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Perspective

Drug Development in Abu Dhabi: Advancing Innovation Through Government Support and a Thriving Ecosystem

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Abstract
Drug development is a complex, high-risk, and resource-intensive process, with global challenges such as high costs, regulatory hurdles, and low clinical trial success rates. These obstacles are especially acute for biotech startups and companies in emerging markets, where access to infrastructure, patient populations, and capital can be limited. This Perspective advocates for Abu Dhabi's emerging life sciences ecosystem as a potential framework for other regions seeking to accelerate pharmaceutical innovation. By offering government-backed incentives, advanced research infrastructure, regulatory support, and access to regional genomic data, Abu Dhabi provides a model for addressing industry bottlenecks and fostering sustainable drug development growth in new markets.

Introduction

Developing a new drug is a highly intricate and time-intensive endeavor involving multiple stages, starting long before it reaches the market. It begins with obtaining an Investigational New Drug (IND) approval, which allows the drug to proceed to Phase 1 clinical trials. After demonstrating initial safety, further approvals are needed for subsequent phases of clinical trials to assess efficacy, dosage, and potential side effects. Each phase presents distinct scientific, financial, and logistical challenges, contributing to the low success rate of drug candidates. Finally, achieving clinical approval or commercial approval from regulatory agencies marks the culmination of this rigorous process, enabling the drug to be marketed and made available to patients.

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The process begins with drug discovery, where potential compounds are identified through target screening, medicinal chemistry, and preclinical testing. Researchers must evaluate both efficacy and safety before advancing to human trials, a process that can take several years. Preclinical studies, conducted *in Silico, In vitro* and *In vivo* models, assess toxicity, pharmacokinetics, and mechanism of action.

The transition to clinical trials is one of the most challenging phases. Conducted in three main stages, these trials test drugs in diverse patient populations to evaluate safety, optimal dosage, and therapeutic efficacy. However, many drugs fail due to toxicity, lack of efficacy, or poor bioavailability, leading to a high attrition rate.

Regulatory approval further complicates drug development. Agencies such as the US FDA, EMA (Europe), MHRA (UK), and other global regulatory bodies enforce stringent guidelines to ensure patient safety and efficacy. Navigating these complex approval processes requires substantial investment, expertise, and time, often delaying market entry.

Financial constraints are a major hurdle. Developing a single drug can cost billions of dollars with no guarantee of success. Small biotech firms and startups often struggle to secure funding, access advanced research infrastructure, and conduct large-scale clinical trials. Notably, many Series A and seed-funded companies are unable to finance Phase II studies, even after successful Phase I trials. Consequently, most acquisitions occur post-Phase I, with large pharmaceutical companies. In some cases, these acquisitions lead to the discontinuation of drug development to eliminate competition.

Additionally, the need for global patient recruitment further complicates the process, as certain diseases require multinational collaborations to gather adequate clinical data.

This article represents the authors' informed perspective on the drug development landscape and regional opportunities, and is not intended as a traditional systematic review, original research article, or policy report.

This article highlights the opportunities available in Abu Dhabi that help address these challenges. By leveraging government-backed incentives, world-class research facilities, and regulatory support, pharmaceutical companies can fast-track drug development, overcome traditional barriers, and advance innovative treatments more efficiently.

Key Advantages of Abu Dhabi's Drug Development Ecosystem

1. *Strategic Location*: Situated at the crossroads of Europe, Asia, and Africa, Abu Dhabi provides access to a diverse patient population, facilitating large-scale clinical trials. Over 80% of the world can be reached from Abu Dhabi within an 8-hour flight.
2. *World-Class Healthcare System*: With internationally accredited hospitals and research institutions, the emirate offers a robust environment for conducting high-quality clinical research.
3. *Tax and Business Incentives*: The UAE's business-friendly policies, including little to no tax payments, make it an attractive destination for biotech companies.
4. *Commitment to AI and Digital Health*: Investments in artificial intelligence, big data, and digital health solutions enhance drug development efficiency and precision medicine approaches.
5. *Sustainability and Long-Term Vision*: Abu Dhabi's commitment to pharmaceutical self-sufficiency and innovation ensures continuous support for biotech and pharma industries.
6. *A regulatory environment that acts as a partner:* Abu Dhabi's Department of Health (DoH) and other regulatory agencies truly act as a partner in cutting through some the red tape and common bottlenecks that other regulatory bodies might have when moving to first in human trials and commercialization.
7. *Robust Supply Chain Infrastructure:* With world-class logistics hubs, including major seaports and airports, Abu Dhabi offers a reliable and efficient supply chain network. This facilitates the timely transport of raw materials, clinical trial supplies, and commercial drug products, ensuring smooth operations for pharmaceutical companies.

