance directive," and "frail elderly" or "pre-frailty." The completed search techniques are presented in Appendix 1.

### *Study selection*

Based on the initial scoping review, no potential studies were discovered that identified patients using objective measures of frailty. Given this, this study designs inclusion and exclusion criteria that use an operational definition of frailty[37] and draw from previous systematic reviews[25] to capture frail patients in a diverse population. A mean age criterion of 50 years was chosen because frailty is a geriatric syndrome associated with aging (prior studies indicate that it may manifest before age 65),[15] and this was combined with the absence of focus on a disease-specific terminal condition or dementia. Research of interventions focusing on developing resuscitation-assisted euthanasia or suicide was excluded, but studies of interventions promoting the ACP or communicating AD were included. ACP is considered an interactive process, so the relevant results (such as ACP process outcomes, action outcomes, and care outcomes) should be included in the standard.[38] ICU patients were not included because they could not make plans for the future in most cases.[39] Because there were insufficient resources for translation, articles in non-English languages were deleted. Table 1 lists the inclusion and exclusion standards in detail. After searching for and removing duplicate entries, all records were sent to reference manager software (Zotero). Two reviewers independently evaluated titles and abstracts to out irrelevant research and kept papers that met the inclusion criteria. Abstracts and titles will be classified as "certainly not relevant" or "possibly relevant." Take note of the reason for exclusion. If there was any uncertainty or dispute, it was resolved with the assistance of a third review author.

### *Data extraction*

One reviewer used standardized JBI data extraction methods to extract quantitative and qualitative data from the included papers and discussed those findings with the second reviewer.[40] The quantitative information extracted was the authors, year, participant, setting, design, intervention, result, and outcome. The retrieved qualitative information encompassed the population, method, setting, cultural knowledge, study objectives-related data analysis, and specifics regarding the phenomena of interest. The author's interpretations of the qualitative data analysis, which included topics and subtopics, were also obtained. Two reviewers independently evaluated these extractions' level of "confidence" (defined as clear, believable, and unsupported) using illustrations (i.e., direct citation of participant voices, field observation records, or other data).[40]

### *Quality appraisal*

Two independent reviewers used the JBI Critical Appraisal tools,[40] comprising checklists for randomized controlled trial (RCT), quasi-experimental study, non-randomized controlled trial (NRCT), and qualitative research to evaluate the quality of the included papers. The checklist only accepts answers in the form of “Yes,” “No,” or “Unclear.” All “Yes” responses indicate high quality, one or two “Unclear” or “No” responses indicate moderate quality, and more than two “Unclear” or “No” responses indicate low quality. This method rates the literature as low, moderate, and high quality. Any disagreements in the research were discussed until an agreement was reached.

**Table 1.** Eligibility criteria of studies

| | Inclusion | | Exclusion |
|---|---|---|---|
| | Quantitative component | Qualitative component | Quantitative and Qualitative components |
| Types of participants | Health status is focused on pre-frailty or frailness. Adult (≥50 years old) regardless of gender and geographical location. | | Mean age < 50 years. Focus on a disease-specific terminal condition or dementia. |
| Types of interventions | Interventions that adopted any tools or methods to promote ACP or communication of AD.<br>Any comparator or no comparator. | | Interventions to help develop resuscitation assisted euthanasia or suicide. |
| Outcomes/ Phenomena of interest | Advance care planning outcomes<br>-ACP process outcomes, such as knowledge, and readiness， quality of life<br>-Action outcomes, such as ACP Engagement, completion of ACP<br>-Care Outcomes, such as mood or health care expenditures | Experiences with the interventions. | |
| Context | The community, hospital settings, clinics, nursing homes, or homes. | | Intensive care unit |

| | | | |
|---|---|---|---|
| Types of studies | (1) Various types of experimental studies, such as RCTs, non-RCTs, and observational analysis/descriptive studies (prospective and retrospective cohort studies and cross-sectional studies).<br>(2) Mixed methods studies are only considered when data and findings for quantitative components are reported and can be extracted. | (1) Various types of experimental qualitative studies<br>(2) Mixed-methods studies are only considered when data and findings for qualitative components are reported and can be extracted. | Opinion pieces, guidelines, individual case reports, study proposals/protocols, conference abstracts, Ph.D. theses, grey literature, and non-peer-reviewed journals. |

### *Data synthesis and integration*

This study used a convergent segregated approach to synthesize and integrate quantitative and qualitative data because the review examined different dimensions of a phenomenon of interest.[41,42] A statistical meta-analysis of quantitative data was performed using the Cochrane Collaboration's Review Manager 5.4 program to obtain a summary estimate of the effect. Using I-square statistic and Chi-square test to evaluate heterogeneity. The results were presented in narrative summaries when it could not do statistical pooling. Qualitative research findings were gathered using the meta-aggregation approach based on the JBI methodology.[40] The extract findings (Level 1) were compiled into statements. Then, these findings with similar (at least two findings per category) are combined to create the categorization (Level 2). Finally, a comprehensive set of synthesized findings for evidence-based practice was developed by synthesizing these categories (at least two for each synthesized finding) (Level 3).[40]

### *Patient and public involvement*

Patients and the public were not involved in the development of this study.

## RESULT

### *Study selection*

A total of 12,158 articles were retrieved. There were 1934 duplicate articles removed, and 9617 papers were deleted based on title and abstract. The full text of the 90 articles screened was reviewed, and 17 were finally included (Figure 1).

### *Methodological quality*

The methodological quality evaluation of the included studies is shown in Appendix 2. Only five were rated moderate quality for the included quantitative studies (n = 10), while the others were rated low quality. There were four RCTs, all of which lacked information on participant blinding[43–46] and three on treatment assignment blinding.[44–46] The remaining six studies were categorized into three quasi-experimental studies, one mixed study, one NRCT, and one cross-section survey. Four studies were unclear whether participants received similar treatment or care besides the exposure or intervention of interest.[47–49,50] Two studies lack information regarding study methodologies, control groups, and multiple outcome measurements.[24,51] Four studies were rated as moderate quality and others as low quality for the qualitative component of the included studies (n = 8). Those studies were rated as moderate quality because the researcher's theoretical and cultural orientations and potential influence are not mentioned in the research.[31,51–53] Other studies were rated low-quality because they lacked study objectives, clearly stated data collection and analysis procedures, and participant ethical review guidelines.[29,30,54,55]

### *Study characteristics*

Table 2 and Table 3 summarize the characteristics of the included studies. Seventeen articles published between 2007 and 2022 were included for review. The study design included two-arm RCT (n = 4),[43–46] two-arm NRCT (n = 1),[24] two-arm quantitative quasi-experimental study (n = 3),[47–49] mixed method design with a single group pretest-posttest design and a qualitative component (n = 1),[51] a cross-sectional study (n = 1)[50] and a qualitative study (n = 7).[28–30,51–55] There were 3312 participants in this study whose mean age ranged from

63 to 88 years. Sample sizes ranged from 10 to 986 from nursing homes, communities, hospitals, clinics, and senior centers.

