Protocol: Remote learning developments in postgraduate medical education in response to the COVID-19 pandemic: A BEME systematic review

Review Team

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Please note: This protocol's background and methodology are largely shared with the protocol *"Remote learning developments in undergraduate medical education in response to the COVID-19 pandemic: A BEME systematic review"*

BACKGROUND

The novel coronavirus disease (Covid-19) has had a profound impact on postgraduate medical education globally. The need for physical distancing has necessitated rapid shifts to remote (i.e., distanced, online) learning for residents, fellows and practicing physicians. Education programs and accreditation bodies (Nasca 2020) alike have had to adapt to new realities. Tragically, the pandemic's end is not yet in sight and it remains unclear when we will return to a new normal. To date, more than 106,000,000 people have been infected, 2,325,000 have lost their lives (Johns Hopkins University 2021) and vaccines have only just arrived.

Our review team has conducted two prior systematic reviews on developments in medical education in response to the COVID-19 pandemic, a rapid review by Gordon et al. (2020), and a scoping review by Daniel et al. (2020). The rapid review was conducted in a compressed time frame – one month from search to submission – to quickly assess the COVID-19 education landscape. The scoping review was subsequently conducted to map the rapidly expanding body of literature. The team identified a significant number of articles focused on the pivot to remote learning (n=58) and simulation (n=24), making these areas ripe for in-depth reviews in the near term. Smaller numbers of articles were identified in other important areas (e.g., assessment, well-being, interviews / selection), and thus the authors concluded the literature base for these areas needed more time to mature.

In mid-December, the team reran the search utilized in the prior reviews and categorized the articles (See figure 1 for PRISMA). We identified 81 new articles related to remote learning (representing pivots from face-to-face learning or de novo developments) in addition to the 81 articles that addressed distance learning from our first two reviews. We thus decided there was a sufficient literature base for three reviews focused on remote learning: 1) developments in *undergraduate* medical education intended to replace face-to-face learning in "classroom" or simulated settings, 2) developments in *postgraduate* medical education designed to replace face-to-face learning from "didactics" or other non-workplace related learning activities, and 3) developments across the continuum intended to replace clinical or workplace-based learning.

This review aims to synthesise published reports of educational developments in medical education in response to the COVID-19 pandemic focusing on the **pivot to online learning or de novo developments in remote learning for postgraduate learners.**

REVIEW QUESTIONS

Our review will address the following:

- What novel solutions or developments in medical education have been deployed for post-graduate learners in response to the COVID-19 pandemic as institutions pivoted to remote / online learning? (i.e., description, or 'what was done') (Cook et al. 2008)
- What is the impact of these changes in response to the COVID-19 pandemic? What educational (Kirkpatrick's), social media, or other outcomes have emerged in response to these medical education developments? (i.e., justification or 'did it work?')

- What lessons to be applied in the future have been learned and what conclusions have been drawn by the teams who deployed these developments or changes? (i.e., implications or 'what's next?')

Definitions

Undergraduate medical education

Medical students are described as any student undertaking a course of study at a medical school to reach a primary qualification in medicine, enabling them to practice as doctors.

Postgraduate medical education

Refers to any learner who has obtained a primary qualification in medicine, regardless of whether they are within a subsequent program of training.

Pivot to online learning or de novo remote learning (non-clinical)

Any form of synchronous or asynchronous, remotely accessible, distance learning, intended to adapt or continue the learning previously delivered face-to-face in classrooms, conference centers, simulation spaces, or other non-workplace environments.

Pivot to online learning or de novo remote learning (clinical)

Any form of synchronous or asynchronous, remotely accessible, distance learning, intended to adapt or continue the learning previously delivered face-to-face in workplace settings.

Clinical workplace-based learning

Any learning event undertaken within the clinical setting of hospitals, general practice, or community clinics, i.e., medical students' or physician / fellow / trainee clinical workplace.

