Editorial

Precision Oncology Programs: Essential Components of Comprehensive Cancer Centers

Programas de Oncologia de Precisão: Componentes Essenciais dos Centros de Oncologia

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https://doi.org/10.34635/rpc.1100

Keywords: Medical Oncology; Molecular Targeted Therapy; Neoplasms/drug therapy; Precision Medicine

Palavras-chave: Medicina de Precisão; Neoplasias/tratamento farmacológico; Oncologia Médica; Terapia de Alvo Molecular

INTRODUCTION

Precision medicine has emerged as a transformative approach to cancer care in the rapidly evolving oncology landscape. No longer confined to the realm of experimental science, precision oncology has matured into a critical component of modern cancer treatment, including surgical oncology. This shift from traditional "one-size-fits-all" approaches to personalized interventions based on molecular profiling represents one of the most significant advances in oncology over the past decade.

The integration of precision oncology programs within Comprehensive Cancer Centers (CCCs) is not merely advantageous but essential for delivering optimal patient care while advancing our understanding of cancer biology. These programs serve as the nexus where cutting-edge genomic technologies, bioinformatics capabilities, clinical expertise, and translational research converge to create a potent force against cancer.

Received/Recebido: 24/03/2025 **Accepted/Aceite:** 28/03/2025 **Published online/Publicado online:** 29/03/2025 **Published/Publicado:**

CORE COMPONENTS AND INDIVIDUAL BENEFITS

Successful precision oncology programs within CCCs are characterized by several key elements. Advanced genomic profiling technologies enable the identification of actionable molecular alterations unique to each patient's tumor. This molecular characterization provides crucial information that guides therapeutic decision-making beyond conventional histology-based approaches, informing both medical and surgical oncology interventions. The data generated through these analyses requires sophisticated bioinformatics infrastructure to interpret complex genomic findings and translate them into clinically relevant information.

Perhaps most critically, multidisciplinary molecular tumor boards bring together experts from various specialties—medical oncology, surgical oncology, pathology, genetics, bioinformatics, and others—to collectively interpret results and formulate personalized treatment plans. This collaborative approach ensures that all aspects of a patient's case are considered when determining the optimal therapeutic strategy. As demonstrated by Oh[1] *et al* (2023) in their work on precision cancer medicine, this multidisciplinary approach is particularly valuable in complex malignancies where surgical decisions must be carefully integrated with other treatment modalities.

The benefits of this approach for individual patients are substantial and multifaceted. By matching patients to therapies specifically targeted to their tumor's molecular profile, precision oncology programs enhance treatment efficacy while minimizing exposure to potentially ineffective therapies. This targeted approach reduces unnecessary toxicity, improves quality of life, and in many cases, extends survival. For surgical oncology patients, molecular profiling can help determine the optimal timing of surgical intervention and guide adjuvant therapy decisions. Furthermore, comprehensive molecular profiling facilitates enrollment in clinical trials investigating novel targeted agents, providing patients with access to cutting-edge experimental therapies that may offer hope when standard treatments have failed. The NeoCOAST platform trial reported by Cascone[2] *et al* (2023) exemplifies how precision oncology approaches can inform neoadjuvant therapy decisions before surgical resection in lung cancer, potentially improving surgical outcomes.

REGIONAL IMPACT AND SCIENTIFIC ADVANCEMENT

The value of precision oncology programs extends far beyond individual patient care. These programs serve as catalysts for regional impact through multiple mechanisms. By fostering collaboration between researchers, clinicians, and industry partners across disciplines, including surgical oncology, they create an ecosystem that stimulates innovation and attracts top talent. This collaborative environment promotes a culture of continuous improvement and accelerates the translation of research findings into clinical practice.

Portugal's pioneering efforts in this field, as documented by Mainoli[3] *et al* (2024) through the Precision Oncology Platform trial, demonstrate how a well-structured precision oncology program can have a significant regional impact. Their work provides a valuable blueprint for implementing such programs in other regions and highlights the importance of incorporating surgical expertise in precision medicine initiatives.

Education and training represent another crucial dimension of regional impact. Precision oncology programs serve as hubs for educating healthcare professionals across the region on the principles and applications of genomic medicine in oncology. This educational effect expands the program's impact beyond the walls of the CCC itself, elevating the standard of cancer care throughout the region, with particular benefits for the practice of surgical oncology as molecular insights increasingly inform surgical decision-making.

The scientific contributions of precision oncology programs cannot be overstated. The aggregated data from molecular profiling contributes significantly to our collective understanding of cancer biology, driving further research and development of innovative therapies. The creation of large, well-annotated biorepositories provides invaluable resources for future investigations in both medical and surgical oncology, potentially yielding insights that benefit cancer patients globally. Leader[4] *et al* (2024) articulate this vision eloquently in their concept of precision oncology, extending "from base pairs to city squares," emphasizing the broad societal impact of these programs.

Finally, a robust precision oncology program enhances a CCC's reputation as a center of excellence. This elevated status attracts patients seeking cutting-edge care and researchers eager to work in an environment at the forefront of oncology, further cementing the center's position as a leader in cancer care and research, including advanced surgical oncology approaches.

CONCLUSION

In conclusion, embedding a precision oncology program within a Comprehensive Cancer Center represents not

just a desirable addition but a fundamental necessity for optimizing cancer care in the modern era. These programs deliver immediate benefits to individual patients through personalized treatment approaches while simultaneously generating broader regional impact through collaboration, education, and scientific advancement.

As we look to the future, the role of precision oncology will only grow in importance as our understanding of cancer biology deepens and our therapeutic arsenal expands. The field of surgical oncology stands to benefit significantly from these advances, as molecular information increasingly guides surgical planning and intervention. The European collaborative efforts described by Taskén[5] *et al* (2024) through the PCM4EU and PRIME-ROSE consortia illustrate the growing recognition of precision oncology's value and the need for coordinated implementation across healthcare systems.

Comprehensive Cancer Centers that embrace and invest in robust precision oncology programs today position themselves at the vanguard of this revolution, ready to deliver the promise of truly personalized cancer care to patients while driving meaningful advances in the field of oncology.

ETHICAL DISCLOSURES

Conflicts of Interest: The authors have no conflicts of interest to declare.
Financial Support: This work has not received any contribution grant or scholarship.
Provenance and Peer Review: Commissioned; not external peer-reviewed.

RESPONSABILIDADES ÉTICAS

Conflitos de Interesse: Os autores declaram a inexistência de conflitos de interesse.
Apoio Financeiro: Este trabalho não recebeu qualquer subsídio, bolsa ou financiamento.
Proveniência e Revisão por Pares: Solicitado; sem revisão externa por pares.

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