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REVIEW ARTICLE

Scientific output of researchers with research productivity grants in the field of medicine: an integrative review

Produção científica dos pesquisadores bolsistas em produtividade em pesquisa da área de medicina: revisão integrativa

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ABSTRACT

Introduction: Bibliometrics uses mathematical models to perform quantitative and qualitative analyses of scientific indicators, serving as criteria for the allocation of resources by development agencies, such as the National Council for Scientific and Technological Development (CNPq). Among the types of funding available, the Research Productivity Grant (RPG) stands out, aimed at researchers with outstanding scientific output. Although medicine has seen remarkable scientific growth in Brazil, there is still a lack of studies evaluating these indicators in the country. **Objective:** To analyze and compare technical and scientific indicators among medical specialties of CNPq RPG researchers in medicine. **Methods:** This is an integrative review conducted in the PubMed/MEDLINE, Scientific Electronic Library Online (SciELO), and Virtual Health Library (VHL) databases between October and December 2025. The PICO (Population, Intervention, Comparison, Outcome) strategy was used to guide the selection of observational and bibliometric studies, resulting in the inclusion of 14 articles. **Results:** The RPGs in the field of medicine showed steady growth and strong international indexing of scientific production. Significant heterogeneity was observed among specialties, with Neuroscience and Cardiology leading in metrics such as published articles and number of citations received. There was also a marked concentration of production in institutions in the Southeast and South regions of Brazil. **Conclusions:** The productivity of RPGs in medicine is robust, but asymmetrical across different specialties and geographic regions. The indicators confirm the maturity of the field, but point to the need for assessments that consider the specificities of each subfield to mitigate regional and funding inequalities.

Keywords: Bibliometrics; Work performance; Medicine.

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RESUMO

Introdução: A bibliometria utiliza modelos matemáticos para realizar análises quantitativas e qualitativas de indicadores científicos, servindo como critério para a alocação de recursos por agências de desenvolvimento, como o Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). Entre as modalidades de fomento, destaca-se a bolsa de produtividade em pesquisa (PQ), destinada a pesquisadores com destacada produção científica. Embora a Medicina apresente crescimento científico notável no Brasil, ainda há carência de estudos que avaliem estes indicadores no país. **Objetivo:** Analisar e comparar indicadores técnico-científicos entre as especialidades médicas dos pesquisadores PQ do CNPq da área de Medicina. **Métodos:** Trata-se de uma revisão integrativa realizada nas bases PubMed/MEDLINE, *Scientific Electronic Library Online* e Biblioteca Virtual em Saúde, entre outubro e dezembro de 2025. Utilizou-se a estratégia PICO (*Population, Intervention, Comparison, Outcome*) para nortear a seleção de estudos observacionais e bibliométricos, o que resultou na inclusão de 14 artigos. **Resultados:** As PQ apresentaram crescimento constante e forte indexação internacional da produção científica. Observou-se heterogeneidade significativa entre as especialidades, com Neurociências e Cardiologia liderando em métricas como artigos publicados e número de citações recebidas. Notou-se, ainda, uma marcada concentração da produção em instituições das regiões Sudeste e Sul do Brasil. **Conclusões:** A produtividade das PQ da Medicina é robusta, porém assimétrica entre as diferentes especialidades e regiões geográficas. Os indicadores confirmam a maturidade da área, mas indicam a necessidade de avaliações que considerem as especificidades de cada subárea para mitigar desigualdades regionais e de fomento.

Palavras-chave: Bibliometria; Desempenho profissional; Medicina.

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Introduction

Bibliometrics uses mathematical models to perform quantitative and qualitative analyses of the scientific production in a given field. Its data can be used as criteria for the allocation of research funding by universities, governmental bodies, and private institutions[1,2]. In Brazil, the National Council for Scientific and Technological Development (CNPq) and the Coordination for the Improvement of Higher Education Personnel (CAPES) are the main funding agencies and use bibliometric parameters to guide their scientific policies[3,4]. CAPES focuses on the evaluation and funding of graduate programs, while CNPq concentrates on funding researchers and research projects[3,4].

