



ARTICLE

THE CHAIN OF CUSTODY FOR CODE

Mapping accountability from dataset to deployment in AI-driven healthcare.

THE DISAPPEARANCE OF RESPONSIBILITY

In traditional medicine, accountability is personal. When a physician errs, the causal link between action and outcome is visible. AI breaks that visibility.

When an algorithm misclassifies a lesion, whose error is it – the clinician who trusted it, the developer who trained it, the hospital that deployed it, or the data that taught it? Each link points to another; responsibility dissolves in recursion. The system learns collectively, fails collectively, and apologizes to no one. The task of modern governance is to make that invisible chain **visible again**.

THE CONCEPT OF DIGITAL CUSTODY

Custody in law means control with responsibility – possession joined to obligation. In AI, custody must extend beyond physical data to include every digital artifact that influences patient care:

- training datasets,
- preprocessing scripts,
- model weights,
- validation protocols,
- deployment environments.

Each component has a custodian whose duty is to maintain traceability and integrity. When all custodians are known and their actions logged, accountability becomes reconstructable.

Without such a system, every AI remains a ghost: influential, but unanswerable.

THE CIRCLE MODEL OF CUSTODY

Circle Datasets establish a multi-tier chain of custody for medical AI:

- **Data Custodians** – local institutions validating and curating raw observations under standardized Observational Protocols.
- **Model Custodians** – federated aggregators who compile derivative models while preserving data lineage.
- **Deployment Custodians** – clinical operators responsible for local implementation and outcome monitoring.

Each tier inherits obligations from the prior one, forming a continuous moral and technical lineage from data to decision. Every transformation – from collection to computation – is auditable. Custody ceases to be symbolic and becomes executable.

PROVENANCE AS ACCOUNTABILITY INFRASTRUCTURE

Accountability depends on the ability to reconstruct cause. Circle Datasets achieve this through immutable provenance trails: cryptographic records of every data transformation, model update, and deployment event.

This infrastructure enables **reverse engineering of responsibility**. When an AI makes an erroneous recommendation, investigators can trace the failure back through layers of custody – identifying whether the fault lies in input, logic, or application. Accountability becomes empirical, not rhetorical.

THE LEGAL RECONFIGURATION

Emerging frameworks such as the EU's *AI Liability Directive* and the U.S. FDA's *Good Machine Learning Practice* already anticipate this logic. They recognize that legal responsibility in autonomous systems must follow traceable control, not ownership.

Federated custody aligns perfectly with this requirement: each participant's obligations are documented, bounded, and provable. The principle is simple: **no liability without custody, no custody without record**. When regulation meets architecture, enforcement becomes evidence-based.

THE MORAL DIMENSION

Accountability is not merely legal but ethical. A system that cannot be held to account is morally incomplete – it exercises power without bearing consequence. By contrast, a governed chain of custody reintroduces conscience into automation.

Each custodian carries both technical responsibility and moral representation. The result is an AI ecosystem that mirrors the ethical structure of medicine itself: distributed, documented, and humane.

THE PRACTICAL DIVIDEND

Traceable custody reduces fear. Clinicians gain confidence because they can verify source integrity. Developers gain legal clarity because fault can be isolated. Institutions gain regulatory trust because transparency is demonstrable. The network becomes self-defending – not by avoiding error, but by ensuring that error never hides.

Accountability, once embedded, ceases to inhibit innovation; it enables it.

THE MORAL OUTCOME

A “chain of custody for code” is not bureaucracy; it is the foundation of moral agency in digital medicine.

It transforms AI from a black box into a signed instrument – a tool whose history, handlers, and responsibilities are known. Only when code itself carries lineage can medicine reconcile intelligence with conscience. Federated custody achieves that reconciliation, turning automation into a transparent act of care.

SELECTED REFERENCES

- RegenMed (2025). *Circle Datasets Meet the Challenges of Federated Healthcare Data Capture*. White Paper.
- European Commission (2024). *AI Liability Directive*.
- FDA (2023). *Good Machine Learning Practice for Medical Device Development*.
- OECD (2024). *Accountability Mechanisms in Federated AI Systems*.

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