### *Synthesis of quantitative evidence*

A meta-analysis was performed to examine the effect of interventions on ACP completion, as several studies were available for statistical pooling.[44–46,48] The forest graph is shown in Figure 2. Other outcomes, including quality of life concerns, ACP engagement, surrogate decision-maker appointment, knowledge, healthcare utilization, behavioral intention, readiness, preferences for end-of-life care, the certainty of end-of-life care, and AD-relative outcomes, are not available for statistical aggregation and are therefore presented through narrative synthesis.

### *ACP completion*

A pooled analysis of these four studies showed that the intervention significantly improved ACP document completion (MD 1.49 [95% Cl 1.17-1.91], P = 0.33, $I^2 = 12\%$]).[44–46,48]

### *Quality of life concerns*

Three studies used End-of-Life Questionnaire (QOLC-E) to measure participants' quality of life concerns.[48–50] One result exhibited no statistically significant improvement in the QOLC-E sub-scores ($p > 0.05$) after the ACP intervention;[48] but another demonstrated significant differences in the care and support subscale ($p = 0.016$) and the value of life subscale of mQOLC-E ($p = 0.012$).[49] In addition, the average score of frail group is significantly lower than that of the non-frail group ($p < 0.001$), and all groups agree that existential distress, food-related concerns and value of life are the most undesirable subscales.[50] One using the 12-item Short-Form Health Survey (SF-12) found no significant distinction in participants' quality of life scores ($p > 0.05$);[43] however, another using the Comprehensive Quality of Life Outcome scale found a statistically significant association between the change in comprehensive QOL and the presence of ACP discussions ($p = 0.01$).[24]

### *ACP Engagement*

One study used a validated ACP Engagement Survey to measure engagement in the ACP process.[44] This study revealed that ACP Behavior Change and Action scores increased significantly ($p < 0.001$), and 98.1% of experiment participant groups reported that ACP participation (behavior change or action) scores increased over time, compared with 89.5% in the control group only.[44]

### *Surrogate decision-maker appointment*

One study that used oral counseling to investigate patient surrogate decision-maker appointments discovered that the intervention group (94%) appointed more surrogate decision-makers than the control group (67%) ($p < 0.001$).[43]

### *Knowledge*

One study used a standardized scale of palliative care knowledge and attitudes to measure palliative care knowledge and attitudes in participants and found that the experimental group had a higher level of knowledge ($p = 0.014$) after an intervention.[47] Of the two studies that used a self-developed instrument to assess participants' knowledge scores about ACP, one study observed no significant association between the change in knowledge score and the presence of ACP discussion ($p > 0.01$);[24] while in another study, the intervention group was much more likely to correctly answer six of the eight knowledge items, suggesting the intervention group scored significantly higher than the control group ($p = 0.01$).[45]

### *Healthcare utilization*

One study found a significant difference ($p = 0.026$) between the level of goal setting and the time to a first inpatient stay.[50] Specifically, those who began goal setting had a lower risk of an inpatient stay than those who did not start goal setting, while there was no difference between those who completed goal setting and those who did not begin goal setting.[50] Another study discovered that current ACP interventions did not reduce the use of healthcare ($p > 0.05$).[49] The participants in the experimental group reported that 91.2% had visited the emergency department, 93.0% had been hospitalized, and 84.2% had visited the outpatient department.[49]

### *Behavioral intention*

A study using a self-developed behavioral intention scale to assess patients' behavioral changes in ACP.[45] This research found that the intervention group had a significantly higher behavioral intention in three out of the four behavioral intention items, suggesting that the intervention group showed substantially higher ACP behavioral intention scores than the control group.[45]

### *Readiness*

Two studies using a validated tool to examine participants' ACP readiness discovered that the intervention group's readiness has improved.[24,46] One study reported that the readiness score was significantly associated with ACP discussions ($p = 0.01$).[24] Another study found that the increase in readiness over time was significantly different between the two groups ($p = 0.0056$).[46]

### *Preferences for End-of-Life Care*

Two studies used a self-developed questionnaire to assess patients' preference for end-of-life care and found no statistically significant difference between the two groups for life-sustaining treatment outcomes ($p > 0.05$),[49,50] while the frail group was more willing to involve their physicians and families in hospice preferences,[50] However, other studies indicated that experimental group more wished to receive cardiopulmonary resuscitation (CPR), mechanical ventilation (MV), and artificial feeding items at the end of life because they hope for recovery through medical treatments.[48]

### *Certainty of End-of-Life Care*

One study used the SURE test (Sure of myself; Understand information; Risk-benefit ratio; Encouragement) to measure the certainty of participants' end-of-life care and found that all scores in the experimental group were much higher than the control group.[49]

### *AD-related outcome*s

A study using a self-developed questionnaire to examine AD-relative outcomes (awareness of AD, willingness to complete AD, and communication with family members about AD) found that after the intervention, the experimental group was more likely to be aware of AD ($p < 0.001$), and the number of people willing to complete AD increased from 46.2% to 78.6%, and the communication with family members on AD increased from 21% to 41%.[48]

