

2018-07-23

Research skills in medical education

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<http://hdl.handle.net/10026.1/11886>

10.15694/mep.2018.0000151.1

MedEdPublish

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OPINION ARTICLE

Research skills in medical education [version 1]

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Peninsula Medical School

V1 First published: 23 Jul 2018, 7:151
<https://doi.org/10.15694/mep.2018.0000151.1>
 Latest published: 23 Jul 2018, 7:151
<https://doi.org/10.15694/mep.2018.0000151.1>

Abstract

This article was migrated. The article was marked as recommended.

The ability to find, interpret and use information is a key skill in any clinician's arsenal. During medical training, we aim to equip our students with the ability to navigate the potentially baffling amount of information available online, and come to valid conclusions. This article reflects on the nature of research skills and how they are delivered in medical education. It also explores whether these are the most efficient methods for enabling students to become able researchers. Comparisons with other types of university degrees are made, and consideration given to how research skills should best be integrated into our teaching.

Keywords

research skills, transferable skills, life-long learning, employability

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Competing interests: No competing interests were disclosed.

Grant information: The author(s) declared that no grants were involved in supporting this work.

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How to cite this article: Watson HR and Burr S. **Research skills in medical education [version 1]** MedEdPublish 2018, 7:151
<https://doi.org/10.15694/mep.2018.0000151.1>

First published: 23 Jul 2018, 7:151 <https://doi.org/10.15694/mep.2018.0000151.1>

Research skills in medical education

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Categories: Educational Strategies

Received: 06/07/2018

Published: 23/07/2018

Abstract

The ability to find, interpret and use information is a key skill in any clinician's arsenal. During medical training, we aim to equip our students with the ability to navigate the potentially baffling amount of information available online, and come to valid conclusions. This article reflects on the nature of research skills and how they are delivered in medical education. It also explores whether these are the most efficient methods for enabling students to become able researchers. Comparisons with other types of university degrees are made, and consideration given to how research skills should best be integrated into our teaching.

Keywords: research skills; transferable skills; life-long learning; employability

How can we best prepare our students to enquire, evaluate and be life-long learners?

Research skills are required in all branches of medicine (Laidlaw *et al.*, 2012). Clinicians need to be lifelong learners, able to evaluate evidence and understand the process of scientific enquiry. Whether or not a doctor pursues a research career, they still need to be able to make sense, and be critical, of the huge amount of information available online. They may also be required to carry out their own research study, and the training we provide should lay the foundations for them to develop their own rigorous and informed approaches to research.

Knowledge, skills and behaviours can be absorbed by students without them noticing, and it is only when the values they are exposed to conflict with their own that they become conscious they have been taught covertly (Phillips, 2013). This approach to conveying information may be more appropriate for some transferable skills than others, and carries the danger that values can be imparted on students without them considering if they fully agree with or understand them. Research skills include tangible principles that can be taught more visibly; like good study design and the scientific method. Evidence suggests that we are more likely to recognise having learned something if we are told explicitly that we will be learning it (Murdoch-Eaton *et al.*, 2010). In addition, enabling students to be more aware of their own skillsets may well be important for employability, as they will be able to communicate these skillsets to potential employers when applying for jobs. In a typical academic setting, teachers may have spent decades with research as their primary activity. In contrast, the students' primary activity is to learn and understand medical knowledge. Thus, we may need to be more overt about research skills and explain their impact on employment within our curricula so that the students can understand what they are learning, and why.

As educators, we must understand the perceptions of research that students have when they enrol in medical school. Most of our medical students are high-achievers, previously attaining high grades by learning and recalling facts. A UK study found that whilst school pupils are generally familiar with the idea of research, for example in forming hypotheses, they have few opportunities to test their own research questions (Yeoman *et al.*, 2017). Whilst considering this evidence, it is also important to note that many of our students in the UK are now graduates, coming from a first degree where they are likely to have been exposed to research experience. We must consider what, if any, exposure to research our students have had before coming to medical school, especially when we ask students to conduct novel research or literature reviews in the early years of medical study. We should also be aware that science education prior to university is predominantly factual, leading to a potential distortion of the amount of uncertainty there is in science. It is important to openly explore the idea that ‘nobody knows’ as a new and uncomfortable concept for those unfamiliar with research. Therefore, it might not be appropriate to ask students to interpret peer-reviewed primary research until they understand the process of research and the limitations of knowledge. To ease this transition, we should emphasise application, and create employment-relevant contexts to engage students in developing these skills (Murdoch-Eaton and Whittle, 2012).

