



Challenges facing early-career and mid-career researchers: potential solutions to safeguard the future of evidence-based medicine

Georgia C Richards ¹, Stephen H Bradley,^{2,3}
Andrew B Dagens,⁴ Christoffer B Haase,⁵ Brennan C Kahan,⁶
Tanja Rombey,⁷ Cole Wayant ⁸, Logan Z J Williams,⁹
Peter J Gill^{10,11}

10.1136/bmjebm-2019-111273

For numbered affiliations see end of article.

Correspondence to:
Georgia C Richards, Centre for Evidence-Based Medicine, Nuffield Department of Primary Care Health Sciences, University of Oxford, Oxford OX1 2JD, UK; georgia.richards@phc.ox.ac.uk

The challenges facing the evidence-based medicine (EBM) movement are well documented.^{1,2} Yet, the problems facing early-career and mid-career researchers (EMCRs) working in the ecosystem of EBM have not been articulated. The coming together of a cohort of EMCRs from across the globe enabled this articulation.³ The 2019 EBMLive conference (see [box 1](#)) provided a space for EMCRs to discuss problems, exchange ideas and create a list of potential solutions. This article outlines four key problems faced by EMCRs and their potential solutions (see [box 2](#)).

Problem 1: tokenistic training of evidence-based medicine

Ninety-five per cent of medical schools in the USA and Canada integrate EBM into their curricula.⁴ Yet, EBM is not prioritised. Instead, it is incorporated into other activities within the curricula, and formal assessment of EBM competency progressively decrease as one's clinical training advances.⁴ In the UK, core EBM topics are taught but few medical schools provide time in the curricula for students to practice and assess their skills.⁵ Evidence on the level and implementation of EBM training for health scientists is less clear. However, we anticipate that training varies widely depending on one's degree or degrees, discipline, experience, university and country. Given the lack of consensus on the best methodology to teach EBM,⁶ we propose the development of a standardised, evidence-based curriculum for all health professionals and scientists with a focus on research biases, conflicts of interest, and transparent and reproducible research practices.

Evidence that illustrates the potential harm of biases in clinical practice and research must

be included when teaching students and training scientists about research biases.⁷ Healthcare trainees and scientists must be taught that payments as small as a meal may affect their prescribing practices⁸ or the direction of their study's results, and the importance of reporting and declaring such payments or competing interests. Teaching healthcare professionals how to communicate medical uncertainties and stopping treatment when standard practice provides no benefit, or is harmful, is essential. Overall, adequate time must be allocated to ensure learners practice critical appraisal skills and open science. In doing so, the next generation of health professionals and scientists will conduct more robust and reproducible science, improving the translation of their research for patients, policymakers, funders and front-line clinicians.

Problem 2: emphasis of quantity over quality

The culture of 'publish or perish' is well established in academia.⁹ For EMCRs, this pressure to publish is considerable. Employers, institutions and funding bodies use the metric of one's publications to make judgements that can defer the progression of one's career, impede employment opportunities and inhibit the development of becoming an independent researcher. More recently, this metric is determining the specialty and career pathway of junior doctors working in the UK. Important contributions to research, such as enrolling participants in clinical trials which do not warrant authorship, are not accounted for in the scoring system of specialist training posts.¹⁰ This shallow focus on publication metrics perpetuates research waste, scientific misconduct and poor research practices.^{11,12} Furthermore,



© Author(s) (or their employer(s)) 2021. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Richards GC, Bradley SH, Dagens AB, et al. *BMJ Evidence-Based Medicine* 2021;26:8–11.

Box 1 The EBMLive Conference

The EBMLive Conference (www.ebmlive.org) is a joint partnership between the Centre for Evidence-Based Medicine and the *BMJ*, designed to *develop, disseminate, and implement better evidence for better healthcare*. Since inception, EBMLive has worked tirelessly to include the voice of students and early-career researchers. Building on previous work, the inaugural Doug Altman Scholarship³ and Building Capacity Bursaries were launched in 2019 to fund the travel and attendance of early-career researchers from across the globe to attend the conference.

