Methods Supplement

Supplemental Description of the Search Strategy

During the original search in February 2017, ACP-related terms were combined with the cancer-related terms in the CINAHL, Cochrane Library, MEDLINE (EBSCO), PubMed, and Web of Science databases. For example, in the PubMed database, MeSH terms were used for the following search terms: advance care planning, advanced directives, and neoplasm. Additionally, key word searches in "all fields" were conducted for the search terms: advance care planning, advance directive, cancer, neoplasm, oncology, tumor, and malignancy. All ACP-related search terms were separated from the cancer-related search terms parenthetically. Within the two parenthetical phrases, search terms were combined using the "OR" Boolean operator. Between parenthetical phrases, the "AND" Boolean operator was used. Outcome-specific search terms were not used (e.g., "mechanical ventilation") as to avoid narrowing the initial catchment of articles. The time limiter of January 1, 1990 to March 31, 2017 was applied and the search conducted. The same approach was applied across the remainder of the databases.

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

Another updated search was conducted between July 16, 2019 and August 5, 2019. All original search terms and the additional healthcare surrogate-related terminology were entered in each of the databases (CINAHL Plus, Cochrane Library, MEDLINE [EBSCO], PubMed, and Web of Science) as before with the exception of the time limiter, which was amended to June 2017 to present. In order to ensure the comprehensiveness of the search, an additional database was added at this stage. The SCOPUS database was searched using all the original search terms and original time limiter of 1990 to present.

A final stage of the search was conducted on November 8, 2021. All original search terms and the additional healthcare surrogate terminology were entered into each of the databases (CINAHL Plus, Cochrane Library, PubMed, and Web of Science) as before with the exception of the time limiter which was amended to 2019 to present. As the MEDLINE [EBSCO] database is subsumed under the PubMed database, the MEDLINE [EBSCO] database was not searched separately as this stage. Database-specific search terms and limiters at each search stage can be referenced below.

Detailed Database Searches

Initial Search from February 2017

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

Cochrane Library. MeSH descriptor: Advance Care Planning

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

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

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

Updated Search from June 2017 (Stage 1)

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

Cochrane Library. MeSH descriptor: Advance Care Planning

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

PubMed. (("advance care planning"[MeSH Terms] OR ("advance"[All Fields] AND "care"[All Fields] AND "planning"[All Fields]) OR "advance care planning"[All Fields]) OR ("advance directives"[MeSH Terms] OR ("advance"[All Fields] AND "directives"[All Fields]) OR "advance directives"[All Fields] OR ("advance"[All Fields] AND "directive"[All Fields]) OR "advance directive"[All Fields]) OR (advance[All Fields] AND care[All Fields] AND directive[All Fields])) AND (("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "cancer"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "neoplasm"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "oncology"[All Fields]) OR ("tumour"[All Fields] OR "neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "tumor"[All Fields]) OR ("neoplasms"[MeSH Terms] OR

"neoplasms"[All Fields] OR "malignancy"[All Fields])) AND ("2017/03/01"[PDAT] : "2017/12/31"[PDAT])

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

Updated Search from June 2017 (Stage 2)

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

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

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

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

Updated Search from July/August 2019

CINAHL Plus. ("advance care planning" or "advance directive" or "advance care directive" or "healthcare surrogate" or "health care surrogate" or "health care proxy" or "healthcare proxy" or "health proxy" or "healthcare agent" or "health care agent" or "power of attorney") AND (cancer or neoplasms or oncology or tumor or malignancy) Limiters - Published Date: 20170601-20191231, Language: English; Search modes - Boolean/Phrase

Cochrane Library. Advance Care Planning in Title Abstract Keyword Search; Limiters - with Cochrane Library publication date between June 2017 and December 2019 (Word variations have been searched)

MEDLINE (EBSCO). ("advance care planning" or "advance directive" or "advance care directive" or "healthcare surrogate" or "health care surrogate" or "health care proxy" or "healthcare proxy" or "health proxy" or "healthcare agent" or "health care agent" or "power of attorney") AND (cancer or neoplasms or oncology or tumor or malignancy) Limiters - Published Date: 20170601-20191231, Narrow by Language: English; Search modes - Boolean/Phrase

PubMed. ("advance care planning"[All Fields] OR "advance directive"[All Fields] OR "advance care directive"[All Fields] OR "healthcare surrogate"[All Fields] OR "health care surrogate"[All Fields] OR "health care proxy"[All Fields] OR "healthcare proxy"[All Fields] OR "health proxy"[All Fields] OR "healthcare agent"[All Fields] OR "health care agent"[All Fields] OR "power of attorney"[All Fields]) AND (("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "cancer"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "oncology"[All Fields]) OR ("tumour"[All Fields] OR "neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "tumor"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "malignancy"[All Fields])) AND (("2017/06/01"[PDAT] : "2019/12/31"[PDAT]) AND English[lang])

SCOPUS. (TITLE-ABS-KEY (*"advance care planning"* OR *"advance directive"* OR *"advance care directive"* OR *"healthcare surrogate"* OR *"health care surrogate"* OR *"healthcare proxy"* OR *"health care proxy"* OR *"health proxy"* OR *"healthcare agent"* OR *"health care agent"* OR *"power of attor*"*) AND TITLE-ABS-KEY(*cancer* OR *neoplasms* OR *oncology* OR *tumor* OR *malignancy*)) AND PUBYEAR > *1989* AND (LIMIT-TO (LANGUAGE, *"English"*))

Web of Science. TOPIC: ("advance care planning" OR "advance directive" OR "advance care directive" OR "healthcare surrogate" OR "health care surrogate" OR "health care proxy" OR "healthcare proxy" OR "health proxy" OR "healthcare agent" OR "health care agent" or "power of attorney") AND TOPIC: (cancer OR neoplasms OR oncology OR tumor OR malignancy) Refined by: LANGUAGES: (ENGLISH) Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=2017-2019

