

The Art of the Possible in Digital Quality: Better Measures, Better Incentives, Better Care

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Abstract

Digital quality has made real progress. CMS and NCQA have moved the field toward FHIR®- and CQL-based measure content, more interoperable data, digital HEDIS®, and a shared goal for 2030: less burden, better data flow, and aligned measures. Most of that work has moved existing paper measures into digital formats. Far less has changed about what gets measured or how directly measurement supports care and quality improvement.

The next phase should deliver measures that are clinically meaningful and computable: outcomes tracked together across conditions, individualized goals and care plans, and change in disease risk over time. It should also bind measurement more tightly to guidelines, care delivery, and payment. The standards for this now exist. Much of the remaining work is to make clinical goals, reasoning, and exceptions explicit and computable, so shared definitions can support both bedside recommendations and related measures. AI-assisted authoring, expert review, and deterministic execution can help develop that content while preserving accountability for its clinical meaning. Done well, quality measurement moves from a rear-view mirror to a navigation system: timely, clinically useful, aligned with incentives, and still able to support accountability.

Introduction: two roadmaps, one destination

CMS and NCQA have approached digital quality from different angles, toward the same destination. CMS works through policy: FHIR-based interoperability rules for EHRs and health plans, the Digital Quality Measurement Strategic Roadmap, and the Universal Foundation, which aligns measures across CMS programs [1–3]. The CY 2027 proposed rule seeks input on FHIR-based reporting alongside existing options during 2028–2029, followed by required reporting for applicable measures beginning in 2030, subject to future rulemaking [4]. NCQA works through implementation. NCQA is transitioning HEDIS toward FHIR/CQL digital content and electronic clinical data, with a planned phaseout of hybrid reporting by measurement year 2029 [5, 6]. Both share the same end state: less burden on clinicians and plans, better data, and aligned measures.

In 2023, one of us (B.R.) described the transformation as three pillars from his seat at NCQA [7]:

1. **Paper to software.** Measures that are easier to distribute, model, collect, and update, with less variation in logic and scores.
2. **New architecture.** Content that serves many uses (quality improvement, population management, analytics) from timely data across clinical, claims, lab, and registry sources.

3. **A better measurement system.** Higher-resolution measures for the priority domains of value-based care, relevant across payers, providers, and accountability models.

The pillars build on each other. The first makes the second possible, and the second makes the third affordable. Digital quality was always meant to be more than a format change. It is a chance to rethink what we measure, how quickly the system learns, and how directly measurement drives better care.

Where we are, and where we aren't yet

Most progress sits in the first pillar. Our illustrative assessment in Figure 1 suggests that the move from paper to software has advanced since 2023. New architecture is lagging: measures are still built as derivatives of clinical guidelines or goals that are often undocumented, making it difficult to reconstruct decision support. The third pillar, a better measurement system, remains largely conceptual. The percentages reflect the authors' judgment rather than measured benchmarks.

Most progress sits in the first pillar

Estimated share of the way to each pillar's goal, 2026 (authors' judgment, illustrative)

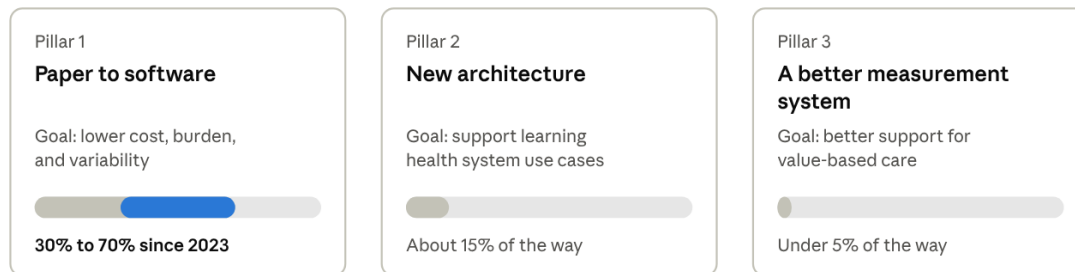


Figure 1 · Three pillars of digital quality and illustrative progress, 2023 to 2026 (authors' judgment)

The first pillar's gains are real. Executable measure logic and standard test cases reduce variation, while dependable implementation still requires compatible data models, terminology, dependencies, and validated software [7]. The second pillar has started: the same digital content now has a few configurations to support quality improvement and population management as well as reporting. The third has barely begun. Most measures still look the way they did on paper.

