HIMSS
IBERIAN
COMMUNITY

Transforming Emergency Radiology with AI Orchestration System

A REAL SAMPLE IN THE VALENCIA HEALTH REGION

The integration of Artificial Intelligence (AI) in medical imaging is transforming emergency radiology workflows, enhancing efficiency, precision, and accelerating clinical decision-making. As part of a broader strategy to modernize emergency radiology across the **Valencia Health Region, the Generalitat Valenciana has deployed an AI Orchestration Platform in all 29 hospitals of its regional healthcare network**, serving a population of approximately 5 million people. This system ensures scalable, efficient, and high-quality radiological services, optimizing workflows while maintaining full interoperability with existing clinical and IT infrastructures.

The Hospital General Universitario Dr. Balmis in Alicante was the first hospital to validate this implementation, playing a key role in testing and optimizing the system before its full-scale deployment. The AI Orchestration Platform, powered by Idonia, enables hospitals to integrate and manage multiple AI algorithms while granting healthcare teams full control over AI selection and implementation.

In this study, **an AI algorithm for detecting bone fractures and chest pathologies was first integrated into emergency radiology workflows at Hospital General Universitario Dr. Balmis using the AI Orchestration Platform.** The solution orchestrates the sending of medical images to the AI algorithm, which processes and prioritizes cases in real-time. By classifying radiological studies into priority levelspositive, negative, or uncertain—the system enables emergency physicians to efficiently triage cases and ensure immediate attention to critical patients. Given the increasing demand for imaging services, this AI-driven automation reduces diagnostic review times, alleviates radiologists' cognitive workload, and enhances decision-making, ultimately improving clinical efficiency in emergency medicine. The successful validation at Dr. Balmis paved the way for its rapid adoption across the entire regional network.

In this context, the medical image interoperability platform has facilitated the seamless integration of the AI algorithm chosen by the healthcare team, who quickly recognized the potential to add more algorithms for comparison or to support new clinical processes in areas like oncology and neurology.

TRANSFORMING EMERGENCY RADIOLOGY WITH AI: FASTER TRIAGE, SMARTER DECISIONS

The Hospital General Universitario Dr. Balmis was the first hospital in the Valencia Health Region to implement the AI Orchestration Platform, paving the way for its deployment across the 29 hospitals in the network. As the initial site, it faced a growing challenge: how to streamline emergency radiology workflows without overloading radiologists already operating at full capacity.

With rising patient volumes and increasing demand for faster diagnostics, the hospital sought an innovative solution that would transform emergency triage and decision-making while also integrating primary care workflows to ensure a seamless patient journey across different levels of care. At the core of this initiative was the **goal of enhancing efficiency in patient triage and prioritization within the emergency department, ensuring that the most critical cases received immediate attention.** By integrating seamlessly with the hospital's Picture Archiving and Communication System (PACS), the AI system provided real-time, automated case prioritization, allowing emergency physicians and radiologists to focus first on the most critical cases. This shift not only reduced waiting times for radiological diagnoses but also facilitated faster, data-driven decision-making, significantly improving response times and reducing diagnostic bottlenecks (Figure 1). The AI provides a diagnostic in 1:35 minutes on average, ensuring that critical patients receive medical attention faster. It also increases diagnostic accuracy and security because it allows detection of findings that may have gone unnoticed by the physician, greater diagnostic certainty by allowing the emergency physician to have confirmation of the diagnosis, leading to better outcomes and optimized resource allocation.

1 The patient goes to the emergency room where the necessary studies are conducted.

2 The images are sent in real-time to the AI Orchestrator.

3 The AI Orchestrator anonymizes and sends the study to the corresponding AI algorithm.

4 The AI algorithm analyzes the image and returns the result: fracture, no fracture or doubt.

5 The clinical staff review the original study + result with the support of the provided tracking and visualisation tools.

6 The patient receives the necessary diagnosis and care.

Figure 1. AI-assisted radiology workflow. The diagram illustrates the automated process of transferring, anonymizing, and analyzing radiological studies using AI, ensuring seamless integration into clinical decision-making.

