REVIEW ARTICLE

Understanding the Impact of Medical Educational Interventions in Training Shared Decision Making for Residents

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ABSTRACT

Background/Objective: **Shared decision making (SDM) is a model of communication between the doctor and patient that helps to empower the patient. SDM is a recent improvement in patient care that allows the consideration of the patient's preferences in the planning and implementation of the treatment plan, which is patient centered.**

Purpose: **This review aimed to 1) evaluate the nature of interventions implemented in the studies and 2) assess the level of effectiveness employed within these studies using Kirkpatrick's learning evaluation.**

Methods: **Systematic searches were conducted in five electronic databases: Medline, PsycInfo, Web of Science, CINAHL, and Scopus. Methodological rigor was assessed using the Quality Assessment Tool for Studies with Diverse Designs (QATSDD). Kirkpatrick's Evaluation Hierarchy was used to categorize the level of evaluation completed within the studies.**

Results: **In total, 12 articles were included in the final analysis. Interventions were most rated as positive in combining training methods to teach residents SDM with decisional aids (83.3%). In addition, there were significant improvements in residents' knowledge (90%), changes in attitude (75.0%), changes in behavior intended and self-reported by participants (*n* = 8/9; 88.8%), organizational/clinical changes that aided patient collaboration and decision (*n* = 1; 8.3%).**

Conclusion: **From this study, educational interventions applied to training SDM skills in residents achieved positive outcomes; however, they could achieve more positive outcomes when diverse approaches to training are applied.**

KEY WORDS

interventions, medical education, residents training, shared decision making, training evaluation.

INTRODUCTION

Shared decision-making (SDM) as a communication model is a conversational process between the doctor and patient. Information is shared, and the patient is supported to make an informed decision regarding their healthcare[1)]. This process has emerged as the cutting edge for improving patient care through collaboration by the physician, considering patient preferences and values to make a joint treatment plan for the patient's care[2-4)]. The SDM model demonstrates the movement toward a more patient-centered style of care where the patient is treated with dignity and is involved in decision making around their care[5)]. Several studies exploring SDM have reported improved patient satisfaction, resolution of mental health symptoms, and reduction in medical litigation[6)]. The benefits of SDM are broad. Some benefits are for the patients, such as reduced lab tests and reduced cost of treatment. For the health care system, it reduces time wasted on major clinical decisions and assists healthcare workers in understanding the patient's

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perspective. Further, it aids in reducing anxiety in the patient while at the same time increasing the knowledge of the patient, leading to better-informed choices and preventing unwanted healthcare outcomes[8-10].

Due to the documented benefits of SDM to the patient, healthcare team/provider, and the system, medical curricula have placed more emphasis on implementing and incorporating SDM training in recent years to strengthen physician-patient relationships and achieve better patient outcomes[10,11]. Training medical students to be effective at SDM is essential. Because communication is vital to providing adequate healthcare delivery, high-quality communication skills training is fundamental for successfully training physicians to achieve better clinical skills outcomes for patients and surrogates[12]. So, medical education has focused efforts on improving trainee's development of SDM skills using various methods, including peer role-plays, video analysis, simulated patients consultations, workshops, and demonstrations[13-15]. Beyond the interventional tools and policies propelling the training and implementation of SDM in the residents' program, other external factors can cause challenges when implementing SDM interventions in patient care; for example, culture and family values, how much education and knowledge patients must make the informed choice, time to accomplish decision making, and what suitable model to use in the diversity of clinical cases[16,17].

Effective shared decision-making between patient and physician depends more on good conversation[18]. Implementing SDM in medical education requires the development of principles and processes that are dynamic and valuable to overcoming these challenges with adequate knowledge, experience and application of the various decision aids for patients' care[19,20]. Furthermore, a thorough understanding of the types and effectiveness of SDM interventions used in residents' training is required. Systematic reviews are valuable tools for examining the overall evidence for implemented interventions. They can help identify strategies for overcoming the challenges of providing the best-prepared physicians to deliver adequate and high-quality healthcare to patients[21]. Two previous systematic reviews have evaluated SDM training for physicians. Durand *et al*.[19] examined the impact of SDM interventions implemented in undergraduate curricula but did not evaluate the quality of the studies or assess the overall level of evaluation. Ospina *et al*.[3] examined SMD training for undergraduate and postgraduate medical trainees. They discussed the overall level of evaluation and conducted quality assessments; however, they did not specifically examine the impact of SDM training on residents. Training for medical residents aims to prepare them to provide a high quality of health care; therefore, it is paramount to evaluate the impact of existing educational training to identify the most valuable tools for training SDM[21]. The aim of this systemic review, therefore, is 1) to review other approaches of interventions that were used for improving shared decision making for residents; and 2) to evaluate the measures of interventions used. Based on this review, guidance will be provided for future research and those seeking to design effective SDM interventions within residents training in the different disciplines of medicine.

METHODS

This systematic review was conducted and reported following the Preferred Reporting Items for Systemic Review and Meta-analysis (PRISMA) guidelines[22].

Search strategy

Studies included comprehensive searches of five electronic databases. These are Medline, PsycInfo, Web of Science, CINAHL, ERIC and Scopus. Additionally, complete reference lists of all studies included following the database searches were accessed to identify additional relevant studies. Finally, the researchers applied best practices to ensure they omitted no vital information[23,24]. The searches were conducted between April and May 2021 and updated in July 2021.

The PICO framework utilized in this research was to construct search terms as guided by the PICO question, Medical Subject Headings (MeSH), and any other words thought to be relevant, according to Considine *et al*.[25,26]. The (P: participant, population, I: intervention, C: comparison, control or comparator, O: outcomes, S: study type (PICO's), which was designed around three distinct sets of search terms; 1) Medical Students (e.g., "medical trainees" OR "Resident/residency "; 2) Educational interventions (e.g., "training" OR "program"); and 3) Shared Decision Making (e.g., "collaborative decision making"). In addition, a complete sample search strategy for Medline in a combination of search fields: title, abstract, and MeSH to ensure the best possible search result was obtained. This strategy was adopted as required to suit the other databases.

Eligibility criteria (Inclusion and Exclusion criteria)

The studies included in this review primarily focused on evaluating an intervention to improve SDM among medical residents, e.g., time-series design, randomized controlled trials, pre/post-test. Additionally, the study must be published in the English language, limited to a peer-reviewed journal and present data on the outcomes of the intervention in terms of whether there was an improvement in the learners' reaction, behaviour skills and what was the outcome of the interventional element[38]. There was no time limit imposed on the year of studies.

The papers excluded were editorials, letters to the editor, posters, opinions, and conference articles. Other exclusion criteria included: studies investigating other elements of communication skills (e.g., team building communication skills); studies reporting other health workers and health profession students (e.g., nursing students, staff nurses, qualified physicians).

