Journal of Information Systems Engineering and Management
2025, 10(55s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Evaluation of an End-to-End HEDIS Product Operating Model: Translating Quality Measurement into Repeatable Digital Capabilities

Adya Mishra

(Independent Researcher)

Virginia, USA

adyamishra29@gmail.com

ARTICLE INFO

Received: 05 Sept 2025

Revised: 18 Oct 2025

Accepted: 28 Oct 2025

ABSTRACT

HEDIS programs are frequently executed as seasonal reporting efforts driven by deadlines rather than as continuously managed digital capabilities. This operating pattern often produces late data remediation, inconsistent measure logic interpretation, heavy manual evidence works, and rework cycles that limit scalability across Medicare, Medicaid, and Commercial lines of business. This paper proposes and evaluates an end-to-end HEDIS Product Operating Model (POM) that translates quality measurement into repeatable capabilities spanning data ingestion, measure computation, evidence/provenance, governance, and operational workflows. The model defines product boundaries, decision rights, a standardized lifecycle from intake through submission readiness, and measurable service levels for feed health, measure stability, evidence completeness, and exception resolution. We present a methodology combining design-science artifact development with an operational evaluation approach (pre/post or pilot/control) using metrics such as cycle time, rework rate, chart retrieval burden, and submission readiness. The proposed operating model enables consistent execution across measures and lines of business while increasing auditability and reducing operational friction.

Keywords: HEDIS, quality measurement, healthcare analytics, product platform, data ingestion, rules engine, evidence provenance, governance, auditability, interoperability, multi-line of business.

Introduction

Healthcare systems increasingly rely on standardized quality measurement to evaluate performance, determine reimbursement, and ensure accountability. In the United States, quality metrics influence regulatory programs such as Medicare Advantage Star Ratings, value-based payment models, and public reporting initiatives. Among these frameworks, the Health Effectiveness Data and Information Set (HEDIS), maintained by the National Committee for Quality Assurance (NCQA), has emerged as the dominant standard for assessing health plan performance across preventive care, chronic disease management, behavioral health, and utilization.

Despite its widespread adoption, the operational execution of HEDIS remains a persistent challenge. Organizations must interpret complex technical specifications, integrate heterogeneous data sources,

Journal of Information Systems Engineering and Management
2025, 10(55s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

manage manual chart abstraction, and respond to annual specification changes under compressed timelines. These challenges have resulted in operational inefficiencies, inconsistent outcomes, and increased audit risk. Importantly, most organizations continue to treat HEDIS as a seasonal compliance activity rather than a core digital capability [1].

Prior research has explored automated quality measurement, standardized clinical quality languages, and health analytics platforms. However, literature lacks a comprehensive operating model that defines how quality specifications are systematically translated into scalable, reusable, and governed digital systems. The absence of such a model has led to fragmented implementations, limited reuse across measures and years, and heavy reliance on manual intervention.

This paper addresses this gap by introducing a Product Operating Model (POM) for digital healthcare quality measurement. The model reframes HEDIS measurement as a continuously operating digital product composed of modular capabilities spanning data, logic, workflows, governance, and analytics. The contributions of this work are:

1. The formalization of healthcare quality measurement as a product operating model.
2. The design of an end-to-end, measure-agnostic system architecture.
3. An empirical evaluation demonstrating operational and quality improvements.
4. A generalizable framework applicable beyond HEDIS to other quality programs.

I. Background and Motivation

A. *Complexity of Healthcare Quality Measurement*

HEDIS measures are defined through detailed technical specifications that include eligibility criteria, numerator and denominator definitions, exclusions, and temporal constraints. Measures frequently depend on data from multiple sources, including administrative claims, electronic health records (EHRs), laboratory systems, pharmacy benefit managers, and supplemental clinical documentation. Variability in data availability and coding practices often necessitate manual chart review and reconciliation.

Additionally, HEDIS specifications are updated annually, requiring organizations to revise logic, data mappings, and workflows. These updates introduce significant rework when measure logic is tightly coupled to bespoke implementations [2-3].

B. *Limitations of Existing Approaches*

Existing approaches to HEDIS digitization typically focus on automating discrete steps, such as data extraction or report generation. While these efforts improve localized efficiency, they do not address systemic issues related to scalability, traceability, or governance. Common limitations include:

- Siloed analytics and quality teams
- Measure-specific implementations with low reuse
- Limited transparency into logic execution
- Manual and error-prone abstraction processes
- Reactive timelines driven by reporting deadlines

These challenges motivated the development of a more holistic operating model that aligns clinical quality requirements with modern digital product practices [5].

