



Training diabetes healthcare practitioners in motivational interviewing: a systematic review

Tracey Kaczmarek, David J. Kavanagh, Peter A. Lazzarini, Jason Warnock & Jaap J. Van Netten

To cite this article: Tracey Kaczmarek, David J. Kavanagh, Peter A. Lazzarini, Jason Warnock & Jaap J. Van Netten (2021): Training diabetes healthcare practitioners in motivational interviewing: a systematic review, Health Psychology Review, DOI: [10.1080/17437199.2021.1926308](https://doi.org/10.1080/17437199.2021.1926308)

To link to this article: <https://doi.org/10.1080/17437199.2021.1926308>



Published online: 24 May 2021.



[Submit your article to this journal](#)



Article views: 391



[View related articles](#)



[View Crossmark data](#)



Training diabetes healthcare practitioners in motivational interviewing: a systematic review

Tracey Kaczmarek ^{a,b,c}, David J. Kavanagh ^{b,d,e}, Peter A. Lazzarini ^{a,b,f,g}, Jason Warnock ^c and Jaap J. Van Netten ^{a,h}

^aSchool of Clinical Sciences, Queensland University of Technology, Brisbane, Australia; ^bInstitute of Health & Biomedical Innovation, Queensland University of Technology, Brisbane, Australia; ^cDepartment of Podiatry, Metro North Hospital & Health Service, Queensland Health, Brisbane, Australia; ^dSchool of Psychology & Counselling, Queensland University of Technology, Brisbane, Australia; ^eCentre for Children's Health Research, Queensland University of Technology, Brisbane, Australia; ^fAllied Health Research Collaborative, Metro North Hospital & Health Service, Queensland Health, Brisbane, Australia; ^gSchool of Public Health and Social Work, Queensland University of Technology, Brisbane, Australia; ^hDepartment of Rehabilitation, Amsterdam Movement Sciences, Amsterdam UMC, University of Amsterdam, Amsterdam, Netherlands

ABSTRACT

Diabetes presents significant self-care challenges that require sustained motivation. Motivational Interviewing (MI) has substantial support in enhancing motivation for behavioural change, but its effective application in routine healthcare requires practitioners to acquire and use related skills. The aim of this systematic review was to investigate the impact of MI training on MI-related skills of practitioners who provide diabetes healthcare. PubMed, EMBASE and PsycINFO were searched using the terms motivational interviewing, motivation enhancement, and diabetes. Two assessors independently screened titles, abstracts and full texts for papers reporting the impact of MI training on diabetes healthcare practitioners' outcomes. Of 625 abstracts screened, 22 papers from 17 unique studies were included. All 17 studies reported some improvement in MI skills, with 14 finding improvements in more than 50% and three less than 35%. However, the risk of bias and outcome measures varied widely between studies. All studies showed diabetes healthcare practitioners acquired and applied MI skills post-training, to varying levels. Findings suggest training should include education, role play, and ongoing supervision to maintain skills.

ARTICLE HISTORY

Received 9 April 2020
Accepted 3 May 2021

KEYWORDS

Motivational interviewing; education; diabetes; behaviour; self-care; intervention

1. Introduction

Diabetes mellitus is a global pandemic, with an estimated 451 million people diagnosed worldwide in 2017 – a number that is expected to rise to 693 million by 2045 (Cho et al., 2018). The two main types of diabetes are type 1 diabetes, caused by an autoimmune reaction that results in little or no insulin production, and type 2 diabetes, where high blood glucose levels result from a combination of insulin deficiency and an inability to respond to insulin (Cho et al., 2018). While the rise in diabetes is mainly caused by increasing numbers of people with type 2 diabetes, also levels of type 1 diabetes are rising (Cho et al., 2018). The most debilitating aspect of diabetes lies in long-term complications associated with the disease, which include, but are not limited to, heart disease, kidney disease, eye disease and foot disease (Berhe et al., 2020; Lazzarini et al., 2012). People with diabetes often have

difficulty engaging in recommended behaviour changes aimed at preventing or reducing these associated complications, with 67% adherence to medical recommendations such as daily medication taking – lower than almost all other chronic disease – (DiMatteo, 2004) and with over 95% of people with diabetes not engaging with the five healthy lifestyle recommendations of regular exercise, healthy diet, healthy weight, no smoking, and limited alcohol consumption (King et al., 2009; Lazzarini et al., 2012; Vluggen et al., 2018).

Lack of engagement with or non-adherence to recommended lifestyle and self-care behaviour is a multidimensional phenomenon, determined by social and economic, therapy-related, patient-related, health-system-related and condition-related factors (Connor, 2003; De Geest & Sabate, 2003; Johnson, 2002; Konstantinou et al., 2020). Concerning patient-related factors, one key factor is motivation (Golay et al., 2008). Healthcare practitioners' behaviour may positively influence a patient's motivation, thereby contributing to behaviour change and in turn improving patient engagement to adapting healthy lifestyle including increasing exercise, taking medication and improving diet (Emmons & Rollnick, 2001; Vluggen et al., 2018). This influence can be positive when a good relationship between practitioners and patients is built, which may occur when a partnership is formed between both; however, the influence could also be negative when practitioners take a more traditional expert role (Emmons & Rollnick, 2001; Vluggen et al., 2018). To achieve the former, various educational and behavioural strategies have been proposed (Usherwood, 2017). One of these is motivational interviewing (MI), first introduced by Miller and Rollnick (Miller & Rollnick, 1991).

MI is an evidence-based counseling technique directed at enhancing patient motivation for behavioural change, through exploring and resolving ambivalence (Soderlund, 2018). The focus on behaviour change makes MI an attractive tool for addressing patient engagement to self-care (Emmons & Rollnick, 2001; Soderlund, 2018). MI's empathic and accepting method of conducting clinical sessions encourages patients to consider and discuss the advantages and possibility of improved self-care ('change talk') (Gabbay et al., 2011). MI has been successfully used to change patient behaviour in many conditions, including in those with substance abuse, Human Immunodeficiency Virus (HIV), and diabetes (Emmons & Rollnick, 2001). One recent review reported MI interventions had positive patient outcomes for people with diabetes in some trials (Berhe et al., 2020; Fisher et al., 2017), but noted that translation of MI into routine clinical practice requires practitioners to receive effective training in the core skills of MI, and be sufficiently supported to apply those skills over time (Fisher et al., 2017).

To identify components of effective training, several reviews have explored the effects of MI training for health practitioners, and identified substantial variations in outcomes (Barwick et al., 2012; Chilton et al., 2012; Hall et al., 2012; Morton et al., 2015; Söderlund et al., 2011; Thepwongsa et al., 2017). For example, one review examined a range of practitioner disciplines (including obstetric practitioners, physicians, nurses), conditions and outcomes (including smoking cessation, engagement in treatment plans), and concluded from 10 studies that practitioner training can result in the acquisition and self-reported use of MI skills, but that those studies varied substantially in quality (Söderlund et al., 2011). Other reviews examined training outcomes in specific practitioner disciplines, such as primary care and mental health (Barwick et al., 2012; Morton et al., 2015). In mental health, the review found evidence for significant changes in practitioner behaviour after MI training in 17 of 22 studies (Barwick et al., 2012). The only review that focused on health practitioners working with people with diabetes examined general practitioners (GPs) only and identified just one study with mixed results (Thepwongsa et al., 2017).

As people with diabetes have lower engagement with recommended self-care and lifestyle behaviours than many other chronic diseases (DiMatteo, 2004), resulting in severe long-term consequences that are often not noticeable in the short-term, engaging people with diabetes is both extra challenging and extra important. Care for people with diabetes is provided by practitioners specialised in diabetes, yet still a range of different practitioner disciplines, such as endocrinologists, nurses, health psychologists, and educators, discuss self-care and lifestyle with people with diabetes.

With the peculiarities associated with the disease, and with this range of practitioners focusing solely on this group of patients, it is important to investigate outcomes of training in MI in this group of practitioners, to identify components of effective training (Winkley et al., 2020). To the best of our knowledge there has been no systematic review investigating whether the MI-related skills and clinical practice of the different practitioner disciplines who work with people with diabetes are improved following MI training. Therefore, the aim of this study was to systematically review the effects of MI training on the MI-related skills and clinical practice of practitioners who provide diabetes healthcare.

2. Methods and materials

The systematic review was undertaken using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009). A PRISMA checklist is provided in Appendix 1. The protocol was prospectively registered at PROSPERO (CRD42018090338).

2.1. Search strategy

The search was performed on 13th January 2021 and included all papers published in the English language, without date limits, that referred to the use of MI by healthcare practitioners who were treating people with diabetes. The databases searched were PubMed, EMBASE and PsycINFO, using the search terms (('motivation* enhance*' or motivation* interview*') and diabet*) in the title or abstract. A broad initial search was undertaken to maximise the identification of all papers that reported MI training for healthcare professionals working with people with diabetes.

2.2. Eligibility assessment

After the removal of duplicates, titles and abstracts of papers identified in the initial search were independently screened by two researchers (TK and JvN) for inclusion in the full text review. To be eligible, the title or abstract needed to include a reference to MI-training of health practitioners, who were working with adults with diabetes mellitus (excluding gestational DM). Any disagreements were discussed between authors until consensus was reached. All papers deemed eligible were included for full text assessment.

