egnite

Heart Failure & Structural Heart

Benchmark Report

2026

Introduction

In 2023, egnite released its first public benchmarking data examining trends in structural heart disease and heart failure. This 2026 update draws on a dataset that has grown to more than 15 million patients—including 6.6 million echocardiogram reports, 1.4 million with heart failure, and 750,000 with structural heart disease — and is used every day by clinicians and hospital leaders, including my own team, to manage patients across clinical practice and clinical trials.

The progress in HFrEF has been particularly encouraging. Four-class GDMT has more than doubled, from 9% to 21%, while use of three or more classes has increased from 31% to 46%, driven largely by the rapid adoption of SGLT2 inhibitors.

But progress has not been uniform. Despite the introduction of two FDA-approved therapies for tricuspid regurgitation, treatment of symptomatic severe TR has increased only marginally—from 6% to 7% over three years.

These data highlight both how quickly clinical practice can evolve and where significant gaps remain. We hope they provide useful context for clinicians, health systems, and industry as we work to improve the identification and treatment of patients with cardiovascular disease.

We've always focused heart team resources on severe valve disease, but as you will see in this report, there are significantly more untreated moderate patients than previously reported — 4:1 for aortic stenosis and as high as 12:1 for tricuspid regurgitation. Heart teams today are not ready to provide care for this volume of patients.

I believe more clinicians and hospital administrators need to lean into Artificial Intelligence (AI)-powered technology, such as egnite's CardioCare platform, to manage their valve disease patients more wholistically. Morristown uses CardioCare and the egnite deidentified dataset to do just that — both in the clinical setting as well as in publications featured in JACC, presented at TCT and other conferences.

I invite you to explore the findings in egnite's latest Benchmark report and consider how your practice will address the needs of cardiovascular patients and lean into AI innovations to improve care and cross-physician collaboration.



Dr. Rahul Sharma, MBBS, FRACP

Director of Structural Interventions and Associate Director of the Cardiac Catheterization Laboratory at Stanford Health Care; Senior Medical Advisor, egnite



Dr. Philippe Généreux

Director, Structural Heart Disease Program at Morristown Medical Center; Medical Advisory Board, egnite

See bibliography for publications
2023 vs. 2026 figures reflect 24 vs. 47 health systems; directional trends

egnite Registry

Research-Grade Real-World Cardiovascular Data

A de-identified, longitudinal registry drawn from data used daily in patient care — built for clinical research, real-world evidence, and program benchmarking.



15.7M+
Patients



47
Health Systems



830
Facilities



6.6M
Echocardiogram Reports

What's in the Registry

Diagnoses
ICD-10

Echo & Reports
Structured + NLP-extracted

Procedures
CPT · ICD-10-PCS

Encounters
Longitudinal visit history

Medications
RxNorm coded

Orders
Labs · Imaging · Referrals + More

Lab Results
SNOMED coded

Provider & System
Specialty · Geography · Site

egnite Data

Population Used in the 2026 Benchmarking Analysis

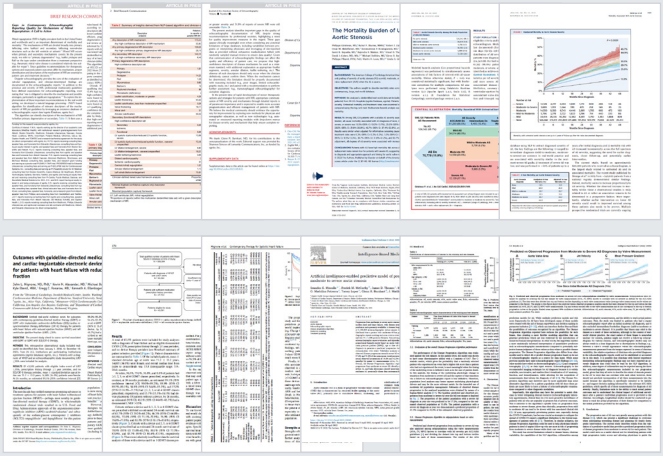
656K
Systolic HF Patients

952K
Diastolic HF Patients

183K
Aortic Stenosis Patients Moderate+

265K
Mitral Regurgitation Patients Moderate+

303K
Tricuspid Regurgitation Patients Moderate+



20 Publications
Visit **egnitehealth.com** to learn more

Data from teaching and non-teaching heart programs in the United States who have given appropriate data permissions

Moderate+ includes moderate, moderate-to-severe, and severe; patients with more than one valvular condition are counted in each Systolic HF ICD-10 diagnosis, or HF/HFpEF diagnosis with any LVEF EF ≤40%

Increased Therapy Adoption in HFrEF, Tricuspid Procedures Lag

HFrEF Medical Therapy Transformed



2.3x
Growth in 4-Class GDMT

4-class GDMT rose from 9% to 21%, 3+ class prescribing from 31% to 46%, and specialist evaluation of systolic HF patients with 2+ hospital admissions rose from 12% to 20%.

SHD Procedural Gaps Persist



7%
Growth in ssTR Treatment Rates

Treatment of symptomatic severe TR moved from 6% to 7% of eligible patients — despite new FDA-approved therapies in 2024. The evaluation bottleneck has not moved.

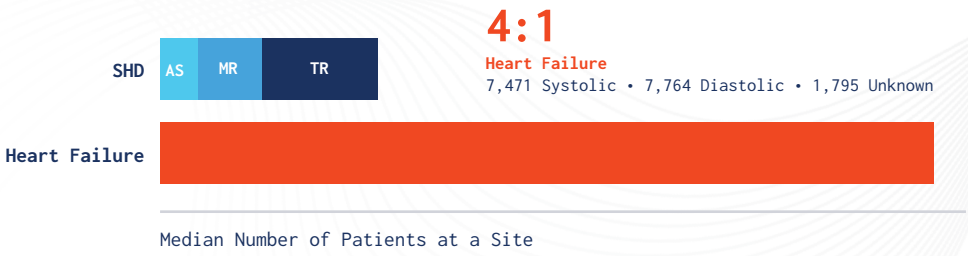
2023 figures reflect 24 health systems; 2026 reflects 47. Comparisons are directional trends in the national benchmark, not a matched same-site panel.

