SHORT REPORT

Immersed in scholarly projects: Upskilling our future medical workforce

B. Ward[1], B. Diug[2] & M. Wallace[3, 4]

Abstract

Introduction: Much has been written about the need for medical students to have research skills. Increasing numbers of medical schools are incorporating compulsory research experiences to increase research literacy. However, little is known about the student perceptions of, and outcomes from, those programs. We aimed to examine medical students' perceptions of a compulsory 6-week scholarly project at a large Australian university. There was a particular focus on comparing students' perceptions based on their prior research experience.

Methods: A cross-sectional study design was used to survey 418 final-year medical students. Responses were analysed using descriptive and bivariate statistics.

Results: One hundred and eleven students responded to the survey (27% of the cohort). Fifty-one percent had prior research experience. The majority of respondents perceived they had enhanced their confidence (69%) and research skills (74%), and as a result of this unit, 62% reported enhanced willingness to participate in future research projects. Students produced a variety of outputs in addition to their assessment requirements. Students without prior experience were significantly more likely to report they were suitably challenged and their project had enhanced their skills in interpreting and applying evidence.

Conclusion: We found that short (6-week) scholarly projects enhanced final-year medical students' perceived ability to interpret and apply evidence. Many students also reported an increased willingness to participate in future research activities. As clinician research literacy and engagement are thought to improve healthcare performance and health outcomes, scholarly experiences in the final year of medical school have the potential to enhance graduate enquiry to improve healthcare.

Keywords: medical student; research; curriculum

[1] School of Rural Health, Faculty of Medicine, Nursing and Health Sciences, Monash University, Bendigo, Australia
[2] School of Public Health and Preventive Medicine, Faculty of Medicine, Nursing and Health Sciences, Monash University, Melbourne, Australia
[3] Department of Obstetrics and Gynaecology, Faculty of Medicine, Nursing and Health Sciences, Monash University, Melbourne, Australia
[4] The Ritchie Centre, Hudson Institute of Medical Research, Melbourne, Australia

Correspondence: Bernadette Ward bernadette.ward@monash.edu

Introduction

The importance of the medical workforce having scholarly skills that enable lifelong learning and evidence-based practice is well established (Havnaer et al., 2017). The COVID-19 pandemic has also highlighted the exponential speed at which medical knowledge, research evidence and "fake news" are growing (Naeem et al., 2021). Indeed, advances in research have been shown to render 25% of systematic reviews out of date within 2 years of publication (Shojania et al., 2007), and only 60% of medical care is thought to align with evidence-based, or consensus-based, guidelines (Braithwaite et al., 2020). This reinforces the need and responsibility for all doctors to be able to evaluate, and where appropriate apply, new evidence to their healthcare practice.

It is also important that a proportion of doctors who are clinician researchers is involved in generating evidence (Eley et al., 2016; Joyce et al., 2009). Indeed, the engagement of clinicians and healthcare organisations in research has been shown to improve healthcare performance (Boaz et al., 2015). An Australian Academy of Health and Medical Sciences (AAHMS) (2022) report highlights the importance of developing clinician researchers who can identify gaps in knowledge and areas requiring improvement, undertake research and translate those findings into evidence-based practice that targets patient needs. The authors also identify the importance of having a much larger network of health professionals (beyond clinician researchers) who can support research studies and disseminate and implement research findings at the local level (AAHMS, 2022). That larger network of research active health professionals must have a very strong understanding of research and the ability to interpret and implement research findings to improve patient care (AAHMS, 2022). By the time of graduation, therefore, every medical student should be research literate: able to locate, understand and evaluate research; discuss the findings; interpret the implications; and, if appropriate, apply those findings to their clinical practice (Eley et al., 2022).

Australian medical schools routinely offer research coursework, and many have transitioned from a bachelor's (MBBS) to a master's (MD) program with embedded research opportunities (AMC, 2020). However, there is some contention about what program structures and student workload are needed to achieve meaningful learning that translates into a medical workforce equipped to engage in research/scholarly activities (Cornett et al., 2021; Eley et al., 2022).

