



Effect of an intercalated research degree on general practice careers: a matched cohort study

Ibrahim Saleh Al-Busaidi MBChB (Otago), BMedSc(Hons)

Department of Medicine, Christchurch School of Medicine, University of Otago, Christchurch, New Zealand.
Email: ibrahim.al-busaidi@cdhb.health.nz

ABSTRACT

INTRODUCTION: Intercalated degrees are one of the most focused undergraduate research training activities offered to medical students worldwide. The effect of intercalating on actual career choices has not been previously investigated.

AIM: To examine the effect of obtaining an intercalated research degree on choosing general practice as a career.

METHODS: This was a retrospective, matched cohort study of intercalating students at the University of Otago, New Zealand (1995–2008). Medical students who completed the intercalated Bachelor of Medical Sciences with Honours, BMedSc(Hons), degree were retrospectively identified. Gender- and graduation year-matched controls were identified from a publicly available graduate database in a 1:1 ratio. MEDLINE® and Google Scholar-indexed publications resulting from BMedSc(Hons) projects were determined using standardised search criteria. Speciality choice was obtained from online lists of registered doctors.

RESULTS: Over the 14-year period, 99 (3.9%) students completed an intercalated degree with a publication rate of 36.4%. Of these, 42 (42.4%) were female and over two-thirds (68.7%) of projects were laboratory-based. The median follow-up period after graduation was 14 years (range 7.7–21.7 years). The congruence between students' BMedSc(Hons) research subject area and clinical speciality was 9.1%. Sixteen (16.2%) intercalating students chose general practice as a career, whereas 83 (83.8%) chose 19 different hospital-based specialities. Compared to controls, students who completed an intercalated degree were significantly less likely to pursue a career in general practice (odds ratio 0.37; 95% confidence interval = 0.18 – 0.77; $P = 0.007$).

DISCUSSION: The present study findings suggest that completing an intercalated degree is associated with lower odds of pursuing a career in general practice. Future research should explore reasons for this observation to help develop strategies to promote primary care and general practice careers among medical graduates, including those interested in research careers.

KEYWORDS: Career choice; general practice; intercalated degree; medical education; primary health care; research; New Zealand

Introduction

Clinical academics are a unique group of doctors well-equipped to identify unanswered clinical questions and translate them into useful bedside applications.¹ However, reports from several

countries indicate that the proportion of clinical academics has gradually declined over the past four decades.^{1,2} Early exposure to research during medical school is associated with later academic success.³ Accordingly, medical schools have

J PRIM HEALTH CARE
2020;12(2):159–165.
doi:10.1071/HC19097
Received 4 November 2019
Accepted 16 March 2020
Published 14 May 2020

WHAT GAP THIS FILLS

What is already known: Intercalated research degrees provide medical students with a clear and coordinated research training pathway, contributing to the development of a sustainable clinical academic workforce.

What this study adds: Intercalating during medical school is associated with reduced likelihood of pursuing a career in general practice.

established several undergraduate research training programmes in an attempt to reverse the decline in the clinical academic workforce.² Undertaking an intercalated research degree during medical school is one of the most coordinated formal clinical academic research training pathways offered to medical students around the globe.²

Health-care systems are confronted with a concerning decline in the number of primary care clinicians required to meet the demands of the aging and ever-growing patient population.^{4,5} Speciality choices may vary depending on several factors including age at medical school entry, gender, ethnicity, medical school entry status (graduate vs. non-graduate entrants) and programme curriculum content and structure.^{5,6} Recent reports suggest that completing an intercalated degree during medical school is associated with a lower likelihood of pursuing general practice careers.^{5,7,8} In a cross-sectional survey-based study, Park *et al.*⁹ reported 1/30 intercalated degree graduates at the University of Auckland, New Zealand, chose a career in general practice and 19/30 chose a career in hospital-based specialist medicine, respectively. However, these studies^{5,7-9} relied on self-reports of career intentions, preferences or speciality training applications.

This study, therefore, sought to determine, utilising novel methods, whether obtaining an intercalated degree during medical undergraduate training is related to pursuing general practice as a career choice.

