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The Publication Ranking Score for Pediatric Urology: Quantifying Thought Leadership within the Subspecialty

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Abstract

OBJECTIVES—Clinical care parameters are frequently assessed by national ranking systems. However, these rankings do little to comment on institutions' academic contributions. The Publication Ranking Score (PRS) was developed to allow for objective comparisons of scientific thought-leadership at various pediatric urology institutions.

METHODS—Faculty lists were compiled for each of the *US News & World Report* (USNWR) top-50 pediatric urology hospitals. A list of all faculty publications (2006–2011) was then compiled, after adjusting for journal impact factor, and summed to derive a Publication Ranking Score (PRS). PRS rankings were then compared to the USNWR pediatric urology top-50 hospital list.

RESULTS—A total of 1,811 publications were indexed. PRS rankings resulted in a mean change in rank of 12 positions, compared to USNWR ranks. Of the top-10 USNWR hospitals, only 4 were ranked in the top-10 by the PRS. There was little correlation between the USNWR and PRS ranks for either top-10 ($r=0.42$, $p=0.23$) or top-50 ($r=0.48$, $p=0.0004$) hospitals.

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Conflict of Interest: JSW currently serves on the pediatric urology working group for RTI International Best Hospitals Project which is a consultant to *US News and World Report* magazine regarding their ranking of pediatric urology hospitals. JSW also has served on an advisory panel for Glaxo Smith Kline. AK is a co-manager and co-owner of UrologyMatch, LLC. None of the remaining authors have any conflict of interest, financial or otherwise, to disclose.

CONCLUSIONS—PRS institutional ranking differs significantly from the USNWR top-50 hospital list in pediatric urology. While not a replacement, we believe the PRS to be a useful adjunct to the USNWR rankings of pediatric urology hospitals.

Keywords

Urology; Pediatric Hospitals; Program Evaluation; Quality of Healthcare

INTRODUCTION

Patients are paying increasing attention to national hospital rankings, particularly those put forth by *U.S. News & World Report* (USNWR).^{1,2} The USNWR rank list of “America's Best Hospitals” is based on three domains of health care quality: structure, process, and outcome.³ Structure is determined by variables such as nurse staffing, availability of imaging and other technologies, patient volume, and nursing magnet status. Outcome is determined by variables such as adjusted mortality rates and number of adverse patient events. The process domain is determined by the hospital's reputation amongst clinicians within a given specialty. Unlike the structure and outcome scores, the process rankings are subjectively generated from survey responses of approximately 450 urologists who are asked to list what they consider to be the top five urology programs in the country. Given the inherent subjectivity of this measure, some authors have reported concerns regarding possible bias in this assessment.⁴ Indeed, little relationship exists between the subjective process score and the objective quality measures of the structure and outcomes scores.⁵ Thus, the USNWR rankings, while intended to be a pure measure of hospital quality, may instead lean heavily on institutional reputation.

Recently, Kutikov and colleagues reported their own ranking methodology for urology programs, based entirely on the academic output of those programs.⁶ They coined the name Academic Ranking Score (ARS) for their measure, which assesses scholarly productivity by quantifying contribution to the scientific literature and ‘thought leadership’ within urology. Kutikov's ARS is designed to provide an objective metric that would fall within the USNWR “process” domain. Though it must be noted that the ARS addresses only one aspect of academic output—publications—and not elements of the structure or outcome domains, Kutikov *et al.* found that the average program changed rank by more than 5 positions between the USNWR rankings and the ARS list. Indeed, there was no correlation between programs ranked in the top 10 by USNWR and the ARS.

To date, this methodology has not yet been extended to pediatric urology institutions. We sought to expand this new ranking system for the assessment of pediatric urology institutions in order to better quantify the scholarly contributions of various programs and to compare these scores with the USNWR hospital rankings. As noted above, the ARS does not encompass all aspects of academic productivity; thus for the purposes of this analysis we used another term, the Publication Ranking Score (PRS), for clarity.

PATIENTS & METHODS

For each hospital listed in the 2012–2013 USNWR rankings of the fifty “Top Ranked Hospitals for Pediatric Urology,” we compiled a summary of the currently-employed pediatric urology faculty. We searched hospital websites and contacted programs directly as needed. As part-time versus full-time employment status of the physicians was not listed by any of the programs, stratification by full-time equivalents was not performed. Few programs listed non-clinical (PhD) faculty on their webpage. However, for those that did, academic output of these researchers was included in the assessment. A small number of physicians were employed at more than one top-50 hospital. In such cases, these clinicians were included in each hospital's faculty list.