The implementation followed a structured yet adaptable approach, ensuring minimal disruption to hospital operations. Collaboration between hospital administrators, radiologists, emergency physicians, IT specialists and the technical team was key to aligning the AI solution with clinical priorities. Traditionally, radiologists manually reviewed high volumes of images, leading to inefficiencies and increased workload (Figure 2). AI-driven automation transformed this process by enabling real-time classification of cases into priority levels—positive, negative, or uncertain (Figure 3). This allowed clinicians to focus on the most urgent cases first, reducing cognitive burden and accelerating decision-making. By optimizing hospital resources, this approach not only improved patient flow and emergency response times, but also contributed to a more sustainable emergency radiology service. Since implementation, the system has processed over 580.000 studies, averaging 5.700 studies per day, significantly reducing the workload of radiologists and emergency physicians, increasing diagnostic accuracy and capability of the emergency department (Figure 4). With AI integration, more studies can be processed per day compared to traditional manual workflows, leading to increased efficiency and faster diagnose.

Figure 2. Before and After AI-Orchestrated Radiology Workflow. Comparison between the traditional workflow, where radiologists manually review images (left), and the AI-assisted workflow, which prioritizes critical cases for faster intervention (right).

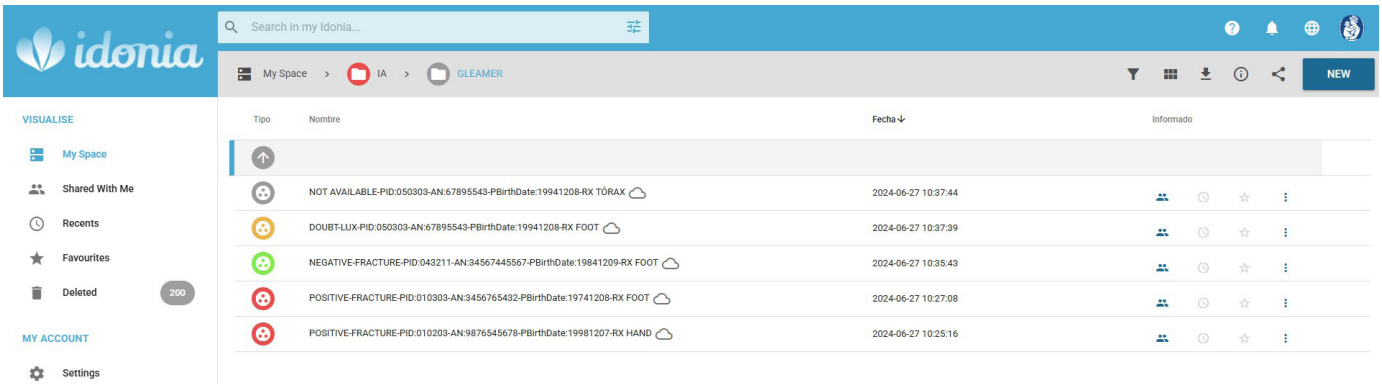

Figure 3. Real-Time prioritization of radiological studies. The system classifies cases using a color-coded scheme, allowing clinicians to review and act on urgent findings first.