Study Selection

The titles and abstracts of unique records returned from the database searches were screened against the eligibility criteria by two reviewers. The screening process is done via Covidence software; Covidence de-duplicated all identified records before starting the screening, uploading documents and reports exported by the software[27-29]. A report of the conflicts was presented after each screening stage for discussion between the two reviewers. If the reviewers found it unclear and thought it should be included based on the title and abstract, both reviewers assessed the entire paper independently, and a decision was reached based on the discussion[22,30]. An experienced medical librarian guided the use of the software "Covidence"[29]. After the initial title and abstract screening were complete, the full texts of the articles deemed potentially eligible for inclusion were screened against the eligibility criteria. First, template titles were formulated following PICO's framework strategies to meet the research purpose (P: participant, population, I: intervention, C: comparison, control or comparator, O: outcomes, S: study type[13]. According to the framework's application, the population being examined were medical residents; the interventions reviewed were the teaching, demonstrations or simulations done. Further, the comparators considered depended on the study design and the studied variables. The outcome aims to find the effect of educational interventions in shared decision training. Lastly, the design method used in each study was described and included[13].

Data Extraction

Two reviewers completed the data extraction for each study. Data items extracted from each study were: 1) citation details (i.e., first author and year); 2) country of publication, based on the first author's affiliation at the time the study was conducted); 3) participant characteristics (*n*, gender, year of training); 4) Study design; 5) Setting in which the intervention was implemented; 6) type/description of intervention; and 8) measures used to evaluate the intervention using Kirkpatrick's four levels of measurement; 9) outcome and findings of the study, See Table 1. Kirkpatrick's framework is a widespread tool used to evaluate training programs' effectiveness.

Data synthesis

Narrative synthesis using words and text was applied in this study to summarise the findings of the multiple studies with diverse methodology and measures[31,32]. Furthermore, this review describes findings from other research on medical education intervention on SDM and forms used in testing the various types of the interventions. Considering that included studies in this review were of diverse study design and measurement, it was not feasible to conduct a meta-analysis[33,34]. Therefore, given the variety of studies reviewed, we developed codes to allow the synthesis of data relating to the specific nature of intervention in each study. The intervention was assessed under author-defined primary outcomes, a summary measure of effect and the most relevant measure to SDM training[35]. The evaluation measures used were based on Kirkpatrick's four levels classification of training programs; level 1-Reaction (satisfaction), level 2- Learning (knowledge or skill in a setting), level 3- Behaviour (in practice), and level 4-Outcome of each medical education intervention (effects on patients /decision/clinical)

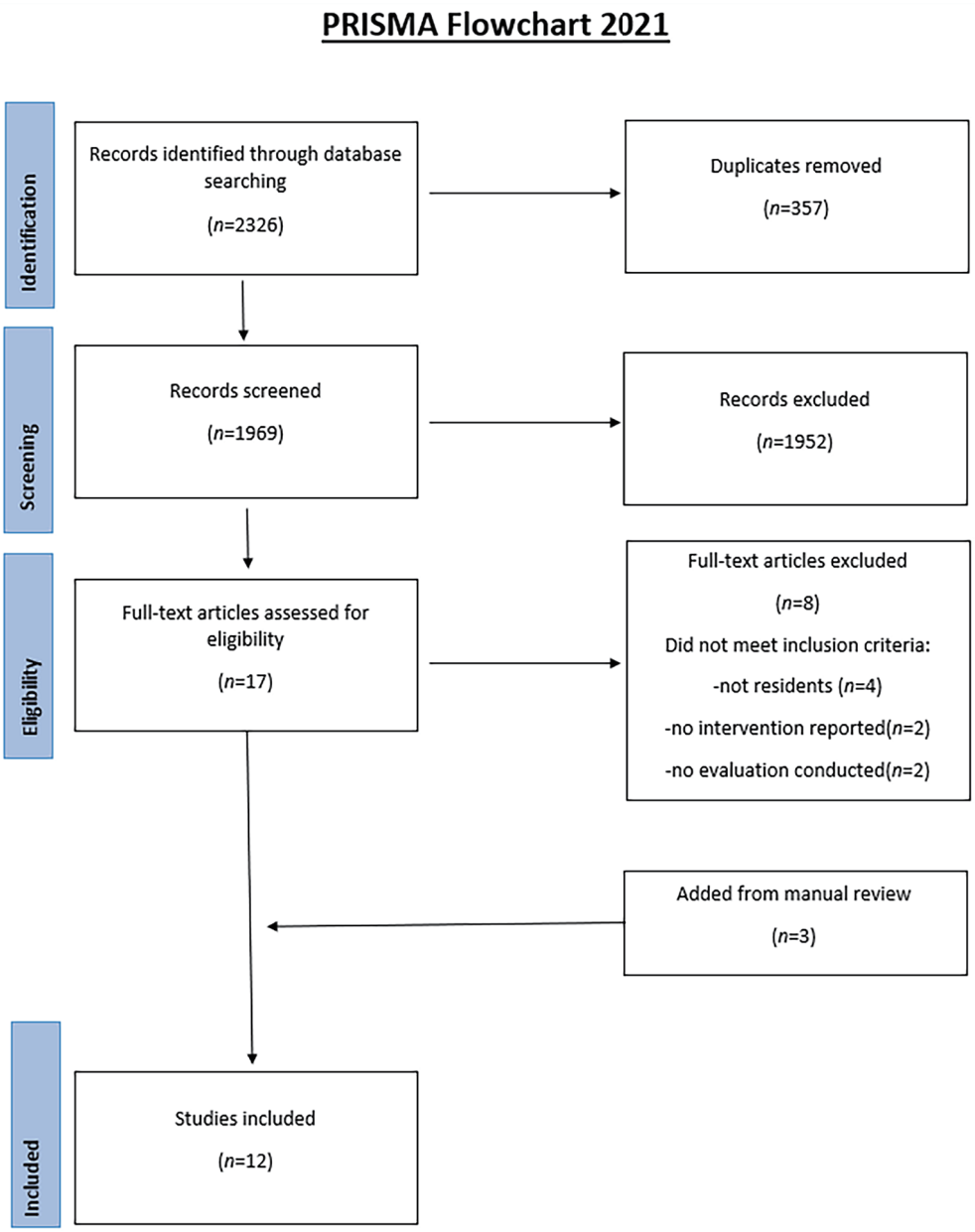

Figure 1: Prisma Flowchart

and abstraction of the process in each result was considered[13,36]. The outcomes achieved in each study were classified as positive/ mixed /negative/ or of no clear effect[37].

Quality Appraisal

Following data extraction, a critical appraisal of the included studies was conducted using the Quality Assessment Tool for Studies with Diverse Designs (QATSDD)[54,55]. This tool was chosen as it has been reported to have a good record of displaying reliability and validity for quality appraisal of studies with qualitative, quantitative, or mixed study designs design. Studies were scored under 16 criteria, including aspects of the theoretical approach, the research setting, data collection, and method of analysis[38,40]. Each indicator was assessed on a 4-point Likert scale and awarded a score of 0 (not at all) to 3(complete) for each criterion. Eleven items on the checklist are common to all studies, and there are two specific items for qualitative studies and three specific items for quantitative studies[41]. The maximum score for qualitative 39 and quantitative studies is 42, and the maximum score for mixed methods studies is 48[42]. This tool has been reliably developed and used, for example, by health services researchers and has been widely applied in systematic reviews on medical education and health services[43]. The critical appraisal was conducted independently by two reviewers on all studies and applied the quality appraisal QATSDD approach, which is reliable means of assessing Diverse study quality (QATSDD)[54,55]. Any disagreement was solved through discussion until consensus was reached.

