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Quibim: empowering biopharma to turn images into actionable predictions using artificial intelligence

Taking an innovative approach to applying artificial intelligence (AI) to medical imaging, Quibim is designing predictive panels to enable healthcare providers to improve patient outcomes.

The rapid growth in medical imaging and the digitization of the process have created large repositories that contain valuable insights for improving patient outcomes[1,2]. Yet, the biopharma industry's ability to extract these insights has been limited by its lack of tools for transforming imaging data into actionable predictions. Quibim is addressing this critical limitation with its cloud-based tissue-agnostic platform for extracting key radiomics drivers from the world's largest imaging-data registries.

Quibim has developed QP-Discovery, a platform that handles, indexes, stores, and harmonizes imaging data (Fig. 1). By standardizing image quality, the platform minimizes variability in the signal, contrast, and noise across equipment vendors. Quibim has paired its platform with a tool, QP-Link, to link imaging data with electronic health-record information and other multi-omics techniques.

QP-Link is the bridge between local picture-archiving and communication systems (PACS) and the Quibim cloud. The tool de-identifies medical images, removing patient identifiable data, and shares the images with Quibim's analysis tools. Once the analysis is complete, QP-Link automatically sends the results back to the hospital PACS. Since Quibim's commercial launch in 2021, more than 125 sites worldwide have begun using the platforms.

These platforms set Quibim apart from other companies that are applying artificial intelligence (AI) to medical imaging. Most companies are trying to improve radiology workflows. Quibim, in contrast, is focused on creating medical devices that bring its breakthroughs to healthcare providers. The idea is to design tools that unlock imaging data to improve patient outcomes.

Drug developers, including Johnson & Johnson's Janssen Pharmaceuticals, have recognized the potential of Quibim's capabilities[3]. Working with a top-tier biopharma company, Quibim has developed an AI-based model to predict treatment response to immune-checkpoint inhibitors in non-small-cell lung cancer using baseline chest computed tomography (CT) scans[4]. This model could enable the identification of those patients who are most likely to respond to treatment and is proof of Quibim's ambition.

"We like to work with biopharma to solve big challenges, such as predicting how patients will respond to immunotherapy," said Quibim CEO Ángel Alberich-Bayarri. "We are using data to generate new knowledge and new biomarker panels, both in partnership with biopharma companies and through our own studies. Evidence generation is central to our model."

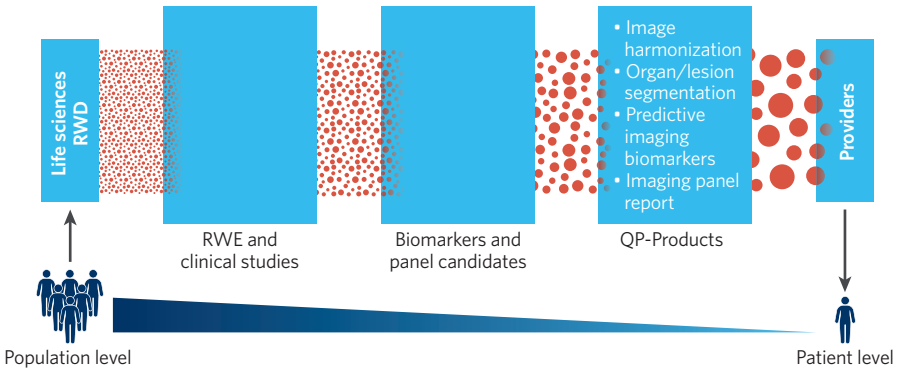

Fig. 1 | From population to patient level. RWD, real-world data; RWE, real-world evidence.

Quibim's successes are built on three elements: data, technology, and partnerships. The company has unique attributes in each of these areas, which are ushering in a radiomics-enabled era of precision health that will be defined by the ability to use predictive modeling to uncover patterns and characteristics in medical images to improve outcomes (Fig. 2).

