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Comparative bibliometric analysis of publications by past Royal Australasian College of Surgeons research scholarship recipients

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Title: A comparative bibliometric analysis of publications by past RACS research scholarship recipients

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Abstract (word count: 249)

Background: The Royal Australasian College of Surgeons (RACS) awards scholarships to surgeons, surgical trainees and recipients focused on developing their clinical knowledge and improving outcomes for patients. A bibliometric analysis of research scholarship recipients publications and h-index scores was conducted to understand the benefits of receiving these scholarships.

Methods: A bibliometric analysis of RACS scholarship recipients in 2015 was performed using Open Researcher and Contributor ID (ORCID), Scopus, Google Scholar, ResearchGate, LinkedIn, and PubMed to identify number of publications, h-index scores, Field-Weighted Citation Impact and the Relative Citation Ratio.

Results: Nineteen research scholarship recipients authored 842 publications, with 491 (58%) published after completion of their scholarship. Seven recipients published 50% or more of their articles in the five years since completion. Five recipients have each published more than 45 articles since 2015. H-index scores varied between Scopus and Google Scholar (overall range: 4-34). Scopus identified the most publications, followed by ResearchGate. Determining publication numbers for recipients was problematic due to self-reporting in some databases (i.e. Google Scholar, ResearchGate), variations in author names (i.e. maiden to married name), duplication of publications, and the inclusion of supplementary material (i.e. extra tables) in self-reporting databases. FWCI and RCR values exceeded 1 on 12 occasions demonstrating recipients are more cited than the global average.

Conclusion: Continuous tracking of publication rates and h-index scores of scholarship recipients demonstrates recipients' continuing interest in advancing and disseminating medical knowledge to improve patient outcomes. The 2015 scholarship recipients publication numbers continued to increase after their scholarship tenure.

Keywords: Fellowships and Scholarships; Surgeons; Program Evaluation; Societies, Medical; Research Support as Topic.

Introduction

Since the 1970s, the Royal Australasian College of Surgeons (RACS) has received financial bequests to fund scholarships. RACS currently awards approximately 60 scholarships or grants each year to support recipients in (1) undertaking travel, (2) performing research and (3) completing professional development. These scholarships allow medical students, junior doctors and surgeons to travel, conduct research to increase scientific knowledge in the wider surgical community and further the recipients own knowledge and skills. This, in turn, benefits health professionals and society in general through improved health outcomes.

RACS has a responsibility to report the outcomes of scholarships and grants to those who have donated funds, thus it is important to determine the impact of receiving a scholarship or grant on the subsequent careers of recipients.

Different surgical colleges/societies and funding groups have employed a diverse range of techniques in attempting to document the effectiveness of scholarships and fellowships on the recipients' academic output. Some studies used online searching to gauge academic productivity (1, 2), others surveyed recipients directly for the perceived impact of a scholarship or grant on academic productivity or career progression (3-7).

Studies attempting to determine research performance or impact after a scholarship have used multiple performance indicators. A systematic review found a variety of indicators that researchers focused on when determining performance, including number of publications, number of citations, impact factor, research funding, degree of co-authorship and h-index scores (8). Outcome indicators varied according to indicators recorded within the surgical community. Most studies show an increase in publication rates, h-index scores, research funding and number of citations following receipt of scholarships, fellowships or grants.

Aims

Our aims were to:

1. track publication rates of previous RACS scholarship recipients by performing searches in various databases to determine number of publications and h-index scores.
2. report Field-Weighted Citation Impact (FWCI) values and Relative Citation Ratio (RCR) values for each scholarship recipient.
3. evaluate the effectiveness of different databases in providing accurate publication data to compile academic metrics.

Methods

This study comprised of searches on previous RACS research scholarship recipients to determine number of publications, h-index scores, FWCI values and RCR values. No ethics approval was sought as RACS research scholarship recipients were not approached to provide information regarding their publications. Scholarship recipients are acknowledged in Surgical News and by the Royal Australasian College of Surgeons and as such are in the public domain. A subsequent outcome was a comparison of different databases for accuracy of reporting in publication data for individual recipients.

Searches were performed to enable a comparative analysis of the peer reviewed publication output by RACS research scholarship recipients pre- and post-scholarship. Eligibility focused on RACS research scholarship recipients in 2015 (n=20). The publication timeframe was unrestricted, including all publications pre- and post-scholarship. Information sources searched included Open Researcher and Contributor ID (ORCID), Scopus, SciVal, Google Scholar, ResearchGate, LinkedIn and PubMed. Searches were also undertaken to determine if research scholarship recipients were affiliated with a university and whether a university homepage listed their publications.

