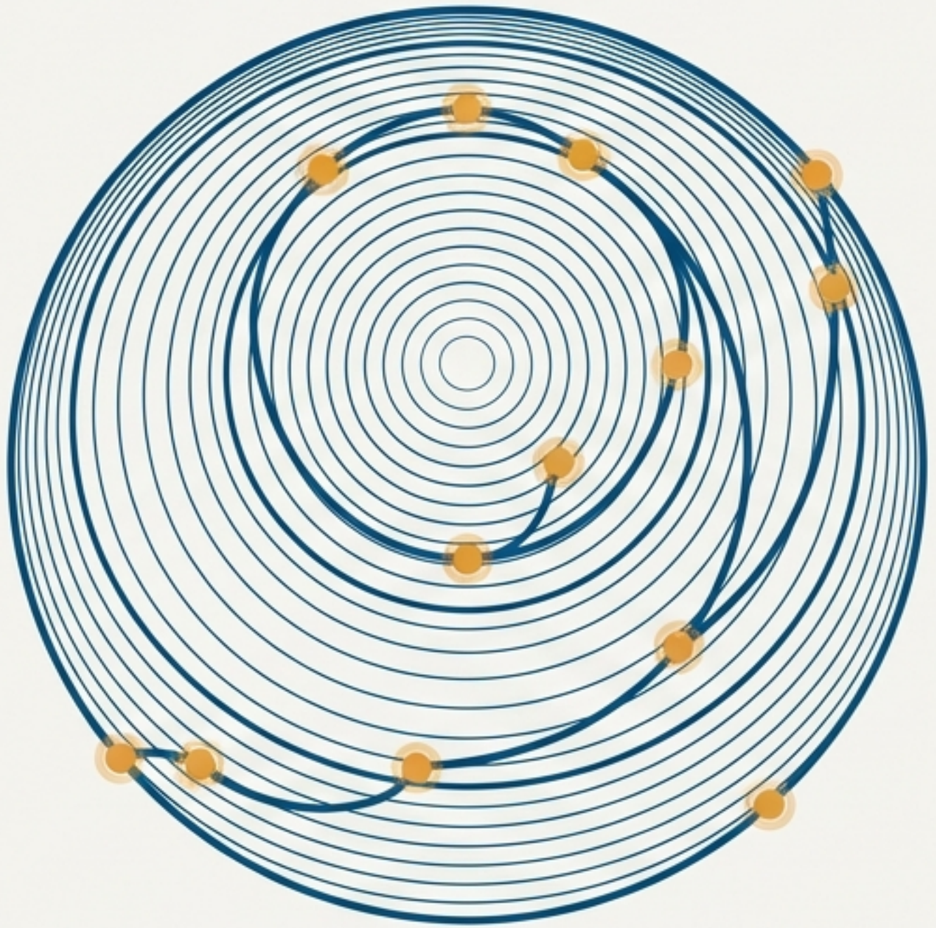
The Future of Proactive Care

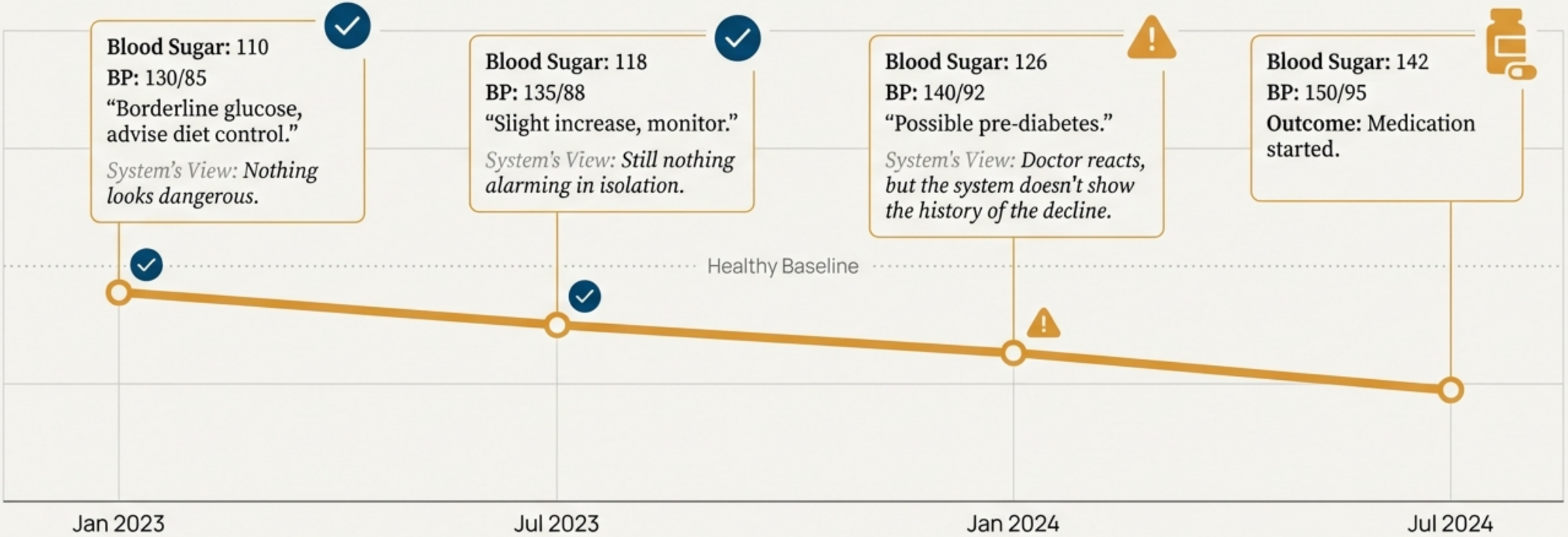
A Clinical Intelligence Platform for Longitudinal Patient Risk Monitoring



Continuous, explainable risk monitoring across each patient's full health journey.

The Invisible Decline: How Risk Accumulates in Plain Sight

Raj, 52



Each visit was treated independently. The **early intervention opportunity** over 18 months was **missed** because no system connected the dots.

Why Our Current Systems Fail to See the Story

Data is Stored, Not Understood

EMRs act as digital filing cabinets. They store labs, notes, and vitals but have no native trajectory awareness.