Treatment = surgical or transcatheter intervention at 12 months (Kaplan-Meier). Evaluation = documented encounter with a member of the site-reported Heart Team (for SHD) or Heart Failure Specialist (for HF).

Trends in Systolic HF Patient Care

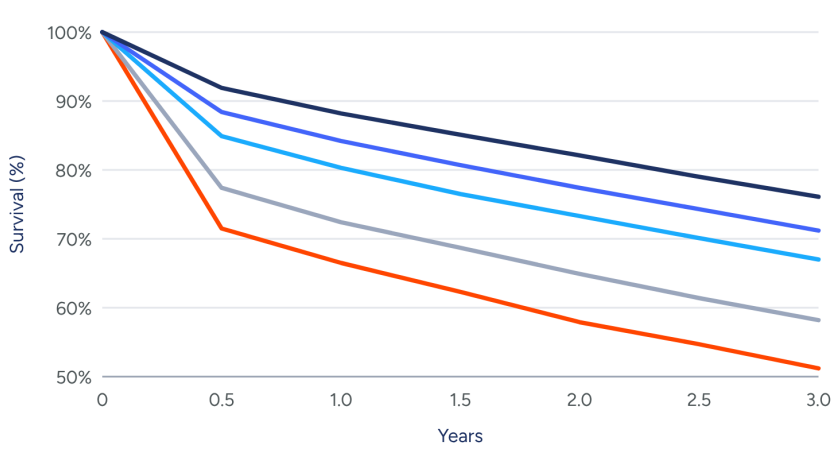
Heart Failure Is the Largest Cardiovascular Population

4 HF Patients for Every Moderate+ SHD Patient



Survival Association With Every GDMT Class Prescribed

46% Increase in 3 Year Survival For Patients Prescribed 4 vs 0 GDMT Medication Classes



3 Year Survival	
4 GDMT	**76%**
3 GDMT	**71%**
2 GDMT	**67%**
1 GDMT	**58%**
0 GDMT	**52%**

SHD counts are moderate-or-greater

Systolic HF ICD-10 diagnosis, or HF diagnosis with EF ≤40%

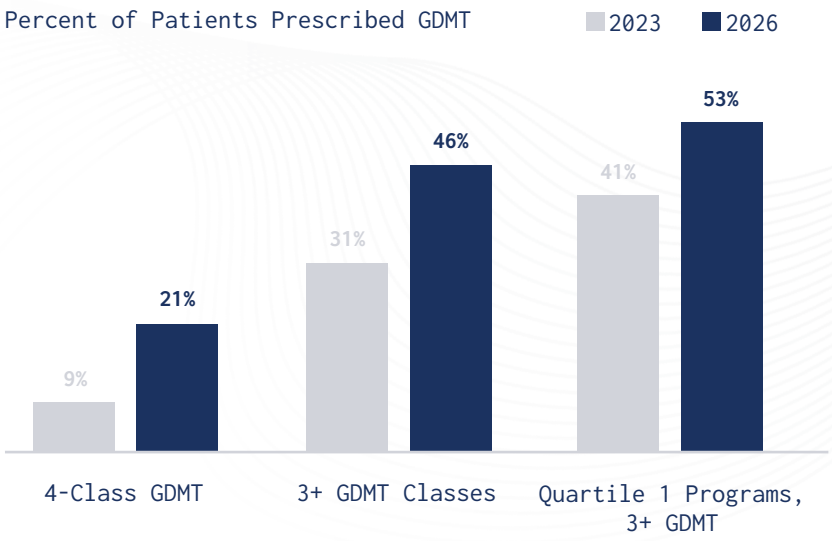
Diastolic HF ICD-10 diagnosis with lowest LVEF > 40%/no LVEF, or HF diagnosis with any LVEF ≥ 50%

Unknown documented diagnosis of HF and no known LVEF or lowest LVEF >40 & <50

Median number of active patients at each site; active defined as: alive, not palliative, not lost to follow-up, not treated

Time varying (Simon-Makuch) survival model indexed at each patient's first HF-related admission on/before first recorded low EF (<40)

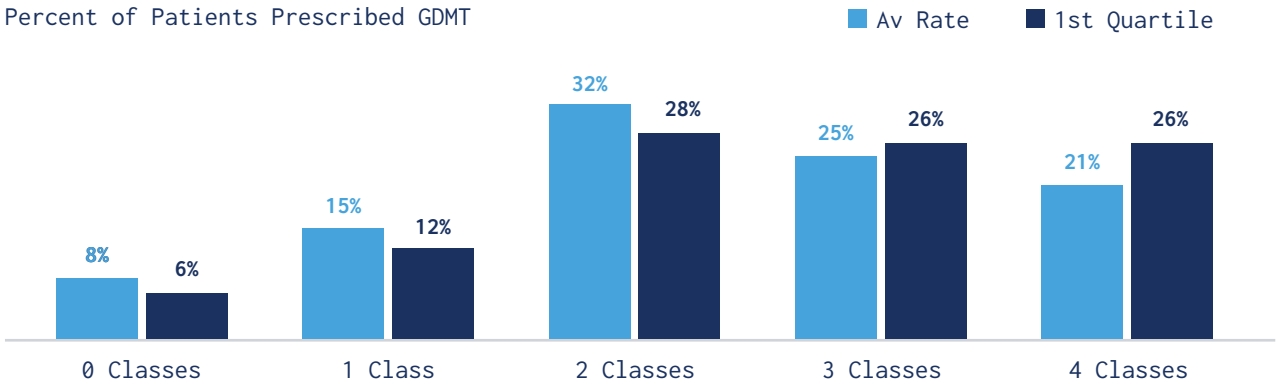
4 Class GDMT for HFrEF Grew 2x Since 2023



+12 points
in 4-class GDMT prescribing

Growth spans average programs and top-quartile alike, consistent with SGLT2i adoption and protocolized in-patient prescribing. Yet even now, **fewer than half of systolic HF patients receive 3+ guideline classes.**