The same two researchers then independently checked the full text of those papers for final inclusion in the review. Inclusion criteria were: study designs that reported original research; interventions that included face-to-face MI-training, which could include (but was not limited to) didactic education, videos, role play or peer supervision; and (as primary outcome) reporting of qualitative or quantitative outcomes on MI skills of practitioners. We chose to include only face-to-face training because alternative training methods (e.g., online training) were considered to be too different and thereby not providing useful comparisons, and because the current systematic review was also performed to inform a face-to-face training programme to be developed by the authors. Exclusion criteria were: study designs that did not report original research, such as systematic reviews, narrative reviews, and commentaries; interventions that did not include a face-to-face aspect, such as online or via telephone; and any studies that reported multi-faceted interventions (combination of MI and other therapies (e.g., cognitive-behavioural therapies)) that did not specifically separate and report the outcomes of the MI-training component. Any disagreements were discussed between authors until consensus was reached. All papers deemed eligible after this process were included for qualitative synthesis.

Forward and backward searches of all final included papers were then independently undertaken by two researchers (TK and DK), to check for any papers that may have been missed, using the same eligibility assessment procedures.

2.3. Risk of bias assessment

Papers with a controlled design for our primary outcome (e.g., an RCT or cohort study reporting use of MI skills for both an intervention and a control group of practitioners) were assessed for risk of bias. Papers with a non-controlled design for our primary outcome were narratively described. The latter group included any study that only reported behavioural outcomes for practitioners from an intervention group, even if the design comprised an RCT or cohort study in relation to patient outcomes. Risk of bias assessments was performed by two researchers (TK and JVN) independently, using scoring sheets developed by the Dutch Cochrane Centre (www.cochrane.nl). Any disagreements were resolved by discussion until consensus was reached. This assessment included 10 items, each scored as positive (+), negative (-), or unclear (?); risk of bias was considered 'very low' when a paper scored positively on 8–10 items, 'low' when positive on 6–7 items, and 'high' when positive on 0–5 items.

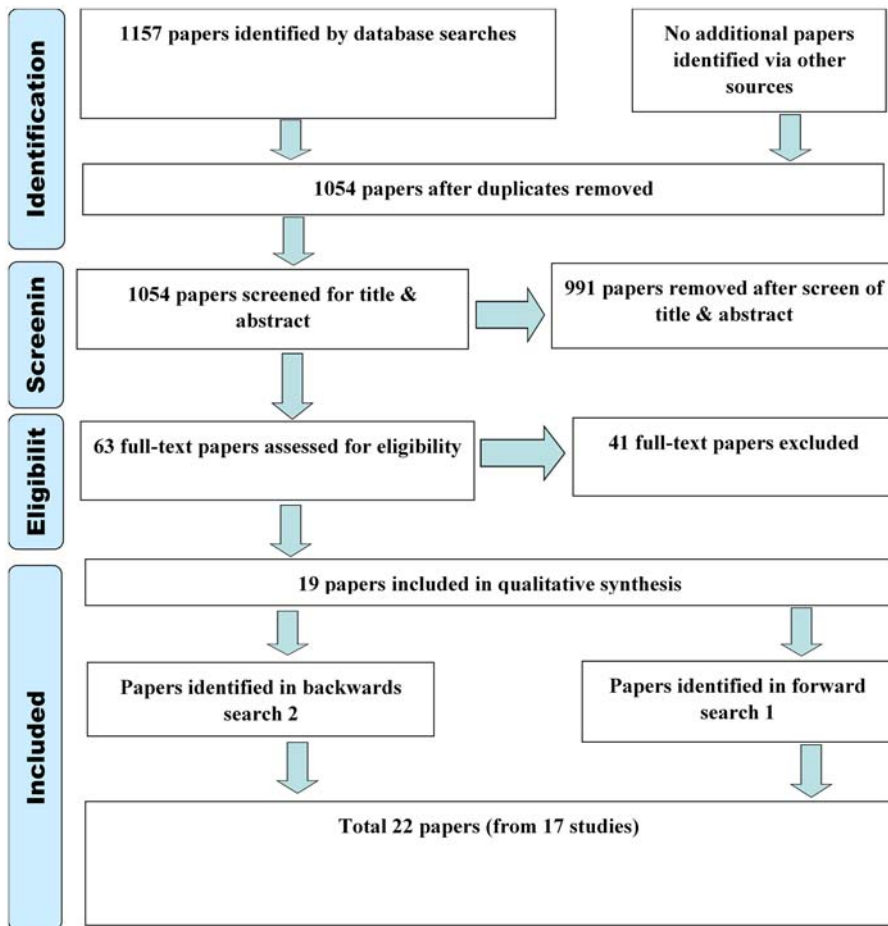
2.4. Data extraction

Results from papers with a controlled study design for our primary outcome were summarised in text and key data extracted into evidence tables by one researcher (TK), and checked by another (DK or JVN). Key extracted data included: descriptive statistics of study population details; descriptions of the training intervention and control condition: what was used to measure outcomes; and results found. If some results were not reported in the paper, authors were contacted to see if the data were collected. However, these contacts did not result in further data becoming available. Quantitative synthesis via meta-analyses was not possible because of the heterogeneity of designs and outcome measures in the identified studies (Morton et al., 2015).

3. Results

The literature search resulted in 1054 unique papers after duplicates were removed (Figure 1). After review of the titles and abstracts, 63 papers were retained for full text review with 19 of those deemed eligible for final inclusion in this review. A further three papers were identified in the forward and backward search making a total of 22 papers included in this review. As these 22 included papers originated from 17 unique studies, we present outcomes per study instead of per paper. Information from multiple included papers from the same unique study are combined; this concerns the Diabetes-6 study, which published three included papers (Graves et al., 2016; Ismail et al., 2018; Magill et al., 2018), the ADaPT study, which also published three included papers (Ismail et al., 2010; Maissi et al., 2011; Patel et al., 2011) and one study by Jansink and colleagues, which published two included papers (Jansink, Braspenning, Keizer, et al., 2013; Jansink, Braspenning, Laurant, et al., 2013).

The 17 studies included 11 RCTs (including one pilot RCT), 1 non-RCT and 5 cohort studies. However, as practitioner outcomes were not always the primary outcome, some studies only reported practitioner's outcomes in their intervention group. As described in the methods, we considered these studies for our primary outcome to be non-controlled studies. Therefore, we report the results in three subgroups. The first of these comprised six studies (five RCTs and one non-RCT (Brug et al., 2007; Jansink, Braspenning, Laurant, et al., 2013; Magill et al., 2018; Nightingale et al., 2016; Rubak et al., 2006; Welch et al., 2011)) reporting direct comparisons of post-training outcomes between an intervention group and a control group (see Table 1 [risk of bias] and Table 2 [evidence table]). The second subgroup comprised five studies (two RCTs (Stott et al., 1996; van Eijk-Hustings et al., 2011) and four cohort studies (Britt & Blampied, 2010; Doherty et al., 2000; El-Mallakh et al., 2012; Stoffers & Hatler, 2017)) that reported pre- and post-comparisons within the intervention group (see Table 1 [risk of bias] and Table 3 [evidence table]). The third subgroup comprised five studies (Ekong et al., 2020; Ismail et al., 2010; Keukenkamp et al., 2017; Rosenbek Minet et al., 2011; Skelton, 2012) that had a non-controlled design for our primary outcome, as they all aimed



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(7): e1000097. doi:10.1371/journal.pmed1000097

Figure 1. PRISMA 2009 flow diagram.

to investigate patient outcomes, and only reported practitioner outcomes from the intervention group post-training (see Table 4).

3.1. Study and training characteristics

Sample sizes ranged from 1 to 88 health practitioners, with a median of 12 practitioners. The MI training in all studies was conducted as group sessions and frequently included videos, role play and feedback. The total length of the intervention ranged from 2 to 40 h, with a median of 16 h. All studies except one (Skelton, 2012), also provided one or more follow-up sessions of supervisor support. Three studies formally evaluated the barriers and facilitators of specific MI-training characteristics for practitioners. One study found that the most beneficial characteristics of training workshops were practical aspects, real patient video examples, and role play (Doherty et al., 2000). Another study concluded that continuous supervision is needed to facilitate uptake of MI, while high workload and fatigue of health professionals were barriers (van Eijk-Hustings et al., 2011). The third study conducted qualitative interviews with nurses and identified the resulting patient empowerment experienced by nurses as a



Table 1. Risk of bias of included publications with a controlled study design for our primary outcome.

RCTs Reference	Randomisation	Independent assignment	Professional blinded	Outcome assessor blinded	Similarity groups	Follow up outcomes from adequate number	Were all professionals reported irrespective of drop out	Professionals treated equally except for intervention	Selective reporting ruled out	Free from commercial interest	Score
Rubak et al. (2006)	+	?	-	-	?	+	+	+	+	+	6/10
Brug et al. (2007)	+	?	-	+	?	+	+	+	+	+	7/10
van Eijk-Hustings et al. (2011)	+	?	-	-	+	-	-	?	+	+	4/10
Weich et al. (2011)	+	?	-	-	?	?	+	+	+	+	5/10
Stott et al. (1996)	+	?	-	?	-	+	?	-	-	+	3/10
Jansink, Braspenning, Laurant, et al. (2013)	+	+	-	+	+	-	-	+	?	+	6/10
Ismail et al. (2018)	+	+	-	+	+	+	?	+	+	+	8/10
COHORT STUDIES Reference											
Doherty et al. (2000)	+	?	+	+	-	+	-	?	?	-	4/10
Britt and Blampied (2009)	+	+,-	+	+	?	+	+	?	+	+	8/10
Stoffers and Hatler (2017)	+	+	+	+	-	-	-	-	+	+	6/10
Nightingale et al. (2016)	+	-	+	+	-	-	-	-	+	?	4/10
El-Mallakh et al. (2012)											7/10

Note: Item assessments are: + = positive; - = negative; ? = unclear. Score is total number of items scored as positive.

