**Critical Appraisal of Experimental Studies Published on the Impact of Different Approaches of Medical Ethics Education**

**Kabirian M1, Shamsi Gooshki E2, Khadivzadeh T3\***

1 Assistant Professor, Nursing and Midwifery Care Research Center, Mashhad University of Medical Sciences, Mashhad, Iran.

2 Assistant Professor, Medical Ethics and History of Medicine Research Center, Tehran University of Medical Sciences, Tehran, Iran

3 PhD Student of reproductive Health, Nursing and Midwifery Care Research Center, Mashhad University of Medical Sciences, Mashhad, Iran.

\*Corresponding author: Dr Talat Khadivzadeh, Nursing and Midwifery faculty, ebn-e-sina avenuie, Mashhad, Razavi Khorasan, Iran. e-mail: [Kabirianm1@gmail.com](mailto:Kabirianm1@gmail.com) Phone.N: 09155257786

**Introduction:** Experimental research is one of the most effective type of investigation in medical sciences. Given the importance of these studies in producing credible scientific evidence regarding the medical ethics education, the present study aimed to critically evaluate the quality of published experimental and quasi-experimental research and the impact of different approaches on medical ethics education.

**Methods:** We investigated the published experimental or quasi-experimental studies from 2008 to 2018 and the impact of different approaches on medical ethics education in the CINAHL, Cochrane Library, PubMed, PsycINFO, Web of Science, Scopus, and Embase databases. Moral, Ethics, Education, Training, Instruction and Medical sciences were the keywords in this study. Of the 936 articles, 22 papers were evaluated using the SURE 2018 and analyzed by two researchers separately. SURE was adapted and updated from the former Health Evidence Bulletins Wales checklist. It consisted of 14 items with a scoring of “yes, no and can’t tell”. The score range for each article was defined from 0 to 28. Data were analyzed using descriptive statistics and SPSS ver. 22.

**Results:** The mean overall quality of the 22 reviewed articles was 14.30 ± 3.23 with a range of 8-20. The appropriateness of the research question and the type of interventions earned the full score in 95.7% and 100% of the articles. Randomization and random allocation were reported in 13% and 43.5% of the articles. None of the articles reported blindness (0%). 69.6% of the articles had a zero score on the sample size. 82.6% of the articles were referred to the main results, while only one article was reported the exact description of the data analysis. In terms of ethics in the research, 21.7% and 52.2% of the articles were referred to the code of ethics and the conflict of interest, respectively.

**Conclusion:** There is a moderate to low level of quality in the experimental studies published in the field of ethics education. The most notable weakness of articles was related to the research methodology section. Therefore, it is suggested that statisticians, methodologists, and standard tools be considered for the self-assessment of articles and training in this regard.

**Keywords:** Critical Appraisal, Education, Ethics, Medical Sciences, SURE checklist

**Introduction**

Literature reviews in the medical databases often result in an enormous volume of results (1). A large output of medical literature coming out every year (2). With the ever increasing load of scientific literature (more than 12,000 new articles added every week to the MEDLINE database); keeping abreast of the current literature can be difficult (3). The main objective of medical literature is to provide unbiased and accurate medical information supported by strong scientific evidence that could aid and enhance patient care (2).

Experimental studies such as randomized controlled trial (RCT) are placed at the highest level of evidence (4). Whenever a trial is conducted, there are three possible statements for the results: findings are correct (truth), represents random variation (chance) or they are influenced by systematic error (bias) (5). Studies have shown that bias can obscure up to 60% of the real effect of a healthcare intervention. A mounting body of empirical evidence shows that ‘biased results from poorly designed and reported trials can mislead decision-making in healthcare at all levels (6).

Therefore, critical appraisal of the quality of clinical research helps distinguish what is significant and what is significant from what is not (1). Critical appraisal is the process of carefully and systematically examining a study to judge its trustworthiness, value, and relevance in a particular context (7). Critical appraisal allows the researchers to reduce overloaded information by eliminating irrelevant or weak studies, identify the most relevant articles, distinguish evidence from belief, assumptions, and misreporting, assess the validity of the study, assess the usefulness and clinical applicability of the study, and recognize any potential for bias (1). Critical appraisal of scientific literature is an important skill to be mastered not only by the academic medical professionals, but also by those involved in clinical practice. Before incorporating changes in the management of patients, a thorough evaluation of the current or published literature is a necessary step in practicing evidence-based medicine (2).