1. Government Initiatives and Regulatory Support

With the vision of translating research "from bench to bedside", the Abu Dhabi government, through agencies such as the Department of Health (DoH) [1] and Abu Dhabi Investment Office (ADIO), has implemented several initiatives to accelerate drug development [2]. The establishment of the Abu Dhabi Biopharma Hub71 [3] provides an integrated platform for pharmaceutical companies, researchers, and investors to collaborate on innovative therapies.

Key government-led support includes:

- *Golden Visa Program* for life science professionals and researchers, enabling long-term residency and stability.
- *Regulatory Support and Oversight:* The Department of Health (DoH) provides fast-tracking pathways to expedite approvals for clinical trials and new drug applications [1]. Additionally, the Emirates Drug Establishment (EDE) serves as the federal authority regulating a wide range of products, including pharmaceuticals, medical devices, blood derivatives, genetically modified organisms (GMOs), stem cells, medicated cosmetics, veterinary medications, and agricultural products. This collaborative regulatory framework ensures efficient market entry while maintaining stringent safety and quality standards [4].
- *Public-Private Partnerships (PPPs)* to encourage collaboration between global biotech firms and local institutions.
- *Investment and Grants*, including financial incentives from ADIO to support biotech startups and multinational pharmaceutical companies setting up in Abu Dhabi. As well as grants from the department of health that goes as high as 2 Million AED [5].

2. Educational and Research and Development Infrastructure

Abu Dhabi has invested heavily in state-of-the-art research facilities and academic-industry partnerships to enhance drug discovery and translational medicine. Institutions such as Khalifa University, NYU Abu Dhabi, UAEU, and the Mohamed Bin Zayed University of Artificial Intelligence (MBZUAI) contribute to cutting-edge biomedical research. A critical component of this ecosystem is the education and workforce development strategy, which ensures a steady pipeline of skilled professionals.

Each year, Abu Dhabi produces hundreds of graduates in biomedical sciences, biotechnology, and pharmaceutical fields, with institutions such as Khalifa University and UAE University training the next generation of scientists. The demand for highly skilled researchers and technicians continues to grow, prompting increased investment in specialized training programs and academic-industry collaborations.

3. Advanced Clinical Trials in Abu Dhabi

Abu Dhabi has established itself as a hub for advanced clinical trials, providing state-of-the-art facilities, world-class hospitals, and a highly diverse patient population that enables efficient drug testing. The emirate's commitment to medical research is evident through collaborations with leading pharmaceutical companies and global research institutions.

Key Hospitals, Institutions, Companies Conducting Clinical Trials:

- *Cleveland Clinic Abu Dhabi:* Conducts cutting-edge clinical trials in oncology, cardiology, and rare diseases, collaborating with international research networks [6].
- *Sheikh Shakhbout Medical City (SSMC):* A joint venture with Mayo Clinic, SSMC is leading several clinical trials in cancer, infectious diseases, and regenerative medicine.
- *Burjeel Medical City:* A specialized research hospital focusing on rare diseases with project called NADER (Needs Assessment and Therapeutics Development for Rare Diseases – 'nader' meaning 'rare' in Arabic. In addition to The Center for Research on Rare Blood Disorders (CR-RBD) which runs blood disease related clinical trials.
- *Abu Dhabi Stem Cells Center (ADSCC):* Runs advanced clinical trials in stem cell

therapy and regenerative medicine, pioneering innovative treatment methods.

- *SEHA (Abu Dhabi Health Services Company):* Through its network of hospitals and clinics, including Sheikh Tahnoun Medical City (STMC) and Tawan facilities, SEHA conducts a wide range of clinical trials in infectious diseases, metabolic disorders, and genetic research
- *M42 Healthcare:* A major player in precision medicine and personalized therapy trials, leveraging AI and genomics for groundbreaking research [7]. The institution is also leading clinical trials through the Innovative Research Organization for Science (*IROS*), which focuses on advanced therapies, biomarker discovery, and real-world evidence studies to enhance treatment outcomes.
- *Clinical CROs:* in addition to IROS several other clinical CROs were licensed in UAE such as PDC, IQVIA, Pheonix, CTI.

Why Abu Dhabi for Clinical Trials?

- Diverse Patient Population: With over 200 nationalities represented, Abu Dhabi offers an ideal environment for conducting inclusive and representative clinical trials. This diversity is particularly advantageous as regulatory agencies, including the US FDA, emphasize the need for diverse participant pools. While diversity is preferred in Phase 1 and 2 trials, it becomes a mandate for pivotal Phase 3 trials, making Abu Dhabi a strategic location for meeting these regulatory requirements.
- Regulatory Efficiency: The Department of Health (DoH) provides a streamlined regulatory process, ensuring faster approvals and compliance with international standards.
- State-of-the-Art Facilities: Abu Dhabi is home to advanced hospitals and research centers equipped with cutting-edge technology for conducting trials across multiple therapeutic areas. Notably, the emirate has dedicated Clinical Research Units (CRUs) that are fully staffed to support clinical trials. These include:
  - Cleveland Clinic Abu Dhabi (CCAD)
  - Sheikh Shakhbout Medical City (SSMC)
  - Abu Dhabi Clinical Trials Unit (CTU), operated by SEHA and located next to Sheikh Khalifa Medical City (SKMC).