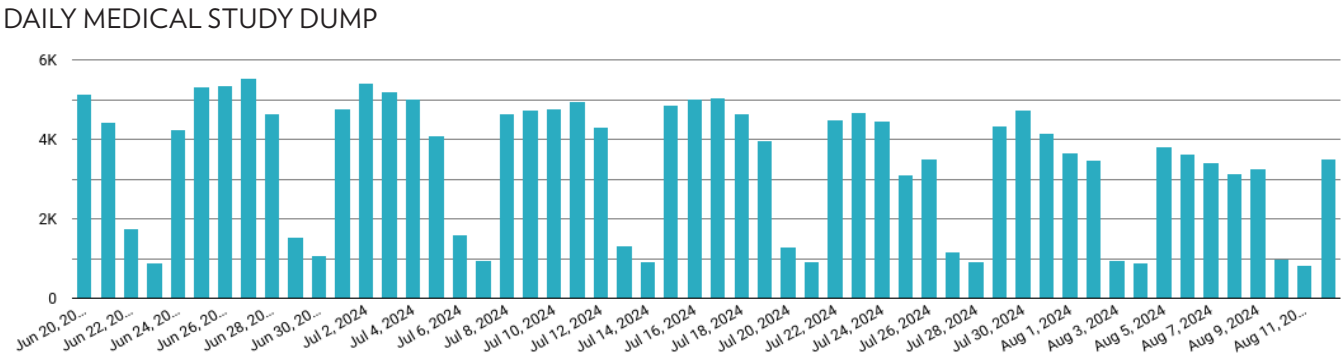

Figure 4. Daily processing of radiological studies. Overview of the number of studies processed each day, illustrating the system's scalability and efficiency.

From a financial perspective, the AI Orchestration platform has led to reduction in operational costs related to radiology workflows. The automation of triage and case prioritization has decreased the time spent per study by radiologists, allowing for an overall increase in efficiency and cost savings. In addition, reduced diagnostic delays and improved patient flow have contributed to an estimated return on investment (ROI), reinforcing the economic sustainability of AI-driven healthcare transformation.

ADDRESSING KEY CHALLENGES IN AI-DRIVEN EMERGENCY RADIOLOGY

Despite these advancements, the transition to AI-driven emergency radiology was not without its challenges. Successfully embedding AI into clinical workflows required overcoming key barriers to ensure effective adoption and long-term impact, including:

1. Ensuring seamless interoperability and scalable AI integration in hospital systems.

The successful deployment of AI required real-time connectivity with hospital PACS, EHR, and other IT systems to ensure AI-generated insights were seamlessly embedded into clinical workflows. Additionally, a scalable approach was needed to integrate multiple AI algorithms without adding complexity to hospital infrastructure.

How the problem was solved:

The AI Orchestration Platform was deployed as a middleware solution, serving as a centralized integration layer between AI algorithms and hospital IT systems. This eliminated the need for one-to-one integrations, standardized data exchange, and reduced IT complexity. Unlike static AI integration, the AI Orchestration Platform ensures hospitals retain full autonomy over AI selection and deployment, allowing them to deploy, test, and switch between multiple AI models as clinical needs evolve. This vendor-neutral orchestration approach removes integration bottlenecks, ensuring that hospitals can benefit from the latest advancements in AI without the risks of vendor lock-in or infrastructure complexity. As clinical and operational needs evolve, hospitals can seamlessly integrate new AI capabilities without disrupting existing processes. At Dr. Balmis University Hospital, this implementation specifically involved the integration of an AI algorithm designed for the detection of bone fractures and chest pathologies, demonstrating the potential for broader AI adoption in the future. AI-generated prioritization results were directly embedded into PACS and radiology interfaces, allowing physicians to access AI insights within their existing workflow without additional steps. The system anonymizes (sometimes pseudonymizes) medical images before securely transmitting them to multiple AI models,

which analyze and return results that are seamlessly reintegrated into clinical workflows after deanonimized (Figure 5).

VENDOR NEUTRAL ORCHESTRATOR

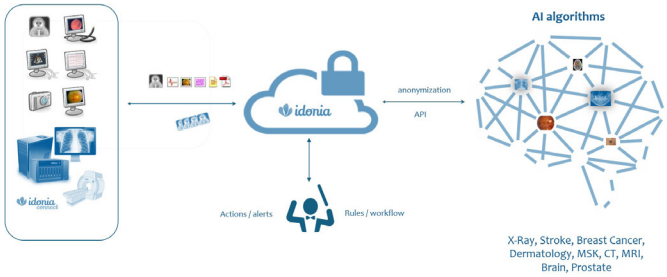

Figure 5. AI Orchestration System: Enabling Seamless and Secure Integration of AI into Clinical Workflows. The diagram illustrates how the Idonia platform facilitates secure image anonymization, submission to AI algorithms, and seamless integration with clinical workflows, ensuring automated decision support and interoperability with cloud services.