In undergraduate science courses, research is generally introduced in a constructive fashion, culminating in a final year extended project within a research framework (Willison and O'Regan, 2007). Factual knowledge is taught in the early years of scientific study, alongside non-explorative, tried and tested experiments. Opportunity for novel research and exploration of the literature comes in the final year. In contrast, during the early years of medical study we often expect students to evaluate research (e.g. with problem-based learning). Perhaps we should learn from traditional science courses and introduce research skills teaching in a more constructive way, building knowledge and understanding each year. However, an extensive US study argues that although science students are exposed to research opportunities, they are predominantly assessed on factual content at lower cognitive levels, meaning that graduates are less equipped with transferable skills than they perhaps should be (Momsen *et al.*, 2010). Aligning assessment with transferable skills is key, but it is also difficult, due to the less tangible nature of transferable skills (Laidlaw *et al.*, 2012). Science courses may need to be more explicit about research skills in the curriculum, and perhaps medical students need a more constructive introduction to research. What is clear is that both science and medical curricula must strive for more effective assessment of research skills.

In order to become lifelong learners, medical students must understand scientific concepts, but also have the skills to find, filter and use new information. With near instant access to extensive knowledge using modern technology, is it still appropriate to ask our students to recite normal range values, drug names and doses? Furthermore, in 40 or so years of practice, guidelines, drugs, surgical procedures and many other things will change. For example, all clinicians throughout their careers require critical thinking and the ability to deal with uncertainty, whereas the same is not true for some aspects of physiology and pharmacology. Of course, this is not to say we should not teach the sciences, but that the priority should shift from learning facts to developing the skills required to evaluate knowledge. This is not a proposal to teach research skills in a standalone way, rather to continue to teach them in context with social interaction (Berkhout *et al.*, 2018), whilst moving the emphasis away from factual recall.

Most university courses claim to be research led, teaching the most recent discoveries in their fields, and we should extend this to research skills training. Styles of oral communication between people may change gradually over centuries, thus it is likely that a doctor can use the same communication strategies throughout their career. In contrast, the skills required to conduct and access research are constantly changing, due to huge advances in technology and internet access and because of the vast increase in research output now available. Over the past 15 years, the methods we use to access scientific journals have changed immensely. It is clear that a lack of training is a barrier to clinicians finding the information they need (Davies, 2007), whilst they must also possess the critical ability to not believe everything they read online (Bullock, 2014). Therefore to future-proof our doctors, we must help them develop the ability to utilise technology effectively to interrogate massive databases, independently of

format.

Take Home Messages

When considering research skills in the curriculum, we must be proactive in responding to the different educational backgrounds of our students, and changes in demands on clinicians. We need to equip students with the agility to become lifelong learners, aware of their own skillsets and able to adapt to change.

Notes On Contributors

Dr Helen R Watson is a Lecturer at Peninsula Medical School, University of Plymouth.

Dr Steven A Burr is an Associate Professor and Deputy Director of Assessment for Medicine and Dentistry at Peninsula Medical School, University of Plymouth.

Acknowledgements

None

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<https://doi.org/10.1080/00071005.2017.1310179>

Appendices

Declarations

The author has declared that there are no conflicts of interest.

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Ethics Statement

Not required as this is an opinion piece.

External Funding

This paper has not had any External Funding

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Reviewer Report 09 August 2018

