

HEXAWARE

AI in Clinical Data Management: How Human-in-the-Loop AI Transformed Heart Health Registries

Hexaware engineered an AI-enabled solution for a client in the healthcare ecosystem, tailored for a national heart health association and designed to transform clinical registry operations with 95% data accuracy, 90% less reporting effort, and 50% greater clinician productivity across 100+ hospitals.

Case study



Client

| Client

Challenge

Solution

Benefits

Summary

A National Mission, a Data Problem, and the Urgency to Scale

The client is a large national nonprofit dedicated to advancing heart and brain health through research, clinical registries, and clinician education across the United States. Achieving that mission depends on one thing above all else: reliable, standardized clinical data from hundreds of hospitals — data that can credibly measure outcomes, support research, and inform quality improvement at scale.

What the organization had instead was a patchwork of fragmented records, manual workflows, and siloed documentation that made even routine reporting a significant operational burden.



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Clinical Registry Management at Breaking Point

Managing clinical registry data across a national hospital network is not purely a technology problem — it is a clinical operations and data governance challenge at scale. Four interconnected barriers were constraining both program reach and research quality:

- 1. Fragmented Clinical Data:** Unstructured notes and inconsistent documentation practices across hundreds of hospital systems made standardization nearly impossible without heavy manual effort. High data variability made data extraction at scale unreliable without significant human intervention.
- 2. Manual Reporting Bottlenecks:** Bespoke scripting and hand-crafted reporting workflows limited both speed and scale. Producing a single registry report could consume the better part of a working day, time that should have been directed toward clinical and research priorities.

- 3. No Real-Time Insight:** Without near-real-time data harmonization, outcome measurement and cohort discovery were perpetually delayed. The organization could not act on registry data with the speed its public-health mission demanded.
- 4. Complex Stakeholder Alignment:** Clinical, operational, and compliance teams each operated with distinct requirements and risk tolerances. Any solution had to be transparent, auditable, and explainable enough to earn trust across all three groups, a significant design constraint that many AI deployments fail to meet.



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AI Clinical Data Management Tailored to the Client's Unique Ecosystem

An AI-enabled solution was designed and deployed specifically for the regulatory, operational, and clinical complexity of the client’s large-scale registry program. The solution automated the high-volume, routine work, while keeping clinicians firmly in control of the decisions that require expertise and judgment.

Core Solution Components

Scalable Data Engineering and Harmonization: Automated ingestion of structured EHR, imaging, and free-text clinical data, normalized to standardized ontologies. This harmonization layer produced consistent, downstream-ready signals from diverse sources, eliminating the manual normalization bottlenecks in the registry process.

Hybrid Model Architecture: Clinical NLP extracted free-text; rule engines handled high-precision cases; supervised classifiers addressed probabilistic tasks. Each inference included a confidence score to auto-process or escalate to clinical review, keeping routing transparent and adjustable.

Clinician-Facing Annotation and Validation UI: Low-confidence and ambiguous cases were surfaced via an intuitive interface with evidence highlights, data provenance, and model rationale. Clinicians could validate or correct extractions quickly, with full context, reducing cognitive burden while preserving clinical authority.

Active Learning Pipeline: Clinician correction were captured as labeled training and fed into an active learning loop, closing model gaps and adapting to new phrasing and edge cases, turning human review time into a compounding performance asset rather than a fixed cost.

MLOps, Governance, and Audit Capabilities: Model versioning, explainability, role-based access, drift detection, and retraining

triggers ensured accuracy and compliance as documentation evolved, with MLOps built in from the start.

Configurable On-Demand Analytics and Reporting: On-demand registry measures, trends, and dashboards reduced reporting time from hours to minutes, delivering timely insights without analyst dependency.

The solution was delivered iteratively via agile sprints, enabling rapid addition of clinical measures and continuous refinement aligned to registry priorities – without disrupting live clinical operations.

Human-in-the-Loop AI for Healthcare: The Operational Model

The defining strength of this engagement is not the AI in isolation; it is how AI and clinical expertise are woven together into a single, self-improving system. This human-in-the-loop AI for healthcare design means clinician authority is preserved at every stage, while clinician time is directed only where it creates the most value.