Critical appraisal is used in evidence-based healthcare training to assist clinical decision-making. It is also increasingly employed in the evidence-based social care and education ministration (8).

The education in medical ethics has become exceedingly important in recent years. In this context, the use of technology raises the issues of ethics and human rights (9). Despite the broad agreement on the importance of teaching medical ethics, there is no consensus about the specific goals of medical ethics education, the essential knowledge and skills learners should acquire, the best methodologies and processes for instruction, and the optimal strategies for assessment.(10-13). Giubilini et al. (2016) described three main challenges for medical ethics education: counteracting the bad effects of the "hidden curriculum," teaching students how to apply ethical knowledge and critical thinking to real cases in clinical practice, and shaping future doctors' right character through ethics education (14). Megregian (2016) found that there was a considerable variation in ethics education in terms of content, format, and evaluation among accredited midwifery education programs in the United States (15). Other qualitative studies showed weaknesses and challenges in medical ethics curriculum under five themes: comprehensiveness of goals, composing organization, proportion of content, active teaching method, and comprehensive system of evaluation (16).

Despite the availability of argument-based literature about ethics education, concerning about the best evidence to teach ethics is still debated. Therefore, this study aimed to conduct a critical evaluation on the quality of published experimental and quasi-experimental studies on the impact of different approaches to medical ethics education.

**Methods**

This descriptive study was carried out in 2018 to evaluate the quality of published articles in the field of ethics education in medical sciences. For this purpose, we studied the published experimental studies from 2008 to 2018 on the impact of different approaches to medical ethics education were investigated in the CINAHL, Cochrane Library, PubMed, PsycINFO, Web of Science, Scopus, and Embase databases. In this study, the keywords were Moral, Ethics, Education, Training, Instruction and Medical sciences. There were no language restrictions. We defined the following inclusion criteria: 1) different disciplines of medical sciences, such as medicine, nursing, midwifery and etc. 2) different approaches of ethics education, such as Team-based Learning, Problem-based Learning, Lecture-based learning, group discussion format, On-line ethics education and etc. 3) either experimental or quasi-experimental studies; 4) Full texts available from 2008 to 2018. Exclusion criteria included qualitative and non-experimental studies, letter to the editor and articles presented at conferences. Based on entry criteria, screening was done in three stages: reviewing the titles, abstracts, and the full texts. Manual searches were done for cross-references in relevant articles. Figure 1 shows the study selection process by PRISMA flowchart.

Two researchers (MK, MAB), who were the PhD candidates of reproductive health, assessed the eligibility of all included studies independently. First, the titles and abstracts were reviewed. Then the eligibility of the full-text articles were examined. Those texts which did not fulfill the priori defined inclusion criteria were excluded. A third researcher (KhT), Assistant Professor, was consulted if there were any disagreements between the two researchers.

The quality of each article was assessed by the Specialist Unit for Review Evidence (SURE) 2018 checklist. The questions were appropriate to assist the critical appraisal of randomized controlled trials and other experimental studies. SURE was adapted and updated from the former Health Evidence Bulletins Wales checklist with reference to the NICE Public Health Methods Manual (2012) and the previous versions of the Critical Appraisal Skills Programme (CASP) checklists, with reference to the CONSORT statement. SURE consisted of 14 items with a scoring of “no, can’t tell and yes” with a range of zero to two points with higher scores indicating better methodological quality. The total score on SURE was 28 points, and the minimum score is 0 points.

The questions included information associated with having structured PICO, random selection, concealed allocation, blinding, well description of intervention, having published protocol, discussed similarity of groups, having sufficient sample size and power calculation, assessed important outcomes, reported conflict of interest, report of ethical approval, intention to treat analysis, described statistical methods and quality of final discussion.

We considered the ethical issues such as plagiarism, intellectual property, overlapping articles, and refusing building data.

The statistical analysis was performed in SPSS v 16. Descriptive statistics (e.g. mean, standard deviation, and frequency) were used for data description.