METHODS

Search Strategy

The search strategy was developed by a librarian (Whitney Townsend) using the Accelerator Polyglot search translation tool (Clark et al. 2020), as outlined by Daniel et al. (2020):

PubMed

(covid-19[tw] OR COVID19[tw] OR COVID-19[nm] OR SARS-CoV-2[tw] OR SARS-CoV2[tw] OR severe acute respiratory syndrome coronavirus 2[nm] OR severe acute respiratory syndrome coronavirus 2[tw] OR 2019-nCoV[tw] OR 2019nCoV[tw] OR coronavirus[tw] OR coronavirus[mh] OR pandemic[tw]) AND ("Internship and Residency"[Mesh] OR "Students, Medical"[Mesh] OR "Education, Medical"[Mesh] OR "Schools, Medical"[Mesh] OR Intern[tiab] OR interns[tiab] OR "House officer"[tw] OR "house officers"[tw] OR Resident[ti] OR residents[ti] OR residency[ti] OR "medical education"[tw] OR fellow[tiab] OR fellows[tiab] OR "junior doctor"[tw] OR "junior doctors"[tw] OR "post-graduate"[tw] OR postgraduate[tw] OR "foundation year"[tw] OR "foundation program"[tw] OR "medical student"[tw] OR "medical students"[tw] OR "Curriculum"[mesh] OR curricul[tiab] OR "medical school"[tw] OR "medical schools"[tw] OR "medical training"[tw] OR "undergraduate"[tw] OR "graduate"[tw] OR Learn*[tw] OR training[tw] OR trainer[tw] OR trainee*[tw] OR*

instructor[tw] OR instructional[tw] OR educat*[tw] OR classroom*[tw] OR simulat*[tw] OR virtual[tw] OR ZOOM[tw]) AND ("2020/05/01"[Date - Publication] : "3000"[Date - Publication])*

Embase

('covid 19':ti,ab OR covid19:ti,ab OR 'covid 19':tn OR 'sars cov 2':ti,ab OR 'sars cov2':ti,ab OR 'severe acute respiratory syndrome coronavirus 2':tn OR 'severe acute respiratory syndrome coronavirus 2':ti,ab OR '2019 ncov':ti,ab OR 2019ncov:ti,ab OR coronavirus:ti,ab OR 'coronavirinae'/exp OR pandemic:ti,ab) AND ('medical education'/exp OR 'health student'/exp OR 'medical school'/exp OR intern:ti,ab OR interns:ti,ab OR 'house officer':ti,ab OR 'house officers':ti,ab OR resident:ti OR residents:ti OR residency:ti OR 'medical education':ti,ab OR fellow:ti,ab OR fellows:ti,ab OR 'junior doctor':ti,ab OR 'junior doctors':ti,ab OR 'post graduate':ti,ab OR postgraduate:ti,ab OR 'foundation year':ti,ab OR 'foundation program':ti,ab OR 'medical student':ti,ab OR 'medical students':ti,ab OR 'curriculum'/exp OR 'curriculum development'/exp OR curricul:ti,ab OR 'medical school':ti,ab OR 'medical schools':ti,ab OR 'medical training':ti,ab OR undergraduate:ti,ab OR graduate:ti,ab OR learn*:ti,ab OR training:ti,ab OR trainer:ti,ab OR trainee*:ti,ab OR instructor*:ti,ab OR instructional:ti,ab OR educat*:ti,ab OR classroom*:ti,ab OR virtual:ti,ab OR zoom:ti,ab) AND [2020-2021]/py*

CINAHL

((MH "Coronavirus+") OR (MH "Coronavirus Infections+")) OR TI (covid-19 OR COVID19 OR MW COVID-19 OR SARS-CoV-2 OR SARS-CoV2 OR MW "severe acute respiratory syndrome coronavirus 2" OR "severe acute respiratory syndrome coronavirus 2" OR 2019-nCoV OR 2019nCoV OR coronavirus OR pandemic) OR AB (covid-19 OR COVID19 OR MW COVID-19 OR SARS-CoV-2 OR SARS-CoV2 OR MW "severe acute respiratory syndrome coronavirus 2" OR "severe acute respiratory syndrome coronavirus 2" OR 2019-nCoV OR 2019nCoV OR coronavirus OR pandemic)