Methods

Intercalated MBChB–BMedSc(Hons) programme

The Bachelor of Medical Sciences with Honours ‘BMedSc(Hons)’ programme is an intercalated

research-based degree that is offered to all academically motivated students at the three campuses of the University of Otago Medical School, New Zealand. After satisfactorily completing 3 years of their 6-year undergraduate medical training (i.e. Bachelor of Medicine and Bachelor of Surgery course, MBChB), students interrupt their studies to complete a 1-year full-time supervised research project culminating in a thesis. Although encouraged, candidates are not required to publish their research findings in peer-reviewed journals to be awarded the degree.

Search strategy and data collection

Actual career choice, general practice or non-general practice specialties, was the outcome measure in this study. To examine the effect of completing an intercalated degree on seeking careers in general practice, a list of completed BMedSc(Hons) theses between 1995 and 2008 at the University of Otago, along with student names, was retrieved from the electronic Otago University Research Archive.¹⁰ The following variables were obtained for each BMedSc(Hons) project: student name, research field or subject area, category (clinical, biomedical or laboratory, or community and public health), supervisor name, academic department of supervisor and year of completion. Medical school graduation date for all BMedSc(Hons) candidates was identified using the University of Otago graduate database.¹¹ The latter cut-off (2008) was to allow time from medical school graduation to completion of postgraduate specialty training. As part of the prevocational medical training, all graduates of New Zealand accredited medical schools have to complete a 2-year supervised intern training programme (hospital and non-hospital-based attachments), which is delivered by accredited providers (District Health Boards). Following the successful completion of prevocational training, graduates have the opportunity to join a speciality (vocational) training programme, which takes 3–7 years on average to complete. Therefore, postgraduate training in New Zealand takes 5 years to complete at a minimum, excluding further subspecialty training.

Gender- and graduation year-matched controls were identified from a publicly available University of Otago graduate database¹¹ in a 1:1 ratio using a random number generator (Microsoft Excel,

Version 2016, Microsoft Corp., Redmond, WA, USA). Current clinical scope of practice or specialist registration was obtained from online registers of doctors in New Zealand¹² and Australia,¹³ as well as Google searches. general practice as a career choice was defined as graduates whose scope of practice and specialist registration was reported as 'general practice' or its equivalent (e.g. family medicine), irrespective of fellowship status to a general practice training college. Graduates who are trainees or registrars under a postgraduate speciality programme were included in the analysis.

MEDLINE®- (National Library of Medicine, Bethesda, MD, USA) and Google Scholar- (Google LLC, Menlo Park, CA, USA) indexed publications resulting from each BMedSc(Hons) thesis were identified using standardized search criteria conducted in the last week of September 2019. The last name and truncated first initial of both students and supervisors were used in the author field query, which were combined with author affiliation ['Otago' and 'New Zealand'] using the Boolean operator 'AND'. A publication was included if the student was one of the co-authors and the publication content was consistent with the BMedSc(Hons) thesis abstract.

Ethical approval

Ethical approval was not deemed necessary as this study used publicly available data obtained from open access sources.¹⁴ The authors did not contact individuals or institutions to obtain further information for the purposes of this study.

Statistical analysis

Data were entered into an Excel spreadsheet, version 2016 (Microsoft Corp., Redmond, WA, USA). Descriptive statistics were used to summarise categorical and continuous variables. Comparisons were made using the Chi-squared test for categorical variables (or the Fisher's exact test, as appropriate). Conditional logistic regression was used to calculate odds ratios (OR) and associated 95% confidence intervals for outcome measures. A value of $P < 0.05$ was considered statistically significant. All analyses were performed using the Statistical Package for the Social Sciences (SPSS) software for Windows Version 20.0 (IBM Corp., Armonk, NY, USA).

Results

Over the 14-year period (1995–2008), 99/2540 (3.9%) medical students completed the intercalated MBChB–BMedSc(Hons) degree. The number of students enrolled in the MBChB–BMedSc(Hons) degree gradually increased throughout the study period from three in 1995 to 10 in 2008. Of these, 57 (57.6%) were male and 42 (42.4%) were female. Over two-thirds of intercalated projects ($n = 68$, 68.7%) were laboratory-oriented and the most common subject areas of research were pathology and molecular biology (25.3%), followed by genetics (10.1%). Community medicine projects (includes general practice and public health) represented 9.1% ($n = 9$) of intercalated projects. Thirty-six (36.4%) theses resulted in 64 peer-reviewed journal publications (range, 1–9 per thesis). The median follow-up period after graduation was 14 years (range, 7.7–21.7 years). The BMedSc(Hons) cohort and project characteristics are presented in Table 1.