> *"EMRs close a visit and move on. There is no persistent memory of patient trajectory."*

Human Trend Blindness

Clinicians see dozens of patients and cannot mentally plot multi-year trends for each one. Slow, gradual deterioration is cognitively invisible.

Brittle, Rule-Based Alerts

Typical logic (`IF glucose > 140 → alert`) misses the crucial context of the trend. The real risk was the slow journey from 110 to 142, not the single threshold breach.

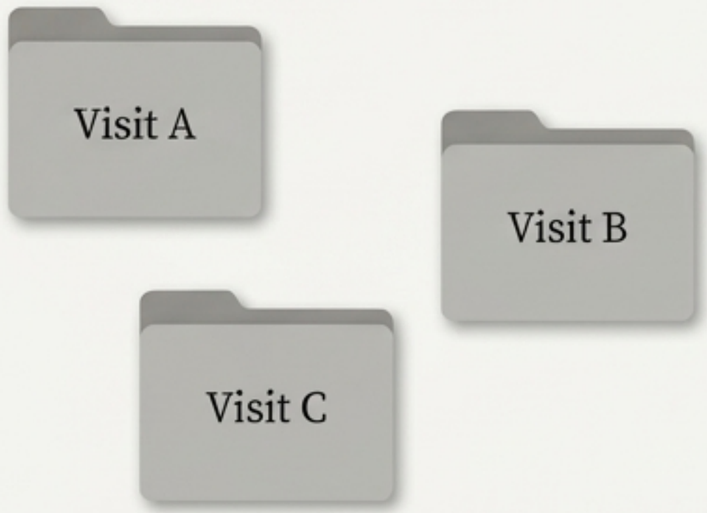
Information Overload & Alert Fatigue

EHRs are filled with "note bloat" and unprioritized alerts, burying critical signals.