RESULTS

Study selection

The PRISMA flow diagram shown in Figure 1, depicts the number of articles selected at each stage of the process. Database and considered reference list searched returned 2326 potential studies for screening; 12 studies were considered eligible based on inclusion criteria. The 12 studies analyzed were published between 2012 and 2021.

Table 1: Characteristics of the 12 included studies that assess educational interventions' outcomes to train residents in SDM.

Characteristics	No. of Studies (%)
Study Design:	
Pre/post intervention	6 (50%)
Post-intervention only	4 (33.3%)
Randomised controlled trial	2 (16.7%)
Country/Countries in which Intervention was Implemented:	
USA	6 (50%)
Switzerland	1 (8.3%)
Canada	4 (33.3%)
Netherlands	1 (8.3%)
Medical Domain:	
Internal medicine	2 (16.7%)
Family Medicine	2 (16.7%)
Emergency Medicine	1 (8.3%)
Paediatric	1 (8.3%)
Rheumatology	1 (8.3%)
Surgery	1 (8.3%)
Internal medicine /paediatric	3 (25%)
Oncology	1 (8.3%)
Participants:	
Junior residents PGY 1	3 (25%)
Senior residents PGY 2, 3, 4 (senior)	5 (41.7 %)
Non-specified residents' class	4 (33.3%)
Strength of Evidence Score:	
1	n=4 (33%)
2	n=6(50%)
3	n=3(25%)

Study Characteristics

Study design and country of publication

As can be seen, Table 1 shows that half of the studies (*n* = 6; 50%) employed pre and post-test designs. A total of four studies (33.3%) used a post design, and two (16.7%) constitute of cluster randomized controlled trial. Half of the studies, six (50%), were conducted in the United States.

Participants

Table 1 provides information regarding study participants' levels; senior residents were (PGY 2, 3, 4) 41.7%, followed by those unspecified in the class at 33.3%, and the PG Y 1 residents in the studies were 3(25%).

Medical Domain

As shown in Table 1, all studies (*n* = 12; 100%) included are exclusively focused on interventions administered across academic and clinical medicine settings. Most studies were from Internal medicine (*n* = 3; 25%) and in combination with pediatric (*n* = 2; 16.7%), followed by family medicine (*n* = 2; 16.7%), and emergency medicine, rheumatology, surgery, oncology (*n* = 1; 8.3%) in each category.

Table 2: Levels of evaluation across 12 SDM studies reviewed with examples related to outcomes.

Level	Example	N studies (%)	Outcomes (n studies; %)
1. Reactions	- Participants' impressions and self-reported effect of training on them—[44].	*n* = 10 (83.3%)	- Positive (*n* = 10/12; 83.3%)
- 2A. Learning: change in attitudes	- Changes in attitude were reported through a self-report survey [45].	*n* = 8 (66.6%)	- Positive (*n* = 6/8; 75.0%). - No clear effect (*n* = 2/8; 25%).
- 2B. Learning: changes in knowledge or skills	- Participants completed a skills acquisition survey[46]. - Newly acquired improved their SDM due to the training[47].	*n* = 10/12 (83.3%)	- Positive (*n* = 9/10; 90%). - no clear effect (*n* = 1; 10%)
3. Behaviour	- Behaviour is changed through well-designed learner-centred educational interventions in a setting that is real to expectation[48].	*n* = 9/12 (75%)	- Positive (*n* = 8/9; 88.8%) - No clear effect (*n* = 1/9; 11.1%)
4A. Results: Change in system/ organizational practice	NA	NA	NA
4B. Results: change among participants; Affecting Changes in clinical outcomes	- Intervention enhances patients verbalizing satisfaction after consultation or reaching a decision causing improvements in conditions within the clinical practice[49]	*n* = 1/12 (8.3%)	- Positive (*n* = 1; 8.3%)

Evaluation Measures

Table 2 describes the evaluation measures, the number of studies representing the nature of the evaluation and the outcomes achieved. Majority of the studies (*n* = 10; 83.3%) used Level 1- Reactions measures. Eight studies (66.6%) were evaluated at Level 2A - Learning: Change in Attitudes; the interventions in 11 studies (91.6%) were evaluated on Level 2B - Learning: Changes in knowledge/skill. Level 3 - Behaviour measures were self-reported by survey in nine studies (88.8%) using shared decisions models. Clinical practice improvements with residency training were evaluated at level 4B - Results: change among participants in only one study (8.3%). No studies evaluated the intervention in Level 4A - Results: Change in system/organizational practice. All the included studies employed more than one evaluation measure at different levels (*n* = 12; 100%).

Table 3 provides an overview of the categories of evaluation measures used, the nature of the intervention, and the outcomes achieved for SDM in resident's education used in the various studies. Based on Effective Practice and Organization of Care (EPOC), educational interventions include but not limited to learning resources like videos, classroom teachings, books, demonstrations, assessments, and other skills practised with standardized or real patients were used in the studies[14,15,52]. These interventions are divided into four categories: interventions that equips residents, interventions that create equal opportunities,

Table 3: Codes applied to summarize data relating to the type of evaluation measures used, the nature of the intervention, and the outcomes achieved for SDM in resident's education.

Type of Evaluation Measures Employed	The Nature of the Intervention	The Outcomes Achieved
Level 1: Measures of *Reactions* Measures relating to the perceived likeability, usefulness or relevance of the applied intervention.	Interventions that *Equips the residents* Interventions focused on the professional development and individual growth of the participants. Examples: skills-based training programs, assigning mentors to each resident, clinical exposure.	Outcomes were coded as *positive* if data were demonstrative of desirable changes in the outcome measure(s) or suggestive of a positive impact of the educational intervention. Example: Increase in the number of completed participants and rate of participation in the measure.
Level 2A: Measures of *Learning-Change in Attitudes* Measures focused on assessing changes in attitude or perceptions towards constructs relating to the intervention. Level 2B: Measures of *Learning-* Changes in Knowledge or Skills Measures focused on assessing for demonstrable changes in knowledge or skills related to the intervention.	Interventions that Create *Equal Opportunities* Interventions that remove barriers to participants Examples: -implementation of flexible and objective principles to all participants. -changes in the reciprocal attitudes or perceptions among participants towards the intervention [50].	Outcomes were coded as *negative* when the nature of changes observed on the measure(s) was undesirable, or the data were suggestive of a negative impact of the intervention.
Level 3: Measures of *Behavior* Measures focused on job-related behaviour changes or transfer of learning to the clinical practice.	Interventions that value *relational skills and increase ease of shared decision making.* Examples: how many residents self-report using SDM models in consultations with Simulated patients or hospital-based consultations.	Outcomes were coded as *mixed* in instances where data from multiple measures were reported, and data were suggestive of the intervention's positive and negative impacts.
Level 4A: *Measures of Results: Changes in Organizational Practices* Measures focused on examining the impact of the intervention upon the practice and functioning of the residents.	Interventions that assess strategies for building and promoting decisions that facilitate collaboration between physicians and patients. Interventions focused on enhancing changes to learners' approach to patients. Examples: institutional or departmental strategies focused on enhancing changes in clinical outcomes. Intervention that affects outcomes after consultation (reaching a decision).	Outcomes were coded as no clear effect when no report was given on the results of the measure.

the interventions that value relational skills and increase ease of shared decision making, and interventions that assess and revise work culture[48,50,53-58].