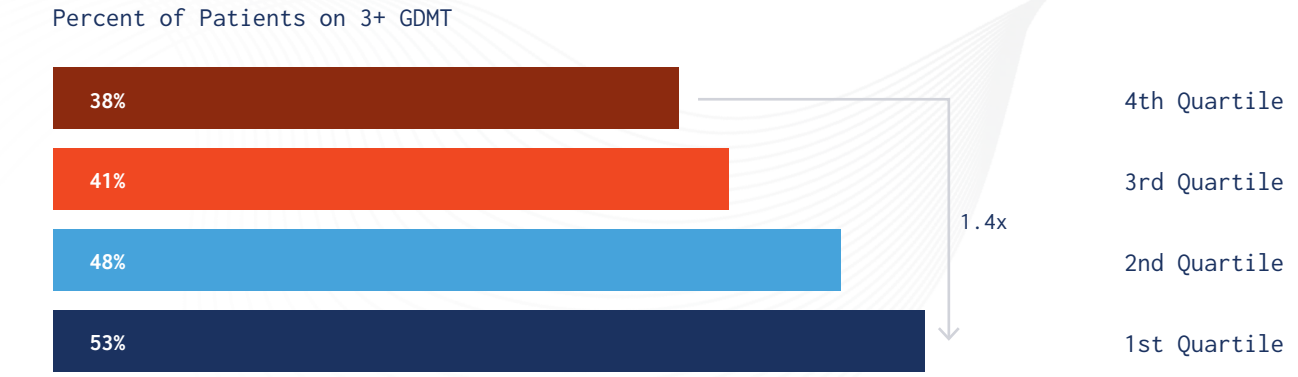
Despite Survival Benefits, Only 21% of Systolic HF Patients are Prescribed 4-Class GDMT



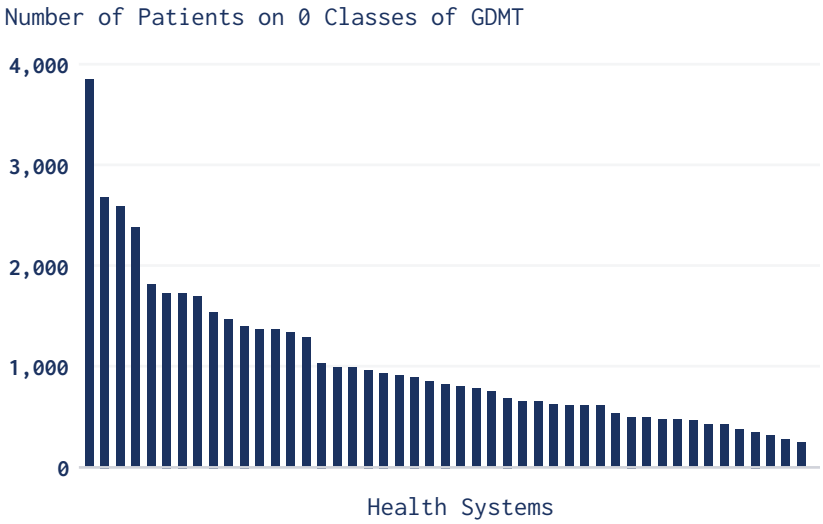
2023 figures reflect 24 health systems; 2026 reflects 47. Comparisons are directional trends in the national benchmark, not a matched same-site panel

ACEi/ARB/ARNi, beta blocker, MRA, SGLT2i, per the 2022 AHA/ACC/HFSA guideline
Does not account for documented contraindications or intolerance

Top-Performing Sites Prescribe 3+ GDMT at 1.4× the Rate of Bottom-Quartile Sites



Hospitals Have Large Cohorts of Systolic HF Patients Prescribed Zero GDMT



On Average, Health Systems have **1,052** patients prescribed 0 classes of GDMT

ACEi/ARB/ARNi, beta blocker, MRA, SGLT2i, per the 2022 AHA/ACC/HFSA guideline

Institutions ranked by 3+ GDMT prescribing rate and divided into quartiles

Average number of active patients at each site; active defined as: alive, not palliative, not lost to follow-up, LVEF ≤ 40

Only 1 in 5 High Risk HFrEF Patients with Repeat Admissions See a HF Specialist

Systolic HF Patients

656.9K
Total Patients



164.7K
2+ Hospital Admissions



20%
2+ Hospital Admissions and Evaluated by HF Specialist

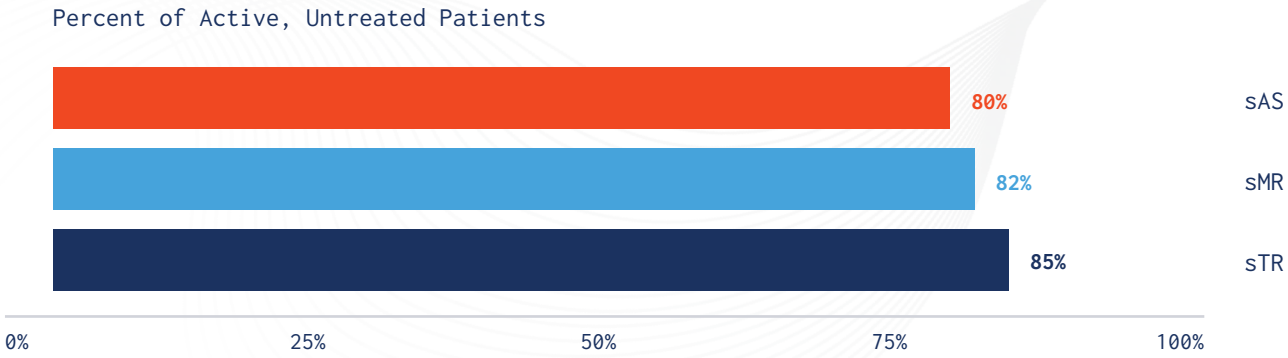


2+ hospital admissions within one year; HF specialist per site-reported designation

Trends in SHD

New Therapies, Slow Start

Majority of Active, Untreated Structural Heart Disease Patients are Symptomatic



Structural Heart Disease Diagnosis Trends

Who is Affected

Aortic Stenosis – more common in men



Tricuspid Regurgitation – more common in women



When Severe SHD is Found

Severe AS	Severe MR
78 Men	**75** Men
81 Women years at diagnosis	**79** Women years at diagnosis
Men are diagnosed with Aortic Stenosis at a younger age	Men are diagnosed with Mitral Regurgitation at a younger age

Diagnostic Statistics

Black patients are tested more – and diagnosed with severe disease less.

