

Graduates from a Postgraduate Program in Cardiology: Are the Results of Almost 30 Years Adequate?

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Abstract

Background: *Stricto sensu* post-graduation in Brazil was implemented in 1965 to increase university professors' teaching quality and to prepare full, independent researchers. The Brazilian share in ISI publications has increased significantly since then, but little information is available on postgraduate quality.

Objective: To review 29 years of the postgraduate programs in cardiology at the Federal University of São Paulo and to analyze master and doctorate graduates' characteristics regarding their origin, publications and subsequent career.

Methods: We developed a questionnaire to evaluate 168 postgraduates who produced 196 theses (116 master's and 80 doctorate) over the period 1975-2004 and contacted 95.9% of them. Information on publications were obtained through the usual science databases.

Results: 30% of graduates came from the North-Northeast-Central West regions and only 50% returned to their original area. Mean age at admission was 32.5 and 34.9 years old for master and doctorate students, respectively; average program duration was, respectively, 39.0 and 43.2 months and approximately 50% went through it without any grants. Thesis publications throughout these 29 years averaged 36.5% for master's and 61.9% for doctorate, but any publishing afterwards occurred in 70.2 and 90.6% of the cases. The average impact factor of the published theses was 1.3 for master's degree and 3.1 for doctorate programs with 65.5% and 87.5% of Qualis A, respectively. Currently, there are graduates in 17 states of the country and 12 have become full professors.

Conclusion: Although the *stricto sensu* program, especially the master's degree program, has many areas that need improvement, they seem to be contributing to improve professional quality and the number of Brazilian indexed publications. (Arq Bras Cardiol 2010; 94(4):471-476)

Key words: Health postgraduate programs; cardiology; academic dissertations; quality; scientific and technical publications.

Introduction

Medical post-graduation in Brazil began in 1965 when the Federal Board of Education issued resolution 977/65 that defined *latu* and *stricto sensu* post-graduation with *stricto sensu* programs aiming at developing professors with scientific formation and doctorate programs aiming at developing adequate teaching capabilities and a fully capable, independent researcher¹⁻³. In the US and Europe, a physician undergoes his postgraduate training in a basic research area, while the Brazilian program can also be developed in the clinical area. Cardiology at the Federal University of São Paulo started its program in 1975 and in 1999, a program in areas associated to cardiology, which accepted non-medical students, was implemented⁴.

The CAPES agency (Development Agency for Capacitation

of Superior Level Personnel) supervises the program and developed a tri-annual evaluation of all its courses, currently with a scoring system from 1 to 7, with levels 6 and 7 being comparable to good international courses^{2,5,6}. There is still controversy on its publishing rules and journal classification system⁶⁻⁸, but the fact is that Brazil went from a 0.88% participation in the ISI (Institute for Scientific Information) database in 1996 to 1.73% in 2004 and the international Brazilian publications in cardiology-related areas accordingly increased from 0.9% in 1998 to 1.9% in 2006 (Krieger, E-oral presentation in the I Forum of Quality in Medical Assistance-Brazilian Society of Cardiology-2008).

During the fifties, superior level personnel was 0.67% of the economically active population and 60% of high school students did not graduate⁹. The number of professors with a doctorate (PhD-equivalent) was 38.2% in public and 12% in private schools in 1998¹⁰ and there is still a great disparity among regions, with 8.801 Doctors in the North, Northeast and Central West regions against 29.006 in the Southeast¹¹.

In 1997, an international commission evaluating CAPES suggested that the agency should get information on its

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postgraduates^{2,6}. Ramos¹² had already suggested that, as well as Barbosa and DePaola¹³, with all of them recognizing the difficulty in adequately contacting all ex-students. The purpose of this study was to obtain a profile of almost three decades of a cardiology postgraduate program, evaluating its graduates' outcome, contributing to the understanding of the results and the implications of the first 40 years of development of the Brazilian postgraduate program.

Methods

This study was performed by contacting master and doctorate graduates from the cardiology program from 1975 to July 2004. A questionnaire with 44 questions was developed to collect basic information on the graduates such as age, gender, school of medical graduation, percentage of time on teaching activities, pre and post-graduation, medical assistance and research, publications pre and post-course and current participation as a faculty member. Some questions were open, so that the interviewee could express his/her feelings without being limited by a specific question. There was a concern about preventing the questionnaire from being too long or bothersome to answer, trying to avoid lack of cooperation. Our protocol was approved at our IRB.

