# Albarah Elkhani – COO, M42 Health

***Scaling integration is less about the volume of data generated and more about building the governance and clinical discipline required to connect analysis with care in a sustained manner***

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*As Abu Dhabi translates strategy into execution, the focus turns from platform design to operational delivery. Albarah Elkhani, COO of Integrated Health Solutions at M42, details how large-scale genomics, clinical pathways and regulatory alignment are embedded into day-to-day healthcare practice. From premarital and newborn screening to rare disease management and genomics-informed clinical trials, he explains how integration is structured to move beyond data generation towards measurable clinical impact within a coordinated ecosystem.*

**What shaped your professional journey, and how does your role at M42 reflect the organisation's integrated healthcare model?**

I serve as Chief Operating Officer of the Integrated Health Solutions platform at M42, where my focus is on ensuring that clinical services, data, and digital infrastructure operate as a single, coordinated system. I trained in clinical microbiology in London and began my career within the United Kingdom's National Health Service, working across hospital laboratories and pathology settings. That early exposure to a mature healthcare system with established clinical pathways and strong governance frameworks shaped how I approach quality, operational discipline, and system design. In the mid-2000s, I moved to the region to support the implementation of advanced infectious disease screening technologies in Saudi Arabia, before relocating to the United Arab Emirates to take on senior operational roles, including with Mubadala Health's National Reference Laboratory.

In 2023, Mubadala Health and G42 Healthcare came together to form M42. Mubadala Health contributed a significant clinical footprint across hospitals, specialty care, diagnostics, in vitro fertilisation, rehabilitation, and long-term care, while G42 Healthcare brought advanced capabilities in artificial intelligence, data science, and genomics, including national-scale initiatives such as the Emirati Genome Programme. The integration of these assets created a platform designed not only to deliver care, but to embed data and analytics into routine clinical practice in a structured and scalable way.

Today, M42 is headquartered in Abu Dhabi and operates in 27 countries with more than 20,000 employees. My role centres on translating that structural integration into operational reality, ensuring that large-scale programmes are embedded effectively within the healthcare system and aligned with regulatory and clinical standards. Alongside this, we are increasingly examining the intersection between environmental and human health, recognising that a truly proactive model of care must account for both individual risk and broader population dynamics.

**From an operational perspective, what are the key challenges in translating large-scale genomics into routine clinical decision-making?**

The central operational issue is ensuring that large-scale genomic initiatives do not remain confined to research or policy frameworks but are embedded into the daily realities of clinical care. From the outset, our work on the Emirati Genome Programme, delivered in partnership with the Department of Health, was structured with that objective in mind. Whole genome sequencing generates substantial information across approximately 23,000 genes per individual, yet its value depends entirely on whether it can be interpreted in context and translated into action. That requires not only analytical capacity, but clearly defined clinical pathways and sustained efforts to upskill clinicians across the ecosystem so that genomic insights become part of routine decision-making rather than a separate layer of reporting.

A practical example is the integration of pharmacogenomics into Malaffi, Abu Dhabi’s health information exchange. By embedding genomics-informed prescribing reports directly into the patient record, clinicians can tailor medication selection and dosing based on an individual’s genetic profile within the normal flow of care. This is particularly relevant in rare diseases, a significant proportion of which have a genetic basis. At Cleveland Clinic Abu Dhabi, collaboration between subspecialists and our genomics teams has strengthened the link between clinical phenotype and whole genome analysis in inherited eye disorders, enhancing diagnostic clarity and

supporting more targeted management.

One of the more complex dimensions of scaling genomics lies in the interpretation of variants of uncertain significance. Determining whether a variant is clinically meaningful requires ongoing dialogue between clinicians, researchers and bioinformaticians; without that feedback loop, discovery and care evolve in isolation. Our approach has therefore been to remove those silos and maintain structured, continuous interaction across disciplines, so that emerging findings can be reassessed in light of clinical evidence and, where appropriate, incorporated into practice. In operational terms, scaling integration is less about the volume of data generated and more about building the governance, coordination and clinical discipline required to connect analysis with care in a sustained manner.

