Supplemental Digital Appendix 1

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eTable 1. Completed PRISMA checklist[1]

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	6
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	6
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	7
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	7
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	7
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	8
Summary	13	State the principal summary measures (e.g., risk ratio,	8

measures		difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	8
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	8
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	8
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	8
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	9
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	10
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	10
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	10
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	11
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	10/11
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	11
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	11
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	12
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	18

eMethods 1. Systematic review protocol[a]

Interventions to improve the breaking of bad or difficult news in healthcare settings: A systematic review and meta-analysis

Judith Johnson and Maria Panagioti

Background

Healthcare professionals frequently need to "break bad news" to patients. Research in this area originated in oncology services, where it was found that communication practices can have a strong and lasting impact on patients. One early study found that patients who felt uninformed at the appointment where cancer diagnosis news was delivered had double the risk of experiencing anxiety or depression a year later[2]. Subsequent research has supported this, finding that specific news delivery practices (e.g., information giving and discussing emotions) are associated with the degree of anxiety and depression that cancer patients experience afterwards[3].

Research has since investigated the delivery of bad and difficult news in a range of healthcare settings, including paediatric[4], emergency[5,6] and obstetric services[7]. Together, this body of literature has identified a number of challenges that can exist in difficult news scenarios, such as when "bad news" occurs suddenly and without warning (e.g., in emergency settings) or when there are short time spans for health professionals to prepare for delivering difficult news (e.g., in obstetric ultrasound settings). It has also highlighted the challenge of delivering difficult news when the news itself is uncertain, such as when diagnosis or prognosis is unclear. Furthermore, this research has suggested a potentially detrimental impact of delivering difficult news on healthcare professionals themselves[6,8].

A range of bad news delivery interventions have been described. These vary in length and format, but tend to share similar components. For example, most are focused on developing the communication skills of practitioners, and include elements of didactic teaching and role-playing or simulation with feedback. Other frequently included features are group discussions[9] and the viewing of videos[10]. These interventions are often designed to enhance fidelity to guiding frameworks for news delivery, such as the SPIKES protocol[11] and the

SHARE protocol[12], which outline specific recommendations for news delivery practices. For example, based on a systematic review of patient preferences for news delivery in cancer care, the SHARE protocol suggests that healthcare staff should i) set up a supportive environment, ii) consider how to deliver the news, iii) discuss additional information that patients would like to know, and iv) provide reassurance and emotional support[13]. Divergent methods have been used to evaluate the effectiveness of interventions, but the most common practice has been the objective rating of participant news delivery skills in a simulated news delivery exercise[9,10,14,15]. Other practices have included measuring practitioner confidence in breaking bad news[16], and gathering information on patient experience[17].

This review will first assess the effectiveness of healthcare interventions to improve news delivery skills, as rated by an observer such as a researcher, instructor or standardised patient (an individual who is trained to role play a patient in a standardised format). Secondly, the review will examine whether some types of interventions (e.g. organization directed versus person directed; simulation/role-play, didactic teaching) are associated with improved treatment effects compared to others. Thirdly, the review will assess the effectiveness of interventions on a range of secondary outcomes including patient anxiety and/or depression, patient satisfaction with news delivery experience, healthcare professional confidence in bad/difficult news delivery, healthcare professionals' perception of their news delivery skill.

Methods

The review will be reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement[1].

Eligibility criteria

- Population: Clinical staff working in any healthcare setting (e.g., primary, secondary or intensive care settings) or healthcare staff students/trainees. Clinical staff from any discipline will be included.
- Intervention: Any type of intervention designed to improve the delivery of bad or difficult news amongst healthcare staff/students. These interventions could be either person-directed (e.g., training programmes for improving communication skills) or

organisation/system-directed (e.g., reducing delays for appointments where bad/difficult news will be delivered, improving referral pathways, enhancing availability of patient information on units).

- Comparison: Any type of control (e.g., no intervention, alternative intervention, waiting list)
- Outcomes: The primary outcome will be news delivery skill as rated by an observer (e.g., researcher, standardised patient). Where more than one news delivery skill metric is reported, either i) the scale pertaining most closely to overall news delivery skill will be used, or where this is unclear, ii) the pooled estimates of reported relevant scales will be used. Secondary outcomes will be patient anxiety and/or depression, patient satisfaction with news delivery experience, healthcare professional confidence in bad/difficult news delivery, healthcare professionals' perception of their news delivery skill.
- Study designs: Quantitative intervention designs outlined in the Cochrane handbook will be included (RCTs, nRCTs, CBA and ITS).
- Context: Studies conducted in any healthcare or educational setting will be included. Only studies written in English and published in peer-reviewed journals will be included.

Exclusion criteria:

- Interventions addressing general communication skills, without focusing on news delivery skills.
- Studies which test news delivery skills for "good", "neutral" or a range of news types, rather than focusing on "difficult", "bad" or "negative" news.
- Non-English language papers and grey literature

Search strategy and data sources

Five electronic bibliographic databases will be searched: MEDLINE, EMBASE, CINAHL, PsycINFO and Cochrane Register of Controlled Trials. The search strategy will include combinations of two key blocks of terms (bad news, intervention) using a combination of medical subject headings (MESH terms) and text-words. Searches will be supplemented by reading the reference lists of eligible studies and systematic reviews.

Study selection

Search results from each database will be exported to Endnote and duplicates will be removed. Study selection will be undertaken in two stages. In the first stage, titles and abstracts of identified studies will be screened, and in the second stage full-texts of retained studies will be accessed and further screened according to the eligibility criteria. A proportion of titles/abstracts (10%) will be screened independently by 2 reviewers to assess reliability using the kappa statistic. Assuming reliability is confirmed, screening of the remaining titles/abstracts will be undertaken by one reviewer. Two independent reviewers will undertake full-text screening.

Data extraction

A data extraction form will be devised in Excel and piloted in five randomly selected studies. Quantitative data for the meta-analysis will be extracted in a separate Excel file. The following descriptive information will be extracted from eligible studies:

- Study: research design, recruitment method and content of the control condition
- Participants: sample size, age, gender, discipline, setting
- Intervention: content of the intervention, delivery format (group or individual), news delivery skill measurement time points
- Outcomes: Objectively rated news delivery skill, patient anxiety and/or depression, patient satisfaction with news delivery experience, healthcare professional confidence in bad/difficult news delivery, healthcare professionals' perception of their news delivery skill

Risk of bias assessment

The OEPOC risk of bias tool[18] will be used to conduct a critical appraisal, as it is appropriate for use across all different types of intervention designs described in the Cochrane handbook including RCTs, nRCTs, Controlled before-after studies and ITS studies. The OEPOC tool contains nine standardised criteria rated on a 3-point scale (low risk, unclear risk, and high risk).