**Table 2.** Summary of characteristics of quantitative results of included studies

| Author, year | Participants, setting | Design | Intervention | Results | Outcome measures |
|---|---|---|---|---|---|
| Rebecca L. Sudore et al.(2018) | Volunteers(N=986)<br>Primary care clinic | RCT | Online PREPARE Program plus AD, 15 months | ACP Behavior Change and Action scores increased significantly (p < 0.001) | ACP Engagement |
| Anouk Overbeek et al. (2018) | Volunteers (N=201)<br>Care home and community | RCT | Adjusted Respecting Choices ACP program,12 months | There were no statistically significant differences between the intervention and control group in change scores. Of intervention group participants, 93% completed an AD, and 94% appointed a decision-maker. Of control participants, 34% completed an AD, and 67% appointed a decision maker (p < 0.001). | Change in quality of life<br>AD completion<br>Surrogate decision-maker appointment |
| Huei-Chuan Sung et al.(2019) | Older residents (N=57)<br>Care institution | Experimental design | Group patient education, (duration 30-min),6 months | At post-test, the experimental group had greater knowledge (p = 0.014), as well as more positive attitudes overall (p = 0.025) | Knowledge and attitude scales. |
| Wallace Chi Ho Chan et al.(2021) | Volunteers(N=304)<br>Residential care home | Experimental design | Six sessions per week (6–8 participants/ group; mean duration 90-min), 21 months | No significant improvement in QOLC-E sub-scores following the ACP intervention (p > 0.05). No significant difference was found in other outcomes. AD-related outcomes: the ACP group enhanced participants' awareness of AD and more willing to complete AD, and more participants communicated with family members about AD | QOLC<br>Preferences for EOL care<br>AD-related outcomes |
| Li-Hwa Lin et al.(2021) | Patients(N=82)<br>Medical center | RCT | 2-week video-supported nurse-led(5-min), 6 days | ACP knowledge and behavioral intentions: the intervention group showed a significantly higher ACP knowledge score (p = 0.01) The rate of AD signing was 33.3% in the intervention group and 9.3% in the control group (p = 0.01). | The signing of AD forms<br>Knowledge of ACP<br>Behavioral intention |
| Hillary D.Lum et al.(2020) | Patients(N=110)<br>Seniors Clinic | RCT | Talks group visits,2 sessions (8–10 participants/ group; mean duration 120-min) ,6 months | At 6 months, 71% of ENACT participants had an ACP document in the EHR compared with 45% of control arm participants (p < 0.001), which is a 26% difference. ENACT participants trended toward higher readiness to engage in ACP compared with control at 6 months. | ACP Documents<br>Readiness |
| Renli Deng et al.(2020) | Older adults (N=74)<br>Nursing homes | Experimental design | 2 sessions per month (duration 60 min) ,2 months | There was a significant difference in the care and support subscale (p = 0.016) and the value of life subscale of mQOLC-E (p = 0.012) There were no differences in the use of healthcare services and preference for EOL care between the two groups (p > 0.05) | Preferences for EOL care<br>QOLC<br>Healthcare utilization<br>Certainty of EOL care |
| Debra K.Litzelman et al. (2017) | Patients(N=117)<br>Hospital | Mixed method | ACP educational Intervention, 1 year | Those who started goal setting had decreased risk of an inpatient stay compared to those with no goal setting | Healthcare utilization |
| Hiroko Okada et al. (2022) | Older adults (N=200)<br>Hospital | NRCT | One-on-one meetings for ACP discussions(60-min), 6-month | There was only a small change in knowledge scores before and after the intervention, with no significant difference between the two groups. ACP engagement and readiness was significantly higher in the intervention group than in the control group at 6 months (p < 0.05). Comprehensive QOL was significantly higher in the intervention group than in the control group (P<0.001). | Knowledge<br>QOLC<br>Readiness |
| Helen YL Chan et al. (2007) | Older residents (N=287)<br>Long-term care homes | a cross-sectional survey | NG | The mean QOLC-E score of the vulnerable group was significantly lower than the non-vulnerable group (P<0.001). Considerable numbers were uncertain about their end-of-life care preferences and they preferred their physician to be their surrogate. | QOLC<br>Preferences for EOL care |

ACP, advance care planning; AD, advance directive; RCT, randomized controlled trial; QOL, quality of life concerns; EOL, End-of-life

**Table 3.** Summary of characteristics of qualitative results of included studies

| Author, year, | Participants, setting | Methodology/ methods | Phenomenon of interest | Theme |
|---|---|---|---|---|
| Francesca Ingravallo et al. (2018) | Older adults (N=30) and 10 family members<br>Nursing homes | Qualitative,<br>face-to-face interviews | This study explored the attitudes of NH residents and family members toward ACP and their opinions as to the right time to broach the subject, how it should be approached, and the content of ACP | Three themes: (1) Life in the NH (2) plans and attitudes toward ACP (3) Contents and manner of ACP |
| Sheng-Yu Fan et al. (2019) | Older adults (N=28)<br>A long-term care institution | Thematic analysis,<br>in person-to-person interviews, using an ACP booklet | To explore the experiences and processes of ACP discussions in older residents of a long-term care institution | Three themes: (1) A way to gain a good death (2) Uncertainty in decision-making (3) The role of families in the ACP decisions |
| Sarah Combes et al. (2021) | Frail elders (N=10) and 8 family members<br>Community | Thematic analysis,<br>in-depth interviews | To explore the barriers and enablers to ACP engagement with frail elders | Four themes: (1) Advance care planning is unclear (2) Lack of relevance (3) Importance of family, relationships, and home<br>(4) Engagement strategies |
| Carrie Bernard et al. (2020) | Volunteers (N=439)<br>Group clinics | Thematic analysis,<br>questionnaire | This study aimed to better understand the barriers faced by older patients regarding talking to their family members and family physicians about ACP | Eight themes: (1) They were too young for ACP (2) The topic is too emotional (3) ACP is the MD's responsibility (4) Fear of negative impact on the relationship with MD (5) Not enough time in appointments (6) Concern about family dynamics (7) It is not a priority (8) A lack of knowledge about ACP |
| Sok Shin Yap et al. (2018) | Older adults(N=30)<br>Community | Thematic analysis,<br>semi-structured interview | The purpose of this study was to identify factors that influence the engagement of Chinese Australians with ACP | Three themes: (1) Knowledge (2) Attitudes (3) Needs |
| Jeanine Yonashiro-Cho et al. (2016) | Older adults(N=34)<br>A large urban area | Grounded theory,<br>3 focus groups | The purpose of this study is to explore the knowledge, attitudes, and preferences of older Chinese Americans toward ACP | Three themes: (1) Knowledge of advance directives (2) Health as a factor in end-of-life decision-making and communication<br>(3) Communication of end-of-life care preferences |
| Jolien J. Glaudemans et al. (2020) | Older adults (N=22) and 8 family members<br>Nursing homes | Grounded theory,<br>semi-structured interview | To explore older people's and their families' experiences with ACP in primary care | Three themes: (1) Openness and trust (2) Timing and topics<br>(3) Roles of family |
| Debra K.Litzelman et al. (2017) | Patients (N=86)<br>Hospital | Thematic analysis,<br>semi-structured interview | The purpose of these interviews was to explore patient experiences with an emphasis on the discussions patients may have had with CCAs that were focused on ACP and the designation of healthcare representatives | Three themes: (1) The importance of ACP conversations and how their CCA facilitated these conversations<br>(2) The usability of the GW cards<br>(3) Their feelings towards their CCA |

NH, nursing home; MD, The Medical Doctor; ACP, advance care planning; CCAs, The Care Coordinator Assistants; GW cards, Go Wish card

### *Synthesis of qualitative evidence*

Three themes emerged from qualitative evidence through a meta-aggregation process: positive impact, low engagement, and high acceptance. Gain advantages and raising consciousness are the two identified subthemes within the issue of positive impact. Barriers to ACP and awareness of ACP are the two identified subthemes within the issue of low engagement. Roles of families and engagement strategies are two subthemes in the high acceptance (Table 4).