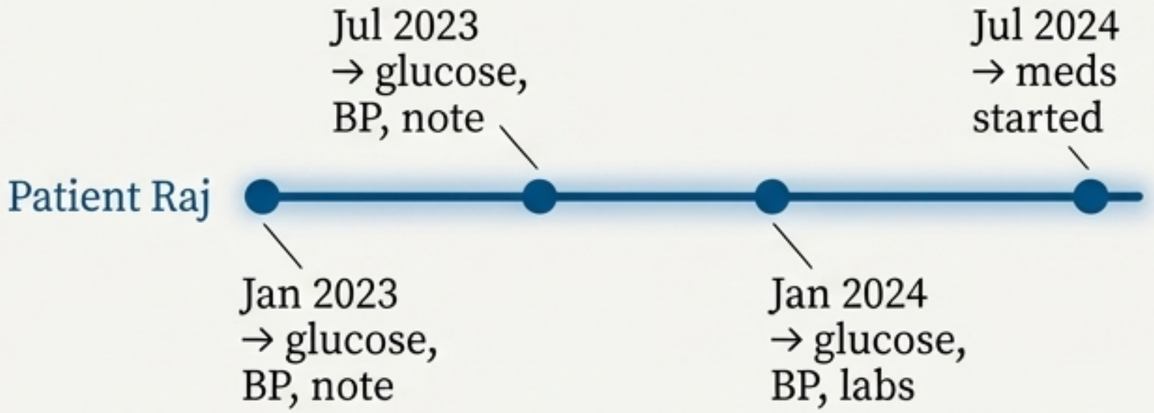
"~70% of doctors report receiving more notifications than they can effectively manage."

The Solution Starts with a Fundamental Shift: From Records to Timelines

The Old View: A Filing Cabinet



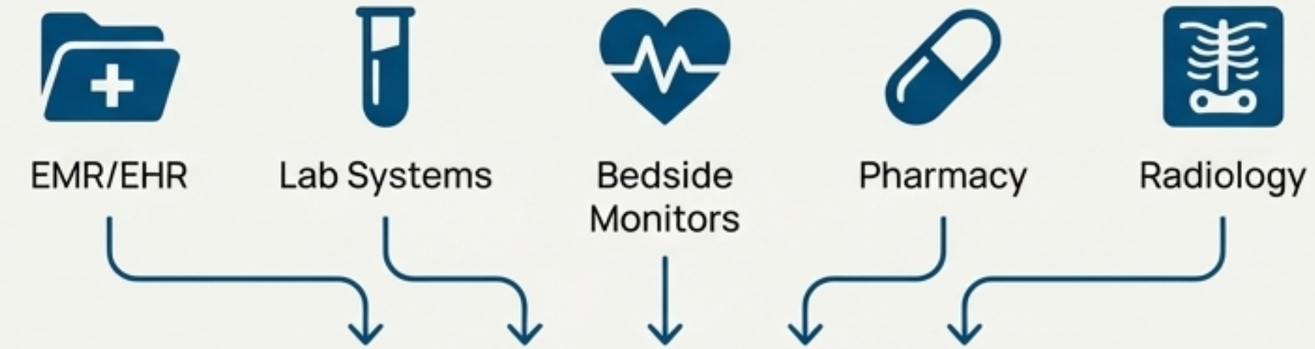
The New View: A Living Story



The patient is not a database row. The patient is a time-ordered story.
This makes their history computable, not just readable.

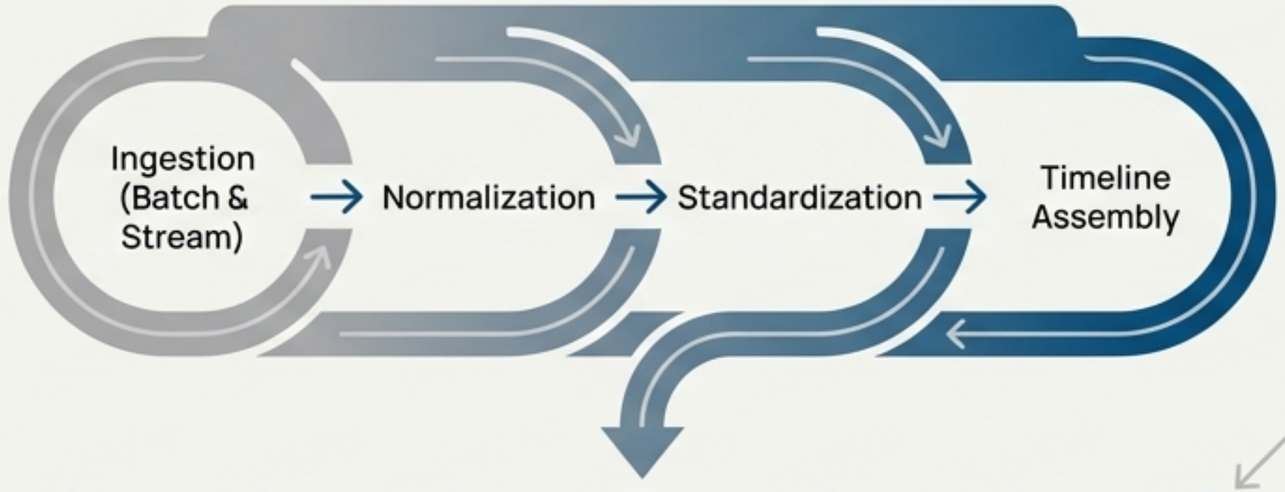
Pillar 1: Building the Foundation – A Persistent, Unified Timeline

