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# Supporting curriculum changes through evidence syntheses

A Systematic Review of Embedded Research Programs in Undergraduate Medical Education

DALHOUSIE UNIVERSITY

30 April, 2015

Objectives

- Describe Dalhousie's **Research in Medicine Unit** (RIMU) in the Undergraduate Medical Education (UGME) curriculum

- Describe the **systematic review** underway that looks at evidence from similar programs
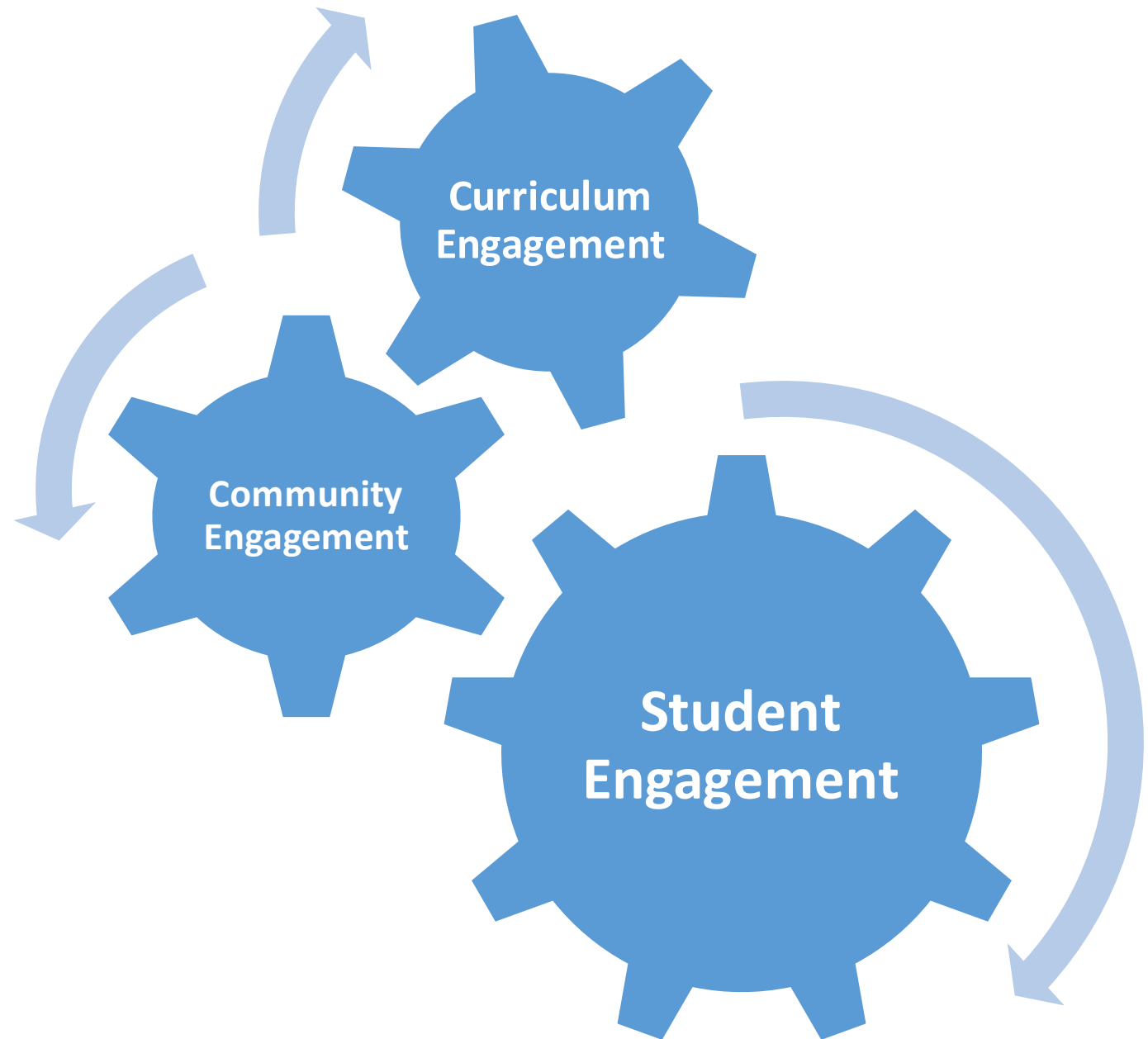
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Background – Research in Medical School Curricula

Motivators

- Importance of critical thinking and research skills for medical graduates/clinicians

- Medical graduates need an understanding of how evidence is generated to enhance evidence-based clinical practice (Laidlaw et al., 2012)

