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The effects of advance care planning intervention on nursing home residents: A systematic review and meta-analysis of randomised controlled trials

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ABSTRACT

Background: Advance care planning is a communication and decision-making process during which people express their wishes for future healthcare and treatment decisions. Advance care planning is particularly relevant to frail older adults. Recently, more advance care planning interventions have been implemented in nursing homes using randomised controlled trial approaches; however, no meta-analysis has been performed evaluating and synthesising the effect of advance care planning in nursing homes.
Objective: To determine the effect of advance care planning interventions on end-of-life outcomes in nursing home populations.
Design: Systematic review and meta-analysis of randomised controlled trials.
Data sources: Medline, EMBASE, Cochrane Library, Medical database, British Nursing Index, PsycInfo and CINAHL Plus from inception to March 2021.
Review methods: Randomised controlled trials or cluster randomised controlled trials implementing advance care planning interventions in nursing homes, and studies reporting end-of-life outcomes and published in English were included. Studies in which advance care planning was part of a more comprehensive intervention were excluded. The outcomes were evaluated using pooled odds ratios (ORs) or standardised mean differences (SMDs) with random-effects meta-analysis models. A meta-regression was performed to evaluate the heterogeneity of the included studies. The Cochrane Risk of Bias Tool 2.0 was used to assess the methodological quality of the included studies.
Results: Nine trials were identified with 2905 participants, with sample sizes ranging from 87 to 1292. The number of nursing homes involved ranged from 1 to 64. The types of advance care planning intervention differed, with most studies adopting formal education or training for nursing home staff, while the remainder adopted train-the-trainer approaches. The quality of the included studies varied, with two out of nine scoring low in overall risk of bias. Our comprehensive meta-analysis indicated with moderate heterogeneity that advance care planning interventions significantly increased the documentation of end-of-life care preferences ($OR = 1.95$, 95% CI: 1.64, 2.32), but not satisfaction with end-of-life care from families' perspectives ($SMD = 0.08$, 95% CI: -0.08, 0.23). The meta-regression did not identify any variables in advance care planning interventions to explain the heterogeneity.
Conclusion: Advance care planning intervention yielded beneficial effects in nursing home residents by increasing the number of documented end-of-life care wishes but demonstrated no effect on satisfaction with end-of-life care from family caregivers' perspectives. This review highlights the need for more rigorously designed implementation studies to examine the effects of advance care planning interventions on healthcare outcomes among frail older adults in nursing homes.

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What is already known

- Advance care planning could potentially improve patient and family outcomes in nursing homes.
- Mixed results have been reported across randomised controlled trials that examined the effectiveness of advance care planning on nursing home residents.
- There is no meta-analysis available investigating advance care planning interventions in the nursing home context.

What this paper adds

- Advance care planning intervention yielded beneficial effects in nursing home residents by increasing the number of documented end-of-life care wishes.
- Future studies will be necessary to examine the essential components for an effective and successful delivery of structured advance care planning.
- More rigorously designed studies should be implemented to examine the effects of advance care planning interventions on healthcare outcomes among frail older adults in nursing homes.

1. Introduction

Advance care planning is an ongoing communication and decision-making process concerning goals and preferences of care between patients, family and health care providers for future medical treatment and care, including end-of-life care (Brinkman-Stoppelenburg et al., 2014). A multidisciplinary panel of international advance care planning experts has defined advance care planning as "a process that supports adults at any age or stage of health in understanding and sharing their personal values, life goals, and preferences regarding future medical care" (Sudore et al., 2017). It is aimed at assisting patients to identify a surrogate and documenting their wishes (Brinkman-Stoppelenburg et al., 2014; Sudore et al., 2017; Mullick et al., 2013; Rietjens et al., 2017). The ultimate goal of conducting advance care planning with patients and their family members is to ensure that the care patients receive is consistent with the patients' expressed wishes and preferences (Brinkman-Stoppelenburg et al., 2014; Sudore et al., 2017; Rietjens et al., 2017), and the contents of such conversations can be documented in the form of written agreement or advance directives (Brinkman-Stoppelenburg et al., 2014). While most advance care planning interventions are conducted in hospital settings (Brinkman-Stoppelenburg et al., 2014), residential care facilities such as nursing homes, where a lot of frail older adults reside, are also appropriate settings for the application of advance care planning. The delivery mode of advance care planning may differ across acute hospital settings, community settings (out-patient, day centre, or in-home) and nursing homes. For example, advance care planning in acute hospital settings is usually embedded in a palliative care consultation in which the focus of advance care planning is on making immediate medical decisions (Brinkman-Stoppelenburg et al., 2014; Kelly et al., 2019), while most interventions conducted in community settings focus on education, aiming to increase advance care planning awareness and knowledge (Kelly et al., 2019).

The ageing population drives the demand for long-term care and influences the place of death. It is estimated that the proportion of people reaching older age is rising globally due to medical advancements (United Nations, 2020). Some older people require care in nursing homes due to functional decline and cognitive impairment. Due to the differences in health care systems in different countries, the concepts and mandates of nursing homes vary. In this review, nursing home refers to a facility that possesses the unique characteristics of having 24-hour access to nursing or medical support staff. Compared to other populations covered in prior reviews such as older adults in various settings or different adult patient populations (Houben et al., 2014; Weathers et al., 2016), nursing home residents are relatively frailer with multiple comorbidities, they tend to develop cognitive problems gradually (Gilissen et al., 2017) and they have higher incidences of hospitalisation (Kayser-Jones et al., 1989). Therefore, this meta-analysis focuses merely on nursing homes due to the special characteristics of their settings and their residents.