**Results**

Out of the 936 papers identified, most were excluded as they neither discussed medical ethics education nor were experimental or quasi-experimental designs. As seen in Fig 1, 22 studies met the inclusion criteria for this review (17-38). These articles were reviewed to evaluate the quality of articles on the impact of various ethical education approaches in medical sciences. Most of the studies took place at the institutions in Iran (18, 20, 25, 27-29, 32) USA (23, 24, 26) and Korea (17, 22, 30). 10 studies included nursing students (19, 22, 24, 27-31, 34, 36), and five studies included medical students (17, 20, 21, 26, 33). In this review, there were various types of educational methods for teaching ethics in medical science. Most studies evaluated Problem-based Learning (PBL) (25, 29, 31) and Team-based Learning (TBL) (17, 33, 35). Also, the other educational interventions included Students’ Medical Ethics Rounds (SMER) (20), group discussion (26), On-line ethics education (36, 37), Action learning (22), Narrative Pedagogy (24), Education based on the “4A model” (32), ethics education using multimedia software (27, 28) and other education-based intervention (18, 19, 21, 30, 34, 38). Assessment methods were heterogeneous. No two studies used precisely the same outcome measures. Study characteristics are shown in Table 1.

The quality of each study assessed by validity criteria of SURE checklist. The mean overall quality of the 22 reviewed articles was 14.30 ± 3.23 with a range of 8-20. None of the authors followed all the checklist items. The highest quality score was received by the Khatiban,et al (2018) (29). The evaluation of this article includes earning 16 scores for having structured PICO, concealed allocation, well description of intervention, having published protocol, discussed similarity of groups, having sufficient sample size and power calculation, assessed important outcomes, and reported conflict of interest and four scores for report of ethical approval, intention to treat analysis, described statistical methods and quality of final discussion. This article no score was earned for random selection and blinding.

Generally, the appropriateness of the research question and the type of interventions earned the full score in 95.7% and 100% of the articles. Randomization and random allocation were reported in 13% and 43.5% of the articles. None of the articles reported blindness (0%). 69.6% of the articles had a zero score on the sample size. 82.6% of the articles were referred to the main results, while only one article reported the exact description of the data analysis. In terms of ethics in the research, 21.7% of the articles referred to the code of ethics and 52.2% to the conflict of interest. Table 2 shows that blinding, protocols recording and use of proportional statistical methods earned the least amount of tool’s score. It also indicates our judgments of the quality of all included studies.

**Discussion**

In this study, 22 published empirical or quasi-experimental papers were reviewed on the impact of different approaches of medical ethics education, which were indexed at credible databases between 2008 and 2018. There are very few reviews of the literature on the quality assessment of the studies related to the effectiveness of medical ethics education. This reduces the possibility of comparing the results of studies.

The mean overall quality of the 22 reviewed articles was 14.30 ± 3.23 with a range of 8-20, which were of medium to low quality. This result is consistent with the study of Stolt et al (2017) (39). Based on the review of Stolt et al, there is need to develop research and support the evidence-based ethical quality in the field of medical, nursing and healthcare ethics. They also reported that there is a clear need to develop and implement ethics interventions in clinical practice and evaluate the effects of these interventions in the future (39).

The real experimental design consists of three components: randomization, comparison group, and controlled intervention. However, empirical designs are not always used in humanities research for ethical and operational reasons, (40). Also, 87% of articles have not been mentioned for randomization, which can be neglected due to the nature of the subject and the evaluation of educational interventions on human samples. However, in cases in which the random sampling is impossible, it is expected that studies use a random allocation approach to design a quasi-experimental study to quantify the causality and determine the effects. 30.4% of the articles in this study, which were able to carry out random assignments, did not mention any report in their articles. The random assignment is intended to reduce the risk of arrogance in the selection of groups. Therefore, failure to do so plays a role in reducing the quality of the articles and the reliability of their results.

The importance of the sample size in the validity of the empirical studies is that the sample size calculation is considered as a quality evaluation criteria in all standard tools. Despite the high emphasis on the exact calculation of sample size in empirical studies, nearly 70% of the papers in this study have not discussed how adequately the sample size was in their studies.

In this regard, the results of the Garza et al (2016) showed that the common methodological issues in appraising the studies about teaching medical ethics included a lack of concealment of allocation, a lack of blinding, and generally low numbers of subjects (41).