- Dalhousie Medicine aims to promote the development of outstanding scholarship in graduates (Dalhousie University Faculty of Medicine, 2014)
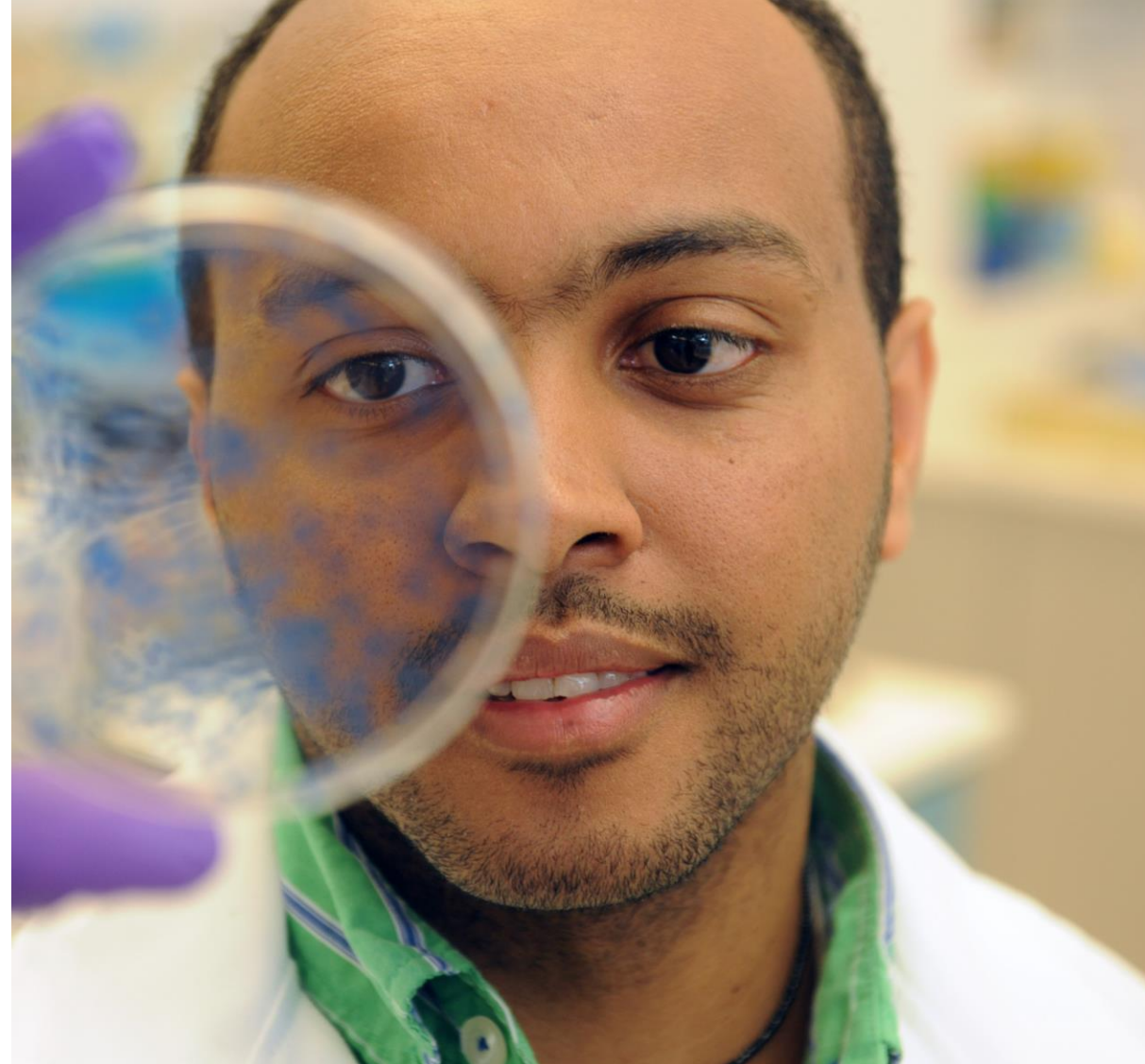
Background – scholarly concentrations

"Traditional" approaches to teach research skills and critical appraisal of the research

- Research methods didactic sessions with or without case-based learning tutorials
- Evidence-based practice didactic sessions with or without case-based learning tutorials
- Journal clubs for critical appraisal

Scholarly concentrations (applied research curricula)