Intervention that Equips Residents: Most of the studies (n = 11; 100%) delivered interventions focused on the development of residents in SDM workshops, training, video demonstrations, exercise with standardized patients or clinical exposure, which addressed the resident's knowledge deficit and increased confidence relating to the use of SDM in communication in actual clinical practice[44,55,58].

Interventions that Create Equal Opportunities; Most of the studies (n = 11; 91.6%) unintentionally removed barriers and created opportunities for all participants to improve in both knowledge and skills of SDM by focusing on participants on completed skills acquisition survey (n = 9/10; 90%) and self-reported attitude survey (n = 6/8; 75.0%). Most participants got an opportunity for training, exercises, and pre/post-test as applicable, except for one study that did not provide an equal test for residents post-intervention (n = 1/12;8.3%)[48,54,56].

The Interventions that valued relational skills and increased ease of shared decision making; Nine studies (n = 9;75%) show case behavioural changes with better confidence in their ability to share decisions with patients. Many residents self-report comfort with practice and the intention of using shared decision-making skills (n = 8/9; 88.8%)[48].

Interventions that assess and revise work culture focus on strategies for building and promoting decisions that facilitate physician-patient collaboration and changing cultures that were not inclusive in physician-patient communication. One study fell under this category (n=1/12;8.3%), implementing all four types of interventions employed[57].

Outcomes

The outcomes were mainly positive in all studies. Table 2 displays the outcomes achieved related to the different levels of measurement. Table 4 presents the achieved outcomes concerning types of intervention applied and the classification of outcomes as undesirable (negative), positive, no clear effect or mixed. Only one study (n = 1/12; 8.3%), which focused on changing organizational practices and culture, found a positive effect on the changes in the residents' approach to patients' values and culture enhanced collaboration in antibiotic use after consultation in the clinic[59].

Quality appraisals

The QATSDD was applied to the individual studies. Quantitative studies (n = 11; 91.7%) achieved a mean total score of 21.45(SD = 3.7) out of a possible total score of 42. In mixed methods (n = 1; 8.3%), only one paper with a total score scored 19/39.6. For qualitative, no paper was reviewed under this category. Most of the studies scored poorly on a lack of a clear theoretical framework, reporting sample size considerations. The rationale behind the choice of data collection tool, reporting statistical assessment of reliability and validity of measurement tool, justification for the analytic method used, and no clear evidence of user involvement in design Item. However, the included studies provided well enough information on some items relating to aims and objectives, a good description of the study setting, Fit between the research question and method of data collection and analysis. All 12 studies assessed

on QATSDD performed well in item describing the strength and limitations of the studies.

Strength of Findings

As shown in Table 4, twelve articles revealed interventions that equipped the students with SDM had 83.3% positive effects, and eleven papers identified interventions with equal opportunities with 91.6% positive effects. In addition, nine articles explained interventions that valued relational skills and increased ease of SDM with 88.8% positive effects. Finally, one paper revealed that interventions that assess and revise work culture had 8.3% positive effect.

As can be seen in Table 5, In the current study, eight papers (66.7%) applied a form of simulation methods (i.e., using simulated patients or peer role play) either virtually or in-person to equip participants in SDM communications skills. The strength of findings observed across each study included in this review defers as demonstrated in Table 1. Half of the papers included in the study received a score of 2 (n = 6;50%), four papers scored 1 (n = 4; 33%), while three papers received the possible highest score of 3 (n = 3;25%) indicating that an average of the data collected supported conclusions presented[71]. Both qualitative and quantitative research designs are needed to clarify which aspects of residency training best prepare doctors to deliver high-quality care.

Table 4: Types of interventions reported across the included studies with examples and outcomes.

Nature of intervention	Examples	Number of studies	Outcomes
1---------- Interventions that *Equips the residents*	Professional development of residents on SDM, workshops, training, video demonstrations exercise with SP /clinical exposure	12	Positive n = 10; 83.3% Mixed = 0 No clear effect 25%.
2---------- Interventions that *Create Equal Opportunities*	Encourages changes in the attitudes or perceptions among participants towards the intervention[50]. Implementation of common objective / principles to all participants, male or female, resident year (training, pre/post survey etc.)	11	Positive 91.6 Mixed No clear effect n = 1;8.3%
3---------- Interventions *that valued relational skills and increased ease of shared decision making*	Interventions focused on how many residents self-report using shared decisions in the setting.	9	Positive 88.8% Mixed No clear effect 11.1%
4---------- Interventions that *Assess and revise work culture*	Interventions focused on nhancing changes in eclinical outcomes. Patients self-report satisfaction after consultation and make decisions.	1	Positive 8.3% Mixed No clear effect

Table 5: The summary of multiple educational interventions in each study.

Author	Educational tools used	Outcomes where simulation process applied.
[60]	Online training and *virtual interactive sessions*, *scenarios*, and small group discussion with a facilitator.	Positive
[74]	Online training, interactive in-person training, video, clinical exposure with patients, decisional aids.	Positive
[61]	In-person training, *use SP*, group discussion, and questionnaires.	No clear effect
[62]	Flipped classroom workshop, demonstration, *peer role play*.	Positive
[63]	Video demonstrations, virtual clinical case scenarios, video debriefing.	NA
[64]	Workshop, *exercise with SP*, scenarios, feedback from SP.	Positive
[65]	Didactic training, the in- person live demon, *practice in a small group with faculty*.	Positive
[66]	Online training, video, decisional aids	NA
[67]	Didactic training, video, *exercise with SP*, use case scenarios, and audio recording.	Positive
[68]	Workshop, didactic teaching, *peer role-play*, decisional aids, scenarios, feedback/debrief.	Positive
[69]	Workshop, exercise with SP/peer role-play, decisional aids, scenarios, debrief.	Positive
[70]	Workshop online, didactic, *Use SP*, scenarios, group practice. Debrief.	NA

DISCUSSION

Prior research has evaluated the effectiveness of SDM training in enhancing communication skills for undergraduate medical students and medical physicians. Such findings have shown that equipping physicians with SDM skills enhances better and clear communication with patients. The current study systematically reviewed, evaluated, and identified the ideal training methods to cultivate SDM skills in medical residents. This review has comprehensively evaluated a paucity of research on educational interventions used in diverse domains of residents' programs to train SDM skills. The impact of these interventions on resident training has been identified by employing Kirkpatrick's four levels of learning[62,66]. Unlike Ospina *et al*.[3], although having a similar aim, the current study focuses on much broader perspectives. Consequently, it only provides an understanding of the impact of educational interventions on medical trainees in SDM. The results of the present review highlight evidence of the effect of simulation-based communication in improving behavioural outcomes.