### *Gain advantages*

Participants thought the ACP could supply an open channel for discussing end-of-life issues, allowing them to express their dying wishes and provide guidance.[29,31,53,55] Some participants claimed that using ACP not only helped them undergo death more comfortably and with less pain but also significantly reduced unnecessary healthcare costs, which benefited them and their families.[30,53,55]

### *Raise consciousness*

Some participants stated that joining the ACP at the right time was tremendously useful because it allowed them to act appropriately.[29,30,55] Additionally, some participants expressed a positive attitude toward the ACP; on the one hand, it allowed them to choose they want surrogate decision-maker; on the other hand, it inspired them to use comprehensive contemplation regarding hospice care.[29,30,55]

**Table 4.** Meta-aggregation of qualitative findings

| Findings (Level 1) | Categories (Level 2) | Synthesized findings (Level 3) |
|---|---|---|
| Residents are willing to talk about the ACP because it allows them to express their opinions (U)[29] | Gain advantages | Positive impact |
| Think that ACP can help with a comfortable death and lessen the pain (U) [54] | | |
| They were comfortable with discussions about ACP and could see the benefit of planning and documenting their wishes (U)[54] | | |
| To complete ACP was because they wanted to reduce the burden on their family and suffering for themselves (U)[30] | | |
| Sharing information on end-of-life preferences will promote their autonomy at the end of life (U)[31] | | |
| Engaging in ACP appeared to increase trust (U)[55] | | |
| ACP can prevent sudden situations in the future (U)[55] | | |
| They were positive about the attention they received during these conversations, felt heard and more at ease, and felt they could trust their GP or nurse more after the ACP discussion (U)[55] | | |
| ACP can reduce the burden on your family and your pain(U)[30] | | |
| Think it is important to do ACP at the right time (C)[29] | Raise consciousness | |
| Believed that the appointment of a proxy was a good idea (U)[29] | | |
| Most participants reported positive attitudes towards ACP (U)[30] | | |
| Respondents were satisfied with the timing of ACP (U)[55] | | |
| Respondents have a positive attitude towards the topic discussed (U)[55] | | |
| These conversations stimulated systematic thinking about various issues about end-of-life care, death, and issues beyond death(U)[55] | | |
| They were comfortable with discussions about ACP and could see the benefit of planning and documenting their wishes(C)[30] | | |
| Participant cognitive impairment or low education is a major obstacle to ACP (U)[29] | Barriers to ACP | Low engagement |
| Uncertainty and lack of information created difficult barriers (U)[54] | | |
| Death is a taboo topic difficult to discuss with family (C)[30,31,52] | | |
| Participants described feeling too young or too healthy to be thinking about ACP (U)[53] | | |
| The topic is too emotional for discussions (U)[53] | | |
| Believing that ACP is the Medical Doctor's responsibility (U)[53] | | |
| Participants were concerned that having an ACP discussion might adversely affect the relationship with the doctor (U)[53] | | |
| Insufficient time in appointments with family physicians emerged as a barrier to ACP discussions (U)[53] | | |
| The language was identified as the largest barrier to overcome to increase advance care planning awareness (C)[30] | | |
| There was low awareness of advance care planning amongst the participants and some confusion regarding the concept (U)[30] | Awareness of ACP | |
| I don't know enough about ACP (U)[53] | | |
| Participants expressed concern about how an ACP discussion may affect family dynamics (U)[53] | Roles of family | High Acceptance |
| Family relationships played an important role in the ACP decisions (C)[54] | | |
| Relationships were important to frail elders and impacted decision-making (U)[52] | | |
| The quality of ACP appeared to improve if the family was involved in ACP (U)[55] | | |
| The quality and accessibility of ACP may improve if GPs and nurses include family members in discussions about ACP (U)[55] | Engagement strategies | |
| Participants believed the best way to engage frail elders with advance care planning was by using the right approach and preparing individuals for advance care planning conversations (U)[52] | | |
| In-language materials and key support networks including GPs, family, and Chinese community groups were identified as ideal forums for the promotion of advance care planning(C)[30] | | |
| These networks were also important in helping participants who spoke little or no English cope with the language barrier when accessing healthcare (U)[30] | | |
| Health as a Factor in the timing of ACP and Communication (U)[31] | | |
| Quality of ACP seemed to improve if respondents 'views on their current life and future, a few specific future care scenarios and expectations and responsibilities regarding ACP were discussed (U)[55] | | |
| ACP is unclear, some confusion remained (U)[52] | Unclear questions | |
| Lack of understanding and clarity about advance directives (C)[31] | | |

The U and C represent the levels of credibility for the findings: U represents "unequivocal" evidence, C represents "credible" evidence, and N represents "not supported" evidence.

### *Barriers to ACP*

Participants often do not have the chance to begin discussions about ACP or end-of-life care due to a lack of relevant information and comprehension, particularly when they think they are too young or in good health.[29,53,54] Others were concerned that discussing or disputing end-of-life options with a family doctor would harm their benefit, and many also claimed that owing to cultural differences, they could not discuss death with their families.[30,31,52,54] Only one study claims that language is the most significant barrier to increasing awareness of ACP.[30]

### *Awareness of ACP*

Some participants showed low ACP awareness because they frequently confused it with other ideas, like wills and euthanasia, and some even claimed they were unaware of it, arguing that family members should make end-of-life decisions rather than themselves.[30,54]

### *Roles of family*

Participants were concerned that their ACP conversations would impact the relationship between families, which could affect the ACP operates and even makes decisions.[52,53] Family relationships were meaningful when making ACP decisions, according to some participants, and it was even possible that family involvement could have a positive effect and enhance the quality of ACP.[54,55]

### *Engagement strategies*

Participants believed the best way to engage frail elders with ACP was by using the right approach and preparing individuals for ACP conversations.[52,55] Therefore, in addition to general practitioners (GPs), nurses, and family, the Chinese community and networking can be included to enhance the quality and accessibility of the ACP, as some participants felt this

could help overcome current language barriers.[30,55] A minor participant believed that communication time for ACP was related to health because they thought they did not require it when they were healthy.[31]

***Unclear questions***

There was still some uncertainty during the process when interviewees were unclear about the meaning of ACP.[31,52] They point out that ambiguous documentation, terminology, and professional language may undermine the motivation of frail elderly to engage in ACP and their trust in professionals while enhancing the ambiguity of ACP language.[31,52]

***Integration of quantitative and qualitative evidence***

The quantitative and qualitative evidence synthesis results were generally consistent, and the three pieces of evidence aggregated are detailed below (Table 5). Participants' positive perceptions of ACP in qualitative evidence help explain the significant improvement in various outcomes of ACP reported in quantitative evidence.

