Strategies to evaluate healthcare provider trainings in shared decision-making (SDM): a systematic review of evaluation studies

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ABSTRACT
Design and objectives We performed a systematic review of studies evaluating healthcare provider (HCP) trainings in shared decision-making (SDM) to analyse their evaluation strategies.
Setting and participants HCP trainings in SDM from all healthcare settings.
Methods We searched scientific databases (Medline, PsychINFO, CINAHL) for healthcare professionals. We included articles reporting data of summative evaluations of HCP trainings in SDM. Two reviewers screened records, assessed full-text articles, performed data extraction and assessed study quality.

Results Out of 7234 records, we included 41 articles reporting on 30 studies: cluster-randomised (n=8) and randomised (n=9) controlled trials, controlled (n=1) and non-controlled (n=7) before-after studies, mixed-methods (n=1), qualitative (n=1) and post-test (n=3) studies. Most studies were conducted in the USA (n=9), Germany (n=8) or Canada (n=7) and evaluated physician trainings (n=25). Eleven articles met ICROMS quality criteria. Almost all studies (n=27) employed HCP-reported outcomes for training evaluation and most (n=19) additionally used patient-reported (n=12), observer-rated (n=10), standardised patient-reported (n=2) outcomes or training process and healthcare data (n=10). Most studies employed a mix of unpublished and published measures (n=17) and covered two (n=12) or three (n=10) Kirkpatrick’s levels. Identified evaluation outcomes covered all categories of the proposed framework.

Conclusions Strategies to evaluate HCP trainings in SDM varied largely. The proposed evaluation framework maybe useful to structure future evaluation studies, but international agreement on a core set of outcomes is needed to improve evidence.

STRENGTHS AND LIMITATIONS OF THIS STUDY

A strength of this study is the fact that we sought all types of evaluation strategies for healthcare provider trainings in shared decision-making and included all types of study designs from post-test studies to qualitative and cluster-randomised controlled studies.

A limitation of this study is the fact that we did not analyse which measures are useful to evaluate healthcare provider trainings in shared decision-making.

A limitation of the proposed evaluation framework is that it focuses on evaluation outcomes, but does not take into account aspects like appropriate study designs.

INTRODUCTION
Healthcare policies, clinical guidelines and a growing body of research strongly advocate for the implementation of shared decision-making (SDM) as a central element of patient-centred care.1 Policy makers are interested in SDM, because it tackles overuse, underuse and misuse of healthcare interventions all at the same time.2 In SDM, the patient and at least one clinician share information and values, deliberate the next step and arrive at a jointly made decision.3 Patients who experienced SDM reported less decisional conflict and improved satisfaction,4 but evidence regarding health-related outcomes is limited.5 To date, the most
conclusive argument for SDM is ethical. Patients have the right to learn about available treatment options and their implications, and to participate in decision-making regarding their health.\textsuperscript{1, 4} Despite multiple implementation initiatives\textsuperscript{8} and widespread support, SDM is not yet implemented in routine care.\textsuperscript{7, 9}

Interventions to foster the implementation of SDM usually target healthcare providers (HCPs), patients or both.\textsuperscript{10} They may include the distribution of written educational material or patient decision aids, patient coaching, audit and feedback for HCPs or HCP trainings in SDM.\textsuperscript{11} HCP trainings in SDM are group or online courses that address HCP SDM attitudes, knowledge or skills. They include the use of lectures, case studies, role play, group discussion or didactic materials.\textsuperscript{12} HCP trainings in SDM are considered key to implement SDM in healthcare, but it is unclear what kind of trainings are most effective and which outcomes they affect.\textsuperscript{10–13} The lack of consensus on an evaluation framework for HCP trainings in SDM partly accounts for this lack of evidence.\textsuperscript{14}

Evaluation frameworks support practitioners and researchers in the design of coherent evaluation strategies.\textsuperscript{15} Kirkpatrick’s four-level training evaluation model\textsuperscript{16} is the most established and feasible model for training evaluation and can be applied to the context of HCP professional development.\textsuperscript{17} Kirkpatrick’s four levels are: 1) reaction, 2) learning, 3) behaviour and 4) results. The reaction level includes participant reactions to the training and can be assessed with attendance levels or subjective training impressions. The learning level covers participant changes in attitudes, knowledge or skills after the training. The behaviour level covers changes in participant behaviours or transference of training content to the workplace. The results level describes more tangible trainings results, for example, system effects or patient health outcomes.\textsuperscript{4, 17, 18}

Elwyn et al.\textsuperscript{4} argue that SDM research has neglected investigation of diverse long-term consequences on the results level. They postulate that widespread implementation of SDM leads to safer and more cost-effective decisions, to reduce utilisation rates and to improve patient health outcomes, but evidence is lacking.\textsuperscript{5} The influential Quadruple Aim framework aims to improve the experience of care, the health of populations, the per capita cost of healthcare and the work life of HCPs,\textsuperscript{19} and may be useful to structure evaluation of HCP trainings in SDM on the results level.