Moreover, the data collated from the papers in this review show that most of the educational interventions focused on *equipping residents* and creating equal opportunities[59]. These interventions include video demonstrations, practical sessions with peers or with SP, decisional aids, and online training. Therefore, this paper assumes that the diverse use of training methods accounts for residents' observed ease and increase in use of SDM to determine patients' preferences. Additionally, previous studies[15,59,69] provide evidence for these observations as they report that a combination of interventions addresses skills deficit in SDM. However, these associated effects were obtained using self-report questionnaires. While being heterogeneous in its methods, the programme estimates focus only on self-reported satisfaction[50]. Specifically, 83.3% of the papers reviewed in the present study relied on self-reported participants' impressions. However, self-reported data are subjective and cannot be reliable as they are obtained via personal views or assumptions rather

than an established fact. Thus, it is subject to bias[50]. Therefore, conclusions cannot be drawn on the reliability of the associated effects.

Nevertheless, the self-reported behavioural evaluations showed a positive impact of SDM training when the training method involved practice, both during and after the training. However, further research must explore if the impact of interventional strategies is transferable to clinical outcomes. According to Kirkpatricks' 4 level model, observed clinical outcomes are the highest level of evidence in evaluating training effectiveness. Therefore, achieving this level of effectiveness will allow for more sustainable educational interventions[50,72-74].

Simulated patients are used in medical education to a greater extent to impact learners' communication skills[75]. In the current study, 66.7% of the studies applied a form of simulation methods (i.e., using simulated patients or peer role play) either virtually or in-person to equip participants in SDM communications skills (See Table 5). Furthermore, 87.5% of the studies showed positive outcomes in the measure level for behavioral changes. These findings are further supported by Kaplonyi *et al*.[76]. They explain that using SPs in building learners' skills in communication is valuable and better in targeting specific skills. SP based communication in medical education gives learners more opportunity to practice the soft skills, provide feedback to learners, aiding learners to refine specific skills (i.e., shared decision making[77,78]. However, it is limited evidence of how this translates to patients' outcomes[76]. Therefore, it is necessary to assess skills outcomes at higher levels.

The results indicated that very few interventions were focused on evaluating interventions at level 4 of Kirkpatrick's Hierarchy of Evaluation. Level 4 refers to changes in system /organizational practice and or change among participants; reports focus on reactions and behaviours. There are various reasons why interventions should be evaluated at the higher levels: 1) This provides the ultimate measure of the impact of educational intervention as it influences desired and sustainable changes in organization /clinical practice,2) this can identify strategies for building and promoting decision that facilitates physicians-patient collaboration in real practice,3) this provides the most reliable evidence for the impact of the intervention, however, it could be very challenging to get the data,4) securing an individual's opportunity to relate practical training on SDM to the specific clinical settings, for example, Emergency medicine, pediatric or surgery[79-81].

Strength and Limitations

This systemic review has a few strengths which should be noted. First, the study focused on medical residents, which differs from previous reviews[3,19]. Moreover, the current study adds specific information which may help tailor interventions to suit the needs of residents. Second, two people conducted database screening to reduce the likelihood of omitted relevant studies or irrelevant studies. Third, two people conducted the quality assessments of the included studies. Fourth, the current review's codes for evaluating interventions measures are similar to methods used in other published systematic reviews[15,37]. Finally, a rigorous systematic search strategy, which was developed and applied with the help of a medical librarian, was implemented across the five databases searched.

Limitations

Despite the considerable strengths listed above, this review also had some limitations which must be highlighted. First, this research was conducted as part of the requirements for fulfilment of a master's dissertation; thus, there was limited time and resources to carry out a more thorough analysis. Grey literature was not included in this study. Although there are some arguments for the inclusion of grey literature in systematic reviews, there are several problematic factors, including:1) a lack of best practice guidance regarding how and where to conduct searches; 2) drawbacks with interpreting data due to potentially low methodological quality; 3) poor reporting skills[82,83]. Second, the inclusion criteria were restricted to studies published in English due to resource constraints. Third, the review focused only on interventions targeting SDM skills, with no comparisons between SDM interventions and interventions targeting other types of communication skills. Such comparisons may have allowed for additional inferences to be made regarding communication skills training. Fourth, due to the heterogeneity of the study designs, it was not possible to conduct a meta-analysis. Future research may want to examine SDM interventions more similar in study design to allow for meta-analyses to be conducted. Finally, classifying outcomes as positive, negative, mixed or having no clear effect may be considered a reductionist approach, which may lead to stereotyping and affect the result's strength.

Future Research

There are a number of recommendations for future research that can be drawn from the current research findings. As mentioned earlier, there is a paucity of research that evaluates the training techniques' clinical outcomes on the development of SDM skills. Therefore, further research should aim to use the higher levels of the Kirkpatrick model in intervention evaluation. Moreover, future research should compare SDM training for residents in different specialities/domains to find if some SDM specific techniques are better for some specialities. In addition, future research should focus on providing more detail when reporting interventions to facilitate replication. Although simulation methods in building communication skills for learners are impactful, further research is needed to investigate the barriers interfering with transferring skills learned using simulation to patient outcomes. Direct involvement of the primary subjects (i.e. medical residents) is the only way to understand and effectively attend to their needs[84]. Thus, future studies should consider user involvement in the design of interventions and the need for a better quality of reporting. Likewise, SDM should not be misconstrued with evidence-based medicine (EBM) as both apply a patient-centred approach to medical care; however, the teaching of SDM falls within the scope of communication courses whereas that of EBM falls under the scope of epidemiology courses[85].

CONCLUSION

The current study demonstrates the results of the few studies on educational interventions that impacted residents in shared decision-making skills. Overall, the main implication of the current findings is that it is difficult to estimate which educational method is best suited for imparting SDM skills to residents. Thus, it is essential to incorporate several of the critical methods discussed above, including the clinical aspects, in developing training programmes for medical residents.

