Group Members

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Sarah currently works as a Clinical Lecturer in the Department of General Practice (RCSI) where she is the lead in curriculum development and assessment. She is involved in the teaching of undergraduate medical students in the areas of reflective writing skills, communication skills, clinical skills and ethics. She works part-time clinically in General Practice and is enrolled on the online Masters in Medical Education Programme at Dundee University. This is her first BEME review.

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Jane is a BEME Coordinator for HPEC/ BICC Centre and is currently involved with two other BEME reviews. She is involved in teaching and advising on search strategies for systematic reviews, Cochrane Reviews and Systematic Reviews for Research. Her areas of expertise are Information Management, Advanced Searching skills, Database development Open Access, Library Management and Digital Technology. She is a published author in the fields of librarianship, digital humanities and health education. At RCSI she established and teaches a modular Academic Writing course to faculty and staff. She serves on the Editorial Board for The Library Association of Ireland's Journal An Leabharlann and is Patient Reviewer for the *British Medical Journal* and an Editorial Reviewer for *International Journal of Health Care Quality Assurance*. Jane Burns is also an Occasional Lecturer in the School of Information Studies at University College Dublin where she teaches Masters level students in the area of reflective online writing skills.

Grainne McCabe, **Assistant Librarian, RCSI**
Grainne is currently involved in one other BEME review in development at RCSI. She teaches and advises on search strategies for systematic reviews. Her areas of expertise are in library skills, information literacy, search skills and advanced search and database management skills.

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Abstract

Background: Reflection is becoming a core clinical skill in undergraduate medical curricula, as exemplified by the recommendations from the Association of American Medical Colleges. (1) There is increasing evidence to support the use of reflection throughout medical training. The ability to critically reflect has been shown to increase student exam performance and student clinical performance with standardized patients. (2, 3)

Internationally, the structure of continuing professional development in medicine is also placing an increased emphasis on reflection skills. Despite this there is no clear consensus in the literature about what methods are effective for teaching reflection.

This systematic review aims to systematically summarise the range of interventions indicated in the literature and provide medical educators with the current best available evidence to choose which intervention(s) to introduce and develop in their undergraduate medical education curriculum to promote students reflective skills.

Methods: A systematic review of the literature will be undertaken using defined search key words; educational subject terms and medical subject headings (MeSH) in a range of relevant databases in consultation with two professional librarians involved in this review. Experimental studies with educational interventions to enhance teaching and learning of reflection will be included.
A modified BEME coding form will be used for data extraction and an evaluation of the methodological strength of the studies identified will be performed using the BEME coding form 'Strength of Findings' model.(4)The use of excel spreadsheets will be used for administration purposes, as tools for individual reviewers to capture annotations about papers being reviewed and to note any comments for discussion when they are involved in the pair reviewing process. This capturing of information will also be useful if there are conflicts about the inclusion or exclusion of papers for the purposes of adjudication by the designated 3rd party reviewer. (TP)

We expect a mix of quantitative and qualitative studies. With quantitative homogeneous data, standard methods for meta-analysis as per the Cochrane Handbook will be followed.(5)
We will perform a review of the qualitative heterogeneous data by grouping and reporting studies using Kirkpatrick's level of outcomes and study design.(6)

Results: As stated above we expect our results to be a mix of quantative and qualitative studies. The output of these results will be represented in tabular formats. A listing of types of interventions as well as relevant applications of these will also be presented.

Discussion: The results of this review will guide future educational interventions for the development of reflection in medical students.

Background (include rationale for review and aims for review)

Reflection has become a widespread topic of discussion amongst medical educators over the past decade and the literature relating to methods of teaching reflection has grown accordingly.(7-9) Reflection is thought to be an essential skill for competent healthcare professionals who are working with increasingly complex patients in correspondingly complex healthcare systems. (10) As a result, evidence of reflective practice is becoming part of licensing and revalidation processes. (11-13) Despite this emphasis, however, there is little concurrence about how to best teach reflection.