At the time of data collection, 16 (16.2%) BMedSc(Hons) graduates chose general practice as a career, whereas 83 (83.8%) chose 19 different hospital-based specialties. Of these specialties, adult internal medicine ($n = 14$) followed by general surgery ($n = 9$) and pathology ($n = 6$) were the most common. Publication of a BMedSc(Hons) project was not associated with choosing general practice as a career (13.9% [$n = 5/36$] vs. 17.5% [$n = 11/63$], $P = 0.64$). There was no significant difference between intercalated degree project category and subsequent general practice career choice (25% [$n = 3$] clinical vs. 19.3% [$n = 11$] biochemical/laboratory vs. 14.3% [$n = 2$] community/public health; $P = 0.84$). The congruence between students' BMedSc(Hons) research subject area and clinical speciality was 9.1% (5 pathology, 1 general practice, 1 general surgery, 1 paediatrics and 1 psychiatry).

Of the identified controls ($n = 99$), 33 (33.3%) sought general practices whereas 66 chose other hospital-based specialties, with adult internal medicine ($n = 10$), radiology ($n = 10$) and anaesthesia ($n = 8$) being the most common choices. Compared to controls, students who completed an intercalated degree during medical school were significantly less likely to pursue a career in general practice (odds ratio 0.37; 95% confidence interval = 0.18 – 0.77; $P = 0.007$).

Table 1. Bachelor of Medical Sciences with Honours (BMedSc(Hons)) cohort characteristics (n = 99)

Characteristic	n (%)
Gender	
Male	57 (57.6)
Female	42 (42.4)
Research project category	
Biochemical/Laboratory	68 (68.7)
Clinical	15 (15.2)
Community/Public Health	16 (16.2)
Research filed/subject area	
Anatomy and Structural biology	7 (7.1)
Cardiology	1 (1)
Clinical neurology	5 (5.1)
Community medicine (general practice and public health)	9 (9.1)
Dermatology	1 (1)
Endocrine and Reproductive sciences	5 (5.1)
Ethics	6 (6.1)
Genetics	10 (10.1)
Immunology and Microbiology	9 (9.1)
Pathology and Molecular biology	25 (25.3)
Obstetrics and Gynaecology	2 (2)
Orthopaedics	3 (3)
Paediatrics	9 (9.1)
Pharmacology	1 (1)
Physiology and Stem cell research	3 (3)
Psychological medicine	3 (3)
Academic Department	
Anatomy and Structural Biology	12 (12.1)
Biochemistry	13 (13.1)
Bioethics	6 (6.1)
General Practice	1 (1)
Medicine	12 (12.1)
Microbiology and Immunology	7 (7.1)
Obstetrics and Gynaecology	2 (2)
Paediatrics	10 (10.1)
Pathology	17 (17.2)
Pharmacology	1 (1)
Physiology	2 (2)
Preventive and Social Medicine/Public Health	5 (5.1)
Psychological Medicine	2 (2)
Surgery	9 (9.1)
BMedSc(Hons) publication status	
Yes	36 (36.4)
No	63 (63.6)

Discussion

To the best of our knowledge, this is the first study to examine the effect of completing an intercalated degree during medical school on verifiable career choices using publicly available medical registers. Of the 99 students who completed an intercalated BMedSc(Hons) degree during the 14-year period, more than one-third had their research published in peer-reviewed publications. Matched controls were twice as likely to pursue general practice careers than intercalated students (33.3% vs. 16.2%). Students who completed an intercalated degree during medical school were significantly less likely to pursue a career in general practice (OR 0.37; 95% confidence interval = 0.18 – 0.77; $P = 0.007$).

Comparison with existing literature

This study builds on previous work that examined the relationship between completing an intercalated degree during medical school and future career speciality aspirations. To the best of our knowledge, all prior studies that assessed the long-term effect of intercalating relied on self-reported speciality intentions or preferences.^{5,7,8} Our results are in keeping with previous studies^{5,7,8} that found intercalating to be associated with lower odds of pursuing general practice careers. Reasons for this observation are complex; many factors, measurable and otherwise, may influence career choices. These include, but are not limited to, age at matriculation, gender, ethnicity, entry status (graduate vs. undergraduate), academic grades, curriculum content (ie extent of exposure to general practice at different stages during medical school), initial career interest and medical school experiences.^{5,6,14–16}