This type of evaluation has not been performed regularly and there is no consensus in the literature^{5,14} concerning the questions, size, format etc., beyond basic needs such as current employment, university position if any, current teaching and research, recommendation or not on the program. In the early seventies, there were no facilities concerning computers as there are nowadays and, additionally, as there was no monitoring of the graduates along the years, many of them changed positions and places, making it difficult to identify their whereabouts. In such cases, we attempted the contact by the telephone company, e-mail addresses catalogs, old friends, relatives, state and national medical societies, his/her advisor and the internet. After an initial telephone or a secure e-mail contact, explaining the reasons for this research, we gave the graduates the option of answering the questions by telephone, or by e-mail, fax or a self-addressed and stamped envelope sent by us.

Out of a total of 168 graduates with 196 theses (116 master's and 80 doctorate), an answer to our quest after the initial contact was obtained in 153 cases, 87 with a master's and 66 with a doctorate degree. Only 4 graduates from the group refused to cooperate and to give oral consent for the research and for those that did not reply initially, most of the times the allegation was "lack of time". Of the 18 who did answer afterward, attempts to communicate until the questionnaire was finally answered ranged from three to eleven times. In seven cases out of the 168 (4.1%) we could not get any answer, although we had enough information that assured us that all were alive. We searched for publications bearing the author/advisor names through Pubmed, The National Library of Medicine from The National Institutes of Health, Scielo through *Biblioteca Regional de Medicina* (BIREME) and Health Pan-American Organization (OPAS, WHO) and Web of Sciences available through CAPES.

Regarding the statistical analysis, each graduate was considered by his/her scientific production, so that the 19 students who had both a master's and a doctor's degree were analyzed twice, once in each course. Statistical analysis was performed utilizing a SPSS 11.5 program; proportion comparisons were performed through Chi square and Pearson's tests when appropriate. A Kappa analysis was used for concordance in comparing master's and doctorate findings and uni and multivariate logistic regression to correlate time until thesis publication with age of admission at the program, length of time to finish the program, origin of the candidate, gender, whether it was a medical or non-medical area, period pre and after 1992, advisor's previous advisory activities.

Results

Gender and origin - Out of 116 master graduates, 65 were males (56%) and 51 females; 59% of them had come from the Southeast region and 31% from the North-Northeast and West Central regions. A total of 86% of them had a medical degree, whereas the remainder had a degree in biology, nursing, nutrition, psychology, physical therapy and veterinary medicine. They came from 36 different schools; 12 of them were federal schools from other states rather than São Paulo, with 99.2% of the medical graduates having previously completed their residency program and 38% having been previously in monitoring or scientific initiation programs. Of the 80 doctorate graduates, 62 (79.5%) were males, from 27 different places and 14 federal schools rather than São Paulo; 67.6% were from the Southeast and 24% from the North-Northeast and West Central regions. Foreigners were 5.4%. All doctorate students had a medical degree and 50% of them had a masters' degree.

Age at admission, grants, reasons for doing it - The average age at admission at the masters' degree course was 32.5 years old (s.d. 5.6 y/o) and 35.4 years old (s.d. 6.2 y/o) at end of the course. For the non-medical students, mean age at admission was 34.1 years old (s.d. 8.4 y/o). Grants from CAPES were available to 44% of the students and grants from CNPq to 14%, while FAPESP grants were obtained by 9% of the graduates. The reasons given to start a master's degree program were to improve technologically and scientifically by 56%, personal reasons by 23% and to improve a professorship qualification by 19%. As for the doctorate, age at admission varied from 21 to 52 (mean 34.8) years old and from 24 to 56 (mean 38.2) years old at the end of the course. Regarding doctorate grants, only 42 of 79 graduates (53.2%) had one, with CAPES and CNPq being responsible for 36 and Fapesp for only 3 of them. Improving technical and scientific skills was the motivation behind 77% of the students, whereas advancement in a university career accounted for the remainder of them.

Advisory and overall difficulties - 72% of the open answers concerning the relationship with the advisor in the master's degree course defined their relationship as stimulating and 26% as adequate, with only 1.3% as inadequate. The number of advisor-student meetings was defined as frequent enough in 72% of the answers. Among the difficulties mentioned: too many simultaneous activities by 22.2%, obtaining materials for the research by 20.6%, not enough money by 6.3% and

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advisory problems by 4.8%. The doctoral advisory was defined as stimulating by 78.8% and inadequate by only 1.9%. Among the difficulties, the main point was the complexity of the chosen research for 40% and problems in obtaining materials for the research in 18% of the cases.