Among the CNPq funding modalities, the Research Productivity Grant (RPG) stands out. It is a direct incentive for high-level national scientific production, awarded to PhD holders with relevant scientific output[5]. Previously, researchers were classified into two main categories (1 and 2), with category 1 subdivided into levels 1A, 1B, 1C, and 1D[6,7]. Recently, CNPq changed this classification from 5 to 3 levels: level C for the entry category, level B for the development category, and level A for the fully consolidated activity category[5]. Selection for the RPG grant is based on rigorous criteria established by the CNPq Advisory Committee, including research leadership, outstanding scientific production, human resources training, and contribution to innovation[3,5,7]. Due to the limitation in the number of RPG grants, parameters such as the number of publications, the impact factor of journals, patents, and the Hirsch H-index are also used[5,8].

Several studies have examined the profile and scientific production of RPGs in different areas of knowledge, with emphasis on the broad area of Health Sciences, such as Neurosciences[9], Tropical Medicine and Infectious Diseases[10], Dentistry[11], Physical Therapy[12], Nutrition[13], and Nursing[7]. The field of Medicine has shown notable growth in scientific

production in recent years[6,14]; however, the analysis of the impact and scientific production has limitations, since indicators such as the impact factor and the number of citations, in isolation, may not reflect the intrinsic quality of the research[1,2,8]. Despite the relevance of Medicine in the national scientific landscape, there is still a lack of studies that comprehensively and temporally evaluate the scientific productivity of researchers in this area, especially regarding understanding the existing asymmetries[6].

The objective of this study was to analyze and compare technical and scientific indicators among the medical specialties of CNPq RPG researchers in the field of Medicine.

Methods

An integrative literature review was conducted, consisting of the search and evaluation of published studies. The research methodology was delimited by applying the PICO (Population, Intervention, Comparison, Outcome) strategy[15], with the following guiding question: What are the differences in technical and scientific indicators (O) among the medical specialties (C) of CNPq RPG researchers in the field of Medicine (P)?

The scientific search was carried out between October and December 2025, in the PubMed/MEDLINE, Scientific Electronic Library Online (SciELO), and the full collection of the Virtual Health Library (VHL) databases. The search strategy was developed using controlled descriptors from the Health Sciences Descriptors platform (DeCS/MeSH) and keywords related to the PICO concepts of the investigation, combined through the boolean operators AND and OR (Table 1).

The inclusion criteria were original articles published in Portuguese, English, or Spanish, with an observational design (cross-sectional, descriptive, or bibliometric). Duplicate articles, studies whose target population did not specifically address CNPq RPGs, investigations not focused on the field of Medicine, and publications outside the scope of the review (such as opinion articles, editorials, letters to the editor, conference abstracts, or those that did not analyze indicators of scientific productivity) were excluded.

The management of the study selection flow was conducted with the aid of the *Rayyan*® software (https://www.rayyan.ai/). Two independent researchers evaluated titles, abstracts, and keywords (screening), and subsequently read in full the articles selected to compose the final sample (eligibility). There were no disagreements at any of the selection stages.

The initial search, based on the use of descriptors in the databases, identified 389 articles. Of these, 98 were removed as duplicates. The remaining 291 articles were then screened by reading the title, abstract, and keywords, a stage that resulted in the exclusion of 277 publications. Subsequently, the 14 eligible studies were read in full and, as all met the eligibility criteria, composed the final sample (Figure 1).

Results

Fourteen scientific publications were included that met the eligibility criteria, published in the period from 2010 to 2024. sTable 1 (in the supplementary materials) presents the characterization of the selected studies, distributed according to author and year, objectives, profile of the sample studied, and main bibliometric indicators analyzed.