Initiating advance care planning in nursing homes is crucial because nursing home residents are more likely to lose the capacity to make decisions regarding their end-of-life care (Flo et al., 2016; Robinson et al., 2012; Advance care Planning, 2009). Thus, early advance care planning interventions in nursing homes while residents still have decision-making capacity to state their preferences and wishes are crucial (Weathers et al., 2016). Studies have shown that the proportions of nursing home deaths have increased in the past few decades. As more individuals are expected to receive care in nursing homes at the end of life, the trends in places of care and death may shed light on the future provision of end-of-life care (Kayser-Jones et al., 1989; Flo et al., 2016). Frequent hospitalisations in the last months of life have been reported among nursing home residents, and the treatments they received were arguably of limited clinical benefit (Gozalo et al., 2011). Documentation of advance care planning conversations is particularly important to make known what kind of end-of-life treatments nursing home residents want (Brinkman-Stoppelenburg et al., 2014; Detering et al., 2010).

Globally, more than 20 countries have advance directives legislation, and that can aid promoting and making the commencement of advance care planning conversation easier for patients to receive and accept. With the development of clinical and ethical guidelines, the complexity for healthcare professionals to prepare and implement advance care planning may reduce, as there is guidance on the processes and governance for advance care planning preparation and implementation (Schrijvers and Cherny, 2014). Although advance care planning has become a topic of interest in nursing home contexts, advance care planning implementation in nursing home facilities is still lacking. One review reported that older adults living in long-term care settings around the world and their families have minimal experience with advance care planning discussions (Mignani et al., 2017).

Advance care planning, in fact, is a complex intervention consisting of various interacting components such as training, a facilitator or using a tool (Gilissen et al., 2017; De Vleminck et al., 2016; Medical Research Council, 2019). A meta-analysis published in 2014 reviewed the efficacy of advance care planning interventions in different adult patient populations and concluded that advance care planning interventions increased the completion of advance directives, occurrence of discussions about advance care planning, and concordance between preferences for care and delivered care (Houben et al., 2014). However, among the 56 included studies, only four (three randomised controlled trials and one pre-post design) were conducted in nursing homes, and they were not included in the meta-analysis due to variability in the definitions and measurements of various outcomes (Houben et al., 2014). The effectiveness of advance care planning in nursing homes remained uncertain. Another systematic review included 13 studies with multiple study designs summarising the effects of advance care planning interventions in nursing home residents, only two of which were randomised controlled trials (Martin et al., 2016). This systematic review showed that advance care planning appeared to have beneficial effects in the nursing home populations, including care consistent with residents' wishes and avoidance of unwanted hospitalisations and life-sustaining treatments, leading to a considerable reduction in hospital costs (Martin et al., 2016). However, no meta-analysis was performed due to the small number of randomised controlled trials available and the heterogeneous nature of the study designs.

Advance care planning has been receiving increasing attention in recent years, and more and more research on advance care planning interventions programs using randomised controlled trial approaches has been conducted in nursing homes (Agar et al., 2017; Brazil et al., 2018; Hanson et al., 2017; Mitchell et al., 2018). However, the effect of advance care planning has been much debated, as studies involve many different types of advance care planning and many different outcome measures, making it difficult to draw conclusions. Hence, there is a need for a timely meta-analysis to show how advance care planning might influence end-of-life care in nursing home residents to provide insight regarding future policymakers' decisions and future research in the nursing home context. This review presents an attempt to evaluate and synthesise the effect of advance care planning on end-of-life outcomes in nursing home residents systematically, as well as to appraise the methodological quality of the included studies. We adopted the organising framework of advance care planning outcomes, which was developed by a large, multidisciplinary Delphi panel, for standardising advance care planning measurement and defining successful advance care planning. Documentation of care preferences and satisfaction with care are important advance care planning outcomes, both objectively and subjectively, which can also be taken into account (Sudore et al., 2018).

2. Methods

This meta-analysis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009).

2.1. Search strategy

A comprehensive search of seven databases: Medline, EMBASE, Cochrane Library, Medical database, British Nursing Index, PsycInfo and CINAHL Plus was conducted from the inception of the databases to 1 March 2021. Search terms included (advance* care planning OR advance* health care planning OR advance* medical planning OR decision making) AND (nursing home* OR skilled nursing facilit* OR residential care home* OR aged care home* OR long-term care home*). Details of the search strategy are in Appendix 1. We also manually searched the reference lists of previously published reviews and selected articles to identify potentially relevant material.

2.2. Eligibility criteria

Studies were included if they (1) were randomised controlled trials or cluster randomised controlled trials, (2) used advance care planning interventions, (3) were conducted in nursing homes, (4) reported end-of-life outcomes, and (5) were peer-reviewed articles published in English. Studies in which advance care planning was only part of a more comprehensive intervention, for example, studies on the effect of palliative care intervention, were excluded. Editorials, letters, conference abstracts, case reports, qualitative research studies, systematic reviews, and meta-analyses were excluded. Control groups could either be placebo (informational videos or written materials unrelated to advance care planning interventions) or inactive (usual care or waitlist).