**Table 5.** Integration of quantitative evidence and qualitative evidence

| Quantitative results | Qualitative finding (categories) | Aggregation |
|---|---|---|
| ACP completion | Gain advantages | Sense of control |
| In intervention group participants, 93% completed AD[43] | Raise consciousness | |
| The intervention resulted in a higher rate of ACP documentation[45] | | |
| Slight increase in AD completions[48] | | |
| The rate of advance directive signing was 33.3% in the intervention group[46] | | |
| The number of new ACP documents at 6 months was significantly different[44] | | |
| Quality of life concerns | | |
| Quality of life scores did not change significantly before and after the intervention[43] | | |
| There was no statistically significant improvement in QOL-E sub-scores following the ACP intervention[48] | | |
| Regarding QOL concerns, the ACP intervention interviews had a positive effect on physical discomfort and food-related concerns and a short-term effect on decreasing existential distress[47] | | |
| Comprehensive QOL was significantly higher in the intervention group than in the control group[24] | | |
| The mean QOLC-E score of the frail group was significantly lower than that of the non-frail group[50] | | |
| Surrogate decision-maker appointment | | |
| 94% appointed a decision-maker[43] | | |
| Behavioral intention | | |
| Significantly higher ACP behavioral intention scores[46] | | |
| The AD sign-up rate was 33.3%[46] | | |
| AD-related outcomes | | |
| Willingness to complete AD increased from 46.2% to 78.6%[48] | | |

| | | |
|---|---|---|
| ACP Engagement | | |
| The intervention resulted in higher self-reported increased ACP engagement scores[45] | | |
| The ACP engagement score increased significantly from baseline to 6-month follow-up, with a 22.5% increase in score[44] | | |
| The scores tended to be higher in the intervention group than in the control group.[24] | | |
| Healthcare utilization | | |
| The current ACP intervention did not decrease healthcare utilization[47] | | |
| ACP had a reduced risk of hospitalization[50] | | |
| Readiness | | |
| The increase in readiness over time was significantly different[44] | | |
| Knowledge | | |
| Significant positive effects of the ACP program on knowledge[47] | | |
| The intervention group had significantly higher scores in knowledge[46] | | |
| There was only a small change in knowledge scores[24] | | |
| / | Engagement strategies | Obstacles and facilitators |
| | Barriers to ACP | |
| Preferences for End-of-Life Care | Roles of family | Impact of intervention |
| There was no statistically significant difference in preference for end-of-life care between the two groups[48] | Awareness of ACP | |
| Respondents in the vulnerable group were more willing to involve their physicians and families in end-of-life care preferences[50] | Unclear questions | |
| AD-related outcomes | | |
| All scores in the experimental group were much higher than those in the control group[47] | | |
| Awareness of AD increased from 23.6% to 76%[48] | | |
| Communicated with family members about AD increased from 21% to 41%[48] | | |

### *Sense of control*

Quantitative and qualitative research has consistently demonstrated that appropriate interventions promote ACP behavior readiness. Quantitative results show that interventions significantly increase participants' knowledge of ACP and end-of-life issues while also enhancing their engagement in ACP,[24,43–48] which may enhance participants' quality of life at the end of their lives. Because after the intervention, a significant proportion of individuals were willing to discuss hospice care preferences with family members or clinicians and complete AD.[43,45,46,48–50] Qualitative research suggests that ACP can allow people to systematically think about their hospice preference, voice their opinions about death, and ensure they pass away comfortably,[29,31,51,53,55] relieving the strain on their loved ones and their suffering.[29,31,55] In addition, a positive attitude toward the issue of palliative care may empower them to make behavioral changes.

### *Obstacles and facilitators*

Qualitative data highlighted facilitators and barriers in the process of ACP engagement.[29–31,52–55] The primary obstacles to ACP awareness improvement were cognitive impairment, educational attainment,[29] and language communication;[30] participants also mentioned that discussing death with family members was taboo due to cultural differences.[30,31,52–54] The optimal way to involve frail elderly in ACP is through the appropriate strategy and preparation of individuals for ACP discussions.[52] Additionally, using the web as a medium while engaging GPs, nurses, and families in ACP discussions may increase the quality of ACP.[30,31,55] However, the quantitative research did not examine how facilitators and obstacles affected the results.

### *Impact of intervention*

Quantitative and qualitative studies show that family relationships influence participants' ACP decisions.[48,52–55] Qualitative findings also revealed that some participants' awareness of the definition of ACP is still unclear.[30,54] Quantitative data mean that participants' awareness of ACP improved after the intervention, improving patients' quality of life in the dying.[49,50] Although the qualitative data revealed that some questions were confusing to the participants,[31,52] was not reflected in the quantitative data. The differences underscore the need to ascertain the clarity of the ACP to the participants.

## DISCUSSION

### *Main findings*

To answer the research question, we integrate quantitative and qualitative evidence by JBI's MMSR guidance to comprehensively understand ACP's effectiveness and the frail elderly' opinions of ACP.[41] The quality of the qualitative studies existential discrepancy because these reviews supplied insufficient methodological information. The quality of the quantitative studies was generally fair because most studies have control groups.

The meta-analysis showed that the intervention of ACP for frail elderly effectively increases readiness, knowledge, and process of ACP behaviors, thus promoting AD completion. The meta-aggregation demonstrates that participants generally have a positive attitude toward ACP, believe that it helps them express their preferences for the healthcare decision, and explain the variables that influence their participation in ACP. The aggregated findings from configurative analysis demonstrate that the quantitative and qualitative synthesis were complementary and coherent to support ACP as an effective and feasible strategy to facilitate frail elderly to express their healthcare wishes timely. In addition, participants generally believe that ACP provides a communication channel for frail elderly patients to frankly discuss hospice issues, understand relevant knowledge, and share views during participation. These aggregations are consistent with the main elements of the theory of planned behavior (TPB) in the behavioral change model of healthy behavior, where attitude, subjective norm, and perceived behavior control three elements that shape an individual's behavior intention and actual behavior.[56] Thus, these aggregates help to explain that behaviors that improve ACP practice can promote engagement and completion of ACP and thus improve end-of-life care quality.

### *Strengths and limitations*

The advantage of this study is that using MMSR to give a comprehensive and in-depth analysis of the quantitative and qualitative data already available to explain the effects and experiences of ACP. Given the insufficiency of research in this field, all identified studies were included in this review. The aggregation of the quantitative and qualitative evidence reached a coherent consensus that enhanced the credibility of the findings on the effectiveness and acceptance of ACP.