REFERENCES

1. Elwyn G, Rix A, Holt T, Jones D. Why do clinicians not refer patients to online decision support tools? Interviews with front line clinics in the NHS. *BMJ OPEN* 2012; **2**. [DOI: 10.1136/bmjopen-2012-001530]
2. George TP. How nurses can encourage shared decision making. *Nursing2021* 2013; **43**: 65-66. [DOI: 10.1097/01.NURSE.0000431767.44118.c3]
3. Hauer KE, Fernandez A, Teherani A, Boscardin CK, Saba GW. Assessment of medical students' shared decision-making in standardized patient encounters. *J Gen Intern Med* 2011; **26**: 367-372.
4. Lin GA, Fagerlin A. Shared Decision Making. *Circ Cardiovasc Qual Outcomes* 2014; 7: 328-334. [DOI: 10.1161/CIRCOUTCOMES.113.000322]
5. Godolphin W. Shared decision-making. *Heal Q* 2009; **12**: e186-e190.
6. MacDonald-Wicks L, Levett-Jones T. Effective teaching of communication to health professional undergraduate and postgraduate students: A Systematic Review. *JBI Evid Synth* 2012; **10**: 1-12. [DOI: 10.11124/jbisrir-2012-327]
7. Durand M-A, DiMilia PR, Song J, Yen RW, Barr PJ. Shared decision making embedded in the undergraduate medical curriculum: A scoping review. *PLoS ONE* 2018; **13**. [DOI: 10.1371/journal.pone.0207012]
8. Lee Y, Mourad O, Panisko D, Sargeant R, Cavalcanti RB. Evaluation of standardized doctor's orders as an educational tool for undergraduate medical students: a prospective cohort study. *BMC Med Educ* 2013; **13**: 97. [DOI: 10.1186/1472-6920-13-97]
9. Schoenfeld EM, Goff SL, Downs G, Wenger RJ, Lindenauer PK, Mazor KM. A Qualitative analysis of patients' perceptions of shared decision making in the emergency department:"let me know i have a choice". *Acad Emerg Med* 2018; **25**: 716-727.
10. Dong T, LaRochelle JS, Durning SJ, Saguil A, Swygert K, Artino AR Jr. Longitudinal Effects of Medical Students' Communication Skills on Future Performance. *Mil Med* 2015; **180**: 24-30. [DOI: 10.7205/MILMED-D-14-00565]
11. CAHPS. The CAHPS Ambulatory Care Improvement Guide: Practical Strategies for Improving Patient Experience. 2017. Available from: http://www.ahrq.gov/cahps/quality-improvement/improvement-guide/improvement-guide.html
12. Street RL, De Haes HCJM. Designing a curriculum for communication skills training from a theory and evidence-based perspective. *Patient Educ Couns* 2013; **93**: 27-33. [DOI: 10.1016/j.pec.2013.06.012]
13. Müller E, Diesing A, Rosahl A, Scholl I, Härter M, Buchholz A. Evaluation of a shared decision-making communication skills training for physicians treating patients with asthma: a mixed methods study using simulated patients. *BMC Health Serv Res* 2019; **19**: 1-10.
14. Muller E, Strukava A, Scholl I, Harter M, Diouf N, Legare F, Buchholz A. Strategies to evaluate healthcare provider trainings in shared decision-making (SDM): a systematic