Search Strategy:

Three types of searches were performed involving:

- i) identification of an ORCID reference number or Scopus identity number
- ii) identification of university affiliation, Google Scholar account, ResearchGate account or LinkedIn account
- iii) specific searches in PubMed and Scopus for lists of publications.

Accuracy in determining publication lists was improved using publicly available information for example LinkedIn work profiles. Citations were verified from multiple databases and multiple searches. Citations only present in one database were verified via the journal website to determine if authorship was accurate for the scholarship recipient. This could be confirmed by verification of the author's location or known places of work identified on LinkedIn or other publications.

Specific searches were conducted using SciVal to identify FWCI and iCite to determine RCR values for each research scholarship recipient.

Study records:

An excel spreadsheet was created to track all citations, websites, specific homepages and reference/identity numbers for each individual. The dates on which searches were conducted were recorded to ensure publication rates were tracked accurately. An EndNote library was created to track all publications, which could then be sorted according to year (i.e. pre- or post-scholarship) and author (i.e. first author, alternative author or last author). Published conference abstracts/posters/presentations were included in the total publication list as these were considered a potential result from the scholarship. Privacy for scholarship recipients was preserved in the study by storage of records on a password-protected secure network only accessible by one author [PW] and de-identification of recipients in publications. Recipients were assigned a random identification number for all work material and publications.

Results

Searches were performed between 21 October 2019 and 18 November 2019 to collate a publication list for the 2015 scholarship recipients (n=20). However, insufficient details were provided for one recipient (Identity number [ID] 4), resulting in searches being performed on 19 recipients. Searches for FWCI and RCR were conducted in January 2021. A description of recipients is not possible in order to preserve privacy of the small cohort. Table 1 contains a list of the various scholarships received.

For the 19 recipients searched, publication dates ranged between 2000 to 2019, with some publications available in an online-first stage. Seven recipients published between 2000 and

2006, with the remainder publishing from 2008 onwards. The highest total number of publications for a scholarship recipient was 145 (ID 10), while the lowest number of publications was 7 (ID 7) (Table 2). Table 3 shows that the highest number of publications before receiving the scholarship was 79 (ID 10), and the lowest was zero (ID 15). The highest number of publications during or after the scholarship year was 66 publications (ID 10), with the lowest being 2 publications (ID 7) (Table 3).

Total number of publications for all 19 scholarship recipients was 842 (Table 3), for a mean average of 44 publications per recipient (median: 26; mode: 35; range: 7-145). However, twelve recipients published fewer than the mean average, while three recipients had more than 100 publications.

Pre- versus post-scholarship

Of the 842 publications found for all scholarship recipients, 351 were published in the years before the scholarship was awarded (41.7%) (Table 3). After receiving the scholarship in 2015, recipients increased their publishing output with 491 publications recorded.

Ten recipients increased their number of publications after their scholarship, with five recipients markedly doing so (IDs: 2, 3, 13, 15, & 20). Five recipients had published over 45 times since 2015 (IDs: 6, 8, 10, 13, & 20). Seven recipients published slightly fewer publications after their scholarship than before, while one recipient showed a more significant decrease in number of publications after the scholarship (ID 7).

First author versus co-authoring versus last author

Seven recipients were first author on more than 50% of their publications, while other recipients relied more on co-publishing (n=12). Co-authoring publications may demonstrate that scholarship recipients were collaborating, engaging and networking with other members in the research community. Four recipients were first author on 26% or less of their total publications. One of these recipients had a publication list over 100, while the other three recipients had 19 to 35 publications. An inspection of all publications for last author revealed only 54 listed a recipient in this position (Table 3).

H-index score

H-index scores were available for all authors via Scopus (Table 4). Google Scholar provided h-index scores for the eight recipients with a Google Scholar account. Their h-index scores varied from 4 (ID 11) to 34 (ID 6) for all publications and years, and from 5 (ID 18) to 30 (ID 6) for publications from 2014 onwards as Google scholar only provides information on all years or on publications post 2014 (Table 4).

Google Scholar scores were close to h-index scores reported in Scopus, varying from one to five points lower than the Google Scholar score. H-index scores on Scopus ranged from zero to 19 for recipients without a Google Scholar account (Table 4). A few recipients had multiple h-index scores on Scopus because they were affiliated with different workplaces and their publications had been grouped separately on the database.