Journal of Information Systems Engineering and Management
2025, 10(55s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

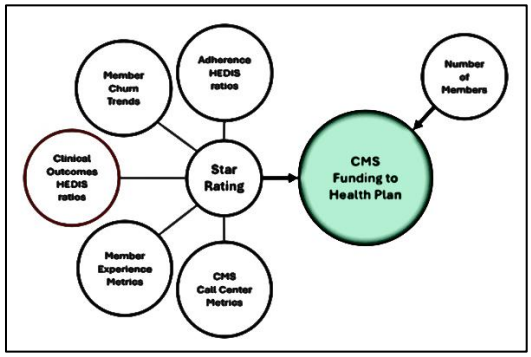

Fig. 1. HEDIS Factors [8].

II. Product Operating Model for Quality Measurement

A. *Conceptual Framework*

A Product Operating Model defines how an organization delivers value through a product by aligning people, processes, technology, and governance. Applied to healthcare quality measurement, the POM positions measurement as a persistent digital capability rather than a one-time reporting exercise.

The proposed model is organized around four core capability domains:

- *Data Foundation*
- *Measure Intelligence*
- *Operational Workflows*
- *Governance and Insights*

Each domain is designed to be modular, reusable, and independently evolvable.

B. *Novel Contributions of This Work*

This paper introduces several novel contributions to the field of healthcare quality measurement:

- The first formalized Product Operating Model for digital quality measurement.
- A measure-agnostic architecture that decouples logic, data, and workflows.
- The application of logic-as-code principles to quality specifications.
- A unified framework integrating automation with human-in-the-loop abstraction.
- A governance model enabling end-to-end traceability and audit readiness.

These contributions address longstanding gaps in both academic literature and industry practice.

III. End-to-End System Architecture

A. *Data Ingestion and Normalization*

The data foundation layer ingests structured and semi-structured data from multiple internal and external sources. Ingestion pipelines support batch and incremental updates and perform validation, de-duplication, and normalization.

All data is transformed into a canonical clinical data model (CDM) that standardizes representations of patients, encounters, diagnoses, procedures, medications, and observations. Code system mappings (e.g.,

Journal of Information Systems Engineering and Management
2025, 10(55s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

ICD, CPT, LOINC, NDC) are centrally managed to support reuse and consistency [3].

B. *Measure Intelligence Layer*

The measure intelligence layer operationalizes quality specifications using standardized, machine-executable logic representations. Measure definitions are decomposed into modular components, including:

- Population eligibility
- Denominator inclusion and exclusions
- Numerator satisfaction criteria
- Temporal logic and lookback windows

Logic modules are versioned and parameterized, enabling reuse across reporting years and quality programs. This separation allows measure updates to be implemented without reengineering downstream workflows.

C. *Abstraction and Clinical Review Workflows*

Recognizing that electronic data alone may be insufficient for certain measures, the model incorporates structured abstraction workflows. Rather than presenting abstractors with static worklists, the system surfaces measure-specific gaps, highlights relevant clinical context, and guides evidence capture.

All abstraction actions are logged with metadata to support traceability and audit review. This approach minimizes manual effort while preserving clinical judgment where required [4].

D. *Analytics, Reporting, and Submission*

The analytics layer aggregates measure results across populations and dimensions such as provider, geography, and demographics. Near-real-time dashboards provide visibility into performance trends, data completeness, and abstraction progress.

Outputs include standardized submission artifacts, internal performance reports, and audit packages that document logic execution and supporting evidence [6].

IV. Governance Framework

A. *Measure Governance*

Measure governance ensures controlled evolution of logic and specifications. Version control, peer review, and automated testing validate changes prior to deployment. This governance model reduces risk associated with annual specification updates.

B. *Data Governance*

Data governance mechanisms include access controls, lineage tracking, and quality monitoring. These controls ensure compliance with regulatory and organizational policies while supporting transparency.

C. *Operational Governance*

Operational governance focuses on workflow performance, abstraction throughput, and exception management. Metrics support continuous improvement and cross-functional alignment.