**Where have you observed the most tangible impact from embedding genomics directly into healthcare delivery?**

The clearest impact has been in premarital genetic screening, where genomics shifts from theoretical risk assessment to structured prevention. In Abu Dhabi, premarital genetic testing was incorporated into the screening programme from 1 October 2024, drawing on sequencing conducted through the Emirati Genome Programme. The expanded panel now covers approximately 570 genes associated with more than 840 autosomal recessive disorders, reflecting the regional burden of inherited conditions. Publicly reported early data show that roughly 85 percent of couples were genetically compatible, while around 14 to 15 percent required further counselling or clinical follow-up. Given that autosomal recessive conditions carry a 25 percent risk of an affected child when both partners are carriers of the same pathogenic variant, the programme is structured not merely to inform couples of risk, but to interrupt the cycle of transmission across generations.

Crucially, the model extends beyond disclosure. Couples identified as carriers are offered structured counselling and access to fertility services where appropriate, allowing them to make informed reproductive decisions. This is where prevention becomes operational rather than conceptual. At the same time, integrating genomic testing into routine clinical workflows has materially shortened the diagnostic pathway for individuals already living with rare inherited disorders. Whereas the global diagnostic odyssey can extend for years, embedding genomic data within a live healthcare environment has enabled diagnoses in months or even weeks in certain cases, with clear implications for patient management and health system efficiency.

Newborn genetic screening represents the next stage of this approach. Launched in partnership with the Department of Health and implemented with appropriate consent, the programme uses whole genome sequencing for defined cohorts to complement traditional biochemical screening. While conventional newborn screening focuses on a limited set of acute conditions, genomic analysis enables earlier identification of a broader spectrum of treatable risks and supports longer-term preventive planning. Taken together, these initiatives illustrate how integrating genomics at key life stages can reshape care delivery in a way that is practical, measurable and aligned with population health objectives.

**In practical terms, what defines a truly patient-centred rare disease pathway within an integrated health system?**

An optimal pathway begins with clearly articulated clinical protocols that connect early identification to structured downstream care within a fully integrated system. Screening and genomic diagnosis must feed directly into defined referral routes, multidisciplinary review, genetic counselling and access to appropriate therapeutic options, ensuring that findings translate into coordinated action rather than remaining informational. This requires close alignment with the Department of Health and sustained collaboration across clinical teams so that pathways are standardised, embedded and continuously refined. At the core of this model is an active feedback loop between clinicians, researchers and bioinformaticians, allowing diagnostic insights to evolve in parallel with emerging evidence and clinical experience.

This coordination is particularly important in a region that has historically been underrepresented in global genomic datasets and clinical trials. Variant interpretation typically relies on international reference databases, yet limited regional data can increase the frequency of variants classified as of uncertain significance. By maintaining structured interaction between frontline clinicians and genomic scientists, we are able to reassess findings within their clinical context, improve diagnostic confidence and contribute region-specific data to the broader scientific community. Over time, this integrated approach not only enhances patient care but also creates a foundation for participation in genetically informed clinical trials, including in cell and gene therapy, ensuring that the rare disease pathway remains both locally responsive and globally connected.

**As Abu Dhabi expands its clinical research ambitions, what operational factors are most critical to strengthening its role in genomics-informed trials?**

From an infrastructure perspective, the foundations are largely established. Within M42 and across the broader Abu Dhabi ecosystem, we operate across much of the life sciences continuum, from large-scale genomic data generation and advanced analytics to clinical trial management, hospital-based enrolment and emerging pre-clinical capabilities. Our genomic datasets enable more precise cohort identification, while the health information exchange provides visibility into disease prevalence and patient pathways. We also maintain internal clinical research capacity alongside specialised facilities capable of conducting complex studies. At the ecosystem level, the Health, Endurance, Longevity and Medicine cluster (HELM), launched by the Department of Health in partnership with economic and investment authorities, creates a coordinated platform to accelerate research, development and commercialisation in biotechnology, precision medicine and advanced therapies. In strategic terms, the direction is clear and institutionally supported.