- Many types of scholarly concentration programs (Bierer, 2010)
  - Included 39 studies of programs
  - Variety of structures, organization, goals, etc.
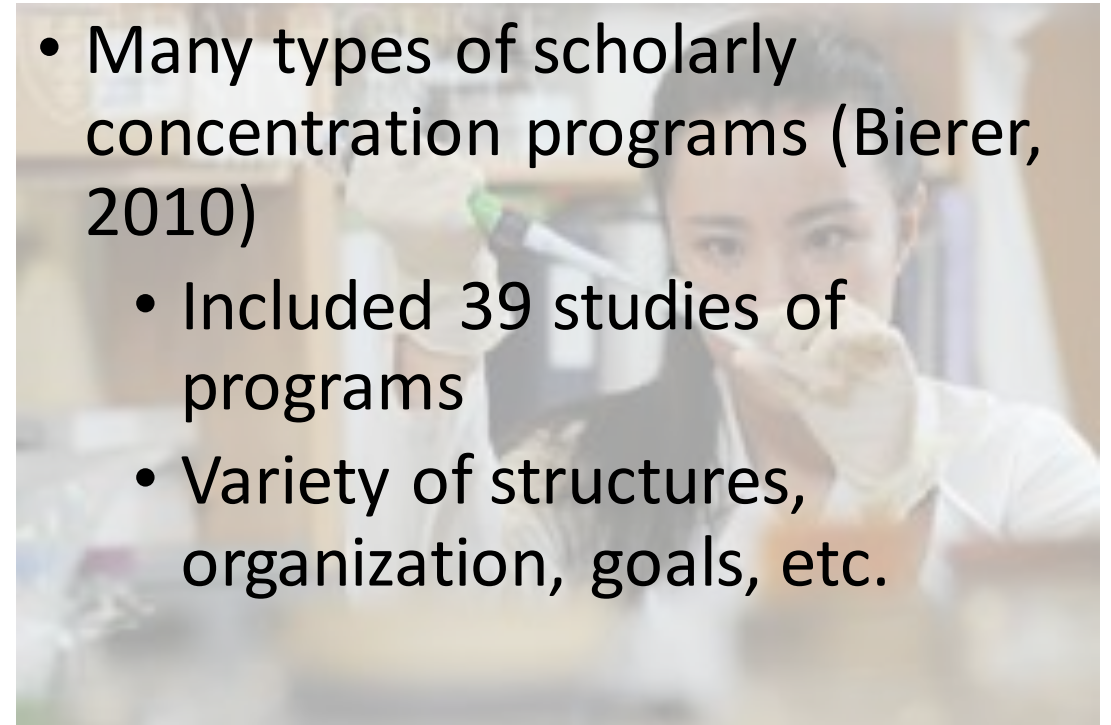
Background – Dalhousie Medicine Research in Medicine (RIM) Unit

- Introduced in 2013 (first graduating class in 2017)

- 4 year program including an in-depth investigation into a research topic

    - Required to produce scholarly material*

- Modeled on a similar program at the University of Pittsburg and comparable programs in the US and Europe

- First UGME longitudinal, hands-on research curriculum in Canada

- Regular feedback requested from students and involved faculty (Dalhousie University Faculty of Medicine, 2014)

Pause For Feedback

How can curriculum development and/or evaluation produce evidence?

◆ What kinds of evidence has been produced in your experience?
  • Has that evidence been disseminated?
  • What would be required to disseminate the evidence?
  • Who would that evidence be useful for? Who is the audience?

Research Mentors for students

Key community engagement designed to have mutual benefit to faculty and local researchers as well as students

Background – RIM Structure (Student Timelines)

Submit final report and present at RIM Research Day – Feb/March of Year 4

Winter term Year 1 – pairing with mentor and writing research proposal to submit in April
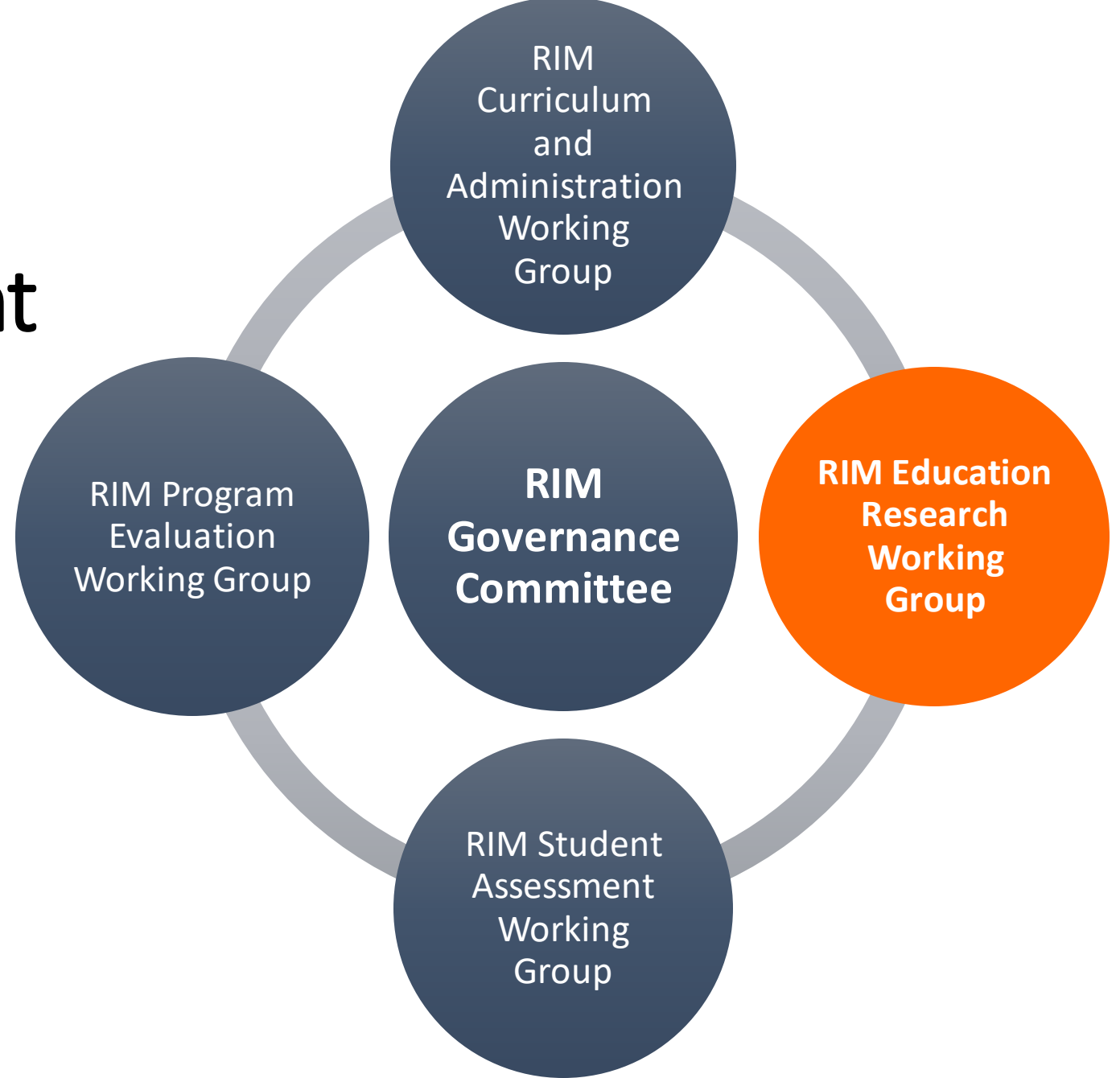
Submit annual progress reports

