

Creating a Pharmacy Publication Repository: Benchmarking Qualitative and Quantitative Measures of Scholarship in a Pharmacy Department

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Conducting research and contributing to medical literature are integral aspects of improving patient care by sharing knowledge and advancing pharmacy practice. The American College of Clinical Pharmacy (ACCP) standards of practice for clinical pharmacists endorse involvement in research and scholarship to advance care.¹ Similarly, the American Society of Health-System Pharmacists (ASHP) emphasizes the importance of research in its residency accreditation standards, standards for Certified Center of Excellence in Medication-Use Safety and Pharmacy Practice designation, and minimum standards for hospital pharmacy practice.²⁻⁴

In partnership with the Medical College of Wisconsin (MCW) and the MCW Institutional Review Board, the Pharmacy Research Committee (PRC) at Froedtert Health (FH) upholds the standards set forth by ACCP and ASHP through its commitment to promote high-quality research and quality improvement projects. Since its formation in 2011, the PRC's primary focus has included reviewing pharmacy research and quality improvement projects and ensuring the quality and scientific validity of project protocols. The quality and extent of projects completed may seem apparent to those implementing quality improvement projects or publishing

Abstract

Objectives: The purpose of this initiative was to quantify scholarship of pharmacists at Froedtert Health (FH), categorize their publications according to the quality metrics of the journals in which they were published, and create a repository to organize the data.

Methods: This project was a retrospective evaluation of publications written by pharmacists employed at Froedtert Health from the health system's founding in 1980 through 2023. Quantity of publications was measured for all employees and for residents. Quality metrics for each publication's journal included journal citation indicator (JCI) quartile, JCI percentile, JCI category, and journal impact factor (JIF).

Results: In total, 299 publications by Froedtert Health employees were identified from 1980 through 2023. Residents were authors for 79 (26.4%) of the publications. The journals with the most publications were the *Journal of the Pharmacy Society of Wisconsin (JPSW)* and the *American Journal of Health-System Pharmacy (AJHP)* with 37 publications each. The top JCI category was Pharmacology & Pharmacy. Overall, JCI quartiles one and two accounted for slightly over half of all publications in the repository. Journals in the third quartile accounted for the greatest proportion of publications (85/207, 41.1%). The mean JIF was 3.58.

Conclusions: Creation of a scholarship repository allowed for objective measurement of publications. The data in the tool demonstrated increases in the volume of publications and quality metrics over time.

Keywords: research, medical writing, and health system

manuscripts, but there is a lack of objective data to demonstrate the quantity and quality of scholarly work in the pharmacy department. Records of past publications could allow for objective demonstration of FH scholarship. Benchmarking this data could allow the PRC to set measurable goals in continuously improving the quality of published research and quality improvement projects.

The purpose of this initiative was to quantify scholarship of pharmacists at FH, categorize publications according to quality metrics of the journals they were published in, and create a repository to organize the data.

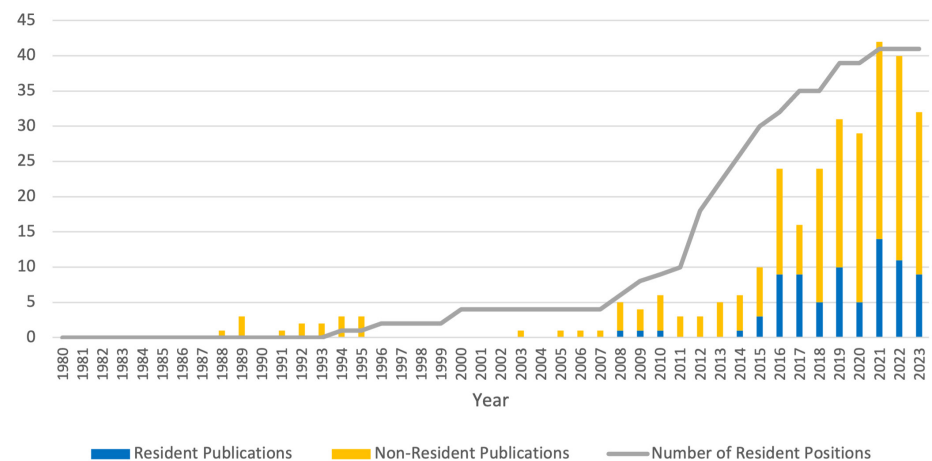
Methods

This project was a retrospective evaluation of publications written by pharmacists employed at FH from the health system's founding in 1980 through 2023. The project included the creation of a scholarship repository to organize the retrospective data, assess quantity and quality of publications, and allow for ongoing evaluation of publications as they are completed.