2. Managing and processing large volumes of radiological data due to the high influx of imaging studies.

How the problem was solved:
The AI Orchestration Platform automates data processing by anonymizing, structuring, and securely transmitting large volumes of imaging studies to the AI algorithm without disrupting clinical workflows. Idonia utilizes cloud-based services that provide scalability, high performance, and security, dynamically adapting infrastructure to meet hospital requirements and fluctuating demand. This approach guarantees optimal resource allocation while maintaining system stability. As a result, the system enabled the real-time transmission of radiological studies, ensuring that emergency physicians receive prioritized AI results within an average of **1 minute and 35 seconds.** Additionally, the platform's scalable infrastructure has allowed for rapid expansion, deploying AI-driven solutions across three hospitals per week within the 29 hospitals of the Valencia Health Region. This accelerated implementation has been achieved without compromising performance or service reliability, ensuring seamless adoption across the network.

3. Upholding the highest standards of medical data privacy and security. Ensuring compliance with strict healthcare data protection regulations required robust measures to safeguard patient information.

How the problem was solved:
To protect sensitive medical data, the AI Orchestration System was built with end-to-end security measures that comply with GDPR, ISO 27001, ISO 27017, ISO 27018, SOC 2/3, and Spain's Esquema Nacional de Seguridad (ENS). All medical images undergo automatic anonymization before being processed by AI algorithms, removing patient identifiers and several quasi-identifiers while preserving diagnostic integrity. Data transmission is secured through end-to-end encryption, ensuring safe exchange between hospital systems and AI models. These measures ensured that AI insights could be securely integrated into clinical workflows without compromising patient confidentiality.

4. Enhancing clinical adoption by aligning AI insights with physician workflows. Ensuring that AI-driven insights were intuitive, reliable, and seamlessly integrated into existing workflows was crucial to driving adoption and preventing workflow disruptions.

How the problem was solved:
To facilitate adoption, AI-generated insights were directly embedded into radiologists' and emergency physicians' existing reporting systems, eliminating the need for additional steps. The system implemented intuitive, color-coded case prioritization to help clinicians quickly identify urgent cases. Extensive validation phases allowed physicians (emergency doctors and primary care) to compare AI results with traditional diagnostics, reinforcing confidence in AI-assisted decision-making. A reliability and validity study conducted by the Generalitat Valenciana confirmed the clinical effectiveness of the AI system, reporting a positive predictive value (PPV) of 76.8% for thoracic lesions and 61.3% for bone lesions, with negative predictive values (NPV) of **83.0% and 95.0%**, respectively. These results demonstrated that AI not only accelerated workflows but also maintained high diagnostic reliability, increasing physician trust and ensuring that the system complemented, rather than replaced, human expertise. Continuous collaboration with hospital teams ensured that AI outputs were tailored to clinical workflows, maintaining alignment with physicians' needs and enhancing usability.

SCALING AI IN HEALTHCARE: REGIONAL STRATEGY AND FUTURE DEVELOPMENTS

Beyond addressing immediate implementation challenges, the Generalitat Valenciana is committed to ensuring long-term scalability and sustainability in AI adoption. This strategic vision guarantees that the 29 hospitals across the Valencian Community can continuously evolve their AI capabilities while maintaining clinical integrity.

To achieve this, the Generalitat Valenciana has developed a structured framework for AI integration, allowing healthcare institutions to:

- Flexibly adopt and test AI solutions: Hospitals can seamlessly integrate, validate, and switch between AI algorithms, selecting the most suitable models for their clinical needs without being tied to a single provider.

- Ensure system robustness and risk mitigation: The implementation of advanced monitoring and logging mechanisms allows for real-time detection of anomalies, reducing operational risks and ensuring uninterrupted AI-driven workflows.

- Leverage AI-generated data for continuous improvement: By systematically analyzing algorithm performance and patient demographics, hospitals can refine workflows, optimize triage decisions, and enhance overall patient outcomes.