Field-Weighted Citation Impact and Relative Citation Ratio

FWCI and RCR values were collated for each scholarship recipient, with some profiles requiring additional information to ensure a more accurate representation of publications. Four recipients had a FWCI value higher than two (IDs: 6, 15, 17, 19), with a further eight recipients FWCI value higher than one (IDs: 1, 2, 3, 8, 11, 13, 18, 20). Similarly three recipients had a RCR value higher than two (IDs: 6, 15, 19), with a further nine recipients

scoring above one (IDs: 1, 3, 8, 10, 11, 12, 13, 16, 29) (Table 5). FWCI values above one indicate that the publication is cited more than expected according to the global average, demonstrating that the research scholarship recipients were publishing globally important and recognised research.

Relative effectiveness of different databases

Recipients had multiple profiles over the various databases, demonstrating variability in recording number of publications or lists. Some recipients had profiles in multiple locations, while others had fewer profiles.

Scopus author search was the most successful method in finding recipients' publications (n=19) but proved challenging with recipients appearing multiple times due to the authors using different variations of their full names or multiple locations (i.e. hospital or university affiliations), leading to the creation of several profiles for some recipients.

The second most successful method of locating a scholarship recipient was through ResearchGate (n=16). Although many recipients were affiliated with a university (n=15), only nine had publications listed on a university homepage (47%). LinkedIn provided further information for 14 recipients, who listed publications on their LinkedIn page. Twelve recipients had an ORCID number, with some listing their publications on this database. Eight recipients had a Google Scholar account listing their publications (42%). Google Scholar requires author maintenance to ensure the accuracy of the publication list, but it can provide further details like the h-index score or how many times a publication has been cited. Google searches revealed that a few recipients used ResearcherID, Loop or Mendeley to record publications.

Searching for recipients in PubMed provided a starting point for determining publication lists for recipients, but care had to be exercised with PubMed searches because five of the recipients have very common surnames. The PubMed search results frequently resulted in inflated publication numbers that required review.

Discussion

RACS research scholarship recipients published more after the completion of their scholarships. This demonstrates a continued interest in contributing to and disseminating clinical knowledge via peer reviewed publication, and is a powerful measure of success of these scholarships.

Colleges, associations, societies and funding bodies frequently explore the impact of scholarships on recipients by determining publication rates, h-index scores, citation rates and records of other funding received (4, 7). Due to the methodology used and information gathered in the present study, it is difficult to compare with other key studies exploring benefits and outcomes from scholarships. However, one clear common outcome is that receiving a scholarship or grant increases publication rates and future funding opportunities for recipients (4, 5, 9, 10), with many progressing in academic profile (10).

Discrepancies in search results from Scopus, Google Scholar, PubMed and ResearchGate have previously been reported (11-13), consistent with discrepancies between different databases presented here. Inclusion of searches for ORCID identity numbers provided some benefit, but overall did not facilitate the process of identifying recipient publications. Despite the aim of ORCID to allow for easy identification of authors and their publications, relying on accuracy in claiming authorship may still be a noble aspiration. Branco et al (14) found

approximately 20% of applicants for a trauma and surgical critical care fellowship program misrepresented their publication lists. Discrepancies between databases, and potential misrepresentation from individuals, continues to contribute to the debate of how to accurately assess publication rates.

Variation in reported h-index scores from different databases has previously been discussed, and academics have been cautioned on many issues regarding accuracy across disciplines and databases (15-17). This offers the perspective that exploring h-index results for scholarship recipients is potentially not beneficial.

Despite the comparable nature of FWCI and RCR (18), discrepancies between the number of publications and citations recorded in the corresponding databases for these scholarship recipients demonstrated there was still a level of variability in values and provided limited evidence on the benefits of one metric over the other. Key findings from this paper are highlighted in Figure 1. This research contained several limitations in detecting and reporting on publications by scholarship recipients (Figure 2). Challenges in determining publication rates included:

- i) relying on authors to self-report and update publication lists in databases (i.e. ResearchGate, Google Scholar or university homepages)
- ii) authors changing their publishing name or having a common author name, such as, maiden versus married surnames, common surnames (e.g. Jones or Smith) or anglicising names (e.g. John instead of Wei)
- iii) widely varying results from different databases (e.g. ID 8)
- iv) duplication of articles or inclusion of supplementary material.