We are aware of the limitations of this review. First, even though we thoroughly searched the current literature, it is possible to miss relevant studies because we only included English language papers, and a grey literature search was not undertaken. Second, few studies have explicitly looked at ACP with frail elderly who are cognitively normal and do not have a specific terminal condition, nor have any studies that have used an operational measure of frailty. Therefore, the prevalence and degree of frailty in the research included in this systematic review are unknown; nonetheless, the results can be applied to the elderly without significant medical issues in the community or institutional settings. Third, because most of the studies included in this analysis were not blinded, people who received ACP were likelier to accept participating in ACP-related investigations, potentially risking participation bias. However, most studies had a reasonable response rate, which is beneficial for reducing this risk.

***Policy and Practice Recommendations***

There is an obvious need to strengthen and coordinate activities to encourage the involvement of frail old persons and their families in the ACP process. As the research results show, there are contributing factors and obstacles to the participation of frail older adults in the ACP.[29–31,52–55] Therefore, when drafting relevant policies, such patients' actual constraints should be considered. For example, ACP's language and professional terms are improved according to local cultural characteristics, and new processes have been added to overcome cultural differences in different regions. Moreover, the results of the findings show that the ACP is an effective way to provoke discussion about death and hospice decision-making and promote AD completion.[29,31,51,53,55] The meta-analysis of four studies showed that the completion rate of ACP improved after the intervention despite heterogeneity in the data.[44–46,48] Therefore, to target the inclusion of this group of people in the ACP in the primary health care system, more in-depth conversation and assessment are required while also considering the variations in the complex legal frameworks among countries.

In clinical practice, because frailty is a dynamic process and difficult to define, frail elderly patients often lack the information and awareness to plan their future medical plans. Moreover, the research results show that there is still a need to provide special ACP tools suitable for the frail elderly, which can be used for people of different education in various settings. Therefore, to encourage patients to learn the pertinent information about ACP and increase their readiness, for instance, we can use movies or video games to facilitate the process of ACP and make the ACP knowledge easier to understand.

## CONCLUSION

Synthesizing the information from quantitative and qualitative research demonstrates that ACP is an effective and feasible strategy to facilitate frail elderly to express their healthcare wishes timely and improve their outcomes. Because the frail elderly usually lacks the opportunity to start ACP discussions, they will miss a golden opportunity to discuss it. Consequently, more extensive and rigorous research is required to improve the quality of research, especially randomized controlled trials to support the reported results, to ascertain the most effective and beneficial ACP interventions and tools for the frail elderly population.

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**Figure1 PRISMA flow diagram of the study selection process**

**Figure2 Forest plot of pooled results for ACP completion**

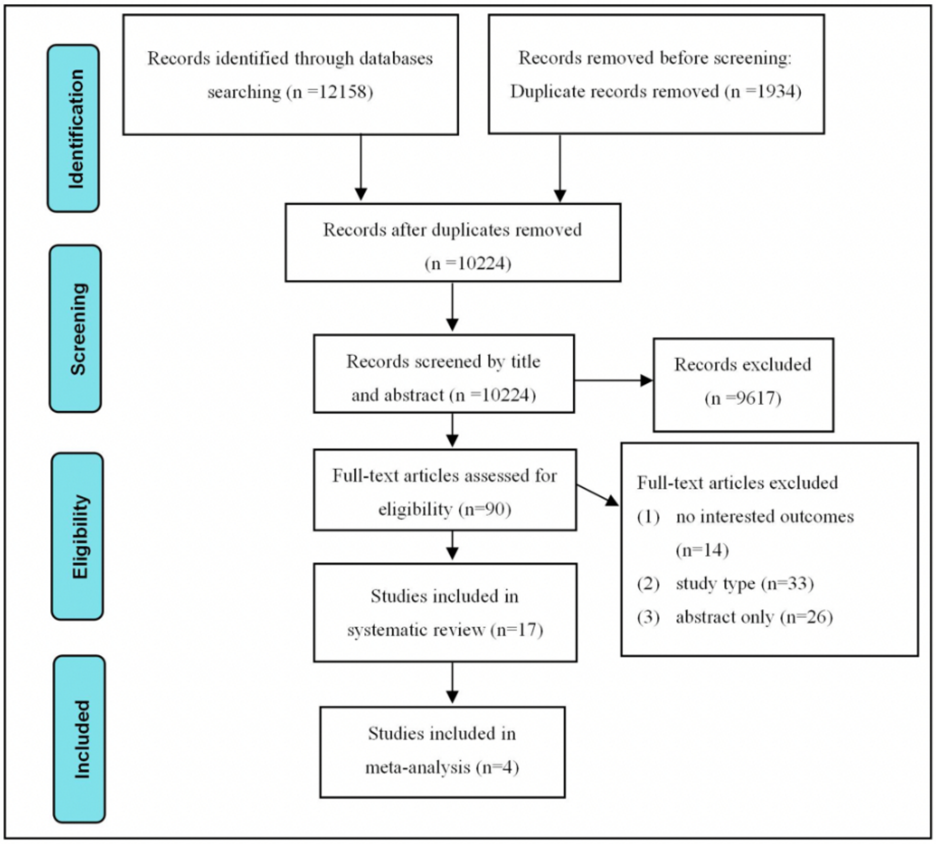
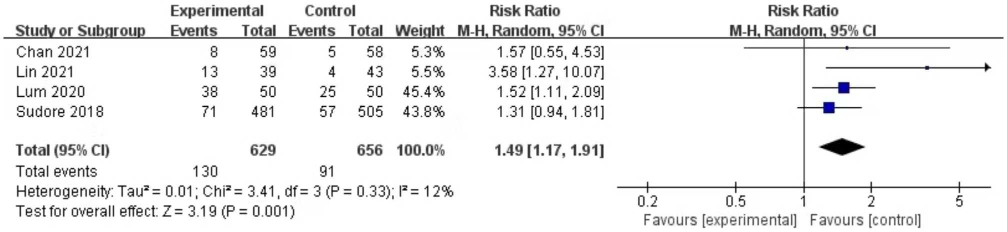


**Figure1 PRISMA flow diagram of the study selection process.**

PRISMA flow diagram of the study selection process

173x155mm (144 x 144 DPI)



| | Experimental | | Control | | | Risk Ratio |
|---|---|---|---|---|---|---|
| **Study or Subgroup** | **Events** | **Total** | **Events** | **Total** | **Weight** | **M-H, Random, 95% CI** |
| Chan 2021 | 8 | 59 | 5 | 58 | 5.3% | 1.57 [0.55, 4.53] |
| Lin 2021 | 13 | 39 | 4 | 43 | 5.5% | 3.58 [1.27, 10.07] |
| Lum 2020 | 38 | 50 | 25 | 50 | 45.4% | 1.52 [1.11, 2.09] |
| Sudore 2018 | 71 | 481 | 57 | 505 | 43.8% | 1.31 [0.94, 1.81] |
| **Total (95% CI)** | | **629** | | **656** | **100.0%** | **1.49 [1.17, 1.91]** |
| Total events | 130 | | 91 | | | |

Heterogeneity: Tau² = 0.01; Chi² = 3.41, df = 3 (P = 0.33); I² = 12%

Test for overall effect: Z = 3.19 (P = 0.001)

Forest plot of pooled results for ACP completion.

