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Optimizing engagement of undergraduate students in medical education research: the eMERG training network.

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Conflict of interests:
The authors report no conflicts of interest.

Contribution statement:
MS and JH have equal contribution and drafted the manuscript. GT edited part of the manuscript and had lead role in the ESMSC course. MS and AP are the ESMSC leads and conceived the idea of eMERG. JH is the lead coordinator of the eMERG research network. CP, NA NS and NA have contributed in most of the series of experiments throughout ESMSC courses. TA and TP are a senior Academic with input in several projects of the eMERG collaboration. NS and PP have contributed in several eMERG projects and are part of the administration of the course and the research network.

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Main message of article:

- eMERG is a pilot international research training network where undergraduate medical students receive support to conduct research in Medical Education
- eMERG structure can serve as a novel model to convey research experience from one generation to another, and in the same time, motivate and aspire students to develop leadership skills.
- eMERG was developed in a financial crisis environment and its research outputs as well as students’ perceptions are promising.

**Ethical Approval:**

ESMSC licence (ethical approval) met directive 63/2010, PD 56/April 2013 declaration, according to local policy. The license reference number is 884 28/4/2015, MS, AP et al.

**Place of Study:**

ESMSC runs at the Experimental Research Centre (ERC) ELPEN which is accredited by the NASCE committee (Network for Accredited Skills Centres in Europe). ERC ELPEN holds all the relevant facilities for advanced animal model simulation training.
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Abstract

Background: The practice of evidence-based medicine and critical appraisal are essential for the modern doctor. Early engagement of medical students in research methodology is considered as a rising need for most medical school curricula; however, few peer-reviewed initiatives have been reported so far. We developed a Medical Education Research Group (eMERG) as part of a novel undergraduate surgical masterclass, which aimed to train undergraduate students on basic research methodology, as well as to motivate them to pursue a clinical and academic career in surgical specialties.

Methods: eMERG consists of an international structured network of senior academics, consultant-level clinicians, senior and junior trainees who support undergraduate trainees. Students are selected from a competitive pool of applicants. Several small prospective studies in skills-based education, as well as systematic reviews on similar topics have run under the umbrella of this framework, in the form of scholarship awards. Structured feedback questionnaires were distributed to evaluate the experience of the first three years.

Results: 12 students have participated in this pilot initiative. 11 manuscripts have been submitted for publication and 8 were accepted following peer-review in MEDLINE-indexed journals. Delegates perceived this experience as an excellent training opportunity which improved their research productivity. Delegates also stated engagement in research developed interest in the relevant surgical speciality, impacting their career aspirations.
Conclusions: eMERG is one of the first reported European educational research networks for undergraduate level trainees. Research outcomes and students’ perceptions conclude that eMERG enhances engagement with research methodology and motivation towards a career in surgery.
Introduction:

Understanding research methodology is turning to an essential pre-requisite for future physicians. In the United Kingdom, more than a third of medical students undertake an intercalated Bachelor of Science (iBSc) degree [1]. iBSc’s role in Medical Curricula is primarily to introduce undergraduate students to research, involving them directly in projects, and increase their motivation for a clinical and academic career [2]. Apart from iBSc, several medical schools offer additional options, including intercalated Master of Science (MSc), Master of Research (MRes) or PhD [3]. Besides formal research involvement as part of those degrees, an increasing number of students decide to engage in research further, seeking to undertake research projects that run concurrently to their clinical placement [4].

Despite the overall increasing trend of engagement with research at the undergraduate level, there is still lack of fundamental infrastructure to support students, or even young trainees, naïve to academia [5]. Additionally, although medical education recipients are primarily undergraduate students, little effort has been made to engage them with research opportunities relevant to this topic.

Addressing the gap in terms of a formal supporting mechanism for research in the field of undergraduate medical education, we founded a pilot research training network. This collaboration network aims primarily to provide a supporting umbrella and enhance training opportunities for undergraduate students who are interested in medical education; and secondarily to motivate them to engage with research at the earliest stage.