(Source Serif Pro Italic)
We ingest all data types: demographics, labs, vitals, notes, and medication orders.



Primary Data Sources

(Source Serif Pro Regular)
Raw data is preserved. We convert messy inputs into atomic, structured events, ordered by time.



(Source Serif Pro Regular)
The result is a single, canonical source of truth for every patient, where every event is time-stamped and independently meaningful.

Unified Patient Timeline

Pillar 2: The Engine – From Raw Data to Risk Insight

Function 1: Automated Trend Extraction

Every clinical metric becomes a time series. We make slow deterioration mathematically visible.

Before

`glucose = 126`

→

After

glucose ↑ steadily for 18 months

Key Features Computed

- Direction (↑ / ↓) — Source Serif Pro Regular
- Rate of change (slope) — Source Serif Pro Regular
- Persistence (duration of trend) — Source Serif Pro Regular

Function 2: Trend-Based Risk Reasoning

We replace brittle rules with contextual reasoning, creating a risk curve, not a binary alarm.

Before

`IF glucose > 140 → alert`

→

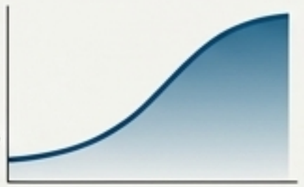
After

IF metric is worsening

AND trend duration is significant

AND patient context increases risk

Reasoning Engine



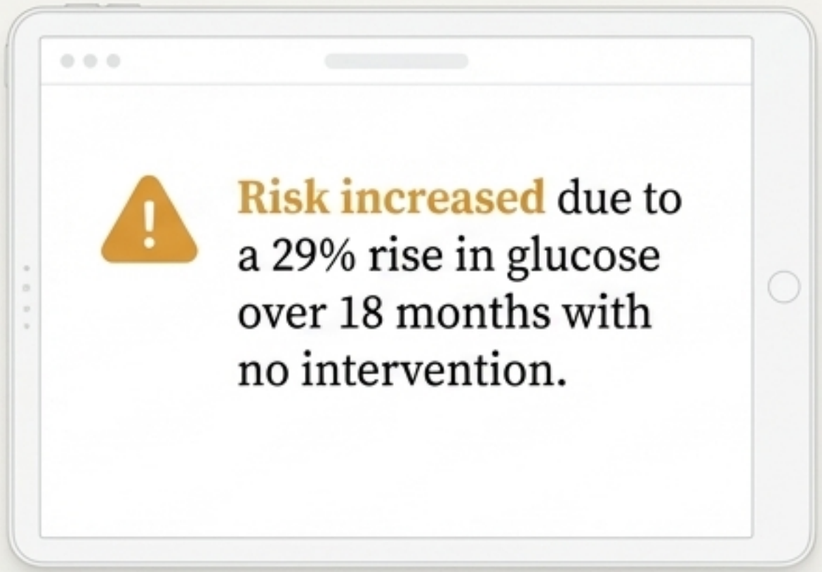
THEN risk is rising

Source Serif Pro Regular

Pillar 3: The Interface – Trusted, Explainable Intelligence

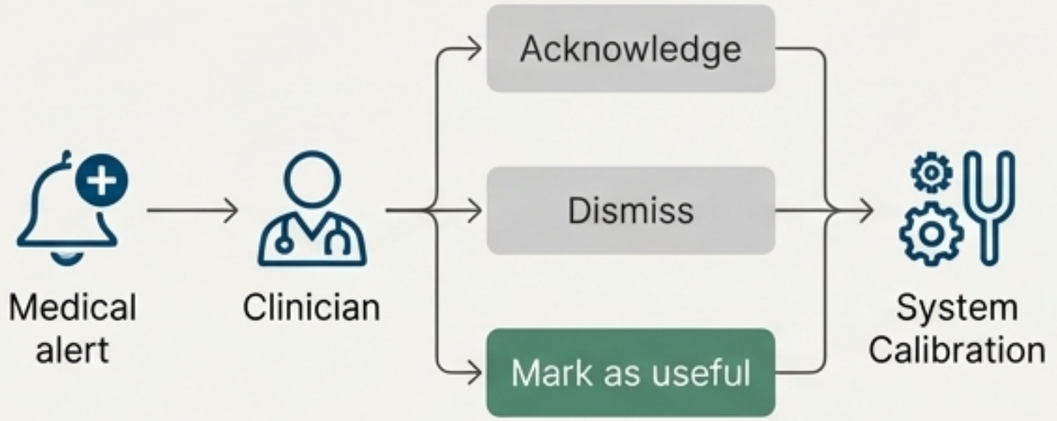
Explainable Risk Summaries

"Every alert must answer: What changed? Over what time? Why does it matter?"



- Builds trust, reduces alert dismissal, and speeds clinical judgment.

Human-in-the-Loop Feedback



This feedback is used for calibration and threshold tuning, not real-time prediction.

- Reduces alert fatigue over time and adapts the system to local workflows.