AND

TI (Intern OR interns OR "House officer" OR "house officers" OR OR "medical education" OR fellow OR fellows OR "junior doctor" OR "junior doctors" OR post-graduate OR postgraduate OR "foundation year" OR "foundation program" OR "medical student" OR "medical students" OR curricul OR "medical school" OR "medical schools" OR "medical training" OR undergraduate OR graduate OR Learn* OR training OR trainer OR trainee* OR instructor* OR instructional OR educat* OR classroom* OR simulat* OR virtual OR ZOOM) OR AB (Intern OR interns OR "House officer" OR "house officers" OR OR "medical education" OR fellow OR fellows OR "junior doctor" OR "junior doctors" OR post-graduate OR postgraduate OR "foundation year" OR "foundation program" OR "medical student" OR "medical students" OR curricul* OR "medical school" OR "medical schools" OR "medical training" OR undergraduate OR graduate OR Learn* OR training OR trainer OR trainee* OR instructor* OR instructional OR educat* OR classroom* OR simulat* OR virtual OR ZOOM) OR TI (Resident OR residents OR residency) OR ((MH "Education, Health Sciences+") OR (MH "Schools, Medical+") OR (MH "Students, Health Occupations+") OR (MH "Curriculum+"))*

PsycInfo
((DE "Coronavirus" OR DE "Middle East Respiratory Syndrome" OR DE "Severe Acute Respiratory Syndrome")) OR TI (covid-19 OR COVID19 OR MW COVID-19 OR SARS-CoV-2 OR SARS-CoV2 OR MW "severe acute respiratory syndrome coronavirus 2" OR "severe acute respiratory syndrome coronavirus 2" OR 2019-nCoV OR 2019nCoV OR coronavirus OR pandemic) OR AB (covid-19 OR COVID19 OR MW COVID-19 OR SARS-CoV-2 OR SARS-CoV2 OR MW "severe acute respiratory syndrome coronavirus 2" OR "severe acute respiratory syndrome coronavirus 2" OR 2019-nCoV OR 2019nCoV OR coronavirus OR pandemic)

AND

TI (Intern OR interns OR "House officer" OR "house officers" OR OR "medical education" OR fellow OR fellows OR "junior doctor" OR "junior doctors" OR post-graduate OR postgraduate OR "foundation year" OR "foundation program" OR "medical student" OR "medical students" OR curricul OR "medical school" OR "medical schools" OR "medical training" OR undergraduate OR graduate OR Learn* OR training OR trainer OR trainee* OR instructor* OR instructional OR educat* OR classroom* OR simulat* OR virtual OR ZOOM) OR AB (Intern OR interns OR "House officer" OR "house officers" OR OR "medical education" OR fellow OR fellows OR "junior doctor" OR "junior doctors" OR post-graduate OR postgraduate OR "foundation year" OR "foundation program" OR "medical student" OR "medical students" OR curricul* OR "medical school" OR "medical schools" OR "medical training" OR undergraduate OR graduate OR Learn* OR training OR trainer OR trainee* OR instructor* OR instructional OR educat* OR classroom* OR simulat* OR virtual OR ZOOM) OR TI (Resident OR residents OR residency) OR ((DE "Medical Education" OR DE "Medical Internship" OR DE "Medical Residency" OR DE "Psychiatric Training") OR (DE "Medical Students") OR (DE "Curriculum" OR DE "Curriculum Development"))*

4 electronic databases were searched, consistent with our prior reviews: Medline, Embase, CINAHL and Psycinfo. MedEdPublish will be hand searched. The searches were run on December 21, 2020. The PubMed date limit was set from 05/01/20 – present, overlapping our prior review slightly to ensure no articles were missed. All other databases were searched from 1/1/20 – present, as they do not have an option to delineate by month.

Inclusion criteria:

- The study describes a development in medical education explicitly deployed in response to COVID-19.
- The study involves a pivot to online learning or a novel remote learning development intended to continue learning previously delivered face-to-face in classroom or similar ‘non-clinical’ or ‘non-workplace’ environments.
- The study is in postgraduate education (i.e., graduate medical education (GME) or continuing medical education (CME))
- The study includes postgraduate learners (e.g., residents, fellows, or physicians).
- The study describes Kirkpatrick’s outcomes (Level 1: Reaction, Level 2: Learning, Level 3: Behavioral Change, Level 4: Organizational Performance) (Kirkpatrick 2016) OR other outcomes (e.g., social media metrics).
- The study is in any language.

Exclusion criteria:

- The study is an opinion piece, perspective, commentary, editorial, call for change, needs assessment or other study where no actual development was deployed.
- The study describes the development as a minor part of a larger package of planned measures.
- The study only includes other healthcare professionals or medical students (i.e., no residents, fellows, or physicians).
- The study describes remote or distance learning explicitly deployed to replace workplace-based (clinical) learning or simulations.

Screening of title, abstract and full texts will be conducted independently by 2 authors with disagreements resolved through discussion or involvement of a third author.