The outcomes of interest that were adopted by more than three included trials were included in the meta-analysis, while the outcomes of interest that were adopted by 2–3 trials were included in the qualitative synthesis only.

2.3. Study selection

Two reviewers (A. N. and J. K.) assessed all titles and abstracts independently against the inclusion criteria. A full text of each relevant study was then retrieved and read in detail to assess the eligibility. Disagreements were resolved by consensus.

2.4. Data extraction and quality assessment

Two reviewers (A. N. and J. K.) worked independently to extract data from the included studies. A predesigned data-extraction form summarising information about study characteristics (author, year, study design, year of publication), participant characteristics, intervention characteristics and outcomes measures (outcomes, time point and measurement tools) were employed for every included study. When unclear presentations or insufficient data were found in the included articles, the corresponding authors of the respective articles were contacted for clarification.

The Cochrane Risk of Bias Tool 2.0 was used to assess the methodological quality of the included studies (Sterne et al., 2019). Two reviewers (A. N. and J. K.) independently assessed the methodological quality of each randomised controlled trial based on the domains of (1) bias arising from the randomisation process, (2) bias due to deviations from the intended interventions, (3) bias due to missing outcome data, (4) bias in measurement of the outcome and (5) bias in selection of the reported result. Studies were categorised as "low," "high" or "some concerns" in the overall risk of bias score. All data were verified, discrepancies were discussed and consensus was reached.

2.5. Statistical analysis

All analyses of pooled effectiveness were performed using STATA version 16.0. A random effects meta-analysis model was used to estimate the differences between the means of family satisfaction with end-of-life care and the occurrence of events between study and control group. Heterogeneity was estimated using I^2 and considered substantial if above 50%. Pooled odds ratios (ORs) with 95% confidence intervals (CIs) were calculated for dichotomous data (documentation of end-of-life care preferences). Pooled standardised mean differences (SMDs) and their 95% CIs were calculated for continuous data (family satisfaction with end-of-life care). A meta-regression was performed to evaluate the heterogeneity of the study characteristics further. Candidate factors used in the meta-regression to detect contributors to heterogeneity included age, gender, individual allocation vs. cluster allocation, whether the intervention was delivered by a trained facilitator or a nurse, study overall risk of bias or risk of bias in all individual domains.

Leave-one-out analysis was conducted to identify whether individual studies influenced the overall result of pooled estimate disproportionately. We conducted a trim-and-fill approach and funnel plots to investigate possible publication bias. Where changes were made in the trim-and-fill analysis, we reported the adjusted estimated pooled effect size from the analysis. The trim-and-fill analysis adjusted the estimated pooled SMD based on the funnel plot as a measurable impact on possible publication bias (asymmetry of the funnel plot).

3. Results

In total, 934 citations were generated in the initial search of the specified electronic databases from 1996 to 1 March 2021, of which 623 were potentially relevant after the removal of duplicates. An additional hand search of reference lists identified four potentially relevant articles. Of these, 603 were excluded, leaving 20 eligible randomised controlled trials for full-text review. A total of nine articles were included in the qualitative and quantitative analysis (Fig. 1).

3.1. Study characteristics

Table 1 summarises the characteristics of the nine studies. These studies involved 2905 participants, with sample sizes ranging from 87 to 1292. Seven of the included studies were cluster randomised controlled trials (Agar et al., 2017; Brazil et al., 2018; Hanson et al., 2017; Mitchell et al., 2018; Overbeek et al., 2018; Sævareid et al., 2019; Morrison et al., 2005), while two were randomised controlled trials

