Belrhali I, Naciri S, Ruck S, Mrabti H, Errihani H. Oncology Fellowship Training in Morocco: Bridging Global Innovation and Local Practice. *Academic Medicine & Surgery*. Published online November 10, 2025. doi:10.62186/001c.145254

Educational Advances in Medicine & Surgery

Oncology Fellowship Training in Morocco: Bridging Global Innovation and Local Practice

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Keywords: oncology education, Morocco, fellowship, immunotherapy, antibody–drug conjugates, global oncology, medical training

https://doi.org/10.62186/001c.145254

Academic Medicine & Surgery

Background

Emerging therapies such as immunotherapy and antibody–drug conjugates (ADCs) have revolutionized oncology worldwide. However, access to these innovations remains highly unequal across regions, particularly in low- and middle-income countries (LMICs), where education and practice often lag behind therapeutic advances.

Objective

This perspective critically describes the structure of oncology fellowship training in Morocco, illustrating how residents adapt to global innovations through hybrid training models that combine national residency and international fellowship exposure.

Methods

A descriptive and comparative approach was used, drawing from institutional experience, fellowship curricula, and international training frameworks to analyze the Moroccan model within the broader LMIC context.
Description and Findings:
Moroccan oncology residency includes four years of progressive hospital-based training, complemented by structured international fellowships such as the Diplôme de Formation Médicale Spécialisée (DFMS) or FOSFOM in France and Belgium. Fellows gain hands-on experience with immunotherapy, ADCs, and multidisciplinary cancer care. Continuous learning through congresses (ASCO, ESMO) and digital education platforms further strengthens competencies.

Conclusions

This hybrid educational pathway bridges global innovation and local clinical realities. The Moroccan experience highlights the importance of structured mentorship, bilingual education, and international collaboration in shaping a sustainable oncology workforce for LMICs.

INTRODUCTION

Over the past decade, oncology has experienced a paradigm shift driven by the rise of immunotherapy and antibody–drug conjugates (ADCs). Landmark trials such as ASCENT, TROPiCS-02, KEYNOTE-355, and DESTINY-Breast04 have defined new standards of care across multiple malignancies.[1-4] These breakthroughs, now embedded in international guidelines,[5,6] have dramatically improved survival compared with conventional chemotherapy.

However, access to innovation remains profoundly unequal. High-income countries (HICs) rapidly integrate immunotherapy and ADCs, while most low- and middle-income countries (LMICs) continue to rely on chemotherapy due to limited infrastructure, biomarker availability, and drug reimbursement.[7-9] Furthermore, fewer than 10% of participants in pivotal clinical trials originate from LMICs,[10] reflecting persistent global disparities in research, education, and access to innovation.

In Morocco, medical oncology residency spans four years and combines both clinical immersion and theoretical training. During the first six months, residents are fully integrated into inpatient oncology wards, where they acquire the fundamentals of cancer management, chemotherapy protocols, and oncologic emergencies. After this initial period, they begin active participation in outpatient clinics and day-hospital units, contributing to the diagnosis, follow-up, and therapeutic monitoring of patients with gynecologic, breast, digestive, urologic, sarcoma, and head and neck cancers. This exposure is complemented by on-call duties in oncologic emergencies, promoting progressive autonomy and clinical judgment. Throughout the pro-

gram, residents work under the close supervision of senior residents, specialists, and professors, ensuring continuous mentorship and skill acquisition. A six-month rotation in radiation oncology consolidates their understanding of radiotherapy planning and delivery techniques.

The Moroccan model is distinctive for its integration of structured international fellowships—such as the *Diplôme de Formation Médicale Spécialisée* (DFMS) or *FOSFOM*—in France or Belgium, which expose residents to advanced therapeutic modalities and multidisciplinary practices not yet widely available in their home institutions. Complementary participation in major congresses (ASCO, ESMO) and digital education initiatives further enhance professional development.[11,12]

Documenting this hybrid approach to oncology training is particularly valuable, as few studies have explored how LMIC residency programs adapt to rapid global therapeutic evolution. This paper therefore aims to describe and critically analyze the Moroccan oncology training pathway, emphasizing its unique features, challenges, and the potential replicability of its model across other LMIC contexts.