Reflection is a complex construct and subsequently one of the challenges in this area has been lack of consensus around its definition. However, a recent systematic review of the literature by Nguyen et al established five core components and two extrinsic elements to reflection. (14) In their operational definition they outline the five core components as follows:

"Reflection is the *process of engaging the self (S) in attentive, critical, exploratory and iterative (ACEI) interactions with one's thoughts and actions (TA), and their underlying conceptual frame (CF), with a view to changing them and a view on the change itself (VC*)."

In their conceptual model of reflection they add to the five core components by describing the two extrinsic elements that impact reflection, the trigger and the context. This definition distinguishes reflection from other thinking processes and illuminates the extrinsic elements that inform and refine instances of reflection.

This process of exploring one's thoughts and actions as described in this definition has been seen by educators to have many benefits. They argue that it can complement experiential learning by helping to identify learning needs, therefore leading to clinical competence. (15, 16) New knowledge can be integrated with previous knowledge in this process. Professionalism can also be enhanced through reflection on personal beliefs, attitudes, values and needs and through self-regulation and monitoring. (17, 18)

There is increasing evidence to support the use of reflection throughout medical training. For example, Sobral found that better academic performance in second year medical students was linked to higher scores on the Reflection in Learning scale and in reflection self-efficacy.(2) Similarly, clinical performance with standardized patients in third year medical students was improved after reflection and re-visitation in a study by Blatt et al.(3) Internal medicine residents, studied by Mamedes et al, were more accurate when diagnosing complex, unusual cases if they were practicing reflection.(19) Finally Toy et al found that residents were more likely to achieve their rotation goals when using reflective practice. (20)

Evidence for the use of reflection is increasing and is now considered by many to be an essential aspect of lifelong learning. (21) Reflection is becoming a core clinical skill in undergraduate medical curricula, as exemplified by the recommendations from the Association of American Medical Colleges. (1) Internationally, the structure of continuing professional development in

medicine is also placing an increased emphasis on reflection skills. For example, the College of Family Physicians in Canada and the General Medical Council in the United Kingdom (UK) now require doctors to produce evidence of reflection as part of their licence renewal process. (11, 12)

Despite the fact that reflection is now being used for licensing renewal there is no clear consensus in the literature about what methods are effective for teaching reflection. A systematic review investigating reflection and reflective practice in health professional education from 2009 found only ten studies in the literature which investigated the development of reflective thinking or the contextual influences which facilitated or deterred the development of reflection skills. (22) A scoping search of the literature this year found that there have been a significant amount of new and relevant publications which have investigated the teaching and learning of reflective skills in undergraduate medical education.

This systematic review aims to summarise the range of interventions suggested in the literature and provide medical educators with the current best available evidence to choose which intervention(s) to introduce and develop in their undergraduate medical education curriculum to promote students reflective skills. This will allow medical educators to provide their students with skills that will benefit them academically, clinically and professionally, and prepare them for future licensing requirements.

Review question(s)/objectives, type of review and keywords

Primary review objectives

1. To determine which educational interventions are currently being used to facilitate the development of reflection in undergraduate medical students.
2. To determine how reflection in medical students is being measured/assessed.

Additional questions

1. Is there a difference in effectiveness between the interventions identified?
2. Where in the curriculum are such interventions offered or required?
3. Which faculty are generally responsible for introducing such interventions?
4. Where in the curriculum are such interventions recommended?
5. Which faculty are recommended to be responsible for introducing such interventions?
6. What are the barriers to using these interventions?

Intended Search Terms

Search terms will be using subject headings where thesauri exist in conjunction with free text terms using truncation and appropriate Boolean operators. A combination of MeSH terms and keywords will be used to capture studies of interest under the following headings

Critical thinking
Reflection
Reflecting
Reflective skills
Reflective practice
Reflective capacity
Reflective writing
Medical students
Medical education
Biomedical education
Undergraduate
Teaching
Instruction
Narrative medicine

Sample MEDLINE search

Database: PubMed

Search date: 24/2/2015

Retrieval: 1523

Search strategy:

1. Search ((self-reflection[Title/Abstract]) OR reflection[Title/Abstract]) OR reflective[Title/Abstract]
2. Search "Narration"[Mesh]
3. Search (narration[Title/Abstract]) OR narrative[Title/Abstract]
4. Search (((((self-reflection[Title/Abstract]) OR reflection[Title/Abstract]) OR reflective[Title/Abstract])) OR "Narration"[Mesh]) OR ((narration[Title/Abstract]) OR narrative[Title/Abstract])
5. Search "Education, Medical, Undergraduate"[Mesh]
6. Search "Students, Medical"[Mesh]
7. Search "Education, Medical/methods"[Mesh]
8. Search (medical[Title/Abstract]) OR medicine[Title/Abstract]
9. Search ((undergraduate*[Title/Abstract]) OR under-graduate*[Title/Abstract]) OR student*
10. Search (((medical[Title/Abstract]) OR medicine[Title/Abstract])) AND (((undergraduate*[Title/Abstract]) OR under-graduate*[Title/Abstract]) OR student*)
11. Search ((("Education, Medical, Undergraduate"[Mesh]) OR "Students, Medical"[Mesh]) OR "Education, Medical/methods"[Mesh]) OR ((((medical[Title/Abstract]) OR medicine[Title/Abstract])) AND (((undergraduate*[Title/Abstract]) OR under-graduate*[Title/Abstract]) OR student*))
12. Search (((((((self-reflection[Title/Abstract]) OR reflection[Title/Abstract]) OR reflective[Title/Abstract])) OR "Narration"[Mesh]) OR ((narration[Title/Abstract]) OR narrative[Title/Abstract]))) AND ((((("Education, Medical, Undergraduate"[Mesh]) OR "Students, Medical"[Mesh]) OR "Education, Medical/methods"[Mesh]) OR ((((medical[Title/Abstract]) OR medicine[Title/Abstract])) AND (((undergraduate*[Title/Abstract]) OR under-graduate*[Title/Abstract]) OR student*)))
13. Search (((((((((nurs*[Title/Abstract]) OR midwifery[Title/Abstract]) OR pharmacy[Title/Abstract]) OR physiotherapy[Title/Abstract]) OR dental[Title/Abstract]) OR dentist*[Title/Abstract]) OR veterinary[Title/Abstract]) OR psychology[Title/Abstract]) OR dietetics[Title/Abstract]) OR dietician*[Title/Abstract]
14. Search (((((((((self-reflection[Title/Abstract]) OR reflection[Title/Abstract]) OR reflective[Title/Abstract])) OR "Narration"[Mesh]) OR ((narration[Title/Abstract]) OR narrative[Title/Abstract]))) AND ((((("Education, Medical, Undergraduate"[Mesh]) OR "Students, Medical"[Mesh]) OR "Education, Medical/methods"[Mesh]) OR ((((medical[Title/Abstract]) OR medicine[Title/Abstract])) AND (((undergraduate*[Title/Abstract]) OR under-graduate*[Title/Abstract]) OR student*))))) NOT ((((((((((nurs*[Title/Abstract]) OR midwifery[Title/Abstract]) OR pharmacy[Title/Abstract]) OR physiotherapy[Title/Abstract]) OR dental[Title/Abstract]) OR dentist*[Title/Abstract]) OR veterinary[Title/Abstract]) OR psychology[Title/Abstract]) OR dietetics[Title/Abstract]) OR dietician*[Title/Abstract])

Study Selection Criteria

Population

Medical student (defined as 'students undertaking a course of study at a medical school in order to reach a primary qualification in medicine, enabling them to practice as doctors').

Intervention

The intervention is not predefined as this is an exploratory review. However the following interventions may be mentioned amongst others:

Didactic teaching
Small Group Discussions
Case Based Teaching
Problem Based Learning
Experiential Learning
Micro-Teaching
Interactive Exercises
Role Plays and Simulations
Films, Videotapes and Audiotapes
Independent Learning/Projects
Written materials and readings
Computer-based materials
Coaching

Comparator:

All comparators of interventions, if present, will be considered.

