Medical Physics Workforce In Latin America: Advancing Toward Professional Recognition

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2026 JULY 19–22 VANCOUVER, BC
JOINT AAPM | COMP MEETING

ABSTRACT

Purpose: To provide a comprehensive review of the progress made by the most populous countries in Latin America toward the professional recognition of medical physicists.

Methods: A survey was conducted across the ten most populous Latin American countries. Data on the main medical physics education and training pathways, the size of the medical physics workforce, gender balance, and national regulations governing medical physics were collected. Professional recognition in clinical settings was qualitatively assessed through structured interviews with medical physicists in each country.

Results: The diversity of education and training in Latin American countries ranges from bachelor's degrees in physics without clinical training to established medical physics residencies. Brazil is the only country with a formal certification process for qualified medical physicists, while Peru and Argentina are developing accreditation pathways aligned with the IOMP framework. The gender balance and distribution in each specialty remain pending for radiation therapy and for males. Professional recognition is demonstrated by clear legal requirements and by the participation of medical physics organizations in government councils and other professional societies. Professional recognition correlates with advocacy from professional medical physics organizations, yet public awareness of the medical physics profession remains low.

Conclusions: Educational and clinical training opportunities in Latin America remain limited in several countries, often requiring professionals to pursue specialized training abroad. Establishing professional organizations or licensing bodies, defining minimum practice standards, and implementing structured academic education and training pathways with accreditation examinations would be valuable steps toward enhancing the recognition of medical physicists as healthcare professionals.

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INTRODUCTION

As healthcare technologies continue to advance, the demand for well-trained and professionally recognized medical physicists has grown worldwide. International organizations have established recommendations for education, clinical training, certification, and professional practice to promote high standards of patient safety and quality of care [1-3].

LA countries have diverse healthcare systems, educational structures, and regulatory frameworks, resulting in considerable variability in how the medical physics (MP) profession has evolved. While some countries have established formal pathways for education, clinical training, and professional recognition, others continue to develop these systems according to local resources and needs.

This study reviews the current status of MP across the ten most populous LA countries, focusing on education and training pathways, workforce characteristics, gender distribution, regulatory frameworks, and professional recognition. It aims to highlight regional progress, identify common challenges, and provide insight into future opportunities for standardization and cooperation.

METHODS AND MATERIALS

- A survey was conducted across the **10 most populous LA countries**, using data from national associations, interviews, and a literature review.
- The main **MP education and training pathways** in structured programs were analyzed.
- The **size of the MP workforce** in each specialty and the **gender balance** were examined.
- **National regulations** governing MP were collected, including responsibilities and requirements for professional practice.
- **Professional recognition** was assessed qualitatively through a structured, open-ended survey.

Table 1 shows the surveyed LA countries, along with their populations (2013), human development index (HDI) levels, and official languages (Spanish - 63% and Portuguese - 37%).

Table 1. LA countries, populations, HDIs, and official languages.

No.		Country	Population*	HDI	Language
1		Brazil	211M	0.786	Portuguese
2		Mexico	130M	0.789	Spanish
3		Colombia	52M	0.788	Spanish
4		Argentina	46M	0.865	Spanish
5		Peru	34M	0.794	Spanish
6		Venezuela	28M	0.709	Spanish
7		Chile	20M	0.878	Spanish
8		Guatemala	18M	0.662	Spanish
9		Ecuador	18M	0.777	Spanish
10		Bolivia	12M	0.733	Spanish

https://hdr.undp.org/data-center/human-development-index

Human Development Index (HDI) – health, education, and standard of living

Very High
High
Medium
Low

Population * 2013

Table 2 presents MP professional organizations, certification processes, and legal frameworks.

Table 2. Professional organizations in MP, the existence or not of a certification process, and the legal framework for MP practice.

Country	Professional Organization in Medical Physics	MP Certification	Legal Framework
Brazil	Associação Brasileira de Física Médica (ABFM)	YES	YES
Mexico	Sociedad Mexicana de Físicos en Medicina (SMFM) Federación Mex. de Organizaciones de Física Médica (AMFM/SOFIMED)	NO	YES
Colombia	Asociación Colombiana de Física Medica (ACOFIMED)	NO	YES
Argentina	Sociedad Argentina de Física Medica (SAFIM)	NO	YES
Peru	Sociedad Peruana de Fisica Medica (SPFM)	NO	YES
Venezuela	Asociación Venezolana de Profesionales en Física Médica	NO	YES
Chile	Sociedad de Fisica Medica Chilena (SOFIMECH)	NO	YES
Guatemala	Colegio de Ingenieros de Guatemala, Comisión de Física Médica	NO	YES
Ecuador	Colegio Ecuatoriano de Físicos Médicos y Físicos en Medicina (CEFIM)	NO	YES
Bolivia	Asociación Boliviana de Física Médica	NO	YES

RESULTS

The gender demographics of medical physicists in each country are shown in Figure 1. Some countries did not disclose this information.