Summer Year 1 OR/AND Year 2 – dedicated time to research– Path 1 and Path 2, respectively

OR research conducted through regular UGME schedule (Path 3)

Fall term Year 1 –Core and Research to Practice sessions (lecture and tutorials)

RIM – Development and Evaluation

RIM Education Research Working Group

Consists of members of the Governance Committee, including UGME Evaluation staff and RIM administration to plan research and evaluation of related outcomes

Including:

- Pre-test / post-test survey at intake and graduation
- Comparisons with graduate surveys (Dalhousie pre-RIMU and other Canadian medical schools both pre-RIMU and concurrent)

Beirer et al. (2010) Review of Scholarly Concentration Programs

"The current literature reveals that continuing to measure what is easy to collect (student feedback) rather than what is important to know (behavioral, institutional, or societal outcomes) will not advance research in this area." (Bierer, 2010, p. 443)

Search for evidence for review done in 2008 – Have new data regarding scholarly concentrations in UGME been reported since then?

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Pause For Feedback

How can curriculum development and/or evaluation use published evidence?

- What would you want that evidence to look like? What kinds of evidence?

- How would you like to see such evidence compiled for use?

Systematic Review Process

| Define review question and inclusion/ exclusion criteria | Search for evidence to consider for inclusion | Select relevant studies using pre-determined criteria | Data extraction | Appraisal of the included studies and outcomes | Synthesize data (descriptive and quantitative, if applicable) | Report and disseminate |

Systematic Review Process

Define review question and inclusion/exclusion criteria

Advice and feedback

Involvement of RIM Education Research Working Group members

Search for evidence to consider for inclusion

Select relevant studies using pre-determined criteria

Participation

Data extraction

Appraisal of the included studies and outcomes

Advice/ verify assessment

Synthesize data (descriptive and quantitative, if applicable)