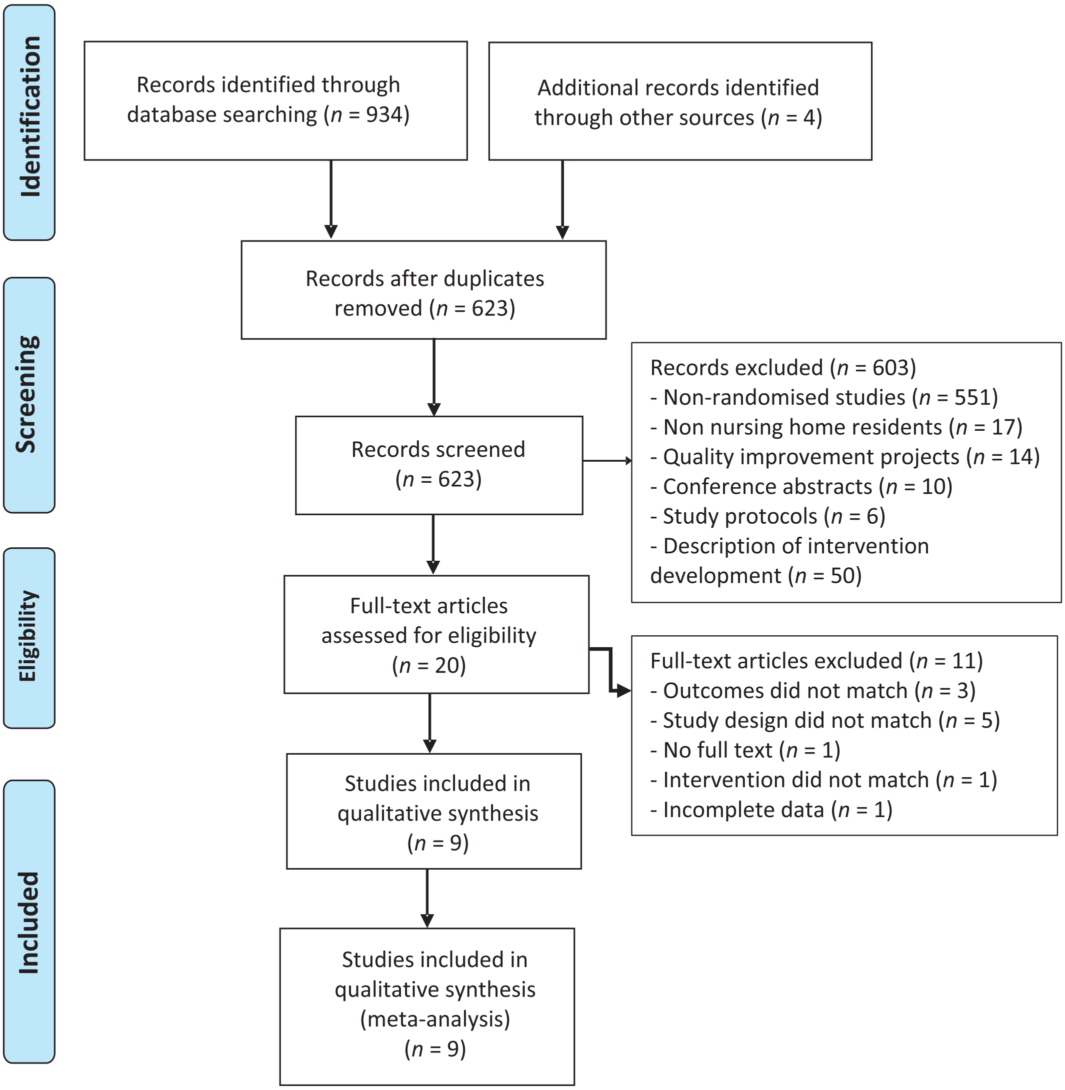

Fig. 1. PRISMA flow diagram of literature search and selection process.

(Reinhardt et al., 2014; Molloy et al., 2000). Five of the studies were conducted in the United States (Hanson et al., 2017; Mitchell et al., 2018; Morrison et al., 2005; Reinhardt et al., 2014; Molloy et al., 2000), with one each in Australia (Agar et al., 2017), the UK (Brazil et al., 2018), the Netherlands (Overbeek et al., 2018) and Norway (Sævareid et al., 2019). The number of nursing homes involved ranged from 1 to 64, and five of the included studies involved residents with dementia (Agar et al., 2017; Brazil et al., 2018; Hanson et al., 2017; Mitchell et al., 2018; Reinhardt et al., 2014). The mean ages of participants ranged from 60.6–87.2, and the participants were mainly female in all these studies.

3.2. Methodological quality

A summary of risk of bias is presented in Table 2. The quality of the included studies was variable, and five of them had some concerns about overall risk of bias (Agar et al., 2017; Brazil et al., 2018; Sævareid et al., 2019; Reinhardt et al., 2014; Molloy et al., 2000), while two each had low (Hanson et al., 2017; Mitchell et al., 2018) or high risks of bias (Overbeek et al., 2018; Morrison et al., 2005). Most studies had a low risk of bias in the randomisation process, missing outcome data, measurement of outcomes and selection of the reported result. The most common methodological limitations were the absence of blinding of participants and the personnel who collected the outcome data.

3.3. Intervention characteristics

The types of advance care planning interventions varied (Table 1). Most of the studies ($n = 7$) implemented formal education or training for the staff, including nurses, social workers, or other allied healthcare staff (Agar et al., 2017; Brazil et al., 2018; Hanson et al., 2017; Overbeek et al., 2018; Sævareid et al., 2019; Morrison et al., 2005; Molloy et al., 2000). Three of them (Agar et al., 2017; Sævareid et al., 2019; Molloy et al., 2000) adopted the train-the-trainer approach, where a group of facilitators were trained and then delivered the intervention in the nursing homes. Sævareid et al. (2019) used active involvement of staff in embodying a new approach of palliative care. The intensity of the training varied considerably. Two studies conducted the training for hours to weeks (Brazil et al., 2018; Hanson et al., 2017), while six involved up to 6–18 months of continuous implementation (Agar et al., 2017; Overbeek et al., 2018; Sævareid et al., 2019; Morrison et al., 2005; Reinhardt et al., 2014; Molloy et al., 2000).

All the interventions provided information regarding advance care planning and treatment options to residents and their proxies, and the information delivery methods were face-to-face (Agar et al., 2017;

Table 1
Characteristics of included studies.

