A unified evidence fabric from UST and ThinkBio.Ai®

WHITEPAPER

Closing the loop between clinical care and research

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Executive summary

Clinical and R&D teams face a persistent translational gap: abundant yet fragmented data, time-pressured decisions, and trial bottlenecks in eligibility, accrual, and site operations. We describe a joint UST–ThinkBio evidence fabric that converts routine clinical data into regulatory-grade evidence, routing research insights back to the point of care. The fabric combines ThinkBio's platform stack (BioThinkHub™, TheraBluePrint™, R-COP™, Pixelomics™, TrialFit™ suite, ClinCare.ai™) with UST's modular clinical-AI frameworks and embedded RA/QA practice. We outline a standards-first reference architecture, detail platform roles, and illustrate impact in oncology, cardiology, and respiratory care.

Introduction

EHR penetration and interoperability mandates (e.g., FHIR, TEFCA) have expanded access to clinical data, yet the practical output for bedside decisions from clinical research is not fully realized. Essential context—notes, images, longitudinal trajectories—often remains under-utilized and under-modeled, making precision care and research reuse. We formalize a deployable, RA/QA-aligned model that turns multimodal, longitudinal data into measurable improvements at the bedside and in the trial office.

THE CORE CHALLENGE

An evidence-lifecycle breakdown

Healthcare produces more information than ever, but much of it is scattered across systems and modalities. High-value signals in unstructured notes and imaging go unharmonized; trials search too late and too narrowly; protocol adherence drifts without real-time telemetry; and AI deployments lag in documented lifecycle controls (validation, bias monitoring, change management). The remedy is not more point tools—it is continuous evidence gathering under compliance: ingest multimodal data, generate interpretable insights, operationalize them within clinical and research workflows, and prove governance at every step.

SOLUTION AND OPERATING ARCHITECTURE

The UST–ThinkBio evidence fabric

Bridging care and research requires a coherent operating model that generates evidence as a routine by-product of practice. ThinkBio contributes purpose-built platforms that transform multimodal data into decisions; UST provides modular clinical-AI building blocks and a mature RA/QA capability, so the system is robust and inspectable. Together, this creates a learning health–trial loop: care generates research-grade data; research returns as point-of-care guidance.

A layered model

Digital biology, AI, and data underpin a three-layer stack:

Core platforms

The durable substrate for data, knowledge, operations, and imaging

Pipelines

Harmonization, modeling, eligibility inference, safety and ops telemetry

Solutions

Clinician, researcher, and patient-facing applications that deliver value in workflow

ThinkBio.Ai platforms

- **BioThinkHub** — The underlying federated data platform that integrates biological, clinical, and multimodal sources in a compliant manner. It supplies harmonized, provenance-rich data to downstream models and applications in a federated manner.
- **TheraBluePrint** — A disease–drug–target knowledge platform spanning oncology, immunology/autoimmune disorders, cardiology, and neurology. It encodes mechanism, pathway, and evidence relationships to support hypothesis generation, therapy selection, and protocol design.
- **R-COP (Research Copilot)** — An AI-powered copilot with three modules:
- **Research and Hypothesis Generation** — guide teams from idea to result using literature, omics, and clinical evidence.
- **Lab Management** — streamline experimental workflows and data capture.
- **Clinical Trials** — support protocol design, feasibility, and trial guidance with live operational telemetry.
- **Pixelomics™** — An advanced spatial biology and imaging platform for research-grade insights. It goes beyond traditional medical imaging toward precise cell matching and clustering, and exports structured features to the intelligence layer, while supporting "traditional" radiology image analysis
- **TrialFit™ suite** — A family of clinical-trial solutions:
- **DrugReboot.ai** — Asset rescue/repurposing via re-analysis of failed or under-powered trials using biology- and precision-medicine contexts.
- **TrialFit.ai** — Intelligent trial matching that connects patient digital twins with disease models and knowledge graphs to predict better trial fit.
- **ClinCare.ai™** — A clinician-facing suite anchored by Patient Panorama™, a 360° knowledge visualization layer built on EMR and related data. It enables clinicians to view a patient's past, present, and projected trajectory through AI-driven insights, along with virtual care workflows and follow-up.