In Practice: Detecting Early-Stage Sepsis in a Hospitalized Patient

1. Admission

A 62-year-old is admitted with pneumonia. The platform begins assembling their longitudinal profile from all available data.

(Source Serif Pro Regular)

2. Continuous Monitoring

Over 12 hours, new vitals and labs stream into the system in near-real-time.

3. Trend Detection

The engine notices a gradual rise in lactate and a slow decline in blood pressure—patterns missed by standard threshold alerts.

4. Risk Scoring

The AI model computes a rising deterioration index, accounting for the patient's specific comorbidities.

5. Explainable Alert

"Lactate increased from 1.2 to 2.8 mmol/L over 6 hours"
"Mean arterial pressure dropped from 80 to 65 mmHg."

(Manrope Medium)

6. Clinical Response

The care team reviews the specific, contextual alert and escalates care, starting the sepsis bundle before the patient crashes.

A Platform Designed for Measurable Clinical and Operational Impact

Timely Deterioration Detection

>30% target reduction in ICU transfers or cardiac/respiratory arrest events.

A pilot at Akron Children's Hospital **reduced emergency response calls by ~40%.**

High Predictive Performance

Sensitivity ≥ 95% for serious events while maintaining Specificity ≥ 85%.

Find the real risk without overwhelming staff.

Reduced Alert Fatigue

>80% of alerts rated 'clinically useful' by staff.

Fewer, more meaningful alerts that clinicians trust and act on.

Improved Patient Outcomes

Demonstrable reduction in length-of-stay, sepsis mortality, and readmission rates.

Engineered for Safety, Governance, and Trust

A Tool for Decision Support, Not Decisions

- **System Outputs**
  - ✅ Risk Level
  - ✅ Explanation
  - ✅ Suggested Review
- **System NEVER Outputs**
  - ❌ A Diagnosis
  - ❌ Treatment Commands