Methods:
ESMSC Medical Education Group (eMERG) is an international collaboration between senior academics, consultant-level physicians, senior and junior trainees with undergraduate medical students (figure 1). It was founded as part of the “Essential Skills in the Management of Surgical Cases (ESMSC Marathon Course), which is an international multidisciplinary undergraduate surgical masterclass [6, 7]. ESMSC recruits motivated undergraduate students from various countries of the European Union (EU). Its current curriculum combines high and low fidelity simulation-based learning modules, with case-based discussions, non-technical skills and basic science workshops.

Students who have successfully completed the course are invited to submit a 300-word statement on their future vision about eMERG and their expectations from this collaboration, along with their cv. Faculty selection committee (FSC) invites shortlisted delegates for a structured interview which aims to explore students’ aspirations for research involvement. Interview panel consists of project leads (MS, AP) along with senior academics that support ESMSC project. Successful applicants receive an “eMERG award” in the form of scholarship supported by a research grant from Experimental Research Centre ELPEN (ERC ELPEN).

Similarly, FSC invites senior and junior trainees who have been faculty members of the course and hold previous research experience to attend a similar interview [7].

eMERG is based on a multilinear chain logic (figure 2), where one or more students are paired with 1 or 2 junior-level trainees and 1-2 senior academics or consultants. Students receive guidance on designing and running a research project as part of the course (prospective observational studies); alternatively, they can be involved in a systematic review, the research question of which lies within the medical education field. Projects’ set-up in most cases has been conceived by ESMSC leads (MS/AP) in the case of prospective studies; or from various senior academics who work in close collaboration (TA/AP) in the case of systematic reviews. Students are encouraged to submit their own research proposals
in certain general topics (figure 2). All eMERG participants receive direct individualized supervision from a senior or junior trainee and the junior lead of the project (MS). Scheduled joint meetings with ESMSC leads (MS/AP) and the senior authors’ team allow resolution of any potential conflicts or challenges.

Following a pilot 2-year application of the eMERG collaboration, we invited selected students to attend a structured interview and discussed their feedback and vision about this initiative.

Results:

From a pool of 45 eligible applications, 12 students were selected to be part of the pilot eMERG concept. Objective research outcomes include 8 published papers [6-13] and 3 submitted in MEDLINE indexed journals. 5 oral presentations were also accepted in US and European international conferences. Students perceived eMERG as a successful training initiative in research methodology, which increases motivation towards a clinical and academic career in various surgical specialties. Rising number of applications during last semester i.e 35 eligible applications between April-November 2017 vs. 10 prior to this (December 2015- April 2017) reflects students’ increasing interest to engage with eMERG.

Discussion

Future challenges including rapid evolution clinical practice based on continuous novel research outcomes, implies a fundamental need for early involvement in research, as well as robust understanding of its methodology [14]. Additionally, austerity measures have affected healthcare systems and led to overworked physicians with increasing burnout rates [7, 15]. Research opportunities and education quality are traditionally the easiest victims of financial implications. Therefore, attrition rates have climbed to record numbers, with several acute
specialties suffering from recruitment issues [15-17]. In this context, medical education and modern curricula should be conceptually reformed to meet future demands, and in the same time enhance motivation of future physicians to increase workforce retention [18].

A similar effort, focused on residents in training has been reported in 2015 [19] from University of Michigan with great research outcomes. The authors recognize three key success components; the clear provision of mentorship both by seniors as well as by peer colleagues, effective teamwork in a supported framework, and identification of education gaps which generates questions for future research. The MERG group consists of medical students, residents and fellows who are passionate to work as part of an educational scholarship.

Further to this, Association of American Medical Colleges (AAMC) have introduced a Medical Education Research Certificate (MERC) [20]. MERC is primarily focused to build a robust understanding of the processes involved in medical education research, and is specifically targeted to clinicians and educators to enable collaborative participation in relevant projects.

