JACC: CASE REPORTS
PUBLISHED BY ELSEVIER ON BEHALF OF THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION.

VOL. 30, NO. 36, 2025

OUTCOMES AND QUALITY

QUALITY IMPROVEMENT PROJECTS

Improving Abstraction Quality Through Registry Metric Deconstruction

Jessica Norman, MSN, RN, Betsy Castillo, RN

ABSTRACT

BACKGROUND Despite regular and complete data submission to the CathPCI Registry, a participating hospital continued to struggle to improve metric 4462 ("Elective PCI with Stress Imaging"), indicating that data capture alone was not translating into measurable quality improvement.

CASE SUMMARY This discrepancy suggested a gap between data collection and meaningful metric analysis, prompting a structured review of data abstraction and documentation processes.

DISCUSSION We deconstructed metric 4462 using raw data, a custom spreadsheet, and logic-based filtering to identify abstraction errors and missed documentation. Of 66 elective percutaneous coronary intervention cases performed in 2024, 22 were initially flagged as metric fallouts. After review, only 7 cases were confirmed to be true fallouts, demonstrating a 68% reduction. This led to specific educational interventions and adjustments to data abstraction protocols.

TAKE-HOME MESSAGES Structured metric analysis reveals actionable abstraction errors, improves clinical documentation, and enhances data integrity. Integrating artificial intelligence–assisted tools in the future could further optimize and scale this quality improvement approach. (JACC Case Rep. 2025;30:105851) Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

The National Cardiovascular Data Registry (NCDR) CathPCI Registry is a national program that collects and analyzes data on patients undergoing diagnostic cardiac catheterization and percutaneous coronary intervention (PCI). It aims to improve the quality of care for patients by providing data feedback, benchmarking performance, and ultimately enhancing the care provided to this specific patient population.[1]

Carta Healthcare is a third-party vendor that provides data abstraction services to contracted hospitals

TAKE-HOME MESSAGES

- Structured metric analysis can identify hidden data abstraction and documentation errors, improving both clinical alignment and operational outcomes.
- Integrating manual review processes with AI-assisted tools will enhance data integrity, support clinical decision-making, and scale quality improvement efforts across health care systems.

From Carta Healthcare, San Mateo, California, USA.
The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

Manuscript received July 25, 2025; revised manuscript received August 22, 2025, accepted August 26, 2025.

ISSN 2666-0849 https://doi.org/10.1016/j.jaccas.2025.105851

ABBREVIATIONS AND ACRONYMS

FFR = fractional flow reserve

FFR-CT = fractional flow reserve derived from computed tomography

iFR = instantaneous wave-free ratio

NCDR = National Cardiovascular Data Registry

PCI = percutaneous coronary intervention

and hospital systems. In addition to abstracting case data, Carta Healthcare assists sites by providing data analysis and insight into improving their performance with regard to the quality metrics outlined in the NCDR.

The NCDR CathPCI Registry reports on a wide range of performance and quality metrics that include a mix of process measures, outcome measures, and safety metrics. Examples include door-to-balloon time for patients with ST-segment elevation myocardial infarction, use of guideline-directed medical therapy at discharge, risk-adjusted in-hospital mortality, bleeding complications, acute kidney injury, and appropriateness of PCI for stable ischemic heart disease. These metrics combined provide hospitals with a comprehensive look at the safety and quality of their PCI programs.

The NCDR CathPCI Registry quality metric 4462, "Elective PCI with Stress Imaging," evaluates whether elective PCIs are supported by documented evidence of ischemia or other qualifying diagnostic findings. A disconnect between data submission and metric performance at a single institution prompted our team at Carta Healthcare to explore how deconstructing this metric to better understand its components could uncover opportunities for data abstraction improvement and clinical alignment.

CASE SUMMARY PROMPTING THE PROJECT LAUNCH

One hospital site that partners with Carta Healthcare for data abstraction services reported persistent underperformance on quality metric 4462 despite consistent and timely data submission. It is important to note that this hospital site was not flagged as an outlier on any other CathPCI quality measure, suggesting that the gap was specifically related to documentation and abstraction around elective PCI indications rather than broader issues with clinical care quality or registry reporting.

Our project was to investigate whether abstraction inaccuracies or missed documentation elements could contribute to the low compliance rate, and whether a structured data review could lead to meaningful improvements.

PROJECT RATIONALE

Metric 4462 is complex, involving specific inclusion criteria, exclusion parameters, and multiple diagnostic data points (eg, stress test timing, imaging modality, fractional flow reserve [FFR]/instantaneous wave-free ratio [iFR] values). It became apparent that poor performance on this metric was not necessarily reflective of clinical practice but might stem from how the cases were documented and how the data were abstracted.