Data analysis

Results will be synthesized using meta-analysis. Cohen's d (or Hedge's g if sample sizes are small) will be used to pool results. Hedge's g is an unbiased estimate of Cohen's d which controls for smaller sample sizes[19]. Effect sizes and associated confidence intervals (CI) for the news delivery outcomes of all the studies will be calculated in Comprehensive Meta-Analysis (CMA)[20]. Pooled effect sizes and forest plots will be constructed using the metaan command in STATA.[21]

The main meta-analysis will examine the effectiveness of the identified interventions in improving news delivery skills as rated by an observer (e.g., researcher or standardised patient).

A pre-specified subgroup analysis[22] will test the effectiveness of different types of intervention components (e.g., simulation/role-play, didactic teaching). A sensitivity analysis will be performed to examine whether results are maintained when only studies with low risk of bias scores are included.

The effects of the identified interventions on secondary outcomes will be pooled if sufficient and amenable data are available in the included studies.

A random effects model will be used to account for heterogeneity in all analyses. Heterogeneity will be assessed with the I^2 statistic. Conventionally, I^2 values of 25%, 50%, and 75% indicate low, moderate, and high heterogeneity, respectively[23]. Funnel plots will be used to assess small sample bias (which indicates publication bias) and Egger's test of small-study effects will be used to quantify observations in the funnel plots[24]. Funnel plots will be constructed using the metafunnel command in Stata[15], and the Egger test will be performed using the metabias command[17].

[a]The protocol was prospectively registered with PROSPERO (CRD42016045892; http://www.crd.york.ac.uk/prospero/display_record.asp?src=trip&ID=CRD42016045892).

eMethods 2. Search strategy for MEDLINE[a]

Ovid Medline (inception – 5/9/16)

1. bad news.tw 1544
2. (difficult adj2 (conversation* or news)).tw. 145
3. spikes protocol*.tw. 13
4. ((deliver* or inform* or communicat*) adj2 truth).tw. 72
5. or/1-4 1731
6. Randomized Controlled Trials as Topic/ or Clinical Trials as Topic/ 283910
7. (trial or interven* or therap* or train* or teach* or treatment* or simulat* or evaluation*).tw. 5945022
8. 6 or 7 6042956
9. 5 and 8 693

=693 hits

UPDATE TO FEB 2017 = 22 hits

[a]The same search strategy was used for each database, but minor formatting adjustments were made for the CINAHL search strategy to account for variations in the database interface.

eMethods 3. List of excluded studies

Studies not testing an intervention with clinical staff/students

1. BISHOP, T. W., GORNIEWICZ, J., FLOYD, M., TUDIVER, F., ODOM, A. & ZOPPI, K. 2016. Innovative patient-centered skills training addressing challenging issues in cancer communications: Using patient's stories that teach. International Journal of Psychiatry in Medicine, 51, 357-366.
2. MAGUIRE, P. & FAULKNER, A. 1988. Communicate with cancer patients: 1. Handling bad news and difficult questions. BMJ, 297, 907-9.
3. NAKAJIMA, N., KUSUMOTO, K., ONISHI, H. & ISHIDA, M. 2015. Does the approach of disclosing more detailed information of cancer for the terminally ill patients improve the quality of communication involving patients, families, and medical professionals? American Journal of Hospice & Palliative Medicine, 32, 776-782.
4. PANAGOPOULOU, E., MINTZIORI, G., MONTGOMERY, A., KAPOUKRANIDOU, D. & BENOS, A. 2008. Concealment of information in clinical practice: is lying less stressful than telling the truth? Journal of Clinical Oncology, 26, 1175-1177.
5. RICHTER, M., KONIG, C. J., KOPPERMANN, C. & SCHILLING, M. 2016. Displaying fairness while delivering bad news: Testing the effectiveness of organizational bad news training in the layoff context. Journal of Applied Psychology, 101, 779-792.

Studies not testing an intervention

1. BISHOP, T. W., GORNIEWICZ, J., FLOYD, M., TUDIVER, F., ODOM, A. & ZOPPI, K. 2016. Innovative patient-centered skills training addressing challenging issues in cancer communications: Using patient's stories that teach. International Journal of Psychiatry in Medicine, 51, 357-366.
2. DALY, M. B., BARSEVICK, A., MILLER, S. M., BUCKMAN, R., COSTALAS, J., MONTGOMERY, S. & BINGLER, R. 2001. Communicating genetic test results to the family: a six-step, skills-building strategy. Family & Community Health, 24, 13-26.
3. MAGUIRE, P. & FAULKNER, A. 1988. Communicate with cancer patients: 1. Handling bad news and difficult questions. BMJ, 297, 907-9.
4. NAKAJIMA, N., KUSUMOTO, K., ONISHI, H. & ISHIDA, M. 2015. Does the approach of disclosing more detailed information of cancer for the terminally ill patients improve the quality of communication involving patients, families, and medical professionals? American Journal of Hospice & Palliative Medicine, 32, 776-782.
5. PANAGOPOULOU, E., MINTZIORI, G., MONTGOMERY, A., KAPOUKRANIDOU, D. & BENOS, A. 2008. Concealment of information in clinical

practice: is lying less stressful than telling the truth? Journal of Clinical Oncology, 26, 1175-1177.

6. STRACHAN, H. 2000. Practile notes. Handling bad news: an innovative training approach. European Journal of Oncology Nursing, 4, 118-121.