The included studies were conducted in Brazil and used the CNPq Lattes Platform curricula (https://lattes.cnpq.br/) as a data repository, an instrument used to estimate scientific productivity and associated metrics. Methodological homogeneity was observed among the investigations, as all adopted a cross-sectional observational design, with a descriptive focus and bibliometric approach.

The articles analyzed CNPq RPGs working in the field of Medicine, covering specific medical specialties (n=8; 57%) and global analyses of the area (n=6; 43%). Among the articles that investigated Medicine as a broad field, studies were identified with samples composed of hundreds of researchers distributed across various subareas[6,16,17]. In addition, an analysis was directed at RPGs linked to the UFMG School of Medicine[18], and another was dedicated exclusively to the scientific production of female RPGs in Medicine at the national level[19]. Data referring to the performance of Medicine within the broad area of Health Sciences were also analyzed, considering stratification by Advisory Committee[7].

Table 1. Detailed search strategy, with syntax and descriptors, used in the PubMed/MEDLINE, Scientific Electronic Library Online, and full collection of the Virtual Health Library databases - 2025.

Database	Search strategy
PubMed/MEDLINE	(("research productivity fellows"[tiab] OR "research personnel"[MeSH] OR "CNPq"[tiab])) AND (("Medicine"[MeSH] OR "Medical Research"[tiab])) AND (("Bibliometrics"[MeSH] OR "Scientific Publication Indicators"[tiab] OR "scientific productivity"[tiab] OR "research output"[tiab]))
Scientific Electronic Library Online and full collection of the Virtual Health Library	(tw:("bolsistas de produtividade" OR "pesquisadores" OR "research personnel" OR "CNPq")) AND (tw:("Medicina" OR "Medicine")) AND (tw:("Produtividade Científica" OR "Produção Científica" OR "Indicadores de Produção Científica" OR "Bibliometria" OR "Bibliometrics"))

Abbreviations: MeSH = Medical Subject Headings.
Source: Prepared by the authors (2025).

Among the medical specialties evaluated individually, studies were identified that addressed Cardiology[20], Nephrology/Urology[21], Pediatrics[22,23], Hematology/Oncology[24], Tropical Medicine and Infectious Diseases[10], and Neurosciences[9]. In addition, comparisons were made between areas such as Surgery, Gynecology and Obstetrics, Psychiatry, Pulmonology, Intensive Care Medicine, Immunology, and Endocrinology[6,14,16]. Due to the partial overlap of researchers evaluated in different periods and specialties, the absolute numerical quantification of the RPGs analyzed was not carried out, and they are presented in a descriptive and aggregated manner.

The extracted variables consistently covered the total number of publications over the career, annual production adjusted for time after PhD completion, the proportion of articles indexed in the Web of Science (WoS) and Scopus databases, the total citations received, and the H-index. Several studies also included analyses of the Qualis stratum of journals, evaluation of the percentage growth of scientific production in the most recent five years, and indicators related to human resources training, such as the number of scientific initiation, master's, and doctoral supervisions, with detailing of these variables in some investigations[10,24].

Performance metrics and academic training indicators vary significantly between the medical specialties analyzed. Clinical Neuroscience has the highest volume of annual production, with an average of 7.4 articles per researcher, in addition to recording the largest total of accumulated citations (50,669) and the highest median H-index (23.75) among the subareas[9,14]. Regarding impact per publication, Cardiology leads with the highest average citations per article (29.5), followed by Immunology (22.7) and Pulmonology (21.7)[6]. Other areas, such as Nephrology and Urology, stand out with the highest average citations per researcher (452)[14]. In terms of human resources training, Tropical Medicine and Infectious Diseases demonstrates significant supervisory capacity, totaling 1,105 master's and 546 doctoral graduates[10].