THE MOROCCAN ONCOLOGY TRAINING PATHWAY

This section draws on institutional experience, national residency curricula, and fellowship program structures to describe the organization of oncology training in Morocco and its integration with international educational models.

The Moroccan oncology residency is a four-year structured program that combines progressive clinical immersion, academic education, and multidisciplinary exposure. During the first six months, residents are fully integrated into inpatient oncology wards, where they acquire the fundamentals of cancer management, chemotherapy administration, and oncologic emergencies. After this introductory phase, they begin to participate actively in outpatient clinics and day-hospital activities, contributing to the diagnosis, follow-up, and therapeutic monitoring of patients across various tumor types, including breast, gynecologic, urologic, digestive, sarcoma, and head and neck cancers. This hands-on experience is complemented by regular on-call duties in oncologic emergencies, promoting both autonomy and clinical decision-making.

Throughout the residency, trainees work under the close supervision of senior residents, attending specialists, and professors, ensuring a structured mentorship model that emphasizes patient safety and guided skill acquisition. The theoretical component includes fortnightly lectures covering core oncology topics, daily multidisciplinary staff meetings, and five specialized tumor boards (digestive, urologic, surgical, gynecologic, and ovarian) each week, fostering continuous discussion and evidence-based therapeutic decision-making. A six-month rotation in radiation oncology further consolidates residents' understanding of radiotherapy planning and treatment delivery, ensuring a comprehensive, multimodal perspective.

Many Moroccan residents further complement this national curriculum with a one-year international fellowship, most commonly through the *Diplôme de Formation Médicale Spécialisée* (DFMS) or *FOSFOM* programs in France and Belgium. These structured fellowships offer exposure to high-income country oncology systems, advanced technologies, and novel therapeutics such as immunotherapy and antibody–drug conjugates (ADCs).[5,6,13] For instance, at the Centre Hospitalier d'Épinal (University of Lorraine, France), Moroccan fellows undertake one year of hospital-based oncology practice, alternating between inpatient care, day-hospital activities, and outpatient consultations. Weekly multidisciplinary tumor boards (RCPs) foster collaborative decision-making, while academic teaching is delivered every two weeks at the Faculty of Medicine of Lorraine. Fellows may also receive introductory palliative care training through the hospital's mobile palliative care team, consistent with international supportive-care frameworks.[12] In addition, several residents pursue Interuniversity Diplomas (DUI) in specialized areas such as supportive care, thoracic oncology, or oncogeriatrics, thereby further strengthening their academic and clinical expertise.

This hybrid model—integrating the Moroccan residency structure with structured European fellowships—provides residents with a unique opportunity to align with international standards of oncology care while retaining local contextual understanding. It represents an adaptive framework capable of bridging disparities in oncology education between resource-limited and high-resource settings.

UNIQUE ASPECTS AND CHALLENGES

The Moroccan oncology training system exhibits several unique characteristics that reflect both its adaptability and the systemic challenges inherent to low- and middle-income country (LMIC) settings.

STRENGTHS AND DISTINCTIVE FEATURES

A defining strength of the Moroccan model is its bilingual educational framework, where clinical practice, documentation, and academic communication are conducted in both French and English. This dual-language environment enhances accessibility to international literature, facilitates participation in global conferences, and supports collaboration with francophone and anglophone oncology networks. It also prepares residents for fellowships abroad and contributes to Morocco's growing visibility within the global oncology community.

Another distinctive feature is the dual-degree pathway combining national residency with international fellowships such as the *Diplôme de Formation Médicale Spécialisée* (DFMS) or *FOSFOM* programs in France and Belgium. These experiences provide first-hand exposure to cutting-edge therapeutics—particularly immunotherapy and antibody–drug conjugates (ADCs)—and to multidisciplinary clinical environments that foster evidence-based decision-making. Upon returning home, fellows play a pivotal role in disseminating new knowledge, updating local practices, and guiding junior trainees, thus creating a virtuous cycle of academic transfer and mentorship.