Table 2. Evidence table for controlled studies that compared post-training practitioner outcomes of intervention and control groups.

Study Design, Setting	Study population/characteristics	Intervention (I) and control (C) details	Results at final follow-up
Rubak et al. (2006) Cluster RCT (by practice) Risk of bias: 6/10 (Low Risk) Setting: Primary care practices; Denmark Follow up: 1 year	I1: 29 GPs (21 practices); I2: 20 GPs (20 practices) – historical cohort that was MI-trained 3 years earlier C: 36 GPs (27 practices) Mean Age: 53 years Sex: M 65%; F 35% Experience: NR Retention: 1 year I:1100%; C 83% I2s (93% practices)	C: 1x1.5 day, + 2 x .5 day follow ups on type 2 diabetes treatment over a year I1: As in C + 1.5 days + 2 x .5 day follow ups on MI over a year I2: trained in MI 3 years earlier, same training as I1	Self-reported strategy use mean sum scores: Pt does not follow advice: C: 2.93; I1: 2.05; I2: 2.04 C vs I1: ***, C vs I2: ***, I1 Vs I2: NS Pt does not want to follow advice: C: 2.92; I1: 2.10; I2: 2.14 C vs I1: ***, C vs I2: ***, I1 Vs I2: NS Pt concept and actual inconsistent: C: 2.82; I1: 2.08; I2: 2.23 C vs I1: ***, C vs I2: *; I1 Vs I2: NS GP Evaluation of MI use: C: 1.93; I1: 1.69; I2: 1.65; C vs I1 **, I1 vs I2 NS % MI Use (self-rating) Pearls: I1: 81 I2: 95 NS Reflective listening: I1: 100 I2:100 NS Visual analogue scale: I1: 92 I2:84 * Stage of change: I1: 81 I2: 79 NS Balance schedule: I1:100 I2:90 * Showing/using ambivalence: I1:85 I2:79 NS Empowering: I1:96 I2:100 NS
Jansink, Braspenning, Laurant, et al., (2013) Cluster RCT Risk of bias: 6/10 (Low Risk) Setting: 58 primary care practices; the Netherlands Follow up: 12months	Nurses: MI: 30; C: 35 M Age: MI:41.6 C 43.7 Experience: Practice assistant: MI:4.4 C:9.7 Diabetes consultations: MI:3.6 C 4.1 Sex: % male MI:10.0 C:4.3 Retention 14mth: MI:50%; C:42%	MI: 4x0.5 days training sessions over 6mths + monthly phone call + follow up after 4 mths where audio feedback given C: Nil	MI application: Baseline 1-year difference P Value (n behavioural counts per consult) Assess change talk: I: 1.43 C: 1.67 I: 1.50 C: 1.36 0.39 ** Invas confidence: I: 0.16 C: 0.27 I: 0.62 C: 0.35 0.28 * The following 22 items were NS between I & C: Demonstrates Sensitivity; Encourages behaviour talk Encourages change talk; Asks how patient feel / thinks; Uses empathetic listening statements; Uses Summaries; Acknowledges Challenges; Sensitive to concerns; Conveys respect; Exchange ideas about change Global score spirit; Global score structure; Applies agenda setting; Assess pt importance of change; Asks open questions; Applies reflection; Is sitting behind the chair; Global score empathy; Draws Pt goals; Rolls with resistance.
Brug et al. (2007) RCT Risk of bias: 7/10 (Low Risk) Setting: 9 primary care organisation; the Netherlands Follow up: 6 months	Dietitians: MI 18; C19 Age range: 24–45 yrs Experience: 2–20 yrs Sex: NR Retention: NR	MI: 2x1 day + 1 day follow up + on demand feedback C: no training	Supports self-efficacy: Resolve discrepancy. MITI.4.2.1, MISC.0 1 Month Six Months (n behavioural counts per consult) Empathy: I:4.6; C:4.0; NS I:4.4; C:3.1; * Spirit: I:3.8; C:3.3; NS I:4.1; C:2.5; * Adherence: I:9.4; C:6.6; NS I:6.4; C:6.9; NS Infidelity: I:1.2; C:3.2; * I:1.6; C:3.8; * Number of Closed Q: I:16.4; C:14.1; NS I:12.3; C:11.9; NS Opened Q: I:4.4; C:3.6; NS I:4.2; C:3.9; NS

(Continued)



Table 2. Continued.

Study Design, Setting	Study population/characteristics	Intervention (I) and control (C) details	Results at final follow-up
<p>Ismail et al. (2018) (Diabetes-6 Study) RCT</p> <p>Risk of bias: 8/10 (Low)</p> <p>Setting: Primary care practices >6000 patients; United Kingdom</p> <p>Follow up: 18 months</p>	<p>MI: 11; nurses 12; nurses Age: Mean I & C: 48</p> <p>Experience: Varied</p> <p>Sex: Female</p> <p>Retention: 18 mth MI: -1 practice; C:100%</p>	<p>MI: 3 h per week for 12 weeks. + monthly supervision</p> <p>C: Nil</p>	<p>Number Q: I:20.8; C:17.6; NS I:16.5; C:15.8; NS</p> <p>Simple reflections: I:9.3; C:6.0; NS I:10.6; C:6.5; *</p> <p>Complex Reflections: I:1.7; C:0.7; NS I: 1.2; C:0.3; NS</p> <p>Reflections: I:10.9; C:6.9; * I: 11.8; C:6.8; *</p> <p>Change statements: I:2.0; C:1.6; NS I:3.6 C:1.1; *</p> <p>% Pt talks majority time: I:55.6 C:5.6 .00 *** I:50.0 C:6.7 ***</p> <p>MITI scores during treatment (n behavioural counts per consult or %):</p> <p>Control Intervention P value</p> <p>Global spirit; 2.63 (1.12) 4.03 (1.05) ***</p> <p>Global empathy; 3.40 (0.98) 4.23 (0.89) ***</p> <p>% open questions, 23.1 (13.3-37.5) 46.5 (33.3-57.1) ***</p> <p>% MI adherence 21.4 (10.0-35.0) 63.4 (33.3-83.3) ***</p> <p>Complex reflections; 55.6 (41.9-71.4) 53.8 (40.0-71.4) NS</p> <p>Reflection / question ratio 0.50 (0.33-0.71) 0.44 (0.32-0.61) NS</p> <p>Skills scores post training</p> <p>MITI Global spirit (mean; SD) 3.42 (0.67)</p> <p>MITI Global empathy (mean; SD) 4.09 (1.04)</p> <p>% Reflection to Question (median IQR) 0.67 (0.45-0.82)</p> <p>% Open Questions (median IQR) 45.5 (25.0-72.2)</p> <p>% Complex reflections (median; IQR) 9.1 (0-28.6)</p> <p>% MI adherent (median; IQR) 86.2 (76.9-100)</p> <p>BECCI: Practitioner score (mean SD) 2.78 (0.50)</p>
<p>Nightingale et al. (2016) Non-RCT</p> <p>Risk of bias: 4/10</p> <p>Setting: 3 primary care practices; Pittsburgh (USA)</p> <p>Follow up: 1 year</p>	<p>MI: 20 Medical residents; C: 68</p> <p>Age: NR</p> <p>Experience: NR</p> <p>Sex: NR</p> <p>Retention 1yr: MI: +1; C: 36</p>	<p>MI: 1x3 hr training sessions + 3x1 hr booster sessions over 6 months.</p> <p>C: Nil training</p>	<p>Survey results I C</p> <p>MI adherent approach Before: 27; 1 year: 53% ** Before: 36; 1 year: 47% *</p> <p>Knowledge: Before: 47; 1 year: 69% ** Before: 62; 1 year: 63%NS</p> <p>Application (objective): 19% improvement * No improvement</p> <p>Training Attendance: 2 (12.5%) 1 session; 10 (62.5%) 2 sessions; 4 (25%) 3 sessions. Nil 4 sessions</p>
<p>Weich et al. (2011) RCT</p> <p>Risk of bias: 5/10 (High Risk)</p> <p>Setting: USA. Secondary care setting</p> <p>Follow up: 6 months</p>	<p>MI & C: 2 diabetes educators each</p> <p>Age: NR</p> <p>Experience: NR</p> <p>Sex: NR</p> <p>Retention: 100%</p>	<p>MI: 2x1 day + 2 x mth + group feedback & coaching calls (2/ mth x 1-2hr for 1 yr, then 1/mth) + 2x1-day coaching session/yr.</p> <p>C: Nil training</p>	<p>MISC results</p> <p>(n behavioural counts per consult) Mean MI Spirit I: 4.43; C:2.65 ***</p> <p>Mean MI Inconsistent responses I: 3.27 C: 12.19 ***</p> <p>Mean count client change talk I:13.88 C:9.02 **</p> <p>Information giving, I:22 vs C 0:33</p> <p>Overall responses: I:152 vs C:174</p> <p>% per consult % Reflection to Question ratio: I: 1.92 C: 0.32 ***</p> <p>% Open Questions I: .27 C: .06 ***</p>

Note: NS: not significantly different ($p > .05$); * $p < .05$; ** $p < .01$; *** $p < .001$. C: Control group; I: Intervention group; MISC: Motivational Interviewing Skills Code; MITI 4.2.1: Motivational Interviewing Treatment Integrity; BECCI: Behaviour Change Counselling Index, MTD: Multidisciplinary; DNE: Diabetes Nurse Educator.