In the data analysis in most studies, only the statistical methods were discussed. While it can be concluded that the analysis of data is completely done that researchers consider to how missing data was handled; were potential sources of bias (confounding factors) controlled for; how loss to follow-up was addressed. Based on the results of the present study, only one paper from 22 papers completely described the data analysis (37).

Given the main field of articles, researchers are expected to pay more attention to ethics in their articles. There are two items in the SURE to assess the ethics of research: Obtaining the code of ethics and observing the conflict of interests. In this study, only five articles out of 22 articles clearly outlined the ethics code (19, 30, 31, 33, 34). Also, nearly 50% of the articles did not mention conflicts of interest. This explains the need for more attention to the ethical reports in the research.

A large part of the low quality of writing may be due to the lack of knowledge of the researchers with standard forms and checklists.

The findings are limited by the used search terms and databases, so it was possible that we did not find all relevant articles. Additionally, the searching was completed in specified time interval. Despite the efforts of the research team to select a specialized tool for the evaluation of quasi-experimental studies, the SURE scoring system does not consider any methodological points such as special items for evaluating one-group design of quasi-experimental studies. This review shows, however, that there is a growing body of research on medical ethics education using experimental and quasi experimental designs. In this study, we accepted any interventions using ethical concepts in the expression of education methods to enable an in-depth investigation of the topic. We conducted the literature search following a systematic search protocol, using several comprehensive databases with no language restriction. A large number of citations were evaluated by two researchers first independently and then together to reach a consensus and to minimize selection bias.

**Conclusions**

Experimental studies published in the field of ethics education in medical sciences have a moderate to low level of quality. The most conspicuous weakness of articles was the research methodology section. Therefore, it is suggested that the use of statisticians and methodologists, standard tools for self-assessment of articles and training in this regard should be considered. Both the number and quality of experimental studies need to increase and the scope of research needs to expand to secure the strongest possible evidence base for the provision of medical ethics education.

**Conflicts of interest**

There is no conflict of interest to declare.

**Funding**

The authors received no financial support for the research, authorship and/or publication of this article.

**References**

1. Dissecting the literature: the importance of critical appraisal [Internet]. Royal College of Surgeons. 2017 [cited 2019/4/20]. Available from: <https://www.rcseng.ac.uk>.

2. Umesh G KJ, Magazine R. Critical appraisal of published literature. Indian J Anaesth. 2016;60:670-3.

3. Glasziou PP. Information overload: what’s behind it, what’s beyond it. Med J Aust. 2008;189(2):84-5.

4. Association CM. The periodic health examination. Canadian Task Force on the Periodic Health Examination. Can Med Assoc; 1979.

5. Moher D SK, Altman D. The CONSORT Statement: Revised recommendations for improving the quality of reports of parallel-group randomized trials 2001. Explore (NY). 2005;1:40-5.

6. Schulz KF, Altman DG, Moher D. CONSORT 2010 statement: updated guidelines for reporting parallel group randomised trials. BMC medicine. 2010;8(1):18.

7. What is Critical Appraisal? [Internet]. 2009 [cited 2019 Jun 5]. Available from: <http://www.medicine.ox.ac.uk/bandolier/painres/download/whatis/what_is_critical_appraisal.pdf> .

8. Taylor RS, Reeves BC, Ewings PE, Taylor RJ. Critical appraisal skills training for health care professionals: a randomized controlled trial [ISRCTN46272378]. BMC Medical Education. 2004;4(1):30.

9. Brock DW. Shaping future children: Parental rights and societal interests. Journal of Political Philosophy. 2005;13(4):377-98.

10. Eckles RE ME, Gaffney M, Helft PR. Medical ethics education: where are we? Where should we be going? A review. Academic medicine. 2005;80(12):1143-52.

11. 2000;34(2):108-19. GJ. Review of ethics curricula in undergraduate medical education. Medical education. 2000;34(2):108-19.

12. Persad GC EL, Sedig L, Flores L, Emanuel EJ The current state of medical school education in bioethics, health law, and health economics. . Medicine & Ethics. 2008;36(1):89-94.

13. Lakhan SE HE MT, Laird C. Time for a unified approach to medical ethics. Philos Ethics Humanit Med. 2009;4(13).

14. Giubilini A MS, Savulescu J. The Medical Ethics Curriculum in Medical Schools: Present and Future. J Clin Ethics. 2016;27(2):129-45.