Data Integrity and Auditability

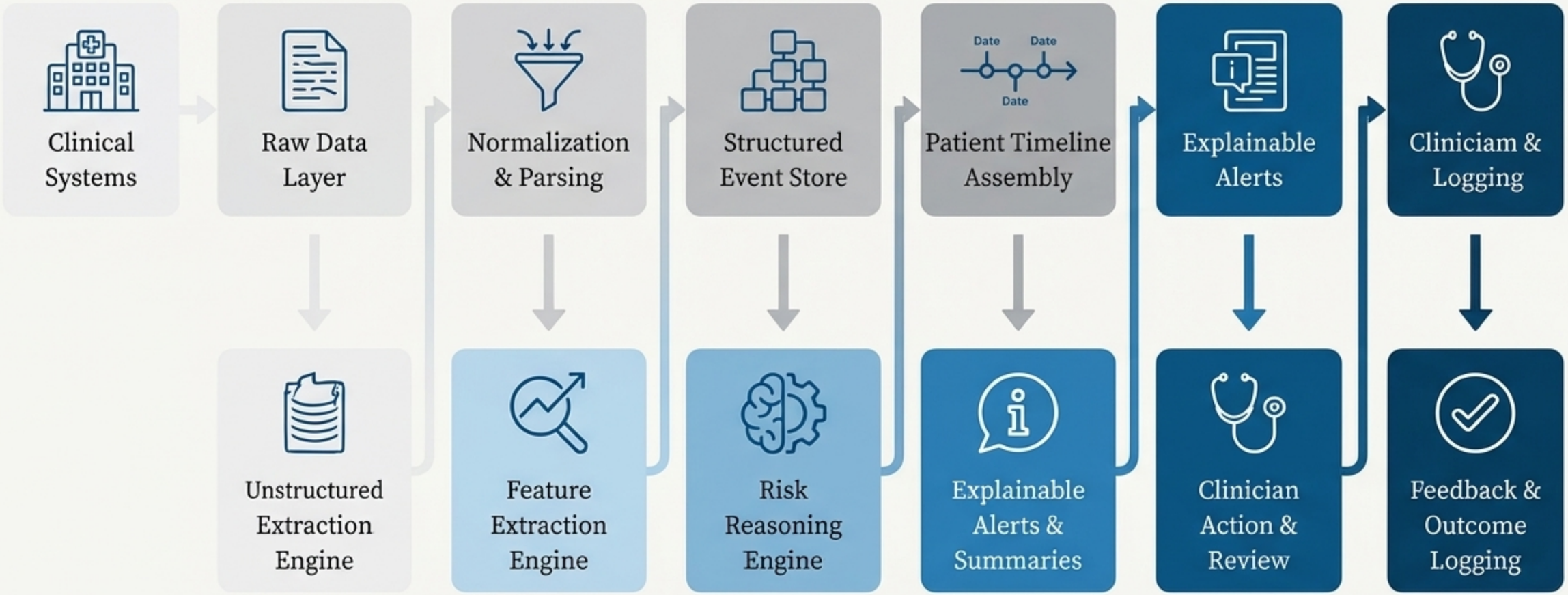
- Raw data is preserved and never overwritten.
- All processed data is explainable and auditable.
- The entire system uses append-only logs and versioned event formats.

Strict Separation of Layers

- AI never consumes raw documents or free text directly.
- The Risk Reasoning Engine only receives structured, validated features, preventing hallucination.

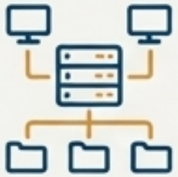
This architecture is designed for longitudinal reasoning, safe explainability, and regulatory auditability from the ground up.

The End-to-End Intelligence Flow



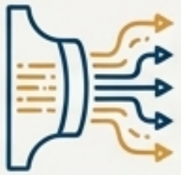
Each layer exists to fix a specific, real-world failure in patient monitoring.

This is a Foundational, Enterprise-Grade Initiative



Broad System Integration

Requires deep interfacing with EHR, LIS, pharmacy, and monitoring systems via FHIR/HL7, including meticulous security validation.



Massive Data Engineering

Demands robust pipelines for handling streaming data from thousands of patients, plus harmonization of years of historical records.

Rigorous AI Validation

Clinical models require large training cohorts, multi-disciplinary design sessions (doctors, nurses, ethicists), and continuous monitoring for drift and bias.

Clinical Workflow Transformation

Success hinges on substantial user training, change management, and clinical governance to align the tool with clinicians' needs.

This is not a ‘10-week hackathon’ but a **multi-phase digital transformation** designed to monitor every inpatient continuously.

This system does not replace doctors.
It replaces forgotten history.

Documents are evidence.
Events are truth.
Timelines create intelligence.