20% more likely to receive an echo when presenting with VHD symptoms, compared with white patients

70% less likely to be diagnosed with severe aortic stenosis relative to white patients

Symptoms defined as: A patient must have 2+ relevant symptoms documented in the EMR in the 12 months prior to a diagnosis or any time after to be symptomatic

Active defined as: alive, not palliative, not lost to follow-up

sAS: Severe Aortic Stenosis; sMR: Severe Mitral Regurgitation; sTR: Severe Tricuspid Regurgitation

Observational associations from EMR and echocardiographic data; not adjusted for age, sex, comorbidity, insurance status, or site

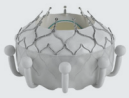
The Tricuspid Market

Two FDA Approvals, Yet ssTR Treatment Growth is Slow

Aug 2023 — Feb 2024 — Apr 2024 — July 2026

6%
Treatment Rate for ssTR

egnite Benchmark Report 2023



EVOQUE: First FDA-approved transcatheter replacement



TriClip Approved: transcatheter repair (TEER)

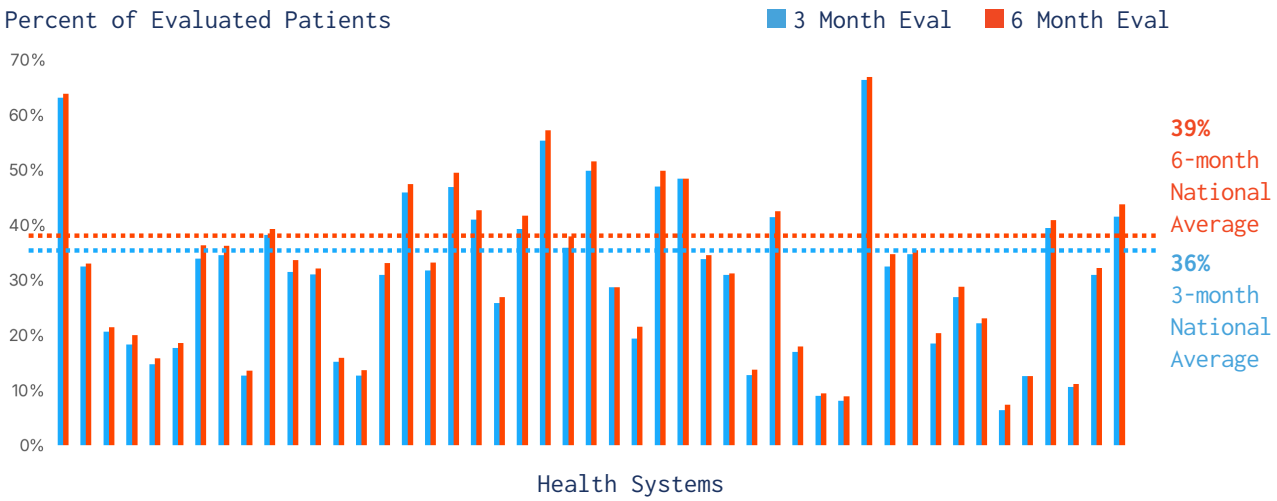
7%
Treatment Rate for ssTR

egnite Benchmark Report 2023

+1 percentage point in 3 years, despite two FDA approvals

Severe Symptomatic Tricuspid Regurgitation

<40% of Indicated Patients Are Seen by The Heart Team



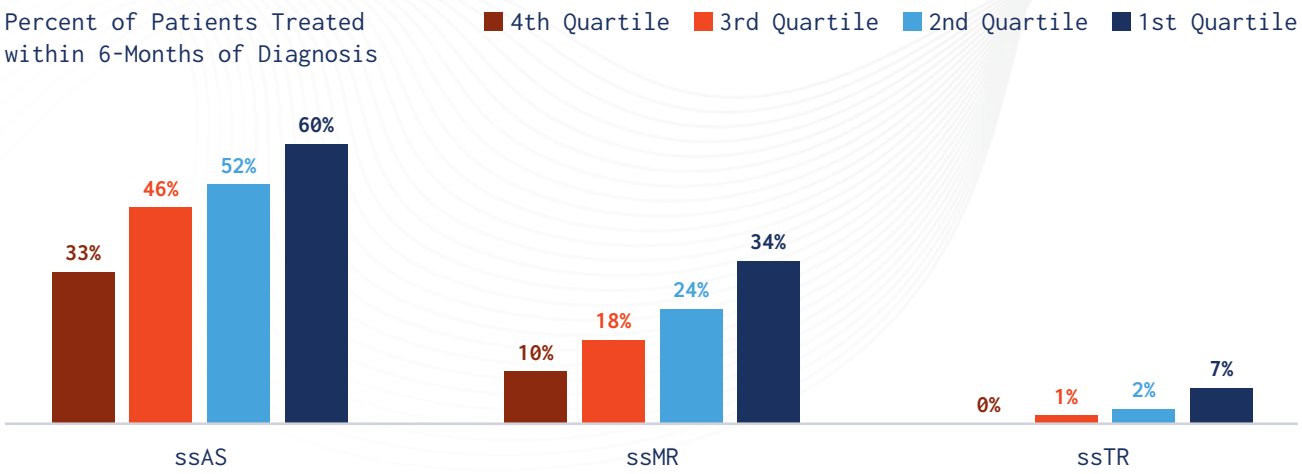
2023 figures reflect 24 health systems; 2026 reflects 47. Comparisons are directional trends in the national benchmark, not a matched same-site panel. Data Jan 2020 – July 2026

Treatment = surgical or transcatheter intervention at 12 months (Kaplan-Meier)

Evaluation = documented encounter with a member of the site-reported Heart Team
Indicated per AHA/ACC Guidelines

Wide Variability in SHD Treatment

Even Top-Quartile Programs Treat Only 7% of ssTR Patients



Institutions ranked by 6-month Class I treatment rate and divided into quartiles; Quartile 1 = highest