The observed association in our study could be explained by that interest in hospital-based specialist medicine that is kindled and fostered, while intercalating may directly influence career choice. It is also possible that academically outstanding students, such as those accepted into the dual-degree MBChB–BMedSc(Hons) programme, are expected by their families, teachers or peers to pursue specialities of higher perceived status and financial reward than general practice.^{17,18} An alternative explanation is that students who are interested in seeking specialist practice may be more inclined to undertake an intercalated degree to gain an

in-depth understanding of an area in medicine and facilitate entry to competitive non-general practice training.^{7,9} The latter explanation is supported by the observation that more intercalating students who published their theses sought specialist medicine careers.

Implications for research and practice

Findings from this study have implications for, and are of value to, medical schools and universities, funders and designers of medical undergraduate research training activities and general practice speciality training programmes and colleges in New Zealand and abroad. The intercalated dual-degree medicine-research programme is one of the most focused and coordinated undergraduate research training pathways offered to medical students across the globe, which contributes to the development of the clinical academic workforce.^{2,3,7} Previous studies found intercalated degrees offered in population science and primary care (ie covering public health, epidemiology and general practice subjects) did not negatively affect subsequent general practice career choices¹⁹ and, in some instances,²⁰ resulted in higher likelihood of pursuing primary care specialties. In our study, over two-thirds (68.7%) of intercalated degree projects were laboratory-based, whereas only 16.2% were community-based projects. Therefore, increasing the opportunities for medical students to undertake non-laboratory community-oriented intercalated degrees may play a role in promoting interest among students into pursuing general practice as a future career.

Several measures can be implemented at the medical school and health policymakers' level to promote general practice careers among medical students. Health workforce policy has changed over the past two decades to address shortages in New Zealand doctors, including increasing medical school intakes.²¹ More recently, the New Zealand government has increased the number of general practice training positions available annually via the Royal New Zealand College of General Practitioners (RNZCGP).²¹ However, these measures are unlikely to match the attrition in the general practice workforce that is driven primarily by retiring general practitioners (GPs); according to the 2018 general practice workforce survey, nearly half of the

GPs (47%) intend to retire over the next 10 years.²¹ Recently, collaboration between the Medical Council of New Zealand, Health Workforce New Zealand, RNZCGP, Royal New Zealand College of Urgent Care, and District Health Boards has resulted in the staged introduction of community-based attachments across New Zealand.²² By November 2020, all medical graduates (house officers) are required to have completed one community-based attachment during their 2-year prevocational medical training programme.²² Although the effect of this initiative on promoting general practice careers has not been investigated, recent data indicate that participating patients, house officers and practices view the programme positively.²³

At the medical school level, the introduction of specific practice-oriented general practice courses has been associated with choosing general practice as a career.¹⁵ In addition, a dedicated undergraduate general practice education programme may prove beneficial in attracting students committed to general practice in New Zealand. Perhaps the Rural Medical Immersion Programme of the University of Otago serves as an example of a successful programme.²⁴

General practice training colleges can play a strong and important role in building and developing research capacity in primary care. Several measures can be instituted towards achieving this goal, including strengthening the status of general practice as a career choice. Currently, no research experience is required to apply for a training position at the RNZCGP.²⁵

Another way of building research capacity is the integration of research education and requirement as part of the general practice prevocational training programme.²⁶ During the first year of the General Practice Education Programme (GPEP Year 1), registrars participate in mandatory educational seminars on research methods and critical analysis of the literature.²⁵ All trainees are required to complete a range of learning activities throughout their speciality training, which include clinical audits and critical appraisal of the literature related to a specific clinical question.²⁷ GPEP Year 2/3 registrars are required to complete an academic component equivalent to a 15-credit university paper (this

includes a postgraduate certificate or a research project completed as part of an approved research component or a completion of an approved re-entry course).²⁷ Although there is no uniform formal research requirement for trainees of the RNZCGP, the College offers trainees who have successfully completed GPEP Year 1 requirements a research route to Fellowship (full- or part-time research or study with a recognised postgraduate institution with a maximum of 12 months' research time).²⁷

Several strategies to promote research involvement among GPs have been studied and implemented.²⁸ Providing financial and administrative support to GPs and general practices is important to maximize their participation in research activities. Re-establishing and funding some of the highly productive practice-based research networks such as the Computer Research Network of the RNZCGP may encourage more GPs to participate in research, facilitate collaboration between different general practice groups and act as a research contact point for patients, GPs and practices in New Zealand.²⁹