Outcome:

The usefulness of the Kirkpatrick model in measuring the effectiveness of an intervention according to different educational outcomes is well described. It has traditionally been adapted for different BEME reviews. For our purposes, we will use a modified version as below :(6)

Level 1	**REACTION**	Participants' views on the learning experience, its organisation, presentation, content, teaching methods, and quality of instruction.
Level2A	**LEARNING**- Change in attitudes	Changes in the attitudes or perceptions among participant groups towards teaching and learning.
Level2B	**LEARNING**- Modification of knowledge or skills	For *knowledge*, this relates to the acquisition of concepts, procedures and principles; for *skills*, this relates to the acquisition of thinking/problem-solving, psychomotor and social skills.
Level3	**BEHAVIOUR** - Change in behaviours	Documents the transfer of learning to the workplace or willingness of learners to apply new knowledge & skills.
Level4A	**RESULTS** - Change in the system / organizational practice	Refers to wider changes in the organization, attributable to the educational program.
Level4B	**RESULTS** - Change among the participants' students, residents or colleagues	Refers to improvement in student or resident learning/performance as a direct result of the educational intervention.

Types of studies:

We would expect to find comparative studies which provide data for any of the outcomes listed above, including the following designs:

Systematic reviews
Controlled trials (randomised and non-randomised)
Cohort studies
Cross-sectional studies
Case control studies
Case report (should not be included in analysis of outcomes)
Descriptive studies
Qualitative studies
Theses

Table 1: Exclusion criteria at title and abstract screening phase

Exclude - duplicate	
Exclude - learners not medical students	e.g. other disciplines, pre-registration / foundation, postgraduate trainees, residents, interns or qualified healthcare professionals
Exclude - topic not medical education	e.g. health services research not related to medical education
Exclude - does not include empirical data	i.e. must include a 'method'. A broad range of qualitative, quantitative and mixed methods are acceptable for inclusion. Editorials or commentaries would not be included. Quality assessments for each method will be carried out for each synthetic approach as appropriate.

Search sources and strategies:

Scoping Review

A Scoping review was performed in July/August 2015 to assess the extent of the body of literature on the review question using the sample search strategy mentioned above in PubMed. 1523 articles were retrieved and 698 articles were published in the last 5 years. The first 200 (by date) titles and abstracts were divided evenly between four study authors (SF, JU, ES, EOB). Each reviewer independently reviewed 50 articles and allocated them to be included or excluded from the review based on a coding sheet (Appendix 1) adapted to an excel spreadsheet for the scoping review. JU reviewed articles 1-50, SF 51-100, ES 101-150 and EOB 151-200. Each reviewers data extraction was then validated for accuracy by another member of the four reviewers (i.e. JU reviewed SF's 50 data extraction and vice versa, EOB reviewed ES's data and vice versa). After discussion there was consistency between coders and agreement was reached on the data extraction. 20 articles (10%) were found to be relevant to the review question and/or secondary questions. This suggests that there is a significant number of new literature relevant to our review question published since Mann's systematic review in 2009 and justifies a systematic review of the updated literature. (22)

Working with Jane Burns and Grainne McCabe, both experienced librarians involved in teaching and advising on search strategies for systematic reviews, we will further adapt and modify the MeSH and free text terms to ensure depth and breadth of coverage.

The following databases will be searched to identify potentially relevant records using appropriate derivatives of the searches:

Medline
Embase
ERIC
BEME published reviews, Cochrane, DARE
Web of Science
Scopus

Keyword searches will be performed in English but no further language restrictions will be applied. If there are any articles not in English that are potentially relevant to our review, a specialist translation service may be used if translation performed by Google translate is not adequate to review the article. No geographical restrictions will be applied. No limits for date of publication, study design or publication type will apply.

Grey literature will be searched using Google scholar, Open Grey, Dart Europe and institutional repositories. The search will be supplemented by hand searching references of retrieved articles. A secondary hand search will be considered if there are insufficient or incomplete results.