This project was completed at FH, a health system in southeast Wisconsin with 40 clinics and 10 hospitals, which include an academic medical center affiliated with MCW. The pharmacy department began with six pharmacists at a single inpatient site in 1980 and has grown to 359 pharmacists across dozens of sites, including ambulatory, inpatient, and specialty environments, in 2023. Many of these pharmacists conduct quality improvement or research projects. Additionally, pharmacists involved in professional organizations and academia participate in professional writing endeavors such as practice standards and textbook chapters. Among the 359 pharmacists at FH are 41 residents in various practice areas, including acute care, ambulatory care, community, health system pharmacy administration and leadership, medication use safety and policy, informatics, critical care, emergency medicine, infectious disease, and oncology. All residents are required to complete a longitudinal project each year, some of which are published in journals.

Publications of current and past employees with author affiliations with "Froedtert pharmacy" were collected via

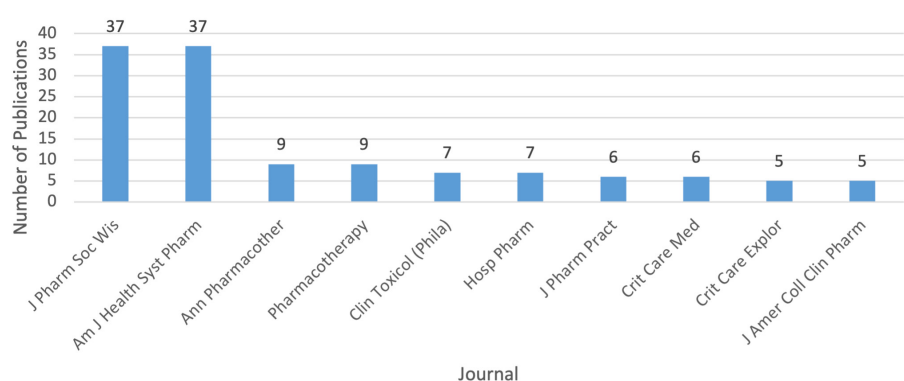
FIGURE 1. Publications Per Year



PubMed and Google Scholar searches of each employee from 1980 through 2023 using employee rosters. To supplement these searches, articles were found in the *Journal of the Pharmacy Society of Wisconsin* (JPSW) using the journal's online index, including issues from 2017 through 2023. Additionally, publications were identified via the pharmacy department newsletter from its inception in 2015 through 2023, which recognized publications that were voluntarily self-reported by authors. Publications included book chapters, journal articles, and practice standard statements, some of which could not be identified via online searches and relied on the supplemental sources. Abstracts were not considered publications and were therefore excluded. Authors were included on the basis of their employment with the FH pharmacy department. This did not include affiliations with MCW or another school of pharmacy in the absence of employment with FH. Data was exported from PubMed as a Microsoft Excel file, which served as

the basis for the repository. Publication data included title, authors, year of publication, and citation, which was entered manually for publications found outside of PubMed. Quality metrics for each publication's journal were assessed using Clarivate Journal Citation Reports (JCR). Information gathered from JCR included journal citation indicator (JCI) quartile, JCI percentile, and JCI category. JCI quartile and percentile are measures of relative journal influence, which take into account citation counts and citation impact.⁵ Quartile one (percentile of 76-100%) is indicative of greater journal impact. JCI category is a classification of a journal's subject matter, such as "toxicology" or "oncology." Journal impact factor (JIF) was also included. JIF is a more commonly used journal citation measurement that is based on the number of citations made in the past year for works published in the journal within the past two years. This differs from JCI, as JCI counts citations made at any time for works published in the past three years. JCI and JIF values

FIGURE 2. Publications by Journal (Top 10) from 1980 to 2023



collected were those for the year each work was published or the most recent year if the current year was not yet available. If a journal was not found in JCR, these metrics were left blank, and publications in that journal did not contribute to JCI or JIF calculations in the repository. All data were compiled in an Excel spreadsheet in a restricted, shared folder on a secure network.

Analysis of the data included yearly trends of the number of works published to assess the volume of scholarship. Publications with resident authors were identified within the total volume. Resident authorship was defined as any publication with an author who was a resident at the time of or one year prior to publishing, or if the publication was the result of the resident author's longitudinal project regardless of whether publication was within one year of residency graduation. The number of publications per journal, JCI category, JCI quartile, and mean JIF were assessed to measure the quality of scholarship through metrics of the journal they were published in.

This project was approved by FH PRC as a quality improvement initiative.