283x67mm (72 x 72 DPI)

## Appendix 1

**Search date: 20/04/2022**

**[Search strategy for MEDLINE / EMBASE / PsycINFO/ CINAHL via OvidSP]**

1. exp Frailty/
2. frailty.mp.
3. exp Frail Elderly/
4. Frail Elderly.sh,kf.
5. Frail Older People.mp.
6. Frailty syndrome.mp.
7. (Frailty adj2 syndrome).mp.
8. (Frail* or geriatric syndrome* or geriatric disorder*).ti,ab.
9. ((elder* or old* or senior* or geriatric*) adj4 function* adj4 (declin* or impair*)).af.
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11. exp Advance Care Planning/
12. (advance* care adj plan*).tw.
13. (advance* adj (medical plan* or statement*)).tw.
14. acp.tw.
15. Statement of wishes.tw.
16. Terminal Care/
17. terminal care.tw.
18. ((end of life or EOL) adj5 (care or discuss* or decision* or plan* or preference*)).tw.
19. Living Wills/
20. living will*.tw.
21. 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20
22. 10 and 21
23. limit 22 to (english language and yr="2003 - 2022" and "all aged (50 and over)")

**PubMed**

(((Frail Elderly[MeSH Terms]) OR (Elderly, Frail[Title/Abstract] OR Frail Elders[Title/Abstract] OR Elder, Frail[Title/Abstract] OR Elders, Frail[Title/Abstract] OR Frail Elder[Title/Abstract] OR Functionally-Impaired Elderly[Title/Abstract] OR Elderly, Functionally-Impaired[Title/Abstract] OR Functionally Impaired Elderly[Title/Abstract] OR Frail Older Adults[Title/Abstract] OR Adult, Frail Older[Title/Abstract] OR Adults, Frail Older[Title/Abstract] OR Frail Older Adult[Title/Abstract] OR Older Adult, Frail[Title/Abstract] OR Older Adults, Frail[Title/Abstract])) AND (Advance Care Planning[MeSH Terms])) OR (Advance Health Care Planning[Title/Abstract] OR Advance Medical Planning[Title/Abstract] OR Medical Planning, Advance[Title/Abstract] OR Planning, Advance Medical[Title/Abstract] OR Advance Directives[Title/Abstract] OR Living Wills[Title/Abstract] OR Terminal Care[Title/Abstract]) AND ((aged[Filter]) AND (2003:2022[pdat]))

**Cochrane library**

#1 (advance care planning):ti,ab,kw OR (Advance Directive):ti,ab,kw OR (Living will):ti,ab,kw OR (advance* NEAR/3 plan*):ti,ab,kw OR (future care planning):ti,ab,kw
#2 (Anticipatory care plan*):ti,ab,kw OR (end of life NEXT (discuss* or conversation* or decision* or plan* or preference*)):ti,ab,kw OR (Medical treatment order):ti,ab,kw OR (Statement of wishes):ti,ab,kw OR (Medical directive):ti,ab,kw
#3 (advance* NEXT (medical plan* or statement*)):ti,ab,kw
#4 advance care planning
#5 Advance Directive
#6 Living will
#7 (Frail Elderly):ti,ab,kw OR (Frail):ti,ab,kw OR (Elderly):ti,ab,kw OR (Frailty syndrome):ti,ab,kw
#8 #1 or #2 or #3 or #4 or #5 or #6

#9 #8 and #7

**CINAHL complete**

S1 "advance* care plan*"
S2 "Anticipatory care plan*"
S3 "future care planning"
S4 (MH "Advance Care Planning")
S5 "Advance Care Planning"
S6 "Living Wills"
S7 (MH "Advance Directives+") OR (MH "Living Wills")
S8 "Advance Directives"
S9 "Resuscitation Orders"
S10 "Medical treatment order"
S11 "Statement of wishes"
S12 "Medical directive"
S13 "end of life discuss*"
S14 "end of life conversation*"
S15 "end of life decision*"
S16 "end of life plan*"
S17 "end of life preference*"
S18 "advance* medical plan*"
S19 "advance* statement*"
S20 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19
S21 (MH "Frailty") OR (MH "Frail Elderly")
S22 " frailty"
S23 "Frailty syndrome"
S24 "Frail Older People"
S25 S21 OR S22 OR S23 OR S24
S26 S20 AND S25
S27 (AG "50 and over") AND (DT "2003 - 2022") AND (ZL "English")
S28 S26 AND S27

## Appendix 2

**Table 2a. Methodological quality of included randomized controlled trial**

| | Rebecca L et al, 2018 | Anouk Overbeek et al, 2019 | Li-Hwa Lin et al, 2021 | Hillary D. Lum et al, 2020 |
|---|---|---|---|---|
| 1. Was true randomization used for assignment of participants to treatment groups? | Yes | Yes | Yes | Yes |
| 2. Was allocation to treatment groups concealed? | Yes | No | Unclear | Unclear |
| 3. Were treatment groups similar at the baseline? | Yes | Yes | Yes | Yes |
| 4. Were participants blind to treatment assignment? | No | No | Unclear | No |
| 5. Were those delivering treatment blind to treatment assignment? | Yes | No | Unclear | No |
| 6. Were outcomes assessors blind to treatment assignment? | Yes | No | Unclear | No |
| 7. Were treatment groups treated identically other than the intervention of interest? | Yes | Yes | Yes | Yes |
| 8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed? | Yes | Yes | Yes | Yes |
| 9. Were participants analyzed in the groups to which they were randomized? | Yes | Yes | Yes | Yes |
| 10. Were outcomes measured in the same way for treatment groups? | Yes | Yes | Yes | Yes |
| 11. Were outcomes measured in a reliable way? | Yes | Yes | Yes | Yes |
| 12. Was appropriate statistical analysis used? | Yes | Yes | Yes | Yes |
| 13. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial? | Yes | Yes | Yes | Yes |
| Overall quality | Moderate | Low | Low | Low |