Final Search from November 2021

CINAHL Complete. ("advance care planning" OR "advance directive" OR "advance care directive" OR "healthcare surrogate" OR "health care surrogate" OR "healthcare proxy" OR "health care proxy" OR "health proxy" OR "healthcare agent" OR "health care agent" OR "power of attor*") AND (cancer or neoplasms or oncology or tumour or malignancy or tumor) Limiters - Published Date: 20190101-20211231; English Language; Peer Reviewed, Expanders - Apply equivalent subjects, Search modes - Boolean/Phrase

Cochrane Library. ("advance care planning" OR "advance directive" OR "advance care directive" OR "healthcare surrogate" OR "health care surrogate" OR "healthcare proxy" OR "health care proxy" OR "health proxy" OR "healthcare agent" OR "health care agent" OR "power of attor*") AND (cancer OR neoplasms OR oncology OR tumor OR malignancy) in Title Abstract Keyword - with Publication Year from 2019 to 2021, with Cochrane Library publication date Between Jan 2019 and Dec 2021, in Trials (Word variations have been searched)

PubMed. (("advance care planning"[All Fields] OR "advance directive"[All Fields] OR "advance care directive"[All Fields] OR "healthcare surrogate"[All Fields] OR "health care surrogate"[All Fields] OR "health care proxy"[All Fields] OR "healthcare proxy"[All Fields] OR "health proxy"[All Fields] OR "healthcare agent"[All Fields] OR "health care agent"[All Fields] OR "power of attorney"[All Fields]) AND ("cancer s"[All Fields] OR "cancerated"[All Fields] OR "canceration"[All Fields] OR "cancerization"[All Fields] OR "cancerized"[All Fields] OR "cancerous"[All Fields] OR "neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "cancer"[All Fields] OR "cancers"[All Fields] OR ("neoplasm s"[All Fields] OR

"neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "neoplasm"[All Fields]) OR ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "oncology"[All Fields] OR "oncology s"[All Fields]) OR ("cysts"[MeSH Terms] OR "cysts"[All Fields] OR "cyst"[All Fields] OR "neurofibroma"[MeSH Terms] OR "neurofibroma"[All Fields] OR "neurofibromas"[All Fields] OR "tumor s"[All Fields] OR "tumoral"[All Fields] OR "tumorous"[All Fields] OR "tumour"[All Fields] OR "neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "tumor"[All Fields] OR "tumour s"[All Fields] OR "tumoural"[All Fields] OR "tumourous"[All Fields] OR "tumours"[All Fields] OR "tumors"[All Fields]) OR ("malign"[All Fields] OR "malignance"[All Fields] OR "malignances"[All Fields] OR "malignant"[All Fields] OR "malignants"[All Fields] OR "malignities"[All Fields] OR "malignity"[All Fields] OR "malignization"[All Fields] OR "malignized"[All Fields] OR "maligns"[All Fields] OR "neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "malignancies"[All Fields] OR "malignancy"[All Fields])))) AND ((english[Filter]) AND (2019:2021[pdat]))

SCOPUS. (TITLE-ABS-KEY ("advance care planning" OR "advance directive" OR "advance care directive" OR "healthcare surrogate" OR "health care surrogate" OR "healthcare proxy" OR "health care proxy" OR "health proxy" OR "healthcare agent" OR "health care agent" OR "power of attor*") AND (cancer OR neoplasms OR oncology OR tumour OR malignancy OR tumor)) AN D (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019)) AND (LIMIT-TO (LANGUAGE, "English"))

Web of Science. ("advance care planning" OR "advance directive" OR "advance care directive" OR "healthcare surrogate" OR "health care surrogate" OR "healthcare proxy" OR "health care proxy" OR "health proxy" OR "healthcare agent" OR "health care agent" OR "power of attor*") AND (cancer OR neoplasms OR oncology OR tumor OR malignancy) Publication year: 2019 2020 or 2021, Language: English

Supplemental Description of the Synthesis of the Results

Effect Size. The primary effect size for the series of subset meta-analyses was the odds ratio (OR) as the dependent variables, aggressive and comfort-focused end-of-life care outcomes, were all dichotomous in nature. The odds ratio represents the odds of a given outcome in the presence of a variable (i.e., exposure to the variable) compared to the odds of a given outcome in the absence of the variable. It can be calculated via OR = AD/BC, where A = frequency of participants with the outcome that were exposed, B = frequency of participants without the outcome that were exposed, C = frequency of participants with the outcome that were not exposed, and D = frequency of participants without the outcome that were not exposed.

As the odds ratio is bound between 0 and positive infinity, the distribution of values across studies was likely to be non-normal. As such, this meta-analysis was conducted using the logarithm of the odds ratio (LOR), this is computed via LOR = ln(OR), where ln is a natural log. The LOR has a near normal distribution, with values ranging from negative infinity to positive infinity. The associated variance of each log odds ratio (VOR) was computed via (1/A + 1/B + 1/C + 1/D), where A = frequency of participants with the outcome that were exposed, B = frequency of participants without the outcome that were exposed, C = frequency of participants with the outcome that were not exposed, and D = frequency of participants without the outcome

that were not exposed. Therefore, the estimated parameters were in LOR scale, which were back-transformed to the odds ratio using an exponent function, in order to have more interpretable results. The lower and upper bound of the 95% confidence interval (CI) were also back-transformed using the same computation. When possible, raw outcome data (counts of patients with and without the outcome according to ACP groups) were abstracted. When raw data were not reported, the logarithm of the reported odds ratio was computed, and the corresponding confidence interval was abstracted and utilized to compute variance. To do so, the standard error of the log odds ratio was first computed via (log(upper bound of the confidence interval) – log(lower bound of the confidence interval))/2*1.96). Then, the standard error was squared to obtain the estimated variance around the log odds. When both unadjusted and adjusted odds ratios were reported, the unadjusted estimates were utilized

Non-significant odds ratios were those odds ratios with a confidence interval that included 0, and indicate that there was no relationship between the exposure and the outcome. If significant, the magnitude of the odds ratio was interpreted as follows: 1) an OR > 1 signified the exposure increases the odds of the outcome by that given value, and 2) an OR < 1 signified the exposure decreases the odds of the outcome by (1-OR).