Table 1. Structure of Oncology Training Pathway in Morocco and Through International Fellowships

Stage	Duration	Setting	Core Activities and Competencies	Key Challenges
Residency – Inpatient Training (Morocco)	1 year	National Institute of Oncology (INO), university hospitals	Management of hospitalized oncology patients, chemotherapy protocols, oncologic emergencies, symptom control	Limited exposure to novel therapies and biomarkers
Residency – Day Hospital and Consultations (Morocco)	1 year	Oncology day-hospital units	Diagnosis and follow-up of patients across tumor types (breast, gynecologic, digestive, urologic, sarcoma, head & neck); treatment monitoring	Restricted access to immunotherapy and targeted therapies
Rotation in Radiation Oncology (Morocco)	6 months	Radiotherapy departments	Radiotherapy planning, dose calculation, multidisciplinary coordination	Limited availability of modern radiotherapy techniques in some centers
Theoretical and Academic Training (Morocco)	Throughout 4 years	University and hospital-based teaching	Fortnightly didactic sessions, daily staff meetings, 5 weekly tumor boards (digestive, urologic, surgical, gynecologic, ovarian)	Lack of standardized modules on emerging therapies (immunotherapy, ADCs)
International Fellowship (France/ Belgium/ Switzerland)	1 year	DFMS/FOSFOM programs – e.g., CH Épinal, Université de Lorraine	Exposure to advanced therapeutics, multidisciplinary tumor boards, academic seminars, palliative care training, and optional university diplomas (DUI)	Cultural adaptation, administrative barriers, variability in fellowship content
Return to Morocco – Clinical Practice and Knowledge Transfer	Continuous	National oncology centers	Implementation of acquired knowledge, supervision of trainees, participation in continuing medical education and registries	Integration of innovations limited by drug availability and health policy constraints

PERSISTENT CHALLENGES

Despite these strengths, several structural challenges continue to hinder the full modernization of oncology education in Morocco. The national curriculum currently lacks standardized modules dedicated to emerging therapies, molecular oncology, and clinical research methodology, resulting in variable exposure among residents. In addition, limited access to biomarker testing—including PD-L1, BRCA, MSI, and HER2-low—restricts the implementation of precision oncology and the eligibility of patients for targeted or immune-based therapies.[7,9,10]

Economic constraints and the absence of routine inclusion in international clinical trials further accentuate the gap between global therapeutic innovation and local practice. Finally, the uneven availability of modern radiotherapy and diagnostic technologies across regions poses additional barriers to equitable training experiences nationwide.

ADAPTIVE RESPONSES

Despite these limitations, Moroccan oncology residents demonstrate remarkable adaptability. Through active participation in international congresses (ASCO, ESMO, EMUC) and digital learning platforms, they maintain continuous exposure to the latest guidelines, protocols, and trial updates. Online mentorship initiatives and hybrid education models increasingly serve as cost-effective bridges, enabling residents to remain scientifically up to date despite systemic constraints.[11,12]

Altogether, the Moroccan experience illustrates how bilingualism, academic mobility, and digital innovation can partially offset resource limitations and nurture a new generation of oncologists capable of connecting global science with local realities.

COMPARATIVE REFLECTION

Comparing oncology training frameworks between high-income countries (HICs) and low- and middle-income countries (LMICs) reveals a complex landscape of both disparities and complementarities.

In HICs such as France and Belgium, oncology fellowship programs are guided by standardized national curricula, ensuring consistent exposure to clinical research, precision oncology, and multidisciplinary coordination. Trainees benefit from routine access to innovative therapies, molecular diagnostics, and advanced technologies such as next-generation sequencing and adaptive radiotherapy.[5,6,13] Academic institutions in these settings also emphasize research literacy—encouraging participation in clinical trials, publication writing, and translational projects as integral components of training.

By contrast, residency programs in LMICs such as Morocco often operate within resource-constrained environments, where access to immunotherapy, ADCs, and biomarker-driven testing remains limited.[7,9,10] Educational exposure to these emerging modalities is therefore indirect, obtained through congresses, digital platforms, or international fellowships rather than routine local practice. Never-

theless, Morocco's hybrid model—combining national residency with structured European fellowships—offers an innovative strategy for bridging educational inequities and achieving practical alignment with global standards.

Comparable hybrid or partnership-based initiatives have been implemented in other LMIC contexts. In India, for instance, short-term observerships and virtual case discussions with international mentors have shown measurable improvements in trainees' confidence and clinical judgment. Similarly, programs such as the African Cancer Fellowship Initiative*, the ASCO Virtual Mentorship Network, and ESMO e-learning programs have demonstrated the feasibility of sustainable cross-border educational collaboration.[11,12] These initiatives mirror Morocco's experience, underscoring the growing role of digital education, structured mentorship, and academic partnerships in global oncology capacity building.