Diagnosis: Documented on echo report and/or EHR

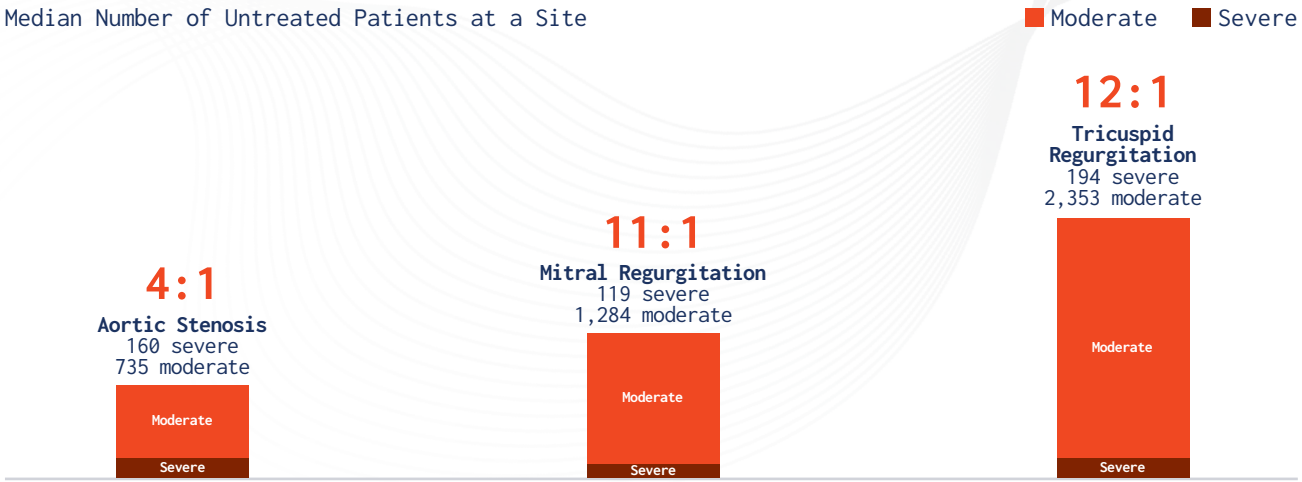
Treatment = surgical or transcatheter intervention (Kaplan-Meier)

Beyond Severe

The Moderate Patient Pipeline

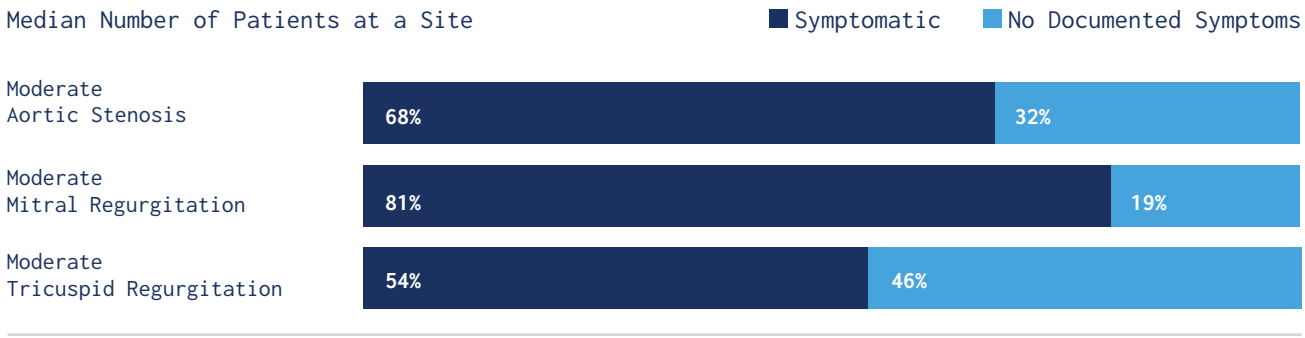
The Severe SHD Patients Are Only the Beginning

For every 1 untreated severe patient there are 5-12 untreated moderate patients



Moderate Patients Likely Symptomatic

Over half of all Moderate SHD patients are experiencing symptoms



Rosenhek R, et al. Eur Heart J. 2004;25(3):199-205; Delesalle G, et al. J Am Heart Assoc. 2019;8(6):e011036

Median number of active patients at each site; active defined as: alive, not palliative, not lost to follow-up

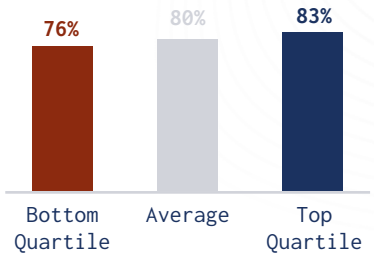
Symptoms defined as: A patient must have 2+ relevant symptoms documented in the EMR in the 12 months prior to a diagnosis or any time after to be symptomatic and/or EF <50 for Aortic Stenosis

Median number of active patients at each site; active defined as: alive, not palliative, not lost to follow-up

The Average Health System Has Hundreds of Moderate Patients Overdue for Echo Putting Earlier Disease Detection and Revenue at Risk

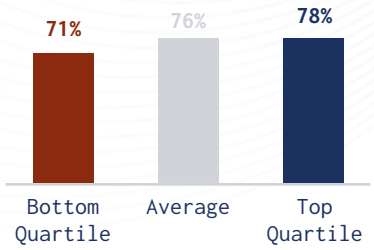
Moderate Aortic Stenosis

57 Median number of patients 2+ years since last echo



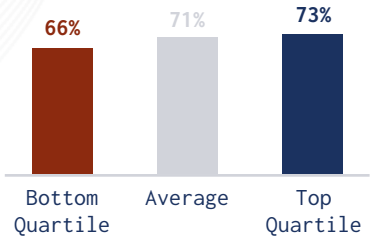
Moderate Mitral Regurgitation

161 Median number of patients 2+ years since last echo



Moderate Mitral Regurgitation

207 Median number of patients 2+ years since last echo



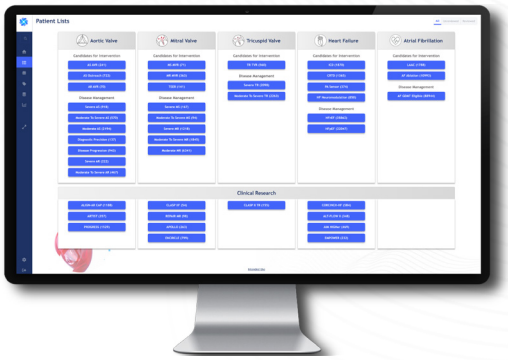
2+ years defined as: greater than 2 years since initial echo & diagnosis of Moderate SHD, per AHA/ACC surveillance guidelines (AS & MR)