15. Megregian M. Ethics Education in Midwifery Education Programs in the United States. Journal of Midwifery & Womens Health. 2016;61(5):586-92.

16. Khaghanizadeh M MH, Abbasi M, Abaspour A. Identity of Medical Ethics Curriculum Based on the Experiences of Medical Ethics Professors: A Qualitative Study. Medical Ethics Journal. 2011;5(16).

17. Chung EK RJ, Baik YH, San A. The effect of team-based learning in medical ethics education. Medical Teacher. 2009;31:1013-7.

18. Abedian K BNM, Shahhosseini Z. The Effect of an Education-Based Intervention on Self-Reported Awareness and Practice of Iranian Nurses in Observing Patients’ Rights. Global Journal of Health Science. 2015;7(3):98-104.

19. Baykara ZG DS, Yaman S. The effect of ethics training on students recognizing ethical violations and developing moral sensitivity. Nursing Ethics 2015;22(6):661-75.

20. Beigy M PG, Moghaddas F, Maghbouli N, Shirbache K, Asghari F, Abolfat-h Zadeh N. Students’ medical ethics rounds: a combinatorial program for medical ethics education. J Med Ethics Hist Med. 2016;9(3).

21. Chin JL VT, Abdul Karim S, Chan YH, Campbell AV. Evaluating the Effects of an Integrated Medical Ethics Curriculum on First-year Students. Ann Acad Med Singapore 2011;40:4-18. 2011;40:4-18.

22. Choe K PS, Yooc S. Effects of constructivist teaching methods on bioethics education for nursing students: A quasi-experimental study. Nurse Education Today. 2014;34:848-53.

23. CM B. The Effect of a Workshop on Reducing the Experience of Moral Distress in an Intensive Care Unit Setting. DIMENS CRIT CARE NURS. 2008;27(6):263-7.

24. Gazarian P FL, Sheehan K. Effectiveness of narrative pedagogy in developing student nurses’ advocacy role. Nursing Ethics. 2016;23(2):132-41.

25. Heidari A AH, Taziki A, Akbari V, Ghadir MR, Moosavi-Movahhed M, Ahangari R, et al. Teaching medical ethics: problem‐based learning or small group discussion? Journal of Medical Ethics and History of Medicine. 2013;6(1):1-6.

26. K A. A trial of a reproductive ethics and law curriculum for obstetrics and gynaecology residents. Teaching and learning ethics. 2014;0:1-3.

27. Khalili A AS, Joonbakhsh F, Ahmadinia H, Davodi M. Comparative study of the impact of professional ethics education using lecture and multimedia software on knowledge of nursing students. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2017;8(2):212-6.

28. Khalili A DM, Pouladi S, Paymard A, Shayan A, Azodi P, Azodi F, et al. Comparative Study on the Effect of Professional Ethics Education Using Two Methods, Group Discussion and Multi-Media Software on the Knowledge of Nursing Students. Research Journal of Pharmaceutical, Biological and Chemical Sciences

2016;7(4).

29. Khatiban M FN, Amini R, Farahanchi A, Soltanian A. Lecture-based versus problembased learning in ethics education among nursing students. Nursing Ethics. 2018;1(12).

30. Koo OH RY, Kim MS. Effects of ethics education on ethical values in nursing students. Journal of Engineering and Applied Sciences. 2018;13(2):2903-8.

31. Lin Ch LM-S, Chung Ch-Ch, Yang Ch-M. A comparison of problem-based learning and conventional teaching in nursing ethics education. Nursing Ethics. 2010;17(3):373-82.

32. Molazem Z TN, Sharif F, Keshavarzi S, Ghadakpour S. Effect of education based on the “4A Model” on the Iranian nurses’ moral distress in CCU wards. J Med Ethics Hist Med 2013;6(5).

33. Ozgonul L AM. Comparison of lecture and team-based learning in medical ethics education. Nursing Ethics. 2017;1(11).

34. S M. Caring for tomorrow’s workforce: Moral resilience and healthcare ethics education. Nursing Ethics

2016;23(1):104-16.

35. S. H. Teaching ethics to pharmacy students using a team-based learning approach. Pharmacy Education. 2011;11(1):99-106.

36. Trobec I ISA. Developing nursing ethical competences online versus in the traditional classroom. Nursing Ethics

2015;22(3):352-66.