In this review, we aimed to analyse how the diversity of evaluation strategies and the quality of published evaluations contributes to the current lack of evidence on HCP trainings in SDM. Thus, we aimed to investigate the quality of published evaluations of HCP trainings in SDM, and to analyse their evaluation strategies. We aimed to analyse evaluation strategies regarding 1) use of data sources, 2) use of unpublished or self-developed and published or psychometrically tested measures and 3) coverage of Kirkpatrick’s four levels. We aimed to categorise identified outcomes in an evaluation framework for HCP trainings in SDM based on Kirkpatrick’s four-level evaluation model\textsuperscript{16} and the Quadruple Aim framework\textsuperscript{19} to guide future research and to initiate discussion about a core set of evaluation outcomes for this purpose.

METHODS
Registration and search strategy
This study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines for systematic reviews\textsuperscript{20} in most parts (see online supplementary file S1). We made the following changes to the protocol: we adapted the PICOS (P: patient, problem or population, I: intervention, C: comparison, control or comparator, O: outcomes, S: study type) criteria to meet our research purpose, we did not remove duplicates in the secondary search, we did not assess risk of bias across studies and we did not use any summary measures or additional analyses as we limited our work to qualitative synthesis only. We performed an electronic database search employing Medline, CINAHL and PsycInfo databases (via OVID) on 26 June 2016. For this purpose, we developed a detailed search strategy for each database. We adapted the PICOS criteria\textsuperscript{20} and considered a combination of the following aspects appropriate: population AND intervention AND construct AND outcome OR study design. Terms and keywords were adapted for each database and searches in Medline and PsycInfo were limited to publications concerning humans. We updated the electronic database search on 30 January 2019. Full insight in the electronic database search strategy is attainable in online supplementary file S2. Moreover, we performed a secondary search including reference and citation tracking of included full-text articles, consultation of experts in the field of research via a shared decision-making facebook group and a screening of the Canadian inventory of SDM training programmes for healthcare professionals (http://www.decision.chaire.fmed.ulaval.ca/en/list-of-sdm-programs). Additionally, we screened references of two reviews on SDM interventions for HCPs.\textsuperscript{11, 12} We registered details of the protocol for this systematic review on PROSPERO website accessible via www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42016041623.

Article selection
We aimed to include articles reporting on summative evaluations (outcome or study design) of HCP (population) trainings (intervention) in SDM (construct) and developed inclusion and exclusion criteria, accordingly. We aimed to exclude articles reporting on formative evaluations or interventions that do not have the main aim to teach SDM skills to HCPs (Table 1). Following the first database search (26 June 2016), two reviewers independently screened titles and abstracts of a random sample of 300 (>5%) records identified in the electronic database to ensure sufficient inter-rater reliability. We discussed any differences until we reached consensus.
# Table 1  Descriptive data of included study articles

| Study                  | Country of origin | Study design | Healthcare provider sample* | Patient sample* |
|------------------------|-------------------|--------------|-----------------------------|-----------------|
| Bernhard et al**       | AUS, NZ, CHE, GER, AUT | RCT          | Medical, surgical, radiation and gynaecological oncologists (n=62) | n=769           |
| Bieber et al**         | GER               | RCT          | Specialists in internal medicine (n=13) | n=111           |
| Bieber et al**         | GER               | RCT          | Specialists in internal medicine (n=10) | n=85            |
| Bieber et al**         | GER               | NCBA         | Physicians with direct patient contact (n=123) | n/a             |
| Bieber et al**         | GER               | RCT          | Physicians treating patients with cancer (n=27) | n=107           |
| Butow et al**          | AUS               | RCT          | Medical, surgical, radiation and gynaecological oncologists (n=62) | n=158           |
| Cohen et al**          | UK                | CRCT         | General practitioners (n=20) | n/r             |
| Davis et al**          | UK                | QUAL         | General practitioners (n=21) | n=38            |
| Dion et al**           | CAN               | NCBA         | Family medicine residents (n=247) | n/a             |
| Edwards et al**        | UK                | RCT          | General practitioners (n=20) | n/r             |
| Edwards et al**        | UK                | CRCT         | General practitioners (n=21) | n=747           |
| Edwards et al**        | UK                | QUAL         | General practitioners (n=18) | n/a             |
| Edwards et al**        | UK                | CRCT         | General practitioners (n=20) | n=352           |
| Feng et al**           | USA               | RCT          | Primary care physicians (n=118) | n/r             |
| Geiger et al**         | GER               | RCT          | Physicians (n=38) | n=152           |
| Härter et al**         | GER               | CRCT         | Physicians treating patients with cancer (n=33) | n=160           |
| Jo and An**            | KOR               | CBA          | Female intensive care unit nurses (n=41) | n/a             |
| Kasper et al**         | GER               | NCBA         | Physicians working in outpatient clinics (n=10) | n=40            |
| Körner et al**         | GER               | CRCT         | Healthcare provider executives of different occupational backgrounds (n=74) | n/a             |
| Körner et al**         | GER               | CRCT         | Healthcare provider executives of different occupational backgrounds (n=74) | n/r             |
| Légaré et al**         | CAN               | CRCT         | Family medicine group physicians (n=39) | n=544           |
| Légaré et al**         | CAN               | CRCT         | Family medicine group physicians (n=33) | n=459           |
| Légaré et al**         | CAN               | CRCT         | Family physicians (n=306) | n=449           |
| Loh et al**            | GER               | Post         | General practitioners (n=20) | n/a             |
| McCallister et al**    | USA               | NCBA         | Pulmonary and critical care medical fellows (n=16) | n/a             |
| Metcalfe et al**       | AUS               | NCBA         | General practitioners (n=63) | n/a             |
| Murray et al**         | CAN               | RCT          | Oncology or palliative care nursing and allied healthcare providers (n=88) | n/a             |
| Price-Haywood et al**  | USA               | CRCT         | Primary care physicians (n=18) | n=161           |
| Sanders et al**        | NL                | CRCT         | General practitioners (n=42) | n=175           |
| Sanders et al**        | NL                | CRCT         | General practitioners (n=47) | n=226           |
| Simmons et al**       | USA               | NCBA         | Internal medicine residents (n=98) | n/a             |
| Stacey et al**         | CAN               | RCT          | Call centre nurses (n=39) | n/a             |
| Stacey et al**         | CAN               | NCBA         | Oncology medical residents (n=11) | n/a             |
| Sullivan et al**       | USA               | RCT          | Internal medical residents, attendings (n=45) | n/a             |
| Sullivan et al**       | USA               | RCT          | Internal medical residents (n=213) | n/a             |
| Tinsel et al**         | GER               | CRCT         | General practitioners (n=36) | n=1120          |
| Towle et al**          | CAN               | QUAL         | Family physicians (n=8) | n=198           |
| Volk et al**           | USA               | Post         | Clinicians from diverse specialties (n=49) | n/a             |
| Wilkes et al**         | USA               | CRCT         | Primary care physicians (n=120) | n=712           |
| Yuen et al**           | USA               | Post         | Internal medicine residents (n=29) | n/a             |