Monash University is a large Australian university that has recently transitioned from an MBBS (Hons) degree to an MD degree. The final year of the Monash University MD consists of six 6-week rotations. One of those rotations "Applied Studies in Medical Research and Professional Practice" (colloquially known as the "Scholarly Intensive Placement [SIP]") has been introduced as part of the transition to the MD degree (Wallace et al., 2021). Scholarly work is defined as an in-depth examination of a topic (Cambridge, 2020). SIP projects are embedded in health services and/or research settings. Project topics, complexity and type vary enormously (e.g., nested research activities,

professional practice [e.g., quality improvement], education projects). The focus is not on research outputs *per se* but on experiences that build on and apply formal research literacy/scholarly skills. Students select their SIP topic from a pre-approved list of topics available at their allocated rural or metropolitan site, and students who have undertaken an intercalated honours, Master of Public Health (MPH) or PhD degree can return to their supervisor for further research. Students have a dedicated supervisor(s) and submit a learning agreement. Supervisors are supported by academic staff and provide formative feedback to assist students to complete a 4000-word scholarly report, abstract and oral presentation.

The aim of this study was to examine medical students' perceptions of the recently introduced compulsory 6-week SIP at Monash University. At Monash University, approximately 20% of medical students undertake an optional, intercalated, full-year honours research degree, and many students self-report involvement in extra-curricular research (Muhandiramge et al., 2021). Given the relatively short duration of the SIP (6 weeks), we hypothesised that students' perceptions of the SIP may differ depending on whether they did, or did not have, prior research experience.

Methods

Ethical approval was granted by Monash University Human Research Ethics Committee (2021-22920-62084). In 2021, all final-year MD students enrolled through Monash University Australia were invited to participate in an end-of-year, anonymous, cross-sectional online Qualtrics™ survey. They were sent an explanatory statement, and their consent to participate was implied by response to the survey. As the investigators are involved in delivering the SIP, the invitation to participate was sent by an administrative staff member via the learning management system, and investigators did not have access to the data until final marks were released. All responses were de-identified prior to the commencement of data analysis.

In the absence of a sufficiently relevant validated tool, Likert 5-point scale (strongly disagree to strongly agree) questions were developed from those reported in the literature (Cornett et al., 2021; Havnaer et al., 2017). Most questions are summarised in Table 1 and were primarily based on three key areas: (1) project engagement (e.g., the student had opportunities to apply theoretical knowledge, was suitably challenged, overall satisfaction), (2) skill development (e.g., helped improve skills in critical thinking, interpreting and applying evidence) and (3) implications for future practice (e.g., the student has developed increased confidence in scholarly/research work, increased willingness to engage in future scholarly/research work). The survey also included questions about supervision, and students were also asked to report their previous research/scholarly experience (type of formal degree and/or voluntary experience) and if their SIP resulted in outcomes in addition to their required assessment items. For those who answered "yes", a list of options was provided. Two reminders were sent over 3 weeks. The full survey tool is available on request.

Table 1

Students' Perceptions of Their SIP Experience: Engagement, Skill Development and Implications for Practice by Prior Research/Scholarly Experience*[a][b] (n = 103[c])