Search Strategy

After compilation of an institution's faculty list, a PubMed search for academic output, including journal articles, reviews, case-reports, and editorial comments, from January 2006 to January 2011 was performed. Using Boolean operators, all publications by each clinician/scientist during the specified period were collected. Author position (e.g first author, second author, etc) was not considered in the search; all author positions were weighted equally. Search results were then manually reviewed by two reviewers (RJM and JCL). Articles irrelevant to our search were removed, such as those that did not address urologic subject matter. In instances in which an article was written collaboratively by more than one author from a particular program, the article was only counted once toward the program's total. If an article was written collaboratively by authors from different programs, then the article was counted toward each program's total. All of an author's academic output over the 5-year study period was counted toward the program where he or she practiced at the time the USNWR rank list was published.

Normalization by Impact Factor

After collecting the list of academic output from each program, we normalized this content by the impact factor of the journal in which it was published. Impact factors were obtained from Web of Science. When available, the 5-year impact factor was used. When there was no 5-year impact factor, then the most recent impact factor was used. Journals without an impact factor were scored as zero for our analysis.

Once impact factors were obtained, the number of publications per journal per institution was adjusted by multiplying each journal's total publication count by each journal's impact factor. These weighted publication totals were then summed to create the raw publication ranking score (PRS). The raw PRS was then divided by the number of clinicians/scientists at each institution to determine the faculty-adjusted PRS. Both the raw and adjusted PRS were then compared to the USNWR top-50 hospital rank list.

Statistical Analysis

Descriptive statistics and Spearman correlation coefficients were calculated using STATA 11.2 (College Station, Texas). Two-sided p-values of less than 0.05 were considered to be statistically significant.

RESULTS

Literature Search

A total of 1,811 publications produced by the faculty at pediatric urology programs listed in the USNWR top-50 hospitals were indexed to compute each institution's PRS. On average, there were 4.2 physicians per hospital (SD 2.5, range 1–12). The mean number of publications per pediatric urologist per year was 1.8 (SD 1.4, range 0.07–8.4 at each program). The raw PRS ranged from 1.8 to 505.3 for pediatric urology programs, with a mean of 103.5 and a median of 79.9.

Per-Program PRS

Calculation of institutional rank based on PRS led to an average change in rank of ± 12.0 positions (Table 1) from the USNWR rankings. Of the top-10 USNWR hospitals, only 4 were ranked in the top-10 by the PRS. Of the USNWR top-10 hospitals, the average change in rank was ± 10.0 positions, with a range of 1 to 27 positions (Figure 1). There was little correlation between the ranks of institutions in the USNWR top-10 ($r=0.42$, $p=0.23$) or top-50 ($r=0.48$, $p=0.0004$) and the PRS ranks.

Faculty-adjusted PRS

When the PRS ranks were adjusted for number of faculty within each program, the average change in rank increased to ± 17 positions, but relationships between the top-10 ($r = -0.21$, $p=0.56$) and top-50 ranks ($r = -0.10$, $p=0.49$) demonstrated no significant correlation. Of the top-10 USNWR hospitals, only 2 were ranked in the top-10 by the faculty-adjusted PRS. Of the USNWR top-10 hospitals, the average change in rank was ± 19 positions, with a range of 3 to 34 positions (Figure 1).

DISCUSSION

No ranking system is perfect. One has only to consider the history of “best-of” lists to rapidly realize that they all have flaws obvious to both expert and casual observers alike. Recent rankings from fields as diverse as American colleges and universities,⁷ the film industry,⁸ and college athletics⁹ serve to exemplify the controversy that necessarily surrounds all attempts at ranking complex entities in simple numeric order.

In the world of pediatric urology, neither the PRS nor the USNWR rankings can claim to adequately capture all of the qualities of a strong pediatric urology program: superior clinical and surgical care for both rare and common conditions, scientific rigor and innovation, academic involvement and leadership, and high-caliber nursing and ancillary support, to name but a few. In short, numerous characteristics are necessary for a pediatric urology program to be considered “excellent,” and as a result, attempts to adequately categorize our community in a “best-of” list are essentially impossible. Given the complexity of weighting various program features and the inability to collect data that can robustly and completely characterize all of these qualities, it necessarily follows that all rankings are flawed; nevertheless, despite their flaws, some can be useful.