<https://doi.org/10.21956/mep.19616.r29166>

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Irine Sakhelashvili

European University

This review has been migrated. The reviewer awarded 4 stars out of 5

I was reading this brief, but concise article touching, very thought-provoking topic with great interest. As my previous colleagues mentioned, yes, perhaps research skills are required only for researchers. However, by my opinion, it may be concerning to the advanced abilities and knowledge, like MatLab, Spss, etc. In the matter of the critical thinking, reading and writing skills, (and not only them) they are absolutely necessary in every field of medicine, regardless, are you theoretic or doctor-practitioner. I strongly believe that the ability of the logical reasoning, ability to find the relevant literature, to distinguish valid and invalid arguments is useful for everyone, especially for the doctors. Moreover, familiarity with the common guidelines and ethical principles, which are the pillars in the scientific society must be valuable for all the students of medical faculty. Maybe basics of research are not easy for beginners, but Anatomy and physiology also is not easy for studying...I share the opinion of the respectful authors that we should teach the students each year giving them the opportunity to come deeper into the research area. Fundamental principles of the research process and basic language of scientific society must be an obligatory part of the curricula. Not only scientist should read and analyze as much as possible. Professionals, especially doctors should be in touch with the state-of-the art technology, with novel treatment strategies, with new approaches in a field of their occupation. Evidence-based medicine practice needs to be familiar with the strategies of seeking the information and filter relevant evidence from the big ocean of data. In respect of this, I agree with the authors that instead of teaching only the theory, it would be better to help them in obtaining the critical appraisal skills. Developing the abilities of independent work would be much helpful for the future career of the medical students.

Competing Interests: No conflicts of interest were disclosed.

Reviewer Report 03 August 2018

<https://doi.org/10.21956/mep.19616.r29167>

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Sateesh Babu Arja

Avalon University School of Medicine

This review has been migrated. The reviewer awarded 4 stars out of 5

I agree with Professor Subha Ramani's comments. All medical students do not require research skills unless they choose the research career. But everyone should know Basic research principles, research methodology, and research ethics. They should be able to read, review, appraise and critique the literature to improve the practice of Medicine. This is all about practice-based learning which is one of the core learning objectives of medical education. Students should have lifelong learning aptitude. One thing I would like to see in this article is if there are any solutions. Journal club sessions in early medical education where medical students practice appraising and critiquing the literature, Evidence-based medicine courses in the early years of medical school, and problem-based learning strategies can be solutions.

Competing Interests: No conflicts of interest were disclosed.

Reviewer Report 25 July 2018

<https://doi.org/10.21956/mep.19616.r29164>

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Subha Ramani

Harvard Medical School, Brigham and Women's Hospital

This review has been migrated. The reviewer awarded 3 stars out of 5

I agree with many of the points made by the authors. If physicians in training are required to be able to sit through reams of evidence, critically appraise and know what and when to apply in their own practice, they need to be trained in the skills reported in this article. We live in an era of ever increasing information overload, unfortunately not all the information is scientific or accurate. Thus, all physicians need to sort through the wheat from the chaff and know what data are applicable to their own clinical

practice. In addition, patients retrieve information from the internet and come into consultations with this information. Physicians need to be prepared to engage in these conversations and inform patients what information is valid and what is not. I agree that physician trainees need these skills regardless of whether they pursue a research career or not because they need critical appraisal skills to practice high quality patient care and engage in academic discussions with their peers. I wonder, though, if everyone needs research skills or the skills to appraise research and practice evidence based patient care. In-depth 'research' skills may be necessary for those planning research careers. Those who do not intend to be researchers need the skills of retrieval, appraisal and application definitely. Lastly, I agree that knowledge tests will not assess adequately understanding or application. While I agree with the principles, I would like to see more solutions to these challenges and hope the authors or others would educate other educators on how to effectively and efficiently achieve these goals.

Competing Interests: No conflicts of interest were disclosed.

Reviewer Report 23 July 2018

<https://doi.org/10.21956/mep.19616.r29165>

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P Ravi Shankar

American International Medical University

This review has been migrated. The reviewer awarded 4 stars out of 5

This is an interesting brief article dealing with the teaching-learning of research skills in medical education. Medical students and doctors should have the skill to evaluate the ever increasing amounts of information easily available through modern technology. The amount of information is likely to accelerate in the future. In a situation where information is readily accessible and can be looked up easily it may not make sense to have students memorize information which can be easily retrieved. I agree with the authors that the emphasis should be on concepts and less on facts. Modern research highlights the fact that there is uncertainty in medicine and there are areas where knowledge is deficient. Many medical schools teach research skills to their students but I am not sure that students gain knowledge of the research process and the limitations of knowledge. Inculcating lifelong learning skills in students is important so that they are ready to face the challenges of the ever changing medical landscape of tomorrow. I agree with the authors that the emphasis should shift from learning facts to learning to evaluate knowledge.

Competing Interests: No conflicts of interest were disclosed.