The opportunity now lies in expanding scale and enhancing diversity. Global regulators and sponsors are increasingly prioritising broader ethnic representation in clinical trials, reflecting long-standing imbalances in study populations. The Middle East and North Africa region has historically been underrepresented in both clinical research and genomic reference datasets, which limits the applicability of precision therapeutics. Through the Emirati Genome Programme, including its extension to participants of multiple nationalities, we are strengthening the regional evidence base and improving our ability to identify appropriate patient cohorts for genetically informed studies. As integration across research, clinical care and regulatory frameworks continues to mature, Abu Dhabi is positioned to play a more substantive role in globally relevant clinical development, grounded in both regional representation and operational capability.

**How has the Emirati Genome Programme evolved in scale and structure, and what differentiates its execution from other population genomics initiatives?**

The Emirati Genome Programme was launched as a national population genomics initiative with the objective of mapping the Emirati citizen population, estimated at approximately one million individuals, and building a comprehensive genetic reference to support precision, preventive and personalised healthcare. To date, more than 800,000 Emirati citizens have contributed samples, placing the programme among the largest population genome initiatives globally and bringing it close to its stated target. M42 serves as the delivery partner, responsible for consenting, sample collection, sequencing and clinical genomic analysis, operating high-throughput, clinical-grade sequencing platforms to ensure that outputs meet standards suitable for direct clinical use. The programme was designed from inception not only as a research effort, but as a platform capable of

informing healthcare delivery and public health strategy.

What differentiates the programme is the deliberate focus on integration rather than accumulation. Genomic data are supported by substantial analytical infrastructure and are governed through robust data security frameworks and defined processes for secondary informed consent, enabling responsible use within clinical workflows. The emphasis has been on translating sequencing into actionable insights, linking population-scale genomics with diagnostic pathways, research discovery and policy development. Establishing this capability within a relatively short period reflects coordinated investment across laboratory infrastructure, analytics and regulatory alignment.

Equally significant has been community participation. The programme is voluntary, and the scale of enrolment reflects sustained efforts to build genomic literacy and public trust, supported by national leadership and the Department of Health. Engagement has extended well beyond clinical settings into broader public spaces, reinforcing awareness of the long-term value of such initiatives. In that sense, the Emirati Genome Programme represents not only a sequencing milestone, but a structural component of the UAE's broader life sciences and precision health agenda, anchored in clinical-grade data, regulatory guardrails and societal commitment.

**What message would you convey to international partners about the next phase of Abu Dhabi's life sciences development?**

Abu Dhabi has built an integrated life sciences ecosystem that brings together healthcare delivery, genomics, research capability and regulatory alignment within a single, coordinated framework. The foundational elements are established, including large-scale genomic data, structured clinical pathways, internal clinical research capacity and a regulator that is closely aligned with delivery while maintaining clear guardrails. This enables discovery, clinical trials and translational research to move efficiently from data generation to patient impact. For international partners, the opportunity lies in collaborating within an environment that combines diverse population datasets with operational discipline and national strategic support for life sciences as a long-term priority.

The next stage builds on that foundation through deeper scientific capability and broader collaboration. The Abu Dhabi Biobank strengthens the research backbone by enabling detailed molecular and phenotypic analysis in a purpose-built laboratory environment designed for academic and industry partnership. In parallel, the Emirati Genome Programme has incorporated approximately 100,000 long-read genomes with associated methylation data, allowing more

precise resolution of structural variation and insight into epigenetic influences on disease. As non-communicable diseases account for the majority of global morbidity, understanding how genetic architecture interacts with environmental factors is increasingly important. Our ambition is to translate these capabilities into clinically relevant insight while contributing meaningfully to global research and therapeutic development.

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