Publication records and bibliometric indices of Canadian and U.S. pharmacy deans

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Abstract

Background: As leaders and role-models in schools and colleges of pharmacy, Chief Executive Officer (CEO) deans must have a sufficient background and experience in research and scholarship.

Objective: The primary purpose of this research was to characterise and compare the publication records and bibliometric indices of the current CEO deans at the schools and colleges of pharmacy (SCOP) in Canada and the United States (U.S).

Methods: This was a cross-sectional study of pharmacy dean publication records and bibliometric indices using the Web of Science (WoS) database. Deans were identified using the Canadian website, Association of Faculties of Pharmacy. The methodology of Thompson and Nahata was used to conduct the WoS searches. The software programme developed by Soler was used to separate homologues and calculate bibliometric indices. Bibliometric indices generated included: lifetime publications, publications/year, h-index, m-quotient, lifetime citations, citations/year, and average citations/paper. The Kruskal-Wallis analysis of variance for nonparametric data was used to assess differences between groups.

Results: Median bibliometric indices for Canadian pharmacy deans (N=10) vs. U.S. pharmacy deans (N=124) were as follows: No. of publications=57.5 vs. 20.5, Publications/year=3.5 vs. 0.5, h-index=14.5 vs. 8, Total citations=628.5 vs. 223.5, Citations/year=38.2 vs. 11.2. None of the differences were significant at $p<0.05$.

Conclusion: Median bibliometric indices of Canadian pharmacy deans were higher but not significantly different from U.S. pharmacy deans.

Keywords: *Publications, Scholarship, Faculty*

Introduction

Canadian and United States (U.S.) schools and colleges of pharmacy (SCOP) form the core of North American pharmaceutical education. Similarities and differences exist between the two countries in their approach to graduating excellent practitioners. While the U.S. has an entry level doctor of pharmacy (Pharm.D.) degree requirement, Canadian SCOP have a mix of bachelor of science (B.Sc.) and Pharm.D. degree requirements but has an established goal of 2020 for the Pharm.D. degree as the entry-to-practice qualification (Association of Faculties of Pharmacy of Canada [AFPC], 2010). Types of pharmacy schools also varies greatly. Canada's pharmacy education is built upon a foundation of publicly funded, research-based SCOP located in mostly urban centres with affiliated medical centres (Austin & Ensom, 2008). U.S. SCOP, in contrast, have a diversity of public and private, research-intensive and teaching-intensive, medical centre affiliated and non-medical centre affiliated, and both urban based and rural SCOP. Kehrer *et al*. (2010) described a number of areas where both Canadian and U.S. SCOP might cooperate for the mutual benefit of both associations.

CEO pharmacy deans have the responsibility as leaders of pharmacy education to be role models in the area of scholarship, teaching, and service (Bauman *et al*., 2012; Kehrer & Svensson, 2012). One of the ways to measure scholarship is through the discipline of bibliometrics, which involves the application of mathematical and statistical methods to scholarly publications (Thompson & Walker, 2015). By applying bibliometric principles to pharmacy publications, benchmarks can be established to set goals for scholarly production (Bosso *et al*., 2010). The potential to establish bibliometric standards for pharmacy deans, department chairs, pharmaceutical faculty, and pharmacy practice faculty using subgroup analysis (public vs. private, research-intensive vs. teaching-intensive, *etc*.) could eventually provide a global framework for scholarly standards in academic pharmacy.

The purpose of this research was to characterise the publication records and bibliometric indices of the current CEO deans of Canadian SCOP and compare these data to U.S. pharmacy deans.

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Methods

This was a cross-sectional study of the current deans of SCOP in Canada as of November 1, 2017. Canadian deans were identified using the online list from the Council of Deans from the AFPC website. The methodology of Thompson and Nahata (2012) was used in conducting the Web of Science searches and calculating the bibliometric indices utilising the methods and software programmes developed by Soler (2006). Briefly, the search strategy for this study began with a general search of the author and the country of the SCOP (Example, au=Smith J* and ad=Canada). These publication files were then captured and screened through the FILTER programme to remove homologues. After filtering, the files were compiled and analysed using the MERIT programme. These data were then entered into an Excel spreadsheet for further analysis. The estimated accuracy and precision of the methodology was 95% and 98%, respectively (Thompson, 2010). In addition, data were double-checked using information, biographies, and press-releases available on the individual Canadian SCOP website. Further checking was done through biographical research web sites such as ResearchGate, ResearcherID, LinkedIN, and others. Lastly, viewing of the original research articles was done if homologues were still in question. Comparative data from U.S. SCOP's were obtained from a recently published paper (Thompson, 2019).