Report and Disseminate

Systematic Review Process

- **Define review question and inclusion/exclusion criteria**
- **Search for evidence to consider for inclusion**
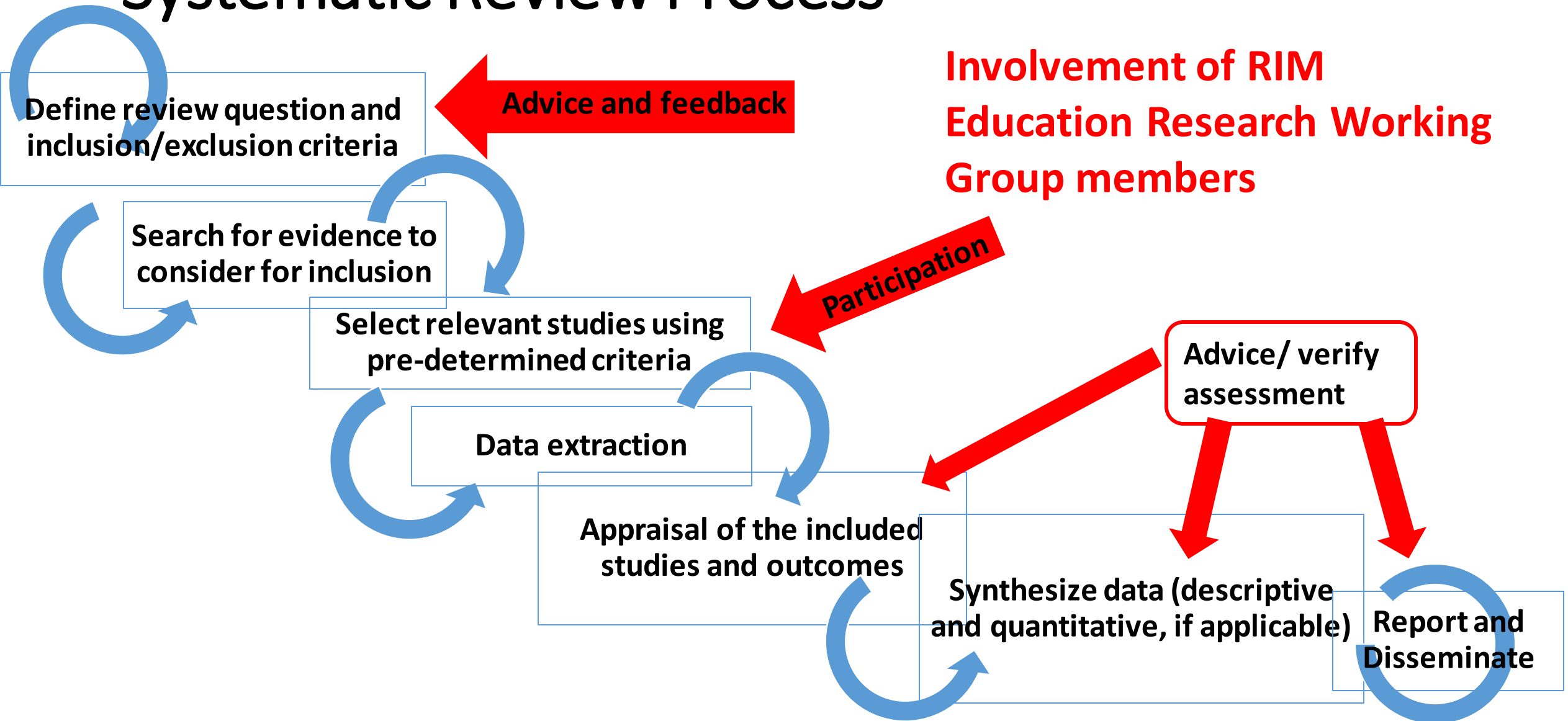- Select relevant studies using pre-determined criteria
- Data extraction
- Appraisal of the included studies and outcomes
- Synthesize data (descriptive and quantitative, if applicable)
- Report and disseminate

Submit plan as protocol (register in PROSPERO)

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Systematic Review Protocol

- Review Question:

Are applied research curricula in UGME programs more effective than theoretical or no research training at increasing research knowledge, skills, capacity and/or outputs amongst graduates?

- Secondary questions:

  - How are the outcomes of applied research curricula being measured and evaluated?

  - What are the characteristics of successful applied research programs in UGME curricula?

Systematic Review Process - Searching

DONE
- Structured database searches: MEDLINE, Embase, PsycINFO, Education Resources Information Centre, and Web of Science