Data Extraction

Based on BEME Guidance (Hammick, Dornan and Steinert, 2010), we devised and piloted a data extraction form in Google sheets to allow quick review and sharing of extracted data.

Key items included in the data extraction were:

- Article identifiers (authors, title, journal, type of article, month of publication)
- Context (type and number of learners, specialty of the originators of the intervention and subjects of the intervention, region of origin and implementation, organization responsible, collaborations)
- Characteristics of the educational development
- Purpose of development
- Summary (description) of development
- Resources (cost ($), time, resources needed to implement)
- Explicit theories or frameworks underpinning the development
- Outcome measures (Kirkpatrick's, social media metrics (e.g., reach, engagement), and other outcomes (e.g., teacher perspectives))
- Summary of results
- Risk of bias of reporting (see below)
- Risk of bias of study design (MERSQI score, (Reed et al. 2007, Cook et al. 2015))
- Lessons Learned as reported by the authors
- Limitations as reported by the authors
- Conclusions as reported by the authors

Extraction will be completed by two authors independently and differences resolved through discussion or involvement of a third party until a full consensus is reached.

Quality Assessments

Two major areas that will be considered: *quality of the study design* and *quality of reporting* to support replicability.

The Medical Education Research Quality Instrument (MERSQI) for methodological evaluation of medical education studies (Reed et al. 2007, Cook et al. 2015) will be used to assess the quality of the study design. (See Table 1)

A visual RAG ranking system (as previously used by Gordon et al. (2019b) and Gordon et al. (2018), originally modified from Reed et al. (2005) was employed to assess risk of bias in reporting. The areas assessed included underpinning theories, resources, setting, education (pedagogy), and content. (See table 2) Items will be judged to be of high quality (Green), unclear quality (Yellow), or low quality (Red).

Synthesis of evidence

Narrative Summary (Description)
Descriptive analysis will be used to summarize the data from the extraction form. A visual infographic will be developed to summarize key data, similar to Daniel et al. (2020), including geographic distribution of articles, institutional setting, medical specialties, resources, Kirkpatrick's levels, etc.

Meta-analysis (Justification)
Homogenous outcome data, including any form of evaluation (Kirkpatrick's outcomes) will be considered for meta-analysis, but given the heterogeneous nature of interventions, comparison is unlikely to be feasible.

Thematic analysis (Implications)
Direct quotations will be extracted from papers concerning the explicit use of theories, limitations, lessons learnt and conclusions. We will produce a thematic analysis according to the procedures outlined by Braun & Clarke (2013).

