



Publication patterns and the impact of self-citation among minimally invasive surgery fellowships



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ABSTRACT

Introduction: The *h*-index is a widely utilized academic metric that measures both productivity and citation impact. The purpose of this study is to define the impact of self-citation among minimally invasive surgery (MIS) fellowship program directors.

Methods: Through the Fellowship Council's website, all program directors and associate program directors from the 148 MIS fellowship programs were identified. Using the Scopus database, we calculated the number of publications, citations, self-citations, and *h*-index for each surgeon.

Results: A total of 274 surgeons were identified. The mean number±SD of publications, citations, and *h*-index for the cohort were 60.5 ± 77.2, 1765 ± 4024, and 16.0 ± 15.0, respectively. The self-citation rate for the entire cohort was 3.23%. Excluding self-citations reduces the mean number of citations to 1708 ± 3887 and *h*-index to 15.8 ± 14.6. The *h*-index remained unchanged for 77% (210/274) of surgeons. Only 5% (15/274) of surgeons had a change in *h*-index of greater than one integer and no surgeon had a change greater than three integers.

Conclusion: Self-citation is infrequent and has a minimal impact on the academic profile of program directors of MIS fellowships.

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Introduction

The Hirsch Index (*h*-index) is a commonly used metric within the academic world to measure the impact of published work. Jorge Hirsch developed the metric in 2005 to address the shortcomings of other bibliometric indicators such as total number of publications or total number of citations.¹ Those metrics measure quantity or quality, but not necessarily both. The *h*-index measures both the quantity and quality of scholarly activity in a very simplistic manner defined as “the number of papers with citation number > or = *h*.”¹ Self-citation is a known limitation of the metric and previous studies have investigated the impact of self-citation among other medical specialties.^{2–7} The *h*-index has been previously examined as it pertains to general surgery.^{8,9} However, to our knowledge, no publication exists examining the effect of self-citation on academic general surgeons. The purpose of our study is to define the

publication patterns and the impact of self-citation among minimally invasive surgery (MIS) fellowship program directors and associate program directors.

Method and materials

Inclusion of programs and faculties

The Fellowship Council was created to organize fellowship programs teaching MIS. Their website (<https://fellowshipcouncil.org>) lists the 148 MIS programs along with their respective program directors and associate program directors. In addition, metrics available for each program are available to include specialty within MIS, year each fellowship was established, percent of fellowship time dedicated to research, and operative case volume over the last two years. Fellowship programs were categorized as Hepato-Biliary-Pancreatic (HPB), Advanced Gastrointestinal/Minimally Invasive Surgery (Adv GI/MIS), Bariatric, and Flexible Endoscopy. Some programs fell into more than one category. Case volume was calculated by the number of procedural cases performed at each program divided by the number of fellows.

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Fellowships without case volume available were denoted as the statistical mean for the cohort. This website was accessed on October 29th, 2017 and 274 unique surgeons were identified for analysis.

Impact of self-citation on the *h*-index

The Scopus database was used to extract the number of publications, total number of citations, and *h*-index for each respective surgeon. Author name and academic affiliation were entered into the “author search” page and metrics were available within the “View citation overview” page of scopus.com as previously described by Rad et al.² The total number of citations and *h*-index were recorded before and after checking the box labeled “Exclude self-citations of selected author” and any changes were noted.

Statistical analysis

Surgeons were analyzed in two groups, those that the *h*-index remained unchanged, and those that changed by one or more integer. Qualitative variables were analyzed within the two groups with a Fisher's exact test and continuous variables were analyzed with a Student's T-test. Data were extracted and analyzed using a Microsoft Excel spreadsheet (Microsoft Corporation, Redmond, Washington).

Results

A total of 274 surgeons were identified. The mean number \pm SD of publications, citations, and *h*-index for the entire cohort were 60.5 ± 77.2 , 1765 ± 4024 , and 16.0 ± 15.0 , respectively. The self-citation rate for the entire cohort was 3.23%. Excluding self-citations reduces the mean number of citations to 1708 ± 3887 and *h*-index to 15.8 ± 14.6 . The *h*-index remained unchanged for 77% (210/274) of surgeons. Only 5% (15/274) of surgeons had a change in *h*-index of greater than one integer and no surgeon had a change of greater than three integers.