Stage	Who Acts	What Happens
AI Handles	Automated stack	High-confidence, routine cases processed end-to-end – unlocking throughput, eliminating repetitive work
Clinicians Decide	Reviewer UI	Ambiguous cases surfaced with evidence highlights and model rationale – fast, informed decisions
Loop Closes	Active learning	Every correction captured as training data – gaps close systematically over time
System Learns	MLOps layer	Drift detection and automated retraining keeps accuracy aligned with evolving clinical language

This model converted a traditional bottleneck – clinical review – into a strategic asset. The more clinicians engage with edge cases, the fewer edge cases the system generates. The productivity return compounds over time.

Responsible AI: Governance That Earns Clinical Trust

In clinical settings, responsible AI is not a compliance checkbox; it’s the foundation on which adoption is built. Every component of the solution was designed with explainability, auditability, and bias mitigation as first-class requirements.

- Explainability and evidence highlighting give clinicians full visibility into the reasoning behind each model prediction, enabling informed validation rather than blind acceptance of AI outputs.
- Role-based access controls and secure PHI handling protect sensitive patient data in full compliance with HIPAA and institutional requirements.
- Full audit logging provides a traceable, regulatorily defensible record of every data decision, from raw extraction through to registry submission.
- Bias mitigation through diverse training data, ongoing monitoring, and human oversight on edge cases ensures the model performs equitably across patient populations and documentation styles.
- Continuous drift detection with transparent retraining policies keeps model accuracy aligned with evolving clinical language without requiring manual performance monitoring.

These measures did not just satisfy compliance requirements. They built the clinician trust that made sustained adoption possible and earned the credibility needed to expand the solution’s scope over time.

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Real Results, Measurable at Every Level of the Organization

Outcomes validated the human-in-the-loop AI design as both effective and scalable. Gains spanned operational efficiency, data quality, and program reach.

Metric	Result	What It Means
Data Accuracy	95%	Research-grade registry data after human-guided refinement
Reporting Effort	90% reduction	Turnaround cut from hours to minutes; faster decision cycles
Clinician Productivity	50% gain	Focus shifted from rote curation to high-value review
Scripting Time	Half a day → 10–15 minutes	AI-driven query optimization replaced manual scripting
Hospitals Onboarded	100+	Automated workflows with minimal manual intervention

Beyond the operational metrics, the solution delivered downstream benefits that directly advanced the association’s public-health mission: faster cohort identification for clinical studies, higher-quality registry data for benchmarking, simplified compliance readiness through automated audit trails, and stronger clinician confidence driven by transparent model explanations.



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One Engagement. A Methodology Built to Last.

What was built for this national heart health association is more than a successful deployment — it is a proven, replicable model for AI-driven clinical data management at scale.

By combining clinical NLP solutions, hybrid modeling, and automated data harmonization with a human-in-the-loop validation layer, this AI-enabled solution transformed fragmented registry data into a research-grade intelligence asset — achieving 95% data accuracy, 90% less reporting effort, and 50% greater clinician productivity across 100+ hospitals.

The methodology transfers. Whether the use case is cardiac registry curation, oncology data extraction, or population health analytics — any domain requiring high-precision, auditable data extraction and continuous learning can benefit from the same architecture: AI that scales, humans that govern, and a system that gets smarter with every interaction.



Turn Clinical Data Into Clinical Advantage

Discover how human-in-the-loop AI can elevate data accuracy, accelerate reporting, and unlock clinician productivity at scale. Connect with Hexaware to explore what this model can do for your registries.

Contact: marketing@hexaware.com

About Hexaware

Hexaware is a global technology and business process services company. Every day, Hexawarians wake up with a singular purpose: to create smiles through great people and technology. With this purpose gaining momentum, we are well on our way to realizing our vision of being the most loved digital transformation partner in the world. We also seek to protect the planet and build a better tomorrow for our customers, employees, partners, investors, and the communities in which we operate.

With offices across the world, we empower enterprises to realize digital transformation at scale and speed by partnering with them to build, transform, run, and optimize their technology and business processes.

Learn more about Hexaware at <https://www.hexaware.com>.

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