The 2023 talk also asked three questions about the building blocks of a learning health system. The answers have moved, but not far enough.

Building block	Question asked in 2023	2023 answer	2026
Standards and guidelines	Are they consistent and actionable?	Not always: fragmented, narrative, disconnected	Standards for computable guidelines exist. Few guidelines are published in computable form, and fewer are linked to the measures that score them.
Data collection and transfer	Is it agreed and trusted?	No: variable, non-standardized, needs validation	Certified EHRs and regulated health plans must expose FHIR APIs, and HEDIS is moving to electronic clinical data. Completeness and validation are now the binding constraint.
Measurement	Is it clinically relevant and supportive of value-based care?	Partially: specifications only, limited by data, retrospective	Digital specifications support deterministic execution with compatible data models, terminology, dependencies, and validated software. Most measures still count processes against fixed thresholds, one condition at a time, after the fact.

A case study: cardiovascular-kidney-metabolic health

Even our best digital measures show the gap. Cardiovascular-kidney-metabolic (CKM) syndrome is a strong test case: it is common, costly, underdiagnosed, and undertreated, and its component conditions drive each other [8, 9]. The measures that address CKM populations in HEDIS and Star Ratings, MIPS, and CMS dialysis facility reporting cover these topics:

Topic	What the measure does
Glycemic control	Most recent HbA1c or glucose management indicator assessed against population thresholds [17].

Topic	What the measure does
Kidney disease screening	Receipt of eGFR and uACR evaluation, rather than change in kidney function or damage [18].
Blood pressure control	Blood-pressure control against a specified population threshold (e.g., CMS165v14) [22].
Ischemic vascular disease	MIPS 441: all-or-none achievement of four care targets [23].
Cardiovascular prevention	MIPS 438: statin therapy, with elevated 10-year ASCVD risk as one eligibility pathway [24].
Heart failure utilization	Risk-standardized acute, unplanned cardiovascular-related hospital admissions among patients with heart failure [19].
Dialysis safety	Bloodstream infection in hemodialysis; used for payment in the End-Stage Renal Disease Quality Incentive Program (ESRD QIP) [20].
Mortality	All-cause mortality reported for dialysis facilities; not used for payment under the finalized payment-year 2026 ESRD QIP measure set [20, 21].

These are good measures. Together they show three limits.

1. **Outcomes remain fragmented.** The examples above assess clinically important aspects of care, including cardiovascular-related admissions among people with heart failure and mortality among people receiving dialysis. They do not provide an integrated view of cardiovascular events, kidney decline, kidney failure, and death across a defined CKM population before kidney failure.
2. **Change in estimated risk is largely missing.** Risk is used to identify eligible patients and to adjust some outcome measures. Those uses differ from assessing how a patient's estimated risk changes over time. A change-in-risk measure would need a defined outcome, time horizon, model version, and approach to comparing repeated estimates; a lower estimate does not itself establish that care prevented an event.
3. **CKM is an interconnected syndrome, but measurement remains divided by condition, setting, and program.** Glycemic and blood-pressure measures, cardiovascular admissions among patients with heart failure, and dialysis safety each answer useful questions. What is missing from the examples reviewed here is a coherent view of how care across these domains affects the patient's overall clinical course. NCQA's Cardiovascular-Kidney-Metabolic Syndrome: Improving Quality of Care and Accountability white paper describes the corresponding clinical silos [9].

This is the shift we are proposing: complement today's condition- and program-specific measures with a coherent assessment of care and outcomes across a defined CKM population.

The alternative starts from what purchasers and patients want: fewer cardiovascular events and kidney failures, slower disease progression, and better health and function. Define those objectives across the CKM population, then develop measures and incentives that support coordinated care. Computable clinical knowledge makes that more practical. Using the measures for accountability still requires explicit attribution, observation periods, and evidence that the results are reliable and valid for the intended use.