Author/Year (in alphabetical order)	Study design/country	Setting & sample characteristics	Participants [number; gender (female); mean age, y]	Intervention	Assessment time-point	Outcome measures	Measurement tools
Agar M et al., 2017	Cluster RCT/Australia	20 nursing homes; people with advanced dementia	131 (IG: 67; CG: 64) Female: 60% Mean age: 85.3	IG: Facilitated case conferencing (Palliative Care Planning Coordinators facilitated family case conferences and trained staff in person-centred palliative care), 16 h per week CG: Usual care Duration: 18 months	Baseline, every 3 months, last month of life	Family-rated quality of end-of-life care (symptom-related comfort during the last 7 days of life, symptom management in the last 90 days of life, family or caregivers' satisfaction with care during the last 90 days of life)	End-of-Life Dementia (EOLD) Scales
Brazil K et al., 2018	Cluster RCT/UK	24 nursing homes with a dementia nursing category	197 (IG: 80; CG: 117) Female: 69% Mean age: 60.	IG: ACP intervention (a trained ACP facilitator, family education, family meetings, documentation of advanced care plan decisions, and orientation of physician and nursing home staff to intervention) CG: Usual care Duration: 6 weeks	Baseline, 6 weeks	1. Family carer satisfaction with nursing home care 2. Documentation of ACP decisions—DNR	1. The Family Perceptions of Care Scale 2. Nursing home administrative records
Hanson LC et al., 2017	Cluster RCT/USA	22 nursing homes; residents with advanced dementia	302 (IG:151; CG:151) Female: 81.5% Mean age: 86.5	IG: An 18-minute goals of care intervention video decision aid plus a structured discussion with nursing home care team CG: Informational video and usual care planning Duration: NR	Baseline, 3, 6, and 9 months	1. Families rated quality of overall care 2. Goals of care documentation	1. Satisfaction with Care at the End of Life in Dementia (SM-EOLD) Instruments 2. Palliative Care Treatment Plan Domain Score
Mitchell SL et al., 2018	Cluster/RCT/USA	64 nursing homes; residents with advanced dementia	402 (IG: 212; CG: 190) Female: 80.3% Mean age: 86.7	IG: A 12-minute ACP video for proxies with written communication of their preferred level of care CG: Usual care Duration: NR	Baseline, 3, 6, 9, and 12 months	1. Proportion of residents with documented DNH directives 2. Documented directives to forgo other treatments (tube-feeing and intravenous hydration) 3. Documented goals-of-care discussion	1–3: Medical record and documented advance directive
Molloy DW et al., 2000	RCT/USA	6 nursing homes with more than 100 residents each	1292 (IG: 636; CG: 656) Female: 74.6% Mean age: 83.1	IG: The Let Me Decide advance directive program included educating staff in local hospitals and nursing homes, residents, and families about advance directives and offering competent residents or next-of-kin of mentally incompetent residents an advance directive that provided a range of health care choices for life-threatening illness, cardiac arrest, and nutrition CG: No specific directions or written material to control institutions Duration: 12 months	Baseline, 6, 12, and 18 months	1. Satisfaction with level of health care received 2. Advance directive completion	1. Satisfaction questionnaires 2. Completed advance directive
Morrison RS et al., 2005	Controlled clinical trial/USA	1 nursing home	139 (IG: 43; CG: 96) Female: 51.8% Mean age: 86.3	IG: Education in ACP that used role play/practice sessions; structured ACP discussions with residents; completion of a treatment directive by the social worker; flagging of advance directives on nursing home charts; formal review of residents'	Baseline, 6 months	Nursing home chart documentation of advance directives and treatment preferences (healthcare proxies, living wills) and do-not-resuscitate orders, preferences for artificial nutrition and hydration, intravenous antibiotics, and	Nursing home chart and medical records

(continued on next page)

Table 1 (*continued*)

Author/Year (in alphabetical order)	Study design/country	Setting & sample characteristics	Participants [number; gender (female); mean age, y]	Intervention	Assessment time-point	Outcome measures	Measurement tools
				goals of care at pre-existing regular team meetings; and feedback to physicians on the congruence of care they provided CG: An educational training session on New York State law regarding advance directives Duration: 6 months		hospitalisation	
Overbeek A et al., 2018	Cluster RCT/Netherlands	16 residential care homes; frail residents	201 (IG: 101; CG: 100) Female: 70.5% Mean age: 86.5	IG: Information provision through leaflets; facilitated ACP conversations based on scripted interview cards; and completion of an AD, including appointment of a surrogate decision-maker. CG: NR Duration: 12 months	Baseline, 12 months	1. Satisfaction with healthcare 2. Documentation of care preferences in an advance directives	1. A subscale of the Patient Satisfaction Questionnaire 2. Completed advance directives
Reinhardt JP et al., 2014	RCT/USA	1 nursing home; residents with advanced dementia	87 (IG: 47; CG: 40) Female: 79.3% Mean age: 59.3	IG: Palliative care team provide face-to-face, structured conversation about end-of-life care options with family members of nursing home residents CG: Receive social contact via telephone Duration: 6 months	Baseline, 3, and 6 months	1. Family members' ratings of satisfaction with their relative's care and well-being 2. Medical Order for Life-Sustaining Treatments	1. Satisfaction with Care at End-of-Life in Dementia Scale 2. Medical records
Sævareid TJL et al., 2019	Cluster RCT/Norway	8 nursing homes	154 (IG: 77; CG: 77) Female: 70.1% Mean age: 87.2	IG: Implementation support (a guide for how to carry out ACP, a 2-day training seminar for the project teams) CG: Wait-list control (offer training after the intervention period) Duration: 12 months	Baseline, 12 months	Prevalence of patients' preferences for treatment and decision making in a conversation on end-of-life treatment	Patient electronic health records

Abbreviations: ACP: advance care planning; AD: advance directives CG: control group; IG: intervention group; NR: not reported; RCT: randomised controlled trials; UK: United Kingdom; USA: United States of America.