The USNWR attempts to categorize hospitals on their clinical merits; essentially, the question these rankings are trying to address is “Where should a parent take their child for treatment?” While this question is clearly of paramount importance, it seems evident that there is more to pediatric urology programs than just their clinical reputation. The PRS is an attempt to begin to answer another question altogether: “Which pediatric urology programs are contributing most to the academic and scientific milieu within our community?” Thus, the PRS is not intended to replace the USNWR, but instead simply to provide an additional viewpoint based on a different set of criteria.

Unlike the USNWR structure and outcome scores, the process component of the rankings is determined subjectively, via a survey of a small number of urologists. This methodology leaves the process component vulnerable to bias. As such, previous groups devised a more objective measure of “process”, ultimately generating the ARS of Kutikov and colleagues.⁶ In this study, we applied the ARS (which we alternatively dubbed the “publication ranking score”, PRS, to denote the subtly different methodologies between their study and ours) to the subspecialty of pediatric urology. Ultimately, the rankings of academic output determined by the PRS differ significantly from the USNWR hospital rankings. Only four top-10 USNWR hospitals remained in the top-10 based on the PRS. Calculation of the institutional PRS rank resulted in a change in rank of 12 positions, on average (range 0–30), and there was no significant correlation between USNWR rank and PRS rank.

Public awareness of the USNWR rankings is widespread and institutions make efforts geared to improving their position in these rankings.¹ However, a process score that relies heavily on reputation leaves this measure subject to considerable bias, as physicians who contribute survey responses may have conflicts of interest that influence their decision-making regarding which hospitals they rank.⁶ Indeed, the overall USNWR rankings closely correlate with rankings generated by the process score alone.^{10,11} As such, the USNWR system, which is marketed as a measure of hospital quality, is in fact quite substantially a measure of hospital reputation. We believe that an objective, reproducible, and current metric such as the PRS is a useful adjunct to consider along with the USNWR pediatric urology hospital rankings.

By collating scholarly output and weighting it based on the quality (defined, for better or for worse, by impact factor) of the journal in which it was published, the PRS objectively measures academic output. In addition to greater objectivity, we believe the PRS offers greater transparency than USNWR. The PRS is not meant to be a measure of hospital quality, but rather a measure of one *aspect of institutional* quality—academic output or thought leadership—to be considered within a spectrum of other structural and outcome metrics when attempting to discriminate between pediatric urology programs.

Our study's methods generally mirror those of Kutikov, but do differ in two important areas.⁶ Whereas Kutikov *et al.* only included academic contributions made by clinical faculty, we sought to also include manuscripts written by basic scientists and other non-MD urologic researchers. We believe that basic science, translational, and interdisciplinary research is equally as valuable as clinical research, and institutions that valued these types of inquiry deserved recognition, in the form of a higher institutional PRS. Moreover, Kutikov

and colleagues included only publications in which the departmental contributor was either first- or last-author, reasoning these positions denoted the greatest contribution to the manuscript content. However, we recognize that collaborative research efforts are becoming increasingly commonplace as contemporary research strategies become more technically complex and each researcher hones a unique skillset. As such, we chose to include middle authors, believing that they are contributing substantially (particularly in light of the increasing frequency with which journals are requiring author attestation statements describing each author's contribution to the manuscript's conception, execution, and drafting).

Our study is not without limitations. As noted above, manuscript publication in high-quality journals is clearly important, yet it only captures one aspect of a pediatric urologist's scholarly contributions. Other measurable indicators of quality academic contributions may include amount of peer-reviewed grant funding, number of presentations given at scholarly meetings, and presence of faculty members on editorial boards or other leadership roles in urology.¹² The PRS does not measure these features of academic productivity.

Additionally, the professional mobility of today's pediatric urologists complicates the PRS. We credited each author's academic output over the 5-year study period toward the program where s/he practiced at the time the USNWR rank list was published. However, if an author recently transitioned to a new institution, the hiring institution will invariably reap the benefit of his/her productivity. Ultimately, this crediting schema rewards institutions for hiring academically-productive faculty. The prior institution is relatively disadvantaged given that graduated trainees, for example, bolster another institution's PRS without further raising the originating institution's PRS. This is ameliorated by the continual academic output of incoming fellows. Furthermore, we recognize that the PRS does not quantify clinical acumen or teaching skills, both of which must also be strong for a urologist to achieve the true "triple threat" status of clinician-scientist-teacher.