These specialized units enhance the efficiency and quality of clinical research, ensuring compliance with international standards.

- Public-Private Collaborations: Strong partnerships between government entities, academic institutions, and biotech companies accelerate clinical research.
- Investment in Digital Health & AI: Abu Dhabi is integrating artificial intelligence and big data into clinical trials, enhancing research precision and efficiency.

The emirate's strong infrastructure, regulatory framework, and commitment to innovation make it an ideal destination for pharmaceutical companies looking to conduct early-phase, mid-phase, and late-stage clinical trials with high efficiency and global impact.

4. The UAE Genomic Project and Its Impact on Drug Development

The UAE has launched one of the most ambitious national genome programs worldwide [8], aimed at sequencing the genetics of its population to drive advancements in personalized medicine and drug discovery. The Emirati Genome Program (EGP), initiated in 2019, seeks to sequence one million Emirati genomes, providing a comprehensive reference for understanding genetic variations and their implications for health. This initiative plays a crucial role in drug development by identifying genetic predispositions to diseases such as diabetes, cardiovascular disorders, and rare genetic conditions, which are prevalent in the region. By leveraging genomic data, researchers and pharmaceutical companies can design targeted therapies and improve drug efficacy for the local population. The UAE government has invested over AED 3 billion in genomic research and biotechnology, with collaborations between entities such as M42 Healthcare and the Abu Dhabi Department of Health (DoH).

In 2021, M42 Healthcare launched the Omics Center of Excellence, the largest sequencing facility in the region, to support precision medicine research. This infrastructure is expected to accelerate clinical trials, biomarker discovery, and pharmacogenomic studies, positioning Abu Dhabi as a leading hub for genomics-driven drug development in the Middle East.

A significant future goal of the UAE's genomic initiatives is the integration of Digital Twin Technology and virtual avatars for precision medicine. By leveraging the extensive multi-omics database created through the genome program, Trusted Research Environments (TREs) will enable the simulation of individual genetic profiles to predict disease progression and drug responses. Digital twins — virtual representations of patients — can simulate how various treatments would interact with specific genetic backgrounds, leading to highly personalized therapeutic strategies. This technology holds immense potential in reducing the time and cost of clinical trials, as researchers can pre-test drug responses virtually before administering them in real-world scenarios.

While genomic sequencing identifies mutations and genetic abnormalities, the next critical step is translating this knowledge into actionable therapies. The UAE is increasingly focused on advancing gene therapy and other precision medicine treatments to address inherited genetic disorders and cancers. Unlike inherited monogenic diseases, where a single mutation may cause disease, cancers often involve acquired mutations with multiple clones and sub-clones. Identifying and targeting the dominant driver mutation remains essential for effective treatment.

To accelerate the development of gene therapies, the UAE is embracing in-silico approaches, which use advanced computational models to simulate molecular interactions and predict therapeutic outcomes. By integrating multi-omics data with artificial intelligence and machine learning algorithms, researchers can rapidly identify promising drug candidates, optimize therapeutic targets, and personalize treatment strategies. This approach minimizes reliance on traditional experimental methods, reducing time and costs while increasing the likelihood of clinical success.

Through its commitment to genomic research, digital twin technology, and in-silico drug discovery, Abu Dhabi is positioning itself as a global leader in personalized medicine. By transforming genetic insights into novel therapies, the UAE is making significant strides in improving healthcare outcomes and advancing the future of drug development.

Abu Dhabi Investment Office (ADIO) and Its Support for Drug Development

The Abu Dhabi Investment Office (ADIO) plays a crucial role in fostering biotechnology, pharmaceutical research, and drug development in the emirate. Through its Innovation Program, ADIO has committed AED 2 billion ($545 million) to support life sciences companies, providing funding, incentives, and infrastructure to accelerate advancements in healthcare and biotechnology. Key initiatives by ADIO include:

- Financial Incentives & Grants: Offering equity-free funding, subsidies, and partnerships to pharmaceutical companies, biotech startups, and contract research organizations (CROs).
- Infrastructure Development: Supporting the creation of biopharma manufacturing hubs and advanced research centers to enhance drug discovery and production capabilities.
- Public-Private Partnerships (PPPs): Facilitating collaborations between global pharma leaders, local biotech firms, and academic institutions to drive innovation.
- Fast-Tracking Market Entry: Assisting companies in navigating regulatory approvals and licensing processes, enabling faster commercialization of new drugs. ADIO has partnered with leading biotech firms such as G42 Healthcare and PureHealth, enhancing Abu Dhabi's position as a global hub for drug development and precision medicine. By investing in life sciences, ADIO is shaping the future of healthcare innovation in the UAE.