Brazil et al., 2018; Morrison et al., 2005; Reinhardt et al., 2014; Molloy et al., 2000), written (Overbeek et al., 2018; Sævareid et al., 2019) and video (Hanson et al., 2017; Mitchell et al., 2018). In addition to information delivery, advance care planning discussion initiated by trained healthcare professionals took place in most of the included studies (Agar et al., 2017; Brazil et al., 2018; Hanson et al., 2017; Overbeek et al., 2018; Morrison et al., 2005; Reinhardt et al., 2014; Molloy et al., 2000), while the remaining two studies did not involve any face-to-face discussion after information delivery (Mitchell et al., 2018; Sævareid et al., 2019).

Table 2
Summary of risk of bias.

Author/year (in alphabetical order)	Randomisation process	Deviations from the intended interventions	Missing outcome data	Measurement of the outcomes	Selection of the reported result	Overall risk of bias
Agar et al. (2017)	L	S	L	L	L	S
Brazil et al. (2018)	L	S	L	L	L	S
Hanson et al. (2017)	L	S	L	L	L	L
Mitchell et al. (2018)	L	L	L	L	L	L
Molloy et al. (2000)	S	S	L	L	L	S
Morrison et al. (2005)	H	H	S	S	L	H
Overbeek et al. (2018)	L	S	L	H	L	H
Reinhardt et al. (2014)	L	S	S	L	L	S
Sævareid et al. (2019)	L	S	L	S	L	S

Abbreviations: H: High risk of Bias; L: Low risk of Bias; S: Some concerns.

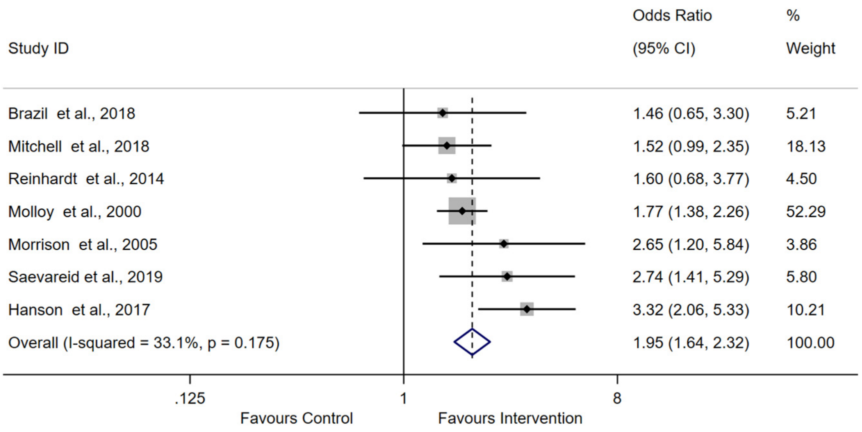

Fig. 2. Forest plot for documentation of end-of-life care preferences.

3.4. Meta-analysis of selected outcomes of the interventions

3.4.1. Effects on documentation of end-of-life care preferences

Seven studies reported the documentation of end-of-life care preferences as an outcome (Brazil et al., 2018; Hanson et al., 2017; Mitchell et al., 2018; Sævareid et al., 2019; Morrison et al., 2005; Reinhardt et al., 2014; Molloy et al., 2000). Advance care planning interventions yielded an overall significant result in increasing documentation of end-of-life care preference compared to control (OR = 1.95, 95% CI: 1.64, 2.32), with moderate heterogeneity identified ($I^2 = 33.1\%$, $p =$ 0.18) (Fig. 2). The meta-regression displayed no significant effects on heterogeneity when adjusting for age, gender, individual allocation vs. cluster allocation, whether intervention was delivered by a trained facilitator or a nurse, study overall risk of bias or risk of bias in all individual domains.

Overbeek et al. (2018) was identified as an outlier with a disproportionate impact on the overall pooled effects of documentation on end-of-life care preferences in the leave-one-out sensitivity analysis. Specifically, the OR was 22.65 in Overbeek et al. (2018), while the range of ORs in other studies was 1.46–3.32. Thus, it was excluded from the pooled analysis in this outcome.

3.4.2. Effects on family satisfaction with end-of-life care

Six studies reported family satisfaction with end-of-life care as an outcome (Agar et al., 2017; Brazil et al., 2018; Hanson et al., 2017; Overbeek et al., 2018; Reinhardt et al., 2014; Molloy et al., 2000). The pooled effect of advance care planning intervention showed an overall nonsignificant effect on family satisfaction with end-of-life of care compared to control (SMD = 0.08, 95% CI: −0.08, 0.23), and heterogeneity was substantial ($I^2 = 53.8\%$, $p = 0.06$) (Fig. 3). The meta-regression displayed no significant effects on heterogeneity when adjusting for age, gender, individual allocation vs. cluster allocation, whether intervention was delivered by a trained facilitator or a nurse, study overall risk of bias or risk of bias in all individual domains.

In the sensitivity analyses for publication bias in both outcomes, funnel plots displayed asymmetry distributions, suggesting the risk of some publication bias (Appendices 2 and 3). The trim-and-fill approach did not trim or fill any additional studies for either outcome; the results of the trim-and-fill approach meta-analysis remained unchanged from the main analysis.