Discussion

This integrative review synthesized the results of 14 studies published between 2010 and 2024, identified according to the search strategy and defined inclusion criteria. The studies evaluated, through bibliometric methods, the profile

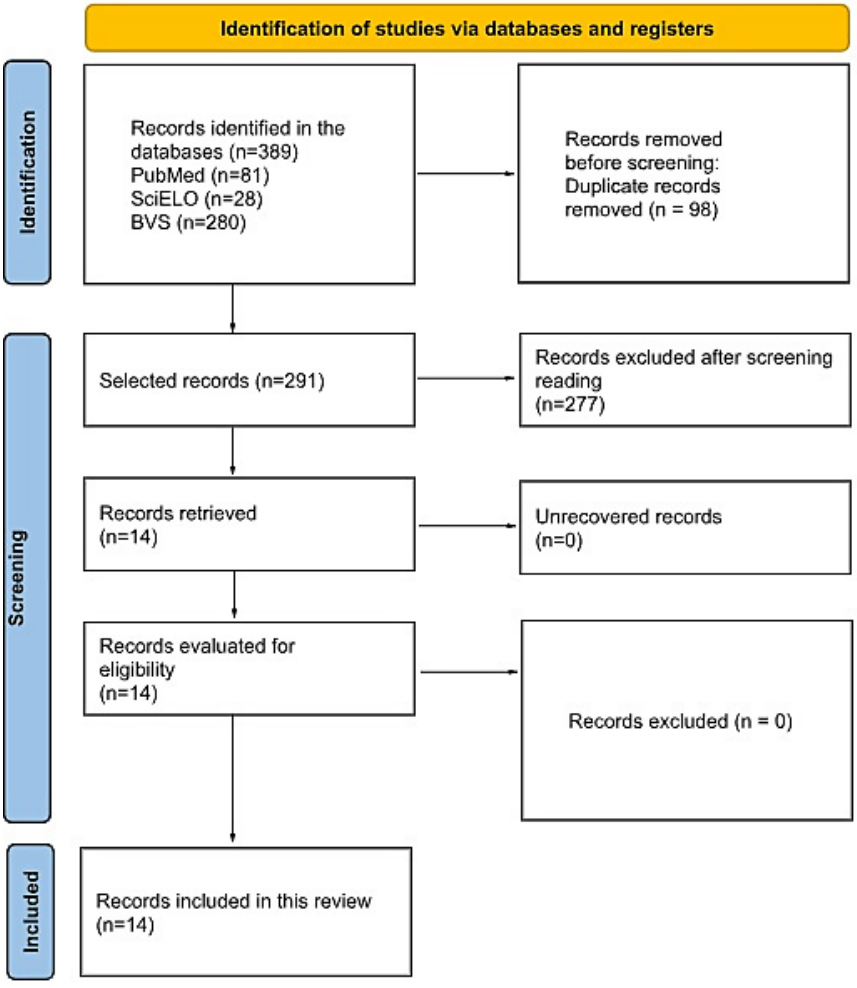

Figure 1. Flowchart for study selection according to PRISMA recommendations.

Source: Prepared by the authors (2025).

and scientific productivity of CNPq RPGs in the field of Medicine, in cuts that include both the area as a whole and specific subareas and isolated institutions. In all studies, the extraction of data from Lattes curricula and international indexing databases provided methodological uniformity and allowed the comparison of scientific production indicators, such as the number of articles, citations, and H-index. The methodological standardization favored the analysis of how such indicators are distributed between Medicine as a broad area and its different specialties.

The studies that evaluated Medicine showed a consolidated production pattern, with a significant quantity of publications over the RPGs' careers. In a sample of 542 researchers, the median of 119 articles per researcher illustrates a pattern of expansion of Brazilian science described in more general analyses of the area[6]. This scenario is corroborated by the analysis of the Advisory Committees (CAs), in which Medicine holds the largest absolute number of publications (53,822 articles) among the six areas that make up the Health Sciences. Although the average of articles per RPG (98.8) is surpassed by Dentistry (130.7), the global amount of publications reaffirms Medicine as a nucleus of high productive density in the PQ grant system.