In addition to ADIO's efforts, other prominent investment entities such as Mubadala and Abu Dhabi Developmental Holding Company (ADQ) have heavily invested in national and

international pharmaceutical and biotech companies [9, 10]. For example, Arcera, funded by ADQ, aims to build a global life sciences powerhouse anchored in Abu Dhabi [11]. Similarly, M42, backed by Mubadala, is a leading healthcare company focused on precision medicine and advanced clinical research. These investments further strengthen Abu Dhabi's position as a global hub for drug development and biotechnology innovation.

Room for improvement

Despite the rapid success in building the infrastructure of Abu Dhabi's life sciences ecosystem, there remains room for improvement. One notable challenge is the recruitment of experienced biotech and drug development startups, which is still limited. Additionally, the international visibility and marketing of the ecosystem are underdeveloped, meaning that many potential collaborators and investors remain unaware of the region's opportunities, particularly in areas like access to genomic data.

While large-scale genomic datasets exist, access is currently highly restricted due to data security and sovereignty concerns. Establishing clear, secure, and efficient frameworks for data sharing will be essential for maximizing precision medicine and research collaborations. Similarly, the local funding landscape for drug development is still maturing, with limited awareness of the high-risk, high-reward nature of pharmaceutical investment among local venture capital and family offices. Moreover, biomanufacturing and GMP-certified production facilities remain scarce, limiting scalability for advanced therapies.

These challenges are not unique to Abu Dhabi but represent the natural growing pains of an emerging biotech hub. With sustained investment, policy commitment, and international partnerships, these gaps can be progressively addressed, further strengthening Abu Dhabi's position in the global drug development ecosystem.

Conclusion

With strong government backing, a rapidly growing research infrastructure, and a strategic location, Abu Dhabi is well-positioned to become a global leader in drug development. The emirate's comprehensive life sciences strategy integrates all key players in the ecosystem, including the Department of Health, the newly established Emirates Drug Establishment, Mubadala Health, ADQ, Masdar City, academic institutions, and healthcare providers. This collaborative approach fosters seamless coordination between academia, industry, and government, accelerating innovation in healthcare and biotechnology.

Indeed many companies have already or plan to have a branch of operations in Abu Dhabi; establishing state-of-the-art infrastructure including preclinical contract research organization and shared lab facilities. As Abu Dhabi continues to attract international investment and talent, its pharmaceutical and biotech sectors are set to thrive, making it an ideal destination for drug discovery and development.

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Disclosure Statement

The authors have nothing to disclose.

References

1 Dhabi DoHA. About The Department of Health 2025 [Available from: https://www.doh.gov.ae/en/about.
2 Office ADI. About the Abu Dhabi Investment Office [Available from: https://www.investinabudhabi.ae/About-us.
3 Hub71 - Abu Dhabi's Global Tech Ecosystem [Available from: https://www.hub71.com/.
4 Establishment ED. Welcome to Emirates Drug Establishment 2025 [Available from: https://ede.gov.ae/ar/.
5 Dhabi DoHA. DOH-Ma'an grant for Abu Dhabi healthcare research /innovation [Available from: https://www.doh.gov.ae/en/research/Abu-Dhabi-Health-Research-and-Innovation-Grant.
6 Dhabi CCA. Clinical Trials and Research Studies [Available from: https://www.clevelandclinicabudhabi.ae/en/institutes-and-specialties/research/clinical-research-specialty.
7 M42 - About M42 [Available from: https://m42.ae/who-we-are/about-m42/.
8 Office ADM. Abu Dhabi named fastest-growing emerging startup ecosystem in MENA region 18/06/2024 [Available from: https://www.mediaoffice.abudhabi/en/technology/abu-dhabi-named-fastest-growing-emerging-startup-ecosystem-in-mena-region/.
9 Mubadala. MUBADALA- A SOVEREIGN INVESTOR 2024 [Available from: https://www.mubadala.com/en/who-we-are/about-mubadala.
10 ADQ. Who we are 2025 [Available from: https://www.adq.ae/about-adq/who-we-are/.
11 ADQ. ADQ launches holding company Arcera to build a global life sciences powerhouse anchored in Abu Dhabi 2025 [Available from: https://www.adq.ae/newsroom/adq-launches-holding-company-arcera-to-build-a-global-life-sciences-powerhouse-anchored-in-abu-dhabi/.