Protocol: Pivot to online learning for adapting or continuing workplace-based clinical learning in medical education following the COVID-19 pandemic: A BEME systematic review

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

Background

The novel coronavirus disease (COVID-19) is a highly contagious disease that was first reported in Wuhan, Hubei Province, China, in December 2019 (Wu *et al.*, 2020). Within weeks of the emergence of the disease, it had spread to several countries, and the World Health Organisation (WHO) declared the outbreak as a Public Health Emergency of International Concern in January 2020 and as a pandemic in March 2020 (WHO, 2020). The disease has been reported in 192 countries/regions, has affected over 100 million worldwide, and caused over 2.2 million deaths as of February 2, 2021 (John Hopkins University, 2021).

The response of medical schools and partnering health services relating to undergraduate medical training has been drastic and disruptive (Kinder and Harvey, 2020). Limitations placed on attendance to the clinical environment to comply with social distancing regulations, and emergently, medical faculties had to adapt and develop new modes of practice to ensure a modicum of continuity in training. Undergraduate medical curricula, particularly outcomes linked to learning within the clinical environment, have been redesigned and reimagined. This was to ensure that doctors in training develop the theoretical knowledge, professional attitudes, and technical skill, required to be competent and safe practitioners of medicine once they graduate.

A recent BEME review appraising the published literature relating to the developments within medical education following COVID-19 was published in August 2020 (Gordon *et al.*, 2020). Due to the pace and scale of published work within medical education, an update to this initial review was subsequently published in January 2021 (Daniel *et al.*, 2021). One of the major themes identified in both reviews was the pivot to online learning. Across both reviews, 81 articles focused on pivots to remote learning (n = 58) and simulation (n = 24), making these areas ripe for in-depth study.

In mid-December, our research group reran the electronic search as per the previous scoping review and categorised 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 online learning from the first two reviews. We thus decided there was a sufficiently large 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.

3) Developments across the continuum intended to replace clinical or workplace-based learning.

This systematic review aims to synthesise published reports of educational developments in medication in response to the COVID-19 pandemic focusing on the **pivot from workplace-based clinical learning to online learning for undergraduate and postgraduate medical education**.

Review Questions

Our review will address educational developments and asks:

1) What learning pivots or innovations in undergraduate and postgraduate medical education have been explicitly deployed to adapt or continue workplace-based clinical learning? (**description)**

2) What is the reported impact of these developments or innovations for the learners? (**justification**)

3) How and why were these specific pivots selected by the educators (**clarification**)

Methods

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 programme of training.

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.

Pivot to online learning for continued workplace-based clinical learning

> Any form of synchronous or asynchronous, remotely accessible learning, intended to adapt or continue the learning previously delivered within the clinical workplace for undergraduate medical students and postgraduate learners.

Outcomes

Primary outcomes will comprise direct, indirect, intended, and unintended impact of online solutions or developments deployed to adapt or continue workplace-based clinical learning, on learner knowledge, attitudes, skills, behaviours, perceptions, or learning approaches.

Inclusion / Exclusion Criteria

- Studies that described developments or interventions in undergraduate or postgraduate medical education that were deployed explicitly in response to COVID-19.

- Studies with undergraduate medical students and/or postgraduate doctors.

- Studies that considered Kirkpatrick's outcomes (level 1: reaction, level 2a: attitudes, level 2b, level 3: change in behaviour, level 4a: organisation practice change, level 4b: benefits to patients).

- The online educational development or intervention must have been explicitly deployed as an innovation or adaptation to continue workplace-based clinical learning. This included:

  - Development or adaptations that involved live patients or an aspect of the clinical workplace (e.g. ward rounds, multidisciplinary team meetings, virtual clinics, surgery).

  - Development or adaptations that involved practical skill learning as a pivot from learning that used to take place within the clinical workplace (e.g. surgical training and clinical skill learning that was previously delivered using patients in the clinical workplace).

  - Involved the review of archived radiological imaging, histological specimens, or other clinical materials, as a pivot from reduced face-to-face clinical exposure.

  - Development or innovation as a pivot from a clinical rotation or clinical experience that was disrupted following COVID-19.

The following exclusion criteria were applied:

- Opinion pieces, call for change, editorials, needs assessments, and other studies where no actual development has been deployed.