Ultimately, while HICs benefit from robust infrastructures and standardized educational policies, LMICs like Morocco showcase the power of adaptability. Through bilateral cooperation and blended learning, they transform structural limitations into opportunities for innovation—illustrating that meaningful progress in oncology education can arise not only from resource abundance, but from strategic collaboration and cultural resilience.

PERSPECTIVES FOR CURRICULUM DEVELOPMENT

Building on these observations, the modernization of oncology education in low- and middle-income countries (LMICs) such as Morocco requires a strategic shift toward competency-based and innovation-oriented curricula.

INTEGRATING EMERGING THERAPIES AND MOLECULAR ONCOLOGY

To ensure equitable exposure to modern oncology, the national residency curriculum should include standardized modules on immunotherapy, molecular diagnostics, and antibody–drug conjugates (ADCs). These modules could be implemented through collaborative teaching between Moroccan and European institutions, combining online lectures, case-based learning, and interactive clinical scenarios. Incorporating basic principles of clinical trial design and translational research would further prepare residents for participation in global oncology studies.

STRENGTHENING BINATIONAL MENTORSHIP AND FACULTY EXCHANGE

Formalized **mentorship partnerships** between Moroccan and European oncology departments would promote sustained academic supervision and bilateral knowledge transfer. These programs could include joint tumor boards, visiting professorships, and co-mentored publications, creating long-term mentorship chains that continue beyond the fellowship year. Such initiatives would also help foster a culture of **research productivity and academic leadership** among Moroccan oncologists.

EXPANDING DIGITAL EDUCATION AND CONTINUOUS LEARNING

Digital learning platforms—including ASCO eLearning, ESMO Virtual Preceptorships, and global MOOCs—offer a scalable and cost-effective method to democratize access to oncology education. Integrating these tools within the Moroccan residency framework would ensure regular exposure to updated international guidelines, interactive discussions, and cross-institutional collaboration. Hybrid teaching formats, already tested during the COVID-19 era, can serve as sustainable models for ongoing professional development.

ESTABLISHING REGIONAL CENTERS OF EXCELLENCE

Developing North African regional oncology training hubs could further harmonize curricula across neighboring LMICs. By pooling faculty, educational materials, and mentorship structures, these centers could provide standardized, high-quality training while promoting **S**outh–South collaboration. Morocco, given its bilingual and internationally connected system, is particularly well positioned to play a leadership role in such an initiative.

EVALUATING EDUCATIONAL OUTCOMES

Finally, it is essential to implement *evaluation metrics* that assess both short- and long-term outcomes of these educational reforms. Indicators may include the number of residents trained in immunotherapy and ADCs, participation in international congresses or research projects, and post-fellowship career trajectories. Such data would provide valuable feedback for continuous curriculum improvement and inform global oncology education policy.

In summary, Morocco's evolving oncology education system offers a fertile ground for innovation. By combining structured mentorship, digital learning, and regional collaboration, the country has the potential to serve as a model of scalable oncology education reform for other LMICs.

CONCLUSION

The rapid evolution of oncology through immunotherapy and antibody–drug conjugates (ADCs) has deepened global inequities in access, education, and clinical practice. Yet, the Moroccan experience demonstrates that innovative, hybrid educational pathways can bridge these gaps and cultivate a new generation of oncologists capable of translating global science into local impact.

By combining structured national residency, international fellowships, and digital learning, Morocco has built a model that promotes both excellence and equity. The bilingual and mentorship-driven nature of this system provides a solid foundation for continuous professional development and collaborative research.

Moving forward, aligning oncology education in low- and middle-income countries (LMICs) with global standards will require *sustained partnerships, curriculum standardization, and the use of technology as a democratizing tool*. Morocco's experience serves as a proof of concept that high-quality oncology training is achievable even in resource-constrained environments when driven by innovation, collaboration, and a shared vision of equity in cancer care.

Ultimately, the future of oncology education lies not only in technological advancement, but in building bridges—between nations, disciplines, and generations—to ensure that knowledge truly becomes global.

Submitted: August 30, 2025 EST. Accepted: October 06, 2025 EST. Published: November 10, 2025 EST.

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