	No Prior Research/ Scholarly Experience (n = 55)		Prior Research/ Scholarly Experience (n = 56)		
	Agree %	Disagree %	Agree %	Disagree %	*p*(d)
Student engagement					
The student had/was:					
Opportunities to apply theoretical knowledge	82.0	14.0	75.5	17.0	0.76[e]
Sufficiently occupied	76.0	12.0	56.6	18.9	0.11
Suitably challenged	88.0	6.0	66.0	15.1	**0.03**
Manageable workload	90.0	4.0	88.7	3.8	0.95
Adequate time allocation	86.0	10.0	86.8	3.8	0.32[e]
Made a lot of effort	94.0	2.0	75.5	5.7	**0.03[e]**
Overall, satisfied with SIP	80.0	12.0	69.8	20.8	0.40(e)
Skill development					
Helped improve skills in:					
Critical thinking	78.0	16.0	64.2	17.0	0.13
Analytical tasks	78.0	14.0	66.0	17.0	0.32
Problem solving	70.0	14.0	60.4	17.0	0.59
Written communication	72.0	10.0	73.6	9.4	0.99
Oral communication	64.0	22.0	56.6	17.0	0.29
Interpreting and applying evidence	82.0	10.0	60.4	15.1	**0.04**
Implications for practice					
The student has:					
Developed a more integrated understanding of the topic	84.0	12.0	73.6	11.3	0.18[e]
Increased confidence in scholarly/research work	74.0	16.0	63.5	9.6	0.08
Developed skills that will be useful in career	80.0	10.0	67.3	9.6	0.21[e]
Become more willing to engage in scholarly/ research work	64.0	12.0	59.6	11.5	0.86

* completely agree/agree versus completely disagree/disagree

(a) Previous experience includes undergrad/graduate/honours/masters/PhD/research assistant/vacation/volunteer research.

(b) Percentage that neither agreed/disagreed are not shown so percentages total < 100%.

(c) Eight respondents did not answer these subsets of questions.

(d) Chi-square test for independence.

(e) Fisher's exact test whereby > 1 cells have expected count < 5.

Following data cleaning, descriptive and Pearson's chi-square test (with Yates continuity correction and Fishers exact test, where appropriate) statistics were used to examine engagement, skills and practice implications, comparing between students with and without prior research experience. The STROBE cross-sectional checklist informed the study reporting (von Elm et al., 2008).

Results

Of the 418 Monash University Australia students who completed a SIP, 111 (27%) responded. Of these, 51% had previously been involved with research. This included previous honour's, master's and PhD degrees, undergraduate coursework, as well as research assistant and/or vacation/volunteer experiences in a range of clinical, laboratory, policy and education settings. Approximately 20% of respondents (21/111) reported their SIP was related to previous research or projects.

As shown in Table 1, and described in more detail below, the majority of respondents (irrespective of their prior scholarly/research experience) perceived that they were engaged with their SIP project, that the SIP improved their scholarly/research skills and that the SIP experience had positive implications for their practice.

Engagement

Of the 103 responses to questions about engagement during the SIP, the following percentages of students strongly agreed, or agreed, with statements that during the unit they had opportunities to apply theoretical knowledge (79%), were sufficiently occupied (66%), were suitably challenged (77%), had a manageable workload (89%), had adequate time allocation (86%), made a lot of effort (85%) and, overall, were satisfied with their SIP (75%) (see Table 1). A chi-square test for independence (with Yates continuity correction) indicated that those without prior research/scholarly experience were significantly more likely to report they were suitably challenged, x2 (2, n = 103) = 6.9, p = 0.03), and made a lot of effort, x2 (2, n = 103) = 6.8, p = 0.03 [Fisher's exact]) (see Table 1).

Skill development

Of the 103 responses, the following percentages of students strongly agreed, or agreed, with statements that the unit had helped to improve their skills in critical thinking (71%), analytical tasks (72%), problem solving (65%), communication skills (written 73%; oral 60%) and interpreting and applying evidence (71%). Those without prior research/scholarly experience were significantly more likely to report perceived improvement in their skill to interpret and apply evidence, x2 (2, n = 103) = 6.5, p = 0.04) (see Table 1).

Implications for practice

Of the 103 responses, the following percentages of students strongly agreed or agreed with statements that the unit had helped them to develop a more integrated understanding of the topic (79%), increased their confidence in scholarly/research work (69%), helped

them develop skills that will be useful in their career (74%) and become more willing to engage in scholarly/research work (62%). Approximately 20% of respondents reported that their SIP had influenced their future career aspirations, with no significant difference in responses between those with, or without, prior research/scholarly experience. In the implications for practice section of the survey, there were also no significant differences in responses between students with and without prior research experience (Table 1).

The majority (77%) of respondents reported having a dedicated SIP supervisor, and more than 90% reported that their supervisors were available to answer questions, provide clear explanations and feedback and opportunities for interaction.