In our case, we describe one of the first undergraduate multi-specialty research training collaborations, targeted again on medical education and mainly simulation-based learning for surgical specialties. Besides formal curricular opportunities to engage with research, there is a fundamental gap in current evidence on supporting undergraduate students in their research aspirations [21, 22]. Additionally, there has been an increasing number of students’ societies trying to systematize a basic infrastructure to provide research opportunities. This reflects a recognized demand to set up formal networks which can potentially provide protected opportunities to motivated students across several universities[21, 23]. Additionally, as a result of the network-character component, these opportunities can cross the borders and enhance interaction and exchangeability of research methodology. In the case of eMERG, the
concept to focus on medical education highlights and implies the need for a collaboration with international character.

Connecting clinicians and students from various training levels, combines the peer-to-peer learning strategy with the conventional hierarchy-based teaching approach, between senior academics and fellow members. This unique concept resolves traditional stereotypes such as professor-led (or senior academic) research and develops a bridge between senior & junior researchers with medical students [24, 25]. As a result, undergraduate students feel more engaged and motivated to be part of research; and this can inspire confidence on them to develop and support their own novel ideas [26]. This was reflected as an overall conclusion of the feedback received from the structured interviews.

Providing a formal framework for students to support their own ideas can foster career development through multiple facets. Problem-solving is one of the skills that can be indirectly enhanced, as students have the autonomy and flexibility to refine their project-approach in line with challenges that arise throughout [27]. Additionally, this develops another fundamental skill which is found in successful researchers; and that is leadership [23]. eMERG fosters a culture of adaptive learning tailored to the undergraduate level for each research project. It also promotes a student-led problem-solving approach in a background of a collaborative network which provides a supporting infrastructure to achieve research training with successful outcomes. Overall, this can aspire a leadership culture from the undergraduate level with emphasis on achieving fundamental development of multiple soft-skills, required to be a successful future researcher.

An important note related to our initiative, is the financial circumstances on which both ESMSC and eMERG have been set up. Despite global crisis and continuous economic recessions, we managed to structure an initiative with acceptable outcomes, without transferring any cost to the student[7].
eMERG’s foundation is set around an internationally accredited surgical masterclass (esmsc) which brings together a big network of academics, qualified clinicians and trainees. In summary, the key difference from self-motivated research is that eMERG provides a structured framework which can train students in research methodology. In the same time, its international foundation, promotes diversity and exchangeability of knowledge.

Limitations:
However, we recognize a series of limitations; firstly, the limited numbers of students that have been part of eMERG are strongly motivated individuals who would anyhow seek to pursue any developmental opportunities. Secondly, eMERG has focused primarily on Medical Education research and more specifically on SBL strategies. Also, we can only base our conclusions on limited data on research outcomes, as well as students’ subjective feedback on their experience. Finally, this is a pilot implementation for a two-year window which can introduce severe bias on future developmental goals.

Future aspirations:
eMERG is planning to expand its collaboration between researchers across the EU and the US. The primary focus of our research will be to identify all fundamental skills required at the undergraduate level for most of the surgical specialties; an in the same time develop core performance outcomes to objectively assess them using evidence synthesis methodology. This will be the foundation, as well as the main evolving mechanism, of the newly introduced course curriculum (integrated generation 4 – iG4) [7]. We will also promote participation of students from deprived areas of the world who have limited opportunities. This would increase eMERG amplitude and in the same time enhance exchangeability of knowledge.

Conclusions:
eMERG is one of the first research training networks for undergraduates which allows robust engagement of delegates with various medical education projects. Its structure can serve as a novel model to convey research experience from one generation to another, and in the same time, motivate and aspire to develop leadership skills. Although newly introduced, our outputs indicate that eMERG meets its initial targets, and in the same time it allows collateral development of various soft skills including decision making and problem solving. Although we plan expansion of eMERG amplitude, our primary challenge will be to secure funding to allow engagement of more students globally.
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Figures

Figure 1: eMERG logo
figure 2: Structure of eMERG working groups. The letter “G” in the logo represent the multilinear structure logic of the group.
Main message of article:

- eMERG is a pilot international research training network where medical students receive support to conduct research in Medical Education.
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