Across the 29 hospitals in the Valencian Community, the next steps will focus on further optimizing AI-driven triage and expanding AI applications within radiology. Leveraging the flexibility of the AI Orchestration System, the regional healthcare network

is positioned at the forefront of medical imaging innovation, ensuring seamless adoption of new AI models as they emerge. Future advancements will extend AI-based triage beyond emergency radiology, incorporating neurological, cardiovascular, and other imaging modalities to enhance diagnostic precision and accelerate treatment pathways across all hospitals. Additionally, refining real-time analytics capabilities will be a priority, enabling clinicians to extract actionable insights from AI-generated data, optimize resource allocation, generate personalized clinical alerts and improve overall patient flow management. Continuous validation and clinician collaboration will remain central to the region's AI strategy, ensuring smooth integration into daily clinical workflows while reinforcing trust and adoption among healthcare professionals. By maintaining a dynamic and adaptable AI ecosystem, the Valencia Health Region is setting a benchmark for scalable, AI-driven transformation in radiology.

The success of this AI-driven radiology transformation at the Hospital General Universitario Dr. Balmis served as a model for other hospitals within the Generalitat Valenciana network. By leveraging Idonia's AI Orchestrator, this scalable and interoperable approach to AI integration was quickly replicated across other hospitals (total of 29) in 8 weeks, ensuring that the entire Valencian healthcare ecosystem benefits from AI-driven efficiency, improved diagnostics, and enhanced clinical workflows

TOWARDS STAGE 5 DIAM

This workflow complies with several of the HIMSS Analytics Maturity models. On the Digital Imagine Analytics Maturity (DIAM) scale, the hospital is advancing towards Stage 5 (Advanced Imaging Analytics) by systematically tracking radiological data and leveraging AI insights to optimize clinical workflows. Through the AI Orchestrator, radiologists and emergency physicians gain access to predictive analytics, improving triage efficiency, resource allocation, and diagnostic accuracy. These also fulfil many of the HIMSS Stage 7 DIAM requirements.

In addition to support broader digital transformation efforts under DIAM, the integration of AI orchestration fully advances the hospital positioning with EMRAM (Electronic Medical Record Adoption model) framework. The ability to image reports to be exchanged electronically in real-time or near real time to both patients and clinicians fulfils many of the EMRAM Stage 7 compliance statements. This AI-driven workflow at The Hospital General Universitario Dr. Balmis also aligns with Stage 5 - 6 (Data Integration), as it enables seamless radiological data exchange between AI models, PACS, and clinical decision-support systems. By enabling secure AI-enhanced imaging sharing within the Generalitat Valenciana healthcare network, fostering regional interoperability and advancing patient-centered imaging solutions. Secure remote access to images as well as allowing clinical decision support for improvement of efficiency, safety and quality of care is accomplishing several of the higher Stage 7 EMRAM requirements, and overall introducing the ability to fully improve quality of care. It would be prudent to continue to expand this in other departments to fully enhance patient care and streamline physician workflows.