Strengths and limitations

This study needs to be considered in light of its strengths and limitations. An important strength of this study is that it examines the impact of intercalating on actual career choices. The novel and comprehensive search strategy utilising publicly available online registers allowed for accurate determination of scope of speciality choices for all intercalated students and matched controls.³⁰

The search strategy and methods followed to determine actual speciality choices and peer-reviewed journal publications were employed in previous studies;^{30,31} however, it is possible that some data, such as peer-reviewed publications, may have been missed. For instance, intercalating students may have published their findings in journals not indexed in the two article databases used in this study. This is, however, unlikely as MEDLINE® and Google Scholar are the two most widely used biomedical bibliometric databases.

We used a matched-cohort design, which tends to reduce confounding bias introduced through gender and graduation cohort. However, other important factors such as age at entry and medical school

entry status could not be collected, but have previously been shown to independently influence career choices.^{5,6}

Furthermore, the results presented in this study were drawn from a single intercalated programme offered to undergraduate medical students at one university in New Zealand, which may limit the generalisability of the findings to other cohorts around the world. Finally, the associations found in this study may not necessarily represent causation.

Conclusion

In conclusion, the present study suggests that completing an intercalated degree is associated with reduced likelihood of pursuing a career in general practice. Further work should aim to explore reasons behind our observed association to help promote GP and primary care careers among medical graduates, including those interested in academic research careers.

Competing interests

The author declares no competing interests.

Acknowledgements

There was no funding for this research. The author is grateful to the editors of *The Journal of Primary Health Care* and the reviewers of this manuscript for their guidance and patience.

References

1. Jain MK, Cheung VG, Utz PJ, et al. Saving the endangered physician - scientist - a plan for accelerating medical breakthroughs. *N Engl J Med*. 2019;381:399-402. doi:10.1056/NEJMp1904482
2. Al-Busaidi IS, Wells CI. Stimulating the clinical academics of tomorrow: a survey of research opportunities for medical students in New Zealand. *N Z Med J*. 2017;130:80-8.
3. Amgad M, Man Kin Tsui M, Liptrott SJ, Shash E. Medical student research: an integrated mixed-methods systematic review and meta-analysis. *PLoS One* 2015;10:e0127470. doi:10.1371/journal.pone.0127470
4. Spence D. General practice in meltdown. *Br J Gen Pract*. 2016;66:259. doi:10.3399/bjgp16X685021
5. Gale TCE, Lambe PJ, Roberts MJ. Factors associated with junior doctors' decisions to apply for general practice training programmes in the UK: secondary analysis of data from the UKMED project. *BMC Med*. 2017;15:220. doi:10.1186/s12916-017-0982-6
6. Shelker W, Zaharic T, Sijnja B, Glue P. Influence of rural background and rural medical training on postgraduate