The standards arrived. The knowledge layer didn't.

The field has tried to close this gap more than once, and each time the wall moved.

Year	What happened
2016	NCQA concluded that more sophisticated measures would need new specification standards before they could scale.
2018–2025	Those standards arrived and were adopted: FHIR, CQL, the Clinical Practice Guidelines implementation guide (CPG-IG), the quality measure and DEQM implementation guides, and ECDS reporting [10, 25].
2024	NCQA and partners drafted more than fifty new diabetes measure concepts, including individualized goals, glucose-monitoring trends, and treatment adjustment. These concepts illustrate the additional clinical detail needed for richer measures.
2026	NCQA announced its CKM report, describing fragmented accountability and identifying PREVENT and KFRE as tools that could support more integrated risk-based care [9, 11, 12].

The 2024 concepts exposed several remaining barriers: unavailable computable goals and reasons, gaps in device-data interoperability, and the complexity of specifying richer measures. An individualized A1c goal may remain in a note, and a reason for not starting treatment may never reach the measure in usable form.

When individual goals and reasons are unavailable to a measure, population thresholds become the default. Making that clinical knowledge computable creates room for finer-grained measurement. Alongside interoperable data and sound implementation, it is a major part of the remaining work.

What's needed: digitally native measures

Fixing this for CKM takes digitally native measure development. Goals, risk, and reasons have to be computable. The FHIR Clinical Practice Guidelines implementation guide provides a way to express shared clinical definitions and recommendations, including the patient information they depend on. Patient-level metrics can assess care processes and progress toward goals; population measures can reuse that clinical logic while specifying their own populations, exceptions, attribution, time windows, and scoring [10]. The opportunity is to align bedside guidance and measurement through a common, versioned knowledge package (Figure 2).

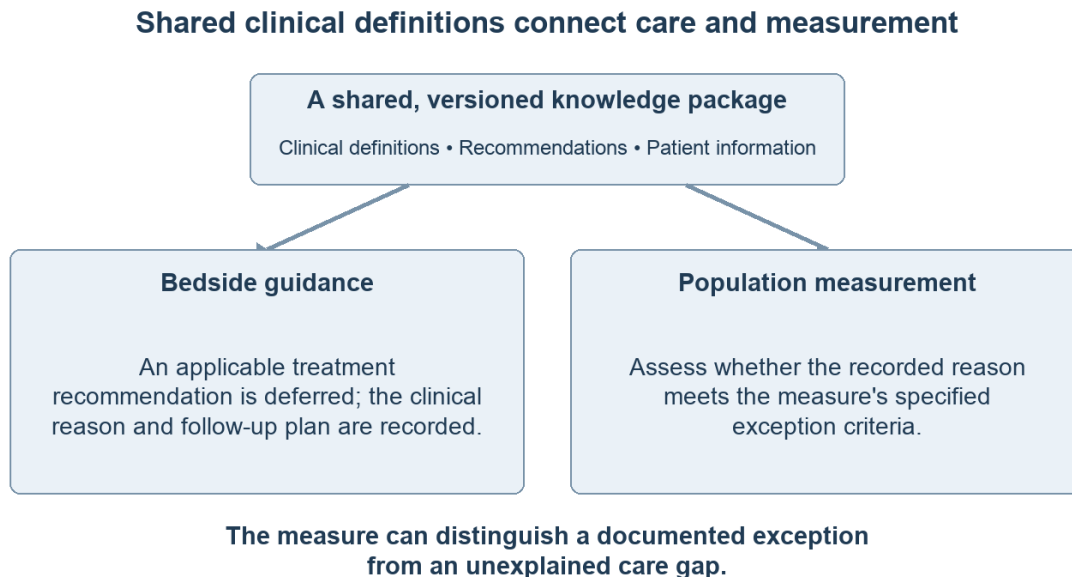


Figure 2 · Shared clinical definitions connect bedside guidance and population measurement.

