CARDIOLOGY 2024

QI Work: Challenges and Progress in the ECHO Lab

Thursday 2/15/2024

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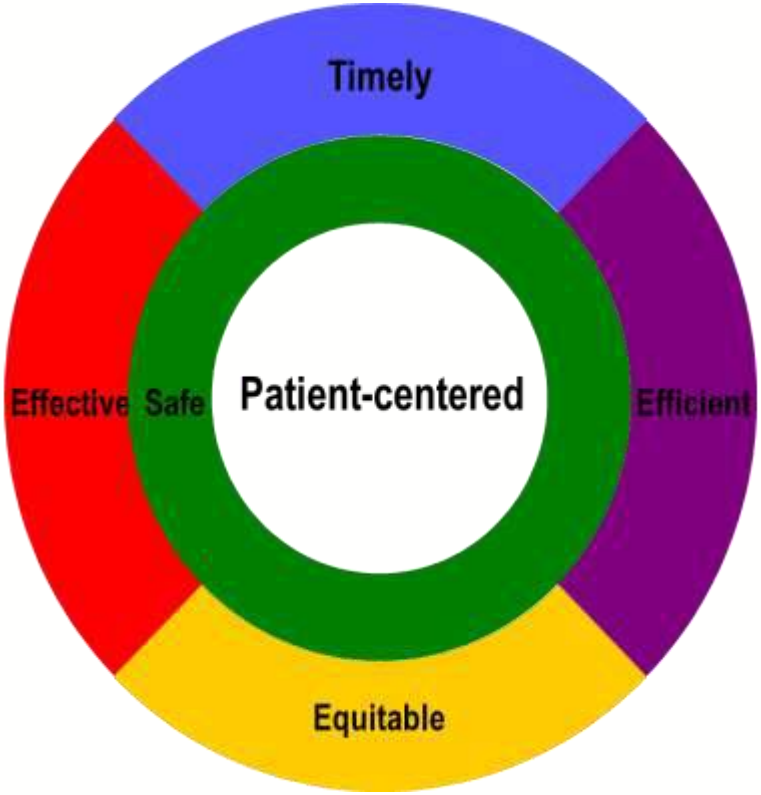
QI IN THE ECHO LAB

- Quality improvement (QI) metrics in the Echo Lab
- Incorporate QI into Echo Lab workflow
- Opportunities and Challenges

WHAT MEASURES TO PERFORM?



1. Safety : Diagnostic Accuracy
2. Effective : keeping with guidelines
3. Patient Centered : around patient needs
4. Timely : reducing wait
5. Efficient : eliminating waste
6. Equitable

Institute of Medicine (IOM). Crossing the Quality Chasm: A New Health System for the 21st Century. Washington, D.C: National Academy Press; 2001.

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WHAT MEASURES TO PERFORM?

GUIDELINES AND STANDARDS

American Society of Echocardiography Recommendations for Quality Echocardiography Laboratory Operations

Ensuring a high level of quality in echocardiography is a primary goal of the American Society of Echocardiography (ASE). Establishing a definition of quality in cardiovascular imaging has been challenging, and there has been limited agreement on quality standards for imaging. Quality can be measured as adherence to established guidelines for the use of a technology to ensure patient satisfaction and

Picard et al. JASE Jan 2011

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ASE GUIDELINE QUALITY METRICS

- Compliance with protocol
- Inter-reader variability
- Documentation of measured EF
- Cross modality comparisons
- Communication – timeliness, critical result reporting
- Patient wait time – process to track and intervene

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ECHO LAB ACCREDITATION

ACPC QUALITY NETWORK

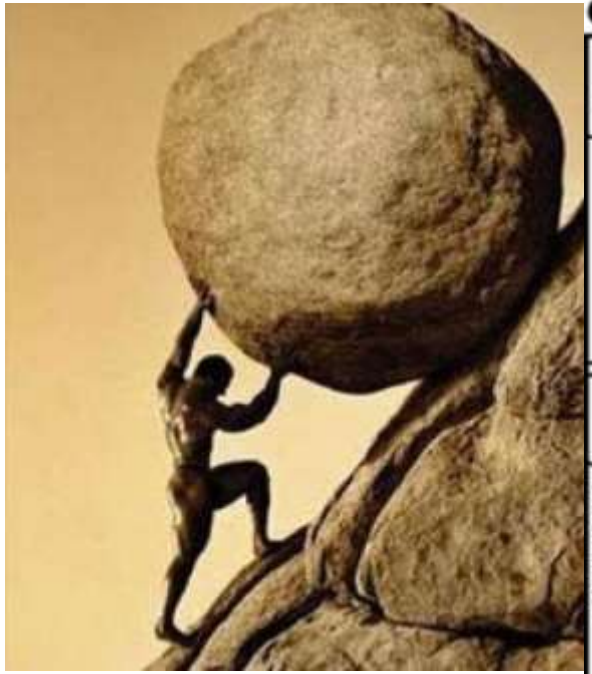
ACPC IMAGING METRICS

- TTE and fetal echo initial study completeness
- TTE and fetal echo initial study quality
- Diagnostic accuracy – TTE, TEE , fetal
- Sedation echo complications
- TEE complication rate
- Critical result reporting
- Coronary artery imaging and reporting in KD

SOPE MULTICENTER COLLABORATIVE

- First multi-center effort to systematically study diagnostic errors (DE) in surgical patients
- Baseline data – DE rate ~ 7%, not related to center volume
- 75% DE are preventable and related to cognitive or imaging factors
- Next steps : implement PDSA cycles to decrease error

WHY IS ECHO QI DIFFICULT?