review of evaluation studies. *BMJ OPEN* 2019; **9**. [DOI: 10.1136/bmjopen-2018-026488]
15. Ospina NS, Toloza FJ, Barrera F, Bylund CL, Erwin PJ, Montori V. Educational programs to teach shared decision making to medical trainees: A systematic review. *Patient Educ Couns* 2020; **103**: 1082-1094.
16. Charles C, Gafni A, Whelan T. Decision-making in the physician-patient encounter: revisiting the shared treatment decision-making model. *Soc Sci Med 1982* 1999; **49**: 651-661. [PMID: 10452420 DOI: 10.1016/s0277-9536(99)00145-8]
17. Elwyn G, Laitner S, Coulter A, Walker E, Watson P, Thomson R. Implementing shared decision making in the NHS. *BMJ* 2010; **341**: c5146. [PMID: 20947577 DOI: 10.1136/bmj.c5146]
18. Stewart MA. Effective physician-patient communication and health outcomes: a review. *CMAJ Can Med Assoc J* 1995; **152**: 1423.
19. Agoritsas T, Heen AF, Brandt L, Alonso-Coello P, Kristiansen A, Akl EA, Neumann I, Tikkinen KA, Weijden T van der, Elwyn G, Montori VM, Guyatt GH, Vandvik PO. Decision aids that really promote shared decision making: the pace quickens. *BMJ* 2015; **350**: g7624. [PMID: 25670178 DOI: 10.1136/bmj.g7624]
20. Gomella LG, Albertsen PC, Benson MC, Forman JD, Soloway MS. The use of video-based patient education for shared decision-making in the treatment of prostate cancer. *Semin Urol Oncol* 2000; **18**: 182-187.
21. Van der Leeuw RM, Lombarts KM, Arah OA, Heineman MJ. A systematic review of the effects of residency training on patient outcomes. *BMC Med* 2012; **10**: 65. [DOI: 10.1186/1741-7015-10-65]
22. Moher D, Liberati A, Tetzlaff J, Altman DG, Group TP. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLOS Med* 2009; **6**: e1000097. [DOI: 10.1371/journal.pmed.1000097]
23. Bramer WM, de Jonge GB, Rethlefsen ML, Mast F, Kleijnen J. A systematic approach to searching: an efficient and complete method to develop literature searches. *J Med Libr Assoc JMLA* 2018; **106**: 531-541. [PMID: 30271302 DOI: 10.5195/jmla.2018.283]
24. Relevo R. Effective Search Strategies for Systematic Reviews of Medical Tests. In: Chang SM, Matchar DB, Smetana GW, Umscheid CA, editors. *Methods Guide for Medical Test Reviews*. Rockville (MD): Agency for Healthcare Research and Quality (US), 2012 Available from: http://www.ncbi.nlm.nih.gov/books/NBK98242/
25. Eriksen MB, Frandsen TF. The impact of patient, intervention, comparison, outcome (PICO) as a search strategy tool on literature search quality: a systematic review. *J Med Libr Assoc JMLA* 2018; **106**: 420-431. [PMID: 30271283 DOI: 10.5195/jmla.2018.345]
26. Frandsen TF, Bruun Nielsen MF, Lindhardt CL, Eriksen MB. Using the full PICO model as a search tool for systematic reviews resulted in lower recall for some PICO elements. *J Clin Epidemiol* 2020; **127**: 69-75. [DOI: 10.1016/j.jclinepi.2020.07.005]
27. Kellermeyer L, Harnke B, Knight S. Covidence and Rayyan. *J Med Libr Assoc JMLA* 2018; **106**: 580-583. [PMID: null DOI: 10.5195/jmla.2018.513]
28. Perez Jolles M, Richmond J, Thomas KC. Minority patient preferences, barriers, and facilitators for shared decision-making with health care providers in the USA: A systematic review. *Patient Educ Couns* 2019; **102**: 1251-1262. [DOI: 10.1016/j.pec.2019.02.003]
29. Veritas Health Innovation. Veritas Health, LLC. Veritas Health. 2020. Available from: https://www.veritashealth.com/
30. Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart LA. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. *BMJ* 2015; **349**: g7647. [PMID: 25555855 DOI: 10.1136/bmj.g7647]
31. Campbell DT, Stanley JC. Experimental and quasi-experimental designs for research. Belomt, CA: Wadsworth
32. Snilstveit B, Oliver S, Vojtkova M. Narrative approaches to systematic review and synthesis of evidence for international development policy and practice. *J Dev Eff* 2012; **4**: 409-429. [DOI: 10.1080/19439342.2012.710641]
33. Haidich AB. Meta-analysis in medical research. *Hippokratia* 2010; **14**: 29-37.
34. Zenner C, Herrnleben-Kurz S, Walach H. Mindfulness-based interventions in schools—a systematic review and meta-analysis. *Front Psychol* 2014; **5**. [DOI: 10.3389/fpsyg.2014.00603]
35. Cook DA, Hamstra SJ, Brydges R, Zendejas B, Szostek JH, Wang AT, Erwin PJ, Hatala R. Comparative effectiveness of instructional design features in simulation-based education: Systematic review and meta-analysis. *Med Teach* 2013; **35**: e867-e898. [DOI: 10.3109/0142159X.2012.714886]
36. Gärtner FR, Bomhof-Roordink H, Smith IP, Scholl I, Stiggelbout AM, Pieterse AH. The quality of instruments to assess the process of shared decision making: A systematic review. *PLOS ONE* 2018; **13**: e0191747. [DOI: 10.1371/journal.pone.0191747]
37. Lydon S, O'Dowd E, Walsh C, O'Dea A, Byrne D, Murphy AW, O'Connor P. Systematic review of interventions to improve gender equity in graduate medicine. *Postgrad Med J* (e-pub ahead of print 26 February 2021; doi:10.1136/postgradmedj-2020-138864).
38. Fenton L, Lauckner H, Gilbert R. The QATSDD critical appraisal tool: comments and critiques. *J Eval Clin Pract* 2015; **21**: 1125-1128.
39. Sirriyeh R, Lawton R, Gardner P, Armitage G. Reviewing studies with diverse designs: the development and evaluation of a new tool. *J Eval Clin Pract* 2012; **18**: 746-752.
40. Alele F, Malau-Aduli B, Malau-Aduli A, Crowe M. Systematic review of gender differences in the epidemiology and risk factors of exertional heat illness and heat tolerance in the armed forces. *BMJ Open* 2020; **10**: e031825. [PMID: 32265238 DOI: 10.1136/bmjopen-2019-031825]
41. Graham-Clarke E, Rushton A, Noblet T, Marriott J. Facilitators and barriers to non-medical prescribing ─ A systematic review and thematic synthesis. *PLOS ONE* 2018; **13**: e0196471. [DOI: 10.1371/journal.pone.0196471]
42. Harrison R, Jones B, Gardner P, Lawton R. Quality assessment with diverse studies (QuADS): an appraisal tool for methodological and reporting quality in systematic reviews of mixed- or multi-method studies. *BMC Health Serv Res* 2021; **21**: 144. [PMID: 33588842 DOI: 10.1186/s12913-021-06122-y]
43. Walton M, Harrison R, Burgess A, Foster K. Workplace training for senior trainees: a systematic review and narrative synthesis of current approaches to promote patient safety. *Postgrad Med J* 2015; **91**: 579-587.
44. Dannels DP, Gaffney ALH. Communication Across the Curriculum and in the Disciplines: A Call for Scholarly Cross-curricular Advocacy. *Commun Educ* 2009; **58**: 124-153. [DOI: 10.1080/03634520802527288]
45. Pollard S, Bansback N, Bryan S. Physician attitudes toward shared decision making: A systematic review. *Patient Educ Couns* 2015; **98**: 1046-1057. [DOI: 10.1016/j.pec.2015.05.004]
46. Files JA, Blair JE, Mayer AP, Ko MG. Facilitated Peer Mentorship: A Pilot Program for Academic Advancement of Female Medical Faculty. *J Womens Health* 2008; **17**: 1009-1015. [DOI: 10.1089/jwh.2007.0647]
47. Helitzer DL, Newbill SL, Morahan PS, Magrane D, Cardinali G, Wu C-C, Chang S. Perceptions of skill development of participants in three national career development programs for women faculty in academic medicine. A*cad Med J Assoc Am Med Coll* 2014; **89**: 896.
48. Botma Y, Van Rensburg GH, Heyns T, Coetzee IM. A conceptual analysis of transfer of learning in Health Sciences Education. *Afr J Phys Health Educ Recreat Dance* 2013; **19**: 32-43.
49. Knapp RG, Miller MC 3rd. Clinical relevance: an issue in biostatistical training of medical students. *Med Educ* 1987; **21**: 32-7.
50. Yardley S, Dornan T. Kirkpatrick's levels and education 'evidence'. *Med Educ* 2012; **46**: 97-106. [DOI: 10.1111/j.1365-2923.2011.04076.x]
51. Coates D, Clerke T. Training Interventions to Equip Health Care Professional s With Shared Decision-Making Skills: A Systematic Scoping Review. *J Contin Educ Health Prof* 2020; **40**: 1. [DOI: 10.1097/CEH.0000000000000289]
52. Légaré F, Adekpedjou R, Stacey D, Turcotte S, Kryworuchko J, Graham ID, Lyddiatt A, Politi MC, Thomson R, Elwyn G, Donner-Banzhoff N. Interventions for increasing the use of shared decision making by healthcare professionals. *Cochrane Database Syst Rev* 2018; **2018**: CD006732. [PMID: 30025154 DOI: 10.1002/14651858.CD006732.pub4]
53. Dannels DP, Housley Gaffney AL. Communication Across the Curriculum and in the Disciplines: A Call for Scholarly Cross-curricular Advocacy. *Commun Educ* 2009; **58**: 124-153. [DOI: 10.1080/03634520802527288]
54. Files JA, Blair JE, Mayer AP, Ko MG. Facilitated peer mentorship: a pilot program for academic advancement of female medical faculty. *J Womens Health 2002* 2008; **17**: 1009-1015. [PMID: 18681821 DOI: 10.1089/jwh.2007.0647]
55. Harden RM. AMEE Guide No. 21: Curriculum mapping: a tool for transparent and authentic teaching and learning. *Med Teach* 2001; **23**: 123-137. [PMID: 11371288 DOI: 10.1080/01421590120036547]
56. Helitzer DL, Newbill SL, Morahan PS, Magrane D, Cardinali G, Wu C-C, Chang S. Perceptions of Skill Development of Participants in Three National Career Development Programs For Women Faculty in Academic Medicine. *Acad Med J Assoc Am Med Coll* 2014; **89**: 896-903. [PMID: 24871241 DOI: 10.1097/ACM.0000000000000251]
57. Knapp RG, Miller MC. Clinical relevance: an issue in biostatistical training of medical students. *Med Educ* 1987; **21**: 32-37. [PMID: 3821598 DOI: 10.1111/j.1365-2923.1987.tb00511.x]
58. Pollard S, Bansback N, Bryan S. Physician attitudes toward shared decision making: A systematic review. *Patient Educ Couns* 2015; **98**: 1046-1057. [PMID: 26138158 DOI: 10.1016/j.pec.2015.05.004]
59. Legare F, Labrecque M, Cauchon M, Castel J, Turcotte S, Grimshaw J. Training family physicians in shared decision-making to reduce the overuse of antibiotics in acute respiratory infections: a cluster randomized trial. *Can Med Assoc J* 2012; **184**: 1468-1468.
60. Huffman LC, Hubner LM, Hansen RL. Autism-Focused Online Training in Shared Decision-Making: A Randomized Controlled Trial. *J Dev Behav Pediatr* 2021; **42**: 173-181. [DOI: 10.1097/DBP.0000000000000882]
61. Mahmood S, Hazes JMW, Veldt P, Riel P van, Landew R, Moens HB, Pasma A. The Development and Evaluation of Personalized Training in Shared Decision-making Skills for Rheumatologists. *J Rheumatol* 2020; **47**: 290-297. [PMID: 30936289 DOI: 10.3899/jrheum.180780]
62. Kanzaria HK, Chen EH. Shared Decision Making for the Emergency Provider: Engaging Patients When Seconds Count. *MedEdPORTAL J Teach Learn Resour* 2020; **16**: 10936. [PMID: 32875088 DOI: 10.15766/mep_2374-8265.10936]
63. Worthington RO, Oyler J, Pincavage A, Baker NA, Saathoff M, Rusiecki J. A Novel Contraception Counseling and Shared Decision-Making Curriculum for Internal Medicine Residents. *MedEdPORTAL* 2020; **16**: 11046. [DOI: 10.15766/mep_2374-8265.11046]
64. Ritter S, Stirnemann J, Breckwoldt J, Stocker H, Fischler M, Mauler S, Fuhrer-Soulier