Table 3. Evidence table for controlled studies that compared pre- and post-training practitioner outcomes.

Study Design, Setting	Study population/characteristics	MI Training (MI) and control (C) details	Outcome category and results
Stott et al. (1996) Cluster RCT (by practice, stratified by size); Risk of bias: 3/10 Setting: 29 primary care practices Wales Follow up: 3 years	MI: 16 doctors, 18 nurses C: 14 doctors, 15 nurses Age: NR Experience: NR Sex: NR Retention: MI 97%; C NR	MI: ≥ 2x1-hr + 2 group meetings 7 mths apart + newsletter, personal contacts, review of audio (≥ 4 sessions: 19% doctors, 44% nurses) C: DM Education	MI vs. C: NR. MI: Self-reported MI resource use 'Most of the time'; with 19% (diary), 22% (balance chart), 35% (change ruler), 71% (agenda setting chart)
Doherty et al. (2000) Cohort study Risk of bias: 4/10 Setting: United Kingdom. Secondary care setting Follow up: 6/12/18 months	MI: 13 members MTD team, with 6 completed after 1 year C: Nil Age: NR Experience: NR Sex: NR Retention 3yrs: MI: 6 (5 doctors on short-term contracts and 2 chiropodists did not complete the trial)	MI: Average – 24 hr workshop + 6 hr supervision + 10 hr peer supervision. C: Nil	At one year, 25 skills were reported to have been acquired and 19 of those were reported to have been used. Most frequent reported were simple reflections, patient-centred summaries, paraphrase reflections and asking open questions. At 3 follow-up measurements one year after end of study, comparison of 14 skills, all improved, except for 3 that regressed at 3rd measure and 3 that remained the same at all 3 points. Most frequently applied were patient-centred summaries, understanding the change cycle, and asking open questions. Training evaluation: Flexible and responsive learning experiences (n=2) Supervision Peer (n=4) / individual (n=3) Focusing on individual aspects of behaviour change (n=2) Usefulness of video sessions for reflection (n=2) Baseline: The 2 nurses did not reach beginning proficiency on any measures of MI skills, apart from %Complex reflections. Post 1 yr: Reflection to Qst ratio; %Open Qst; %MI-adherent sessions: both nurses reached beginning proficiency %Complex Reflection and %MI Adherent Responses: both nurses were Competent
Britt and Blampied (2009) Cohort study Risk of bias: 8/10 Setting: New Zealand. Secondary care setting Follow up: 1 year	MI: 2 DNE C: Nil Age: NR Experience: NR Sex: NR Retention 3yrs: MI: NR	MI: 2x1-day training sessions + Ongoing supervised practice for up to 12months.	Training evaluation: Flexible and responsive learning experiences (n=2) Supervision Peer (n=4) / individual (n=3) Focusing on individual aspects of behaviour change (n=2) Usefulness of video sessions for reflection (n=2) Baseline: The 2 nurses did not reach beginning proficiency on any measures of MI skills, apart from %Complex reflections. Post 1 yr: Reflection to Qst ratio; %Open Qst; %MI-adherent sessions: both nurses reached beginning proficiency %Complex Reflection and %MI Adherent Responses: both nurses were Competent
van Eijk-Hustings et al. (2011) RCT Risk of bias: 4/10 Setting: Primary and secondary care hospital Follow up: 6 months	MI & C each had: 2 practice nurses, 4 diabetes nurses, 4 dietitians Age: MI 38.5; C 42.5 Experience: NR Sex: MI 100%; C 90% female Retention: NR	MI: 2x1 day + 1 day at 6wks + 2x2 hr over 4 mths observation + feedback offered. C: no training	MI vs. C: NR. MITI scores within intervention group immediately post-training and after 6 months showed: global scores for empathy and spirit increased for all professionals, but MI-adherent behaviour declined for the diabetes nurses and dietitians, while it increased for the practice nurses. Training evaluation suggested this should be continuous, but high workload and fatigue are barriers

(Continued)

Table 3. Continued.

Study Design, Setting	Study population/characteristics	MI Training (MI) and control (C) details	Outcome category and results
<p>El-Mallakh et al. (2012) Interrupted time series Risk of bias: Setting: USA Primary care Follow up: 24 months</p>	<p>MI: 1 baccalaureate prepared nurse C: Nil Age: Experience: Sex: F Retention: 24 months</p>	<p>MI: 4x 3-hour sessions + 16 h of role play and face to face phone-based coaching.</p>	<p>Scores for %CR were at the proficiency skill level for 22.7%, and at the competency skill level for 72.2% of sessions. Scores for R/Q – below the proficiency level for 22.2%, at proficiency for 44.4%, and at the competency level for 33.3% of sessions. Mean SD Scores on fidelity: Baseline Final Global spirit: 4.00 (3.41) 4.67(2.85) Reflective question to Ratio: 1.62(0.95) 1.90(0.78) Complex reflections: 0.95(0.16) 0.42 (0.23) % Open Questions: 0.77(0.33) 1.00(0.22) Motivational interview adherent: 1.00 (0.36) 1.00(0.13)</p>
<p>Stoffers and Hatler (2017) Cohort study Risk of bias: 6/10 Setting: USA Tertiary care hospital Follow up: 6 weeks</p>	<p>MI: 33 Nurses C:0 Age: NR Experience: NR Sex: NR Retention 6 weeks: NR</p>	<p>MI: 2 h training + 1 workshop</p>	<p>Overall confidence to successfully give DM education in most difficult patients: increased on the 'Teaching Diabetes Education Scale' (5-point Likert) from 2.81–3.79 ($p=0.017$) * Areas of greatest development were confidence in developing creative ways and ability to teach.</p>

Note: NS: not significantly different ($p > .05$); * $p < .05$; ** $p < .01$; *** $p < .001$. C: Control group; I: Intervention group; MISC: Motivational Interviewing Skills Code; MITI 4.2.1: Motivational Interviewing Treatment Integrity; BECCI: Behaviour Change Counselling Index., MTD: Multidisciplinary; DNE: Diabetes Nurse Educator.

positive impact on training outcomes, while concerns about overstepping the role as nurse and lack of support from physicians were established as barriers (Graves et al., 2016).

3.2. Risk of bias

In the twelve studies with a controlled design for our outcome, the risk of bias ranged from 3–8 (Table 1). Overall, seven were rated as being low or very low risk of bias, and five were high risk of bias. Due to the nature of the intervention, it was not possible to blind healthcare practitioners to the intervention, and all scored negative on this item. Outcome assessor blinding was only done in three studies (Brug et al., 2007; Jansink, Braspenning, Laurant, et al., 2013; Magill et al., 2018).

3.3. Outcome measures

Studies used a variety of outcome measures to measure the effectiveness of the intervention on practitioners. Some employed the Motivational Interviewing Treatment Integrity Code (MITI) (Moyers et al., 2003), some the Motivational Interviewing skills in health care encounters (MISHCE) (Petrova et al., 2015), and some the Manual for Motivational Interviewing Skill code (MISC) (Miller et al., 2003), which all allow scoring of MI skills that are displayed in clinical session segments, while others relied on self-report or unvalidated questionnaires (see Tables 2–4).

3.4. Outcomes summary

All seventeen studies reported some uptake of MI skills by health practitioners following an MI training intervention; however, with varied level of improvement and maintenance of this improvement (Tables 2–4). Fourteen studies (Britt & Blampied, 2010; Brug et al., 2007; Doherty et al., 2000; Ekong et al., 2020; El-Mallakh et al., 2012; Keukenkamp et al., 2017; Magill et al., 2018; Nightingale et al., 2016; Rosenbek Minet et al., 2011; Rubak et al., 2006; Skelton, 2012; Stoffers & Hatler, 2017; van Eijk-Hustings et al., 2011; Welch et al., 2011) reported improvements in more than 50% of MI-related skill outcomes assessed, while the other three studies reported improvements in 8–35% of MI-related skill outcomes (Tables 2–4).

Change statements and increasing open questions were found to improve particularly frequently, while empathy and reflections increased in some. Skills that did not improve varied widely between studies (Tables 2–4).

3.5. Detailed outcomes

The findings from the six controlled studies with outcomes of both an intervention and a control group post-training, and thereby most robust for our outcome of interest, are individually summarised below (see Table 2 for further details).

In an RCT with low risk of bias, Rubak and colleagues (Rubak et al., 2006) randomised 65 GPs to receive an MI intervention (1.5 days of initial MI training and two half-day follow-up support MI sessions) or control group (no MI training or support sessions) and were followed up for one year. They also assessed the outcomes at the same time of a third, non-randomised, historical group of 20 GPs who had received the MI intervention three years earlier and no further updates since. At one year, the MI intervention group had significantly greater mean scores on all four generalised scenarios used to assess outcomes compared to the control group (all, $p < 0.05$), while they were similar to the historical MI intervention group (all, $p > 0.05$).