*Participants who provided data for analysis.
†Articles report data from one study.
AUS, Australia; AUT, Austria; CAN, Canada; CBA, controlled before-after study; CHE, Switzerland; CRCT, cluster-randomised controlled trial; GER, Germany; KOR, Korea; n/a, not applicable; NCBA, non-controlled before-after study; NZ, New Zealand; NL, The Netherlands; n/r, not reported; QUAL, qualitative study; Post, post-test only study; RCT, randomised controlled trial.
Records identified in the electronic database search were then split in half to be assessed for possible inclusion in the study by one of two reviewers. Following the update of the database search (30 January 2019), two reviewers independently screened all identified records and discussed any differences until consensus was reached. Two reviewers independently assessed full-text articles for eligibility by applying inclusion and exclusion criteria (box 1). We resolved differences by discussion until we reached consensus. If consensus could not be reached, the final decision was made by discussion with two other reviewers.

**Data extraction, quality assessment and analysis of evaluation strategies**

We used data extraction sheets to collect descriptive data of included articles, for example, country of origin of the study, study design, characteristics of HCP and patient samples. Furthermore, we extracted data on evaluation outcomes reported in included articles and all data relevant to assess study quality of included articles. Data extraction sheets were pilot-tested and adjusted accordingly. We assessed study quality of included articles with the integrated quality criteria for review of multiple study designs (ICROMS) tool. Two reviewers independently performed data extraction and quality evaluation and discussed any differences until consensus was reached. One reviewer performed analysis of evaluation strategies in discussion with the team. As study results are repeatedly published in more than one article, we will present results on two levels: study and article, if applicable.

**Quality assessment with the ICROMS tool**

The ICROMS tool appraises the quality of multiple study designs and stems from an iterative process over 2 years that included review of existing quality criteria, pilot testing and expert consensus. It aims to establish criteria critically appraising the quality of multiple study designs, in order to broaden the database for systematic reviews and to inspire rigorous research. The ICROMS tool comprises 7 dimensions and defines 33 specific criteria for these dimensions applicable only to some study designs. ICROMS dimensions are: 1) clear aims and justification, 2) managing bias in sampling between groups, 3) managing bias in outcome measurements and blinding, 4) managing bias in follow-up, 5) managing bias in other study aspects, 6) analytical rigour, 7) managing bias in reporting/ethical considerations. The ICROMS tool is applicable for cluster-randomised and randomised controlled trials, controlled and non-controlled before-after studies, controlled and non-controlled interrupted times series, cohort studies and qualitative studies. As the ICROMS tool is not applicable to post-test studies, we did not assess study quality for articles reporting on this study type. ICROMS-specific criteria are answerable with yes (2 points), no (0 points) or unclear (1 point). The ICROMS tool defines mandatory criteria and minimum scores for different study types to distinguish if studies are fit for inclusion in a systematic review. Minimum scores vary per study type and range from 16 for qualitative studies over 18 for controlled before-after studies to 22 for non-controlled before-after studies or cluster-randomised and randomised controlled trials. Detailed information on the ICROMS tool is attainable in the original publication. We analysed quality assessment results on article level.