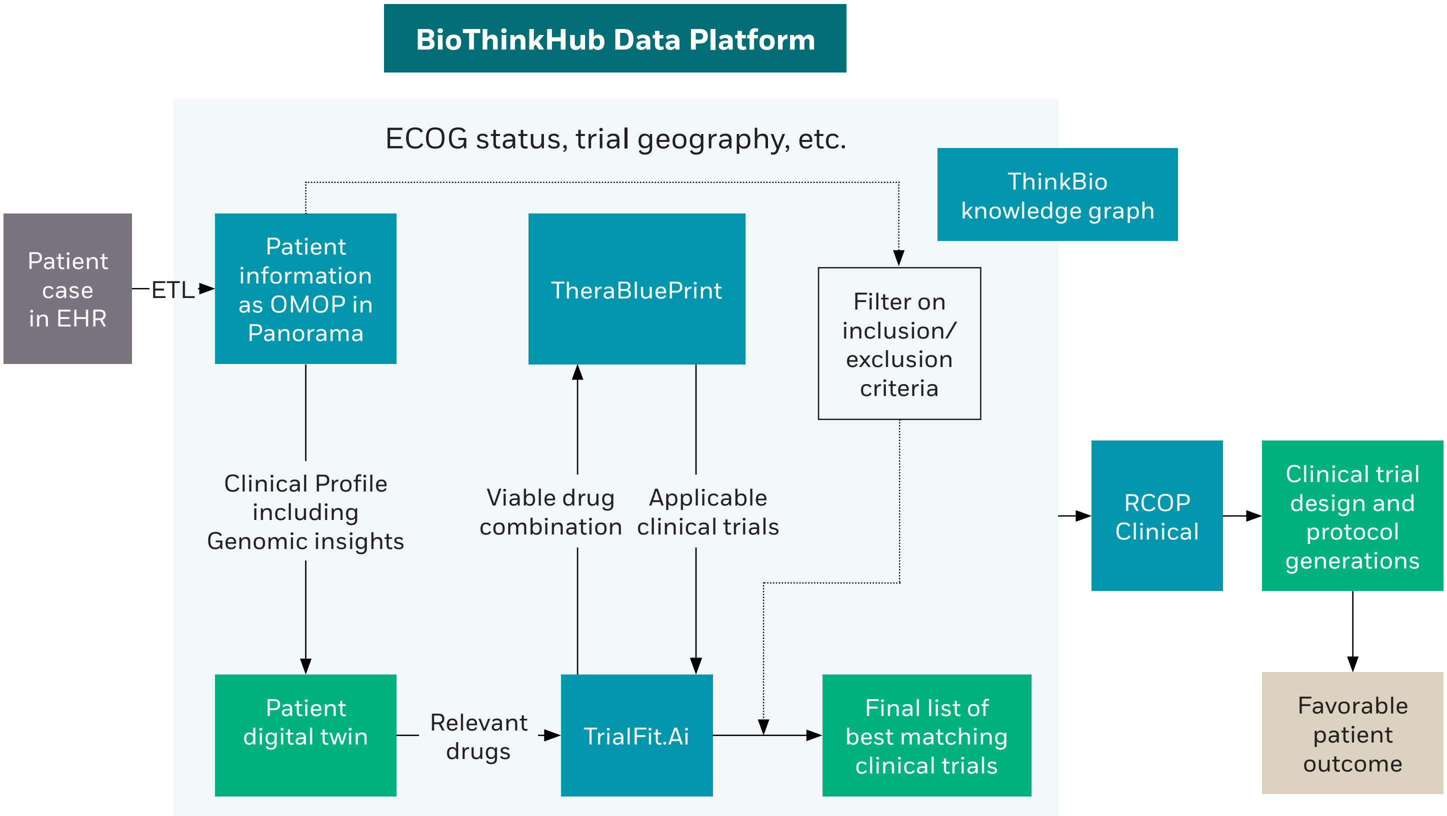

Figure 1. Schematic of ThinkBio.Ai platforms and solutions in bridging the gap between patients' clinical data contained in the EHR to providing point of care support.

SOLUTION AND OPERATING ARCHITECTURE

The UST–ThinkBio.Ai evidence fabric

Data plane (get the data right).

FHIR-first clinical connectors, DICOM imaging, and pipelines for text/omics capture longitudinal, multimodal records with lineage. BioThinkHub anchors federation and compliance. Pixelomics contributes structured imaging features.

Intelligence plane (make it useful).

Patient digital twins and disease models (TrialFit.ai combined with TheraBluePrint) drive trial/therapy fit; R-COP models forecast enrollment and detect protocol deviations; DrugReboot.ai explains failures and proposes repurposing/co-therapy paths; ClinCare.ai/Patient Panorama surfaces risk and pathway guidance.

Governance plane (make it safe).

Validation packages, bias and drift monitoring, explainability, and PCCP-ready change control are embedded from the outset, with documentation routed to RA/QA systems (RIMS/eCTD). R-COP consolidates audit trails.