Uncontrolled studies

1. ABEL, J., DENNISON, S., SENIOR-SMITH, G., DOLLEY, T., LOVETT, J. & CASSIDY, S. 2001. Breaking bad news--development of a hospital-based training workshop. Lancet Oncology, 2, 380-4.
2. ANTOUN, J. & SAAB, B. R. 2010. A culturally sensitive audiovisual package to teach breaking bad news in a Lebanese setting. Medical Teacher, 32, 868-9.
3. ATASOY, B. M., SARIKAYA, O., KUSCU, M. K., YONDEM, M., BUYUKKARA, E., EKEN, E. G. & KAHYAOGLU, F. 2012. Students meeting with caregivers of cancer patient: results of an experience-based learning project. Journal of Cancer Education, 27, 656-63.
4. BAYS, A. M., ENGELBERG, R. A., BACK, A. L., FORD, D. W., DOWNEY, L., SHANNON, S. E., DOORENBOS, A. Z., EDLUND, B., CHRISTIANSON, P., ARNOLD, R. W., O'CONNOR, K., KROSS, E. K., REINKE, L. F., CECERE FEEMSTER, L., FRYER-EDWARDS, K., ALEXANDER, S. C., TULSKY, J. A. & CURTIS, J. R. 2014. Interprofessional communication skills training for serious illness: evaluation of a small-group, simulated patient intervention. Journal of Palliative Medicine, 17, 159-66.
5. BISHOP, T. W., GORNIEWICZ, J., FLOYD, M., TUDIVER, F., ODOM, A. & ZOPPI, K. 2016. Innovative patient-centered skills training addressing challenging issues in cancer communications: Using patient's stories that teach. International Journal of Psychiatry in Medicine, 51, 357-366.
6. COOKE, S., WAKEFIEL, A., CHEW-GRAHAM, C. & BOGGIS, C. 2003. Collaborative training in breaking bad news to patients. Journal of Interprofessional Care, 17, 307-9.
7. DALY, M. B., BARSEVICK, A., MILLER, S. M., BUCKMAN, R., COSTALAS, J., MONTGOMERY, S. & BINGLER, R. 2001. Communicating genetic test results to the family: a six-step, skills-building strategy. Family & Community Health, 24, 13-26.
8. GREENBERG, L. W., OCHSENSCHLAGER, D., O'DONNELL, R., MASTRUSERIO, J. & COHEN, G. J. 1999. Communicating bad news: a pediatric department's evaluation of a simulated intervention. Pediatrics, 103, 1210-7.
9. HAGLUND, M. M., RUDD, M., NAGLER, A. & PROSE, N. S. 2015. Difficult conversations: a national course for neurosurgery residents in physician-patient communication. Journal of Surgical Education, 72, 394-401.
10. LAMBA, S., KULKARNI, M., BRYCZKOWSKI, S., TYRIE, L., LAMBA, V., NAGURKA, R., HOLLAND, B., SCOTT, S. R. & MOSENTHAL, A. C. 2015. 222 Teaching Delivery of Difficult News in Trauma: Simulated Resuscitations With

Structured Communication for Emergency Medicine and Surgery Residents. Annals of Emergency Medicine, 66, S82-S82.

11. LECHNER, B. E., SHIELDS, R., TUCKER, R. & BENDER, G. J. 2016. Seeking the best training model for difficult conversations in neonatology. Journal of Perinatal Medicine, 44, 461-467.
12. MAGUIRE, P. & FAULKNER, A. 1988. Communicate with cancer patients: 1. Handling bad news and difficult questions. BMJ, 297, 907-9.
13. NAKAJIMA, N., KUSUMOTO, K., ONISHI, H. & ISHIDA, M. 2015. Does the approach of disclosing more detailed information of cancer for the terminally ill patients improve the quality of communication involving patients, families, and medical professionals? American Journal of Hospice & Palliative Medicine, 32, 776-782.
14. PARATHIAN, A. R. & TAYLOR, F. 1993. Can we insulate trainee nurses from exposure to bad practice? A study of role play in communicating bad news to patients. Journal of Advanced Nursing, 18, 801-7.
15. PASTOR, D. K., CUNNINGHAM, R. P., WHITE, P. H. & KOLOMER, S. 2016. We Have to Talk: Results of an Interprofessional Clinical Simulation for Delivering Bad Health News in Palliative Care. Clinical Simulation in Nursing, 12, 320-327.
16. PHILLIPS, J., KNEEBONE, II & TAVERNER, B. 2013. Breaking bad news in stroke rehabilitation: a consultation with a community stroke team. Disability & Rehabilitation, 35, 694-701.
17. SCHILDMANN, J., BRUNKLAUS, A., HERRMANN, E., KLAMBECK, A., ORTWEIN, H. & SCHWARZ, C. 2001. Evaluation of a 'breaking bad news' course at the Charite, Berlin. Medical Education, 35, 806-7.
18. SHAW, D. J., DAVIDSON, J. E., SMILDE, R. I., SONDOOZI, T. & AGAN, D. 2014. Multidisciplinary team training to enhance family communication in the ICU. Critical Care Medicine, 42, 265-71.
19. STADELMAIER, N., DUGUEY-CACHET, O., SAADA, Y. & QUINTARD, B. 2014. The Basic Documentation for Psycho-Oncology (PO-Bado): an innovative tool to combine screening for psychological distress and patient support at cancer diagnosis. Psycho-Oncology, 23, 307-14.
20. STRACHAN, H. 2000. Practile notes. Handling bad news: an innovative training approach. European Journal of Oncology Nursing, 4, 118-121.
21. TANG, W.-R., CHEN, K.-Y., HSU, S.-H., JUANG, Y.-Y., CHIU, S.-C., HSIAO, S.-C., FUJIMORI, M. & FANG, C.-K. 2014. Effectiveness of Japanese SHARE model in improving Taiwanese healthcare personnel's preference for cancer truth telling. Psycho-Oncology, 23, 259-265.
22. VAN WEEL-BAUMGARTEN, E., BROUWERS, M., GROSFELD, F., HERMUS, F., VAN DALEN, J. & BONKE, B. 2012. Teaching and training in breaking bad news at the Dutch medical schools: A comparison. Medical Teacher, 34, 373-381.

Studies not reporting a quantitative outcome measure for communication of difficult news

1. ANTOUN, J. & SAAB, B. R. 2010. A culturally sensitive audiovisual package to teach breaking bad news in a Lebanese setting. Medical Teacher, 32, 868-9.
2. ATASOY, B. M., SARIKAYA, O., KUSCU, M. K., YONDEM, M., BUYUKKARA, E., EKEN, E. G. & KAHYAOGLU, F. 2012. Students meeting with caregivers of cancer patient: results of an experience-based learning project. Journal of Cancer Education, 27, 656-63.
3. BISHOP, T. W., GORNIEWICZ, J., FLOYD, M., TUDIVER, F., ODOM, A. & ZOPPI, K. 2016. Innovative patient-centered skills training addressing challenging issues in cancer communications: Using patient's stories that teach. International Journal of Psychiatry in Medicine, 51, 357-366.
4. BRADLEY, C. T., WEBB, T. P., SCHMITZ, C. C., CHIPMAN, J. G. & BRASEL, K. J. 2010. Structured teaching versus experiential learning of palliative care for surgical residents. American Journal of Surgery, 200, 542-7.
5. COOKE, S., WAKEFIEL, A., CHEW-GRAHAM, C. & BOGGIS, C. 2003. Collaborative training in breaking bad news to patients. Journal of Interprofessional Care, 17, 307-9.
6. DALY, M. B., BARSEVICK, A., MILLER, S. M., BUCKMAN, R., COSTALAS, J., MONTGOMERY, S. & BINGLER, R. 2001. Communicating genetic test results to the family: a six-step, skills-building strategy. Family & Community Health, 24, 13-26.
7. LIENARD, A., MERCKAERT, I., LIBERT, Y., DELVAUX, N., MARCHAL, S., BONIVER, J., ETIENNE, A. M., KLASTERSKY, J., REYNAERT, C., SCALLIET, P., SLACHMUYLDER, J. L. & RAZAVI, D. 2006. Factors that influence cancer patients' anxiety following a medical consultation: impact of a communication skills training programme for physicians. Annals of Oncology, 17, 1450-8.
8. LIENARD, A., MERCKAERT, I., LIBERT, Y., DELVAUX, N., MARCHAL, S., BONIVER, J., ETIENNE, A.-M., KLASTERSKY, J., REYNAERT, C., SCALLIET, P., SLACHMUYLDER, J.-L. & RAZAVI, D. 2008. Factors that influence cancer patients' and relatives' anxiety following a three-person medical consultation: Impact of a communication skills training program for physicians. Psycho-Oncology, 17, 488-496.
9. MAGUIRE, P. & FAULKNER, A. 1988. Communicate with cancer patients: 1. Handling bad news and difficult questions. BMJ, 297, 907-9.
10. MERCKAERT, I., LIBERT, Y., DELVAUX, N., MARCHAL, S., BONIVER, J., ETIENNE, A. M., KLASTERSKY, J., REYNAERT, C., SCALLIET, P., SLACHMUYLDER, J. L. & RAZAVI, D. 2005. Factors that influence physicians' detection of distress in patients with cancer: can a communication skills training program improve physicians' detection? Cancer, 104, 411-21.
11. NAKAJIMA, N., KUSUMOTO, K., ONISHI, H. & ISHIDA, M. 2015. Does the approach of disclosing more detailed information of cancer for the terminally ill patients improve the quality of communication involving patients, families, and medical professionals? American Journal of Hospice & Palliative Medicine, 32, 776-782.