More than half (54%) of the respondents reported SIP project outputs that were in addition to their assessment requirements (range 1–6 additional outputs/student), including media work, conference presentations, government/policy reports, changes to health service practice/policy and anticipated peer-reviewed articles. More than a quarter (28%) of respondents reported being an author on at least one publication (including peer-reviewed research/other journal articles, textbook/chapter, government policy reports and conference presentations). The majority of the respondents that were authors on a publication were students with prior research experience. Seventeen percent of respondents also reported that their SIP led to ongoing work with their supervisor.

Discussion

We found that the majority of students who participated in a short compulsory scholarly project in the final year of their medical degree, regardless of prior research experience, perceived that they had improved their scholarly/research skills, increased their confidence in their scholarly/research skills, developed skills that will be useful in their career and became more willing to engage in scholarly activities. Importantly, more than 80% of students without prior research experience and 60% of students with prior research experience reported an improved ability to interpret and apply evidence. This suggests that short intensive projects during the final year of medical school have the potential to increase the research literacy of the future medical workforce and may better prepare them to be able to contribute to research, professional practice and educational activities after they graduate.

Currently in Australia, an annual survey of final-year medical students indicates that approximately 60% of medical graduates are interested in research as a part of their medical career, approximately 20% are not interested in research and approximately 20% are undecided (MDANZ, 2022). In comparison, over 80% of final-year medical students indicate an interest in combining teaching as part of their medical career (MDANZ, 2022). With this in mind, we designed the SIP program to incorporate projects that would appeal to different students' interests while still ensuring that all projects required students to draw upon, or improve, their scholarly/research literacy skills (e.g., being able to identify, critically evaluate and convey the implications of literature in a given

field). For example, in addition to having choices of research projects, students could select projects that made a contribution to professional practice (e.g., audits/quality improvement projects, developing guidelines, etc.) or projects to develop or evaluate educational resources (e.g., for the public, patients, students, healthcare practitioners). This flexible design and range of different settings, supervisors and modalities became a valuable feature, enabling us to adapt to the impacts of COVID-19 on the healthcare system. Anecdotally, the completion of many quality assurance/improvement projects was welcomed by many health services who had to mobilise their workforce to meet the demand for acute services. Further research is needed to examine how compulsory medical student research, professional practice and education projects contribute to evidence-based clinical practice.

Consistent with best practice (Cornett et al., 2021; Havnaer et al., 2017), the Monash SIP program aimed to provide students with a dedicated supervisor. However, the impacts of COVID-19 meant many clinician supervisors became unavailable and academic staff needed to adapt by providing additional support for some projects. As those members of academic staff were often supervising multiple students, it appears that students did not perceive them as a "dedicated" supervisor. This highlights the need for medical schools to have dedicated infrastructure to respond to dynamic contexts while still achieving students' learning objectives. Consistent with the variety of project types, students reported a range of outputs, including publications, presentations, media, educational resources, government/policy reports and changes to health service practice/policy. As the survey was undertaken in the same year that students undertook their SIP projects, it may have been too early to capture some outputs from students completing their SIP late in the year. Most published reports of outputs from medical student projects overseas (Chang et al., 2015; Havnaer et al., 2017) and in Australia (Eley et al., 2018; Hu et al., 2021; Hunt et al., 2011; Mullan et al., 2014; Uebel et al., 2021) focus on traditional research outputs of peer-reviewed publications and conference presentations. With the variety of SIP project types, we felt it was important to capture alternative outputs (e.g., educational resources, changes to health service practice/policy, etc.). Follow-up studies involving supervisors will be important to validate student responses and to capture longer-term outputs.