A broader limitation is that only exploring publication numbers and h-index scores ignores potential research scholarship benefits beyond publications (19). Further investigation is required to explore whether new knowledge gained from research scholarships translates into changes in clinical practice or community benefit. Focusing solely on scholarship impact on publication output was beyond the scope of the present review. Thus, many associations, societies and Colleges that have previously examined publications from scholarships and grants may need to revisit recipients and the projects conducted to explore in more detail total research outcomes.

Conclusion:

RACS scholarship recipients have generated more peer-reviewed publications since the completion of their scholarship which demonstrates a continuing interest in advancing and disseminating medical knowledge. Whilst searches may be undertaken to determine publication rates, discrepancies between different databases may provide inaccurate results. Directly approaching previous recipients may be a more accurate method to gauge publication rates and provide funding bodies with accurate information on the outcomes from receipt of a scholarship. Broader advances in clinical practice and/or community health benefits arising from awarding of scholarships is yet to be explored.

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Table 1: Scholarships received by recipients in 2015

Scholarship name	Number of scholarships
Eric Bishop Research Scholarship	1
Fellowship in Surgical Education	1
Foundation for Surgery ANZ Journal of Surgery Research Scholarship	2 †
Catherine Marie Enright Kelly Research Scholarship	1
Foundation for Surgery John Loewenthal Research Fellowship	1
New Zealand Research Fellowship	1
Peter King Research Scholarship	1
Reg Worcester Research Scholarship	1
Foundation for Surgery Research Fellowship	1
Richard Jepson Research Scholarship	1
Tour de Cure Cancer Research Scholarship	3
MAIC-RACS Trauma Scholarship	1
Raelene Boyle Research Scholarship	1
Sir Roy McCaughey Surgical Research Fellowship	2
Francis and Phyllis-Mary Thornell-Shore Memorial Trust for Medical Research Scholarship ‡	1
Total	19

† Excluded recipient received this scholarship, if excluded recipient was included n=3.

‡ Now known as F&P Thornell-Shore Memorial Trust for Medical Research Scholarship.

Table 2: Publications and information sources for each scholarship recipient

Identity number (ID)	Affiliated with a university	LinkedIn	ORCID	ResearchGate publication number	PubMed publication number	Google Scholar publication number	Scopus publication number	Total publications
1	yes	yes	no	67	46	n.a.	43	70
2	yes	yes	yes	26	15	20	13	26
3	no	no	no	6	6	n.a.	6	8
5	no	no	no	53	9	n.a.	multiple 21, 7, 2, 2, 1, 1, 1	40
6	yes	yes	yes	124	94	163	101	117
7	yes	yes	yes	n.a. (†2)	1	n.a.	2	7
8	yes	yes	yes	7	36	121	59	114
9	yes	no	yes	n.a. (†4)	8	n.a.	11	17
10	yes	yes	multiple	131	111 (‡35)	n.a.	97	145
11	yes	yes	yes	22	12	17	13	19

12	yes	yes	multiple	43	71 (‡41)	n.a.	31	35
13	no	yes	yes	52	51 (‡36)	n.a.	multiple 18, 3, 1	54
14	yes	yes	multiple	15	215 (‡214)	n.a.	multiple 1, 1	16
15	no	yes	yes	30	12	27	multiple 11, 1	35
16	yes	yes	yes	35	26 (‡2)	49	26	45
17	yes	no	yes	24	10 (‡9)	n.a.	1	21
18	yes	yes	multiple	5	40 (‡33)	12	6	13
19	yes	no	yes	n.a. (†3)	6 (‡3)	n.a.	multiple 2, 1, 1	11
20	yes	yes	yes	35	31	52	multiple 31, 1, 1	49

†Denotes publications listed but not under a profile for the scholarship recipient.

‡ Denotes number of publications not written by the scholarship recipient.