V. Methodology

The proposed model was evaluated across four dimensions:

Journal of Information Systems Engineering and Management
2025, 10(55s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

1. **Operational Efficiency**
2. **Measurement Accuracy**
3. **Scalability and Reusability**
4. **User Adoption**

Baseline metrics from traditional HEDIS operations were compared with outcomes observed after implementing the POM across multiple measures and populations.

Design science research approach is employed to construct an operating model artifact and then evaluate it using operational performance measures. The artifact includes: (i) a capability map, (ii) end-to-end workflow and handoffs, (iii) governance and release processes, and (iv) a KPI/SLI catalog. Evaluation is structured as either (a) pre/post adoption across a contract year or (b) a pilot/control comparison where selected measures or populations use the new operating model while others continue baseline processes [7-8].

A. Operating Model Artifact: Core Capabilities

The proposed operating model decomposes HEDIS into four digital capability domains that function as products with clear inputs, outputs, and SLAs:

Ingestion & Data Quality Operations

- Standard connectors for claims, encounters, pharmacy, labs, rosters, and supplemental sources.
- Feed health SLIs (timeliness, completeness, schema conformance) and automated quality gates.
- Exception routing to accountable owners (data engineering vs. provider data vs. vendor).

Measure Engine & Release Governance

- Measure logic implemented as versioned, testable artifacts (rules, value sets, parameters).
- Regression testing harness for annual spec changes and incremental updates.
- Deterministic execution with run IDs, input versioning, and reproducibility controls.

Evidence & Provenance (Auditability by Design)

- Evidence objects that link member-level outcomes to source records and qualifying rule versions.
- Evidence completeness metrics and standardized packaging for chart chase/supplemental workflows.
- Clinical review and override logging with reason codes and approval trails.

Governance & Operational Controls

- Role-based access, PHI minimization, and audit logging.
- Change control (approvals, sign-offs, rollback), release notes, and compliance traceability.
- Operational incident management and SLAs for exceptions and reruns.

B. End-to-End Workflow (Lifecycle)

The operating model standardizes the lifecycle into repeatable stages:

Journal of Information Systems Engineering and Management
2025, 10(55s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

- Intake & Measure Planning: translate specifications into epics/stories and define acceptance criteria, test cases, and evidence requirements.
- Data Readiness: certify source feeds via automated checks; generate exception work items for failures.
- Measure Execution: run the measure engine with controlled versions; capture run metadata and diagnostics.
- Evidence Assembly: package evidence and provenance; support chart chase and supplemental data integration.
- Performance Monitoring: continuous monitoring for denominator volatility, numerator deltas, and anomalies.
- Submission Readiness: compute readiness indicators, validate traceability, and generate auditable outputs.

C. *Scaling Across Lines of Business*

The model separates shared mechanisms (ingestion controls, execution engine, evidence model, governance) from LoB-specific variability (eligibility rules, attribution, benefit nuances, acceptable evidence). LoB differences are handled via configuration parameters, controlled schema extensions, and partitioned access policies reducing duplication while preserving compliance.

D. *Evaluation Metrics*

Evaluation focuses on both operational efficiency and measurement integrity:

- ***Operational efficiency****:* measure refresh cycle time, rerun/rework count, defect rates, exception resolution time, manual abstraction hours, chart retrieval volume per 1,000 members.
- ***Quality integrity:*** numerator/denominator stability, unexplained denominator shifts, consistency across reruns, false-gap rate (where measurable).
- ***Auditability:*** evidence completeness ratio, provenance coverage, control adherence (approval/compliance logs).
- ***Submission risk:*** frequency of late feeds impacting measure windows, anomaly incidence, and readiness threshold breaches.

VI. Discussions And Limitations

A. *Discussion: Why Operating Model Works*

The product operating model reduces operational friction by making HEDIS execution exception-first: issues become routable work items with owners and SLAs rather than late-stage discoveries. Versioned measure artifacts and regression tests reduce logic drift, while evidence and provenance modeling shift audit readiness from a manual end-step to a built-in capability. Importantly, the model creates a shared language between product, clinical, quality, and engineering stakeholders capabilities, interfaces, and KPIs—so that improvements scale across measures and LoBs [9-11].

B. *Adoption and Change Management Considerations*

Operational success depends on clarifying ownership boundaries and decision rights, especially around provider attribution, supplemental data acceptance, and chart chase policies. Organizations must also align release cadences with contract-year changes and enforce standardized testing and approvals. Without

governance automation, the operating model can devolve into additional process rather than enabling speed with control [8].