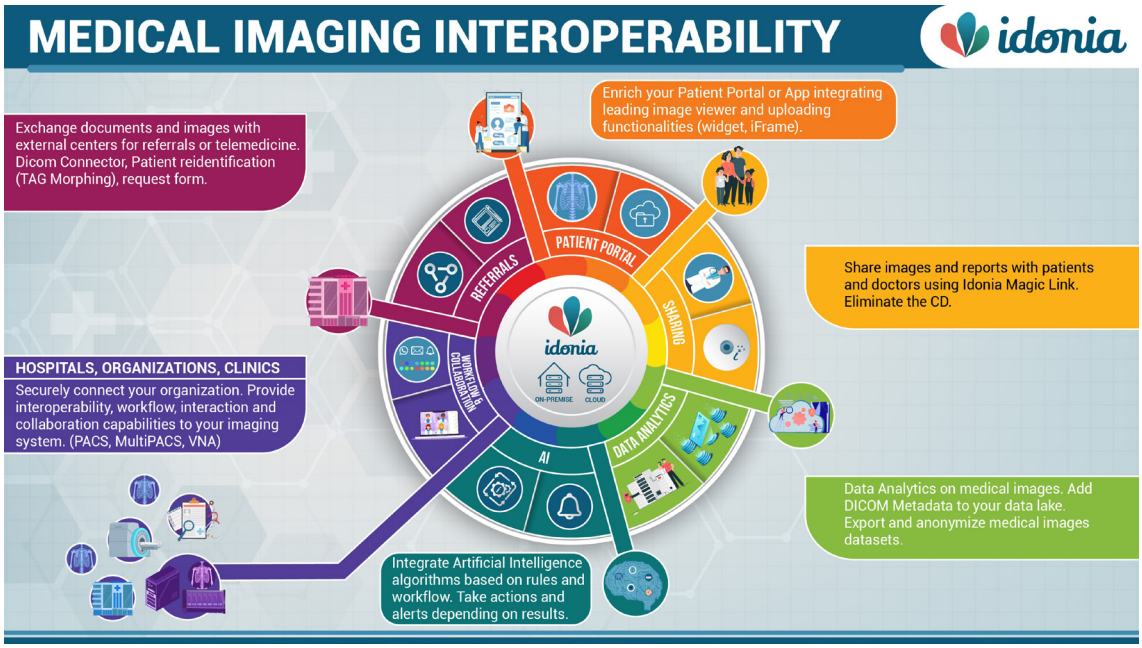

Figure 6. Medical Imaging Interoperability: Connecting AI, Data, and Clinical Workflows. The diagram illustrates how an interoperability platform integrates hospitals, AI algorithms, data analytics, patient portals, and referral systems, ensuring seamless medical imaging exchange and workflow optimization.

This enhanced interoperability strengthens digital governance and fosters a fully integrated radiology ecosystem within the hospital. It supports several stage 6 Governance and analytics outcomes statements in the new HIMSS Analytics maturity model (AMAM) by integrating AI-based recommendations into decision-making workflows, enhancing the appropriateness of imaging studies, and ensuring compliance with clinical guideline as well as significantly improving operational and patient outcomes.

Future advancements and the scalability of the orchestration system also provides a pathway towards AMAM Stage 7, whereby predictive analytics are used to track outcomes to evaluate effectiveness of standardized care pathways and inform leadership decisions to personalize care pathways for unique population segments to advance equitable health outcomes.

Beyond its immediate operational benefits, this initiative contributes to the hospital's digital transformation, aligning with international frameworks. Achieving compliance with three of the internationally recognized HIMSS Maturity models (DIAM, EMRAM and AMAM) positions this hospital and the Valencia health region, at the forefront of the digitally enabled healthcare landscape, particularly in diagnostic imaging.

WHY AN AI ORCHESTRATOR IS ESSENTIAL? THE NEW VNO CONCEPT.

With over 1000 certified (CE/FDA) AI algorithms available for medical imaging, integrating multiple solutions efficiently into hospital workflows presents significant challenges. While most AI solutions offer PACS connectivity, managing separate connections for each algorithm is inefficient. Thus, the need for a medical imaging interoperability platform is critical—not only to enable seamless AI integration but also to facilitate secure image exchange, streamline referrals, enhance data analytics, and improve accessibility for both clinicians and patients (Figure 6).

The AI Orchestration Platform serves as a single connection node for multiple AI algorithms, ensuring seamless interoperability while reducing IT complexity and infrastructure modifications. Users can activate or deactivate AI models as needed, providing flexibility to test, compare, and validate different solutions without vendor lock-in. The AI orchestration system enables seamless interoperability, controlled data management, and infrastructure optimization, allowing hospitals to integrate AI efficiently.

SMALL DETAILS MAKE A BIG DIFFERENCE

Figure 7. Key Functionalities of the AI Orchestration System. The image highlights essential functionalities, including interoperability, controlled data flow, anonymization, AI result separation, and dynamic algorithm management, ensuring seamless AI integration in clinical settings.

Idonia functions as a vendor-neutral AI Orchestrator, providing a critical layer of independence from specific AI algorithms. This vendor-neutral approach allows healthcare providers to seamlessly integrate, validate, and switch between AI models from various vendors, selecting the most suitable solutions for their unique clinical needs. By avoiding vendor lock-in and promoting interoperability, Idonia drives a new concept: the Vendor Neutral Orchestrator (VNO). This VNO model empowers hospitals to harness the latest advancements in AI without being constrained by proprietary systems, fostering innovation and ensuring that AI adoption remains flexible, scalable, and aligned with evolving clinical requirements.