Figure 1: PRISMA flow diagram for included studies Review #3

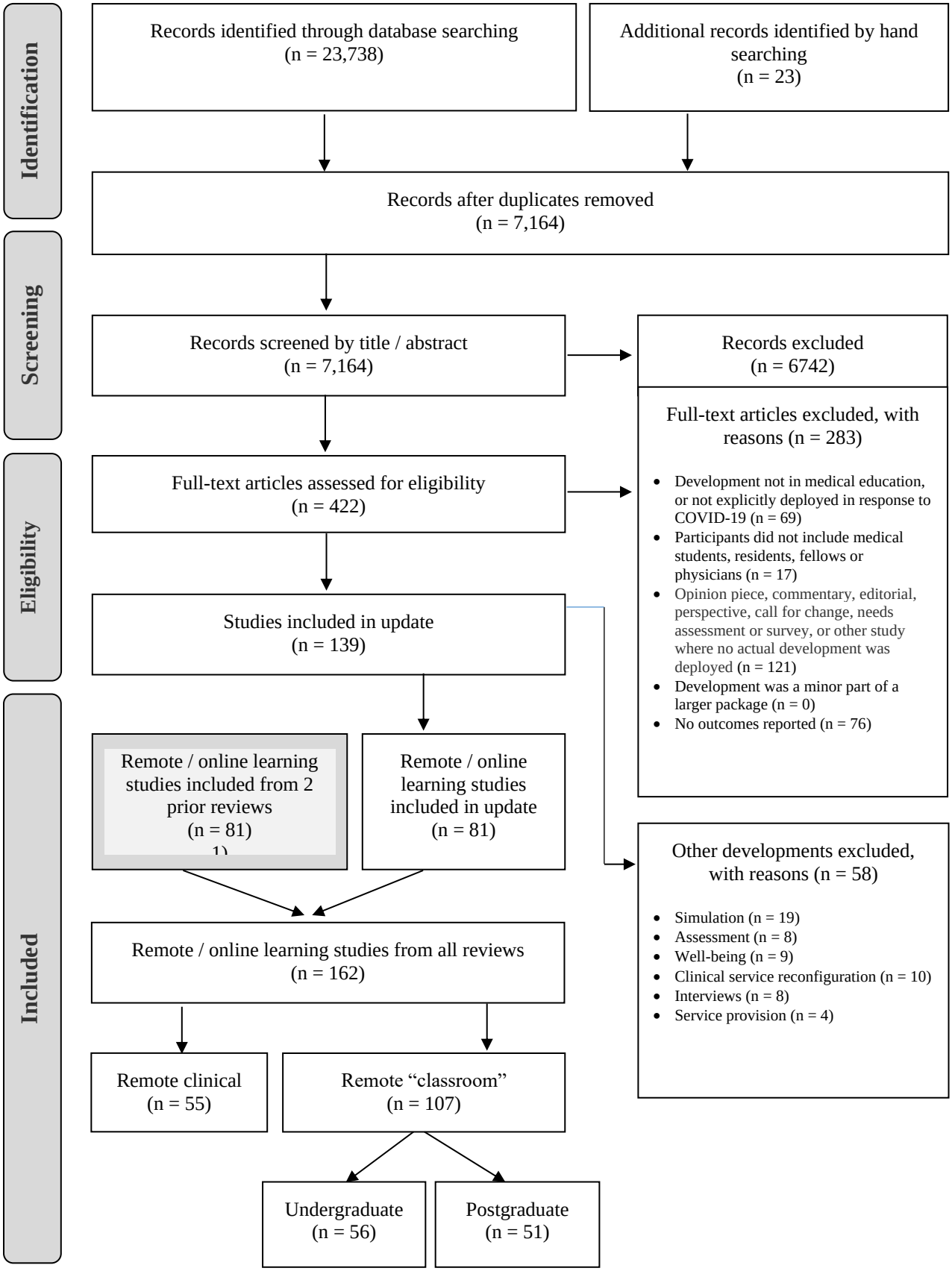

Table 1: Medical Education Research Quality Instrument

Domain	MERSQI Item	Score	Max Score
Study Design	Single Group cross-sectional or single group posttest only	1	3
	Single group pretest & posttest	1.5	
	Nonrandomized, 2 groups	2	
	Randomized controlled trial	3	
Sampling	*Institutions studied*		3
	1	0.5	
	2	1	
	3	1.5	
	Response rate, %		
	Not applicable		
	<50 or not reported	0.5	
	50-74	1	
	>74	1.5	
Type of data	Assessment by participants	1	3
	Objective measurement	3	
Validity of evaluation instrument	*Internal structure:*		3
	Not applicable		
	Not reported	0	
	Reported	1	
	Content:		
	Not applicable		
	Not reported	0	
	Reported	1	
	Relationships to other variables		
	Not applicable		
	Not reported	0	
	Reported	1	
Data analysis	*Appropriateness of analysis*		3
	Inappropriate for study design or type of data	1	
	Appropriate for study design, type of data	2	
	Complexity of analysis	1	
	Descriptive analysis only	1.5	
	Beyond descriptive analysis	2	
Outcomes	Satisfaction, attitudes, perceptions, opinions, general facts	1	3
	Knowledge, skills	1.5	
	Behaviors	2	
	Patient/health care outcomes	3	
Total possible score			18

NB: If applicable to the study and not described, a 0 will be assigned.

Table 2. Quality assessment / risk of bias of the interventions presented

Bias source	High quality	Unclear quality	Low Quality
Underpinning bias (U)	Clear and relevant description of theoretical models or conceptual frameworks that underpin the development	Some limited discussion of underpinning, with minimal interpretation in the context of the study	No mention of underpinning
Resource bias (R)	Clear description of the cost / time / resources needed for the development	Some limited description of resources	No mention of resources
Setting bias (S)	Clear details of the educational context and learner characteristics of the study	Some description, but not significant as to support dissemination	No details of learner characteristics or setting
Educational bias (E)	Clear description of relevant educational methods employed to support delivery	Some educational methods mentioned but limited detail as to how applied	No details of educational methods
Content bias (C)	Provision of detailed materials (or details of access)	Some elements of materials presented or summary information	No educational content presented

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