Program duration and return to origin - The average duration of the master's degree program from admission to homologation by the post graduation secretary varied from 10 to 164, months, with a mean of 39.0 months. In the last 12 years there was a large decrease, compared to the earlier period, in the duration of the program for master's but not for doctorate programs (Figure 1). The average duration for the master's non-medical course varied from 5 to 62 months, with a mean of, 29.4 months. Of those that finished the course, 55.5% returned to their home university. As for the doctorate program, the mean duration was 43.2 months (ranging from 4 to 122 months) and 52.6% returned to their school of origin.

Meetings, publications, program recommendation - Presentations at meetings and congresses were as follows: at regional ones, pre masters' degree: 37.3% and post-masters' degree 55.6%; at national meetings, 54.7 and 69.1%, respectively and at international ones, 17.3 and 30.9%, respectively. Publications occurred for 42.9% pre-master's and 70.2% post-master's degree, while activities as professors went from 26.9% to 48.8%. Of 93 answers to this question, 49 had published their theses (52.7%), while 46 did not, once more with different numbers when comparing an earlier and a later period, with doctorate students publishing more often (Figure 2). Finally, 81.6% considered the course as of great importance to their careers and 98.9% would recommend it. As for doctorate graduates, presentations at regional meetings went up from 37.5 to 53.4% pre and post-doctorate program, respectively; at national meetings, from 62.5 to 72.4% and

at international events, from 39.3% to 62.1%. Publications went from 64.2% pre to 90.6% post-doctorate program and activities as a professor went from 48.2 to 63.5%. The thesis was published by only 61.2% of the postgraduates. In 79.7% of the cases, the postgraduation program was very important for their careers and 100% would recommend the experience.

Journals, impact factor and careers - A total of 29 studies were published in the Brazilian Journal of Cardiology and other journals such as: the American Heart Journal, American Journal of Physiology, Annals of Thoracic Surgery, Atherosclerosis, British Heart Journal, Cardiology in the Young, Circulation, Hypertension, International Journal of Cardiology, Journal of the American Society of Echocardiography, Journal of Cardiovascular Electrophysiology, Journal of Cardiovascular Pharmacology, Journal of Heart Lung Transplantation, Journal of the American College of Cardiology, Nutrition, etc. The average impact factor for the master's thesis, for those who published in a high-impact journal (64% of those that published their theses, no difference between master's and doctorate programs) was 1.3, while for the doctorate it was 3.1, and similarly 65.5% of the master's theses were Qualis A, while for the doctorate theses it was 87.5%. Concerning their subsequent careers, 15 graduates became associate professors and 12 full professors of cardiology, with all of them having completed the doctorate program. Furthermore, 48 were, at the moment of this evaluation, working as chief of cardiology at their services or hospitals.

Comparison between master's and doctorate programs - there were too many heterogenous factors to account for when trying to statistically compare master's and doctorate programs and so we decided to simply present our findings for both programs in Table 1. Age at admission (mean age for master's: 32.5 and 34.8 years old for doctorate), origin, course duration and return to home university were similar. However,