Statistical Analysis. The analysis was conducted using the metafor package in R statistical computing software and run at the level of the individual aggressive and comfort-focused end-of-life outcomes as subset meta-analyses. Thus, this meta-analysis constituted a series of subset meta-analyses.

Overall effects. To determine if the associations in this series of subset meta-analyses should be calculated using a fixed or random effects model, a test of homogeneity was conducted using the Q statistic, which follows a X^2 distribution of *k*-1, where *k* is the number of effect sizes. This test was conducted under the assumption that all effects sizes come from the same population. The null hypothesis for this significance test was that the between study variation (tau) was equal to 0. *A priori* significance testing for the test of homogeneity was $p < .05$. A significant test of homogeneity (Q statistic) indicated that a significant amount of between study variation was present. In this case, a random effects model was utilized to estimate the overall effect, where between study variance was estimated using DerSimonian and Laird estimation methods.[33] Otherwise, a fixed effects model was used.

Under the fixed effects model, each effect size was weighted according to the inverse variance ($1/V(T_i)$), where $V(T_i)$ represented within study variance or sampling error for each study's effect size.[30, 32] Then the inverse variance weighted overall common effect was estimated by taking the sum of the weighted effects and dividing them by the sum of the weights, that is:

$$T_\bullet = \frac{\sum_{i=1}^{k} W_i T_i}{\sum_{i=1}^{k} W_i},$$

where T. = the overall common effect, $W_i = 1/V(T_i)$, and T_i = the effect size for each individual study.

Then the associated variance of the overall common effect under the fixed effects model was estimated by taking the inverse of the sum of the weights, that is:

$$V_{T.} = \frac{1}{\sum_{i=1}^{k} W_i}$$

where $W_i = 1/V(T_i)$, where $V(T_i)$ = the inverse of within study variance for each study.

If a random effects model was indicated, each effect size was also weighted according to the inverse variance, but the variance then constituted both within study variance ($V(T_i)$) and between study variance (tau or $\hat{\sigma}_\theta^2$). Thus, the inverse variance weight for each effect size in the random effects model was $1/[V(T_i) + \hat{\sigma}_\theta^2]$. The inverse variance weighted overall common effect was again estimated by taking the sum of the weighted effects for each study divided by the sum of the weights for each study, that is:

$$T.^* = \frac{\Sigma w_i^* T_i}{\Sigma w_i^*} = \frac{\Sigma T_i / [V(T_i) + \hat{\sigma}_\theta^2]}{\Sigma 1/[V(T_i) + \hat{\sigma}_\theta^2]}$$

And then the associated variance of the overall average effect was estimated by taking the inverse sum of the weights, that is:

$$V(T.^*) = \frac{1}{\sum w_i^*} = \frac{1}{\sum 1/[V(T_i) + \hat{\sigma}_\theta^2]}$$

When a random effects model was indicated, the magnitude of between study variance was interpreted through the I^2 value, where values of 25%, 50%, 75% indicated a low, medium, and high magnitude of between study variation, respectively. Significance testing for the overall effect size was conducted under the null hypothesis that the overall effect is zero. Significance was tested using a z-distribution, where *a priori* significance for the test of the overall effect size was $p < .05$.

Moderator analyses. Moderator analysis determined the source of heterogeneity of effect sizes in the meta-analysis (i.e., helped to explain between study variation). To conduct categorical moderator analysis, a weighted ANOVA-like model was utilized. Weighted models are indicated due to the increased likelihood of violating the assumption of homoscedasticity, as study sizes differ and the variance for effects sizes will not be equal across studies. To determine whether a fixed effect model with predictors or a mixed effect model was indicated, the Qbetween (QM) and Qwithin (QE) statistics was examined under the fixed effects with predictor model. By conducting the analysis under the fixed effects weighted model first, the initial test of the moderator was done under the assumption that the moderator was related to the effect sizes (Qbetween/QM) and the moderator would explain all of the between study variation (Qwithin/QE). If the Qbetween/QM was significant ($p < .05$), the moderator helped to explain variation in the effects sizes. Then the Qwithin/QE statistic was examined to determine the amount of variation explained. If the Qwithin/QE was significant, then a significant amount of between study variation was left unexplained after accounting for the moderator, therefore a weighted mixed effects ANOVA-like model was conducted. In this case, the residual between study variance was estimated using DerSimonian and Laird estimation methods.[33] If the

Qwithin/QE was not significant, this indicated the moderator served to explain all of the between study variation, and the weighted fixed effects model estimates were interpreted.

Under the weighted fixed effects model with categorical moderators, the group effect size (i.e., groups according to the different categories of the moderator) within each study were weighted according to the inverse variance for that group effect size ($w_{ij} = 1/V_{ij}$), where (V_{ij}) represents within group (j) variance pertaining to the study (i). The weighted means for each group were computed:

$$T_{\bullet j} = \frac{\sum_{i=1}^{mj} w_{ij} T_{ij}}{\sum_{i=1}^{mj} w_{ij}}, i = 1, 2, ..., m_j$$

Then the variance of the weighted group mean estimates were computed:

$$v_{\bullet j} = \frac{1}{\sum_{i=1}^{mj} w_{ij}}, i = 1, 2, ..., m_j$$

Hypothesis testing determined if the group effects, according to the categories of the moderator, were significantly different from each other. This hypothesis test is an omnibus test and conducted under the null hypothesis that the group effects were equal. If significant within group effect size estimates were interpreted. In the case where there are more than two categories of the moderator, post-hoc pairwise comparisons using the Tukey method were conducted to determine where the differences were.