In-process
- reference lists of included studies and related reviews

In-process
- grey literature reports from medical schools with similar programs

To do
- contacting experts
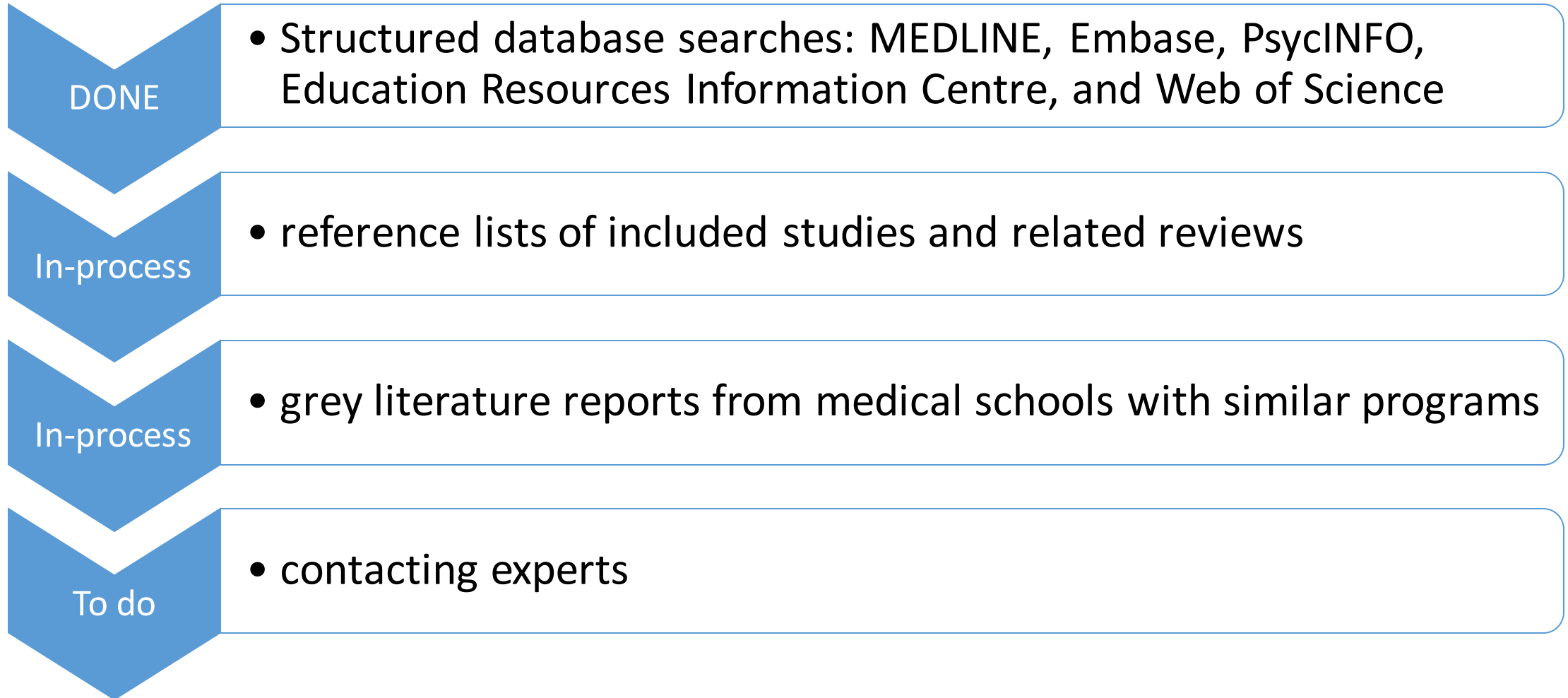
Search Approach – Database Strategies

1. Population/setting:

- undergraduate medical education,
- medical students,
- medical schools

2. Intervention (part 1):

- research or scholarly component, project, concentration, activity

3. Intervention (part 2):

- curriculum,
- program,
- teaching,
- learning,
- education

- No language restrictions.
- Publication period from 1990 to present to encompass era of evidence-based medicine curricula.
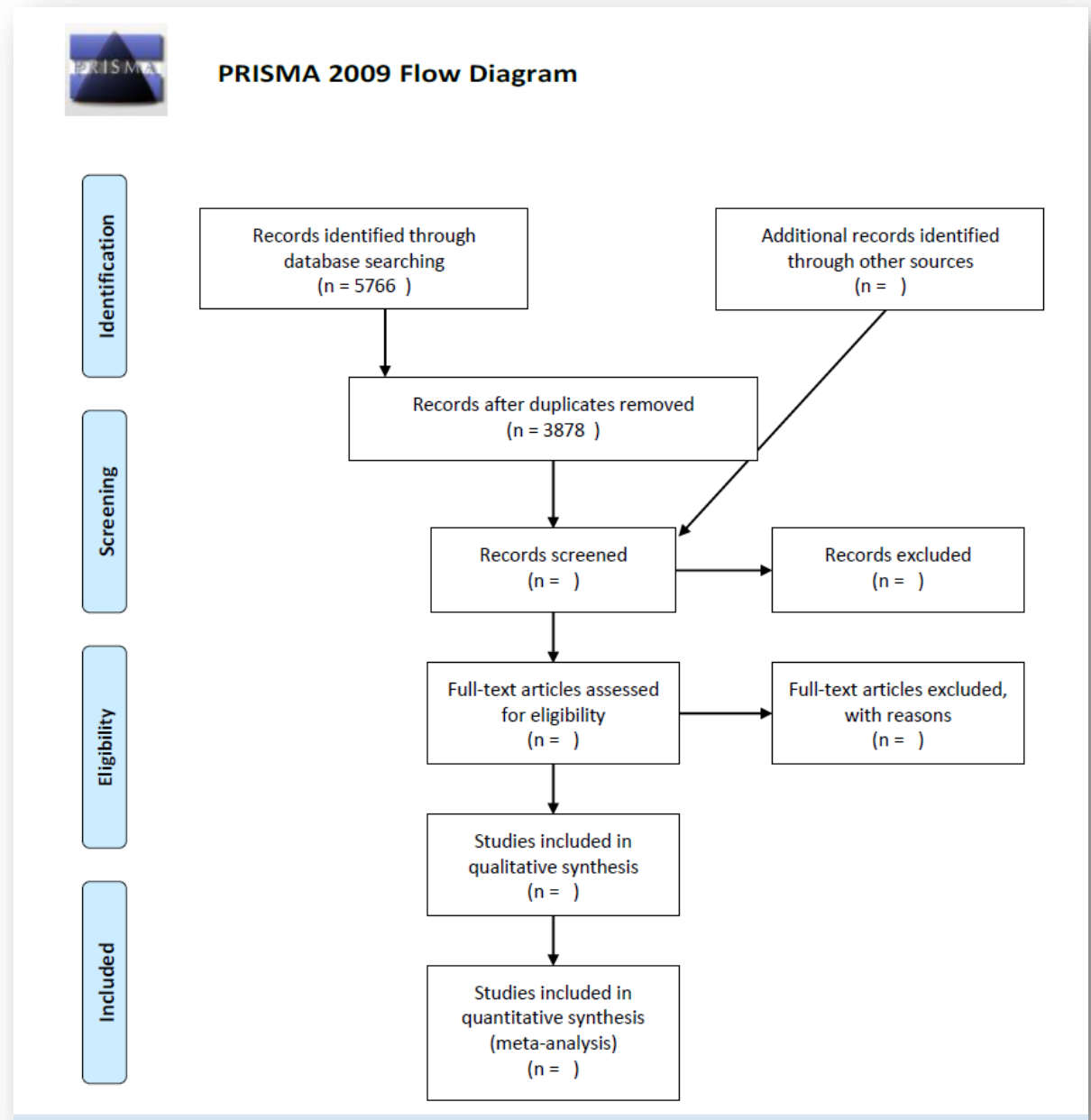
MEDLINE (OVID)