Data: building biobanks of health insights

Data are the bedrock of Quibim's operations. The company is gathering as many datasets as possible covering images, clinical information, and patient outcomes, and is using these resources to generate new knowledge and imaging biomarkers. Access to appropriate data for training, testing, and evaluation of AI-based models is a key limitation to the field, which Quibim is fixing in collaboration with its partners.

The quantity of data is important, with larger volumes leading to additional, more robust insights, but this is far from the only metric that matters. Data quality is at least as important. When targeting subsets of patients, such as those with specific tumor profiles, there will always be major constraints on the amount of data available; however, data quality can compensate for quantity.

Recognizing that, Quibim focuses on accessing images with high-quality annotations that facilitate the feature-extraction process and ultimately enable the linking of imaging data to clinical outcomes. The focus on quantity and quality has led Quibim to commit to creating big international repositories of health-imaging data and to become involved in collaborative initiatives with different European countries. Through these initiatives, Quibim intends to foster the creation of European Union (EU)-wide structured repositories for health-imaging data as an open source for AI experimentation and for use by healthcare professionals, researchers, and innovators worldwide.

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> Ángel Alberich-Bayarri, CEO, Quibim

"We are involved in the best academic research projects related to cancer imaging," Alberich-Bayarri said. "Quibim is the backbone platform for the biggest projects in cancer imaging in Europe. We can learn a lot from these data repositories, mainly across the most relevant indications: lung, prostate, breast, colorectal, and pediatric cancers."

Chaimeleon and ProCancer-I, two EU-funded multidisciplinary and collaborative projects, are devoted to the creation of a cancer imaging repository, facilitating access to large, high-quality, anonymized datasets.

Quibim's focus on data quality and quantity is matched by its commitment to data security by design. Holding certifications for the International Organization for Standardization and International Electrotechnical Commission (ISO/IEC) standard 27001, the Health Insurance Portability and Accountability Act (HIPAA), and General Data Protection Regulation (GDPR) compliance, the company uses Microsoft Azure's secure cloud platform for unlimited data storage. Information is encrypted during storage, transfer, and at the file level.

Technology: transforming data into predictions

Quibim's ability to transform imaging data into actionable insights stems from its technology. The insight-extraction process starts with image harmonization. Healthcare providers use equipment from vendors such as Siemens Healthineers, Canon, and Philips to capture images. The different imaging technologies and practices at healthcare facilities can introduce variability into the dataset.

Quibim has developed its own technology to address image variability. The technology monitors image quality to ensure that the company's analyses are reproducible and consistent—attributes that the AI field has struggled to achieve in the past. Thus, Quibim applies an innovative approach in which a deep-learning model can transform input images into harmonized images, reducing visual heterogeneity while preserving semantic information.

The next step is to identify tissues, organs, and abnormalities in the harmonized images. Quibim has market-leading algorithms for segmenting organs and lesions, as shown by several publications that are a testament to its focus on being number one in segmentation performance[5–8]. The company has segmented the brain, liver, prostate, lungs, and lesions in images using architectures based on skip connections and deep supervision.

After harmonizing images and performing three-dimensional segmentation of the region of interest, Quibim extracts and standardizes radiomic features to remove the 'batch effect' caused using different imaging modalities, scanners, and centers. The process ensures the selection of the most robust radiomic features for the development of AI-based predictive models.

Quibim uses a five-step process to develop AI models, which starts with data curation, feature selection, and model training. After training the model—using the most appropriate methodology for each problem based on the available data—the company evaluates its performance using unseen internal and, ideally, external datasets. The final step is to understand and explain how the model reaches decisions; this step is needed to build trust, detect errors and biases, and improve the reliability of the model.

The multi-step process, which increasingly includes validation of external data from several independent healthcare sites, is needed to mitigate previous problems that have resulted from models that appeared to be effective in initial tests but were unable to perform when applied to broader datasets.