Box 2 Problems facing EMCR and their potential solutions

In the lead up to the EBMLive conference, Doug Altman Scholars submitted personal and general problems they have faced as early-career researchers. The responses were synthesised and shared with the Scholars to generate further discussion. During EBMLive, the problems and ideas for potential solutions were discussed and presented during dedicated sessions for early- and mid-career researchers. The key list of problems facing early-career and mid-career researchers and their potential solutions are as follows:

1. *Tokenistic training of evidence-based medicine*
 - Develop a standardised, evidence-based curricula for teaching evidence-based medicine
 - Incorporate the teaching of research biases, conflicts of interests and medical reversal into curricular
2. *Emphasis of quantity over quality*
 - Restructure research metrics to focus on research quality and impact
 - Institutions, employers and funding bodies must change the culture and current expectations of publication
3. *Lack of meaningful mentorship*
 - Mentorship should be built into academic job descriptions and audited objectively
 - Mentees should be matched with suitable mentors
4. *Increasing administration burdens*
 - Streamline current processes
 - Global use and acceptance of preprint servers

Box 3 The Altman Index

The Altman Index¹³

- ▶ A quantitative metric for scientific integrity and commitment to open access science
- ▶ The Altman index would be calculated based on different components of open scientific practice including (but not necessarily limited to):
 - Pre-registration of methods
 - Software
 - Data
 - Publication (pre-print and print)

Each of these components would be linked to a unique project ID. The Altman index (A) is still a work in progress, but could be calculated in the following manner:

$$A = X_1 + X_2 + \dots + X_3$$

- ▶ X=fraction of open access criteria fulfilled for a given publication
- ▶ i=project identification

As an example, an early-career researcher who has completed three projects might have contributed to open science in the following way:

| Project ID | Criterion fulfilled | | | | | X |
|------------|---------------------|----------|------|-----------|-------|-----|
| | Pre-registration | Software | Data | Pre-print | Print | |
| 1 | Y | Y | N | Y | N | 3/5 |
| 2 | Y | Y | Y | Y | Y | 5/5 |
| 3 | N | N | N | N | N | 0/5 |

N: No=0; Y: Yes=1

So:

$$\begin{aligned}
 A &= X_1 + X_2 + X_3 \\
 &= 3/5 + 5/5 + 0/5 \\
 &= 8/5 \\
 &= 1.6
 \end{aligned}$$

Although all projects this scientist completed were considered in the calculation, only those that fulfilled at least one of the open access criteria contributed to the overall Altman index. In this way, all efforts to practice open science are recognised.

Altman index could then be linked to ORCID, where a more detailed breakdown of a scientist's Altman index could be provided. The Altman index could then be considered alongside (or even in place of) current metrics such as publication impact factor when hiring for academic positions or allocating research grants.

research metrics compound the current environment of limited research funding and difficulty publishing for EMCRs, such that most studies need to be large and multi-centre.

The current system needs restructuring. Instead of focusing on the number of publications, journal impact factors or h-index, we need to evaluate research contributions based on their quality and the likely impact on society. To do this, we propose the incorporation of a new metric system (eg, the Altman Index,¹³ see box 3) and a change in cultural expectations of employers, institutions and funding bodies. To bring about this culture change, we need meaningful leadership and mentorship from the EBM community.

Problem 3: lack of meaningful mentorship

Mentorship that champions the integrity of science along with career success is lacking. Initiatives to embed research integrity and ethical conduct of research seems crowded out by a preoccupation with outputs and grant funding. In such an environment, it is not surprising that EMCRs lack insight or resolve to resist poor research practices, and in some cases, scientific misconduct. Senior academics have an important role to play in helping EMCRs achieve their career goals rather than promoting their research and career agendas. Without meaningful mentorship, EMCRs may choose to leave academia, creating a generational gap.