Median number of active patients at each site; active defined as: alive, not palliative, not lost to follow-up
Kaplan-Meier survival curve

Cardiovascular Service Line Impact

egnite Health

A technology company advancing guideline-directed cardiovascular care and real-world evidence

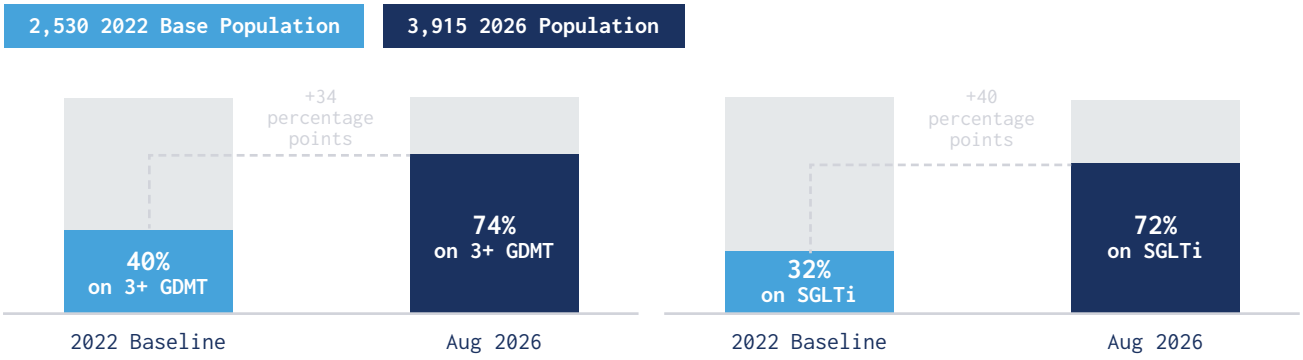


CardioCare is the leading digital health platform **used by hospitals to identify and treat** cardiovascular patients.

It helps hospitals **find & treat up to 25% more** cardiovascular patients across Structural Heart, Heart Failure, Atrial Fibrillation & Clinical Trials.

3+ GDMT Up 34 Points in Four Years, Outpacing the 46% National Average

Jackson Heart Case Study: Site Leveraging CardioCare to Identify & Manage Systolic Heart Failure Patients





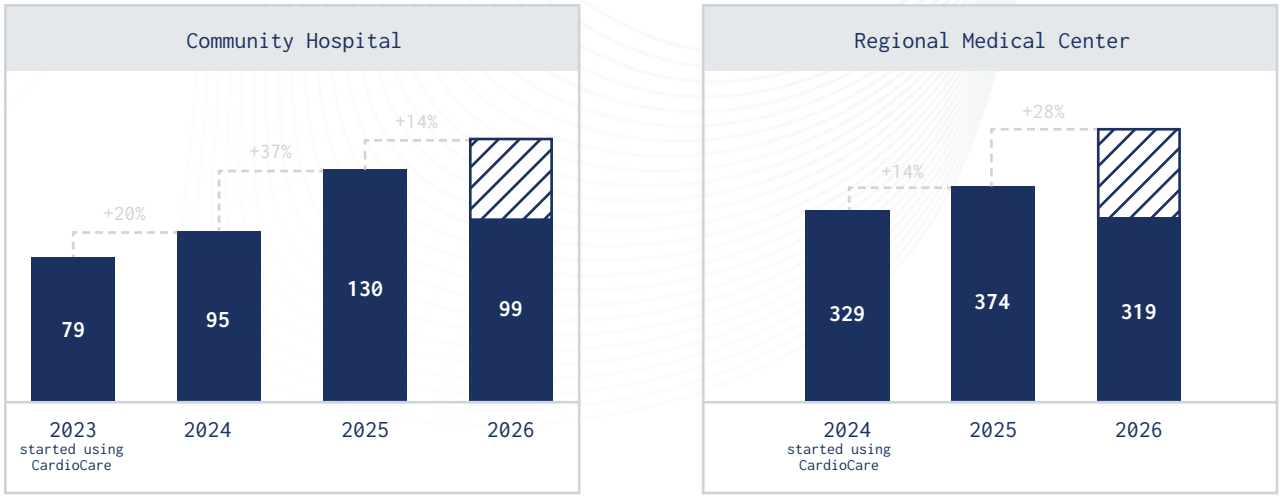
"We've been using CardioCare for 10+ years to improve our care quality, reduce care variation, and ensure our patients are monitored and referred at the right time in their disease. I'm proud to say we provide some of the best heart failure care in Mississippi by using CardioCare data."

Clay Hays, MD
President of the Jackson Heart Cardiology Clinic, largest cardiology practice in Mississippi; Former ACC Mississippi Chair

Data as of September 2026
National Average for Customers Subscribed to CardioCare

Case Studies: Sites Leveraging CardioCare to Identify and Manage Aortic Stenosis Patients

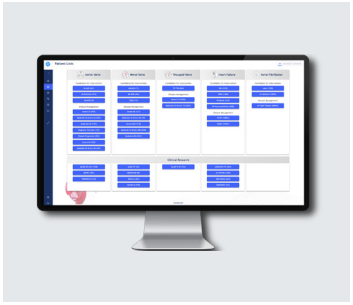
Sustained Year-Over-Year AVR Growth – National Av. Typically 8-9%



Data Sources Fueling CardioCare's Capabilities

Hospitals & Affiliated Practices (Cardiology & Primary Care)

- Electronic Medical Records (EMR)
- Echo Reports
- ECG Reports



CardioCare Digital Health Platform

- Individual CV patient details (i.e., diagnoses, symptoms, providers, etc.)
- Managing provider details (i.e., patient volumes, GDMT rates, etc.)
- System-wide metrics (i.e., echo quality, time-to, procedure mix, DRG codes, etc.)