V, Meier CA, Nendaz M. Shared Decision-Making Training in Internal Medicine: A Multisite Intervention Study. *J Grad Med Educ* 2019; **11**: 146-151. [DOI: 10.4300/JGME-D-18-00849]

65. Chesney T, Devon K. Training surgical residents to use a framework to promote shared decision-making for patients with poor prognosis experiencing surgical emergencies. *Can J Surg* 2018; **61**: 114-120. [DOI: 10.1503/cjs.011317]
66. Dion M, Diouf NT, Robitaille H, Turcotte S, Adekpedjou R, Labrecque M, Cauchon M, Légaré F. Teaching Shared Decision Making to Family Medicine Residents: A Descriptive Study of a Web-Based Tutorial. *JMIR Med Educ* 2016; **2**: e6442. [DOI: 10.2196/mededu.6442]
67. Rusiecki J, Schell J, Rothenberger S, Merriam S, McNeil M, Spagnoletti C. An Innovative Shared Decision-Making Curriculum for Internal Medicine Residents: Findings From the University of Pittsburgh Medical Center. *Acad Med* 2018; 93: 937-942. [DOI: 10.1097/ACM.0000000000001967]
68. Simmons L, Leavitt L, Ray A, Fosburgh B, Sepucha K. Shared Decision Making in Common Chronic Conditions: Impact of a Resident Training Workshop. *Teach Learn Med* 2016; **28**: 202-209. [DOI: 10.1080/10401334.2016.1146600]
69. Stacey D, Samant R, Pratt M, Légaré F. Feasibility of Training Oncology Residents in Shared Decision Making: A Pilot Study. *J Cancer Educ* 2012; **27**: 456-462. [DOI: 10.1007/s13187-012-0371-y]
70. Yuen JK, Mehta SS, Roberts JE, Cooke JT, Reid MC. A brief educational intervention to teach residents shared decision making in the intensive care unit. *J Palliat Med* 2013; **16**: 531-536.
71. Miller KH, Miller BM, Karani R. Considering research outcomes as essential tools for medical education decision making. *Acad Med* 2015; **90**: S1-S4.
72. Gonyea RM. Self-reported data in institutional research: Review and recommendations. *New Dir Institutional Res* 2005; **2005**: 73-89. [DOI: 10.1002/ir.156]
73. Hoffmann T, Gibson E, Barnett C, Maher C. Shared decision making in Australian physiotherapy practice: A survey of knowledge, attitudes, and self-reported use. *PloS One* 2021; **16**: e0251347. [PMID: 34014934 DOI: 10.1371/journal.pone.0251347]
74. Colthart I, Bagnall G, Evans A, Allbutt H, Haig A, Illing J, McKinstry B. The effectiveness of self-assessment on the identification of learner needs, learner activity, and impact on clinical practice: BEME Guide no. 10. *Med Teach* 2008; **30**: 124-145. [DOI: 10.1080/01421590701881699]
75. Cleland JA, Abe K, Rethans JJ. AMEE Guide No. 42: The use of simulated patients in medical education. *Med Teach* 2009; **31**: 477-486.
76. Kaplonyi J, Bowles K-A, Nestel D, Kiegaldie D, Maloney S, Haines T, Williams C. Understanding the impact of simulated patients on health care learners communication skills: a systematic review. *Med Educ* 2017; **51**: 1209-1219.
77. Bokken L, van Dalen J, Rethans J-J. The case of "Miss Jacobs": Adolescent simulated patients and the quality of their role playing, feedback, and personal impact. *Simul Healthc* 2010; **5**: 315-319.
78. Nestel D, Burn CL, Pritchard SA, Glastonbury R, Tabak D. The use of simulated patients in medical education: Guide supplement 42.1—Viewpoint. *Med Teach* 2011; **33**: 1027-1029.
79. Kanzaria HK, Booker-Vaughns J, Itakura K, Yadav K, Kane BG, Gayer C, Lin G, LeBlanc A, Gibson R, Chen EH, Williams P, Carpenter CR. Dissemination and Implementation of Shared Decision Making Into Clinical Practice: A Research Agenda. *Acad Emerg Med* 2016; **23**: 1368-1379. [DOI: 10.1111/acem.13075]
80. Kirkpatrick DL, Craig RL. Evaluation of training. *Eval Short-Term Train Rehabil* 1970; : 35.
81. Reio TG, Rocco TS, Smith DH, Chang E. A Critique of Kirkpatrick's Evaluation Model. *New Horiz Adult Educ Hum Resour Dev* 2017; **29**: 35-53. [DOI: 10.1002/nha3.20178]
82. Mahood Q, Eerd DV, Irvin E. Searching for grey literature for systematic reviews: challenges and benefits. *Res Synth Methods* 2014; **5**: 221-234. [DOI: 10.1002/jrsm.1106]
83. Walsh C, Lydon S, O'Dowd E, O'Connor P. Barriers to healthcare for persons with autism: a systematic review of the literature and development of a taxonomy. *Dev Neurorehabilitation* 2020; **23**: 413-430.
84. Raymaker DM, McDonald KE, Ashkenazy E, Gerrity M, Baggs AM, Kripke C, Hourston S, Nicolaidis C. Barriers to healthcare: Instrument development and comparison between autistic adults and adults with and without other disabilities. *Autism* 2017; **21**: 972-984. [DOI: 10.1177/1362361316661261]
85. Simons M, Rapport F, Zurynski Y, Stoodley M, Cullis J, Davidson AS. Links between evidence-based medicine and shared decision-making in courses for doctors in training: a scoping review. *BMJ Open* 2022; **12**: e057335.[DOI: 10.1136/bmjopen-2021-057335]