Finally, the impact factor is an imperfect measure of the contribution of an individual manuscript since it is designed to measure a *journal's* academic contribution, rather than that of individual articles.¹³ Indeed, a small number of highly-cited articles can greatly inflate a journal's impact factor, even if the majority of manuscripts published in the journal are cited much less frequently.¹⁴ While adjustment by impact factor does help temper the effect of large volumes of lower quality manuscripts, it cannot account for a highly meaningful work that is only applicable to pediatric urologists and not to a broader audience, as higher impact factors are often related to journals that focus on primary care or general health.¹⁵ Similarly, both impact factor and PRS likely bias towards clinical research as these often require less investment of time and resources to produce than a typical basic science manuscript.¹⁶ These quirks of impact factor methodology are not insignificant. However, given its widespread acceptance and use, we believe adjustment based on the impact factor to be superior to adjustment based on another factor of our creation.

While the PRS is an incomplete picture of an institution's net contribution to the field of pediatric urology, we believe that it provides a valuable adjunct to the USNWR rankings,

and we hope that our metric will serve as a springboard for further discussion regarding how to best quantify academic quality across pediatric urology institutions.

CONCLUSIONS

The PRS institutional ranking differs significantly from the USNWR top-50 hospital list in pediatric urology and provides a useful, transparent, and objective measure of thought leadership and academic productivity within pediatric urology institutions. We believe this measure can serve as a valuable adjunct to other rankings of pediatric urology programs.

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Figure 1.
 Change between *U.S. News & World Report* rank and publication ranking*
 *Hospital USNWR rank listed at top of rank-change bar

Table 1

USNWR 2012 Top-50 Pediatric Urology Hospitals Re-Ranked by the Publication Ranking Score (2006–2011)

PRS Rank	USNWR Ranking 2012	Change in Ranking	Publication Ranking Score (No. publications adjusted by impact factor)	No. of Faculty	No. of Publications (2006–2010)	PRS Rank Normalized by Number of Faculty
1	2	1	505.3	12	158	8
2	6	4	308.3	11	117	19
3	19	16	265.6	6	63	6
4	29	25	237.6	3	68	2
5	20	15	210.8	2	84	1
6	1	−5	207.8	7	78	18
7	14	7	196.7	6	62	15
8	10	2	176.3	4	72	7
9	27	18	176.0	3	51	3
10	4	−6	171.6	9	69	28
11	8	−3	159.4	6	50	21
12	12	0	151.9	6	33	22
13	5	−8	147.1	8	56	29
14	16	2	143.3	10	52	38
15	33	18	141.6	4	49	12
16	46	30	138.7	5	47	20
17	15	−2	137.9	8	50	31
18	28	10	116.5	3	42	9
19	22	3	113.8	3	35	10
20	3	−17	108.5	5	42	25
21	50	29	106.7	2	38	4
22	38	16	90.5	3	39	16
23	17	−6	90.1	2	32	5
24	36	12	86.8	4	27	24
25	12	−13	84.9	4	63	26
26	41	15	74.8	5	4	35
27	30	3	72.3	2	24	11
28	43	15	65.6	3	21	23
29	47	18	60.1	2	23	17
30	31	1	57.8	4	21	36
31	26	−5	57.5	3	26	27
32	7	−25	53.0	5	20	41
33	44	11	52.9	3	10	30
34	32	−2	50.3	3	17	33

PRS Rank	USNWR Ranking 2012	Change in Ranking	Publication Ranking Score (No. publications adjusted by impact factor)	No. of Faculty	No. of Publications (2006–2010)	PRS Rank Normalized by Number of Faculty
35	34	–1	44.5	4	17	39
36	9	–27	41.3	5	16	43
37	39	2	33.7	2	6	32
38	35	–3	33.6	1	12	13
39	48	9	33.3	1	12	14
40	11	–29	32.2	2	16	34
41	23	–18	28.7	2	14	37
42	18	–24	21.4	2	7	40
43	24	–19	19.6	4	7	46
44	49	5	18.3	4	10	47
45	39	–6	13.2	2	13	44
46	41	–5	12.3	5	30	48
47	21	–26	10.4	2	3	45
47	45	–3	8.5	1	3	42
49	36	–13	2.3	2	1	49
49	25	–25	1.7	3	1	50