Data as of September 2026
National Average per manufacturer reported sales figures 2024-2025

How Leading Programs Are Driving Results with CardioCare

CardioCare Webinar Series, Recently Concluded

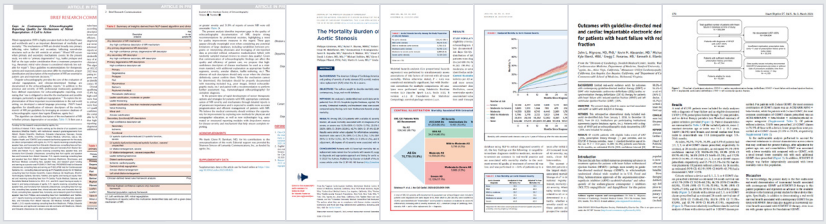


Scan Me
to register for the upcoming webinars & events

How Researchers are Driving Change Using the egnite Deidentified Dataset

Scan Me
to see how physicians and organizations have used the egnite dataset

Recent Publications



CRF TCT · JACC Journal of the American College of Cardiology · Heart Rhythm O2 · Heart Rhythm Society · Intelligence-Based Medicine · American College of Cardiology · JASE Journal of the American Society of Echocardiography

Methods

Methods

Data Source & Population: egnite Database (egnite, Inc., Aliso Viejo, CA), comprising 47 teaching and non-teaching institutions who have given appropriate data permissions. Integrated EMR and echocardiographic data for patients echoed or diagnosed January 1, 2020 – May 31, 2026, with care pathway status as of May 31, 2026. Analyses use the same data logic implemented in the CardioCare platform.

Comparison to the 2023 Report: The 2023 Benchmarking Report reflects 24 health systems; this report reflects 47. Year-over-year comparisons are directional trends in the national benchmark, not a matched same-site panel. Metric definitions are unchanged between reports.

How patients are identified

- Valvular disease and severity — extracted from echocardiography reports by egnite's proprietary NLP, validated at >99% accuracy on 8,000 randomly sampled reports (Brennan JM, et al. J Am Coll Cardiol. 2022;79(9 suppl):1723).
- MR mechanism — degenerative, functional, mixed, or unknown, classified by egnite's Patented NLP (MR NLP protected by U.S. Patent No. 12,580,057) algorithm validated at ≥97% accuracy on 300 adjudicated reports.
- Systolic heart failure ICD-10 diagnosis, or any heart failure diagnosis with lowest EF ≤40%
- Diastolic HF ICD-10 diagnosis with lowest LVEF > 40%/no LVEF, or HF diagnosis with any LVEF ≥ 50%
- Unknown documented diagnosis of HF and no known LVEF or lowest LVEF >40 & <50
- Symptomatic — 2+ relevant symptom entries from eligible ICD-10 codes within 12 months prior to, or any time after, diagnosis. Based on the 2020 ACC/AHA VHD guideline and the 2022 AHA/ACC/HFSA HF guideline with expert consensus.

Care Pathway Terms

Terms	Definition
Active	Alive, not palliative, not lost to follow-up (no documented entries within EMR > 300 days)
Diagnosed	Per NLP of echo report for VHD severity, or EHR ICD-10 for additional datasets
Evaluated	Documented encounter with a member of the site-reported Heart Team (SHD) or Heart Failure Specialist (HF)
Treated	Surgical or transcatheter intervention
Moderate+	Moderate, moderate-to-severe, or severe
Symptomatic	Symptoms defined as: A patient must have 2+ relevant symptoms documented in the EMR in the 12 months prior to a diagnosis or any time after to be symptomatic
GDMT (4 classes)	ACEi/ARB/ARNi · beta blocker · MRA · SGLT2i

Analytic Methods: Evaluation and treatment rates are Kaplan-Meier estimates at the stated interval from diagnosis. Quartile analyses rank institutions by the metric named on each slide — Class I treatment rate for valvular analyses, 3+ GDMT prescribing rate for heart failure analyses — with Quartile 1 representing highest performance. Patients with more than one cardiovascular condition appear in each applicable analysis.

Citations

External references cited in this report

- Brennan JM, et al. J Am Coll Cardiol. 2022;79(9 suppl):1723. (NLP validation)
- Rosenhek R, et al. Eur Heart J. 2004;25(3):199-205. (moderate AS progression)
- Delesalle G, et al. J Am Heart Assoc. 2019;8(6):e011036. (moderate AS outcomes)
- Mignone JL, et al. Presented at Heart Rhythm 2023. (GDMT survival and readmission benefit)
- Généreux P, et al. J Am Coll Cardiol. 2023;81(8 suppl):1989. (untreated AS mortality by severity)
- FDA PMA P230013 (EVOQUE, February 2024); FDA approval, TriClip (April 2024)