TCH DE PROJECT

- TCH surgical volume ~ 1200 /year
- TTE ~ 39 K , 41 echo readers , 50 sonographers, 8 campuses
- TEE ~ 1400 , 20 TEE faculty
- DE assessment cumbersome, manual
- Multiple educational efforts – no unified purpose

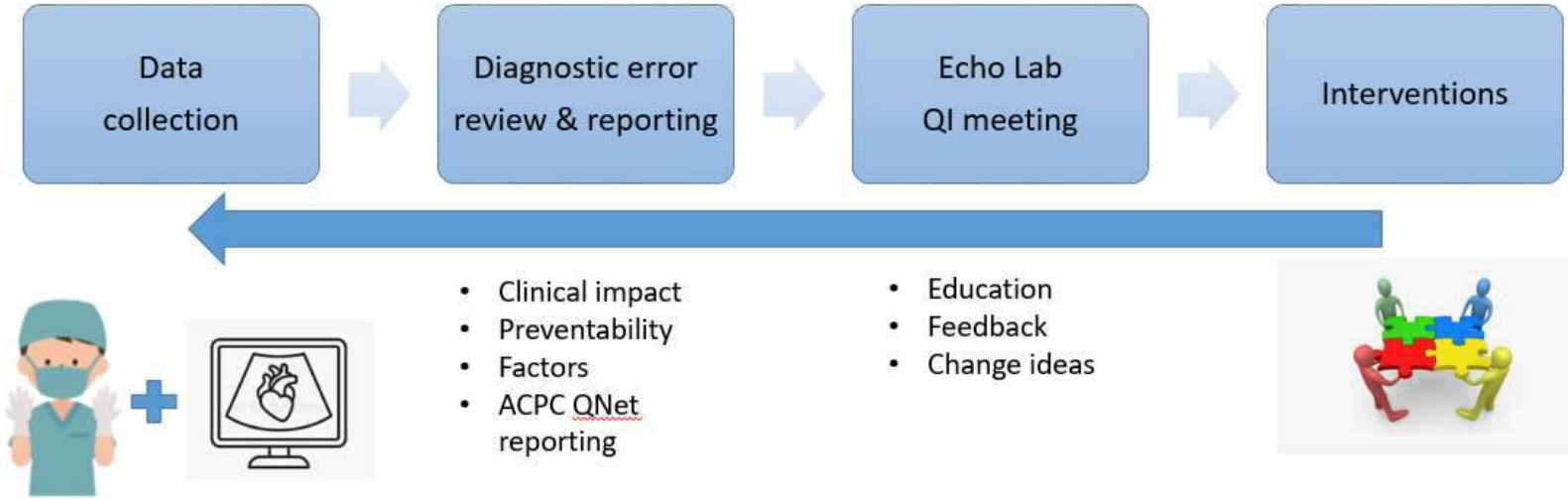
MOVING TOWARDS A SOLUTION

"Every process is perfectly designed to get the results that it gets."