**Analysis of evaluation strategies**

One reviewer analysed evaluation strategies regarding use of data sources (HCPs, patients, standardised patients, observers, training process and healthcare data), use of

![Figure 1](image-url)  
**Figure 1** Evaluation framework for healthcare provider trainings in shared decision-making (SDM).
unpublished or self-developed and published or psycho-metrically tested measures and coverage of Kirkpatrick’s four levels of reaction, learning, behaviour and results. One reviewer categorised identified evaluation outcomes in the proposed evaluation framework for HCP trainings in SDM (Figure 1) that is based on the Kirkpatrick’s four-level evaluation model and the Quadruple Aim framework. One reviewer developed comprehensive subcategories of evaluation outcomes based on the measures identified in the review and categorised evaluation outcomes accordingly. The study team supervised this process and provided feedback in team discussions. As study results are repeatedly published in more than one article, we will present results on two levels: study and article, if applicable.

**Patient and public involvement**

We did not involve patients in the conduction of this study.

**RESULTS**

**Literature search and article selection**

The electronic database search on 26 June 2016 identified 5317 records. After removal of duplicates, 4543 records remained. We found an additional number of 1636 records through the secondary search. The electronic database search on 30 January 2019 identified additional 1222 records. After removal of duplicates, 1055 records remained. We finally screened 7234 records, of which some are likely to be unidentified duplicates due to our complex search strategy. We excluded 7137 records based on title and abstract screening and assessed 97 full-text articles for eligibility. Of the remaining 97 full-text articles, we excluded 56 full-text articles by applying exclusion criteria. The majority of full-text articles because they did not meet the first inclusion criterion and did not report data on an SDM training for HCPs. We included 41 articles in this review. Figure 2 shows the process of article selection.

**Descriptive data of included studies and articles**

Identified articles (n=41) report on studies (n=30) conducted in a limited number of countries (n=10). Most studies were conducted in the USA (n=9), Germany (n=8) and Canada (n=7). Eleven articles report on studies from Germany, nine articles report on studies from Canada and eight articles report on studies from the USA. Six articles depict one study from the UK and four articles present studies conducted either multinationally or the Netherlands or Korea. The majority of included articles (n=27) report on cluster-randomised and randomised controlled trials. Further articles report on one controlled and seven non-controlled before-after studies, three qualitative and three post-test studies. Most articles (n=34) report on the evaluation of physician trainings, two articles report on trainings for nurses and five articles report on trainings for diverse HCPs. Overall, identified articles report on HCP samples ranging from 6 to 306, and n=25 articles report on the use of patient samples ranging from 38 to 1120. Table 1 illustrates descriptive data of included studies and articles.
Quality results of the ICROMS tool

Assessment of the quality of included articles with the ICROMS tool was applicable to 38 of the included articles (Table 2). Three articles were post-test studies, which could not be assessed with the ICROMS tool. Of the 22 articles that met the minimum score, 7 reported on randomised controlled trials; 12 on cluster-randomised controlled trials; and 3 reported on qualitative studies. Looking in detail at the 16 articles that did not meet the minimum score, most of them failed to meet criterion 3E (blinded assessment of primary outcome), 3F (reliable primary outcome measures) and 7D (free of other bias). For detailed results regarding ICROMS criteria, see online supplementary file S3.

Most of the included studies (n=30) and articles (n=41) report use of more than one type of data source to evaluate training effects. Of the studies employing HCP-reported data (n=27), eight studies relied solely on HCPs for training evaluation. The remaining 19 studies additionally employed other types of outcomes, for example, patient-reported, observer-rated, and standardised patient-reported outcomes.

The three studies not relying on HCPs as data source combined patient-reported data with observer-rated measures or training process and healthcare data. The studies not relying on HCPs for data reporting on 30 studies that met our inclusion criteria. Most of these studies were cluster-randomised and randomised controlled trials that evaluated SDM trainings for physicians and were conducted in high-income countries like Canada, the USA, the UK or Germany. Sample sizes varied largely. Of the 38 articles eligible for assessment with the ICROMS tool, only 11 articles met ICROMS quality criteria. Diverse strategies were used to evaluate HCP trainings in SDM, but most studies relied on provider-reported outcomes, covered two or three of Kirkpatrick’s levels and combined published and unpublished measures. The proposed evaluation framework based on Kirkpatrick’s four-level evaluation model and the Quadruple Aim framework appears useful for the design or analysis of strategies to evaluate HCP trainings in SDM.

The poor quality of identified publications indicates that researchers should aim to design more methodologically sound studies to evaluate HCP trainings in SDM. The ICROMS tool is a decision matrix to evaluate the robustness of studies for inclusion in a review and present results could inspire researchers to be more rigorous in their study. Since measurement bias was a common problem of many included studies, it would be good to use more objective training acceptability and feasibility data, more objective learning and observer-rated measures and healthcare data for evaluation. However, assessment of specific learning objectives may require application of self-developed measures. Combined with psychometrically sound primary outcomes, this may be the ideal evaluation approach.