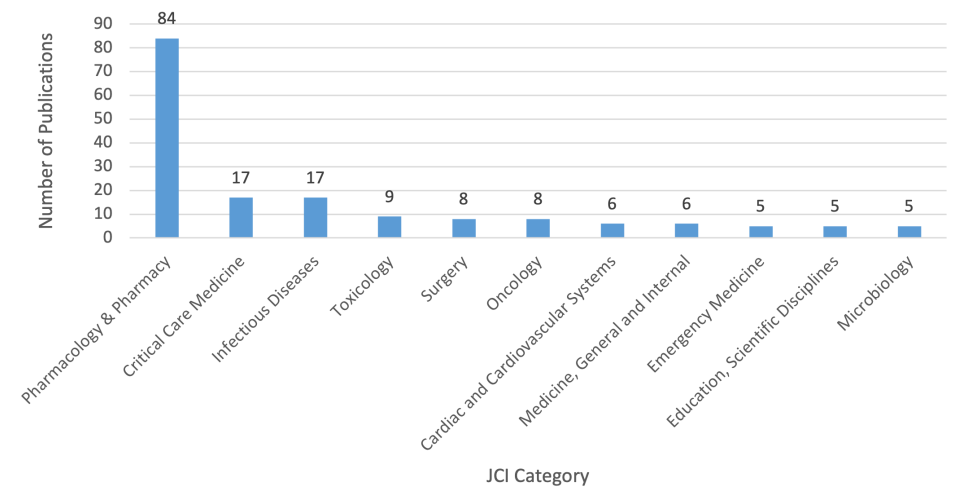
Results

In total, 299 publications from FH pharmacists were identified from 1980 through 2023. FH pharmacists were first authors for 148 (49.5%) of the publications. Residents were authors for 79 (26.4%) of the publications.

The number of annual publications increased throughout the time assessed (Figure 1), peaking in 2021 with 42 publications. The number of residents' publications also slightly increased. In the time assessed, the number of resident authors increased at a rate similar to the increase in total publications. The most recent three years assessed (2021-2023) accounted for 38.1% of all publications in the total 44 year analysis. In contrast, the first three years after publishing began (1988-1990) contained only four publications.

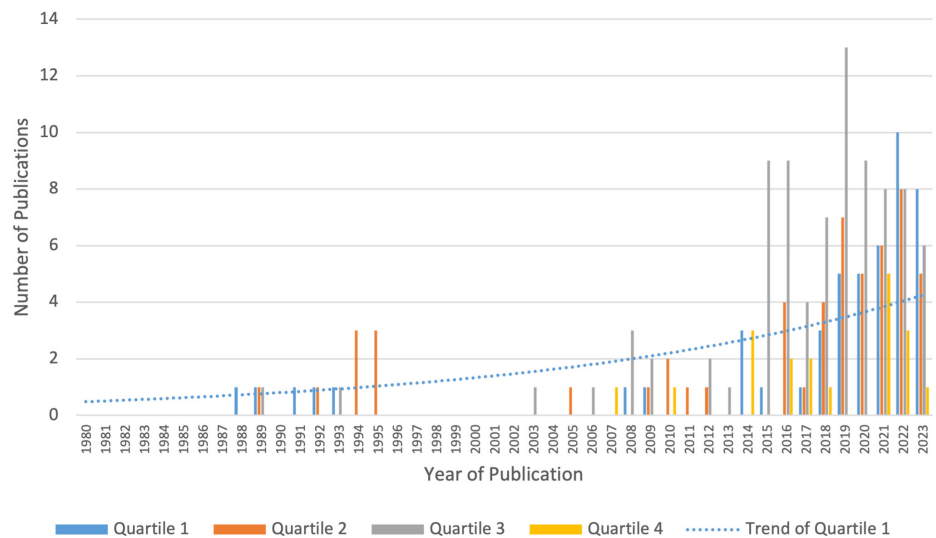
The journals with the most publications from FH pharmacists were *JPSW* and the *American Journal of Health-System Pharmacy (AJHP)* with 37 publications each (Figure 2), followed by *Pharmacotherapy* and *Annals of Pharmacotherapy* with nine publications each, and *Hospital Pharmacy* and *Clinical*