37. VanderKaay S LL, Jung B, E. Moll S. On-line ethics education for occupational therapy clinician–educators: a single-group pre-/post-test study. DISABILITY AND REHABILITATION. 2018:1-13.

38. Zakaria AM SW, Seada AM. Effectiveness of ethical issues teaching program on knowledge, ethical behavior and ethical stress among nurses. Journal of Nursing Education and Practice. 2016;6(7):125-34.

39. Stolt M L-KH, Ruokonen M, Repo H, Suhonen R. Ethics interventions for healthcare professionals and students: A systematic review. Nursing Ethics. 2017;1(20).

40. Polit DF, Beck CT, Hungler B. Essentials of nursing research. Methods, appraisal and utilization. 2006;6.

41. de la Garza S, Phuoc V, Throneberry S, Blumenthal-Barby J, McCullough L, Coverdale J. Teaching medical ethics in graduate and undergraduate medical education: A systematic review of effectiveness. Academic Psychiatry. 2017;41(4):520-5.

Records identified through database searching   
(n = 919)

## Included

## Screening

## Eligibility

## Identification

Additional records identified through other sources   
(n = 17)

Records after duplicates removed   
(n =826)

Full-text articles assessed for eligibility   
(n = 94)

Full-text articles excluded, with reasons

Non experimental or quasi-experimental Design (n=34)

No Outcomes of interest (n=28)

Same population (n=6)

Not available (n= 4)

Critical appraisal included   
(n = 22)

Title and abstract assessed for eligibility   
(n =826)

Records excluded   
(n =732)