The VNO also enhances data security and clinical usability through automated anonymization and rehydration processes. Before an image is processed by the algorithm, all patient identifiers and some quasi identifiers are removed to ensure compliance with GDPR and healthcare privacy regulations. Once AI results are generated, the system securely re-associates patient data (rehydration process), ensuring a fully traceable and integrated workflow. Furthermore, the orchestrator separates AI-generated findings from original reports, allowing radiologists to review and verify results before they reach patients, improving trust in AI-assisted diagnostics.

Additionally, the system ensures controlled volume management to prevent algorithm overload. Previously, direct algorithms connections to PACS sent large volumes of imaging data at once, saturating processing capacity and slowing response times. The AI orchestrator regulates data flow and allows to filter images not relevant for the AI, optimizing transmission timing to prevent bottlenecks and maintain real-time efficiency. This ensures scalable AI integration without disrupting hospital operations. Another important feature is the orchestrator's ability to select destination algorithms. This capability enables clients to choose between different algorithms based on their specific needs and also allows for the sharing of algorithms for quality control purposes.

By streamlining AI integration and ensuring interoperability, Idonia's AI Orchestrator has laid the foundation for an efficient, scalable, and secure approach to AI-driven radiology, setting a benchmark for digital transformation in the Valencia Health Region.

The VNO plays a crucial role in facilitating compliance with emerging European AI legal framework (AI Act), particularly concerning transparency, accountability, and risk management. By providing a centralized platform for AI deployment, the system enables comprehensive monitoring and logging of AI algorithm performance, ensuring that AI-driven decisions are traceable and auditable. Furthermore, the system's robust data anonymization and security measures align with GDPR requirements, safeguarding patient privacy while enabling the use of AI for improved healthcare outcomes. This proactive approach to compliance positions the Valencia Health Region as a leader in responsible and ethical AI adoption within the healthcare sector.

CONCLUSION

The deployment of a Vendor Neutral AI Orchestrator (VNO) across the 29 hospitals of the Valencia Health Region has successfully transformed emergency radiology workflows, optimizing case triage, accelerating diagnostic review times, and enhancing clinical efficiency. By seamlessly integrating AI into radiological decision-making, hospitals across the region have reduced response times for critical cases, improved the allocation of medical resources, and minimized the cognitive burden on radiologists, ensuring a more efficient and resilient emergency care system.

From a financial perspective, the AI Orchestration platform has demonstrated tangible value by reducing radiology workflow costs, increasing throughput, and improving patient flow efficiency. In 1 minute 35 seconds on average the AI provides a result ensuring that patients receive medical attention faster.

Idonia AI Orchestration platform's success is underscored by significant improvements in key performance indicators (KPIs) and a compelling return on investment (ROI). Quantifiable benefits include a reduction in radiology workflow costs, increased throughput with over 580,000 studies processed, and enhanced patient flow efficiency, evidenced by AI-driven results delivered in an average of 1 minute and 35 seconds. These KPIs translate into tangible ROI through reduced diagnostic delays, improved resource allocation, and minimized cognitive burden on radiologists, ultimately reinforcing the economic sustainability of AI-driven healthcare transformation within the Valencia Health Region. Looking ahead, the Valencia Health Region will continue expanding AI applications beyond emergency radiology, incorporating neurological, cardiovascular, and other imaging modalities. The integration of real-time analytics and AI-based decision support will further enhance diagnostic precision, workflow optimization, and patient-centered care. Additionally, continued collaboration with clinicians and ongoing validation of AI algorithms will ensure trust, usability, and continuous improvement in daily practice.

The successful validation of AI Orchestration at Hospital General Universitario Dr. Balmis paved the way for its rapid expansion across all hospitals in the region. This initiative establishes a scalable, compliant, and interoperable AI adoption model, ensuring that the Valencia Health Region remains a benchmark for AI-driven digital transformation in healthcare.

Prepared by

Miguel Cabrer
Luis Alfonso Concepción Aramendía
Bansi Shah