Under the mixed effects model with categorical predictors, variation that was unexplained by the moderator, leftover tau, needs to be accounted for in the inverse variance weighting of each group effect size. The general method of analysis described above remained the same, but now the weight becomes $1/v_i$ + varm, where the weight represents the inverse variance of the effect of the moderator (v_i) plus the residual variance after accounting for the moderator (varm). Leftover tau, or residual variance, was estimated using DerSimonian and Laird estimation methods.[33] Before hypothesis testing with the group effects was conducted, the Qbetween/QM statistic was still examined under the weighted mixed effects ANOVA model with categorical predictors, to determine if the moderator remained significant after the unexplained variation was added back into the model. If the moderator remained significant, group effect hypothesis testing proceeded as described above, with subsequent group effect size estimation when a significant hypothesis test occurred. When a mixed effects model was indicated, the magnitude of between study variance will be interpreted through the I^2 value, where values of 25%, 50%, 75% indicated a low, medium, and high magnitude of between study variation, respectively.[34]

Supplemental Tables

Table A. *ACP Meta-analysis Codebook*

Characteristic	Variable Label	Variable Description	Coding Values	Adjustments/Notes
Study characteristics	Author_Yr	Study identification by author	Entered as the last name of the first author or the article	N/A
	Year	Study publication year	Four digit publication year	N/A
	Country	Country where study conducted	1 = United States 0 = Not United States	N/A
	Design*	Study design	1 = prospective/retrospective chart review (or the like) with comparison group – observational study 2 = prospective/retrospective intervention/program evaluation with comparison group; or randomized control trial – experimental study	N/A
	Intv_type	When an intervention was conducted, the type of intervention implemented	0 = N/A - observational study 1 = ACP intervention trial 2 = ACP quality improvement program or new service line evaluation	N/A
Sample characteristics	Initial_samp	Total number of participants in initial sample	Numerical value for number of participants in initial sample	N/A
	Anal_samp	Total number of participants from initial sample actually included in analysis	Numerical value for number of participants in analyzed sample	N/A
	Age_mean	Mean age of total sample	Numerical value of mean age to one decimal place	When the mean age is only reported within study groups and not for the total sample, the weighted sample mean age will be computed via [(sample size x mean for treatment group) + (sample size x mean for control group)/(total sample size)].
	Age_SD	Standard deviation of mean age in total sample	Numerical value of standard deviation to one decimal place	N/A

	Male_tot	Raw number of reported men in total sample	Numerical value of number of men – whole number	N/A
	Male_pct	Percentage of males in the total sample	Numerical percentage up to one decimal place	If proportion not specifically reported in the study's sample characteristics, calculate proportion by: ([Male_pct = Male_tot/N] reported in sample characteristics)
	Minor_tot	Raw number of reported minorities (non-White participants) in the total sample	Numerical value of the number of minorities – whole number	This may require totaling across minority groups to derive the total. Minorities are defined as all non-White participants in the sample.
	Minor_pct	Percentage of minority (non-White) participants in the total sample	Numerical percentage up to one decimal place	If proportion not specifically reported in the study's sample characteristics, calculate proportion by: ([Minor_pct = MinorityA_tot + MinorityB_tot + …./N] reported in sample characteristics).
Effect size data Raw ingredients required: 1. # of participants in ACP (treatment) group that had the outcome 2. # of participants in ACP (treatment) group that did not have the outcome 3. Total # of participants in the ACP (treatment) group 4. # of participants without ACP (control	ACP_type*	How ACP was operationalized in study	1 = documentation components only (living will only; health care surrogate only, or both (advance directive)) 2 = communication components only (inclusive of communication that ranged from an exploration of EOL preferences to more targeted communication about prognosis and goals of care) 3 = full ACP (embracing both documentation and communication components, such as in Respecting Choices or Five Wishes ACP models) 4 = ACP unspecified or generically referred to in study	N/A
	DV_label	Label corresponding to "DV_code" variable	Free text response corresponding to the "DV_code" coding schema	N/A
	DV_code	Number corresponding to outcome type	3 = CPR 4 = DNR order 5 = No escalation of care 6 = Withdrawal of life-sustaining treatment; treatments limited or withheld 9 = ICU death/mortality/place of death 10 = Hospital death/mortality/place of death 12 = ED admission at the end-of-life 13 = Surgery 14 = Chemotherapy at the end-of-life	N/A

group) that had the outcome 5. # of participants without ACP (control group) that did not have the outcome 6. Total # of participants in the group without ACP (control group) OR…. If raw counts not available the following ingredients are required (If not CI available, OR will be unusable): 1. OR or AOR 2. 95% CI upper bound 3. 95% CI lower bound			15 = Hospice use (referral, admission, enrollment greater than three days prior to death) 16 = Hospice mortality/death/place of death 17 = Home mortality/death/place of death 19 = Hospice use within the last three or seven days of life or operationalized variable representing late hospice referral 20 = Aggressive care 21 = Acute care 22 = ICU care/admission 24 = Mechanical ventilation 25 = Inotropic support 26 = PA catheter 27 = Renal dialysis 30 = Any hospital admission 31 = Feeding tube 34 = Radiation	
	DV_code2	Aggressive care vs. comfort care outcome	1 = aggressive care (corresponding to "DV_code" 3, 9, 10, 12, 13, 14, 19, 20, 21, 22, 24, 25, 26, 27, , 30, 31, 34) 2 = comfort care (corresponding to "DV_code" 4, 5, 6, 15, 16, 17)	N/A
	n_treat	Total number of participants who received/engaged in any form of ACP	Numerical value corresponding to the number of participants with ACP – whole number	N/A
	n_control	Total number of participants who did not receive/engage in ACP	Numerical value corresponding to the number of participants without ACP – whole number	N/A
	ACP_with	Among those that had ACP, the number of participants who experienced the outcome	Numerical value corresponding to the number of participants – whole number	Raw counts will be abstracted whenever possible.