Figure 1: PRISMA Flowchart of the study selection process

**Table 2: Critical appraisal of 22 included experimental or quasi-experimental studies by SURE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | Items of the SURE | NO  N (%) | Can’t tell  N (%) | Yes  N (%) |
| 1 | Does the study address a clearly focused question/hypothesis | 0 (0%) | 1(4.3%) | 22 (95.7%) |
| 2 | Was the population randomized? If YES, were appropriate methods used? | 20 (87%) | 0 (0%) | 3 (13%) |
| 3 | Was allocation to intervention or comparator groups concealed? | 7 (30.4%) | 6 (26.1%) | 10 (43.5%) |
| 4 | Were participants/investigators blinded to group allocation? If NO, was assessment of outcomes blinded? | 23 (100%) | 0 (0%) | 0 (0%) |
| 5 | Were interventions (and comparisons) well described and appropriate? | 0 (0%) | 0 (0%) | 23 (100%) |
| 6 | Was ethical approval sought and received? Do the authors report this? | 4 (17.4%) | 14 (60.9%) | 5 (21.7%) |
| 7 | Was a trial protocol published? | 22 (95.7%) | 0 (0%) | 1(4.3%) |
| 8 | Were the groups similar at the start of the trial? | 4 (17.4%) | 9 (39.1%) | 10 (43.5%) |
| 9 | Was the sample size sufficient? | 16 (69.6%) | 4 (17.4%) | 3 (13%) |
| 10 | Were participants properly accounted for? | 11 (47.8%) | 5 (21.7%) | 7 (30.4%) |
| 11 | Are the statistical methods well described? | 9 (39.1%) | 13 (56.5%) | 1 (4.3%) |
| 12 | Were all important outcomes assessed? | 0 (0%) | 4 (17.4%) | 19 (82.6%) |
| 13 | Is any sponsorship/conflict of interest reported? | 11 (47.8%) | 0 (0%) | 12 (52.2%) |
| 14 | Did the authors identify any limitations? Are the conclusions the same in the abstract and the full text? | 0 (0%) | 5 (21.7%) | 18 (78.3%) |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 1: Characteristics of 22 included experimental or quasi-experimental studies** | | | | | | | |
| First Author  Year  Country | Design | Participants | Intervention | Comparison | Outcome measures | Results | Critical Appraisal by SURE\* |
| Chung EK  2009  Korea (17) | Quasi-experimental  study  Pre-Post Test | First year medical students (n=160) | Team-based Learning (TBL) | - | student engagement, satisfaction and assessed educational achievement | TBL improved student performance and increased student engagement and satisfaction | Q1 to Q14  +/+/+/-/+/?/  -/+/-/?/?/?/+/+ |
| Beigy M  2016  Iran (20) | Experimental  study  Pre-Post Test | Medical Sciences Students (n=335) | Students’ Medical Ethics Rounds (SMER) | - | knowledge and attitude regarding selected ethical topics | SMER improved the knowledge and attitude of students | Q1 to Q14  +/-/-/-/+/?/  -/?/-/?/?/+/-/+ |
| Heidari A  2013  Iran (25) | Quasi-experimental  study | Medical Students (n=20) | Problem-based Learning (PBL) | Small Group Discussion (SGD) | Student satisfaction and their opinions about effect of ethics teaching on student behavior | The satisfaction rates were not statistically significant differences, but positive opinion about method in the PBL group was higher than the SGD group | Q1 to Q14  +/-/+/-/+/?/  -/-/-/-/?/+/-/+ |
| Lin Ch-F  2010  Taiwan (31) | Experimental  study  Pre-Post Test | Senior Nursing Student (n=142) | Problem-based Learning (PBL) | Conventional teaching | Student satisfaction and discrimination ability | PBL was shown to be more effective than conventional teaching in satisfaction and discrimination ability of student | Q1 to Q14  +/-/+/-/+/+/  -/+/-/-/?/+/+/+ |
| Ozgonul L  2017  Turkey (33) | Prospective controlled follow up study (1 and 2 years later) | Medical Students (n=163) | Team-based Learning (TBL) | Lecture groups | Student satisfaction and learner engagement | TBL is a better alternative to lecture to teach ethics in medical education | Q1 to Q14  +/-/-/-/+/+/  -/+/?/+/?/+/+/+ |
| Khatiban M  2018  Iran (29) | Quasi-experimental  study  Pre-Post Test (immediately and one month after) | Nursing Students (n=66) | Problem-based Learning (PBL) | Lecture-based Methods | Moral decision-making, reasoning, development and practical reasoning | PBL method in ethics education enhances moral development | Q1 to Q14  +/-/+/-/+/?/  +/+/+/?/?/+/+/? |
| Zakaria AM  2016  Egypt (38) | Quasi-experimental  study Pre-Post Test (immediately and 3 months after) | Staff nurses (n=70) | Ethical Issues teaching program | - | Knowledge, ethical behavior and ethical stress | Program has positive influence in improving their knowledge, reduction in the frequency and degree of stress | Q1 to Q14  +/+/?/-/+/?/  -/?/+/+/?/+/+/? |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| First Author  Year  Country | Design | Participants | Intervention | Comparison | Outcome measures | Results | Critical Appraisal by SURE\* |
| Arora K  2013  USA (26) | Quasi-experimental  study Pre-Post Test | Obstetrics and gynecology residents (n=39) | Lecture-based and problem-based learning in a group discussion format | - | Knowledge and confidence of medical ethics | Curriculum demonstrated both improvement in confidence as well as knowledge of residents | Q1 to Q14  +/-/?/-/+/?/  -/?/-/+/-/?/+/+ |