In Australia, 65% of final-year medical students report they have a previous qualification, ranging from a certificate/diploma (2–3%) to an undergraduate degree (approximately 40%) to a postgraduate degree (6%), before commencing their medical degree (MDANZ, 2022). At Monash University Australia, approximately 20% of final-year medical students have an intercalated honours, MPH or PhD degree, so it was important to determine if those students with significant prior research experience were still able to benefit from the 6-week SIP. It was very reassuring, therefore, that most students perceived they were highly engaged with their projects, improved their research skills and responded similarly in the implications for practice questions, regardless of their prior research/scholarly

experience. Nevertheless, the students with prior research experience did perceive they made less effort and were less challenged by their SIP project than students without prior research experience. The other main difference was that over 80% of students without prior research experience, compared to approximately 60% of students with prior research experience, perceived that the 6-week SIP had improved their ability to interpret and apply evidence. This was not a surprising finding, but it reassuringly indicated that a very large proportion of students without prior research/scholarly experience, and the majority of students who did have prior research experience, perceived that they are now more capable of interpreting and applying evidence. Additional scaffolding could be provided for the group with prior research/scholarly experiences to further expand their skill sets and/or further improve their ability to interpret and apply evidence.

This study did have some limitations, as it was self-reported, cross-sectional and subject to recall and respondent bias. Respondents were able to skip questions, and this limited the completeness of the dataset and extent of the analysis. Longitudinal studies are needed to evaluate students research skills prior to the SIP, after the SIP and following graduation to determine if short scholarly experiences do improve medical students' research literacy skills and post-graduation engagement in scholarly/research activities. The response rate was 27% but not atypical of surveys. While we would have liked to have included data from students in other medical programs, we were specifically interested to examine what could be achieved in a 6-week project. The pandemic also meant the program and its evaluation had to be adapted.

Conclusion

It is increasingly clear that clinicians need to be competent at accessing and evaluating the literature so that they can rapidly respond to the exponential growth of new research findings and ensure their clinical practices are evidence based. Our findings highlight that short intensive projects in the final year of medical school enhance medical students' perceptions of their ability to interpret and apply evidence, even for students with significant prior research experience. Medical student scholarly programs can be tailored to meet the needs of students with varying degrees of experience, and when partnered with health services, can lead to not only the traditional measures of peer-reviewed manuscripts and higher degree enrolments but potentially also a medical workforce with the skills and intentions to apply their scholarly research skills to other activities, such as quality improvement and educational activities.

Acknowledgements

We thank the students who participated in the study. The study was not funded, but we acknowledge the Victorian Government's Operational Infrastructure Support Program and the Rural Health Multidisciplinary Training program that support staff who conducted the research.

Conflicts of interest and funding

None of the authors have any conflicts of interest or funding to declare.

References

Australian Academy of Health and Medical Sciences (AAHMS). (2022). *A vision for the future: Research and innovation as core functions of the health system*. https://aahms.org/policy/vision-integrating-research-in-health/

Australian Medical Council (AMC). (2022). *Accreditation reports*. https://www.amc.org.au/accreditation-and-recognition/accreditation-reports/

Boaz, A., Hanney, S., Jones, T., & Soper, B. (2015). Does the engagement of clinicians and organisations in research improve healthcare performance: A three-stage review. *BMJ Open*, *5*(12), Article e009415. https://doi.org/10.1136/bmjopen-2015-009415

Braithwaite, J., Glasziou, P., & Westbrook, J. (2020). The three numbers you need to know about healthcare: The 60-30-10 challenge. *BMC Medicine*, *18*, Article 102. https://doi.org/10.1186/s12916-020-01563-4

Cambridge Dictionary. (2020). Scholarly. In *Cambridge dictionary*. Retrieved February 9, 2024, from https://dictionary.cambridge.org/dictionary/english/scholarly

Chang, Y., & Ramnanan, C. J. (2015). A review of literature on medical students and scholarly research: Experiences, attitudes, and outcomes. *Academic Medicine*, *90*(8), 1162–1173. https://doi.org/10.1097/ACM.0000000000000702

Cornett, M., Palermo, C., Wallace, M. J., Diug, B., & Ward, B. (2021). A realist review of scholarly experiences in medical education. *Medical Education*, *55*(2), 159–166. https://doi.org/10.1111/medu.14362