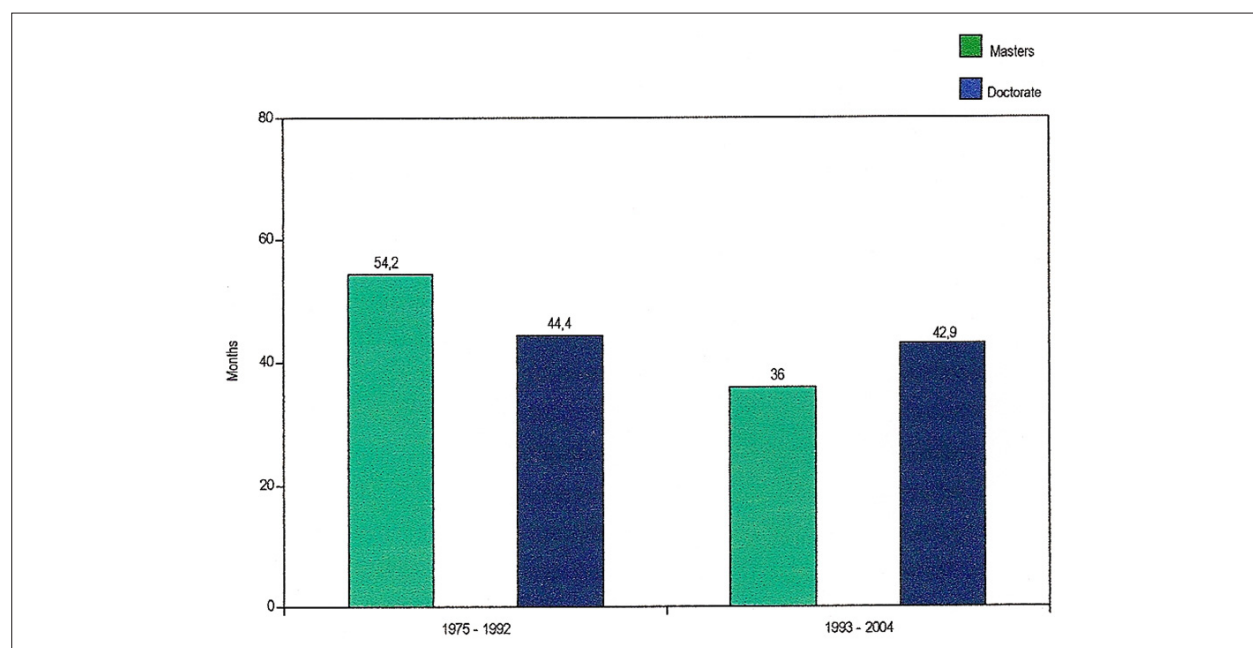


Figure 1 - Duration (admission until homologation) in months to conclude master and doctorate theses at an earlier and posterior program periods.

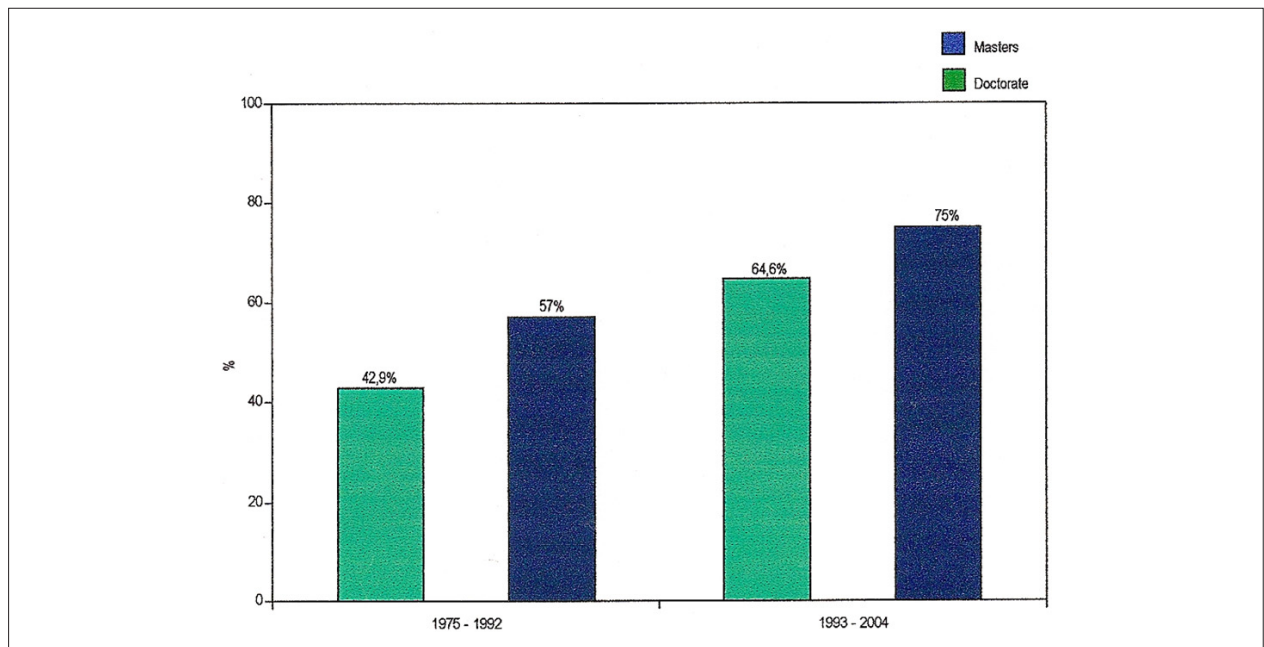


Figure 2 - Publication rates for master and doctorate theses in two different program periods throughout its 29-year duration.

there were significant differences concerning vital issues for a postgraduate program such as international presentations after thesis presentation, publications after the thesis, impact factor and Qualis A, with all of them, as expected, favoring the doctorate over the master's program (details in Table 1).