Although HCPs were the main data source in included studies, reaction to the training was the least studied evaluation level. Training participants’ favourable reactions to use more objective training acceptability and feasibility data, more objective learning and observer-rated measures and healthcare data for evaluation. However, assessment of specific learning objectives may require application of self-developed measures. Combined with psychometrically sound primary outcomes, this may be the ideal evaluation approach.


discussion

Our review aimed to investigate how the diversity of evaluation strategies and the quality of published evaluations contributes to the current lack of evidence on HCP trainings in SDM. Thus, we analysed the quality of published articles on HCP trainings in SDM, and analysed their evaluation strategies regarding 1) use of data sources, 2) use of unpublished or self-developed and published or psychometrically tested measures and 3) coverage of Kirkpatrick’s four levels. We found 41 articles reporting on 30 studies that met our inclusion criteria. Most of these studies were cluster-randomised and randomised controlled trials that evaluated SDM trainings for physicians and were conducted in high-income countries like Canada, the USA, the UK or Germany. Sample sizes varied largely. Of the 38 articles eligible for assessment with the ICROMS tool, only 11 articles met ICROMS quality criteria. Diverse strategies were used to evaluate HCP trainings in SDM, but most studies relied on provider-reported outcomes, covered two or three of Kirkpatrick’s levels and combined published and unpublished measures. The proposed evaluation framework based on Kirkpatrick’s four-level evaluation model and the Quadruple Aim framework appears useful for the design or analysis of strategies to evaluate HCP trainings in SDM.

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### Table 2  Quality results of the ICROMS tool

| Study                  | Study design | ICROMS score | Minimum score* met | Mandatory criteria met | Recommendation for inclusion |
|------------------------|--------------|--------------|--------------------|------------------------|------------------------------|
| Bernhard et al         | RCT          | 20           | No                 | No                     | No                           |
| Bieber et al†          | RCT          | 20           | No                 | No                     | No                           |
| Bieber et al†          | RCT          | 24           | Yes                | Yes                    | Yes                          |
| Bieber et al           | NCBA         | 19           | No                 | No                     | No                           |
| Bieber et al†          | RCT          | 23           | Yes                | Yes                    | Yes                          |
| Butow et al            | RCT          | 22           | Yes                | No                     | No                           |
| Cohen et al†           | CRCT         | 26           | Yes                | No                     | No                           |
| Davis et al†           | QUAL         | 21           | Yes                | Yes                    | Yes                          |
| Dion et al             | NCBA         | 18           | No                 | No                     | No                           |
| Edwards et al†         | RCT          | 18           | No                 | No                     | No                           |
| Edwards et al†         | CRCT         | 24           | Yes                | No                     | No                           |
| Edwards et al†         | QUAL         | 20           | Yes                | No                     | No                           |
| Edwards et al†         | CRCT         | 26           | Yes                | Yes                    | Yes                          |
| Feng et al             | RCT          | 22           | Yes                | No                     | No                           |
| Geiger et al†          | RCT          | 23           | Yes                | Yes                    | Yes                          |
| Härter et al†          | CRCT         | 23           | Yes                | Yes                    | Yes                          |
| Jo and An              | CBA          | 16           | No                 | No                     | No                           |
| Kasper et al           | NCBA         | 19           | No                 | No                     | No                           |
| Körner et al†          | CRCT         | 20           | No                 | No                     | No                           |
| Körner et al†          | CRCT         | 18           | No                 | No                     | No                           |
| LeBlanc et al†         | CRCT         | 26           | Yes                | No                     | No                           |
| Légaré et al†          | CRCT         | 24           | Yes                | No                     | No                           |
| Légaré et al†          | CRCT         | 23           | Yes                | No                     | No                           |
| Légaré et al†          | CRCT         | 19           | No                 | No                     | No                           |
| Loh et al†             | Post-test    | n/a          | n/a                | n/a                    | n/a                          |
| McCallister et al      | NCBA         | 19           | No                 | No                     | No                           |
| Metcalfe et al         | NCBA         | 8            | No                 | No                     | No                           |
| Murray et al           | RCT          | 22           | Yes                | Yes                    | Yes                          |
| Price-Haywood et al†   | CRCT         | 22           | Yes                | No                     | No                           |
| Sanders et al†         | CRCT         | 22           | Yes                | No                     | No                           |
| Sanders et al†         | CRCT         | 23           | Yes                | Yes                    | Yes                          |
| Simmons et al          | NCBA         | 11           | No                 | No                     | No                           |
| Stacey et al           | RCT          | 23           | Yes                | Yes                    | Yes                          |
| Stacey et al           | NCBA         | 18           | No                 | No                     | No                           |
| Sullivan et al         | RCT          | 17           | No                 | No                     | No                           |
| Sullivan et al         | RCT          | 19           | No                 | No                     | No                           |
| Tinsel et al           | CRCT         | 25           | Yes                | Yes                    | Yes                          |
| Towlie et al           | QUAL         | 18           | Yes                | No                     | No                           |
| Volk et al             | Post-test    | n/a          | n/a                | n/a                    | n/a                          |
| Wilkes et al           | CRCT         | 22           | Yes                | Yes                    | Yes                          |
| Yuen et al             | Post-test    | n/a          | n/a                | n/a                    | n/a                          |
| No. of articles        |              | 38           | 22                 | 11                     | 11                           |

*ICROMS minimum score for study type: CRCT and RCT: 22, CBA: 18, NCBA: 22, QUAL: 16, for further details see original publication of the ICROMS tool.21†Articles report data from one study.