3.5. Qualitative analysis on other outcomes

3.5.1. Concordance between preferences for care and delivered care

Concordance between patient's or family-decision maker's preferences for care and the end-of-life care delivered was reported as an outcome in three trials (Hanson et al., 2017; Sævareid et al., 2019; Morrison et al., 2005). Patients in intervention groups in two studies were more likely to receive end-of-life care in concordance with their own or their family-decision makers' preferences (Hanson et al., 2017; Sævareid et al., 2019). In Morrison et al. (2005), residents in the control group were significantly more likely to receive treatment discordance with their wishes than those in the intervention group.

3.5.2. End-of-life care preferences

End-of-life care preferences were reported as an outcome in two trials (Mitchell et al., 2018; Sævareid et al., 2019). Mitchell et al. (2018) found no effect of interventions on end-of-life care preferences, while

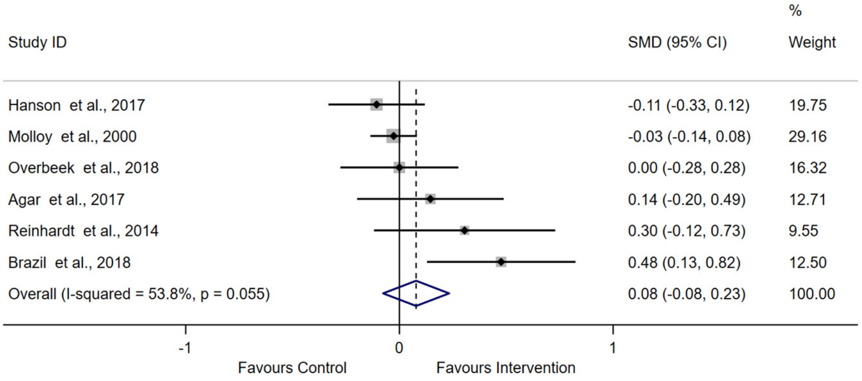

Fig. 3. Forest plot for satisfaction with healthcare.

Sævareid et al. (2019) reported that patients in intervention group were more likely to prefer life-sustaining treatment or hospitalisation.

3.5.3. Use of healthcare services

Use of healthcare services was reported as an outcome in two trials (Overbeek et al., 2018; Molloy et al., 2000). Molloy et al. (2000) reported lower risk of hospitalisation and lower mean number of hospital days in the intervention group, while Overbeek et al. (2018) found no significant differences in the use of hospital care between groups.

4. Discussion

To the best of our knowledge, this is the first meta-analysis examining the effectiveness of advance care planning intervention on documentation of end-of-life care preferences and satisfaction with end-of-life care in nursing home residents. Based on the nine included studies, our comprehensive meta-analysis indicated with moderate heterogeneity that advance care planning intervention significantly increased the documentation of end-of-life preferences, but not the satisfaction with end-of-life care from families' perspectives. Nonetheless, the results should be interpreted with caution due to the methodological limitations and heterogeneity of the studies.

4.1. Advance care planning intervention components

Previous reviews regarding communication about end-of-life issues have revealed that a successful intervention should have a combination of training, education, patient discussion and written documentation, among which discussion of end-of-life care preferences is regarded as an essential component of advance care planning (Davison, 2007). This is supported by the guideline “Palliative Care: Symptom Management and End-of-Life Care” developed by the World Health Organization, which states that communication is an essential skill for delivering good end-of-life care (World Health Organization, n.d.). In general, all the included studies took an educational approach to informing residents and their proxies about the end-of-life care options and treatments available, while the majority followed education by advance care planning discussion initiated by trained healthcare professionals. Our findings did not relate the ineffective outcomes to the lack of a discussion component in the intervention. As the types of advance care planning interventions in the included studies were heterogeneous, it was difficult to synthesise the findings and draw clear conclusions on the important elements in advance care planning. Future studies can examine the essential components of a cost-effective and successful implementation of an individualised advance care plan.

4.2. Impact of advance care planning on documentation of end-of-life care preferences

Our findings show that advance care planning interventions are effective in increasing documentation of end-of-life care preferences, which is in line with previous reviews conducted in adults or the older adult population (Houben et al., 2014; Weathers et al., 2016). Most of the studies examined the documentation of end-of-life care preferences based on medical records, in which only three studies evaluated advance directive completion rates. One prior study described a successful advance care planning intervention as the one that combined effective communication with the completion of advance directives (Barnes et al., 2012). In addition, the completion of written advance directives was associated with a reduction in health services utilisation and fewer reported concerns regarding communication about medical decisions (Teno et al., 2007). Future interventional studies could involve completion of standardised advance directives as the ultimate goal of documentation of end-of-life care preferences. Regular evaluation of written advance directives is also desirable, as end-of-life care preferences may vary across time (Janssen et al., 2012).

4.3. Satisfaction with end-of-life care

Satisfaction with end-of-life care was rated by residents' proxies. As four studies involved residents with advanced dementia and one study involved more than 60% of dementia residents, assessing proxies' satisfaction with end-of-life care may better reflect the quality of end-of-life care experienced by the residents. This was supported by a previous study that reported a moderate correlation between older adults and proxy responses for the domain of satisfaction with medical care (Epstein et al., 1989). Inconclusive results in the outcome of satisfaction with care were reported by some previous systematic reviews. Two reviews (Houben et al., 2014; Weathers et al., 2016) found that family members in advance care planning intervention groups were more likely to be satisfied with end-of-life care, while Lamppu and Pitkala (2021) found that none of the included studies produced effects. Our study is the first meta-analysis to show that advance care planning intervention has no effect on satisfaction with end-of-life care overall. This nonsignificant result may be attributed to the heterogeneity in measurement tools adopted by the six studies, in which only half the studies used validated questionnaires. Future studies should employ validated questionnaires to enhance the validity of the results. In addition, families' reaction and ways of coping with the clinical condition of the residents may account for the variation in the result.