FIGURE 3. Publications by JCI Category (Top 10) from 1980 to 2023



Abbreviation: JCI, Journal Citation Indicator

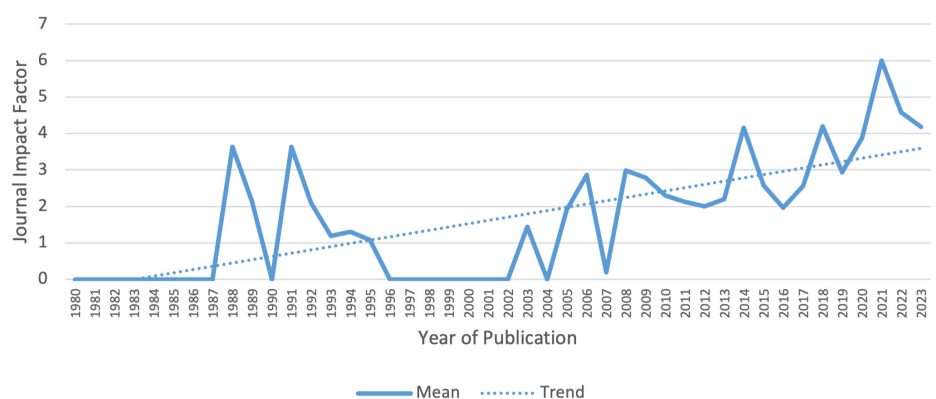
FIGURE 4. Publications in Each JCI Quartile^a Per Year



Abbreviation: JCI, Journal Citation Indicator

^a JCI quartile reported is from the year each work was published or the most recent year if the current year was not yet available.

FIGURE 5. Mean Journal Impact Factor^a Per Year



^a Journal Impact Factor reported is from the year each work was published or the most recent year if the current year was not yet available.

Toxicology with seven publications each. The top JCI category by far was Pharmacology & Pharmacy, followed by Critical Care Medicine and Infectious Diseases (Figure 3).

The distribution of publications in each JCI quartile changed throughout the time assessed with a shift toward a greater proportion of works published in first and second quartile journals as time progressed (Figure 4). Overall, quartiles one and two accounted for slightly over half of all publications in the repository. Journals in the third quartile accounted for the greatest proportion of publications (85/207, 41.1%). This was largely driven by the increase in publications in 2015 and the following years. In the most recent two years, the distribution of quartiles shifted, and quartile one accounted for the greatest proportion of publications (18/49, 36.7%). Similarly, the mean JIF increased throughout the time assessed and demonstrates a positive trend (Figure 5). Overall, the mean JIF was 3.58.

Discussion

The creation of a repository of publications by FH pharmacists in this project uncovered gains in the quality and quantity of publications by members of the pharmacy department. Continuous maintenance of the repository is a sustainable process that requires minimal, albeit manual, effort. Data is kept up to date by running quarterly queries for new publications. The process is simple to allow virtually any individual to be trained to update the data, including pharmacy students.

There are many potential applications for the data available in the research repository. These include measuring scholarly productivity for the pharmacy department, identifying research mentors, and benchmarking progress on the goals of the PRC.

Research and scholarship are important activities to track as they are core elements of pharmacy services according to ACCP and ASHP standards.^{1,4} Measuring quantity and quality metrics allows for internal and external benchmarking for the department, and it allows for recognizing individual staff members for their scholarly contributions. The data in the repository can be easily collected to quantify scholarship across pharmacy department teams (medicine,

surgery, critical care, etc.). Data may also be compared to outside organizations to benchmark scholarship performance against national trends. For example, the repository is planned to be used to compare resident publication rates between Froedtert and national averages. In addition to benchmarking, reporting information on publications provides recognition for the efforts of pharmacists completing projects and highlights their achievements to their peers across the department.

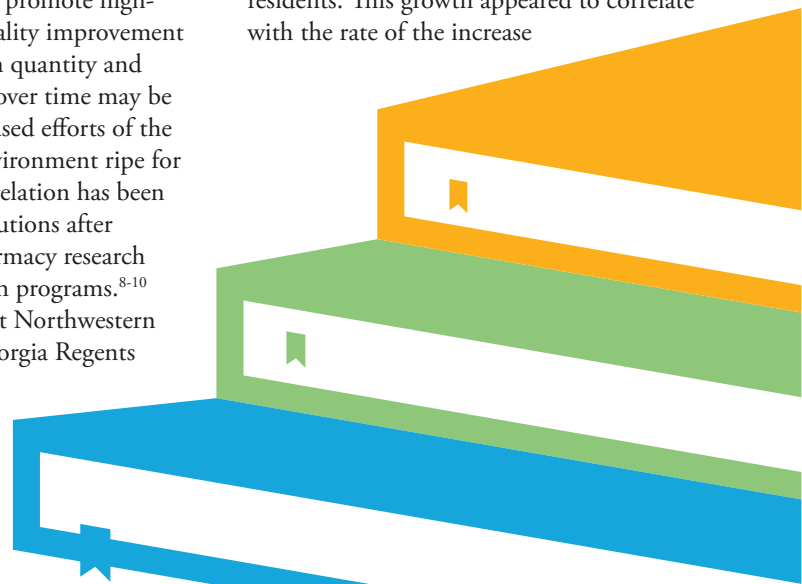
Mentorship has been established as a factor associated with facilitating publication.⁶ In their pursuit of enhancing research training for pharmacy students and residents, the University of North Carolina at Chapel Hill Eschelman School of Pharmacy and the University of North Carolina Medical Center identified common barriers for learners to complete research and provided recommendations to overcome them.⁷ Barriers included a lack of research mentors and the amount of time it takes completing administrative tasks to get a project started. Having a structured process for identifying mentors to pair with trainees was recommended to help to overcome such barriers. The repository may act as a directory of researchers and their research interests, which could be useful in identifying mentors for junior authors and pharmacy students, thus expediting the identification of experienced, published research mentors at FH.