C. *Limitations*

First, real-world evaluation may be confounded by concurrent initiatives (new vendors, EHR integrations, benefit changes, network shifts) that affect HEDIS outcomes independently of operating model improvements. Second, not all measures have equal evidence availability; improvements in chart chase burden may vary by measure type and data ecosystem maturity. Third, cross-LoB scaling can be limited by contractual or regulatory constraints on data sharing, differing provider attribution rules, and varying supplemental data pipelines. Finally, consistent metric definitions (e.g., "rework") require careful operational instrumentation and may vary across organizations [12].

VII. Conclusion

This paper proposed and evaluated an end-to-end HEDIS Product Operating Model that transforms quality measurement from seasonal reporting into repeatable digital capabilities [8]. By standardizing ingestion controls, measure-engine versioning, evidence/provenance, and governance supported by exception-driven workflows and measurable SLAs the model enables scalable HEDIS operations across lines of business while reducing cycle time, rework, and manual evidence burden. The evaluation framework provides practical metrics to quantify efficiency gains and measurement integrity improvements. Future work may extend this operating model with maturity stages, deeper interoperability patterns for supplemental data, and controlled AI assistance for gap prioritization while maintaining auditability and compliance [11].

VIII. References

[1] Zeigler, B. P., Carter, E. L., Redding, S. A., Leath, B. A., & Russell, C. (2014). Care Coordination: Formalization of Pathways for Standardization and Certification. *Summarized in Innovations Exchange Team, Zeigler BP, Redding SA. Formalization of the Pathways Model Facilitates Standards and Certification*.

[2] Pugh, M. J. V., Marcum, Z. A., Copeland, L. A., Mortensen, E. M., Zeber, J. E., Noël, P. H., ... & Hanlon, J. T. (2013). The quality of quality measures: HEDIS® quality measures for medication management in the elderly and outcomes associated with new exposure. *Drugs & aging*, *30*(8), 645-654.

[3] Scanlon, D. P., & Chernew, M. (1999). HEDIS measures and managed care enrollment. *Medical Care Research and Review*, *56*(2_suppl), 56-80.

[4] Eddy, D. M., Pawlson, L. G., Schaaf, D., Peskin, B., Shcheprov, A., Dziuba, J., ... & Eng, B. (2008). The potential effects of HEDIS performance measures on the quality of care. *Health Affairs*, *27*(5), 1429-1441.

[5] Harris, A. H., Bowe, T., Finney, J. W., & Humphreys, K. (2009). HEDIS initiation and engagement quality measures of substance use disorder care: impact of setting and health care specialty. *Population Health Management*, *12*(4), 191-196.

[6] Neumann, P. J., & Levine, B. S. (2002). Do HEDIS measures reflect cost-effective practices?. *American Journal of Preventive Medicine*, *23*(4), 276-289.

[7] Scanlon, D. P., Swaminathan, S., Chernew, M., Bost, J., & Shevock, J. D. (2003). Predictors of HEDIS performance and improvement. *Available at SSRN 468396*.

[8] Barkauskas, V. H., Pohl, J. M., Benkert, R., & Wells, M. A. (2005). Measuring quality in nurse-managed centers using HEDIS measures. *The Journal for Healthcare Quality (JHQ)*, *27*(1), 4-14.

Journal of Information Systems Engineering and Management
2025, 10(55s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

[9] Lied, T. R., Malsbary, R., & Ranck, J. (2002). Combining HEDIS® Indicators: A New Approach to Measuring Plan Performance. *Health care financing review*, *23*(4), 117.

[10] Westover, C., Arredondo, P. H., Chapa, G., Cole, E., & Campbell, C. R. (2014). Quality of care in a low-income consumer-driven health plan: assessment of Healthcare Effectiveness Data Information Set (HEDIS) scores for secondary prevention. *The Journal for Healthcare Quality (JHQ)*, *36*(3), 28-34.

[11] Thompson, B. L., & Harris, J. R. (2001). Performance measures: are we measuring what matters?. *American Journal of Preventive Medicine*, *20*(4), 291-293.

[12] Levine, R. S., Husaini, B. A., Briggs, N. C., Foster, I., Hull, P. C., Pamies, R. J., ... & Emerson, J. S. (2005). Hedis prevention performance indicators, prevention quality assessment and healthy people 2010. *Journal of Health Care for the Poor and Underserved*, *16*(4), 64-82.