- Studies that focused on developments or methods that were not explicitly deployed in response to COVID-19.

- Studies that did not include undergraduate medical students or postgraduate doctors.

Search Terms

The same search strategy that was employed in the initial review, plus its scoping update, will be re-run. Studies deemed relevant to this review will then be appraised against the inclusion and exclusion criteria.

The search strategy was developed by a librarian (Whitney Townsend) using the Accelerator Polyglot search translation tool.

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 'curr

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"))

MedEdPublish and Google Scholar will also be searched for identification of appropriate titles.

Data Extraction

Based on BEME Guidance by (Hammick et al, 2010), we will devise and pilot a data extraction form to be completed within Microsoft Excel.

Key items included will be:

- Education deployed

    o Education problem to be solved or issues to be addressed

    o Rationale for how and why this solution was selected, including details of underpinning

    o Setting and local context of the deployed intervention / development

    o What the deployment was a replacement for

    o Summary of the deployed development or intervention

    o Resources requirements

- Outcome

    o Outcome measure of the study, in accordance with Kirkpatrick's hierarchy.

    o Summary of main results

- Conclusions

    o Lessons learnt following the education development (as stated by the authors)

    o Summary of conclusions

Papers meeting the inclusion criteria will undergo extraction by five authors, within two separate review teams. Team A (ER, NC) will extract 50% of the included papers, with conflicts managed by SP. Team B will extract the remaining 50% of included papers (HU, SA, MP), with conflicts managed by CGC and MG.

Quality Assessment

While many methods have been utilised, there is currently no consensus method within medical education systematic reviews to assess quality and judge risk of bias. The review team has decided to align with the requirements in the STORIES statement (Gordon and Gibbs, 2014). This highlights key items to be extracted and considered amongst primary studies within a high-quality systematic review in medical education. Quality will not in any way be linked to the level of outcome or forum of publication. Instead, this will only be used to categorise outcomes.

There are two major areas that will be considered, and these are largely unrelated, yet both vital.

The first is the quality or risk of bias from the reporting of the intervention. This is to appraise for the reader of the review the quantity and quality of data presented that allows the actual intervention

itself to be understood and potentially replicated. Poor reporting does not necessarily mean there is poor quality education, but it increases the risk of bias from poor reporting.

A visual RAG ranking system will be employed to judge the risk is for a number of items. Items will be judged to be of high quality (green), Unclear quality (yellow), low quality (red). These will cover core areas of reporting. The items to be judged are shown in Table 1. These judgements will be made independently within the two review groups. CGC and MG will adjudicate in instance of disagreement. No paper will be excluded based on this quality assessment.

The second is interventional study design. Given the huge variety of study types that are expected, rather than making judgements as to the quality of research, the data will be extracted and presented to readers. However, if RCTs are found, the CONSORT statement will be used to judge reporting.

Table 1: Quality assessment of the interventions will be assessed using the following matrix.

Bias source	High quality	Unclear quality	Low Quality
Underpinning bias	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 theoretical underpinning.
Resource bias	Clear description of the cost / time / resources needed for the development	Some limited description of resources.	No mention of resources.
Setting bias	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.
Pedagogical bias	Clear description of relevant pedagogy employed to support delivery.	Some pedagogical alignment mentioned but limited detail as to how applied.	No details of pedagogy.

Content bias	Provision of detailed materials (or details of access).	Some elements of materials presented or summary information.	No educational content presented.

Synthesis of evidence

Narrative summary (description)

A descriptive analysis will take place, summarising the data from the extraction form, to focus on describing summary data regarding: need for development and problem to be solved, underpinning theory or frameworks guiding development, details of the change, study type, setting and organisation of intervention, and outcomes of the primary study. Additionally, content related to the quality assessment indices will be extracted, including where relevant any additional content or appendices.

Meta-analysis (justification)

If suitably homogenous outcome data are presented which include any form of evaluation (considering educational and methodological heterogeneity as highlighted in the quality assessment), meta-analysis may be employed to consider the impact of the intervention using Kirkpatrick's hierarchy. We will group similar outcomes to allow for comparison. However, this is felt to be unlikely.