Experience plane (make it usable).

Role-aware workspaces: ClinCare.ai/Patient Panorama for clinicians, R-COP for trial operations and safety, TrialFit consoles for feasibility and matching, and patient portals for follow-up and consent.

Blending ThinkBio's purpose-built platforms with UST's modular AI and RA/QA muscle produces a pragmatic, deployable blueprint: one fabric that clinicians want to use, operations can trust, regulators can inspect, and patients can feel. It is how health systems and sponsors move from data abundance to evidence at the point of decision.

END-STATE OUTCOMES BY STAKEHOLDER

Translating the evidence fabric into practice

Building on the preceding section, the joint UST–ThinkBio.Ai fabric translates the architecture into concrete outcomes for each audience. The table below summarizes the intended end-state, the core capabilities that drive it, and the key source materials informing each outcome.

Stakeholder	End-state	Primary capabilities leveraged
Clinical teams	• One longitudinal patient view with risk flags and pathway guidance reduces diagnostic latency and unwarranted variation. • Automated intake and documentation reclaim clinical time; follow-ups are proactive and patient-friendly.	• Patient Panorama™ (longitudinal CDS), Healia (virtual visits, intake, secure messaging), UST clinical-AI modules (risk engines, pathway support).
Trial operations (sponsors, CROs, sites)	• Higher-precision prescreening via digital twins/knowledge graphs increases eligible-patient yield and diversity; screen failures and start-up delays fall. Overall increase in trial success rates • Live telemetry across sites, enrollment velocity, deviations, safety, shortens cycle times and strengthens inspection readiness.	• TrialFit.Ai (digital-twin/Pixelomics/knowledge-graphs), R-COP™ (real-time ops, deviation automation, audit trails), UST TrialFit framework.
RA/QA leaders	• Documented, repeatable AI/clinical-data lifecycle with validation artifacts, traceability, RIMS/eCTD integration, and AI Judge™ monitoring; backed by UST's scale (250+ RA/QA experts, 12 labs) for inspections and audits.	• UST RA/QA practice (validation, change control, documentation), AI Judge (responsible-AI governance), R-COP™ (audit trails).
Patients and trial participants	• Faster access to appropriate therapies and trials; more personalized care plans; better continuity between clinic visits and virtual follow-ups; better patient outcome • Clearer consent and data-use visibility, with fairness and safety embedded in algorithmic decisions.	• Healia (engagement & follow-ups), TrialFit.Ai (eligibility surfaced earlier), Patient Panorama™ (care-pathway alignment).

USE-CASE BRIEFS

Translating the evidence fabric into practice

The following briefs demonstrate how the UST–ThinkBio.Ai evidence fabric performs in real clinical contexts.

Cardiology — Preventing 30-day readmissions

Problem. Early post-discharge periods carry high risk; fragmented follow-up and documentation burden impede timely intervention.

Evidence. A recent meta-analysis reports meaningful reductions in 30-day all-cause readmissions when timely outpatient follow-up is coordinated, underscoring the value of structured transitions (see References).

Approach. Patient Panorama aggregates longitudinal signals and flags high-risk discharges; Healia automates intake, schedules early follow-ups, and supports tele-visits and secure messaging; UST risk engines and pathway-deviation monitoring keep teams aligned to guideline-concordant care.

Outcome targets. Improved visit adherence; timely medication optimization; lower 30-day readmissions; fewer avoidable ED returns.

Respiratory — Asthma/COPD exacerbation management

Problem. Exacerbations drive utilization and morbidity; chronic OCS exposure adds avoidable risk without tight stewardship.

Evidence. Reviews of remote monitoring/ML in COPD support exacerbation early-warning potential while emphasizing robust implementation and generalizability; OCS stewardship programs target reduction of cumulative exposure (see References).

Approach. Predictive exacerbation alerts from longitudinal features in Patient Panorama trigger outreach and action plans. Healia supports digital coaching and symptom capture between visits. Pixelomics contributes imaging-derived features where relevant to the phenotype and tracks disease progression.

Outcome targets. Fewer moderate/severe exacerbations; reduced cumulative OCS days; improved PFT trends and patient-reported outcomes; lower respiratory-related admissions

Oncology — Trial readiness and precision selection

Problem. Accrual bottlenecks and representativeness gaps slow or terminate studies; manual prescreening can't keep pace with protocol complexity.

Evidence. Multisite analyses consistently identify low accrual as a frequent driver of delay/termination across tumor types (see cited literature in References).