This prompted our team to approach the problem from the ground up: by understanding the metric's components, evaluating each data point, and assessing how abstraction practices aligned with registry definitions.

PROJECT DESCRIPTION

DATA EXTRACTION AND INITIAL REVIEW. A CathPCI data extract report was generated for the 2024 calendar year, then filtered to include only elective PCI procedures, resulting in a dataset of 66 cases eligible for metric 4462 analysis.

METRIC DECONSTRUCTION FRAMEWORK. A custom spreadsheet (Microsoft Excel) was developed that incorporated the following fields:

- Numerator criteria: positive stress imaging within 182 days, documented FFR/iFR or FFR derived from computed tomography (FFR-CT) values
- Denominator criteria: elective PCI status
- Exclusion criteria: staged procedures, appropriate clinical documentation (eg, severe aortic stenosis, new-onset angina)

The spreadsheet used formulas to calculate the days between stress tests and PCI, and conditional formatting highlighted data points to facilitate review (**Figure 1**).

PROJECT DELIVERABLES.

- A metric-aligned abstraction tool (in Microsoft Excel) for consistent data review
- Identification of documentation and abstraction gaps
- Reclassification of incorrect metric fallouts
- Abstraction education plan
- A framework for potential artificial intelligence (AI) integration

FIGURE 1 Example From Excel File Used for Data Breakdown

			Criteria				Exclusions								
Metric Fallout - Requires Review	Procedure Date	PCI Status	Days between Stress Test + PCI	Results	FFR (<=0.8)	iFR (<=0.89)	Severe Aortic Stenosis	Staged PCI	New Onset Angina	Urgent/ Emergent/ Salvage PCI	STEMI	NSTE-ACS	Post-Cardiac Transplant	Pre-op Eval AND Solid Organ Transplant	Stable Known CAD AND Stable Angina AND Brachytherapy
Review	J	Elective	N/A							Urgent			No	No	No
	J	Elective	N/A		0.86		Yes						No	No	No
Review	J	Elective	820	Positive						Urgent			No	No	No
	J	Elective	11	Positive									No	No	No
	J	Elective	13	Positive	0.93	0.91							No	No	No
	J	Elective	14	Positive									No	No	No
	J	Elective	6	Positive									No	No	No
	F	Elective	N/A						Yes				No	No	No
	F	Elective	21	Positive	0.8				Yes				No	No	No
	F	Elective	16	Positive	0.72	0.91			Yes				No	No	No
	F	Elective	31	Positive									No	No	No
	F	Elective	N/A				Yes						No	No	No
	F	Elective	226	Positive					Yes				No	No	No
	F	Elective	6	Positive	0								No	No	No
	F	Elective	41	Positive									No	No	No
Review	M	Elective	N/A										No	No	No

PROJECT OUTCOME, IMPACT, AND FUTURE DIRECTIONS

OUTCOME. Of the 66 cases reviewed:

- 22 cases (33%) were initially flagged as metric 4462 fallouts.
- 15 of these cases were corrected after structured review, leaving 7 confirmed fallouts, representing a 68% reduction.

The majority of the errors were traced to data abstraction practices, such as misclassification of test results, missing entries, or misinterpretation of registry definitions. However, clinician documentation in the catheterization laboratory also contributed to fallout cases, particularly when stress test results, symptom classification, or procedural intent were ambiguously recorded. This finding demonstrates that both documentation quality and abstraction accuracy are critical for reliable registry reporting.

Common issues identified among the 15 reclassified cases:

- 1 stress test misclassified as negative instead of positive
- 3 incorrect diastolic hyperemia-free ratio (DFR) entries
- 2 cases missing stress test documentation
- 3 missed FFR-CT values on coronary computed tomography angiography
- 2 staged PCI procedures incorrectly coded
- 2 misclassified symptoms (worsening vs new-onset angina)
- 2 elective PCIs misclassified as urgent.

Findings among the 7 true metric fallouts:

- 4 involved valid positive stress tests performed outside the 182-day window
- 2 interpreted as staged PCIs by providers but exceeded the 90-day threshold
- 1 with indeterminate stress test results (Figure 2).

IMPACT. These findings enabled the team to make immediate corrections to the data and provide focused education to the data abstraction staff. The insights also gave clinical teams a better understanding of how documentation affects metric performance. As a result, data quality and site performance improved. The team also created a review process that can be used for other metrics moving forward, making it easier to catch issues early and support ongoing improvement.