12. PANAGOPOULOU, E., MINTZIORI, G., MONTGOMERY, A., KAPOUKRANIDOU, D. & BENOS, A. 2008. Concealment of information in clinical practice: is lying less stressful than telling the truth? Journal of Clinical Oncology, 26, 1175-1177.
13. PANG, Y., TANG, L., ZHANG, Y., SONG, L., GOELZ, T., FRITZSCHE, K. & WUENSCH, A. 2015. Breaking bad news in China: implementation and comparison of two communication skills training courses in oncology. Psycho-Oncology, 24, 608-11.
14. PASTOR, D. K., CUNNINGHAM, R. P., WHITE, P. H. & KOLOMER, S. 2016. We Have to Talk: Results of an Interprofessional Clinical Simulation for Delivering Bad Health News in Palliative Care. Clinical Simulation in Nursing, 12, 320-327.
15. PEKMEZARIS, R., WALIA, R., NOURYAN, C., KATINAS, L., ZEITOUN, N., ALANO, G., GUZIK, H. J., LESTER, P. E., SUNDAY, S., WOLF-KLEIN, G. & STEINBERG, H. 2011. The Impact of an End-of-Life Communication Skills Intervention on Physicians-in-Training. Gerontology & Geriatrics Education, 32, 152-163.
16. STIEFEL, F., BOURQUIN, C., LAYAT, C., VADOT, S., BONVIN, R. & BERNEY, A. 2013. Medical students' skills and needs for training in breaking bad news. Journal of Cancer Education, 28, 187-91.
17. STRACHAN, H. 2000. Practile notes. Handling bad news: an innovative training approach. European Journal of Oncology Nursing, 4, 118-121.
18. DELVAUX, N., MERCKAERT, I., MARCHAL, S., LIBERT, Y., CONRADT, S., BONIVER, J., ETIENNE, A. M., FONTAINE, O., JANNE, P., KLASTERSKY, J., MELOT, C., REYNAERT, C., SCALLIET, P., SLACHMUYLDER, J. L. & RAZAVI, D. 2005. Physicians' communication with a cancer patient and a relative: A randomized study assessing the efficacy of consolidation workshops. Cancer, 103, 2397-2411.
19. FALLOWFIELD, L., JENKINS, V., FAREWELL, V., SAUL, J., DUFFY, A. & EVES, R. 2002. Efficacy of a Cancer Research UK communication skills training model for oncologists: A randomised controlled trial. Lancet, 359, 650-656.
20. FALLOWFIELD, L., JENKINS, V., FAREWELL, V. & SOLIS-TRAPALA, I. 2003. Enduring impact of communication skills training: Results of a 12-month follow-up. British Journal of Cancer, 89, 1445-1449.
21. GIRGIS, A., COCKBURN, J., BUTOW, P., BOWMAN, D., SCHOFIELD, P., STOJANOVSKI, E., D'ESTE, C., TATTERSALL, M. H. N., DORAN, C. & TURNER, J. 2009. Improving patient emotional functioning and psychological morbidity: Evaluation of a consultation skills training program for oncologists. Patient Education and Counseling, 77, 456-462.
22. GRECO, M., BROWNLEA, A. & MCGOVERN, J. 2001. Impact of patient feedback on the interpersonal skills of general practice registrars: Results of a longitudinal study. Medical Education, 35, 748-756.
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eTable 2. Outcome measures used in the meta-analysis and main findings of the included studies

Study	Outcome measure for the main meta-analysis (observer measured difficult news delivery)	Outcome measure for secondary meta-analysis (practitioner confidence in difficult news delivery)	Outcome measure for secondary meta-analysis (patient reported depression/ anxiety)	Main findings
Alexander et al., 2006[25]	Two audio-recorded news delivery encounters with standardised patients were evaluated by researchers. Three categories rated: delivering bad news, responding to emotional cues, and general communication skills. Bad news delivery overall summary score was used.	Not applicable	Not applicable	After the intervention, overall communication scores in the intervention group were significantly higher than the control group (9.58 vs. 8.37; p =.04).
Amiel et al., 2006[26]	Eight standardised patient encounters were developed. Two questionnaires were created for each encounter. The first was a generic communication scale assessing difficult news delivery principles/techniques in breaking bad news. The second was a 3-to-4-item questionnaire, designed for each scenario. Mean overall news delivery score was used as rated by standardized patients was used.	Not applicable	Not applicable	Overall new delivery scores after the intervention were 68.4 (S.D. 9.2) in the intervention group and 58.1 (S.D. 9.5) for the control group (p<0.01).
Attar et al., 2010[27]	Overall communication of bad news score as rated by	Not applicable	Not applicable	Overall communication of bad news

	a standardized patient during a single encounter was used. The checklist measured 26 behaviours, including general communication items (16 items).			scores were significantly higher in the intervention group than in the control group (m = 46, S.D. = 5.5 vs. m = 33.6, S.D. = 12.2, p<0.01)
Betson et al., 1997[28]	Not applicable	Single item asking participants to mark the extent to which they agree with the statement "It is easy for me to use reflective technique to clarify the reasons why a patient is upset" on a four-point Likert scale was used.	Not applicable	Participants viewing the English language video (control group) reported greater confidence in their ability to use reflective techniques for clarification purposes than participants viewing the Chinese language video (intervention group) (Student's t = 2.90, df = 157, p = 0.004).
Bowyer et al., 2010[29]	Ratings were based on a single standardized patient encounter. Scores on a single item ("The student prepared me to receive the news") as rated by a standardized patient wife were used.	Single item asking participants "Do You Currently Feel Prepared to Break Bad News?" rated on a five-point Likert scale was used.	Not applicable	Compared to participants in the control condition, participants in the three intervention groups received significantly higher ratings by the standardized patient wife on the communication item (all ps < 0.01). Mean score in the

				control condition was 2.86 (S.D. = 1.32) and in the intervention groups mean scores were 3.23 (S.D. = 1.15), 3.34 (S.D. = 1.15), 3.34 (S.D. = 1.18) and 3.53 (S.D. = 1.14). Compared to participants in the control condition, participants in the three intervention groups also reported higher preparedness (all ps <0.05). Mean score in the control condition was 3.61 (S.D. = 0.72) and mean scores in the intervention groups were 3.82 (S.D. = 0.54), 3.78 (S.D. = 0.61) and 3.8 (S.D. = 0.57)
Daetwyler et al., 2010[30]	Bad news delivery summary scores based on a single standardized patient encounter via video web link were used. Summary scores were based on a 13-item behavioral checklist. Ratings were made by the standardized patient in collaboration with the research project coordinator who was	Not applicable	Not applicable	Scores in the control group increased from 56% to 63%, with a mean change of 8. Scores in the first intervention group (doc.com only) increased from 54% to 68%, with a mean change of 14. Scores in the second

	present but out of site of the webcam.			intervention group (doc.com+Web OSCE) increased from 44% to 71%, with a mean change of 27. A linear trend across these groups, assuming that including additional intervention components should increase the effect, was found to be significant for mean change (p = 0.018)
Fujimori et al., 2014[13]	Participants completed video recorded news delivery encounters with four standardized patients. Scores on the nine-item communication questionnaire subscale called "Considering how to deliver bad news" as rated by two researchers were used. The subscale includes items such as "not using technical words" and "communicating clearly main points of bad news".	Not applicable	Anxiety and depression was measured using the Japanese version of the Hospital Anxiety and Depression Scale (HADS)	After the intervention, on the observer-rated news delivery measure, the mean score for the control group was 14.67 (S.D. = 7.01) and the mean score for the intervention group was 25.93 (S.D. = 8.57), and this difference was significant (p = 0.006). On the anxiety/depression measure, the mean score for the control group was 10.50 (S.D. = 6.90) and the mean score for the intervention

				group was 9.36 (S.D. = 6.93), p = 0.50.
Gorniewicz et al., 2017[31]	Participants completed video recorded standardized news delivery patient encounters which were scored by independent raters. Scores from the 'colon cancer' standardized patient encounter on the breaking bad news checklist subscale, "Breaking bad news", were used. This subscale includes six items such as "provides forewarning" and "expresses personal regrets".	Not applicable	Not applicable	After the intervention, the mean score for the control condition was 3.86 (S.D. = 1.11) and the mean score for the intervention condition was 4.85 (S.D. = 0.88), and this difference was significant (p = 0.004).
Karkowsky et al., 2016[7]	Ratings were based on a single standardized patient encounter. Composite score on a difficult news delivery checklist as rated by a faculty observer was used. Evaluation form measured verbal skills, non-verbal skills and patient-centered care.	Not applicable	Not applicable	Mean change scores from baseline to post-intervention were 0.48 (S.D. = 0.15) for the intervention group and 0.38 (S.D. = 0.12) for the control group, and this difference was not significant (p = 0.63).
Marko et al., 2015[32]	Ratings were based on a single standardized patient encounter and rated by a faculty observer. Overall scores on a difficult news delivery checklist based on the SPIKES framework were used. The checklist included 20 items including	A single item measuring confidence in delivering difficult news on a Likert scale from 1 (high) to 5 (low) was used.	Not applicable	After the intervention, the mean score on the communication checklist for the intervention group was 94.2 (S.D. = 4.84) and for the control group was 69.7 (S.D. =

	"establishes a rapport with the patient" and allows silence for patient to absorb news".			11.3), and this difference was significant ($p<0.001$). After the intervention, the mean score on the confidence item for the intervention group was 1.57 (S.D. = 0.64) and for the control group was 3.62 (S.D. = 0.79), and this difference was significant ($p<0.001$).
Merckaert et al., 2013[33a]	Ratings were based on a single news delivery triadic standardized patient encounter. These encounters were recorded and transcribed, and transcripts were analysed by computer software. Number of supportive utterances by the resident were used.	Not applicable	Not applicable	After the intervention, the mean number of supportive utterances in the intervention group was 33.9 (S.D. = 15.9) and in the control group was 23.1 (S.D. = 10.7), and this difference was significant ($p<0.001$).
Meunier et al., 2013[34a]	Not applicable	Overall score from a 13-item questionnaire measuring self-efficacy regarding ability to communicate with a cancer patient and to manage stress during the encounter was used.	Not applicable	After the intervention, the mean self-efficacy score for the intervention group was 3.4 (S.D. = 0.5) and for the control group was 3.2 (S.D. = 0.6), and this difference was significant ($p<0.001$).
Morton et al., 2000[35]	Ratings were based on a single standardized	Not applicable	Not applicable	After the intervention the

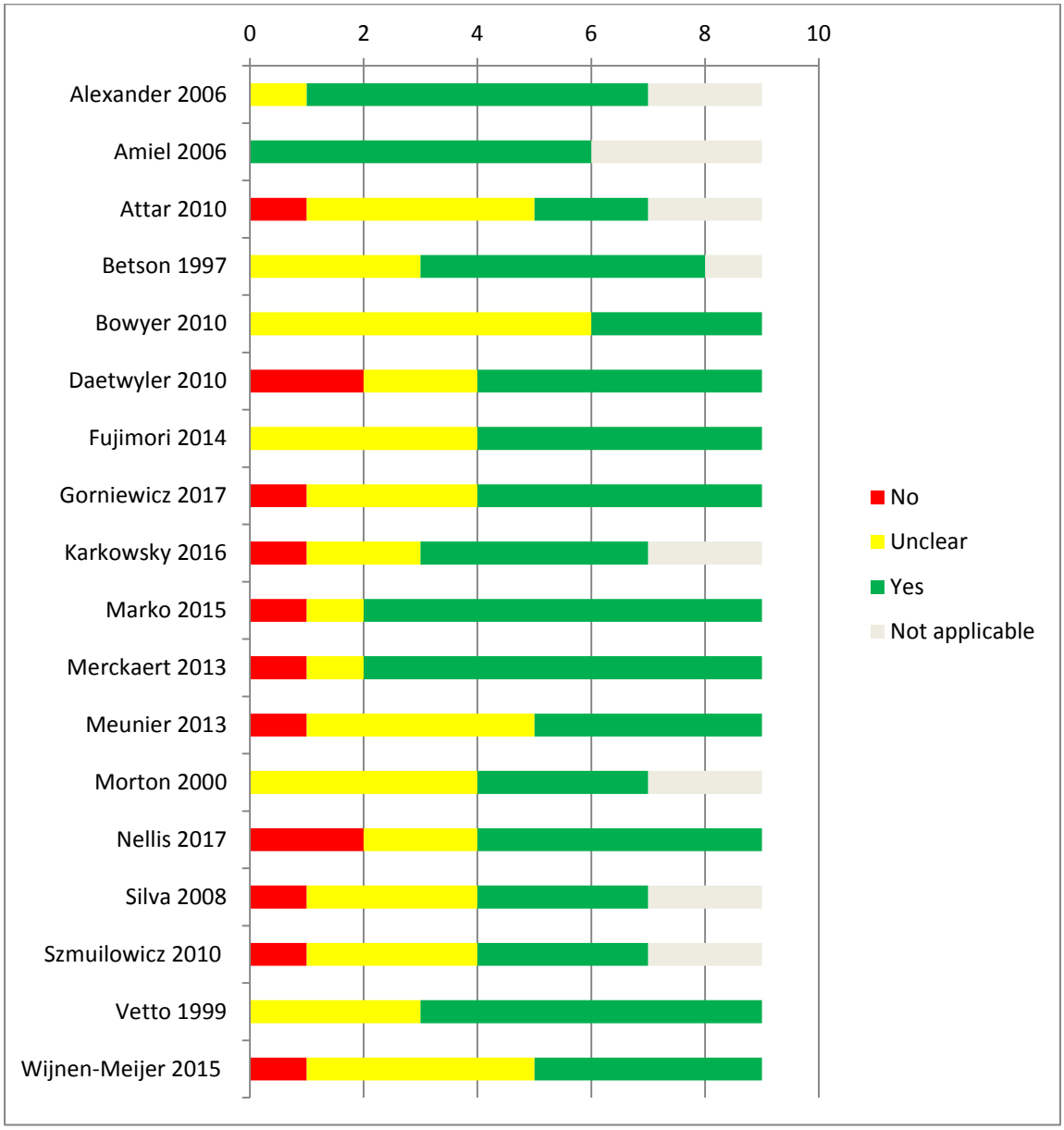
	difficult news delivery standardized patient encounter. Encounters were video recorded and rated by three researchers. The rating scale consisted of two main parts, 1) the structure of the encounter and 2) communication skills. Overall scores were used.			mean score for the intervention condition was 2.8 (S.D. = 0.6) and in the control condition was 2.5 (S.D = 0.5), and this difference was not significant.
Nellis et al., 2017[36]	Ratings were based on a single breaking bad news encounter with standardized patient parents. Ratings were made by the standardized patient parents and faculty facilitators. Overall scores on a communication skills checklist were used.	Single item asking participants the extent to which they "feel capable to tell a parent the child has died" rated on a Likert scale (scored as 0, 1, 2 or 3) was used.	Not applicable	Mean communication score in the intervention group was 37.4 (S.D. = 3.5) and in the control group was 38.5 (S.D. = 3.2). After the intervention, mean score on the capability item in the intervention group was 1.56 (S.D. = 0.73), and in the control group was 1.29 (S.D. = 0.76).
Silva, 2008[10]	Ratings were based on two difficult news delivery standardized patient encounters. Standardized patients rated participants using a news delivery checklist based on the SPIKES model. Overall scores on this were used.	Not applicable	Not applicable	Overall mean score on the communication checklist was 93% for the intervention group and 73%for the control group, and this difference was significant (p = 0.001).
Szmuilowicz et al., 2010[37]	Ratings were based on two difficult news delivery standardized	Single item assessing participant's	Not applicable	After the intervention, the mean

	patient encounters. Encounters were recorded and rated by two researchers. Participants were rated using a scale measuring general interviewing skills, task-related skills and responses to emotion. Overall scores on this scale were used.	sense of preparedness to "Tell about new, life-threatening diagnosis" on a 5-point Likert scale was used.		communication score for the intervention group was 10.6 (S.D. = 2.0) and for the control group was 9.4 (S.D. = 2.2), and this difference was significant when gender and residency track were controlled for ($p = 0.046$). After the intervention, the mean score on the preparedness item for the intervention group was 3.71 (S.D. = 0.59) and for the control group was 3.26 (S.D. = 0.54) and this difference was significant ($p \leq 0.05$).
Vetto et al., 1994[38]	Ratings were made by a faculty observer based on a single difficult news delivery standardized patient encounter. Observers rated items on a nine-item communication checklist which included "Used words/terms understandable to the patient" and "Used emphathic techniques (repeat feelings, legitimize concerns)".	Not applicable	Not applicable	The mean score for the intervention group was 85, and for the control group was 79, and this difference was significant ($p = 0.05$).
Wijnen-Meijer et al., 2015[39]	Ratings were based on five standardized patient encounters. Two observing	Not applicable	Not applicable	The control group mean was 3.10 (S.D. = 0.54) and the

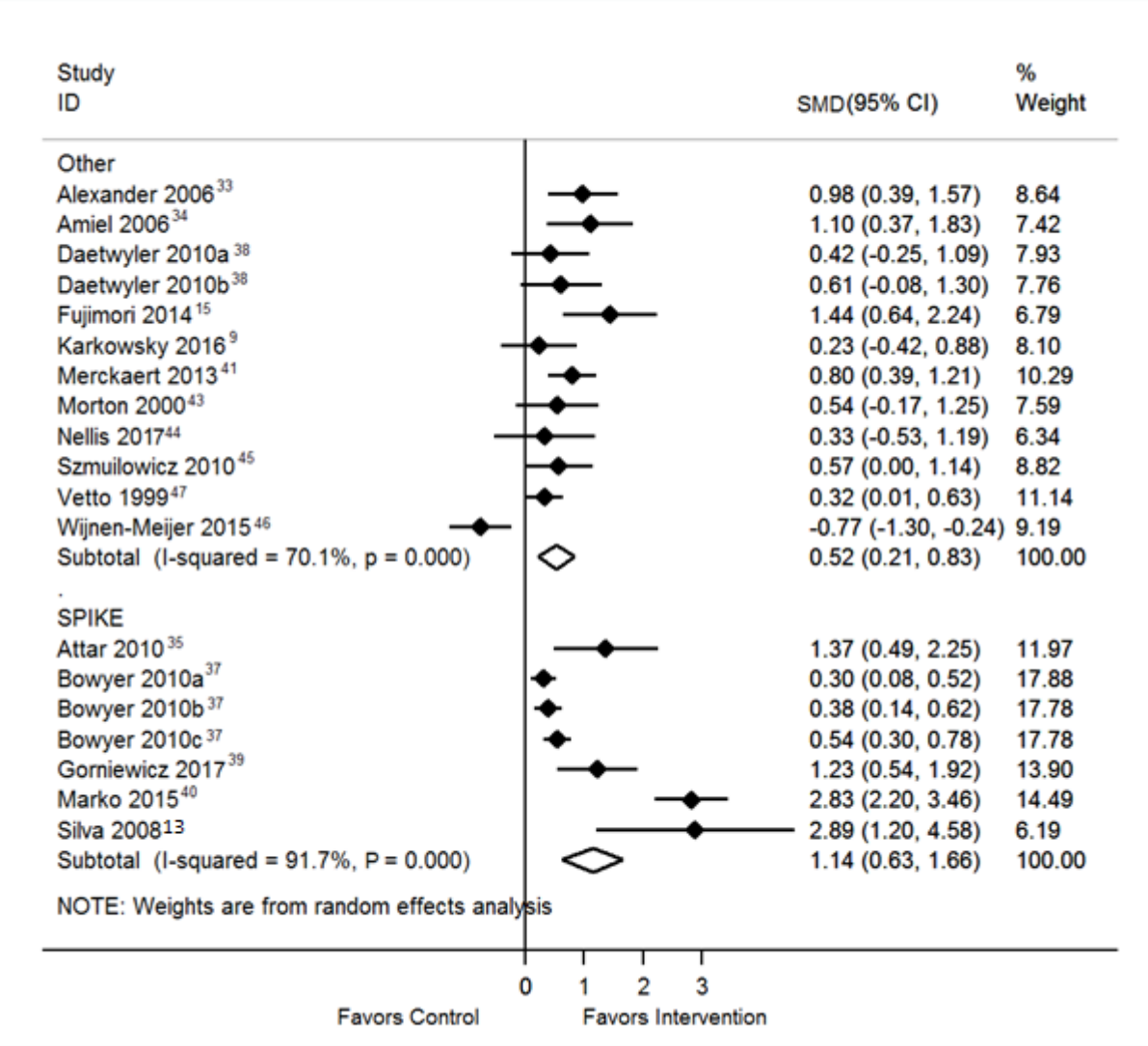
	physicians rated candidates on a range of behavioural and knowledge based skills. Breaking bad news skill rated on a single five-point scale was used.			intervention group mean was 2.62 (S.D. = .70) and this difference was significant (P<0.01).

[a]These two papers report data from the same study

eFigure 1. Ratings of studies included in the review on the 9 EPOC risk of bias criteria

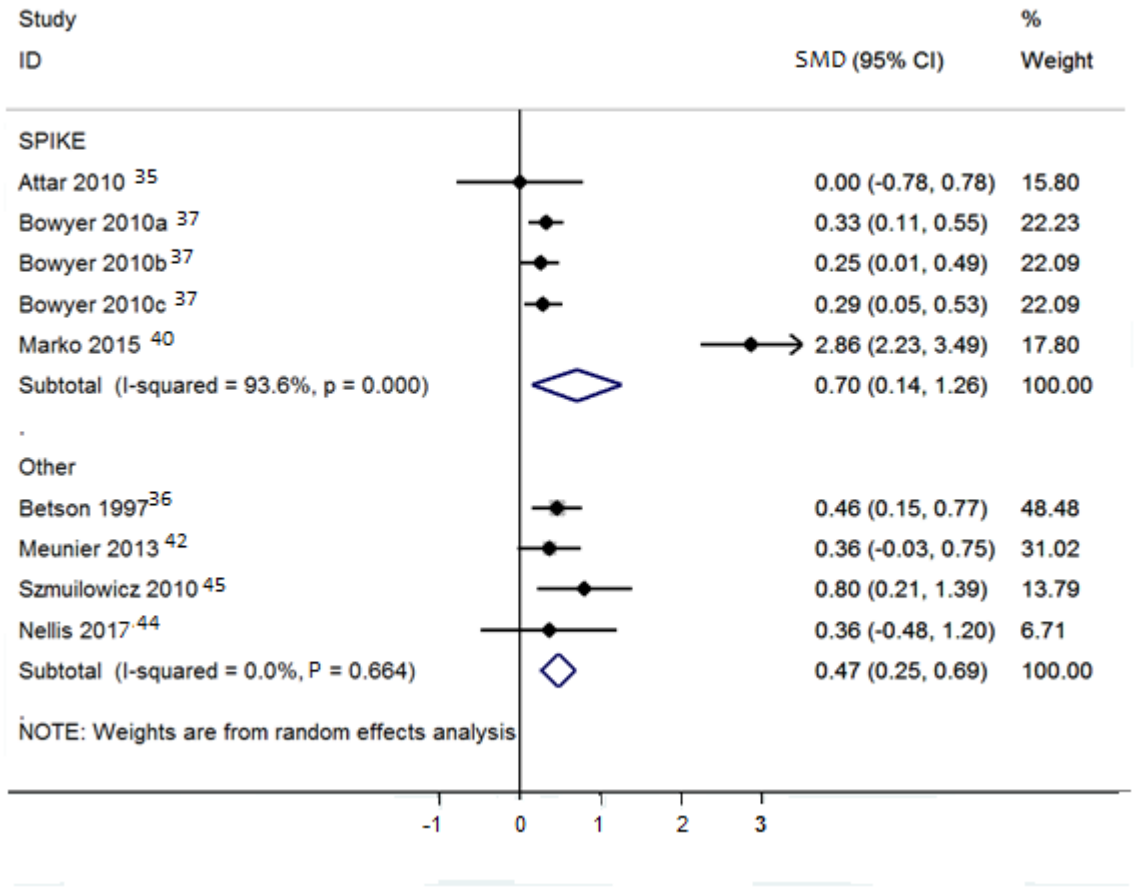


eFigure 2. Pooled effect size of interventions on observer-rated news delivery that used the SPIKES framework vs any other framework or no framework[a]



