

[LCS Expert column]

Expanding Lung Cancer Screening in Brazil ProPulmão and the BRELT Studies

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Introduction

Lung cancer remains one of the deadliest malignancies worldwide, and early detection is critical to improving survival rates. Countries with well-structured healthcare systems, have implemented lung cancer screening programs such as the Lung Health Check (UK) ¹, which aims to detect lung cancer in high-risk populations through low-dose computed tomography (LDCT) scans. Similarly, Brazil, despite its vast geography and socioeconomic disparities, has made strides in this area through the ProPulmão project, an initiative focused on lung cancer screening in underserved communities.

Brazil's Unified Health System (SUS) is committed to universal health coverage, ensuring that all citizens have access to medical services. However, the challenge in Brazil is not only financial, but also logistical - providing access to screening programs across a vast country with significant regional disparities in healthcare infrastructure. To address this, ProPulmão has offered free access to CT tomography, recently having implemented a mobile screening approach to reach remote populations that would otherwise not have access to early detection services.

The evolution of ProPulmão: from concept to impact

The ProPulmão initiative was created in response to a critical gap in lung cancer diagnosis in Brazil. Unlike traditional hospital-based screening programs, which often fail to reach high-risk individuals due to distance and socioeconomic barriers, ProPulmão also uses mobile CT screening unit to bring early detection directly to communities in need.

Over the years, ProPulmão has evolved through a series of structured research trials known as the Brazilian Early Lung Cancer Screening Trials (BRELT), which have systematically evaluated the feasibility, effectiveness, and challenges of lung cancer screening in the Brazilian context.

In addition to screening efforts, the ProPulmão program is dedicated to educating healthcare professionals and patients, aiming to provide comprehensive information on lung cancer, its early diagnosis, and various treatment options. Our actions encompass professional training, public awareness, and policy advocacy to improve respiratory health strategies in Brazil and Latin America, particularly those related to lung cancer.

BRELT1: establishing the foundation for lung cancer screening in Brazil

The first Brazilian Early Lung Cancer Screening Trial (BRELT1) was a milestone in the country's approach to lung cancer detection. Conducted as a hospital-based study, BRELT1 validated the feasibility of LDCT screening in a population with a high burden of granulomatous disease - a common problem in Latin America.

The study showed that despite an increased prevalence of benign lung nodules, granulomatous disease did not lead to an excessive number of unnecessary biopsies, reinforcing the feasibility of screening in Brazil ².

BRELT 2: expanding screening across different healthcare models

Building on the achievements of BRELT1, the BRELT2 trial ³ expanded screening to multiple centers across Brazil, enrolling 3,470 participants from six institutions in São Paulo, Rio Grande do Sul, and Bahia between 2013 and 2021. This trial was instrumental in demonstrating that LDCT screening can be successfully implemented in both public and private healthcare settings.

Importantly, BRELT2 confirmed that lung cancer screening in Brazil produced results comparable to major international studies, with a lung cancer detection rate of 2.1% and over 70% of cases detected at an early stage (I or II). These results underscore the program's potential to improve lung cancer outcomes in the country.

BRELT3: mobile screening for universal access

Despite the results of BRELT2, a significant limitation remained: many high-risk individuals still lacked access to screening due to geographic constraints. This led to the development of the BRELT3 protocol ⁴, which introduced mobile CT units capable of bringing lung cancer screening directly to underserved regions. Inspired by successful mobile screening programs in Europe and North America, BRELT3 focuses on:

- Reducing disparities in access to lung cancer screening.
- Evaluating a 12-month follow-up model for patients with suspicious findings.
- Assessing the feasibility of public-private partnerships in supporting large-scale screening.

The ongoing BRELT3 study aims to contribute to the development of a national lung cancer screening strategy in Brazil by exploring the integration of mobile screening into routine care, while highlighting the need for new approaches to engage high-risk populations in remote areas.

“ *ProPulmão is actively exploring integration of artificial intelligence (AI) to improve screening efficiency and diagnostic precision.* ”

The role of artificial intelligence in lung cancer screening

Artificial Intelligence (AI) has begun to revolutionize lung cancer screening worldwide, and ProPulmão is actively exploring its integration. The Early Lung Imaging Confederation (ELIC) initiative of the International Association for the Study of Lung Cancer (IASLC) has demonstrated how cloud-based AI algorithms can improve lung nodule detection, emphysema assessment, and volumetric analysis of lung lesions ⁵.

AI applications in lung cancer screening, particularly when integrated with mobile CT devices, have the potential to:

- Reduce diagnostic workload for radiologists.
- Improve accuracy in differentiating benign and malignant nodules.
- Facilitate real-time triage, ensuring that high-risk cases are prioritized for follow-up.

Incorporating AI-based decision support into ProPulmão could significantly improve screening efficiency and diagnostic precision, aligning Brazil with global advances in lung cancer detection.

Looking ahead: the future of lung cancer screening in Brazil

As ProPulmão and the BRELT trials continue to evolve, several future directions are being considered:

1. Expansion of mobile screening to other regions in Brazil: following the BRELT3 model, lung cancer screening with LDCT could be offered in partnership with SUS services, supporting access for high-risk individuals.
2. Integration with AI Technologies: collaborating with initiatives like ELIC could enhance ProPulmão's diagnostic capabilities, reducing false positives and optimizing patient management.
3. Public awareness campaigns: Brazil needs to expand its educational efforts to increase screening participation, particularly among non-smokers exposed to environmental risk factors.
4. Public-private partnerships: encouraging collaboration between the public sector, academic institutions, and private healthcare providers will be crucial for scaling up lung cancer screening programs in Brazil.

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Conclusion

ProPulmão shows that early lung cancer detection is achievable in resource-limited settings through mobile screening, interdisciplinary collaboration, and innovative financing. Aligned with a universal healthcare model, it ensures screening reaches those who need it most.

With continued investment in AI, mobile technology, and policy integration, Brazil is well positioned to establish a sustainable and scalable lung cancer screening program that will serve as a global reference for mobile screening initiatives in developing countries.

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