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Using Bradford's law of scattering to identify the core journals of pediatric surgery

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ABSTRACT

Background: Bradford's law of scattering defines an exponentially diminishing return when extending a search for references in journals and can be used to identify the "core" journals in a field. The purpose of this study was to identify the core journals of pediatric surgery.

Methods: With Institutional Review Board approval, we developed bibliometric profiles for the top academically productive pediatric surgeons in the United States. These profiles included the total number of publications, journals in which those authors published their manuscripts, and identification of all articles cited by those surgeons, along with the journals those references were drawn from. Bradford's law of scattering was applied to identify the core journals of pediatric surgery.

Results: We identified $n = 69$ pediatric surgeons (10 ± 0.2 5-year h-index). These authors published 10,031 articles (145 ± 90 per surgeon), which were cited 250841 times (3635 ± 413 per surgeon). Pediatric surgeons' articles contained 199507 references (2891 ± 176 per surgeon). We analyzed 58,310 references (top 20 journals) cited by pediatric surgeons. Bradford's Law identified a single core journal for p = 3-10 zones, with $P = 3$, providing the best correlation between predicted and actual values ($R^2 = 0.9996$). The core journal for pediatric surgery is *Journal of Pediatric Surgery*.

Conclusions: We used Bradford's Law to identify the core journals of pediatric surgery. These core journals include the two leading pediatric surgery−specific journals and the highest impact factor journals in surgery (*Annals of Surgery*) and medicine (*NEJM*). These findings can help busy pediatric surgeons focus their reading to stay updated in a rapidly evolving field.

Introduction

Evidence-based practice is a critical component of modern health-care delivery. The practice itself not only promotes the best medical and surgical practices but can also contribute to decreasing health-care costs.[1] It has become such an integral part of surgical education as well that the American College of Surgeons has established an evidence-based decision program for common surgery procedures.[2] However, every decade, the amount of scientific literature from which one can draw evidence has increased exponentially. The plethora of information can be overwhelming to trainees and practicing surgeons. Thus, one of the ways to cope with the advancing information is to regularly read journal articles focused on the respective subspecialty. However, due to the rapid increase in information, there are many journals one can chose from to learn about the advances in the field. While this problem may seem most burdensome for large specialties, smaller subspecialties like pediatric surgery also face the same problem. Thus, there is a need to identify a list of core journals in which the most up-to-date and relevant articles are published.

Bradford's law of scattering was developed in 1934 and states, "if scientific journals are arranged in order of decreasing productivity of articles on a given subject, they may be divided into a nucleus of periodicals more particularly devoted to the subject and several groups or zones containing the same articles as the nucleus, when the number of periodicals in the nucleus and succeeding zones will be as 1: n: n^2, where "n" is a multiplier".[3,4] In other words, this describes how the work in a subject can be organized into zones that have the same number of articles as the "core". These zones signify the level of importance. To illustrate, the core zone is a small group of journals that has the most relevant articles that are widely cited (Fig. 1). As the number of zones increases, it is less likely that the journals in those zones publish articles that are widely cited.

Bradford's Law has been used to organize literature in multiple fields. Recently, the law has been applied to distribute journals in neurosurgery,[5-7] bariatric surgery,[8] and rheumatology.[9] However, the law of scattering has yet to be applied to the field of pediatric surgery, where the distribution of published articles is separated into pediatric, surgical, medical, and obstetric journals. Thus, there is a need to establish core journals where trainees and practicing pediatric surgeons can reference to find articles relevant to pediatric surgery. The goal of this study was to identify the core journals in pediatric surgery. We hypothesized that there would be several core journals, with the primary focus being on pediatric surgery.

Methods

Ethics statement

This study was approved by the Institutional Review Board of the University of Tennessee Health Science Center.

Study population and bibliometric profiles

We have previously described the generation of bibliometric profiles for academic pediatric surgeons and pediatric surgery training programs.[10] Briefly, the 48 United States pediatric surgery fellowship training programs were identified, and each institutions' website was used to identify board-eligible/certified pediatric surgeons ($n = 434$). Elsevier's Scopus was used to obtain each surgeon's complete bibliographic record. All searches were conducted in January-March 2017. From this list, surgeons ($n = 69$) whose 5-year h-index was greater than one standard deviation above the mean were identified as the top academically productive pediatric surgeons in the United States. The following information was then extracted for each of those authors: total number of publications, total number of
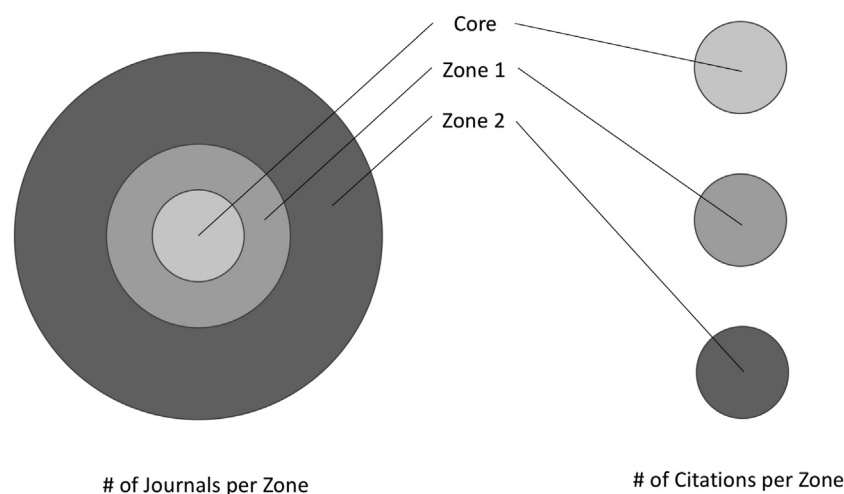

Fig. 1 — Schematic representation of Bradford's law of scattering. On the left, the number of journals present in each zone is indicated with progressively enlarging zones. On the right, the number of citations represented in each zone is depicted. The number of citations in each zone is constant, while the number of journals required to find those citations increases exponentially.