CBA, controlled before-after study; CRCT, cluster-randomised controlled trial; ICROMS, integrated quality criteria for review of multiple study designs; NCBA, non-controlled before-after study; Post-test, post-test only study; n/a, not applicable; QUAL, qualitative study; RCT, randomised controlled trial.
| Data source           | Healthcare providers | Patients | Observers | Standardised patients | Training process and healthcare data |
|-----------------------|----------------------|----------|-----------|-----------------------|--------------------------------------|
| Bernhard et al<sup>44</sup> | ▲                    | ▲        |           |                       |                                      |
| Bieber et al<sup>81</sup> | ▲                    | ▲        |           |                       |                                      |
| Bieber et al<sup>82</sup> | ▲                    | ▲        |           |                       |                                      |
| Bieber et al<sup>83</sup> | ▲                    | ▲        |           |                       |                                      |
| Bieber et al<sup>84</sup> | ▲                    | ▲        |           |                       |                                      |
| Bieber et al<sup>85</sup> | ▲                    | ▲        |           |                       |                                      |
| Butter et al<sup>86</sup> | ▲                    | ▲        |           |                       |                                      |
| Cohen et al<sup>87</sup> | ▲                    | ▲        |           |                       |                                      |
| Davis et al<sup>88</sup> | ▲                    | ▲        |           |                       |                                      |
| Dion et al<sup>89</sup> | ▲                    | ▲        |           |                       |                                      |
| Edwards et al<sup>90</sup> | ▲                    | ▲        |           |                       |                                      |
| Edwards et al<sup>91</sup> | ▲                    | ▲        |           |                       |                                      |
| Edwards et al<sup>92</sup> | ▲                    | ▲        |           |                       |                                      |
| Edwards et al<sup>93</sup> | ▲                    | ▲        |           |                       |                                      |
| Feng et al<sup>94</sup> | ▲                    | ▲        |           |                       |                                      |
| Geiger et al<sup>95</sup> | ▲                    | ▲        | ▲         |                       |                                      |
| Härter et al<sup>96</sup> | ▲                    | ▲        |           |                       |                                      |
| Jo and An<sup>97</sup> | ▲                    | ▲        |           |                       |                                      |
| Kasper et al<sup>98</sup> | ▲                    | ▲        | ▲         | ▲                     |                                      |
| Körner et al<sup>99</sup> | ▲                    | ▲        |           |                       |                                      |
| Koerner et al<sup>100</sup> | ▲                    | ▲        |           |                       |                                      |
| LeBlanc et al<sup>101</sup> | ▲                    | ▲        |           |                       |                                      |
| Légaré et al<sup>102</sup> | ▲                    | ▲        |           |                       |                                      |
| Légaré et al<sup>103</sup> | ▲                    | ▲        |           |                       |                                      |
| Légaré et al<sup>104</sup> | ▲                    | ▲        |           |                       |                                      |
| Loh et al<sup>105</sup> | ▲                    | ▲        |           |                       |                                      |
| McCallister et al<sup>106</sup> | ▲                    | ▲        |           |                       |                                      |
| Metcalfe et al<sup>107</sup> | ▲                    | ▲        |           |                       |                                      |
| Murray et al<sup>108</sup> | ▲                    | ▲        |           |                       |                                      |
| Price-Haywood et al<sup>109</sup> | ▲                    | ▲        | ▲         | ▲                     |                                      |
| Sanders et al<sup>110</sup> | ▲                    | ▲        |           |                       |                                      |
| Sanders et al<sup>111</sup> | ▲                    | ▲        |           |                       |                                      |
| Simmons et al<sup>112</sup> | ▲                    | ▲        |           |                       |                                      |
| Stacey et al<sup>113</sup> | ▲                    | ▲        |           |                       |                                      |
| Stacey et al<sup>114</sup> | ▲                    | ▲        |           |                       |                                      |
| Sullivan et al<sup>115</sup> | ▲                    | ▲        |           |                       |                                      |
| Sullivan et al<sup>116</sup> | ▲                    | ▲        |           |                       |                                      |
| Tinsel et al<sup>117</sup> | ▲                    | ▲        |           |                       |                                      |
| Towle et al<sup>118</sup> | ▲                    | ▲        |           |                       |                                      |
| Volk et al<sup>119</sup> | ▲                    | ▲        |           |                       |                                      |
| Wilkes et al<sup>120</sup> | ▲                    | ▲        |           |                       |                                      |
| Yuen et al<sup>121</sup> | ▲                    | ▲        |           |                       |                                      |

*Articles report data from one study.
▲: the article reports the use of this type of data source for training evaluation.