	ACP_without	Among those that had ACP, the number of participants who did not experienced the outcome	Numerical value corresponding to the number of participants – whole number	Raw counts will be abstracted whenever possible.
	control_with	Among those without ACP, the number of participants who experienced the outcome	Numerical value corresponding to the number of participants – whole number	Raw counts will be abstracted whenever possible.
	control_without	Among those without ACP, the number of participants who did not experienced the outcome	Numerical value corresponding to the number of participants – whole number	Raw counts will be abstracted whenever possible.
	OR	For those studies without raw effect size data for odds ratio, abstract odds ratio provided by study results	OR to one decimal place	When raw data is not reported, the reported odds ratio and corresponding lower and upper bounds of the confidence interval will be abstracted, and variance computed by solving for the SE using the formula, (log(upper bound of the confidence interval) – log(lower bound of the confidence interval))/2*1.96). Then, the standard error was squared to obtain the estimated variance around the log odds. When both unadjusted and adjusted odds ratios are available, unadjusted estimates will be utilized.
	AOR	For those studies without raw effect size data for odds ratio, abstract adjusted odds ratio provided by study results	AOR to one decimal place	N/A
	95CIUB	95% confidence interval upper bound	Confidence interval to two decimal places When only the OR is reported without raw data, the confidence interval must be present for study findings to be evaluable	N/A

	95CILB	95% confidence interval upper bound	Confidence interval to two decimal places When only the OR is reported without raw data, the confidence interval must be present for study findings to be evaluable	N/A
	AOR_note	Control variables entered into adjusted analysis	Free text	N/A

*Represents a moderator variable

Table B. *Risk of Bias Within Studies*

Author (Year)	Random Sequence Generation	Allocation Concealment	Baseline Characteristics Similar	Confounding Risk	Appropriate Analysis	Intervention Independent of Other Changes	Intervention Integrity	Blinding of Outcome Assessment	Incomplete Outcome Data Addressed	Selective Reporting	Risk of Bias
Ahluwalia (2015)	N/A	N/A	Unclear	High	Low	High	High	Low	Low	Low	Moderate
Cagle (2019)	N/A	N/A	Unclear	High	Low	High	Unclear	High	Unclear	Low	High
Chen (2019)/Wen (2020)	Low	Low	High	Low	Low	N/A	Low	Low	Low	Low	Low
Dalmau-Bueno (2021)	N/A	N/A	Low	High	Low	High	Unclear	Low	Low	Low	Moderate
Diamond (2016)	N/A	N/A	High	High	High	High	Low	Low	Low	Low	Moderate
Halpern (2011)	N/A	N/A	High	High	Low	High	Low	Low	Low	Low	Moderate
Ishikawa (2018)	N/A	N/A	Unclear	High	Low	Unclear	Unclear	High	Low	High	High
Jeurkar (2012)	N/A	N/A	Unclear	High	Low	High	Low	Low	Low	Low	Moderate
Johnson (2018)	Low	High	Low	Low	Low	N/A	High	Unclear	Low	Low	Moderate
Mack (2012)	N/A	N/A	Unclear	High	Low	High	High	Low	Low	Low	Moderate
McDermott (2020)	N/A	N/A	Unclear	High	Low	High	Unclear	Low	Low	Low	Moderate
Narang (2015)	N/A	N/A	High	High	Low	High	High	High	Low	Low	High
Peltier (2017)	High	High	High	High	High	N/A	Unclear	Low	High	Low	High
Prater (2019)	N/A	N/A	High	High	Low	Unclear	Low	Low	Unclear	Low	Moderate
Prater (2022)	N/A	N/A	Low	High	Low	High	Unclear	Low	Unclear	Low	Moderate
Rocque (2017)	High	High	Low	High	High	N/A	Low	Low	Low	Low	Moderate
Salazar (2022)	N/A	N/A	Unclear	High	Low	High	Unclear	Low	High	Low	High
Sedhom (2021)	N/A	N/A	Unclear	High	Low	High	High	Low	Low	Low	Moderate
Wallace (2001)	N/A	N/A	Low	High	Low	High	High	Low	Low	Unclear	Moderate
Wright (2008)	N/A	N/A	High	High	Low	High	Low	High	Low	Low	Moderate

Table C. *Sensitivity Analyses with Studies Outside of the United States Removed*

Analysis (Model)	Outcome (*n*) I^2	Publication Bias Tests	Effect Sizes (*k*)	*LOR*	*SE*	*z*	95% CI LB	95% CI UB	*OR*	95% CI LB	95% CI UB	*p*
Aggressive End-of-life Care Outcomes												
Chemotherapy (FE)	(3,018)	EG: p = .071 BM: p = .056	6	-0.38	0.12	-3.12	-0.62	-0.14	0.68	0.54	0.87	**.002**
ICU Admission (FE)	(17,445)	EG: p = .520 BM: p = .469	6	-0.35	0.05	-6.53	-0.46	-0.25	0.70	0.63	0.78	**<.001**
CPR (FE)	(1,723)	EG: p = **.043** BM: p = .333	3	-0.30	0.22	-1.37	-0.73	0.13	0.74	0.48	1.13	.171
Hospital Death (RE)	(17,077) I^2 = 80.7%	EG: p = NA BM: p = 1.00	2	-0.28	0.18	-1.59	-0.63	0.07	0.75	0.53	1.07	.112
Mechanical Ventilation (RE)	(602) I^2 = 85.6%	EG: p = NA BM: p = 1.00	2	-0.86	1.03	-0.83	-2.87	1.16	0.42	0.06	3.19	.406
ED Admission (FE)	(15,769)	EG: p = .415 BM: p = 1.00	3	0.05	0.09	0.49	-0.14	0.23	1.04	0.87	1.25	.624
Comfort-focused End-of-life Care Outcomes												
DNR Order (RE)	(3,445) I^2 = 71.4%	EG: p = .586 BM: p = 1.00	3	0.50	0.28	1.81	0.003	0.83	1.65	0.96	2.84	.070

Table D. *Negative Moderator Analyses*

Moderator (Model)	Outcome	QM(df)	*p*
Aggressive EOL Care Outcomes			
ACP Type (FE with Moderators)	ICU Admission	QM(2) = 0.72	.696
ACP Type (FE with Moderators)	Cardiopulmonary Resuscitation	QM(1) = 0.17	.679
ACP Type (FE with Moderators)	Mechanical Ventilation	QM(1) = 0.84	.359
ACP Type (FE with Moderators)	ED Admission	QM(1) = 0.06	.808
Study Design (FE with Moderators)	ICU Admission	QM(1) = 0.32	.570
Study Design (FE with Moderators)	Hospital Admission	QM(1) = 0.10	.748
Study Design (FE with Moderators)	ED Admission	QM(1) = 0.06	.808
Comfort-focused EOL Care Outcomes			
Study Design	DNR Order	QM(1) = 0.18	.672