Initial statistical analysis involved descriptive and inferential statistics. The Kruskal-Wallis analysis of variance for nonparametric data was used to assess differences between two groups. The a priori level of significance was set at $p<0.05$.

Table I: Demographic data comparing Canadian pharmacy deans with U.S. pharmacy deans

	Canadian Deans (n=10)	U.S. Deans (n=124)
Discipline	Pharmacy Practice = 4 (40%) Pharmacy Administration = 2 (20%) Pharmacology = 2 (20%) Pharmaceutics = 2 (20%) Medicinal Chemistry = 0	Pharmacy Practice = 62 (50%) Pharmacy Administration = 16 (13%) Pharmacology = 24 (19%) Pharmaceutics = 10 (8%) Medicinal Chemistry = 12 (10%)
Gender	Male = 5 (50%) Female = 5 (50%)	Male = 96 (77%) Female = 28 (23%)
Terminal Degree	Ph.D. = 6 (60%) Pharm.D. = 3 (30%) Other = 1 (10%)	Ph.D. = 61 (49%) Pharm.D. = 58 (47%) Other = 5 (4%)

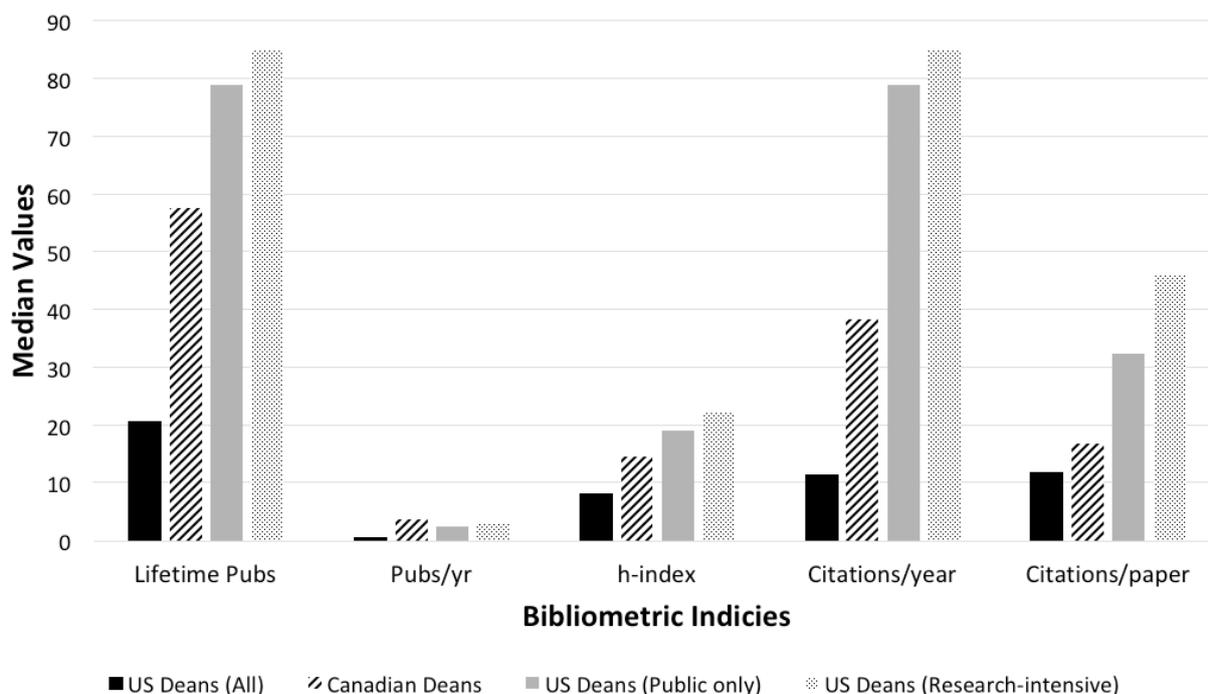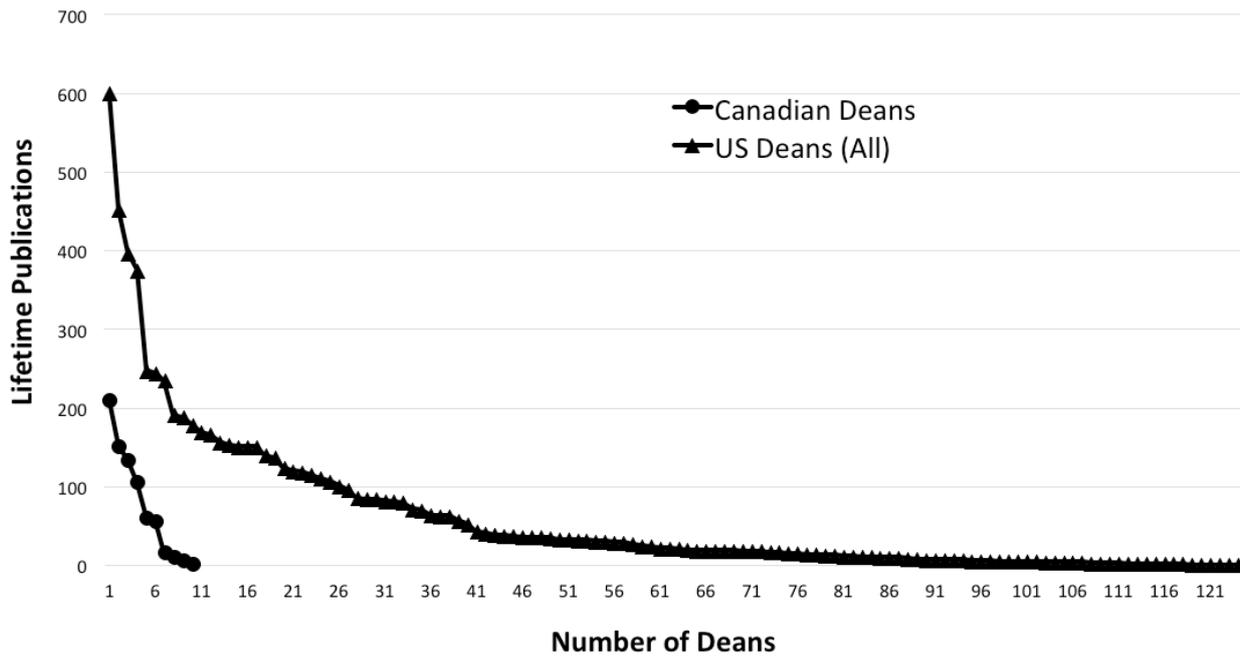**Figure 1: Bibliometric indices (medians) for Canadian and U.S. deans of pharmacy**