That design buys three things:

- **The measure can recognize an appropriate exception.** A documented reason for deferring or withholding treatment can be evaluated against the measure's specified exclusion or exception criteria, rather than being treated as an unexplained care gap.
- **Individual goals can become measurable.** Where a measure permits individualized targets, it can use the goal agreed by the patient and clinician, with its clinical rationale, author, and period of validity recorded and goal attainment explicitly specified.
- **Guideline updates can be assessed across care and measurement.** Shared logic lets developers evaluate and validate an update across both uses, then release the revised artifacts together where appropriate.

A CKM measurement framework could connect syndrome and condition stage, clinical indicators, outcome-specific risk estimates, guideline recommendations, and observed events. That would allow the same clinical picture to support patient care and measurement across a population: who needs further evaluation, whether recommended care was delivered, and how health changes over time. Risk estimates would retain their own outcomes and time horizons, rather than being collapsed into a single

CKM score. This provides a basis for developing and testing richer measures, with patient goals, missing information, and clinical exceptions made explicit.

Five more shifts follow from shared computable clinical definitions.

Shift	Today	What becomes possible
Gaps in care become visible	Unmeasured or unavailable findings can disappear from cohort definitions and risk estimates; absence may be mistaken for a reassuring finding.	Record the difference between not assessed, unavailable, and assessed without an abnormal finding, and report completeness alongside performance.
Results become comparable and explainable	Organizations may use different inputs, versions, or attribution rules and obtain different results.	Shared definitions and explicit inputs, versions, and attribution make differences traceable and support reproducible results.
Improvement counts, as well as level	Most examples assess a threshold, a process, or an event rather than a patient's clinical trajectory.	Track observed progression and change in estimated risk as distinct candidate metrics; validate each before using it for accountability or payment.
New evidence is separated from new performance	An updated definition can change scores even when the underlying care and data have not changed.	Re-evaluate the same data under defined old and new versions to isolate the effect of the specification change.
The patient's goal can inform the target	Population thresholds often stand in for individualized goals.	For measures designed to allow individualization, use explicitly documented goals and specified exceptions, with rules that preserve interpretability across patients and organizations.

Making missing information visible also matters for equity. Sparse testing and incomplete records can hide disease burden or distort comparisons. Measurement should report those gaps and examine how they differ across populations; assessing the risk equation alone will not reveal every problem introduced by the underlying data.

The opportunity for AI

Writing precise, computable clinical logic has been slow, specialized work, and it is now the bottleneck between the standards and better measures. AI changes the economics when it is used in the right place. The pattern that works is AI at design time, determinism at run time, and experts in the loop. In short: AI proposes, standards adjudicate, experts decide [13].

AI can help experts draft and refine computable content, allowing more attention to clinical meaning, evidence, and difficult cases. Corrections can improve subsequent authoring when they are retained and tested.

What runs against a patient's record or computes an accountability score in this approach is reviewed, validated FHIR and CQL content executed by deterministic software. It is never the model. That supports reproducibility and audit; clinical validity depends on the evidence, specifications, data, and testing. Early authoring experience is encouraging. The practical aim is richer measures that carry goals, risk, and reasons and can be maintained as guidance changes.

Implications for accountability measures

Building a measure for a CMS payment program is slow and expensive. A measure is developed and tested, typically reviewed for scientific soundness by CMS's consensus-based entity, Battelle, through its Partnership for Quality Measurement, considered in pre-rulemaking, and adopted through applicable program rulemaking [14, 15]. That takes years, and it is one reason important gaps, including patient-reported outcomes and subspecialty care, stay open.

The review process asks essential questions: Is the measure scientifically sound? Is its evidence sufficient? Is it reliable, valid, and feasible in its intended setting? Have the right people weighed in? A computable package makes the logic, evidence links, and tests easier to inspect and reproduce. It can reduce repeated interpretation of specifications, but it does not answer those scientific and policy questions by design. Review can use that transparency to focus expert attention and target empirical testing more effectively (Figure 3).