In a cluster RCT with low risk of bias, Jansink, Braspenning, Laurant, et al., (2013) randomised 65 nurses to an MI intervention (2.5 days over 6 months, follow-up session at 4 months, plus monthly calls) or control group (no training). At one-year post training, significantly higher scores were found for the intervention on only 2 of the 24 MI skills assessed ('Inviting the patient to talk about



Table 4. Evidence table for studies with a non-controlled design for practitioner training and outcomes.

Study design, setting	Study population/ characteristics	MI Training (MI) and control (C) details	Outcome category & results
<p>Ismail et al. (2010) (ADaPT study) RCT (patient outcomes) Design in relation to practitioner outcomes: cohort study Setting: 7 secondary care settings London/Manchester (United Kingdom) Follow up: 1 year</p>	<p>MI: 6 nurses C: 6 nurses Age: NR Experience: min 3 years Sex: 100% female Retention: 1yr: MI: C: NR</p>	<p>MI: 2x1day MET + 5x1-day CBT + weekly supervision throughout study C: Usual care</p>	<p>MI application (MITI + MISC) Empathy & MI adherence *: Spirit ** Giving information; MI Nonadherence; Closed Q; Open Q; Simple reflections; Complex reflections; Total reflections NS</p>
<p>Rosenbek Minnet et al. (2011) RCT (patient outcomes) Design in relation to practitioner outcomes: Cohort Study Setting: Secondary care setting; Denmark Follow up: 1 and 2 years</p>	<p>MI: 3 DSN, 2 Dietitians, 1 physio & 1 psychologist. C: Nil Age: NR Experience: NR Sex: NR Retention: 1&2yrs: MI: 0</p>	<p>MI: 5x1-day training sessions + 3 practical coaching sessions 3 mthly. Individual supervision with 10 real pt. C: Nil</p>	<p>MI application (MITI) No comparisons with controls Global rating 4–5 points / MI adherent behaviour counts: 80–100% Open Q: 76–83% / Complex reflections 36–42% / Reflection to Q ratio: 0.8 - 1.8.</p>
<p>Skelton (2012) Cohort study Setting: Primary care setting; USA Follow up: 1 year</p>	<p>MI: 5 pharmacy residency sites C: 5 pharmacy residency sites Age: NR Experience: NR Sex: NR Retention: 1yr: I & C: NR</p>	<p>MI: 2x1-day project implementation + MI + 1x webinar negotiating change + 1 x training programme: pharmaceutical care DM. C: Usual care</p>	<p>MI knowledge and use (objective – survey): Baseline vs Post study Very knowledgeable: Before:67%; Post-training: 88%. Skilled in applying MI: Before:17%; Post-training:38% Post-training: 88% very prepared and 86% very confident to communicate with patients</p>
<p>Keukenkamp et al. (2017) Pilot RCT (patient outcomes) Design in relation to practitioner outcomes: treatment fidelity assessment Setting: Secondary care setting Amsterdam (the Netherlands) Follow up: 3 years Ekong et al. (2020) Cohort Study; ROB: Setting: USA Tertiary care hospital Follow up: 6 months</p>	<p>MI: Physical therapist: 1; Human movement scientist: 1 C: 0 Age: NR Experience: NR Sex: NR Retention: 3yrs: MI:NR MI: 8 pharmacists Age: NR Experience: NR Sex: NR Retention 6 months: NR</p>	<p>MI: 16 h group training + 3x 2 h private training sessions + Audio feedback C: DM Education</p>	<p>Results (CoSIT – MI – number of MI skills applied during two 20-minute sessions): Investigator one and two Application of basic skills: one: 54; two 49 times Elicit change talk: one: 13; two: 11 times MI principals: one: 5; two: 5.5</p>
<p>Motivational Interviewing Skills Code; MITI 4.2.1: Motivational Interviewing Treatment Integrity; BECCI: Behaviour Change Counselling Index., MTD: Multidisciplinary; DNE: Diabetes Nurse Educator.</p>	<p>Motivational Interviewing Skills in Health Care Encounters (MISHCE) Acceptable MI consistency scores (averages range from 88.0–91.5%)</p>	<p>Motivational Interviewing Skills in Health Care Encounters (MISHCE) Acceptable MI consistency scores (averages range from 88.0–91.5%)</p>	<p>Motivational Interviewing Skills in Health Care Encounters (MISHCE) Acceptable MI consistency scores (averages range from 88.0–91.5%)</p>

Note: NS: not significantly different ($p > .05$); * $p < .05$; ** $p < .01$; *** $p < .001$. C: Control group; I: Intervention group; MISC: Motivational Interviewing Skills Code; MITI 4.2.1: Motivational Interviewing Treatment Integrity; BECCI: Behaviour Change Counselling Index., MTD: Multidisciplinary; DNE: Diabetes Nurse Educator.

behaviour change') ($p < 0.01$) and ('Assessing the patient's confidence in changing their lifestyle') ($p < 0.05$). For all other skills, differences between intervention and control were not significant ($p < 0.05$), and mean scores were below 2 on a 5-point scale, meaning that neither group was assessed as competent in the MI-related skills.

In another RCT with low risk of bias, Brug et al. (2007) randomised 37 dietitians to receive an MI intervention (2 days of initial training in MI and a one-day follow-up workshop) or control group (no training) and were followed up for 6 months. At one-month follow-up, they found significantly better scores in the intervention group for lack of fidelity to MI principles (1.2 vs 3.2), reflections (10.9 vs 6.9) (both $p < 0.05$) and allowing patients to talk more (55.6 vs 5.6%) ($p < 0.001$). At 6 months, they found significantly better scores in the intervention group for lack of fidelity (1.6 vs 3.8), reflections (11.8 vs 6.8), empathy (4.4 vs 3.1), spirit (4.1 vs 2.5), change statements (3.6 vs 1.1) (all $p < 0.05$), and allowing patients to talk more (50.0% vs 6.7%) ($p < 0.001$). However, they found no differences for closed or open questions or overall adherence to MI at either post-treatment assessment (all $p > 0.05$).

In another RCT with low risk of bias, the Diabetes-6 study, Ismail and colleagues (Graves et al., 2016; Ismail et al., 2018; Magill et al., 2018) randomised 23 nurses to an MI intervention (3 h training per week for 12 weeks and monthly group supervision) or control group (no training). Skills were assessed immediately post training (Magill et al., 2018). The intervention group scored significantly higher on global spirit (4.03 vs 2.63), global empathy (4.23 vs. 3.40), percentage open questions (46.5 vs. 23.1), and percentage MI-adherence (63.4 vs. 21.4) (all $p < 0.001$), while the reflection-to-question ratio and percentage complex reflections did not differ from the control group (both, $p > 0.05$) (Magill et al., 2018).

In a non-RCT with high risk of bias, Nightingale and colleagues (Nightingale et al., 2016) recruited 88 family medicine residents from three university sites. Thirty residents from site A were selected to an intervention (one 3-hour MI training session and three 1-hour booster sessions over 6 months). Training attendance varied between participants (12.5% attended 1 session; 62.5% attended 2 sessions; 25% attended 3 sessions; no one attended all 4 sessions). The residents from sites B and C were used as control group (no training). Skills were assessed with surveys pre-training and at eleven months post-training. Self-reported use of MI-adherent approaches increased significantly in both intervention (27% to 53%; $p < 0.001$) and control groups (36% to 47%; $p < 0.05$). Knowledge increased only in the intervention group (from 47% to 69% $p < 0.01$), while the control group remained unchanged at 63%. The same was found for reported application of MI (19% increase in intervention $p < 0.05$, no change for control group). However, the control group had higher scores at baseline for these latter items.

In an RCT with high risk of bias, Welch and colleagues (Welch et al., 2011) randomised four Certified Diabetes Care and Education Specialists (CDCESs) to receive an MI intervention (two days of initial training with a further two days over twelve months follow-up, plus in-person and group conference calls) or control group (no training). Significantly better post-training scores (p -values < 0.01) were found for the intervention over the control group in the MISC areas of mean MI spirit, inconsistent responses, % reflection to question ratio, % open questions and client change talk. Skills that were attained were reported in the paper to be maintained over time, but without quantification of that result.

4. Discussion

MI can only improve outcomes in patient behaviour when healthcare practitioners are effectively trained in its skills and supported in applying them in routine care. We systematically reviewed the literature for studies on the effectiveness of MI training on diabetes healthcare practitioners, looking at MI-related skills and maintenance of these skills in clinical practice. We identified 22 eligible publications from 17 studies. All studies reported some improvement in MI-related skills by health practitioners following MI training; however, the level of improvement, the specific skills

that did improve and the sustainment of this improvement over time varied considerably, along with the methodological quality of studies.