To create future leaders of EBM, senior academics must invest time and training in becoming meaningful mentors.¹⁴ They must provide moral leadership and practical guidance so that junior researchers can succeed while maintaining their integrity. For mentors and mentees, the principles outlined by Professor Sharon Straus and the late David Sackett are a practical and evidence-based template for positive mentorship.¹⁵ Mentoring needs to be made tangible and measurable, built into academic job descriptions, audited objectively and funded accordingly. There is also evidence that matching mentors and mentees based on ethnicity improves outcomes however, this is not the case for gender-matched pairs.¹⁶ Thus, the suitability of mentors for mentees must also be considered.

Problem 4: increasing administration burdens

The distinction between 'academic' and 'non-academic' activities is no longer clear-cut.¹⁷ The onus of administration usually falls on those who are most junior. Without large grants or adequate research teams or support, EMCRs must manage mandatory bureaucratic structures such as ethical committees, funding reports, manuscript formatting edits and local research governance. This, coupled with a heightened sense of expectation for outputs, teaching, embedding patients and the public in research, practising open and transparent science, can make life as an EMCR overwhelming. Currently, administrative burdens block innovation and inhibit progress for EMCRs.

To foster emerging leaders in medical research, funders, employers, ethics committees, finance teams, journals and publishers should streamline processes. Practical solutions include the agreement on one manuscript style for writing all publications and using one form or system for applying to all ethics committees such as the Integrated Research Application System in the UK.¹⁸ Other possible solutions include the use of literate programming to write and generate living manuscripts that can be easily transferred to different journal styles.¹⁹ Preprint servers such as medRxiv²⁰ may also play a significant role in ensuring the open and accessible publication of research findings.

Conclusions

EMCRs can make significant contributions to fixing the problems in medical research. Yet, the current structures and systems need an overhaul. We propose that the training of EBM, research metrics, mentorship and administration processes must be revised and improved to ensure that there is a future for evidence-based healthcare.

Author affiliations

¹Centre for Evidence-Based Medicine, Nuffield Department of Primary Care Health Sciences, University of Oxford, Oxford, UK

²University of Leeds, Leeds, UK

³York Street Practice, Leeds, UK

⁴Oxford University Hospitals NHS Foundation Trust, Oxford, UK

⁵Section of General Practice, University of Copenhagen, Copenhagen, Denmark

⁶Pragmatic Clinical Trials Unit, Queen Mary University of London, London, UK

⁷Institute for Research in Operative Medicine, Universität Witten/Herdecke, Witten, Germany

⁸Oklahoma State University Center for Health Sciences, Tulsa, Oklahoma, USA

⁹Faculty of Medicine and Health Sciences, The University of Auckland, Auckland, New Zealand

¹⁰Division of Paediatric Medicine, Hospital for Sick Children, Toronto, Ontario, Canada

¹¹Centre for Evidence-Based Medicine, University of Oxford, Oxford, UK

Twitter Georgia C Richards @Richards_G_C and Cole Wayant @ColeWayant_OK

Contributors GCR and PJG devised the concept of the manuscript. All authors provided their personal experiences of problems they have faced as early-mid career researchers and potential solutions. CW and LZJW developed problem 1; TR and BCK developed problem 2; ABD and SHB developed problem 3; CBH and GCR developed problem 4. GCR drafted the initial manuscript and all authors read, drafted and provided comments on the final manuscript.