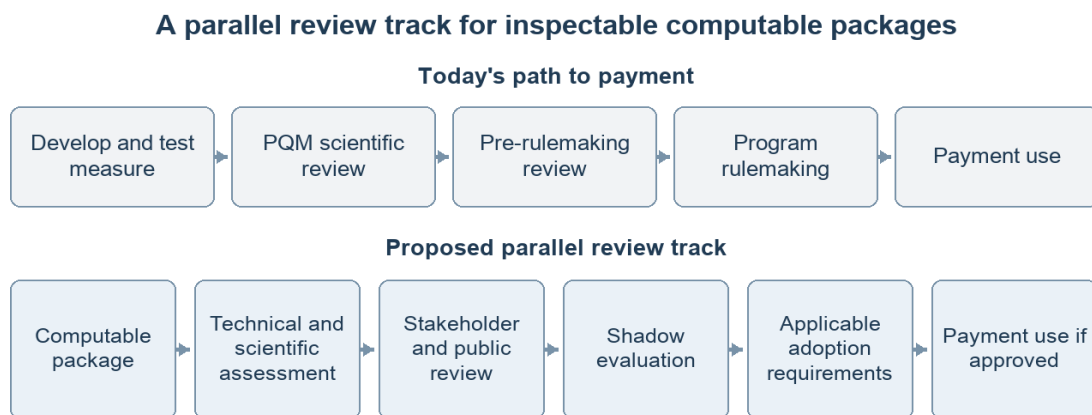


Figure 3 · Today's path from measure development to payment and a proposed parallel review track using computable packages.

As a next step, CMS should pilot a parallel review track that makes structured use of computable evidence, logic, and test packages. It should retain scientific assessment, stakeholder and public input, and applicable program-adoption requirements while evaluating whether technical verification can reduce duplicate work. Candidate measures should first be tested in shadow use, without payment consequences, to assess reliability, validity, feasibility, and unintended effects.

What it will take

Better software alone will not get us to 2030. Four things have to move with the standards.

- **Policy that sets direction.** The dQM transition is the moment to signal that new measures should be built digitally native and tied to the guidelines they score, and that national data standards should carry what outcome measures need: uACR results, patient goals, reasons for exceptions, and patient-reported outcomes.
- **Payment is beginning to reward improvement more directly.** CMS's ACCESS model began in July 2026 and links payment to condition-specific improvement or control targets, including biomarkers in its early-CKM and CKM tracks [16]. Its participants are responsible for managing the qualifying conditions within a track, demonstrating movement toward integrated accountability. These targets remain distinct from a comprehensive CKM measure of major events or validated change in modeled risk.
- **Resources for smaller organizations,** which have the least capacity to build data pipelines and the most to gain from shared, ready-to-run content.
- **Engagement from the start,** with clinicians, patients, payers, and the specialty societies that write guidelines involved in design, before measures are finalized.

Each part of the field has a role in this shift, and each can start now.

Who	Their role	Where to start
CMS and other purchasers	Decide which outcomes to pay for, by population and condition, and clear a faster path for measures that carry them	Outcome and change-in-risk targets for one condition, and a pilot of a parallel review track.
Measure stewards	Turn the outcomes purchasers want into computable, versioned measures	One outcome that matters, and an honest look at what it would take to measure it digitally native.
Health plans and provider organizations	Deliver those outcomes across every party that shares the patient, and prove it	One shadow measure, captured at the point of care, before it is scored or paid on.
Guideline developers	Own the clinical intent every measure depends on	Priority recommendations published in computable, versioned form.

None of these first steps is simple to take alone. Each needs clinical, informatics, measurement, and policy expertise working together, and the authors welcome conversations with organizations ready to start.

Key takeaways

1. **Digital quality is a redesign opportunity.** The field has digitized what it already measured. The bigger opportunity is new kinds of measures: outcomes across conditions, change in risk, and individualized goals.
2. **Published standards provide a foundation.** Richer measures still need computable clinical content, dependable data, and validated implementation.
3. Shared versioned clinical knowledge can align bedside guidance and measurement, with explicit goals, exceptions, and controlled updates.
4. **AI can accelerate expert-led authoring.** Experts decide the clinical meaning, standards and tests assess the resulting artifacts, and deterministic logic supports reproducible execution.
5. **Computable packages can make accountability review more transparent and efficient while retaining scientific assessment.** Progress also requires policy, payment, resources, and engagement.

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