\#	Searches	Results
1	((research or scholarly) adj2 (activit* or project* or program* or component* or concentration*)).tw.	27835
3	Students, Medical/	22530
4	exp Education, Medical/	132131
5	Schools, Medical/	21156
6	medical school*.tw.	25513
7	(medical adj1 school*).tw.	25782
8	(medical adj1 student*).tw.	26409
9	(medical adj2 curricul*).tw.	4430
10	3 or 4 or 5 or 6 or 7 or 8 or 9	170327
11	exp Biomedical Research/ed [Education]	2888
12	exp Research/ed [Education]	4548
13	1 or 11 or 12	31788
14	10 and 13	2317
15	program*.tw.	596026
16	Curriculum/	59193
17	curricul*.tw.	35848
18	exp Teaching/	68264
19	exp Programmed Instruction as Topic/	11953
20	Program Development/	23257
21	Education/	18509
22	education.tw.	298586
23	teach*.tw.	136467
24	learn*.tw.	239485
25	train*.tw.	343443
26	15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25	1359323

Embase (Elsevier)

No.	Query	Results
#18	#15 AND #16 AND #17	2154
#17	#5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14	2394727
#16	#1 OR #2 OR #3 OR #4	249403
#15	((research OR scholarly) NEAR/2 (activit* OR project* OR program* OR component* OR concentration*)):ab,ti	37054
#14	education:ab,ti	380085
#13	train*:ab,ti	441987
#12	learn*:ab,ti	302094
#11	teach*:ab,ti	170584
#10	program*:ab,ti	749622
#9	'education'/exp	1079315
#8	'curriculum'/exp OR 'curriculum development'/exp OR 'education program'/exp	100071
#7	'learning'/exp	328927
#6	'teaching'/de	69557
#5	'program development'/exp	18201
#4	'medical student'/de	44698
#3	'medical school'/exp	44932
#2	'medical education'/de	185234
#1	(medical NEAR/1 (school* OR student* OR education OR curriculum)):ab,ti	81899

Reporting Search and Screening Results

The final report will include a screening flow diagram based on the template provided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement.

PRISMA 2009 Flow Diagram

Identification

Records identified through database searching
(n = 5766)

Additional records identified through other sources
(n =)

Records after duplicates removed
(n = 3878)

Screening

Records screened
(n =)

Records excluded
(n =)

Eligibility

Full-text articles assessed for eligibility
(n =)

Full-text articles excluded, with reasons
(n =)

Studies included in qualitative synthesis
(n =)

Included

Studies included in quantitative synthesis (meta-analysis)
(n =)

Screening: *Population/Setting*

Inclusion

- Undergraduate medical students and clerks (3rd and 4th year)
- Undergraduate medical education curriculum

Exclusion

- Postgraduate medical education (residents, fellows)
- Other health professions trainees
- Clinicians, health care providers
- Other undergraduate students
- Secondary school students

Screening: *Intervention/Exposure*

Inclusion
- Applied research program as part (elective or required) of medical curriculum
- Must consist of students working on research projects and producing scholarly outputs
- May include mentoring by faculty researchers (ideal)
- May be short (term/summer) or long (=>1yr) duration