Funding The authors would like to thank the McCall MacBain Foundation for supporting the development of the Doug Altman Scholarship

Competing interests GCR receives funding from the NHS National Institute of Health Research (NIHR) School for Primary Care Research (SPCR), the Naji Foundation and the Rotary Foundation to study for a Doctor of Philosophy (DPhil) at the University of Oxford. GCR is a member of the EBMLive Steering Committee. SHB, ABD, CBH, BCK, TR, CW and LZJW were Doug Altman Scholars, presented at EBMLive 2019 and had their expenses reimbursed to travel to and attend the conference. CW is funded through the National Institute of Health grant number F30 CA243651-01. BCK has received funding from the NIHR Doctoral Research Fellowship program. PJG has received grant funding from the Canadian Paediatric Society, and the Canadian Institute of Health Research (CIHR) in the past 5 years. He is on the CMAJ Editorial Advisory Board and on the Institute Advisory Board for the CIHR Institute of Human Development, Child and Youth Health (IHDCYH) where he has expenses reimbursed to attend meetings. He is on the editorial board of BMJ Evidence Based Medicine. He is a member of the EBMLive Steering Committee, and he has expenses reimbursed to attend the conference.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

ORCID iDs

Georgia C Richards <http://orcid.org/0000-0003-0244-5620>

Cole Wayant <http://orcid.org/0000-0001-8829-8179>

References

- Greenhalgh T, Howick J, Maskrey N, *et al*. Evidence based medicine: a movement in crisis? *BMJ* 2014;**348**:g3725.
- Goldacre B, Heneghan C. How medicine is broken, and how we can fix it. *BMJ* 2015;**350**:h3397.
- Richards GC, Macdonald H, Gill PJ. A scholarship to foster future leaders in evidence based medicine. *BMJ* 2019;**364**:l775.
- Blanco MA, Capello CF, Dorsch JL, *et al*. A survey study of evidence-based medicine training in US and Canadian medical schools. *J Med Libr Assoc* 2014;**102**:160–8.
- Meats E, Heneghan C, Crilly M, *et al*. Evidence-based medicine teaching in UK medical schools. *Med Teach* 2009;**31**:332–7.
- Ahmadi S-F, Baradaran HR, Ahmadi E. Effectiveness of teaching evidence-based medicine to undergraduate medical students: a BEME systematic review. *Med Teach* 2015;**37**:21–30.
- Herbison P, Hay-Smith J, Gillespie WJ. Different methods of allocation to groups in randomized trials are associated with different levels of bias. A meta-epidemiological study. *J Clin Epidemiol* 2011;**64**:1070–5.
- Mitchell AP, Winn AN, Lund JL, *et al*. Evaluating the strength of the association between industry payments and prescribing practices in oncology. *Oncologist* 2019;**24**:632–9.
- Broad WJ. The publishing game: getting more for less. *Science* 1981;**211**:1137–9.
- NHS. Application scoring. IMT recruitment, 2019. Available: <https://www.imtrecruitment.org.uk/recruitment-process/applying/application-scoring> [Accessed 14 Aug 2019].
- Rawat S, Meena S. Publish or perish: where are we heading? *J Res Med Sci* 2014;**19**:87–9.
- Chalmers I, Glasziou P. Avoidable waste in the production and reporting of research evidence. *Lancet* 2009;**374**:86–9.
- Williams L. 1 If you can't beat 'em, join 'em: combating poor scientific practice with a quantitative, open-access research metric. *BMJ Evid Based Med* 2019;**24**:A1.
- Great mentoring is key for the next generation of scientists. *Nature* 2017;**552**:5.
- Straus SE, Sackett DL. *Mentorship in Academic Medicine*. Chichester, UK: John Wiley & Sons, Ltd, 2013.
- Campbell TA, Campbell DE. Outcomes of mentoring at-risk college students: gender and ethnic matching effects. *Mentoring and Tutoring* 2007;**15**:135–48.
- Whitchurch C. Expanding the parameters of academia. *High Educ* 2012;**64**:99–117.
- Yewlett A, Tufail S, Whitaker M, *et al*. The integrated research application system: an introduction. *Br J Hosp Med* 2009;**70**:M140–1.
- Parkes M. 7 papers as living documents: using literate programming to produce fully transparent, reproducible research manuscripts. *BMJ Evid Based Med* 2019;**24**:A4.
- Rawlinson C, Bloom T. New preprint server for medical research. *BMJ* 2019;**365**.