4.4. Concordance between preferences for care and delivered care

Consistent with previous meta-analyses in the adult population (Houben et al., 2014), patients in intervention groups received end-of-life care that was in concordance with their end-of-life care preferences more often than those in control groups. The findings underscored the importance of advance care planning as a process to prepare patients and their families to engage in making the best possible medical decisions with healthcare professionals.

4.5. End-of-life care preferences

Our findings showed inconsistent results in the choice of end-of-life care preferences. Interestingly, one study showed significant preferences for life-sustaining treatment or hospitalisation for the intervention group. This is inconsistent with a previous meta-analysis demonstrating that patients in intervention group were more likely to prefer comfort care and to avoid life-sustaining treatments (Houben et al., 2014). However, it might be explained by the fact that the majority of the included trials (69.6%) were in populations with chronic diseases and that patients might not wish to suffer from additional life-sustaining treatments. Future studies could examine the possible relations between diagnosis and end-of-life care preferences after advance care planning.

4.6. Use of healthcare services

Mixed results were reported in the outcome of the use of healthcare services, with one trial showing significantly positive results in the intervention group (Molloy et al., 2000), while another study showed no significant differences between groups (Overbeek et al., 2018). Our finding is consistent with a prior meta-analysis in an adult population (Houben et al., 2014), but inconsistent with a systematic review of nursing home residents where advance care planning reduced hospitalisation and led to considerable hospital cost reductions (Martin et al., 2016). Future studies can define and separate different healthcare services to generate results that are more conclusive.

4.7. Implications for future research

There has been increasing awareness of advance care planning in clinical settings and nursing homes in recent years; however, few randomised controlled trials have been conducted to evaluate the effectiveness of advance care planning intervention on end-of-life outcomes rigorously, with most of the studies (six of nine) being published after 2017. Also, none of the randomised controlled trials took place in nursing homes in Asia. As there are cultural differences between North American, European and Asian countries, it may not be appropriate to generalise the findings across culturally different countries. Further studies are necessary to explore the effectiveness of advance care planning intervention on various end-of-life outcomes among nursing home residents in Asian countries.

4.8. Implications for future practice and policy

The findings from this meta-analysis show the beneficial effects of advance care planning interventions for the nursing home population. The available evidence has demonstrated that having a trained healthcare provider as facilitator to initiate and deliver advance care planning intervention is essential in nursing home settings. Advance care planning discussion should be incorporated into routine practice for nursing home residents and their family members to allow timely decision-making for end-of-life care preferences. More importantly, policymakers should consider allocating more resources to support nursing home facilities to establish and implement a structured advance care planning program, given that the demand for nursing home facilities will gradually increase with ageing population.

4.9. Limitations

This is the first meta-analysis to review the literature on advance care planning interventions to improve end-of-life outcomes in nursing home residents. However, some limitations need to be acknowledged. First, the results of this meta-analysis need to be interpreted with caution as the moderate heterogeneity of both outcomes could not be explained by meta-regression. Second, only randomised controlled trials published in English were included, while pilot studies, quasi-experimental studies or studies adopting advance care planning as one of the elements of the palliative care package were excluded. This may have excluded useful studies, thereby limiting the generalisability of the findings. Third, the instruments used for measuring satisfaction with end-of-life care varied across studies, with half of them not being formally validated; thus, this may limit the validity of the results. Fourth, despite efforts made to extract as many outcomes as possible, only two outcomes were selected for quantitative synthesis while three outcomes were selected for qualitative synthesis in this review, which is relatively fewer than in other advance care planning meta-analyses. This is because the outcomes studied by the included trials were not consistent, and they used different definitions, which made outcome extractions difficult.

5. Conclusions

Considering the beneficial effects of advance care planning intervention on increasing documentation of end-of-life care preferences, implementation of advance care planning intervention is recommended in nursing home or clinical settings caring for older adults. Future studies will be necessary to examine the essential components for an effective and successful delivery of structured advance care planning. This review underscores the need for more rigorously designed implementation studies to examine the effects of advance care planning interventions on various patients and healthcare outcomes among frail older adults in nursing homes.

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Data availability statement

The dataset analysed in this study is available from the corresponding author upon reasonable request.

CRediT authorship contribution statement

Alina Yee Man Ng: Conceptualization, Writing - original draft, Formal analysis, Data curation, Writing - review & editing. **Naomi Takemura**: Formal analysis, Data curation, Writing - original draft, Writing - review & editing. **Xinyi Xu**: Data curation, Writing - review & editing. **Robert Smith**: Formal analysis, Data curation, Writing - review & editing. **Jojo Yan-yan Kwok**: Data curation, Writing - review & editing. **Denise Shuk Ting Cheung**: Data curation, Writing - review & editing. **Chia Chin Lin**: Conceptualization, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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