Exclusion
- Programs offered by external groups such as NIH, NHS, other research organizations.
- Didactic or theoretical pedagogy only to teach research methods (with no student research involvement or output)
- Less than one term/summer duration

Screening: *Comparison* (optional)

Inclusion
- Pre-/post-test

- Comparison to group with only theoretical research training

- Comparison to group not exposed to applied research curriculum

Exclusion
- n/a

Screening: *Outcomes*

Inclusion

- Research knowledge
  - Increase in knowledge
  - Increase in perceived knowledge
- Research skills
  - Increase in skills
  - Increase in perceived skills
- Research output
  - Academic products (e.g. poster, formal presentation, publications, grant applications/funding success rates, etc.)
  - Publication/presentation rates
  - Research productivity as compared to non-research trained
  - Change in local research output
  - residency match rate?
- Research Capacity
  - Graduates' research involvement (e.g. research fellowships, clinical scientists, academic appointments, subsequent research degree)
  - Change in local research capacity (community)

Exclusion

- Program descriptions (e.g., implementation, case study with no outcome data)

Screening

- All citations screened by two reviewers independently
- Citations pass through several phases of screening
  - Title and abstract – exclude articles that are clearly on a different topic
  - Full text – any that have been marked to include, unsure, or disagreement between reviewers
    - ➢reasons for exclusion documented

Data Extraction and Appraisal

- Pilot the extraction tool to make sure it captures the information needed for synthesis and recommendations
- Appraise the internal validity (risk of bias) of the included studies using appropriate criteria for the various types of studies identified

Appraisal, continued

Appraise the quality of the outcomes measured based on the 5-point scale available through Best Evidence for Medical Education (BEME)

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

Kirkpatrick's Model for Evaluating Educational Outcomes*

Level 1	REACTION	Participants' views on the learning experience, its organization, presentation, content, teaching methods, and quality of instruction.
Level 2A	LEARNING - Change in attitudes	Changes in the attitudes or perceptions among participant groups towards teaching and learning.
Level 2B	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.
Level 3	BEHAVIOUR - Change in behaviours	Documents the transfer of learning to the workplace or willingness of learners to apply new knowledge & skills.
Level 4A	RESULTS - Change in the system / organizational practice	Refers to wider changes in the organization, attributable to the educational program.
Level 4B	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.

* Kirkpatrick's model (1994) was modified by Freeth *et al* (2003) and was adopted by the BEME Collaboration. This model was further adapted for Steinert et al. (2006) to include students, residents and colleagues (instead of patients) at level 4B.

Narrative/descriptive synthesis based on Kirkpatrick's model; quantitative if possible where data permit

Satisfaction
• Student and/or mentor perception of research experience [1]

Research knowledge
• Increase in perceived knowledge [2A]
• Increase in measurable knowledge [2B]

Research skills
• Increase in perceived skills [2A]
• Increase in measurable skills [2B]

Research Capacity
• Graduates' research involvement (e.g. research fellowships, clinical scientists, academic appointments, subsequent research degree) [3]
• Change in local research capacity (community/mentors) [4A]

Research output
• Academic products (e.g. poster, formal presentation, publications, grant applications/ funding success rates, etc.)[4B]
• Publication/presentation rates
• Research productivity [4B]
• Change in local research output
• residency match rate [4B]

Process – Tools and Lessons Learned

- Trello to manage project

- RefWorks to manage citations

- Office 365 OneDrive to share documents and drafts (RP and JP)

- Validated appraisal tools and process descriptions available through BEME

- Meetings approximately monthly to report progress to RIM Education Research Working Group
  - Solicit input and assistance for each step: research question, selection criteria, screening pilot, data extraction (upcoming), appraisal (upcoming), synthesis (upcoming), report (upcoming)

Project Timeline

Task	Anticipated duration	Proposed scheduling
Refining the research question	Present	Completed
Literature search	2 months	Completed
Pilot screening and data extraction	3-4 months	Completed by June 2015
Data extraction and coding	Up to 8 months	Completed by Sept 2015
Draft report	Ongoing	Completed by Oct 2015
Final report	–	Completed by Dec 2015

Pause For Feedback

What challenges exist in modifying the curriculum (and shifting the organizational culture)?

- Who do you need buy-in from?
- What barriers exist?
- How could you use evidence syntheses (such as a systematic review) to address these barriers? Would that be effective?

Conclusion

- Impressions from the literature scan so far: some, but not much regarding UGME settings; larger body of literature pertaining to Resident (PGME) research projects and training.

- Hope to be able to provide evidence to Working Group, RIM Governance Committee, and UGME Curriculum Committee on impact of applied research programs in UGME on particular research skills and capacity outcomes.

- Literature review may also reveal how others are examining their program (evaluation and outcome measurement tools and approaches).

Questions?

Supporting curriculum changes through evidence syntheses

A Systematic Review of Embedded Research Programs in Undergraduate Medical Education

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