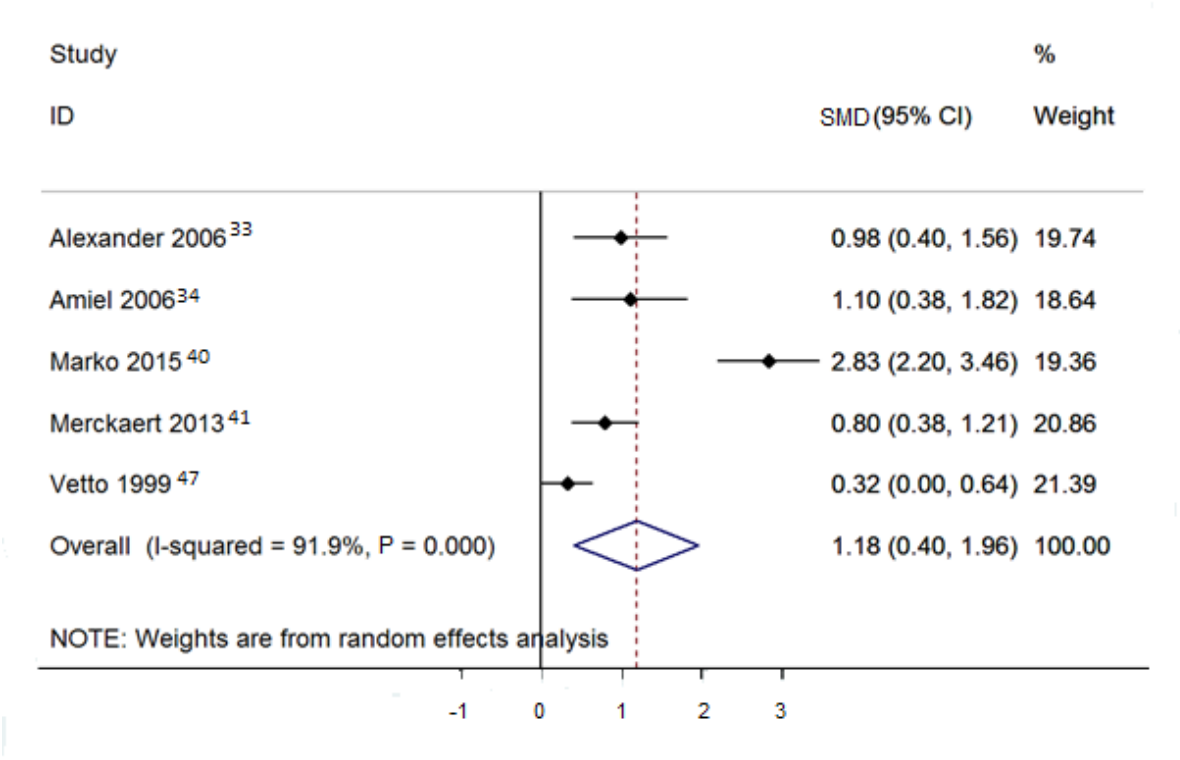
[a]The references in this figure match with the reference list in the main text.

eFigure 3. Pooled effect size of interventions on practitioner confidence that used the SPIKES framework vs any other framework or no framework[a]



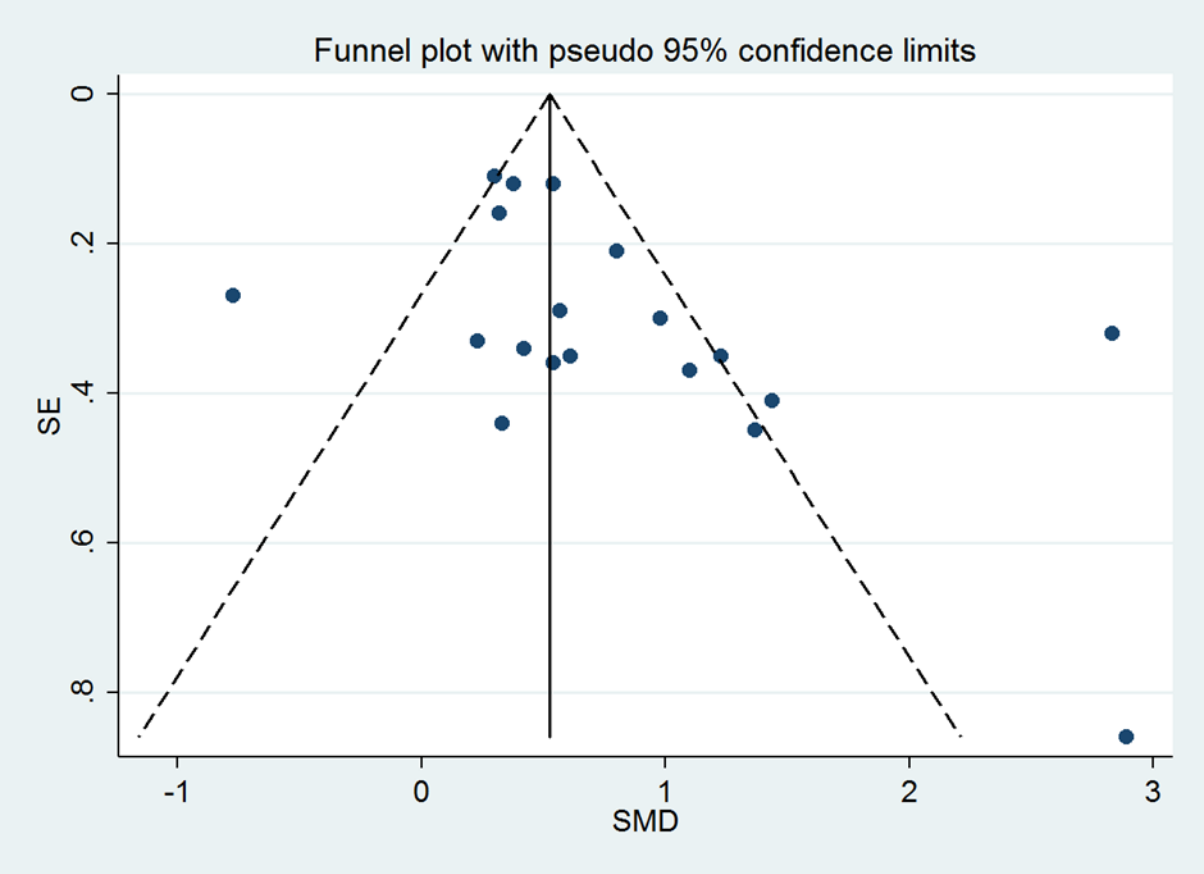
[a]The references in this figure match with the reference list in the main text.

eFigure 4. Treatment effect derived by studies at lower risk of bias for observer-rated news delivery skills[a]



[a]The references in this figure match with the reference list in the main text.

eFigure 5. Funnel plot of standardized mean differences versus standard errors for observer measured difficult news delivery scores



Funnel plot with pseudo 95% confidence intervals. The outer lines indicate the triangular region within which 95% of studies are expected to lie in the absence of both biases and heterogeneity. The funnel plot shows no substantial asymmetry (Egger regression intercept −0.24, SE = 0.06, *P* = .21)

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