Figure 2: Canadian and U.S. pharmacy dean lifetime publications

Results

At the time of the study, there were nine pharmacy deans in Canada and one interim dean for a total of ten deans. Demographic data on the ten Canadian deans as compared to U.S. deans are listed in Table I. Fifty percent of Canadian pharmacy deans were female as opposed to only 28% of U.S. pharmacy deans. There were no statistical differences between female and male bibliometric indices or publication records. Also, the doctor of philosophy (Ph.D.) degree was more prominent as the terminal degree for Canadian deans (60%) versus U.S. deans (49%) and the Pharm.D. degree more prominent in the U.S. (47%) versus Canadian deans (30%). Figure 1 displays bibliometric indices for both groups represented by bar graphs. Median bibliometric indices for Canadian pharmacy deans (N=10) vs. all U.S. pharmacy deans (N=124) vs. public-only U.S. pharmacy deans (N=57) vs. research-intensive U.S. pharmacy deans (N=51) were as follows: publications/year=3.5 vs. 0.4 vs. 2.3 vs. 2.8, h-index=14.5 vs. 8 vs. 19 vs. 22, total citations=628.5 vs. 223.5 vs. 1,122 vs 1,563, citations/year=38.2 vs. 11.2 vs.79 vs. 85. Canadian pharmacy dean publication data appear closer to deans at publicly funded U.S. SCOP than all pharmacy dean or research-intensive U.S. SCOP. Figure 2 provides data on lifetime publication numbers for all U.S. pharmacy deans (median=20.5) and Canadian pharmacy deans (median=57.5). Approximately 20% of deans accounted for 48% of all Canadian dean publication. None of the demographic data or bibliometric indices were statistically different between U.S. and Canadian deans.