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No. of articles (n=41) 34  20  12  2  12
No. of studies (n=30) 27  15  12  2  11
are substantial for the training to be effective as participants’ positive appraisal determines their motivations to learn from the training. Following the reaction level, researchers should assess HCP learning using objective learning measures for knowledge gain. Provider-reported learning measures are useful to establish training effects on HCP attitudes, intentions and confidence regarding SDM-related behaviour, which are the predecessors of actual behaviour. According to the theory of planned behaviour, a positive attitude, acquisition of relevant knowledge and improvement of skills determine HCP behavioural intentions, and thus behaviour change.

Measurement of behaviour change is central, as change of SDM-related behaviours is usually the main aim of HCP trainings in SDM. Since there is no gold standard for measuring SDM and measurement from different viewpoints is inconsistent, multiperspective assessment from the viewpoints of HCPs (standardised), patients and observers appears the best approach. Ideally, validated measures should be used to ensure quality and comparability of results, but a lack of psychometrically tested SDM measures poses a problem. It is also difficult to assess behaviour change in clinical practice, because it is unclear when changes manifest themselves. However, it is critical to establish behaviour change, before measuring training effects on the results level to avoid the risk of interpreting random effects independent from the training.

To establish training effects on the results level relevant to multiple stakeholders, we recommend reference to the Quadruple Aim framework. Beneficial training effects on the work life of HCPs may increase their motivation to implement SDM in practice. Currently, HCPs often experience SDM as another burden and demand on their time, and are therefore often reluctant to implement SDM in routine practice. Although effects of SDM on affective-cognitive aspects of patient experience of care are well established, evidence regarding patient population health is sparse. If studies showed beneficial SDM training effects on healthcare system costs, policy makers could be encouraged to initiate system changes to foster the implementation of SDM.

In sum, the poor study quality and the multitude of evaluation strategies used in identified studies limit conclusive evidence on HCP trainings in SDM. The heterogeneous use of SDM and other outcome measures compromises the interpretation and integration of research results. To achieve solid empirical evidence, we need consensus on a core set of evaluation outcomes and

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**Table 4** Coverage of Kirkpatrick’s evaluation levels

| Study                  | Reaction | Learning | Behaviour | Results |
|------------------------|----------|----------|-----------|---------|
| Bernhard et al^64      | ▲        | ▲        |           |         |
| Bieber et al^23         | ▲        | ▲        |           |         |
| Bieber et al^22         | ▲        | ▲        |           |         |
| Bieber et al^24         | ▲        | ▲        |           |         |
| Bieber et al^30         | ▲        | ▲        |           |         |
| Butow et al^55          | ▲        | ▲        |           |         |
| Cohen et al^50          | ▲        | ▲        |           |         |
| Davis et al^41          | ▲        | ▲        |           |         |
| Edwards et al^22        | ▲        | ▲        |           |         |
| Edwards et al^23        | ▲        | ▲        |           |         |
| Edwards et al^24        | ▲        | ▲        |           |         |
| Edwards et al^24*       | ▲        | ▲        |           |         |
| Feng et al^42           | ▲        | ▲        |           |         |
| Geiger et al^31         | ▲        | ▲        |           |         |
| Härter et al^25         | ▲        | ▲        |           |         |
| Jo and An^49            | ▲        | ▲        |           |         |
| Kasper et al^42         | ▲        | ▲        |           |         |
| Körner et al^26*        | ▲        | ▲        |           |         |
| Körner et al^27*        | ▲        | ▲        |           |         |
| LeBlanc et al^33*       | ▲        | ▲        |           |         |
| Légaré et al^36*        | ▲        | ▲        |           |         |
| Légaré et al^35*        | ▲        | ▲        |           |         |
| Légaré et al^34*        | ▲        | ▲        |           |         |
| Loh et al^28            | ▲        | ▲        |           |         |
| McCallister et al^43    | ▲        | ▲        |           |         |
| Metcalfe et al^46       | ▲        | ▲        |           |         |
| Murray et al^37         | ▲        | ▲        |           |         |
| Price-Haywood et al^24 (2014) | ▲ | ▲ | ▲ | ▲ |
| Sanders et al^37*       | ▲        | ▲        |           |         |
| Sanders et al^48*       | ▲        | ▲        |           |         |
| Simmons et al^50        | ▲        | ▲        |           |         |
| Stacey et al^38         | ▲        | ▲        |           |         |
| Stacey et al^39         | ▲        | ▲        |           |         |
| Sullivan et al^46       | ▲        | ▲        |           |         |
| Sullivan et al^45       | ▲        | ▲        |           |         |
| Tinsel et al^29         | ▲        | ▲        |           |         |
| Towle et al^40          | ▲        | ▲        |           |         |
| Volk et al^37           | ▲        | ▲        |           |         |
| Wilkes et al^48         | ▲        | ▲        |           |         |
| Yuen et al^59           | ▲        | ▲        |           |         |

| No. of articles (n=41)  | 17        | 26        | 27        | 31       |

Continued
validated measures on all levels of the proposed framework for HCP trainings in SDM. In the design of evaluation studies, researchers should aim to cover all four levels of the framework and include outcomes on the results level that relate to the Quadruple Aim framework. Researchers should aim to use outcomes that are valued by multiple stakeholders like patients, HCPs as well as healthcare managers, executives and policy makers. They should also aim to use validated observer-rated measures and objective data to limit bias, whenever feasible. If researchers applied these recommendations, evaluation studies could have more impact and better support the implementation of SDM in routine practice.