In the medical subareas, the pattern of high productivity is maintained, with variations between specialties. In the areas of Nephrology and Urology, the total of 3,195 articles, with a median of 75 per researcher and an adjusted annual production of 6.8 articles, evidences consolidated and expanding careers, with production growth in almost all grantees in the five-year period immediately before the evaluation[21]. In Cardiology, 2,958 articles over the career, with an average of 89 per researcher, reinforce this same high level of publication[20]. In Pediatrics, 2,122 articles distributed among 46 researchers, with a median of 41 articles per grantee, reveal robust production, although with a slightly more modest impact in terms of citations per article, whose median was 7 citations (IQR=5–10)[22]. In turn, the RPGs in Hematology/Oncology bring together 2,655 articles over the career, with a median of 76 articles per researcher[24], while Clinical Neuroscience presents one of the highest annual averages of articles among the specialties evaluated, exceeding 7 articles per year in some cuts[14]. These results indicate that, although there are asymmetries between subareas, the minimum level of production of RPGs in Medicine remains in all studies.

The impact and visibility of this production become evident when analyzing the indexing in international databases and citation indicators. At the global level of the area, almost half of the articles published by Medicine grantees are indexed in WoS, with a proportion of 47.8% of the total[6]. In the subareas, this percentage increases expressively: Clinical Neuroscience has 77.63% of articles indexed in WoS[9]; Hematology/Oncology records 78% of articles in the Scopus database[24]; and Tropical Medicine and Infectious Diseases reaches 70.04% indexing in WoS[10]. In Cardiology and Nephrology/Urology, the proportion of indexed articles is also high, with around 55% to 69% of articles in the WoS and Scopus databases[20,21]. These findings, added to the predominance of publications in journals qualified in the upper Qualis strata in comparative analyses between areas[14,23], reinforce the international insertion of RPG production and suggest adherence to the requirements of publication in journals of greater impact.

The bibliometric indicators of citation and the H-index integrate the analysis of the academic maturity of the careers investigated. Nephrology, Urology, and Cardiology show convergence in high patterns of accumulated citations and averages per publication[20,21]. However, the oscillation of these indicators, identified in Pediatrics, with a median of seven citations in the WoS database, indicates that the metric reach is not uniform between specialties[22]. This heterogeneity may stem from structural variables, such as the density of scientific communities, the epidemiological profile of the diseases studied, and the impact factor of the specific journals of each subarea.

In addition to the accumulated indicators, the studies highlight a consistent increase in productivity in recent periods, which suggests an upward trajectory of RPG grantees in Medicine. In the analysis of Nephrology/Urology, 97.5% of researchers expanded their production in the five-year period prior to the evaluation, with a median individual growth of 73%[21]. In different medical areas, the proportion of grantees who increased the number of articles in the last five years exceeds 80%, with a level similar to that observed for the field of Medicine as a whole[6,9,10]. The comparison between specialties shows that Clinical Neuroscience reaches the highest annual averages of articles, while Pediatrics has the lowest annual averages, both in total production and in indexed articles[14,22]. These findings may suggest that, although there is consolidation of a pattern of high productivity throughout the area, the pace of growth differs between subareas and reflects specific contexts of funding, research group structure, and international collaboration dynamics.

The analysis by research productivity grant level and by CA broadens the understanding of productivity patterns. In the cut of the entire Health Sciences broad area, Medicine grantees show a total number of articles similar to that of other subareas, but maintain a prominent position in terms of absolute volume of publications and number of grantees[7]. The internal differences between grant levels are also notable: in the specific analysis of female grantees in Medicine, the total of 34,969 articles and an average of 165.7 articles per female researcher reveal high performance at all levels, with 1A grantees standing out in relation to category 2 both in production over the career and in the last five years.[19] Institutional studies, such as the evaluation of the UFMG School of Medicine, indicate that, once within the RPG system, differences in productivity between men and women tend to reduce in terms of number of articles and citations, although the imbalance in funding indicators persists[18]. These findings may indicate that the grant level and gender modulate the distribution of resources and opportunities, but do not prevent different grantee profiles from reaching comparable production indicators.