Extracting data

Using a similar method described in Aileen Barrett's BEME Protocol, four study authors (SF, JU, ES, EOB) will independently review 20% of the retrieved articles (randomly selected) each using a modified BEME Coding sheet adapted and developed following the scoping search to ensure comprehensiveness of the tool. (23)Studies that are considered eligible for inclusion will be read fully in duplicate and their suitability for inclusion will be determined. The reviewer's data extraction will then be validated for accuracy by a moderator from the group (TP) for inter-rater reliability to a kappa of 0.80 agreement. Once this agreement has been reached, all articles will be evenly distributed among the four study authors and data extractions completed in duplicate. In the case of disagreements, the two reviewers will read the article in question in full text. If no resolution found, the moderator from the group (TP) will review the paper in an effort to reach a consensus view. The third part adjudication will be recorded using an excel spreadsheet for administration purposes. Here the adjudicated will record relevant bibliographic information, annotations from the primary reviewers in regard to inclusion and exclusion decisions. The adjudicator will have 2 separate columns, 1 to record the decision and another to record reasons for decision and recommendations for reviewers to consider. Additional data will be sought from authors where necessary.

Appraisal of studies

An evaluation of the methodological strength of the studies identified will be performed following the BEME coding form 'Strength of Findings' model:(2)

Please rate strength of findings using the following scale:

1. No clear conclusions can be drawn. Not significant.
2. Results weak/ambiguous, but there appears to be a trend.
3. Conclusions can probably be based on the results.
4. Results are clear and very likely to be true.
5. Results are unequivocal.

Two coders will appraise the quality of each study once it has been deemed suitable for inclusion. Differences of opinion will be resolved by discussion. In the case of disagreement, the two coders will meet with a third party (TP) who will appraise the study in an attempt to reach a consensus view. The third part adjudication will be recorded using an excel spreadsheet for administration purposes. Here the adjudicator will record relevant bibliographic information, annotations from the primary reviewers in regard to their evaluation. The adjudicator will have 2 separate columns, 1 to record the decision and another to record reasons for decision and recommendations for reviewers to consider.

Synthesis of extracted evidence and transfer to research and practice

If the data is sufficiently homogeneous (for example, interventions, comparisons, outcomes, and study designs are similar), we will follow standard methods for meta-analysis as per the Cochrane Handbook.(3)

However based on other systematic reviews in the medical education literature, it is anticipated that the data obtained may be too heterogeneous to be combined for quantitative statistical meta-analysis. In this case we will perform a qualitative review of the evidence by grouping and reporting studies using Kirkpatrick level of outcomes and study design.(1)

Potential expected outcomes and implications for education research and practice

Based on the best available evidence, we expect to make recommendations for medical educators globally who wish to develop reflective skills teaching and learning in undergraduate medical education.

These recommendations will include:

a. A summary of educational interventions to enhance reflective skills
b. An analysis of the available outcomes and effectiveness measures of educational interventions for reflection
c. Suggestions for future research to further knowledge in this field

Projected Timetable

2015/16	Registering BEME title	Acceptance of Protocol	Month 2	Months 3/4/5	Month 6	Month 7
Pilot study						
Refining BEME coding sheet						
Literature search						
Data extraction and coding						
Draft report						
Final report						

Conflict of Interest Statement

The group members report no conflicts of interest

Plans for updating the review and further research

The group plans to maintain and update the bibliography related to the review question. From this, any significant changes in the evidence base available would lead to an update of the review.

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Appendix 1: Scoping Review Coding Sheet

Article Number:
1. Are participants undergraduate medical students? YES / NO
If NO then exclude
2. Does this study look at an educational intervention to promote reflection/ reflective writing to the population? YES / NO
If NO then exclude unless the article can answer any of the following questions:
• **How is reflection in medical students being measured/ assessed?** • **Where in the curriculum is teaching of reflection offered or required?** • **Which faculty are generally responsible for introducing in teaching of reflection?** • **Where in the curriculum is teaching reflection recommended?** • **Which faculty are recommended to be responsible for introducing in teaching reflection?** • **What are the barriers to teaching reflection?**
Excluded? YES / NO
Why? If not clear from above provide reason with reference to the inclusion/exclusion criteria.
Comments: