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CLINICAL & BASIC RESEARCH

# Rate and Predictors of Publication of Resident Abstracts Presented at Oman Medical Specialty Board Scientific Meetings

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# معدل وتنبؤات نشر الملخصات البحثية للأطباء المقيمين التي قدمت في الاجتماعات العلمية للمجلس العُماني للاختصاصات الطبية

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**ABSTRACT:** ***Objectives:*** This study aimed to examine the rate and factors associated with the publication of abstracts presented by residents at Oman Medical Specialty Board (OMSB) scientific meetings. ***Methods:*** This retrospective study was performed in February 2018. Two previous national OMSB scientific meetings at which resident abstracts were presented were identified, having taken place in January 2014 and December 2016, respectively. Independent searches of the MEDLINE® (National Library of Medicine, Bethesda, Maryland, USA) and Google Scholar (Google LLC, Menlo Park, California, USA) databases were conducted to determine subsequent publication of the abstracts. ***Results:*** A total of 68 resident abstracts were presented, of which most were clinical research (92.6%). Residents comprised 36.4% of the authors, of which 73.1% were senior residents. In 64 abstracts (94.1%), a resident was the first author. Overall, 15 abstracts (22.1%) resulted in articles published in 11 journals. Of these, 12 (80%) represented clinical research and 10 articles (66.7%) were published in MEDLINE®-indexed journals. Residents were the first authors of eight articles (53.3%). The median time to publication was 19 months. The presence of two or more resident authors per abstract was significantly associated with publication (odds ratio = 5.50, 95% confidence interval = 1.15–26.36; *P* = 0.03). ***Conclusion:*** The publication rate of resident abstracts presented at two OMSB research meetings was low; however, a higher number of resident authors per abstract significantly increased the likelihood of publication. These findings may influence policymakers to implement measures to support inter-resident collaboration so as to increase research productivity.

***Keywords:*** Biomedical Research; Graduate Medical Education; Internship and Residency; Meeting Abstracts; Publications; Oman.

**الملخص: الهدف:** هدفت هذه الدراسة إلى معرفة المُعَدَّل والعوامل المتعلقة بنشر الملخَصات البَحْثية التي قدمها الأطباء المُقيمين ضمن الاجتماعات العلمية للمجلس العُماني للاختصاصات الطبية. **الطريقة:** تم إجراء هذه الدراسَة الاسْتِعَادِيَّة في فبراير 2018. تم تحديد اجتماعين سابقَينَ للمجلس العُماني للاختصاصات الطبية والتي تم عَقدها في يناير 2014 وسبتمبَر 2016. باستخدام معايير بحثيه موحدة تم البحث في قواعد البيانات ميدلاين® (المكتبة الوطنية للطب، بيثيسدا، ماريلاند، الولايات المتحدة الأمريكية) وجوجل سكولر (جوجل، مينلو بارك، كاليفورنيا، الولايات المتحدة الأمريكية) لتحديد جميع الملخَصات البَحْثية التي تم نشرها لاحقا على هيئة مقالات طبية. **النتائج:** كان هناك 68 ملخصا بحثيا، جُلها كانت بُحوثا سَريريّة (92.6%). شكل الأطَباء المقيمين 36.4% من إجمالي المؤلفين، 73.1% منهم كانوا في سنوات الاختصاص الأخيرة. كان الأطباء المقَيمين المؤلف الأول في 64 (94.1%) ملخصا بحثيا. تم تحديد 15 ملخصا (22.1%) تم نشرها لاحقا كمقالات بحثية في 11 مجلة علمية. كان من إجمالي المنشورات 12 مقالا (80%) كانت بُحوثا سَريريّة و 10 مقالات (66.7%) مُدرَجَة ضمن قاعدة البيانات ميدلاين®. كان الأطباء المقيمين المؤلف الأول في ثماني منشورات بحثية (53.3%). كان متوسطَ الوقت لنشر الملخَصات البَحْثية كمقالات في المجلات العلمية 19 شهرا. علما أن وجود طبيبين مقيمين أو أكثر من ضمن مؤلفي الملخص البحثي كان من العوامل المَرتبطة بالنشر بشكل كبير (نسبة الأرجحية = 5.50، فاصل الثقة = 1.15–26.36؛ P = 0.03). **الخلاصة:** كان معدل نشر الملخَصات البَحْثية التي قدمها الأطباء المقيمين في اجتماعين سابقين للمجلس العُماني للاختصاصات الطبية قليلا؛ لوحظ أن ازدياد عدد المؤلفين من الأطباء المقيمين ارتبط بشكل كبير مع معدل النشر. عليه وعلى ضوء ما تقدم ذكره، قد تؤثر نتائج هذه الدراسة على صانعي القرار لتطبيق إجراءات لدعم التعاون البحثي بين الأطباء المقيمين لزيادة الإنتاجية البحثية.

**الكلمات المفتاحية:** البحوث الطبية الحيوية؛ التعليم الطبي المتقدم؛ فترة التخصص في الطب؛ ملخصات الاجتماعات العلمية؛ منشورات؛ عمان.

**Advances in Knowledge**

- *To the best of the authors' knowledge, this is the first study to examine the characteristics, publication rate and factors associated with the successful conversion of resident abstracts to peer-reviewed articles in Oman.*
- *Although the publication rate of resident abstracts in Oman was within acceptable international limits for conference abstracts, it was nevertheless considerably lower than reported rates for abstracts presented by trainees at intramural resident research meetings.*
- *The successful publication of resident abstracts was significantly higher for abstracts with two or more resident authors.*

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**Application to Patient Care**

- *Failure to disseminate research findings erodes the integrity of the scientific process and may negatively affect patient care. Identifying predictors of publication of resident abstracts would help in the greater dissemination of research findings, thus indirectly influencing patient care and informing future research.*

According to the world medical association, investigators have an ethical obligation to make the findings of their research available to the public, irrespective of outcome.[1] Although research findings can be appropriately disseminated via conference presentations, book chapters and technical reports, publication in peer-reviewed journals is widely recognised as the preferred vehicle for scientific communication.[2,3] For this reason, the majority of accepted conference abstracts should ideally be published in refereed journals shortly after presentation, thus ensuring that their findings can influence patient care and inform future research.[3] Furthermore, converting a conference abstract into a full publication is a marker of the quality of the conference and reflects the value of the published research to the scientific community.[2,4] In contrast, a failure to disseminate research findings wastes valuable resources, may negatively affect patient care and results in the unnecessary potential duplication of research.[5]

Established in 2006, the Oman Medical Specialty Board (OMSB) oversees graduate medical education and training in Oman.[6] As an accredited national body, the OMSB encourages its resident doctors to participate in research by holding workshops and courses on research methods, ethical principles and academic writing. Furthermore, successful completion of a research project—from design to the dissemination of research findings (e.g. presentation at conferences/research meetings or publication in peer-reviewed journals)—is mandatory in certain specialty programmes.[6] The OMSB also provides its residents with a platform to present their findings and exchange research ideas during annual intramural scientific meetings.

Previous research has extensively examined the subsequent publication rates of abstracts presented at regional, national and international scientific meetings.[3,7] According to Fosbøl *et al*., the publication rates of conference abstracts across medical specialties ranges from 8–81% (median: 47%).[7] However, research examining the publication rates of abstracts presented by resident doctors/trainees is sparse.[8] Moreover, the publication rate of conference abstracts presented by residents in Oman is unknown. This study therefore aimed to examine the rate, characteristics and factors associated with the successful publication of abstracts presented by OMSB residents at national research meetings.

## Methods

This retrospective cohort study examined the subsequent publication of resident abstracts presented at national research meetings in Oman. Based on a manual search of archived issues of the *Oman Medical Journal (OMJ)*, the affiliated journal of the OMSB, two national intramural scientific meetings were identified at which residents presented abstracts—the 4th Annual Research Day (ARD) and the OMSB Career and Research Forum 2016 (CRF) held in January 2014 and December 2016, respectively.[9–11] Subsequently, the MEDLINE® (National Library of Medicine, Bethesda, Maryland, USA) and Google Scholar (Google LLC, Menlo Park, California, USA) databases were searched in February 2018 for peer-reviewed publications. Publications were identified using the residents' first and last names, with or without keywords based on the title of the presented abstract. For a resident abstract to be considered published, at least one resident had to be a co-author in the corresponding publication and the conclusion of the publication had to match that of the abstract. Identification of the publications was based on independent literature searches conducted by two separate researchers, with inter-rater agreement found to be 100% according to Cohen's kappa coefficient.

The resident abstracts were reviewed to determine the total number of authors (both resident and non-resident), their genders, resident authorship order (i.e. first author versus co-author), resident level and specialty training programme and the type of research (clinical versus basic science research). For each corresponding publication, various author- and article-related data were collected, including the number of authors and resident authorship order and the year of publication, article citation rate and journal name and impact factor (IF) at the time of publication. Citation rates were retrieved from the Scopus® database (Elsevier, Amsterdam, Netherlands). The journal IF was obtained from the Web of Science™ Journal Citation Reports (Clarivate Analytics, Philadelphia, Pennsylvania, USA).

All collected data were entered into a predesigned Excel spreadsheet, Version 2016 (Microsoft Corp., Redmond, Washington, USA). The analysis was performed using the Statistical Package for the Social Sciences (SPSS), Version 20.0 (IBM Corp., Armonk, New York, USA). Most of the results were presented as descriptive statistics. A direct logistic regression model was used

**Table 1:** Characteristics of abstracts presented by residents at two Oman Medical Specialty Board meetings in Muscat, Oman (N = 68)

| Characteristic | n (%) |
|---|---|
| **Meeting presented** | |
| ARD | 32 (47.1) |
| CRF | 36 (52.9) |
| **Resident authorship order** | |
| First author | 64 (94.1) |
| Co-author | 4 (5.9) |
| **Type of research** | |
| Basic science | 5 (7.4) |
| Clinical | 63 (92.6) |
| **Field of research** | |
| Anaesthesia | 6 (8.8) |
| Clinical biochemistry | 5 (7.4) |
| Dermatology | 2 (2.9) |
| Emergency medicine | 2 (2.9) |
| Family medicine | 5 (7.4) |
| General surgery | 2 (2.9) |
| Haematology | 2 (2.9) |
| Histopathology | 2 (2.9) |
| Internal medicine | 6 (8.8) |
| Microbiology | 1 (1.5) |
| Obstetrics and gynaecology | 5 (7.4) |
| Ophthalmology | 6 (8.8) |
| Orthopaedics | 4 (5.9) |
| Otolaryngology, head and neck surgery | 5 (7.4) |
| Paediatrics | 4 (5.9) |
| Psychiatry | 5 (7.4) |
| Radiology | 6 (8.8) |

*ARD = Fourth Annual Research Day; CRF = Career and Research Forum.*

**Table 2:** Characteristics of residents presenting abstracts at two Oman Medical Specialty Board meetings in Muscat, Oman (N = 78)

| Characteristic | n (%) |
|---|---|
| **Gender** | |
| Female | 43 (55.1) |
| Male | 35 (44.9) |
| **Specialty** | |
| Anaesthesia | 7 (9.0) |
| Biochemistry | 5 (6.4) |
| Dermatology | 2 (2.6) |
| Emergency medicine | 2 (2.6) |
| Family medicine | 8 (10.3) |
| General surgery | 2 (2.6) |
| Haematology | 2 (2.6) |
| Histopathology | 2 (2.6) |
| Internal medicine | 6 (7.7) |
| Microbiology | 1 (1.3) |
| Obstetrics and gynaecology | 5 (6.4) |
| Ophthalmology | 6 (7.7) |
| Orthopaedics | 5 (6.4) |
| Otolaryngology, head and neck surgery | 5 (6.4) |
| Paediatrics | 7 (9) |
| Psychiatry | 7 (9) |
| Radiology | 6 (7.7) |
| **Residency level** | |
| 1 | 4 (5.1) |
| 2 | 7 (9) |
| 3 | 10 (12.8) |
| 4 | 19 (24.4) |
| 5 | 23 (29.5) |
| 6 | 15 (19.2) |

to examine the impact of certain factors on the likelihood of publication of the abstracts. The model contained four independent variables postulated to be associated with publication, including the type of study (clinical versus basic science research), resident authorship order (first author versus co-author), number of resident authors per abstract (one versus more than one) and the total number of authors per abstract. Overall, the model was statistically significant ($\chi^2 = 10.24$; $P = 0.04$), indicating that it was able to distinguish which abstracts resulted in a peer-reviewed journal publication. A value of $P < 0.05$ was considered statistically significant.

As this study did not involve participants and was focused on publicly available data obtained from open access sources, formal ethical approval was not deemed necessary.

## Results

Out of 214 abstracts presented at the two national OMSB scientific meetings, there were 68 resident abstracts (31.8%). Of these, 32 (47.1%) were presented at the ARD and 36 (52.9%) at the CRF. The vast majority of resident abstracts represented clinical research

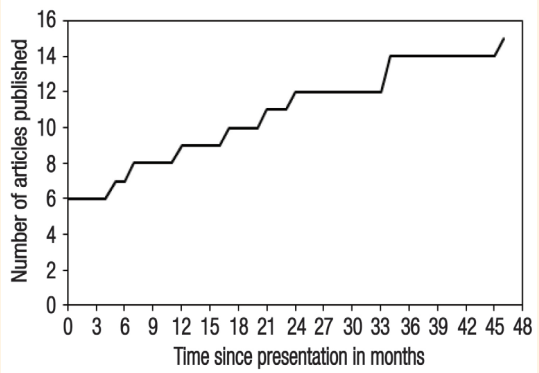


**Figure 1:** Time between presentation and publication of articles converted from resident abstracts presented at Oman Medical Speciality Board scientific meetings (N = 10)*.

**Excluding five abstracts which were published prior to their presentation at the meetings.*

**Table 3:** Logistic regression model of predictive factors related to the publication of resident abstracts presented at Oman Medical Speciality Board scientific meetings (N = 15)

| Factor | OR (95% CI) | *P* value |
|---|---|---|
| Number of resident authors per article | 5.51 (1.15–26.36) | 0.03 |
| Resident authorship order | 1.03 (0.08–12.68) | 0.98 |
| Total number of authors per abstract | 1.20 (0.86–1.68) | 0.29 |
| Type of research | 0.15 (0.02–1.17) | 0.07 |

*OR = odds ratio; CI = confidence interval.*

(92.6%). There were 214 authors in total, with a median of three authors (range: 1–10 authors per abstract). In total, 78 authors (36.4%) were residents, with a mean of 1.1 resident authors per abstract (range: 1–3 resident authors). A total of 64 abstracts (94.1%) had resident first authors [Table 1]. In terms of the characteristics of the residents, most were female (55.1%; *P* = 0.37) and in level ≥4 of their specialty/postgraduate training (73.1%). Family medicine was the most commonly represented specialty (10.3%) [Table 2].

By the end of February 2018, a total of 15 resident abstracts had been subsequently published in peer-reviewed journals, resulting in an overall publication rate of 22.1%. Of the 15 original articles, 12 (80%) represented clinical research and 10 (66.7%) were published in MEDLINE®-indexed journals (National Library of Medicine). There were 80 authors in total, with a median of six authors per article (range: 3–8 authors). Residents were first authors in eight articles (53.3%); however, one article did not include one of the residents who had been an author of the corresponding abstract. The median time to publication was 19 months (mean: 20 months), although five articles (33.3%) were published prior to their presentation as abstracts at the meetings [Figure 1]. The 15 articles were published in 11 different journals, with the *OMJ* being most common (n = 4; 26.7%). Information regarding journal IF was only available for two journals, which had IFs of 0.34 and 0.70, respectively. At the time of analysis, the articles had a total of 18 citations, with an average of 1.2 citations per article (range: 0–5 citations). Six articles (40%) had been cited at least once.

According to the logistic regression analysis, the number of resident authors per abstract was the only statistically significant predictor of publication. Abstracts authored by two or more resident authors were 5.5-times more likely to be published in peer-reviewed journals (odds ratio = 5.50, 95% confidence interval = 1.15–26.36; *P* = 0.03). Other factors, including the type of research, resident authorship order and the total number of authors per abstract, did not significantly influence publication [Table 3].

## Discussion

Research is an essential part of postgraduate medical training; exposure to research during residency has been shown to improve critical thinking skills, stimulate interest in academic medicine and result in better clinical performance during residency training.[12,13] By presenting their research at biomedical meetings or conferences, residents have the opportunity to critically discuss their findings, exchange research ideas and potentially establish new avenues for collaboration with established investigators. In addition, the process of converting an abstract into a full-text article and submitting it to a peer-reviewed journal offers residents practical experience in data analysis, critical appraisal and academic writing as they navigate the peer-review and publication process.[2,14] Finally, the entire research experience, from designing a study to the publication of the findings, can be used as a measure of resident competency.