Regarding the qualification of the metrics used, some studies emphasize the role of the H-index and combined citation indicators as synthesis tools of the scientific trajectory due to the limitations of these parameters, especially when applied in isolation[6,24]. The analyses of Hematology/Oncology and Pediatrics highlight that high absolute values of articles and citations do not always translate into very high H-indexes, since this indicator depends on the distribution of citations among publications[22,24]. In specialties with a more restricted field or with a lower average impact factor, such as some areas of pediatrics, the same production effort tends to generate less return in terms of citation, which reinforces the need to interpret the H-index and the number of citations in light of the specificities of each area.

The distribution of RPGs showed a geographic and institutional concentration of productivity. The analyses of all of Medicine and in Cardiology, Nephrology/Urology, Pediatrics, and other areas reveal a predominance of researchers linked to institutions in the Southeast and South regions, with strong participation of large federal and state universities, such as the University of São Paulo (USP), Federal University of São Paulo (UNIFESP), Federal University of Rio Grande do Sul (UFRGS), State University of Campinas (UNICAMP), and UFMG[16,20-22,24]. This pattern is repeated in the distribution of RPG grants by advisory committees and institutions, indicating that most of the high-impact production in Medicine is concentrated in consolidated academic centers[7,18]. This scenario reinforces the hypothesis that scientific infrastructure, tradition in graduate studies, and fundraising are closely associated with bibliometric performance, which may perpetuate regional asymmetries.

Despite the breadth of the cuts evaluated and the methodological homogeneity between the studies, some limitations must be considered in the interpretation of the studies. The use of self-reported data on the Lattes Platform presents potential variability regarding the frequency of updating and recording of productions by researchers. In addition, the diversity of time windows between the 14 selected articles, which cover the period from 2010 to 2024, restricts the direct numerical comparison of absolute indicators between medical specialties. This chronological variation implies that subareas evaluated in older studies have less exposure time to the accumulation of publications and citations compared to those analyzed in recent periods, which prevents synchronic and equitable comparative analysis. This review is limited to the profile of CNPq RPGs, characterizing the specific patterns of this academic stratum. The systematization of this evidence may contribute to the understanding of scientific production in Medicine and provide data for the planning of funding policies.

Conclusion

The scientific productivity of CNPq RPGs in the field of Medicine evidences a trajectory of sustained growth, with global impact attested by publication in databases of international impact such as WoS and Scopus. The metric asymmetry observed between the specialties, with emphasis on the superior indices in Neurosciences and Cardiology, is linked to the publication in journals of important visibility and to the adherence to international citation standards. The subareas with modest quantitative indicators reflect field specificities, such as restricted research communities and lower citation density, dissociated from intrinsic academic quality.

The geographic polarization in the Southeast and South regions ratifies the interdependence between infrastructure, maturity of graduate programs, and bibliometric performance, evidencing structural determinants in the production of knowledge. The evaluation of scientific merit demands the integration of metrics normalized by subarea and qualitative indicators to mitigate analytical distortions of absolute comparisons and subsidize equitable funding policies.

Author's Contribution

We describe contributions to the papers using the taxanomy (CRediT) provide above: *Conceptualization, Investigation, Methodology, Visualization & Writing – review & editing*: GD Macedo; HGS Lafetá. *Project administration, Supervision & Writing – original draft*: GD Macedo; HGS Lafetá; AAD de Sousa. *Validation & Software*: DRB Martelli; H Martelli Júnior. *Resources & Funding acquisition*: *Data curation & Formal Analysis*: DRB Martelli; H Martelli Júnior.

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Supplementary Materials can be accessed on the article's page on our website. Visit the website at: https://rmmg.org/.

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