Approach. TrialFit.Ai constructs patient digital twins from structured and unstructured EHR, pathology/genomics, biomarkers and imaging features, then aligns them to disease models and a knowledge-graph representation of trial eligibility and previous similar trials to surface candidates in near-real time; R-COP provides live oversight of enrollment velocity, protocol adherence, and safety signals; after negative/interrupted programs, DrugReboot.Ai generates repurposing and co-therapy hypotheses with traceable rational.

Outcome targets. Reduced screening time; higher match precision and diversity; earlier FPI (first-patient-in); fewer protocol deviations; data-backed repurposing opportunities.

From joint value to a working intelligence fabric

ThinkBio brings purpose-built clinical and research platforms (Patient Panorama, TrialFit.Ai, R COP, DrugReboot.Ai, Pixelomics, ClinCare) that turn multimodal data into decisions. UST adds modular clinical AI building blocks (digital twins, predictive risk engines, pathway deviation monitoring), and a global RA/QA practice with validation, documentation, and Responsible AI governance (AI Judge) embedded from day one. Together, we deliver a closed-loop evidence lifecycle that generates research-grade data, allowing research to flow back to the bedside. This is implemented with audit-ready controls and real-world workflows.

The integrated solution

1. Unify the patient story at the point of care (Patient Panorama).

Clinical teams open a single, role-aware workspace where longitudinal EHR, diagnostics, imaging, medications, vitals, and prior treatments are already harmonized. AI analytics surface risk and propose evidence-based pathways, reducing time to decision and variation in practice. Integration is designed for enterprise EMR environments and global data protection standards.

2. Activate precision matching to therapies and trials (TrialFit.Ai).

Patient data are transformed into digital twins and mapped to disease models trained on multimodal public data. Further transformations convert trial designs into a knowledge graph, enabling matching beyond keyword criteria while accounting for safety and feasibility. Real-time trial discovery and EHR workflow integration compress screening cycles.

3. Run trials with live operational telemetry (R COP).

Sponsors and CROs receive predictive analytics for enrollment velocity, automated deviation handling, adverse event signal triage, and regulatory documentation with audit trails, all of which are visible on real-time dashboards.

4. Extend the care surface and close follow-up gaps (Healia).

Virtual visits, secure messaging, automated history taking, and proactive scheduling reduce administrative burden and improve continuity—while capturing additional structured/unstructured signals to enrich the longitudinal record.

5. Unlock signal from images and under powered assets (Pixelomics and DrugReboot.Ai).

Pixelomics converts retinal, pathology, and molecular images into structured features for diagnostics and longitudinal monitoring. DrugReboot.Ai applies knowledge graphs and foundation models to explain clinical failures and propose repurposing or co-therapy hypotheses, prioritized with traceable rationale.

6. Govern with RA/QA from the outset (UST and ThinkBio).

A mature RA/QA engine, 250+ experts, 12 dedicated labs, 100+ projects across 40+ countries, provides validation, change control, RIMS/eCTD document flows, and Responsible AI monitoring (AI Judge) to meet sponsor and regulator expectations.

Conclusion

The UST and ThinkBio.Ai ecosystem operationalizes a continuous evidence loop, spanning from care to harmonization, analytics, trial readiness, operations, and feedback, ultimately back to care. Unlike point solutions, it combines interoperability, multimodal AI, and governance into a deployable architecture. Key risks model generalizability, site variability, and data use rights are mitigated by: (i) standards first integration (FHIR/TEFCA), (ii) validation and monitoring aligned to GMLP/PCCP/NIST RMF, and (iii) RA/QA documentation from design through post-market surveillance.

Precision medicine at scale demands more than data aggregation, it requires a governed, learning ecosystem. By unifying Patient Panorama™, TrialFit.Ai, Healia, Pixelomics, R COP, and DrugReboot.Ai with UST's modular AI and RA/QA practice, organizations can transform routine clinical data into trial-ready evidence and bring research learnings back to the bedside, safely, compliantly, and measurably.

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Since 1999, UST has worked side by side with the world's best companies to make a powerful impact through transformation. Powered by technology, inspired by people, and led by our purpose, we partner with our clients from design to operation. Our digital solutions, proprietary platforms, engineering, R&D, products, and innovation ecosystem turn core challenges into impactful, disruptive solutions. With deep industry knowledge and a future-ready mindset, we infuse expertise, innovation, and agility into our clients' organizations—delivering measurable value and positive lasting change for them, their customers, and communities around the world. Together, with 30,000+ employees in 30+ countries, we build for boundless impact—touching billions of lives in the process.

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