Discussion

There have been few publications evaluating the product of the Brazilian postgraduation program defined 40 years ago by the Federal Board of Education through the resolution 677/65³. In 2005 Hueb, Mady and Ramires assessed the achievements obtained after 30 years of postgraduation in cardiology and the challenges that lied ahead¹⁴. The quality of the product being offered is one (although not the only one) of the best ways to evaluate the quality and responsibility of any industry or plant, and, certainly, Brazilian participation in indexed scientific literature has grown significantly thanks to the increased numbers of postgraduate doctors and that is also the main reason for the health area in Brazil to have surpassed physics in international publications. Our data comprehends 29 years of a cardiology program that has been regularly evaluated as 4 or 5 by the CAPES classification score and has information on 95.9% of all graduates.

The lack of baseline computerized information of the first fifteen postgraduation years (1975-1990) was a huge difficulty when trying to evaluate the subsequent career of the early graduates. Additionally, we also had cases of incomplete questionnaire answers with some questions not being addressed by everyone and no adequate cooperation for further completion of the questions, even after ten or eleven telephone calls. A thesis published by the FMUSP in 1994 located 72% of the graduates and only 40% of them answered the questions¹⁵, while Tosta de Souza⁵ and Silva et

al¹⁶, like ourselves, found a majority of graduates originating from their own Institution^{5,16}. We verified that only 30 and 25% of master's degree and doctorate students, respectively, had come from the North-Northeast-Central West regions, with 50% in each program returning to their home university.

Silva et al¹⁶ observed a mean age of 30.3 years old for admission at a master's program in dermatology at Universidade Federal de Minas Gerais and Beiguelman¹⁷ at Unicamp reported that 70% of those in a doctorate program were older than thirty, whereas in our sample, there was no significant difference regarding the age at admission at the master's or doctorate programs-32.5 x 34,.8 years, respectively. However, more significant was our finding that, on average, a master's thesis took 39 months for homologation, while a doctorate took 43 months and that the rate of thesis publication was also significantly different (36.5 x 61.9%). Younes, Deheinzeln and Birolini⁷ reported that it took up to 5 years until the thesis publication and even longer at international journals, a situation that has considerably improved in the last few years through CAPES and each specific program demand, so that, currently, many postgraduation programs, like ours, will only accept thesis presentation after a publication has occurred. Nevertheless, in our analysis, publications post master's and doctorate thesis occurred in 70.2% of cases that finished a master's program and 90.6% of those that finished doctorate; presentations at International events occurred in 31 and 62% respectively for master's and doctorate programs, while teaching participations also increased significantly. So it seems that the fundamental points of *stricto sensu* are being met, but courses (especially master's degree courses) still take longer than they should and the doctorate program adheres more strictly to the definitions proposed for an adequate postgraduation course. Overall, there have been few attempts trying to compare master's and

Table 1 - Demographic data on gender, origin, age, duration and difficulties throughout the course, advisory and publications of master's degree and doctorate graduates

| | ME (N=116) | DO (N=80) |
|---|------------|-----------|
| Males (%) | 56.0 | 79.5 |
| Origin: SE % | 59.0 | 67.6 |
| Origin: N-NE-WC % | 31.0 | 24.0 |
| Federal schools (not from SP) % | 33.0 | 51.0 |
| Foreigners % | - | 5.4 |
| Average age admission (years old) | 32.5 | 34.8 |
| Average age end of course (years old) | 35.4 | 38.2 |
| Average course duration (months) | 39.0 | 43.2 |
| Return home university % | 55.5 | 52.6 |
| Imported material difficulties % | 20.6 | 18.0 |
| Medical degree as origin % | 86.0 | 100.0 |
| Would recommend program % | 98.9 | 100.0 |
| CAPES-CNPq-Fapesp grants % | 67.0 | 53.2 |
| Advisory very good stimulating % | 72.0 | 78.8 |
| Advisory - inadequate % | 1.3 | 1.9 |
| Presentations at national events after thesis % | 69.1 | 72.4 |
| Presentations at internat events after thesis % | 30.9 | 62.1 |
| Publications pre thesis % | 42.9 | 64.2 |
| Publications post thesis % | 70.2 | 90.6 |
| Published theses % | 52.7 | 61.2 |
| Qualis A % | 65.5 | 87.5 |
| Impact factor (average) | 1.3 | 3.1 |