All studies identified in this systematic review showed uptake and maintenance of MI-related skills post-training, with 14 studies finding improvements in >50% of skills assessed. No clear associations with method, content, or intensity of training emerged. Of the six studies that primarily investigated practitioner training and outcomes by comparing an intervention and a control group, all showed improvement in practitioners' MI-related skills (Brug et al., 2007; Jansink, Braspenning, Laurant, et al., 2013; Magill et al., 2018; Nightingale et al., 2016; Rubak et al., 2006; Welch et al., 2011). Three RCTs with low risk of bias showed overall practitioner improvement post-training at long-term follow up (Brug et al., 2007; Magill et al., 2018; Rubak et al., 2006), as did two studies (another RCT and one non-RCT) with high risk of bias (Nightingale et al., 2016; Welch et al., 2011). The exception was one RCT with low risk of bias that showed very minor improvement, with only 2 of the 24 skills assessed improved at 14 months follow-up (Jansink, Braspenning, Laurant, et al., 2013). The other studies identified in our literature review all showed practitioner improvement post-training, but varied from improvement in only some skills to improvement in almost all skills. Other systematic reviews on healthcare practitioners not working with people with diabetes also report an increase in MI application, knowledge and skills following training, and share our observation of substantial variations between studies (Ekong & Kavookjian, 2016; Lundahl et al., 2013; Thepwongsa et al., 2017).

Overall, the initial MI training in the studies included in this systematic review ranged from 2–40 h and mostly consisted of didactic training in concepts of MI, video examples, and role play. Comparable training characteristics have been reported in systematic reviews focusing on MI training for other health practitioners (Ekong & Kavookjian, 2016; Thepwongsa et al., 2017). Another systematic review reported a mean of 18 h of training (Lundahl et al., 2013), while two others report ranges of 3–80 h (Ekong & Kavookjian, 2016; Thepwongsa et al., 2017), similar to finding a median 16 h and ranges of 2–40 h in this systematic review. Training methods, content, and intensity (condensed or spread over longer periods) varied between studies reported in other systematic reviews (Ekong & Kavookjian, 2016; Lundahl et al., 2013; Thepwongsa et al., 2017). Provision of training was in the form of group sessions and included follow-up supervision, similar to the content found in studies included in this systematic review. Especially follow-up seems important, as analysis of facilitators and barriers identified ongoing supervision as important to support practitioners to maintain their skills (Doherty et al., 2000; van Eijk-Hustings et al., 2011). However, further research is needed to identify training characteristics that differentiate studies with varying outcomes. Interestingly, none of the reviewed studies included recent extensions or improvements to MI, such as Functional Imagery Training (FIT) (Jon et al., 2015; Kavanagh et al., 2014; Rhodes et al., 2018; Solbrig et al., 2019). FIT retains the spirit of MI, but undertakes it using imagery instead, which is more closely linked to emotion than verbal discussion (Ji et al., 2019), and then shows participants how to use motivational imagery as a self-management skill. Again, further research is needed in this and other modified forms of MI, for example in controlled studies comparing different training regimens.

The MI-related skills that most frequently improved following training were change statements and open questions (Brug et al., 2007; Welch et al., 2011), perhaps because they are less complex to learn and apply during clinical sessions. Empathy and MI spirit also increased in some studies (Brug et al., 2007; Magill et al., 2018), suggesting that practitioners can grasp the understanding of the global spirit of MI, and the empathetic and collaborative way in which it should be delivered. Some other skills appear to be more difficult to teach, acquire and apply to a clinical setting. Examples of such complex skills are 'complex reflections' ('reflections that anticipate what clients mean but have not said' (Moyers et al., 2015)), and reduction of confrontation or cathartic interventions (Doherty et al., 2000). Training and close supervision over longer periods may be needed to support practitioners in attaining such complex skills, and may reduce a tendency to revert back to previous ways of communication (Doherty et al., 2000; van Eijk-Hustings et al., 2011).

Other reasons for variations in uptake and application of training may include practitioner interest and whether their involvement was voluntary, which may affect their enthusiasm to learn and apply skills (Britt & Blampied, 2010; Doherty et al., 2000). Contextual factors in the clinical setting are known to also affect the maintenance and use of new skills in routine practice (Graves et al., 2016; van Eijk-Hustings et al., 2011). Examples include lack of support from managers or physicians, workload, time restrictions for appointments and onerous paperwork (Graves et al., 2016; van Eijk-Hustings et al., 2011). Training outcomes may also vary because of differential prior exposure to MI or other communication skills; however, these variables were poorly reported in studies included in this systematic review. Client health literacy and engagement in discussion could also affect practitioner application of MI-related skills, as MI needs a partnership between practitioner and client.

The next step after ensuring effective training to practitioners is for their competent application of MI-related skills to give positive outcomes in patients. A previous systematic review examined provision of training and found that it was not associated with patient outcomes in medical care settings (Lundahl et al., 2013). Interestingly of our fifteen included studies, eight reported on patient outcomes (Brug et al., 2007; Ismail et al., 2008; Jansink, Braspenning, Laurant, et al., 2013; Keukenkamp et al., 2017; Magill et al., 2018; Rosenbek Minet et al., 2011; Skelton, 2012; Welch et al., 2011): five of these reported that patient outcomes did not improve (Ismail et al., 2008; Jansink, Braspenning, Laurant, et al., 2013; Magill et al., 2018; Rosenbek Minet et al., 2011; Welch et al., 2011), despite one of these providing the highest amount of training (40 h) as well as supervision and follow-up (Rosenbek Minet et al., 2011). Of the remaining three studies that reported improved patient outcomes (Brug et al., 2007; Keukenkamp et al., 2017; Skelton, 2012), one reported patients having lower saturated fat intake, but no change to BMI and HbA1c (Brug et al., 2007), one reported improved medication use (Skelton, 2012), and one reported, although non-significant, a tendency for short-term improvement in wearing prescribed footwear in home (Keukenkamp et al., 2017). These three all had at least 16 h of training, with varied follow-up/supervision. The lack of reported good patient outcomes cannot be a reason to discontinue research into training practitioners in MI, as the best way to train and measure skills taught is still unknown.

There were a number of common limitations of the studies identified. Only six of the fifteen studies had a primary focus on the impact of MI training and compared trained and untrained groups using standardised measuring tools, while the remainder only reported the outcomes of practitioners who received training or had effects of training as a secondary outcome in a trial primarily investigating patient-related outcomes. Although improvement of patient outcomes is the ultimate goal of training in MI, it is important that trials describe the training in detail and assess the MI-related skills' outcomes of practitioners in both the intervention and the control group, pre- and post-training. These actions would avoid the ascription of any negative or inconclusive results to practitioners in the control group also displaying some MI-like skills and would add to our understanding of optimal MI training methods.

The identified studies also had relatively small sample sizes, with the largest intervention group comprising of 33 health practitioners, resulting in restricted statistical power to detect changes. There were also large variations in background and experience of healthcare practitioners who were included, for which most studies did not control. Finally, not all practitioners who treat persons with diabetes were included in these studies, such as endocrinologists, ophthalmologists and podiatrists. It is not yet clear whether MI training may also result in practice changes in those professions.

Outcome assessor blinding was only present in three of the fifteen studies, leaving open the possibility of assessment bias, especially on the observational measures. Outcome assessors can, and should, be blinded for training outcomes, and this should become standard practice in future trials. It is not possible to blind participants who receive training, but it may be possible to deliver control training that provides similar novelty effects or expectancies of improved outcomes as MI training. In addition, some studies relied on self-reported use of MI (Nightingale et al., 2016; Rubak et al., 2006; Skelton, 2012; Stoffers & Hatler, 2017; Stott et al., 1996), which is known to be

unreliable (Skelton, 2012). The gold standard for measuring MI application is direct assessment of practitioners (Brug et al., 2007), which was undertaken in nine studies, most frequently with the MITI (Moyers et al., 2003) or MISC (Miller et al., 2003). We recommend that future studies always include one of these two instruments for outcome assessment, to increase comparability between studies and confidence in results.

A strength of this systematic review was the use of a broad search string and a forward and backward search of included papers, minimising the risk of missing relevant papers. Further, all screening and assessments were completed by two independent investigators, and Cochrane tools were used for risk of bias assessment. A limitation of our study was the heterogeneity in the design and methodological quality of studies and the small number of randomised controlled trials of high quality. More studies directly addressing this research question are needed. A recent health technology assessment on psychological interventions for people with diabetes also identified the lack of detail on healthcare practitioner training, including competency before delivering and evaluating MI following training (Winkley et al., 2020). They stated this as a key recommendation for future research (Winkley et al., 2020), and our systematic review is a first step in that direction. Another limitation of our study is including face-to-face training only. We made this choice to reduce differences between training programmes, but online training could be a viable alternative to face-to-face training when that is not possible. Future reviews should consider to include these other forms of training as well.

In conclusion, despite the heterogeneity in the nature and quality of research to date, all of the seventeen studies included in this literature review showed that diabetes healthcare practitioners acquired and applied MI skills post-training, with fourteen showing improvement in more than 50% of MI related skills assessed. Most studies had at least 16 h of MI training, including education on the core concepts of MI, and the training allowed for practice, such as via role play. Training was frequently delivered in small training groups, and ongoing follow-up and supervision support were frequently provided to maintain skills and provide opportunities to learn from feedback. We suggest these items to be included in future MI training programmes. However, future research to test components of MI training is still needed, and should consist of high-quality randomised controlled trials that are adequately powered, and use established, standardised observational tools to assess the application of MI skills in treatment sessions.