Tracking publication metrics has objectively demonstrated the substantial progress made in both quantity and quality of scholarly output from the FH department of pharmacy staff. This progress relates directly to the primary goal of the PRC, which is to promote high-quality research and quality improvement projects. The increase in quantity and quality of publications over time may be correlated with the focused efforts of the PRC to establish an environment ripe for scholarship. Such a correlation has been reported by other institutions after implementation of pharmacy research committees and research programs.⁸⁻¹⁰ While these programs at Northwestern Memorial Hospital, Georgia Regents Medical Center, and Kaiser Permanente Colorado were limited to resident

projects, their findings may be more broadly applicable to pharmacy research as a whole.

Having publication metrics at FH will allow for strategic goal setting to make further progress on the gains measured thus far in the quantity and quality of publications. In the most recent years, the annual volume of works appeared to be plateauing, suggesting new strategies are needed to further increase yearly publications, or that the potential for publication quantity has been fully realized at the current volume. In accepting the possibility of the latter, the PRC could set modest goals for scholarship quantity using the three-year average annual volume in the repository and adding one (or rounding up if the average is not an integer). Recognizing that there may be little opportunity to affect quantity further, the PRC may find it more worthwhile to spend efforts on improving the quality of manuscripts. The PRC aims to improve the quality of publications by providing authors with the proper tools for submitting manuscripts to journals of high JCI percentile.

The PRC has likely influenced the increases in quantity and quality of publications, as it has structured itself to support scholarship and provide resources for completing studies and submitting manuscripts. Nevertheless, other factors may have contributed to the improvements seen in the metrics included in the repository. First, the growing number of pharmacy residents at FH throughout the study period contributed to the number of projects completed in the department, which also contributed to an increase in publications. The residency program began in 1993 with one resident and has since grown to 41 residents. This growth appeared to correlate with the rate of the increase



in publications over the study period. Second, the pharmacy department has a Research Certificate Program that provides education and resources relating to research and publication.¹¹ The Research Certificate Program may contribute to the quantity and quality of publications. The program was first offered to residents when it started in 2020 and was expanded to all staff in 2023. Finally, an external contributing factor may be the COVID-19 pandemic causing a “COVID bump” in the quantity of publications in 2021 followed by another year with a high number of publications in 2022. This peak might be explained in part by social isolation. Safer-at-home orders and continued social distancing may have temporarily shifted pharmacists’ leisure time away from social recreational activities and toward working on scholarly activities, allowing for more expedited submission of manuscripts in the late stages of the pandemic. An increased publication rate of non-COVID-related articles during the pandemic has been documented outside of pharmacy.¹² A further investigation of this potential phenomenon in pharmacy literature is required before drawing definitive conclusions.

A limitation of the publication repository is that it does not include works published outside of journals in PubMed and Google Scholar or *JPSW* unless they are individually identified. Also, finding articles was dependent on the assumption that the rosters of employees that were used to search for authors were comprehensive each year. To mitigate potential discrepancies in rosters, author affiliation with “Froedtert pharmacy” was also searched in PubMed. This strategy then introduced another limitation of relying on author affiliations to be documented in PubMed. Limitations in the presentation of data include assessing the total number of publications without relation to the number of pharmacists employed each year. A limitation of the data itself is that the first 30 years in the repository saw low numbers of yearly publications, making measures such as JIF variable from year to year and limiting the ability to identify trends. A limitation of the repository’s outcomes is that the quality metrics are those of the journals to which the publications are submitted, which is only a surrogate endpoint for the quality of the publication itself.

Conclusion

Creation of a scholarship repository allowed for objective measurement of publications. The data in the tool demonstrated increases in the volume of publications and quality metrics over time.

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