SE - Southeast; N - North; NE - Northeast; WC - West Central; SP - São Paulo. CAPES-CNPq-FAPESP - Brazilian funding agencies. Internat - international.

doctorate program data in the whole Brazilian postgraduation CAPES program.

Our sample showed an average impact of 1.3 for the master's program regarding the published thesis and 3.1 for the doctorate program. When looking at it from another point of view, this previous result is corroborated by 62.5% of Qualis A in the master's and 87.5% in the doctorate's program. Marchini and Caramelli¹⁸ reported a 2.1 average impact during a 10-year period, regarding published doctorate theses at Incor, São Paulo, when evaluating 268 graduates with 195 publications¹⁸. The frequency of published papers increased after both programs, but we did not have the chance to perform an annual individual search or to assess citations of the published papers, as the spanned period of time consisted of almost 30 years and comparisons would not be meaningful. No significant variables resulted from the multivariate analysis, when comparing overall published and non-published theses, but probably it is too early to detect the apparent improvement recently brought by more stringent

CAPES and individual programs criteria. We had a total of 5.4% foreign students that obtained their doctorate degree in our institution and 5 of our postgraduates live permanently abroad, while 5 others are currently postdoctoral fellows in Europe and the USA.

There are several areas of debate concerning master's and doctorate programs, including whether more sophisticated programs should not accept students for a master's degree program. We believe both have a place, depending on the profile and the finality of the program being developed. There is very little information comparing both programs and we do not intend to pass any judgment, due to the inherent characteristics of the different groups, but it is clear that some differences stand out. The doctorate group was more homogeneous, while the master's program group, even considering the latest improvements, took almost as long as the doctorate group, at least in our program. As expected, international presentations, rate of publication, impact factor and Qualis A publications all favored the doctorate group.

Currently, there are postgraduates from our Institution in 17 states of the federation and they have gradually increased their production in places such as Belém, Cuiabá and Maceió, but they have shown that it takes from five to ten years for these new areas to generate significant production and this is something to take into account as an evaluation that has been carried out too early will not detect any signs of change generated by a new group. Additionally, our data shows that only 50% of individuals from states rather than São Paulo return to their home university and that almost 50% of graduates are doing their programs without any financial support from any agencies; our findings are generally confirmed by other available data on postgraduation programs from other top Institutions from our country. That is a point of concern, as important contributions from people giving up their programs half through it because of financial difficulties might go undetected and the literature generally comes from great institutions, used to publish so, on average, the situation could be even worse. On the other hand it reinforces the need for establishing adequate post-doctoral programs to accommodate the best of a large number of doctors coming out from all programs in the country¹⁴⁻¹⁷.

Finally, we see, with great satisfaction, that 15 associate professors and 12 full professors have emerged from this program, a number equivalent to previously available information in the cardiology area¹⁴. The rate of publications by our prior doctorate graduates is recent years is now above 90% and with measures such as thesis homologation only after its publication in an ISI - Indexed Scientific Journal, Brazilian production will continue to increase with quality. Furthermore, difficulties such as postdoctoral grants and those mentioned by 20% of our graduates concerning problems in importing material for research are being addressed by the Federal Government. It has also become clear, even to the lay press that better qualification implies in more chances of a good employment and better salaries, with post-graduates being on top of several types of job requirements¹⁹.

Conclusions

Brazilian *stricto sensu* postgraduation programs are dynamic, improving and evolving, with clear obligations and rules and these seem clearly related to the excellent performance Brazil has had in indexed publications. Its graduates' evaluation is a step further in improving the quality of programs. Our evaluation seems to indicate that although there are areas that clearly need improvement, especially in master's program, the overall results have been quite satisfactory, with good publication rates and excellent academic performance as demonstrated by the number of associate and full professors it has generated.

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