Acknowledgements

We gratefully acknowledge support from librarians Chris Parker, Megan Neumann and Jana Waldmann at The Prince Charles Hospital Rhode Road, Brisbane, Queensland Health. Also, thanks to Avon Dalitz for all his help with formatting of spreadsheets for identified papers.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Tracey Kaczmarek  <http://orcid.org/0000-0002-9661-153X>

Jaap J. Van Netten  <http://orcid.org/0000-0002-6420-6046>

References

- Barwick, M. A., Bennett, L. M., Johnson, S. N., McGowan, J., & Moore, J. E. (2012). Training health and mental health professionals in motivational interviewing: A systematic review. *Children and Youth Services Review, 34*(9), 1786–1795. <https://doi.org/10.1016/j.childyouth.2012.05.012>
- Berhe, K. K., Gebru, H. B., & Kahsay, H. B. (2020). Effect of motivational interviewing intervention on HgbA1C and depression in people with type 2 diabetes mellitus (systematic review and meta-analysis). *PLoS One, 15*(10), e0240839. <https://doi.org/10.1371/journal.pone.0240839>

- Britt, E., & Blampied, N. M. (2010). Motivational interviewing training: A pilot study of the effects on practitioner and patient behaviour. *Behavioural and Cognitive Psychotherapy*, 38(2), 239–244. <https://doi.org/10.1017/S1352465809990531>
- Brug, J., Spikmans, F., Aartsen, C., Breedveld, B., Bes, R., & Ferreira, I. (2007). Training dietitians in basic motivational interviewing skills results in changes in their counseling style and in lower saturated fat intakes in their patients. *Journal of Nutrition Education and Behavior*, 39(1), 8–12. <https://doi.org/10.1016/j.jneb.2006.08.010>
- Chilton, R., Pires-Yfantouda, R., & Wylie, M. (2012). A systematic review of motivational interviewing within musculoskeletal health. *Psychology, Health & Medicine*, 17(4), 392–407. <https://doi.org/10.1080/13548506.2011.635661>
- Cho, N. H., Shaw, J. E., Karuranga, S., Huang, Y., da Rocha Fernandes, J. D., Ohlrogge, A. W., & Malanda, B. (2018). IDF diabetes atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabetes Research and Clinical Practice*, 138, 271–281. <https://doi.org/10.1016/j.diabres.2018.02.023>
- Connor, J. (2003). *Adherence to long-term therapies. Evidence for action*. World Health Organization. Essential Drugs Monitor. 2005(34):33.
- De Geest, S., & Sabate, E. (2003). Adherence to long-term therapies: Evidence for action. *European Journal of Cardiovascular Nursing*, 2(4), 323. [https://doi.org/10.1016/S1474-5151\(03\)00091-4](https://doi.org/10.1016/S1474-5151(03)00091-4)
- DiMatteo, M. R. (2004). Variations in patients' adherence to medical recommendations: A quantitative review of 50 years of research. *Medical Care*, 42(3), 200–209. <https://doi.org/10.1097/01.mlr.0000114908.90348.f9>
- Doherty, Y., Hall, D., James, P. T., Roberts, S. H., & Simpson, J. (2000). Change counselling in diabetes: The development of a training programme for the diabetes team. *Patient Education and Counseling*, 40(3), 263–278. [https://doi.org/10.1016/S0738-3991\(99\)00079-8](https://doi.org/10.1016/S0738-3991(99)00079-8)
- Ekong, G., Chou, C., Lakin, J., Hardin, A., Fox, B., Hunt, C., & Kavookjian, J. (2020). Pharmacist-led motivational interviewing for diabetes medication adherence in a worksite wellness program. *Journal of the American Pharmacists Association*, 60(6), e224–e229. <https://doi.org/10.1016/j.japh.2020.07.025>
- Ekong, G., & Kavookjian, J. (2016). Motivational interviewing and outcomes in adults with type 2 diabetes: A systematic review. *Patient Education and Counseling*, 99(6), 944–952. <https://doi.org/10.1016/j.pec.2015.11.022>
- El-Mallakh, P., Chlebowy, D. O., Wall, M. P., Myers, J. A., & Cloud, R. N. (2012). Promoting nurse interventionist fidelity to motivational interviewing in a diabetes self-care intervention. *Research in Nursing & Health*, 35(3), 289–300. <https://doi.org/10.1002/nur.21472>
- Emmons, K. M., & Rollnick, S. (2001). Motivational interviewing in health care settings: Opportunities and limitations. *American Journal of Preventive Medicine*, 20(1), 68–74. [https://doi.org/10.1016/S0749-3797\(00\)00254-3](https://doi.org/10.1016/S0749-3797(00)00254-3)
- Fisher, L., Polonsky, W. H., Hessler, D., & Potter, M. B. (2017). A practical framework for encouraging and supporting positive behaviour change in diabetes. *Diabetic Medicine*, 34(12), 1658–1666. <https://doi.org/10.1111/dme.13414>
- Gabbay, R. A., Kaul, S., Ulbrecht, J., Scheffler, N. M., & Armstrong, D. G. (2011). Motivational interviewing by podiatric physicians: A method for improving patient self-care of the diabetic foot. *Journal of the American Podiatric Medical Association*, 101(1), 78–84. <https://doi.org/10.7547/1010078>
- Golay, A., Lagger, G., Chambouleyron, M., Carrard, I., & Lasserre-Moutet, A. (2008). Therapeutic education of diabetic patients. *Diabetes/Metabolism Research and Reviews*, 24(3), 192–196. <https://doi.org/10.1002/dmrr.798>
- Graves, H., Garrett, C., Amiel, S. A., Ismail, K., & Winkley, K. (2016). Psychological skills training to support diabetes self-management: Qualitative assessment of nurses' experiences. *Primary Care Diabetes*, 10(5), 376–382. <https://doi.org/10.1016/j.pcd.2016.03.001>
- Hall, K., Gibbie, T., & Lubman, D. I. (2012). Motivational interviewing techniques: Facilitating behaviour change in the general practice setting. *Australian Family Physician*, 41(9), 660–667.
- Ismail, K., Maissi, E., Thomas, S., Chalder, T., Schmidt, U., Bartlett, J., Patel, A., Dickens, C., Creed, F., & Treasure, J. (2010). A randomised controlled trial of cognitive behaviour therapy and motivational interviewing for people with type 1 diabetes mellitus with persistent sub-optimal glycaemic control: A diabetes and psychological therapies (ADaPT) study. *Health Technology Assessment*, 14(22), 1–127. <https://doi.org/10.3310/hta14220>
- Ismail, K., Thomas, S. M., Maissi, E., Chalder, T., Schmidt, U., Bartlett, J., Patel, A., Dickens, C. M., Creed, F., & Treasure, J. (2008). Motivational enhancement therapy with and without cognitive behavior therapy to treat type 1 diabetes: A randomized trial. *Annals of Internal Medicine*, 149(10), 708–719. <https://doi.org/10.7326/0003-4819-149-10-200811180-00005>
- Ismail, K., Winkley, K., de Zoysa, N., Patel, A., Heslin, M., Graves, H., Thomas, S., Stringer, D., Stahl, D., & Amiel, S. A. (2018). Nurse-led psychological intervention for type 2 diabetes: A cluster randomised controlled trial (diabetes-6 study) in primary care. *British Journal of General Practice*, 68(673), e531–e540. <https://doi.org/10.3399/bjgp18X696185>
- Jansink, R., Braspenning, J., Keizer, E., van der Weijden, T., Elwyn, G., & Grol, R. (2013). No identifiable Hb1Ac or lifestyle change after a comprehensive diabetes programme including motivational interviewing: A cluster randomised trial. *Scandinavian Journal of Primary Health Care*, 31(2), 119–127. <https://doi.org/10.3109/02813432.2013.797178>
- Jansink, R., Braspenning, J., Laurant, M., Keizer, E., Elwyn, G., Weijden, T. V. D., & Grol, R. (2013). Minimal improvement of nurses' motivational interviewing skills in routine diabetes care one year after training: A cluster randomized trial. *BMC Family Practice*, 14(1), 44. <https://doi.org/10.1186/1471-2296-14-44>
- Ji, J., Kavanagh, D., Holmes, E., Macleod, C., & Di Simplicio, M. (2019). Mental imagery in psychiatry: Conceptual & clinical implications. *CNS Spectrums*, 24(1), 114–126. <https://doi.org/10.1017/S1092852918001487>