Discussion

Recently, the Global Competency Framework was developed by the International Pharmaceutical Federation (FIP) (Stupans *et al*., 2016). This instrument provides a global framework of consensus knowledge, skills, and attitudes at the level of the practitioner pharmacist. Stupans *et al*. (2016) compared the pharmacy student degree outcome expectations of four different countries (U.S., United Kingdom, Canada, and Australia) to this global framework. The authors found that, while articulating their degree outcomes slightly differently, the precepts of the learning were remarkably similar across the four countries, with some individual differences. These efforts are important in potentially establishing a goal of developing academic benchmarks for faculty on a global scale. Bibliometric data could contribute to these efforts by providing normalising data to compare faculty scholarship efforts.

U.S. pharmacy dean publication records have been evaluated in two different studies (Thompson & Callen, 2008; Thompson, 2019). Despite the ten year difference in data collection, methodology and databases, there were similar results obtained in both the 2007 study Thompson, 2008) and the 2017 study (Thompson, 2019). Deans from public schools had more publications than from private schools in both studies (*p*<0.01). Approximately 20% of deans accounted for 60% of all the publications in both of the previous studies. Deans publishing five or fewer lifetime publications accounted for approximately one-quarter of the total number of deans in the two previous studies. Canadian pharmacy dean were less skewed than what would be predicted

from Lotka's law (Lotka, 1926). With 20% of Canadian deans accounting for just 48% of all publications, this is lower than the generally "80-20" rule where 20% of authors (or faculty members) produce 80% of a group's publications (Lotka, 1926).

Gender discrepancies continue to exist in higher education, particularly in the science disciplines. Inequalities in salary, research funding, publications, and fewer women achieving full professor, chair or dean positions continue to plague academic pharmacy (Svarstad, *et al.*, 2004; Draugalis & Plaza, 2010; Chisholm-Burns *et al.*, 2012; Sugimoto, 2013; West *et al.*, 2013; Draugalis *et al.*, 2014; Tomei *et al.*, 2014). Pharmacy has not been immune to such gender inconsistencies (Draugalis & Plaza, 2010; Draugalis *et al.*, 2014). Female deans at U.S. pharmacy SCOP have ranged between 15-26% of all pharmacy deans over the period of 2002-2017 (Draugalis & Plaza, 2010; Draugalis *et al.*, 2014; Thompson, 2019). Unlike the U.S. situation, Canadian pharmacy deans are equally split between male and female at 50%. Moreover, like their American counterparts, no statistical difference was found between male and female deans in number of lifetime publications (Thompson & Callen, 2008).

Bibliometric methodology always carry limitations. Database limitations, homologues, and source documents errors can be areas of concern. While there are a number of databases available to conduct searches of pharmacy, pharmacy practice, and pharmaceutical sciences, WoS continues to be the single best source of bibliometric data and is the only database with comprehensive historical data and complete author addressees (Yang & Meho, 2008; Kulkarni *et al.*, 2009). Authors with the exact same name in different disciples (homologues) continue to be source of difficulty in bibliometric searches (Soler, 2007; Smalheiser & Torvik, 2009). The software programme developed by Soler (2006) has established accuracy of 95% and precision of 98% in pharmacy author searches (Thompson, 2010). Additional steps taken in this study to decrease the likelihood of homologue interference include searching SCOP web sites. In addition, and a number of publicly accessible online research websites (*i.e.*, ResearchGate, *etc.*) to verify and confirm research publications. Finally, source documents can contain inherent errors however, considering the vast amount of bibliometric data these databases enter daily, the percentage of errors can be considered minuscule (MacRoberts & MacRoberts, 1989). In addition to the bibliometric methodological limitations, the small number of Canadian deans, as compared to U.S. deans was also a limitation.

Conclusion

Median bibliometric indices of Canadian pharmacy deans were higher but not significantly different from U.S. pharmacy deans. Canadian dean bibliometric data were more similar to the subgroup of deans from public U.S. pharmacy SCOP than the composite data from all U.S. deans. In addition, 50% of Canadian pharmacy deans were female as compared to 28% of U.S. deans. Benchmarking of bibliometric data in pharmacy have the potential to provide normative values to compare and contrast different academic strategies for faculty and student success

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