No tests of moderation were conducted on the chemotherapy outcome as the overall effects were computed under a fixed effects model.
Tests of "ACP Type" as a moderator were not possible for the outcomes of hospice fewer than 7 days, hospital death, aggressive interventions, hospice use, and DNR order due to the limited number of effect sizes per category of the moderator.
Test of "study design" as a moderator were not possible for outcomes of hospice fewer than 7 days, CPR, hospital death, mechanical ventilation, and aggressive interventions due to the limited number of effect sizes per category of the moderator.

Supplemental Figures

Figure A. *Forest Plot for Chemotherapy Subset Meta-Analysis, (k = 7)*

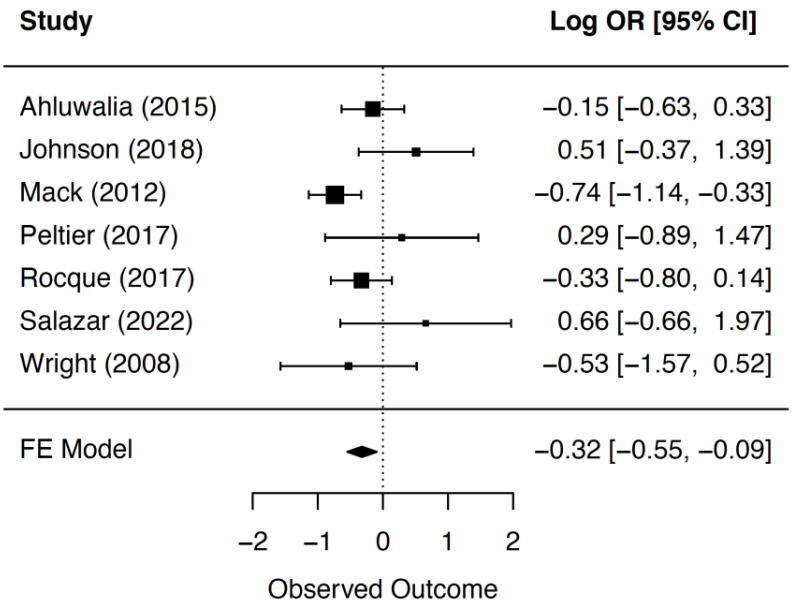

Figure B. *Forest Plot for ICU Admission Subset Meta-Analysis, (k = 7)*

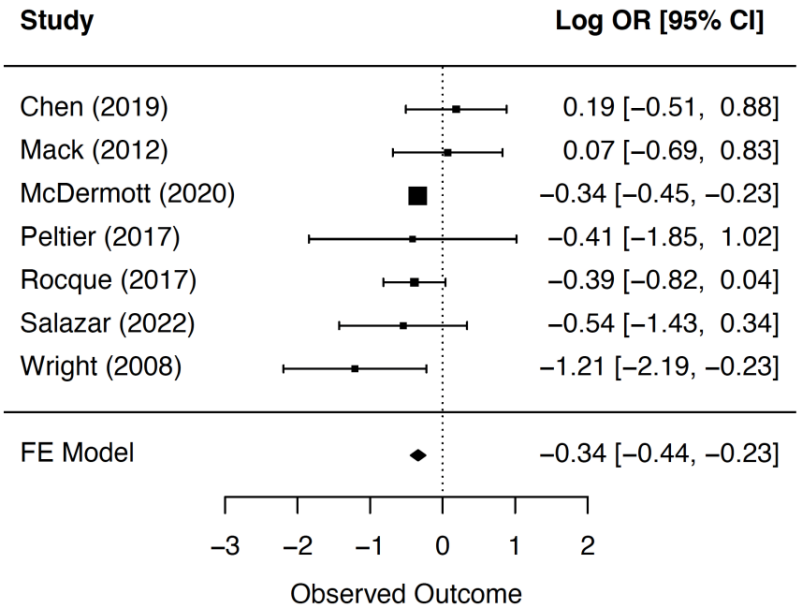

Figure C. *Forest Plot for Hospital Admission Subset Meta-Analysis, (k = 6)*

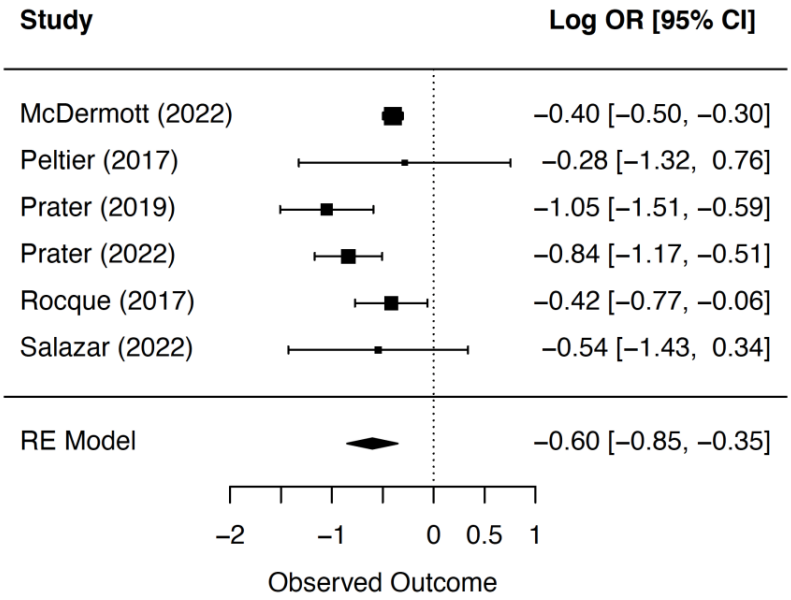

Figure D. *Forest Plot for Hospital Use Fewer than 7 days Subset Meta-Analysis, (k = 5)*