Thematic analysis (clarification)

This will be deployed with respect to the third research question. Direct quotations will be extracted from papers with regards to the rationale for *how* and *why* they selected the pivot in question. The analysis will proceed through three stages, consisting of open, axial, and selective coding, with constant comparison taking place throughout each phase. Each stage provides categories that can be used to explore the themes of the data. This will occur within method-based clusters to explore if there are themes that exist within unique pivot methods, as well as in the data as a whole (Patton, 2004).

Figure 1: PRISMA flow diagram for included studies
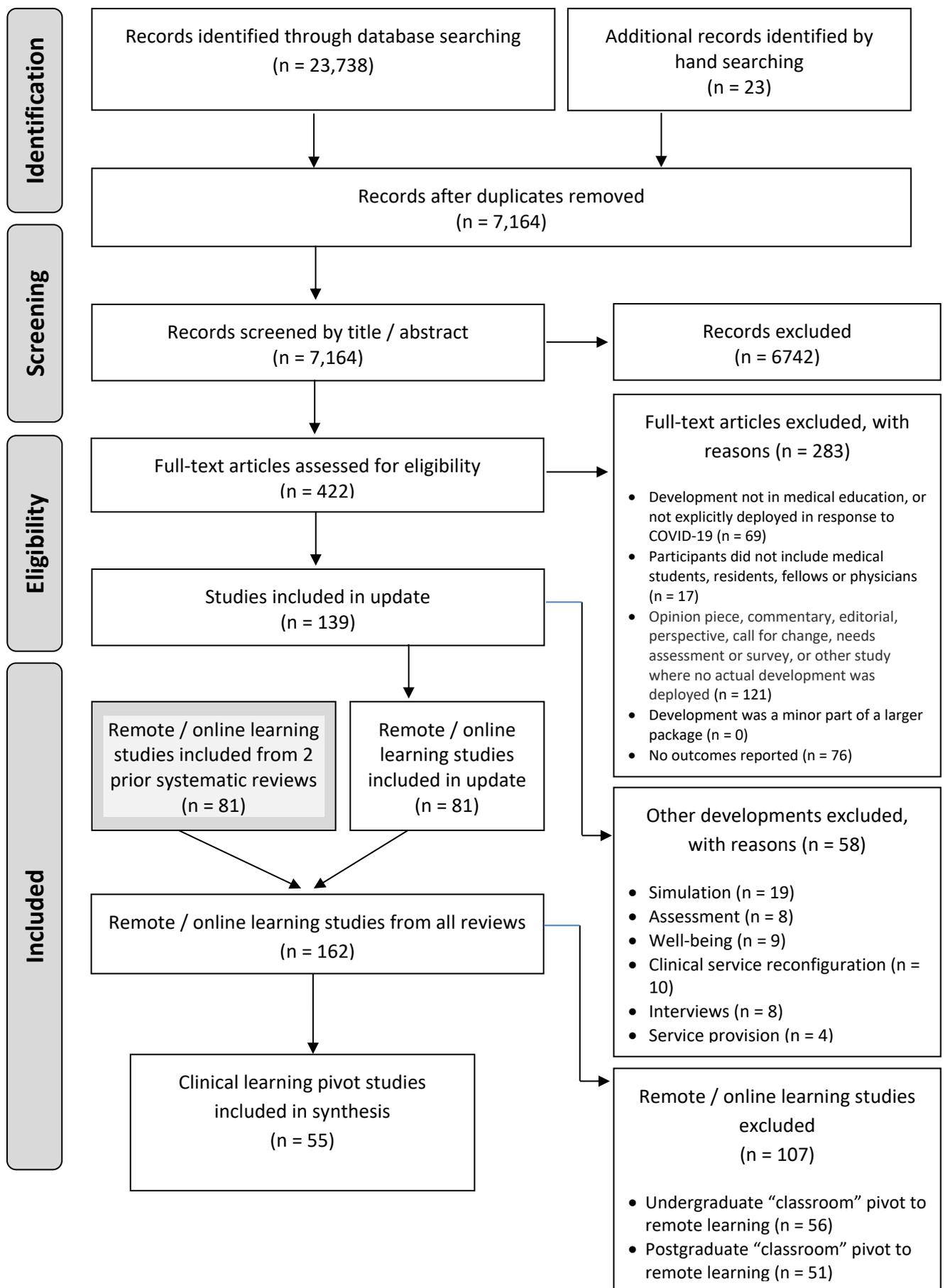
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