- Johnson, M. J. (2002). The medication adherence model: A guide for assessing medication taking. *Research and Theory for Nursing Practice*, 16(3), 179–192. <https://doi.org/10.1891/rtnp.16.3.179.53008>
- Kavanagh, D. J., Andrade, J., May, J., & Connor, J. P. (2014). Motivational interventions may have greater sustained impact if they trained imagery-based self-management. *Addiction*, 109(7), 1062–1063. <https://doi.org/10.1111/add.12507>
- Keukenkamp, R., Merckx, M. J., Busch-Westbroek, T. E., & Bus, S. A. (2017). An explorative study on the efficacy and feasibility of the use of motivational interviewing to improve footwear adherence in persons with diabetes at high-risk of foot ulceration. *Journal of the American Podiatric Medical Association*, 108(2), 90–99. <https://doi.org/10.7547/16-171>
- King, D. E., Mainous, A. G., Carnemolla, M., & Everett, C. J. (2009). Adherence to healthy lifestyle habits in US adults, 1988–2006. *The American Journal of Medicine*, 122(6), 528–534. <https://doi.org/10.1016/j.amjmed.2008.11.013>
- Konstantinou, P., Kassianos, A. P., Georgiou, G., Panayides, A., Papageorgiou, A., Almas, I., Wozniak, G., & Karekla, M. (2020). Barriers, facilitators, and interventions for medication adherence across chronic conditions with the highest non-adherence rates: A scoping review with recommendations for intervention development. *Translational Behavioral Medicine*, 10(6), 1390–1398. <https://doi.org/10.1093/tbm/ibaa118>
- Lazzarini, P. A., Gurr, J. M., Rogers, J. R., Schox, A., & Bergin, S. M. (2012). Diabetes foot disease: The Cinderella of Australian diabetes management? *Journal of Foot and Ankle Research*, 5(1), 24. <https://doi.org/10.1186/1757-1146-5-24>
- Lundahl, B., Moleni, T., Burke, B. L., Butters, R., Tollefson, D., Butler, C., & Rollnick, S. (2013). Motivational interviewing in medical care settings: A systematic review and meta-analysis of randomized controlled trials. *Patient Education and Counseling*, 93(2), 157–168. <https://doi.org/10.1016/j.pec.2013.07.012>
- Magill, N., Graves, H., de Zoysa, N., Winkley, K., Amiel, S., Shuttlewood, E., Landau, S., & Ismail, K. (2018). Assessing treatment fidelity and contamination in a cluster randomised controlled trial of motivational interviewing and cognitive behavioural therapy skills in type 2 diabetes. *BMC Family Practice*, 19(1), 60. <https://doi.org/10.1186/s12875-018-0742-5>
- May, J., Andrade, J., & Kavanagh, D. J. (2015). An imagery-based road map to tackle maladaptive motivation in clinical disorders. *Frontiers in Psychiatry*, 6. <https://doi.org/10.3389/fpsy.2015.00014>
- Maissi, E., Ridge, K., Treasure, J., Chalder, T., Roche, S., Bartlett, J., Schmidt, U., Thomas, S., & Ismail, K. (2011). Nurse-led psychological interventions to improve diabetes control: Assessing competencies. *Patient Education and Counseling*, 84(2), e37–e43. <https://doi.org/10.1016/j.pec.2010.07.036>
- Miller, W. R. M. T., Ernst, D., & Amrhein, P. (2003). *Manual for motivational interviewing skill code (MISC) version 2.0*. University of New Mexico Center on Alcoholism, Substance Abuse and Addictions.
- Miller, W. R., & Rollnick, S. (1991). *Motivational interviewing: Preparing people to change addictive behavior*. The Guilford Press. xvii, 348–xvii, p.
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *British Medical Journal*, 339(7716), 332. <https://doi.org/doi:10.1136/bmj.b2535>
- Morton, K., Beauchamp, M., Prothero, A., Joyce, L., Saunders, L., Spencer-Bowdage, S., Dancy, B., & Pedlar, C. (2015). The effectiveness of motivational interviewing for health behaviour change in primary care settings: A systematic review. *Health Psychology Review*, 9(2), 205–223. <https://doi.org/10.1080/17437199.2014.882006>
- Moyers, T. B. M. T., Manuel, J. K., & Miller, W. R. (2003). *The motivational interviewing treatment integrity (MITI) code. Version 2.0*. University of New Mexico Center on Alcoholism, Substance Abuse and Addictions (CASSA).
- Moyers, T. B., Manuel, J. K., & Ernst, D. (2015). *Motivational interviewing treatment integrity coding manual 4.2.1* [Unpublished manual].
- Nightingale, B., Gopalan, P., Azzam, P., Douaihy, A., & Conti, T. (2016). Teaching brief motivational interventions for diabetes to family medicine residents. *Family Medicine*, 48(3), 187–193.
- Patel, A., Maissi, E., Chang, H.-C., Rodrigues, I., Smith, M., Thomas, S., Chalder, T., Schmidt, U., Treasure, J., & Ismail, K. (2011). Motivational enhancement therapy with and without cognitive behaviour therapy for type 1 diabetes: Economic evaluation from a randomized controlled trial. *Diabetic Medicine*, 28(4), 470–479. <https://doi.org/10.1111/j.1464-5491.2010.03198.x>
- Petrova, T., Kavookjian, J., Madson, M. B., Dagley, J., Shannon, D., & McDonough, S. K. (2015). Motivational interviewing skills in health care encounters (MISHCE): Development and psychometric testing of an assessment tool. *Research in Social and Administrative Pharmacy*, 11(5), 696–707. <https://doi.org/10.1016/j.sapharm.2014.12.001>
- Rhodes, J., May, J., Andrade, J., & Kavanagh, D. (2018). Enhancing grit through functional imagery training in professional soccer. *The Sport Psychologist*, 32(3), 220. <https://doi.org/10.1123/tsp.2017-0093>
- Rosenbek Minet, L. K., Wagner, L., Lønving, E. M., Hjelmberg, J., & Henriksen, J. E. (2011). The effect of motivational interviewing on glycaemic control and perceived competence of diabetes self-management in patients with type 1 and type 2 diabetes mellitus after attending a group education programme: A randomised controlled trial. *Diabetologia*, 54(7), 1620–1629. <https://doi.org/10.1007/s00125-011-2120-x>
- Rubak, S., Sandbaek, A., Lauritzen, T., Borch-Johnsen, K., & Christensen, B. (2006). An education and training course in motivational interviewing influence: GPs' professional behaviour—ADDITION Denmark. *The British Journal of General Practice*, 56(527), 429–436.
- Skelton, J. B. (2012). DOTx.MED: Pharmacist-delivered interventions to improve care for patients with diabetes. *Journal of the American Pharmacists Association*, 52(1), 25–37. <https://doi.org/10.1331/JAPhA.2012.12501>

- Soderlund, P. (2018). Effectiveness of motivational interviewing for improving physical activity self-management for adults with type 2 diabetes: A review. *Chronic Illness, 14*(1), 54–68. <https://doi.org/10.1177/1742395317699449>
- Solbrig, L., Whalley, B., Kavanagh, D. J., May, J., Parkin, T., Jones, R., & Andrade, J. (2019). Functional imagery training versus motivational interviewing for weight loss: A randomised controlled trial of brief individual interventions for overweight and obesity. *International Journal of Obesity, 43*(4), 883. <https://doi.org/10.1038/s41366-018-0122-1>
- Söderlund, L. L., Madson, M. B., Rubak, S., & Nilsen, P. (2011). A systematic review of motivational interviewing training for general health care practitioners. *Patient Education and Counseling, 84*(1), 16–26. <https://doi.org/10.1016/j.pec.2010.06.025>
- Stoffers, P. J., & Hatler, C. (2017). Increasing nurse confidence in patient teaching using motivational interviewing. *Journal for Nurses in Professional Development, 33*(4), 189–195. <https://doi.org/10.1097/NND.0000000000000370>
- Stott, N. C. H., Rees, M., Rollnick, S., Pill, R. M., & Hackett, P. (1996). Professional responses to innovation in clinical method: Diabetes care and negotiating skills. *Patient Education and Counseling, 29*(1), 67–73. [https://doi.org/10.1016/0738-3991\(96\)00935-4](https://doi.org/10.1016/0738-3991(96)00935-4)
- Thepwongsa, I., Muthukumar, R., & Kessomboon, P. (2017). Motivational interviewing by general practitioners for type 2 diabetes patients: A systematic review. *Family Practice, 34*(4), 376–383. <https://doi.org/10.1093/fampra/cmz045>
- Usherwood, T. (2017). Encouraging adherence to long-term medication. *Australian Prescriber, 40*(4), 147–150. <https://doi.org/10.18773/austprescr.2017.050>
- van Eijk-Hustings, Y. J. L., Daemen, L., Schaper, N. C., & Vrijhoef, H. J. M. (2011). Implementation of motivational interviewing in a diabetes care management initiative in the Netherlands. *Patient Education and Counseling, 84*(1), 10–15. <https://doi.org/10.1016/j.pec.2010.06.016>
- Vluggen, S., Hoving, C., Schaper, N. C., & de Vries, H. (2018). Exploring beliefs on diabetes treatment adherence among Dutch type 2 diabetes patients and healthcare providers. *Patient Education and Counseling, 101*(1), 92–98. <https://doi.org/10.1016/j.pec.2017.07.009>
- Welch, G., Zagarins, S. E., Feinberg, R. G., & Garb, J. L. (2011). Motivational interviewing delivered by diabetes educators: Does it improve blood glucose control among poorly controlled type 2 diabetes patients? *Diabetes Research and Clinical Practice, 91*(1), 54–60. <https://doi.org/10.1016/j.diabres.2010.09.036>
- Winkley, K., Upsher, R., Stahl, D., Pollard, D., Kaseera, A., Brennan, A., Heller, S., & Ismail, K. (2020). Psychological interventions to improve self-management of type 1 and type 2 diabetes: A systematic review. *Health Technology Assessment, 24*(28), 1–232. <https://doi.org/10.3310/hta24280>

Appendix 1

Appendix 1



PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Title page
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.	1,3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	2,3
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	3,4
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.	3
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.	3,4
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.	3,4
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	3
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).	3,4
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.	3,4,5
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	3,4
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.	4
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	N/A
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.	N/A
Risk of bias across studies			
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).	18
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
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.	5,17
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.	5,19,21,22
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).	6,7,8
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.	7,8
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	N/A
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	18
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
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).	9,10,11
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).	6,11,12
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.	13