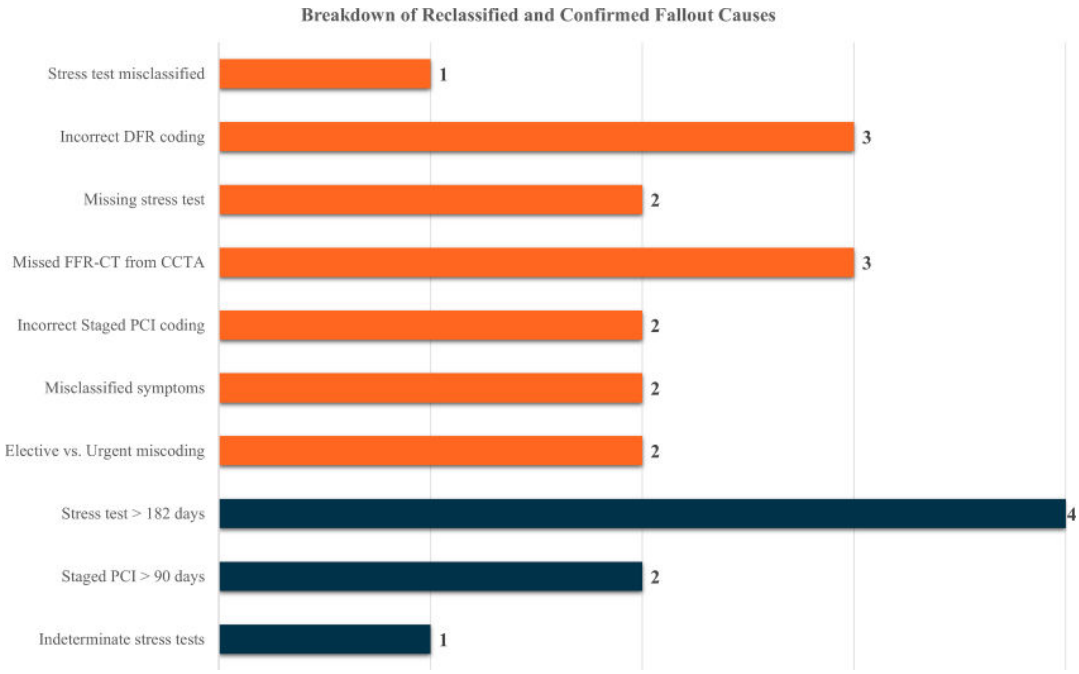
DISCUSSION

The structured review of metric 4462 uncovered issues beyond what surface-level dashboards could detect. Documentation gaps, abstraction inconsistencies, and misinterpretations of metric definitions all contributed to inflated fallout rates.

This project revealed that effective metric analysis requires more than just dashboard monitoring, it involves active engagement with source data, metric definitions, and interdisciplinary collaboration between data abstractors and clinicians.

This approach can be used in many other settings as well. Although reviewing data manually takes time and effort, the spreadsheet we created (Figure 1) provides a solid starting point for future tools that

FIGURE 2 Graph Reflecting Data Analysis Results



CCTA = coronary computed tomography angiography; DFR = diastolic hyperemia-free ratio; FFR-CT = fractional flow reserve derived from computed tomography; PCI = percutaneous coronary intervention.

can help automate the process. By building clear logic into the spreadsheet, we have made it possible for future AI tools to help fill in data, spot issues, and create reports that teams can use to review their work more easily. Most importantly, AI technologies are designed to improve over time by learning from new data, making them well suited to support scalable and adaptive quality improvement efforts.[2]

CONCLUSIONS

This project demonstrates that manually deconstructing registry metrics into actionable data points improves data accuracy and abstraction reliability, reduces unnecessary metric fallouts, and, with the use of AI tools, can create a scalable solution for raw data review.

Providing abstraction teams with structured review tools and targeted education led to improved metric adherence while also strengthening clinical documentation and internal operational workflows.

FUNDING SUPPORT AND AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

ADDRESS FOR CORRESPONDENCE: Jessica Norman, Carta Healthcare, 28 E 3rd Avenue #300, San Mateo, California 94401, USA. E-mail: jessica@carta.healthcare.

REFERENCES

1. Malenka DJ, Bhatt DL, Bradley SM, et al. The National Cardiovascular Data Registry Data Quality Program 2020: *JACC* state-of-the-art review. *J Am Coll Cardiol*. 2022;79:1704–1712.

2. Acs B, Rantalainen M, Hartman J. Artificial intelligence as the next step towards precision pathology. *J Intern Med*. 2020;288:62-81. https://doi.org/10.1111/joim.13030

KEY WORDS nuclear medicine, percutaneous coronary intervention, stenosis, stents