Surgeons were stratified into two groups; those who had a change in *h*-index and those who did not (Table 1). Surgeons were more likely to have a change in *h*-index if the fellowship program was categorized as HPB ($p = 0.0005$) and their associated programs had a significantly higher percentage of the fellowship dedicated to research (14.2% vs. 16.7%, $p = 0.0275$). Individual authors had a significantly higher number of overall publications (40 vs. 128, $p < 0.0001$), overall citations (940 vs. 4472, $p < 0.0001$), *h*-index (12 vs. 29, $p < 0.0001$), and self-citation rate (2.26% vs. 3.90%, $p < 0.0001$). There were no differences with regard to the year the fellowship program was established, number of procedural cases, or program categorization as Adv GI/MIS,

bariatric, or flexible endoscopy.

Surgeons were also stratified into different groups based on the magnitude of change in *h*-index (Table 2). As the absolute change in *h*-index increased, so did the number of publications, *h*-index, and individual citations. For the 5% of surgeons with a change of *h*-index of two integers, the mean number of publications, *h*-index, and citations were 227, 43, and 9433, respectively.

Discussion

Self-citation

Self-citation can certainly manipulate one's *h*-index, though self-citation itself should not be uniformly associated with a negative connotation.¹⁰ In 2015, John Ioannidis published a review article regarding self-citation. He summarizes that “[s]elf-citation is not necessarily inappropriate by default. In fact, usually it is fully appropriate but often it is even necessary.”¹¹ This is especially true in longitudinal and compounding research projects. An example of this would be the landmark STAMPEDE trial which examined medical vs. surgical management of diabetes published in 2012.¹² It would be both inefficient and inappropriate to not cite the initial one year results when publishing the subsequent three and five-year results.^{13,14}

Change in *h*-index

Our study found that an increase in one's *h*-index was associated with a number of factors including percent of the fellowship attributed to research and programs categorized as HPB surgery. It is intuitive that more dedicated time to research would correlate with longitudinal or compounding research projects, which as detailed above, could lead to appropriate self-citation. As for HPB programs, these specific fellowships tend to have a narrower scope within MIS and are more likely to regularly incorporate surgical oncology.¹⁵ Surgical oncologists are nearly twice as likely as MIS surgeons (21% vs. 12%) to be involved in basic science research, which in itself is performed step-wise with many projects building on previously performed research.¹⁶ Studies performed in other surgical specialties have demonstrated higher citation rates associated with both basic science and oncology research.^{17,18} The remaining factors associated with a change in *h*-index are the actual metrics themselves: number of publications, number of citations, and *h*-index. Similar findings have been identified across multiple other specialties.^{2–6} Interestingly in this cohort, the greater the absolute change in *h*-index, the smaller the proportional change (Table 2). This again highlights the significant publishing prowess in this subgroup of surgeons.

Table 1
Program and author characteristics.

	<i>h</i> -index Unchanged	<i>h</i> -index Changed	<i>p</i> value
Total	210 (77%)	64 (23%)	
Years Fellowship Established	13.6	14.2	0.5380
HPB	16 (50%)	16 (50%)	0.0005
Advanced GI/MIS	153 (79%)	41 (21%)	0.2090
Bariatric	86 (77%)	25 (23%)	0.8845
Flexible Endoscopy	6 (86%)	1 (14%)	1
Average Procedural Cases	366	334	0.1409
Percent Research	14.2%	16.7%	0.0275
Number of Publications	40	128	<0.0001
Number of Citations	940	4472	<0.0001
<i>h</i> -index	12	29	<0.0001
Self-Citation Rate	2.26%	3.90%	<0.0001

Abbreviations: HPB, Hepato-pancreatic-biliary surgery; GI, Gastrointestinal; MIS, Minimally Invasive Surgery.