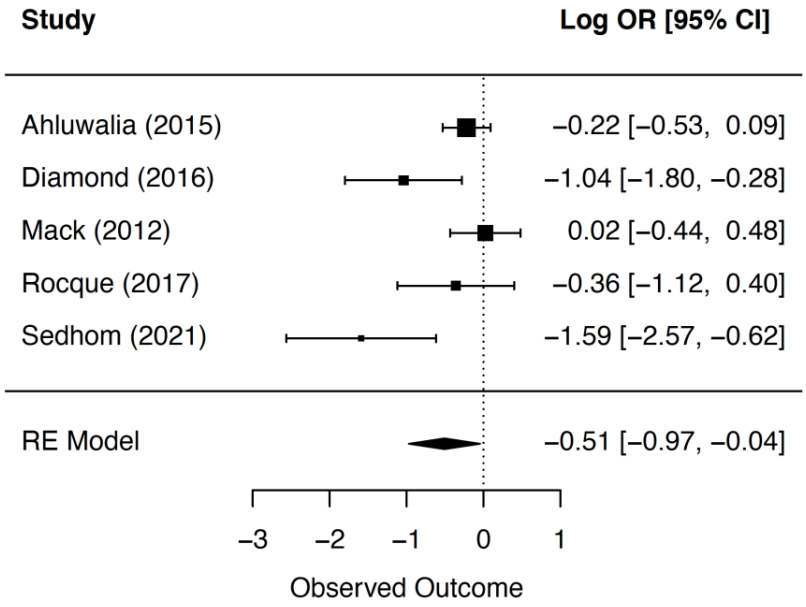

Figure E. *Forest Plot for CPR Subset Meta-Analysis, (k = 5)*

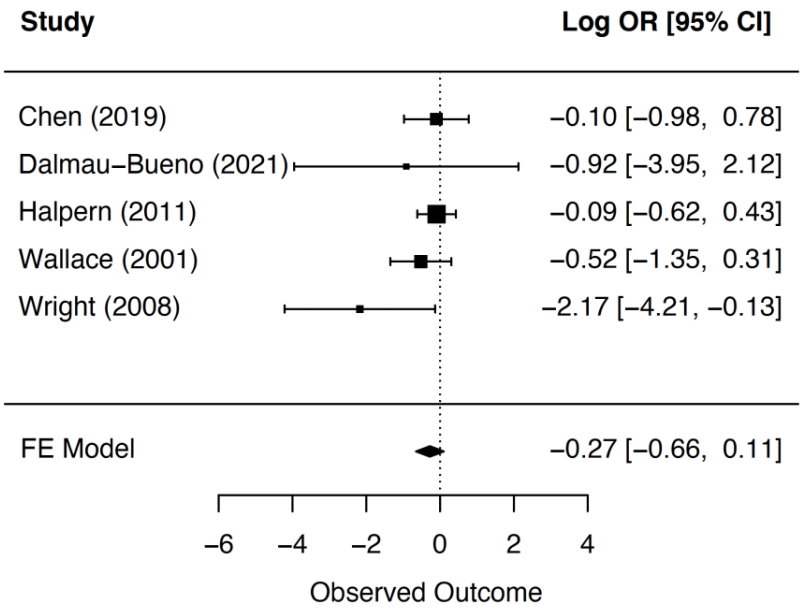

Figure F. *Forest Plot for Hospital Death Meta-Analysis, (k = 4)*

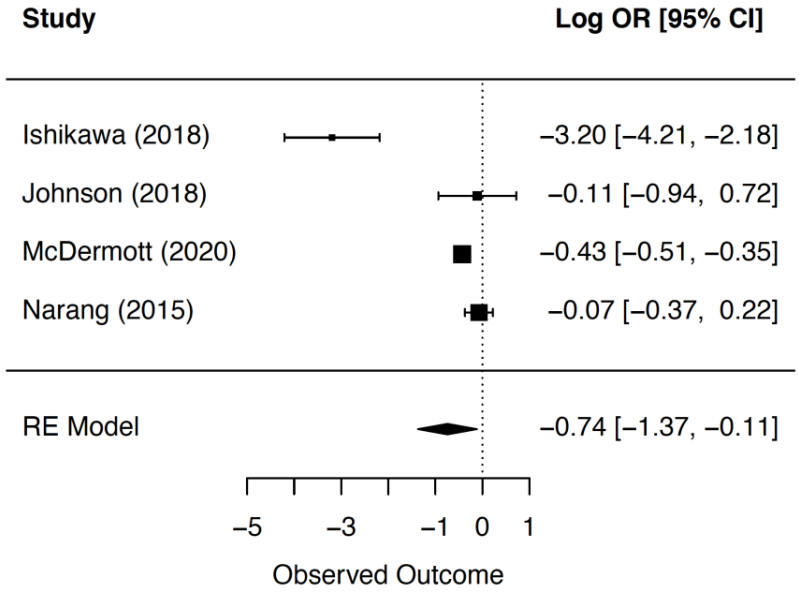

Figure G. *Forest Plot for Mechanical Ventilation Meta-Analysis, (k = 4)*

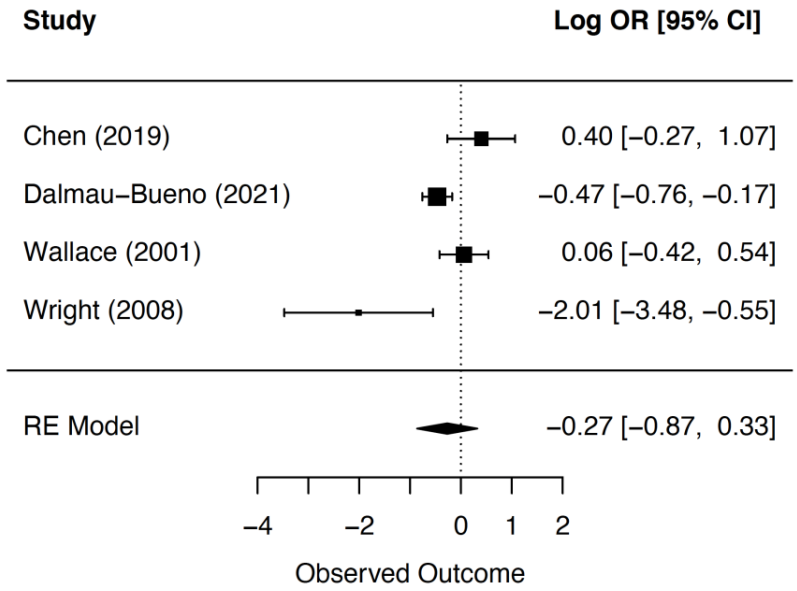