This review has some limitations. First, our primary search included only three databases and inclusion criteria were limited to studies aiming to evaluate HCP trainings in SDM. Consequently, we may have missed some studies, but we assume that our broad secondary search strategy made up for this limitation. Second, we did not analyse evaluation strategies regarding a match of training contents and evaluation outcomes. Additionally, we did not analyse which evaluation outcomes previously showed SDM training effects, which could be valuable information for the design of an evaluation study. However, previous studies investigated the relation between SDM and patient outcomes\(^4\)\(^5\)\(^6\)\(^5\) and interested researchers may obtain valuable information there. Third, our quality assessment with the ICROMS tool can be seen as a limitation as well as a strength of this review. On the one hand, the ICROMS tool is not applicable to post-test studies and considers patient-reported and provider-reported outcomes as unreliable, which introduces a negative bias to our quality results. On the other hand, we provided an overview of the quality of studies in the field, demonstrating a lack of robust evaluation

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### Table 5 Categories of evaluation outcomes integrated in the evaluation framework

| Category                                                  | No. of articles |
|-----------------------------------------------------------|-----------------|
| **Healthcare providers’ reactions**                       |                 |
| Provider-reported training appraisal                      | 17              |
| Overall training appraisal and satisfaction               | 11              |
| Appraisal of training content                            | 5               |
| Appraisal of training materials                           | 3               |
| Appraisal of training didactics                           | 2               |
| Appraisal of training organisation and delivery           | 4               |
| Appraisal of training impact                              | 6               |
| Ideas for training improvement                            | 1               |
| Objective training feasibility and acceptability data     | 4               |
| **Healthcare providers’ learning**                        | 27              |
| Provider-reported learning                                | 23              |
| Subjective knowledge gain                                 | 3               |
| Attitude to SDM                                           | 8               |
| Intention to engage in SDM                                | 3               |
| Confidence in SDM and communication skills                | 7               |
| Confidence in medical competence                          | 10              |
| Objective learning measures                               | 1               |
| **Objective learning measures**                           | 7               |
| Provider-reported SDM and provider-patient interaction     | 14              |
| Patient-reported SDM and provider-patient interaction      | 11              |
| Standardised patient-reported SDM and provider-patient interaction | 2 |
| Observer-rated SDM and provider-patient interaction        | 12              |
| **Healthcare provider training in SDM results**           | 31              |
| Work life of healthcare providers                         | 12              |
| Provider-reported stress and burnout                       | 2               |
| Provider reaction to the decision                         | 6               |
| Provider satisfaction with care                            | 4               |
| Provider-reported provider-patient relationship            | 2               |
| **Patient population health**                             | 11              |
| Patient-reported health literacy                           | 2               |
| Patient-reported intention to treatment adherence          | 3               |
| Patient-reported adherence                                 | 2               |
| Patient-reported health                                   | 10              |
| Medical records                                           | 2               |
| **Patient experience of care**                            | 18              |
| Patient-reported reaction to the decision                  | 11              |
| Patient-reported satisfaction with care                    | 4               |
| Patient-reported attitude to SDM and care                 | 8               |

Continued

| Category                                                  | No. of articles |
|-----------------------------------------------------------|-----------------|
| Patient-reported provider-patient relationship            | 3               |
| Provider-reported patient reaction to care                | 4               |
| **Healthcare system costs**                               | 13              |
| Provider-reported medical practice                        | 4               |
| Patient-reported decisional outcome                       | 3               |
| Standardised patient-reported physician’s final recommendation | 1 |
| Observer-recorded provider recommendation or decision     | 1               |
| Healthcare resource use                                   | 2               |
| Training costs                                            | 1               |
| Medical record review of decision-making                  | 1               |
| Duration of provider-patient interaction                  | 4               |

Detailed information on evaluation outcomes is attainable in online supplementary file S4.
studies. This review has further strengths. First, this review comprises multiple study designs from post-test studies to qualitative and cluster-randomised controlled studies, which reflect the diversity of studies in the field. Second, this review provides an analysis of current strategies to evaluate HCP trainings in SDM and how their diversity functions as a barrier to conclusive evidence. Third, this review proposes an evaluation framework for HCP trainings in SDM that is based on the well-established Kirkpatrick’s evaluation model and the Quadruple Aim framework. The framework may provide guidance in the design of coherence evaluation strategies for HCP trainings in SDM. Fourth, the proposed framework may initiate discussion and hopefully agreement on a core set of validated outcome measures useful for the purpose and meaningful to stakeholders.

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