Eley, D. S. (2018). The clinician-scientist track: An approach addressing Australia's need for a pathway to train its future clinical academic workforce. *BMC Medical Education*, *18*, Article 227. https://doi.org/10.1186/s12909-018-1337-5

Eley, D. S., & Benham, H. (2016). From medical student to clinician-scientist: Where is the pathway in Australia? *Internal Medicine Journal*, *46*, 1449–1452. https://doi.org/10.1111/imj.13277

Eley, D. S., Hu, W., & Talley, M. J. (2022). Educating future clinician academics: The role of medical schools. *The Medical Journal of Australia*, *217*(1), 16–19. https://doi.org/10.5694/mja2.51596

Havnaer, A. G., Chen, A. J., & Greenberg, P. B. (2017). Scholarly concentration programs and medical student research productivity: A systematic review. *Perspectives on Medical Education*, *6*(4), 216–226. https://doi.org/10.1007/s40037-017-0328-2

Hu, W., Mogensen, L., Marjadi, B., Pit, S., Bailey, J., Edmiston, N., & Doyle, A. K. (2021). A decade of socially accountable medical student research: Western Sydney University's community research program. *Medical Deans Australia and New Zealand: Research Case Studies Vol. 1.* https://medicaldeans.org.au/a-decade-of-socially-accountable-medical-student-research-western-sydney-universitys-community-research-program/

Hunt, J. E., Scicluna, H., & McNeil, P. (2011). Development and evaluation of a mandatory research experience in a medical education program: The independent learning project at UNSW. *Medical Science Educator*, *21*(1S), 78–85. https://doi.org/10.1007/BF03341601

Joyce, C. M., Piterman, L., & Wesselingh, S. L. (2009). The widening gap between clinical, teaching and research work. *Medical Journal of Australia*, *191*(3), 169–172. https://doi.org/10.5694/j.1326-5377.2009.tb02731.x

Medical Deans Australia and New Zealand (MDANZ). (2022). *National data report 2022: Responses from final year students at Australian medical schools*. https://medicaldeans.org.au/md/2023/05/MSOD-National-Data-Report-2022.pdf

Muhandiramge, J., Vu, T., Wallace, M. J., & Segalov, E. (2021). The experiences, attitudes and understanding of research amongst medical students at an Australian medical school. *BMC Medical Education, 21*, Article 267. https://doi.org/10.1186/s12909-021-02713-9

Mullan, J. R., Weston K. M., Rich W. C., & McLennan P. L. (2014). Investigating the impact of a research-based integrated curriculum on self-perceived research experiences of medical students in community placements: A pre- and post-test analysis of three student cohorts. *BMC Medical Education*, *14*, Article 161. https://doi.org/10.1186/1472-6920-14-161

Naeem, S. B., Bhatti, R., & Khan, A. (2021). An exploration of how fake news is taking over social media and putting public health at risk. *Health Information & Libraries Journal*, *38*(2), 143–149. https://doi.org/10.1111/hir.12320

Shojania, K. G., Sampson, M., Ansari, M. T., Ji, J., Doucette, S., & Moher, D. (2007). How quickly do systematic reviews go out of date? A survival analysis. *Annals of Internal Medicine*, *147*(4), 224–233. https://doi.org/10.7326/0003-4819-147-4-200708210-00179

Uebel, K., Iqbal, M. P., Carland, J., Smith, G., Islam M. S., Shulruf, B., & Nathan S. (2021). Factors determining medical students' experience in an independent research year during the medical program. *Medical Science Educator*, *31*(4), 1471–1478. https://doi.org/10.1007/s40670-021-01340-9

von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2008). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. *Journal of Clinical Epidemiology*, *61*(4), 344–349. https://doi.org/10.1016/j.jclinepi.2007.11.008

Wallace, M., Ward, B., Lindley, J., & Diug, B. (2021). Research case studies Vol. 1: Research in the curriculum in Australia and New Zealand—A window on innovation and best practice. *Medical Deans Australia and New Zealand.* https://medicaldeans.org.au/category/research-case-studies-volume-1/