Figure H. *Forest Plot for ED Admission Meta-Analysis, (k = 4)*

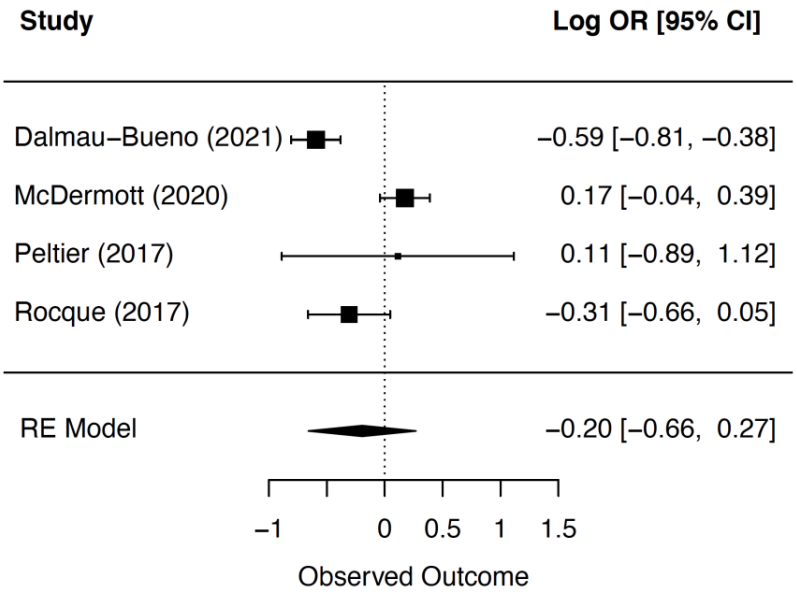

Figure I. *Forest Plot for Aggressive Interventions Meta-Analysis, (k = 4)*

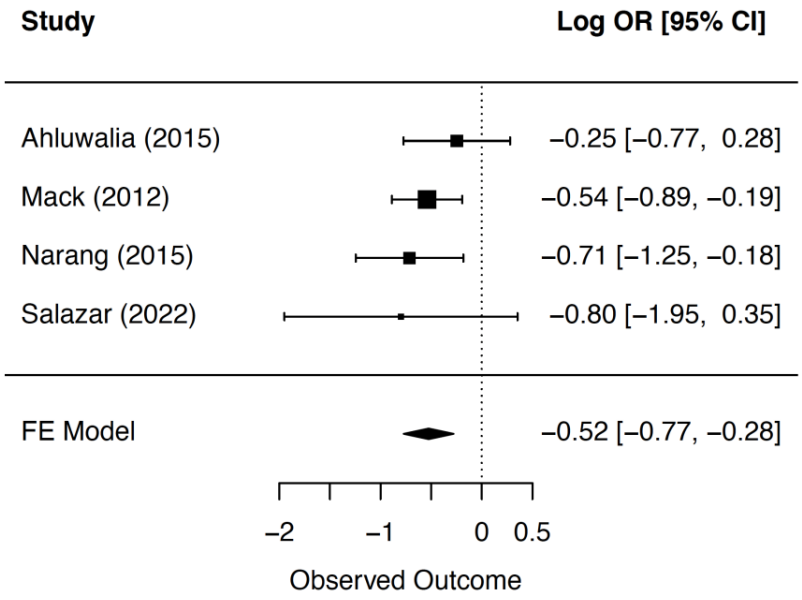

Figure J. *Forest Plot for Hospice Use Meta-Analysis, (k = 5)*

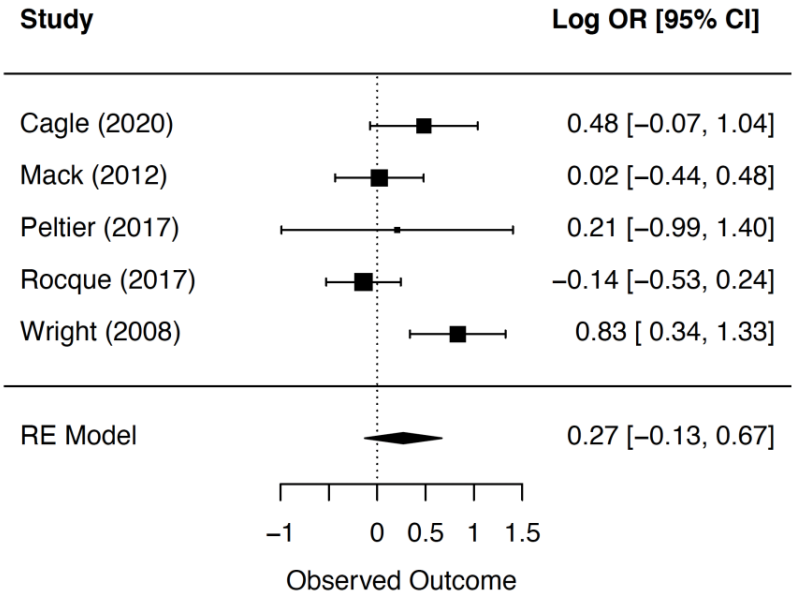

Figure K. *Forest Plot for DNR Meta-Analysis, (k = 5)*