To the best of the authors' knowledge, the current study is the first in Oman to explore the characteristics, rate and factors associated with the successful publication of resident abstracts. Unfortunately, the publication rate of resident abstracts in the present cohort was low (22.1%). Although this rate falls within the range of reported publication rates of conference abstracts across specialties (8–81%), it is considerably lower than those reported by studies specifically examining the publication rates of abstracts presented by trainees at intramural resident research meetings (40–64%).[7,8,15] Nevertheless, the relatively high conversion rates reported in these other studies may be partly explained by the fact that the examined cohorts were residents

from two highly sought-after programmes (the Division of Plastic & Reconstructive Surgery, University of Toronto, Toronto, Canada, and the Department of Plastic Surgery, Johns Hopkins Hospital, Baltimore, Maryland, USA).[8,15] Given the research-intensive nature of these programmes and the high degree of emphasis on research productivity—for example, the Department of Plastic Surgery at Johns Hopkins Hospital includes a mandatory research year as part of their residency programme—it is likely that residents at these institutions are more motivated to publish their research findings.[8] Susarla *et al.* also suggested that the residents may have benefitted from experienced mentorship, as publication of resident abstracts was associated with the academic rank of their faculty investigator.[8]

The low publication rate of resident abstracts in the current study highlights the importance of examining factors which may affect the conversion rate of resident abstracts to full publications. In the present study, the successful publication of resident abstracts was significantly associated with a higher number of resident authors. Similarly, Yumeen *et al.* previously reported inter-resident collaboration to be a facilitator of publication.[15] Collaborating on a joint research project is mutually beneficial for both senior and junior residents, as it can mitigate certain difficulties faced by senior residents (i.e. time constraints due to clinical duties) while allowing junior residents to benefit from the guidance of their more experienced counterparts. Furthermore, the preparation of a manuscript for publication in peer-reviewed journals is often technical and time-consuming; thus, such tasks can be shared by multiple residents.[14] Based on these findings, the authors encourage the implementation of collaborative/joint resident research projects to improve research productivity.

In general, over half of the abstracts presented at biomedical conferences go unpublished.[7] In a survey of internal medicine residents who had successfully completed a scholarly project, Rivera *et al.* found that time constraints and inadequate research skills were the most frequent barriers to publication.[16] In many cases, residents become distracted by their busy clinical schedules and only those interested in academic medicine may be motivated to put additional effort into getting their research published as peer-reviewed articles. Other studies have implicated a number of other obstacles to publication, including a lack of research resources (e.g. research assistants or statistical software), inter-author conflicts and poor mentorship (i.e. lack of involvement on the part of the project supervisor).[15–17] Future studies should explore additional factors that may hinder or facilitate publication of resident abstracts in Oman, such as the number of prior publications by resident authors or the senior author/faculty supervisor, a history of formal research training/attainment of a postgraduate research degree, interest in academic medicine as a career, the availability of research resources and the academic rank of the senior author/faculty supervisor.[8,15–17]

The findings of this study should be considered in the light of certain limitations. First, due to the retrospective nature of the study, the examination of other important factors influencing publication rate of resident abstracts was not possible, such as those mentioned above. Second, the sample size may have been insufficient to detect statistically significant differences. However, although the OMSB office was contacted in order to identify additional resident abstracts, further data could not be obtained. Third, the mean period of time between the presentation of the abstracts and the literature search was 1.2 years, which may not have been sufficient for some residents to convert their abstract into a full-text publication. However, previous research has reported that 1.2 years is the mean time between presentation and publication of resident abstracts.[8] It is also possible that some unpublished resident abstracts were part of larger ongoing studies. Finally, the overall number of publications may have been underestimated, as abstracts published in journals which are not included in the MEDLINE® (National Library of Medicine) or Google Scholar (Google LLC) databases were not included in the study. However, these databases are the largest and most widely used biomedical databases in the world; thus, the number of overlooked articles is likely to have been negligible.

## Conclusion

The publication rate of resident abstracts presented at two OMSB scientific meetings was low, with only one-fifth of resident abstracts subsequently published as full-text articles. A higher number of resident authors per abstract was a significant predictor of successful publication, suggesting that greater emphasis on collaborative research projects may improve resident research productivity. However, future research is recommended to identify other facilitators and barriers to the publication of resident abstracts.

### CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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