Note: Multiple indicates multiple profiles for the same individual or name. n.a = Not applicable

Table 3: Recipient publications classified by authorship and time of publication

Identity number	Publications before scholarship (pre-2014) n (% of total)	Publications after scholarship (2015 onwards) n (% of total)	First author n (% of total)	Alternative first author n (% of total)	Last author n (% of total)	Total
1	31 (44)	39 (56)	22 (31)	48 (69)	1 (1)	70
2	3 (12)	23 (88)	11 (42)	15 (58)	1 (4)	26
3	1 (13)	7 (87)	3 (38)	5 (62)	0 (0)	8
5	16 (40)	24 (60)	21 (53)	19 (47)	0 (0)	40
6	66 (56)	51 (44)	30 (26)	87 (74)	3 (3)	117
7	5 (71)	2 (29)	4 (57)	3 (43)	0 (0)	7
8	58 (51)	56 (49)	46 (40)	68 (60)	11 (10)	114
9	9 (53)	8 (47)	13 (76)	4 (24)	3 (18)	17
10	79 (54)	66 (46)	96 (66)	49 (34)	15 (10)	145
11	11 (58)	8 (42)	4 (21)	15 (79)	0 (0)	19
12	21 (60)	14 (40)	7 (20)	28 (80)	11 (31)	35
13	5 (9)	49 (91)	17 (31)	37 (69)	0 (0)	54
14	8 (50)	8 (50)	7 (44)	9 (56)	0 (0)	16
15	0 (0)	35 (100)	9 (26)	26 (74)	0 (0)	35
16	17 (38)	28 (62)	20 (44)	25 (56)	1 (2)	45
17	7 (33)	14 (67)	15 (71)	6 (29)	1 (5)	21
18	5 (38)	8 (62)	7 (54)	6 (46)	2 (15)	13

19	6 (55)	5 (45)	6 (55)	5 (45)	2 (18)	11
20	3 (6)	46 (94)	24 (49)	25 (51)	3 (6)	49
Total	351	491	362	480	54	842

Table 4: H-index scores for scholarship recipients

Identity number	Google Scholar (all)	Google Scholar (from 2014)	Scopus
1	n.a.	n.a.	15
2	6	6	5
3	n.a.	n.a.	3
5	n.a.	n.a.	multiple 5, 5, 2, 2, 1, 0, 0
6	34	30	29
7	n.a.	n.a.	1
8	16	15	14
9	n.a.	n.a.	5
10	n.a.	n.a.	19
11	4	10	10
12	n.a.	n.a.	12
13	n.a.	n.a.	multiple 5, 3, 1
14	n.a.	n.a.	multiple 1, 1
15	5	6	multiple 5, 1
16	11	10	8
17	n.a.	n.a.	1
18	-	5	3
19	n.a.	n.a.	multiple 2, 1, 1

20	15	9	multiple 6, 0, 1
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Note: Multiple indicates multiple profiles for the same individual, with each score given. n.a = Not available.

Table 5: Citation impact for each scholarship recipient

Identity Number (ID)	Total Publications	SciVal			iCite			
		Publications	Citations	Field Weighted Citation Impact (FWCI)	Publications	Citations	Relative Citation Ratio Mean	Weighted Relative Citation Ratio
1	70	27	395	1.7	50	599	1.19	55.71
2	26	11	84	1.15	17	96	0.86	11.24
3	8	6	101	1.24	8	95	1.56	10.90
5 †	40	25	327	0.87	34	237	0.86	18.09
6	117	70	2870	2.98	107	3314	2.22	213.35
7 †	7	3	15	0.23	1	5	0.25	0.25
8	114	53	761	1.67	51	337	1.24	50.71
9	17	10	56	0.63	10	24	0.29	2.35
10	145	90	1242	0.92	85	912	1.23	92.21
11	19	12	227	1.32	17	182	1.15	13.78
12 †	35	32	505	0.98	34	416	1.29	39.84
13 †	54	24	193	1.11	33	111	1.15	18.33
14 †	16	2	1	0	2	1	0.04	0.09
15 †	35	13	266	2.47	14	200	2.25	26.98
16	45	25	375	0.94	33	299	1.14	26.13
17 †	21	2	54	2.72	2	15	0.86	0.86
18	13	7	39	1.32	11	27	0.39	2.76
19 †	11	1	25	11.31	4	52	3.33	9.99
20 †	49	31	315	1.46	37	302	1.93	59.71

†Denotes that SciVal profiles were amalgamated to provide a more accurate value.

Figure 1: What does this paper add?

- Scholarship recipients published more after their scholarship
- Mixture of first author and co-author publishing, with limited last author publications
- H-Index scores varied for recipients, and ranged from 1-29
- Scopus and ResearchGate profiles were most common
- No database alone contained an accurate and complete list of publications
- Scholarships should not be evaluated solely on number of publications and h-Index scores
- FWCI and RCR values were generally higher than one indicating that publications by recipients were cited more frequently than the global average

Figure 2: Limitations of the Study

- Small cohort of research scholarship recipients
- Only examining publication numbers and h-Index scores