egnite's Real-World Evidence Bibliography

egnite Real-World Evidence Bibliography

Peer-Reviewed Science

1. Peterson BE, Généreux P, Shah P, et al. Mitral regurgitation and severe aortic stenosis: clinical characteristics, prognostic impact, and response to TAVR: insights from egnite data. Circ Cardiovasc Interv. Published online September 11, 2026. doi:10.1161/CIRCINTERVENTIONS.126.016578. PMID: 42723621.
2. Généreux P, Pellikka PA, Lindman BR, et al. Acute valve syndrome in aortic stenosis. Struct Heart. 2025;9(4):100377. doi:10.1016/j.shj.2024.100377. PMID: 40321310. (Published online October 2024; presented at TCT 2024.)
3. Généreux P, Amoroso NS, Thourani VH, et al. Mortality burden for patients with untreated aortic regurgitation. JACC Adv. 2024;3(10):101228. doi:10.1016/j.jacadv.2024.101228. PMID: 39296816. (ACC.24 abstract: entry 13.)
4. Amoroso NS, Sharma RP, Généreux P, Pinto DS, Dobbles M, Thourani VH, Gillam LD. Clinical journey for patients with aortic regurgitation: a retrospective observational study from a multicenter database. Catheter Cardiovasc Interv. 2024;104:145-154. doi:10.1002/ccd.31085. PMID: 38764317. (Presented at TVT 2023: The Structural Heart Summit; June 7-10, 2023; Phoenix, AZ.)
5. Mignone JL, Alexander KM, Dobbles M, Eberst K, Fonarow GC, Ellenbogen KA. Outcomes with guideline-directed medical therapy and cardiac implantable electronic device therapies for patients with heart failure with reduced ejection fraction. Heart Rhythm O2. 2024;5(3):168-173. doi:10.1016/j.hroo.2024.01.004. (Heart Rhythm 2023 abstract: entry 15.)
6. Asch FM, Sharma RP, Cubeddu RJ, et al. Response to letter to the editor: can we use an algorithm as an “Ariadne’s thread” to escape the maze of mitral regurgitation phenotype? J Am Soc Echocardiogr. 2024;37(3). doi:10.1016/j.echo.2023.10.005. PMID: 37839617.
7. Asch FM, Sharma RP, Cubeddu RJ, Généreux P, Dobbles M, Verhoef K, Kwon M, Rodriguez E, Thomas JD, Gillam LD. Gaps in contemporary echocardiographic reporting quality for mechanisms of mitral regurgitation: a call to action. J Am Soc Echocardiogr. 2024;37(1):108-110. doi:10.1016/j.echo.2023.08.021.
8. Généreux P, Sharma RP, Cubeddu RJ, et al. The mortality burden of untreated aortic stenosis. J Am Coll Cardiol. 2023;82(22):2101-2109. doi:10.1016/j.jacc.2023.09.796. PMID: 37877909. (Presented at TCT 2023; full manuscript of the ACC.23 abstract in entry 16.)
9. Moualla SK, McCarthy PM, Thomas JD, Dobbles M, Petrescu OM, Loper T, Barnhart GR, Brennan JM. Artificial intelligence-enabled predictive model of progression from moderate to severe aortic stenosis. Intell Based Med. 2022;6:100062. doi:10.1016/j.ibmed.2022.100062. (TCT 2021 abstract: entry 20.)
10. Thomas JD, Petrescu OM, Moualla SK, Dobbles M, Hays JC, Rodriguez E, Barnhart GR. Artificial intelligence to assist physicians in identifying patients with severe aortic stenosis. Intell Based Med. 2022;6:100059. doi:10.1016/j.ibmed.2022.100059.

egnite Real-World Evidence Bibliography

Conference Abstracts

1. Peterson B, Shah P, Kaneko T, et al. 72219 | Gaps in treatment for concurrent aortic stenosis and mitral regurgitation: U.S. trends from egnite data [abstract]. Struct Heart. 2025;9(suppl). (TVT 2025, June 2025.)
2. Vemulapalli S, et al. Contemporary diagnosis, management, and outcomes of patients with low-gradient severe aortic stenosis: a multi-center analysis [abstract 4147314]. Circulation. 2024;150(suppl 1):4147314. doi:10.1161/circ.150.suppl_1.4147314. (AHA Scientific Sessions 2024.)
3. Généreux P, Amoroso NS, Thourani V, et al. Mortality burden for patients with untreated aortic regurgitation [abstract]. J Am Coll Cardiol. 2024;83(13 suppl). (ACC.24; April 6-8, 2024; Atlanta, GA. Full manuscript: entry 3.)
4. Sharma R, Cubeddu R, Généreux P, Eberst K, Rodriguez E, Gillam L. Contemporary practice patterns and outcomes for patients with mitral regurgitation: results from a large multicenter real-world database [abstract]. J Am Coll Cardiol. 2023;82(17 suppl B):B179-B180. doi:10.1016/j.jacc.2023.09.456. (Presented at TCT 2023; October 23-26, 2023; San Francisco, CA.)
5. Mignone JL, Alexander KM, Dobbles M, et al. Outcomes with guideline-directed medical therapy and cardiac implantable electronic device therapies for patients with heart failure with reduced ejection fraction [abstract MP-453089-9]. Heart Rhythm. 2023;20(5 suppl):S138. doi:10.1016/j.hrthm.2023.03.483. (Presented at Heart Rhythm 2023, HRS 44th Annual Meeting; May 19-21, 2023; New Orleans, LA. Full manuscript: entry 5.)
6. Généreux P, Sharma RP, Cubeddu RJ, Kapadia SR, Makkar RR, Thourani VH, Cohen DJ, Dobbles M, Barnhart G, Leon MB, Gillam LD. Untreated aortic stenosis mortality by diagnosis severity: results from a large real-world database [abstract]. J Am Coll Cardiol. 2023;81(8 suppl):1989. doi:10.1016/S0735-1097(23)02433-6. (Poster, ACC.23/WCC; March 4-6, 2023; New Orleans, LA. Full manuscript: entry 8.)
7. Généreux P, Sharma RP, Cubeddu RJ, Kapadia SR, Thourani VH, Makkar RR, Cohen DJ, Dobbles M, Barnhart G, Leon MB, Gillam LD. Prognostic impact of cardiac damage across the spectrum of aortic stenosis severity: results from a large real-world database [abstract]. J Am Coll Cardiol. 2023;81(8 suppl):1930. doi:10.1016/S0735-1097(23)02374-4. (Podium, ACC.23/WCC; March 4-6, 2023; New Orleans, LA.)
8. Généreux P, Sharma R, Cubeddu R, et al. TCT-404 Prognostic impact of cardiac damage across the spectrum of aortic stenosis severity: results from a large real-world database [abstract]. J Am Coll Cardiol. 2022;80(12 suppl). (TCT 2022.)
9. Brennan JM, Petrescu M, McCarthy PM, Moualla S, Nance H, Barnhart G, Rodriguez E, Thomas JD. Contemporary prevalence of valvular heart disease & diagnostic variability across centers [abstract]. J Am Coll Cardiol. 2022;79(9 suppl):1723. doi:10.1016/S0735-1097(22)02714-0. (Poster, ACC.22; April 2-4, 2022; Washington, DC. Poster.)
10. Moualla S, McCarthy P, Thomas J, Dobbles M, Petrescu M, Loper T, Barnhart G, Brennan M. TCT-58 Using artificial intelligence to predict the progression from moderate to severe aortic stenosis [abstract]. J Am Coll Cardiol. 2021;78(19 suppl S):B24. doi:10.1016/j.jacc.2021.09.908. (TCT 2021; November 4-6, 2021. Full manuscript: entry 9.)

Patent

1. Verhoef K, Kwon M, inventors; egnite, Inc, assignee. Systems and methods for natural language processing-based classification of electronic medical records. US patent 12,580,057 B2. March 17, 2026.