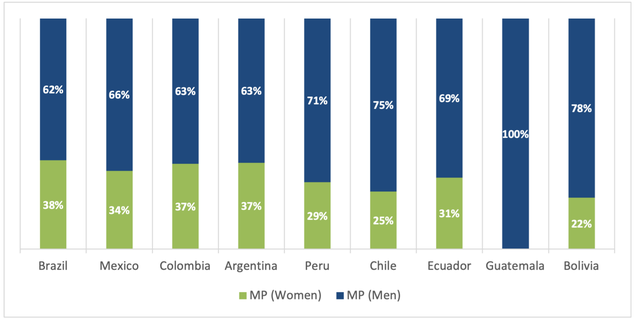

Figure 1. Gender distribution by country.

The distribution of the MP workforce by specialty (Radiation Therapy, Nuclear Medicine, and Diagnostic Imaging) is shown in Figure 2. All countries have the three MP specialties, with some professionals working in more than one field.

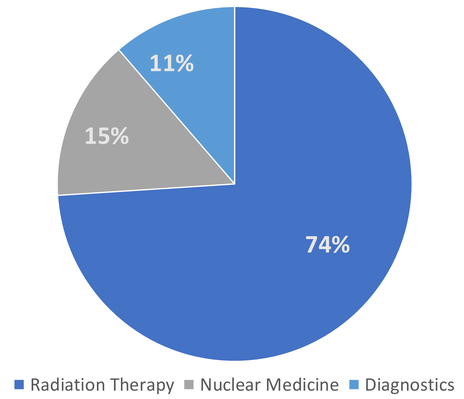

Figure 2. MP workforce by specialty.

Educational and clinical training pathways vary substantially across LA, including undergraduate MP bachelor's programs (4-5 years) in Brazil and Argentina, as well as structured MP residencies (2 years full-time) available only in these two countries (Figure 3).

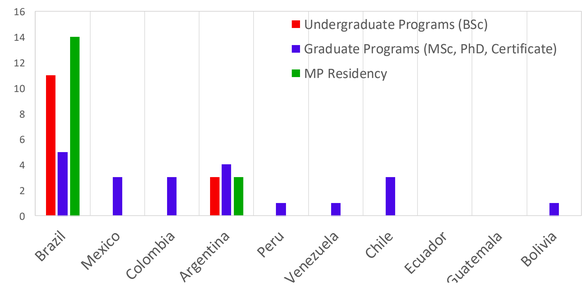

Figure 3. Medical physics pathways in education and training.

All countries have legal frameworks for radiation protection, with some specifying the minimum number of MPs, setting licensing/educational requirements, and designating MPs as responsible for certain activities in medical facilities, highlighting the importance of professional organization advocacy.

In the survey on MP identity and recognition, 80% of respondents (36/45) reported that medical physicists' work is recognized and appreciated only to a small or limited degree. Clinical MP residencies are helping raise awareness among health professionals. All respondents (45) noted that public awareness of MPs' role is either nonexistent outside the healthcare ecosystem or very limited even among physicists, physicians, or engineers.

DISCUSSION

The most populous LA countries have medium or very high HDI levels. However, HDI oversimplifies complex social and economic situations, failing to account for factors such as inequality, sustainability, political issues, and quality of life.

All surveyed LA countries have professional MP organizations, with varying levels of maturity that appear to correlate with MP organizations' advocacy and presence in governmental and healthcare institutions. While Brazil has the most structured MP professional framework, it still faces challenges in addressing regional inequalities and raising public awareness.

Educational and clinical training pathways vary substantially across LA. Brazil and Argentina have undergraduate MP programs that seem to facilitate the establishment of formal MP residencies. Graduate-level programs are available in all surveyed countries except Ecuador and Guatemala. Brazil is also the only LA country with a formal certification process for qualified medical physicists (QMP), which requires passing written and oral examinations. Language barriers arise when MPs seek international certification, underscoring the importance of regional certification boards.

Radiation therapy employs the largest proportion of medical physicists across all surveyed LA countries, while smaller numbers work in nuclear medicine and diagnostic imaging. Although female participation differs across countries, men still comprise the majority of the workforce, as demonstrated in earlier publications [4].

The lack of professional recognition is attributed to several factors, including insufficient recognition by regulatory bodies, where MPs are not consistently considered healthcare professionals, the small number of clinical residencies, and the absence of minimum standards to protect the profession.

CONCLUSIONS

Different economic constraints result in diverse strategies for MP education, clinical training, and the professional workforce across LA countries.

Even with the field's growth, the reduced number of MP clinical residencies has resulted in fewer qualified medical physicists than needed to meet rising clinical demand and technological advances.

LA organizations should promote MP certification processes to raise awareness and professional recognition. Moreover, international or regional exchange clinical training programs and online education could benefit LA professionals.

Additional research is needed to map the quantity of medical imaging devices and radiation therapy techniques accessible within each country, as well as the appropriate number of MPs.

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