**Table 2b. Critical appraisal results for included quasi-experimental studies or mixed methods studies or no randomized controlled trial**

| | Huei-Chuan Sung et al, 2019 | Wallace Chi Ho Chan et al, 2021 | Renli Deng et al, 2020 | Debra K.Litzelman et al, 2017 | Hiroko Okada et al, 2022 |
|---|---|---|---|---|---|
| 1. Is it clear in the study what is the ‘cause’ and what is the ‘effect’ (i.e. there is no confusion about which variable comes first)? | Yes | Yes | Yes | Yes | Yes |
| 2. Were the participants included in any comparisons similar? | Yes | Yes | Yes | Yes | Yes |
| 3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest? | No | No | No | No | No |
| 4. Was there a control group? | Yes | Yes | Yes | No | No |
| 5.Were there multiple measurements of the outcome both pre and post the intervention/exposure? | Yes | Yes | Yes | No | No |

| | | | | | |
|---|---|---|---|---|---|
| 6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed? | Yes | Yes | No | Unclear | Yes |
| 7. Were the outcomes of participants included in any comparisons measured in the same way? | Yes | Yes | Yes | Yes | Yes |
| 8. Were outcomes measured in a reliable way? | Yes | Yes | Yes | Yes | Yes |
| 9. Was appropriate statistical analysis used? | Yes | Yes | Yes | Yes | Yes |
| Overall quality | Moderate | Moderate | Moderate | Low | Low |

**Table 2c. Critical appraisal results for included qualitative studies**

| | Francesca Ingravallo et al, 2018 | Sheng-Yu Fan et al, 2019 | Sarah Combes et al, 2021 | Carrie Bernard et al, 2020 | Sok Shin Yap et al, 2021 | Jeanine Yonashiro-Cho et al, 2016 | Jolien J. Glaudemans et al, 2020 | Debra K.Litzelman et al, 2017 |
|---|---|---|---|---|---|---|---|---|
| 1. Is there congruity between the stated philosophical perspective and the research methodology? | Unclear | Unclear | Yes | No | Unclear | Yes | Yes | Yes |
| 2. Is there congruity between the research methodology and the research question or objectives? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 3. Is there congruity between the research methodology and the methods used to collect data? | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes |
| 4. Is there congruity between the research methodology and the representation and analysis of data? | Yes | Yes | Yes | Unclear | Yes | Yes | Unclear | Yes |
| 5. Is there congruity between the research methodology and the interpretation of results? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 6. Is there a statement locating the researcher culturally or theoretically? | No | No | No | Unclear | No | No | No | No |
| 7. Is the influence of the researcher on the research, and vice- versa, addressed? | Unclear | Yes | Yes | Unclear | Unclear | Unclear | Unclear | Unclear |
| 8. Are participants, and their voices, adequately represented? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body? | Yes | Yes | Yes | Yes | No | Yes | No | Yes |
| 10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Overall quality | Low | Moderate | Moderate | Low | Low | Moderate | Low | Moderate |

**Table 2d. Critical appraisal results for included cross sectional studies**

| | Helen YL Chan et al, 2007 |
|---|---|
| 1. Were the criteria for inclusion in the sample clearly defined? | Yes |
| 2. Were the study subjects and the setting described in detail? | Yes |
| 3. Was the exposure measured in a valid and reliable way? | Yes |
| 4. Were objective, standard criteria used for measurement of the condition? | Yes |
| 5. Were confounding factors identified? | Unclear |
| 6. Were strategies to deal with confounding factors stated? | No |
| 7. Were the outcomes measured in a valid and reliable way? | Yes |
| 8. Was appropriate statistical analysis used? | Yes |
| Overall quality | Moderate |

# PRISMA 2020 Checklist

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| **TITLE** | | | |
| Title | 1 | Identify the report as a systematic review. | Page 1 |
| **ABSTRACT** | | | |
| Abstract | 2 | See the PRISMA 2020 for Abstracts checklist. | Page 2 |
| **INTRODUCTION** | | | |
| Rationale | 3 | Describe the rationale for the review in the context of existing knowledge. | Pages 3-5 |
| Objectives | 4 | Provide an explicit statement of the objective(s) or question(s) the review addresses. | Pages 3-5 |
| **METHODS** | | | |
| Eligibility criteria | 5 | Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses. | table 1 |
| Information sources | 6 | Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted. | Page 5 |
| Search strategy | 7 | Present the full search strategies for all databases, registers and websites, including any filters and limits used. | Page 5 and supplementary material 2 |
| Selection process | 8 | Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process. | Page 5 |
| Data collection process | 9 | Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process. | Page 5 |
| Data items | 10a | List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect. | Table 2 and Table 3 |
| | 10b | List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information. | Table 2 and Table 3 |
| Study risk of bias assessment | 11 | Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process. | Page 5 |
| Effect measures | 12 | Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results. | |
| Synthesis methods | 13a | Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)). | Page 8 |
| | 13b | Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions. | Page 8 |
| | 13c | Describe any methods used to tabulate or visually display results of individual studies and syntheses. | Page 8 |
| | 13d | Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used. | Page 8 |
| | 13e | Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression). | |
| | 13f | Describe any sensitivity analyses conducted to assess robustness of the synthesized results. | |
| Reporting bias assessment | 14 | Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases). | |

# PRISMA 2020 Checklist

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| Certainty assessment | 15 | Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. | |
| **RESULTS** | | | |
| Study selection | 16a | Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram. | Pages 8-9 |
| | 16b | Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded. | Page 9-10 |
| Study characteristics | 17 | Cite each included study and present its characteristics. | Page 9-10 |
| Risk of bias in studies | 18 | Present assessments of risk of bias for each included study. | Supplementary material |
| Results of individual studies | 19 | For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots. | Figure 2 |
| Results of syntheses | 20a | For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies. | |
| | 20b | Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect. | Pages 10-14 |
| | 20c | Present results of all investigations of possible causes of heterogeneity among study results. | |
| | 20d | Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results. | |
| Reporting biases | 21 | Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed. | |
| Certainty of evidence | 22 | Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed. | |
| **DISCUSSION** | | | |
| Discussion | 23a | Provide a general interpretation of the results in the context of other evidence. | Pages 22-23 |
| | 23b | Discuss any limitations of the evidence included in the review. | Pages 23 |
| | 23c | Discuss any limitations of the review processes used. | Pages 23 |
| | 23d | Discuss implications of the results for practice, policy, and future research. | |
| **OTHER INFORMATION** | | | |
| Registration and protocol | 24a | Provide registration information for the review, including register name and registration number, or state that the review was not registered. | Pages 24-25 |
| | 24b | Indicate where the review protocol can be accessed, or state that a protocol was not prepared. | |
| | 24c | Describe and explain any amendments to information provided at registration or in the protocol. | |
| Support | 25 | Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review. | |
| Competing interests | 26 | Declare any competing interests of review authors. | Title page |
| Availability of data, code and other materials | 27 | Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review. | Title page |

# PRISMA 2020 Checklist

*From:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.org/