Table 2
Stratification of Different Groups of Authors Based on *h*-index Increase after Self-citation.

	<i>h</i> -index did not change	<i>h</i> -index increased 1 integer	<i>h</i> -index increased 2 or more integers
Number (% of all)	210 (77%)	49 (18%)	15 (5%)
Number of Publications, Mean (Median; Range)	40 (21; 0–279)	98 (83; 2–351)	227 (199; 65–543)
H-Index including Self-citation, Mean (Median; Range)	12 (9.5; 0–53)	25 (22; 1–89)	43 (34; 16–96)
Individual Citations, Mean (SD)	940 (1364)	2954 (4106)	9433 (12328)
Proportional Increase in H-index from Self-citation by %, Mean (Median; Range)	0	8% (5%; 1%–100%)	6% (6%; 2%–13%)
Self-Citation Rate, Mean (Median; Range)	2% (1%; 0%–39%)	5% (3%; 1%–100%)	6% (6%; 2%–12%)

Table 3
Self-citation rates among other specialties.

Author/Publication Year	Specialty	Mean Number Citations	Mean Number Self-Citations	Self-Citation Rate	% <i>h</i> -index Unchanged
Rad et al., 2012 ²	Radiology	1870	64	3.53%	77%
Susarla et al., 2015 ³	OMFS	375	15	4.10%	91%
Lopez et al., 2015 ⁴	Hand Surgery	800	37	4.63%	84%
Swanson et al., 2016 ⁵	Plastic Surgery	1252	64	5.14%	67%
Silvestre et al., 2018 ⁶	Orthopedic Surgery	2139	124	5.80%	64%
Yheulon et al., 2018	MIS General Surgery	1765	57	3.23%	77%

Abbreviations: OMFS, Oral Maxillofacial Surgery; MIS, Minimally Invasive Surgery.

General surgery and *h*-index

In 2013, Svider et al. published an article examining the scholarly impact of academic metrics among 2429 academic surgeons across different surgical specialties.⁹ Of the eight specialties examined, general surgeons – along with neurosurgeons and urologists – had significantly higher *h*-indices than the other specialties. In addition, general surgeons had the largest *h*-index gap between promotion to all academic ranks from associate professor to chairperson. In that study, the average *h*-index for assistant professor, associate professor, professor, and chairperson of general surgery were 6, 11, 20, and 28, respectively. Despite these relatively higher standards of academic metrics, the general surgeons in this cohort are attaining high *h*-indices with low rates of self-citation. Of similarly published articles, this cohort of surgeons has the lowest self-citation rate of academic physicians when compared to five other specialties (Table 3).^{2–6}

The mean *h*-index for the cohort was 16 indicating academic output between the rank of associate professor and professor. Those who had any change in *h*-index had an average *h*-index of 29, above the level of the average chairperson. For the 5% of surgeons within the cohort with a change of *h*-index of greater than one integer, the average *h*-index was 43 (median 34, range 16–96) demonstrating the prolific academic output of this subgroup (Table 2).

Limitations

There are several limitations to this study. This study only analyzed a particular subset of general surgeons and may not be generalizable to the specialty as a whole. The number of citations or *h*-index do not account for individual journal impact factors or the extent of author contribution. The Scopus database and its search methods have their own limitations. Most search queries only returned one corresponding result with the database conglomerating that author's academic output over their entire career, to include publications performed at other locations and institutions. However, it is possible – especially for more common names – for the search query to return dozens of author results. Such queries were infrequent and when encountered, we attempted to identify the appropriate surgeon by other identifying factors to include middle initial, subject area, and publication dates. Even so, this creates the possibility that papers were missed, especially with

regard to publications written at other institutions. Lastly, the Scopus database is not a “gold standard” for author metrics and previous studies have elucidated poor agreement between Scopus and other databases.^{19,20}

Conclusion

Self-citation is infrequent and has minimal impact on the academic profile of MIS program directors and associate program directors.

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