- medical training and location in New Zealand. *N Z Med J.* 2014;127:12–6.
7. Jones M, Hutt P, Eastwood S, Singh S. Impact of an intercalated BSc on medical student performance and careers: a BEME systematic review: BEME Guide No. 28. *Med Teach.* 2013;35:e1493–510. doi:10.3109/0142159X.2013.806983
 8. McManus IC, Richards P, Winder BC. Intercalated degrees, learning styles, and career preferences: prospective longitudinal study of UK medical students. *BMJ.* 1999;319:542–6. doi:10.1136/bmj.319.7209.542
 9. Park SJ, Liang MM, Sherwin TT, McGhee CN. Completing an intercalated research degree during medical undergraduate training: barriers, benefits and postgraduate career profiles. *N Z Med J.* 2010;123:24–33.
 10. University of Otago. Otago University Research Archive; 2019. [cited 2019 October 31]. Available from: <https://ourarchive.otago.ac.nz/>
 11. University of Otago. Verification of qualifications graduate database; 2019. [cited 2019 October 31]. Available from: <https://www.otago.ac.nz/study/otago079982.html>
 12. Medical Council of New Zealand. Register of doctors; 2019. [cited 2019 October 31]. Available from: <https://www.mcnz.org.nz/registration/register-of-doctors/>
 13. Australian Health Practitioner Regulation Agency. Register of practitioners; 2019. [cited 2019 October 31]. Available from: <https://www.ahpra.gov.au/Registration/Registers-of-Practitioners.aspx>
 14. National Ethics Advisory Committee. National Ethical Standards for Health and Disability Research and Quality Improvement. Wellington: Ministry of Health; 2019.
 15. Deutsch T, Lippmann S, Frese T, Sandholzer H. Who wants to become a general practitioner? Student and curriculum factors associated with choosing a GP career—a multivariable analysis with particular consideration of practice-orientated GP courses. *Scand J Prim Health Care.* 2015;33:47–53. doi:10.3109/02813432.2015.1020661
 16. Ie K, Murata A, Tahara M, et al. What determines medical students' career preference for general practice residency training?: a multicenter survey in Japan. *Asia Pac Fam Med.* 2018;17:2. doi:10.1186/s12930-018-0039-9
 17. Manca D, Varnhagen S, Brett-MacLean P, et al. Respect from specialists: concerns of family physicians. *Can Fam Physician.* 2008;54:1434–1435.
 18. Stein HF. Family medicine's identity: being generalists in a specialist culture? *Ann Fam Med.* 2006;4:455–9. doi:10.1370/afm.556
 19. Nguyen-Van-Tam JS, Logan RF, Logan SA, Mindell JS. What happens to medical students who complete an honours year in public health and epidemiology? *Med Educ.* 2001;35:134–6. doi:10.1046/j.1365-2923.2001.00774.x
 20. Andriole DA, Jeffe DB, Tai RH. Characteristics and career intentions of MD-MPH program graduates: a national cohort study. *Public Health Rep.* 2016;131:637–49. doi:10.1177/0033354916662224
 21. Royal New Zealand College of General Practitioners. 2018 General Practice Workforce Survey 1; 2019. [cited 2020 February 22]. Available from: <https://www.rnzcgp.org.nz/gpdocs/New-website/Publications/GP-Workforce/WorkforceSurvey2018Report1-revised-July-20194web.pdf>
 22. Ministry of Health. Community based attachments; 2017. [cited 2020 February 22]. Available from: <https://www.health.govt.nz/our-work/health-workforce/community-based-attachments>
 23. Le Comte L, Hayward B, Hughes D, et al. Evaluation of general practice house officer attachments in Counties Manukau: insights and benefits. *J Prim Health Care.* 2016;8:288–94. doi:10.1071/HC16001
 24. Farry P, Adams J, Walters L, et al. Development of the Rural Immersion Programme for 5th-year medical students at the University of Otago. *N Z Med J.* 2010;123:16–23.
 25. Royal New Zealand College of General Practitioners. Become a specialist: prepare your application; 2020. [cited 2020 February 24]. Available from: https://rnzcgp.org.nz/RNZCGP/Become_a_specialist/Become_a_General_Practitioner/Applying_for_GPEP/Prepare_your_application.aspx
 26. Ried K, Montgomery BD, Stocks NP, Farmer EA. General practice research training: impact of the Australian Registrar Research Workshop on research skills, confidence, interest and involvement of participants, 2002–2006. *Fam Pract.* 2008;25:119–26. doi:10.1093/fampra/cmn010
 27. Royal New Zealand College of General Practitioners. Fellowship Pathway Regulations; 2019. [cited 2020 February 24]. Available from: https://rnzcgp.org.nz/gpdocs/New-website/Become_a_GP/GPEP_Fellowship_Pathway_Regulations_V2_Dec_2019.pdf
 28. Brodaty H, Gibson LH, Waine ML, et al. Research in general practice: a survey of incentives and disincentives for research participation. *Ment Health Fam Med.* 2013;10:163–73.
 29. Leitch S. New Zealand needs a practice based research network. *J Prim Health Care.* 2016;8:9–12. doi:10.1071/HC15045
 30. Al-Busaidi IS, Wells CI, Wilkinson TJ. Publication in a medical student journal predicts short- and long-term academic success: a matched-cohort study. *BMC Med Educ.* 2019;19:271. doi:10.1186/s12909-019-1704-x
 31. Al-Busaidi IS, Al-Shaqsi SZ, Al-Alawi AK, et al. Characteristics, trends, and factors associated with publication among residents of Oman Medical Specialty Board Programs. *J Grad Med Educ.* 2019;11:104–9. doi:10.4300/JGME-D-19-00259