"Once you have access to huge amounts of imaging data, there is a risk of creating AI models that overfit to different characteristics. The core problem is that you take an AI model, you place it in a new hospital, and it does not work well. So, a key question we face is: how can we make sure that what we learned can be applied to any hospital?" Alberich-Bayarri said.

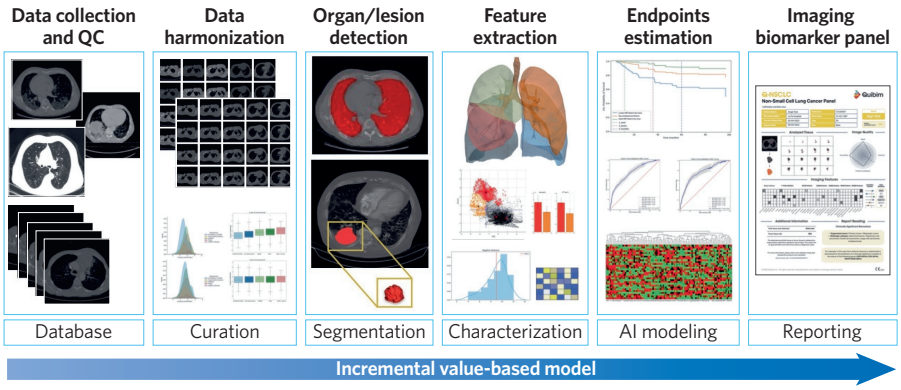

Fig. 2 | The QP product pipeline. AI, artificial intelligence; QC, quality control.

Partnerships: generating real-world evidence

Operating at the leading edge of AI, Quibim forms risk-sharing partnerships with life-science companies, rather than operating on a fee-for-service basis, and promotes, sponsors, and leads its own research projects to generate real-world evidence.

"The model provides an easy way to start pilot projects in radiomics," Alberich-Bayarri said. "Biopharma companies are discovering the enormous power of radiomics and we partner them in this process. We assess the long-term prospects of a project through milestones addressing the value, and only agree to share the risk of developing an algorithm when it is aligned with our product roadmap and we see the value."

> **"Quibim is the backbone platform for the biggest projects in cancer imaging in Europe**
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Through its interactions with academia, pharma companies, and big European consortiums, Quibim is actively collaborating and generating evidence. Unlike service providers that analyze images and play a secondary role, Quibim is taking the lead on partnered and internal projects, and publishing scientific papers to generate evidence and actively advance the radiomics field.

The approach has already delivered QP-Prostate, an AI prostate magnetic resonance imaging analysis solution that integrates with PACS. QP-Prostate, which has regulatory clearances in the EU and United States, automates tasks and gives radiologists precise, quantitative information to improve and standardize decision-making.

By forming risk-sharing partnerships and generating evidence from its own studies, Quibim has created a continuous innovation funnel that will enable it to simultaneously support biopharma companies, develop imaging-based companion diagnostics, and create AI-based products for healthcare providers.

Bringing the benefits to patients

QP-Prostate is just the start. Quibim is developing solutions for delivering insights into the health of the brain, liver, breast, and lung. As more and more products come to market, the company will redefine what physicians can learn from medical images.

Today, there are no tools for predicting outcomes based on lung images. Quibim wants to change that. In the near future, the company plans to introduce a tool to predict survival in lung cancer patients based on imaging. The medical device, QP-Lung, benefited from a value-based strategic collaboration in which Quibim analyzed more than 1,000 chest CT scans from a late-phase clinical trial run by its partner. The analysis resulted in an algorithm that the partner can license to improve future studies and in QP-Lung.

The lung cancer collaboration, plus the algorithm and medical device it generated, illustrate Quibim's focus on becoming the partner of choice in the AI imaging space. As well as supporting cancer drug developers, the imaging specialist is applying its capabilities to inflammation and neurology to allow more biopharma companies and healthcare providers to benefit from its work to transform data into predictions.

Through that transformation, Quibim is unlocking the latent value hidden in imaging databases and creating algorithms and medical devices that will transform repositories into actionable predictions.

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