| Koo OH  2018  Korea (30) | Quasi-experimental  study  Pre-Post Test (6 months after) | Nursing students (n=163) | Lecture, Watching a video clip, discussing as a team and case studies | - | Moral sensitivity  Moral motivation | Moral sensitivity was high at 6 months after the end of the education | Q1 to Q14  +/-/?/-/+/+/  -/?/+/+/?/+/-/+ |
| Vanderkaay S  2018  Canada (37) | Quasi-experimental  study  Pre-Post Test | Occupational therapy clinician-educators (n=33) | On-line ethics education | - | Knowledge and facilitation practices | Ethics knowledge was improved and didn’t decrease over time. Intent to change practice was improved, but there wasn’t actual practice change | Q1 to Q14  +/-/?/-/+/?/  -/?/-/?/+/+/+/+ |
| Hasan S  2011  United Arab Emirates (35) | Quasi-experimental  study  Pre-Post Test  (Cross-over) | Undergraduate pharmacy students (n=56) | Team-based Learning (TBL) | Traditional Methods | student performance, attaining skills for problem solving and application of knowledge | TBL has shown to benefit in student performance, attaining skills of higher problem solving and application of knowledge | Q1 to Q14  ?/-/+/-/+/-/  -/?/-/-/-/+/-/+ |
| Abedian K  2015  Iran (18) | Quasi-experimental  study  Pre-Post Test (2 and 4 weeks after) | Nurses (n=90) | Education-based intervention | - | Awareness and practice | education-based interventions will lead to improvement in level of awareness and practice in observing Patient’s Bill of Rights | Q1 to Q14  +/+/-/-/+/-/  -/+/-/?/-/+/-/+ |
| Baykara ZG  2015  Turkey (19) | Quasi-experimental  study  Pre-Post Test | Nursing student (n=50) | Ethics training | Control | Ethical sensitivity and ethical principle protection/violation | enables them to distinguish ethical violations | Q1 to Q14  +/-/+/-/+/+/  -/+/-/-/?/+/+/+ |
| Beumer C  2008  USA (23) | Quasi-experimental  study  Pre-Post Test | Staff nurses (n=34) | Educational workshop | - | Moral distress | Educational workshop did diminish the staff’s experience of moral distress. | Q1 to Q14  +/-/-/-/+/?/  -/-/-/+/-/+/-/+ |
| Chin JL  2011  Cingapore (21) | Cohort-based quasi-experimental  study | first-year medical students (n=283) | Integrated Medical Ethics Curriculum | - | students’ knowledge, confidence and opinions | New curriculum had significant effects on the ethical development | Q1 to Q14  +/-/+/-/+/-/  -/-/?/+/-/+/-/+ |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| First Author  Year  Country | Design | Participants | Intervention | Comparison | Outcome measures | Results | Critical Appraisal by SURE\* |
| Choe K  2014  Korea (22) | Quasi-experimental  study  Pre-Post Test | Nursing student (n=93) | Action learning | Cross-examination debate | students' recognition of bioethical issues, knowledge and competency | Positive effects of action learning and cross-examination debate implemented as ethics teaching strategies | Q1 to Q14  +/-/-/-/+/?/  -/+/?/-/?/+/+/+ |
| Gazarian PK  2016  USA (24) | Quasi-experimental  study  Pre-Post Test | Senior-level nursing students (n=44) | Narrative pedagogy | - | development of advocacy | Significant differences in student nurse’s perception of their advocacy role following narrative pedagogy | Q1 to Q14  +/-/-/-/+/?/  -/?/-/-/-/+/+/+ |
| Molazem Z  2013  Iran (32) | Quasi-experimental  study  Pre-Post Test | Nurses (n=60) | Education based on the “4A model” | Control | Moral distress | The “4A model” can be used for reducing moral distress and educational interventions | Q1 to Q14  +/-/+/-/+/?/  -/+/-/+/?/+/-/+ |
| Monteverde S  2016  Switzerland (34) | Quantitative pre–post interventional study | Nursing students (n=166) | Healthcare ethics education | - | Moral resilience | Healthcare ethics education in providing students with transformative knowledge that fosters moral resilience. | Q1 to Q14  +/-/?/-/+/+/  -/?/-/-/?/+/+/+ |
| Trobec I  2015  Australia (36) | Quasi-experimental  study  Pre-Post Test | First-year nursing students (n=211) | Learning methods online | Traditional  classroom | Ethical competences | Students develop ethical competence through active engagement in a group work, role play and discussion, and there is no difference between online or traditional learning settings | Q1 to Q14  +/-/+/-/+/?/  -/-/?/-/?/+/+/+ |
| Khalili A  2017  Iran (27) | Quasi-experimental  study  Pre-Post Test | Nursing students (n= 60) | professional ethics education using multimedia software | professional ethics education using lecture | Knowledge | Both lecture and multimedia to enhance learning in the nursing students but this is about more than lecture method was multi-media approach | Q1 to Q14  +/-/-/-/+/?/  -/?/-/-/-/?/-/? |
| Khalili A  2016  Iran (28) | Quasi-experimental  study  Pre-Post Test | Nursing students (n= 60) | professional ethics education using multimedia software | professional ethics education using group discussion | Knowledge | Learning of nursing professional ethics in the discussion group was more than that in the multimedia method | Q1 to Q14  +/-/+/-/+/?/  -/+/-/-/-/?/-/? |
| \* Quality assessment was done by 14 questions of SURE which reported Q1 to Q14 and marked by + as "Yes" and – as "No" and ? as "Can’t tell" | | | | | | | |