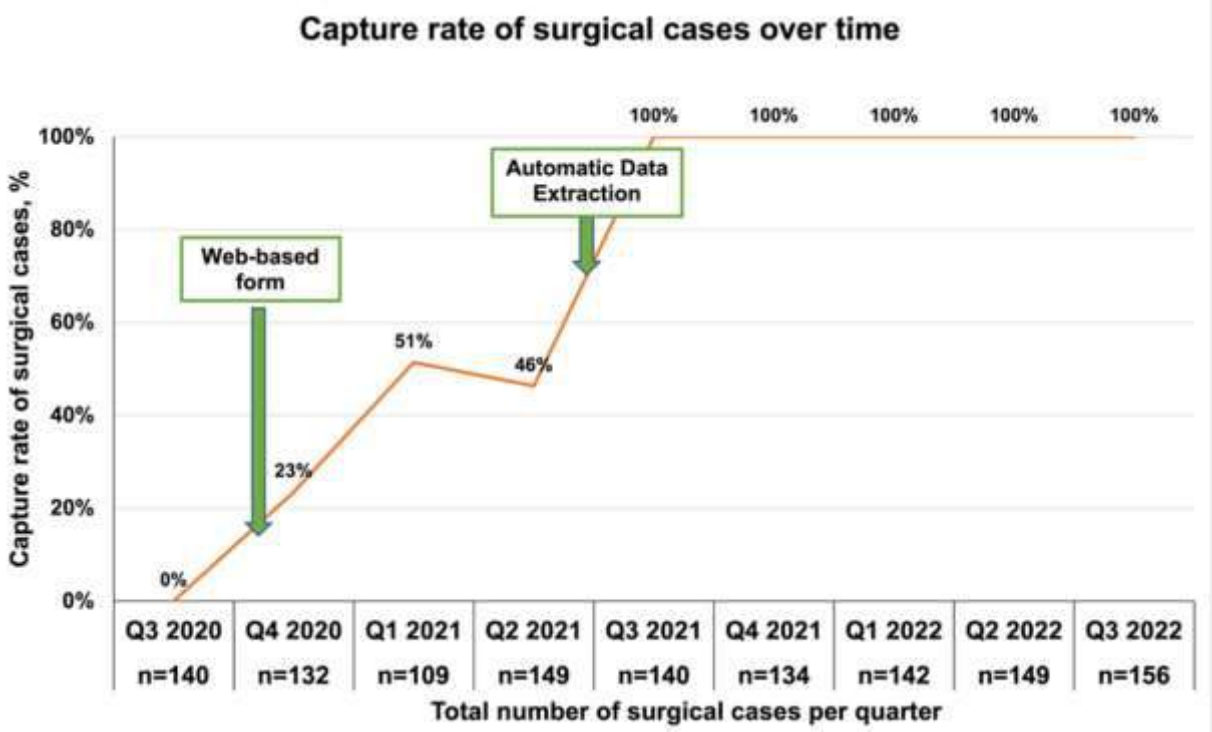
- Paul Bataldan

FROM TRACKING TO IMPROVEMENT

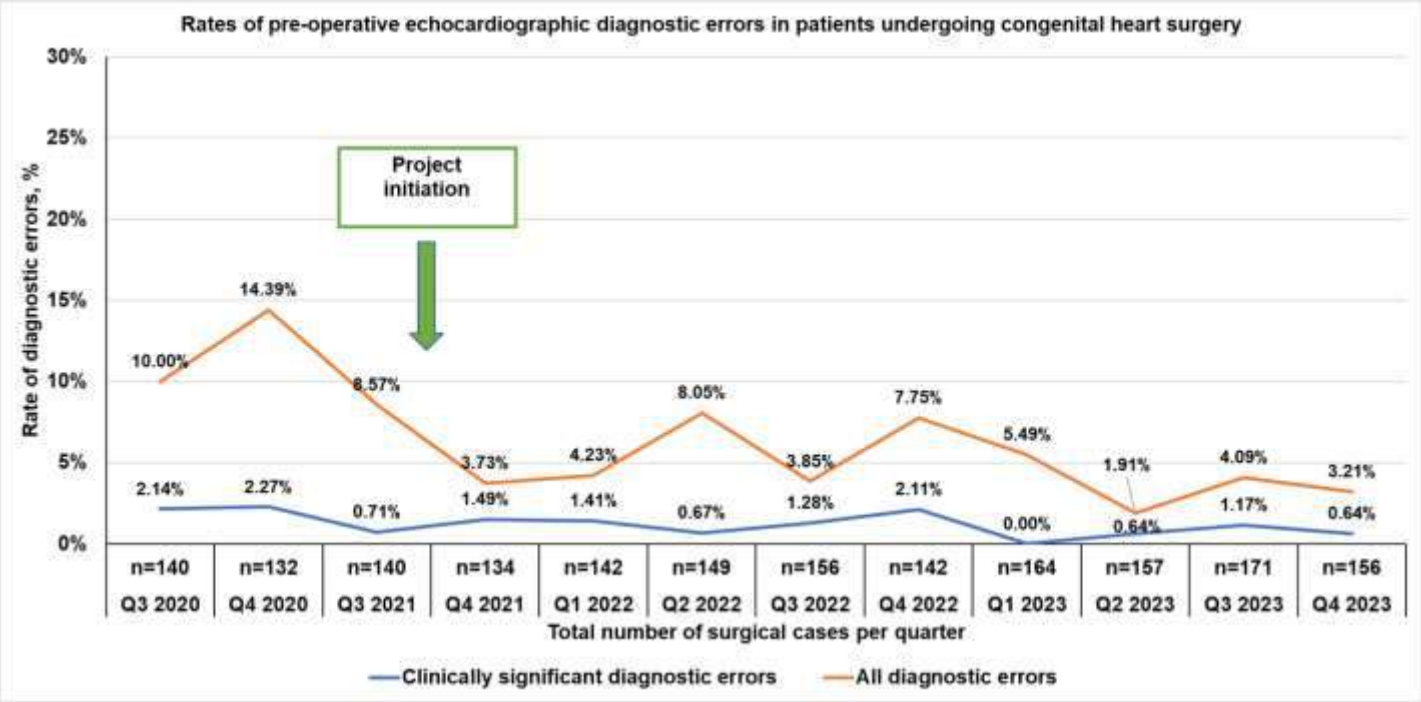
Aim: Reduce the rate of echocardiographic diagnostic errors in patients undergoing cardiac surgery at TCH



DE REPORTING



DE RATE

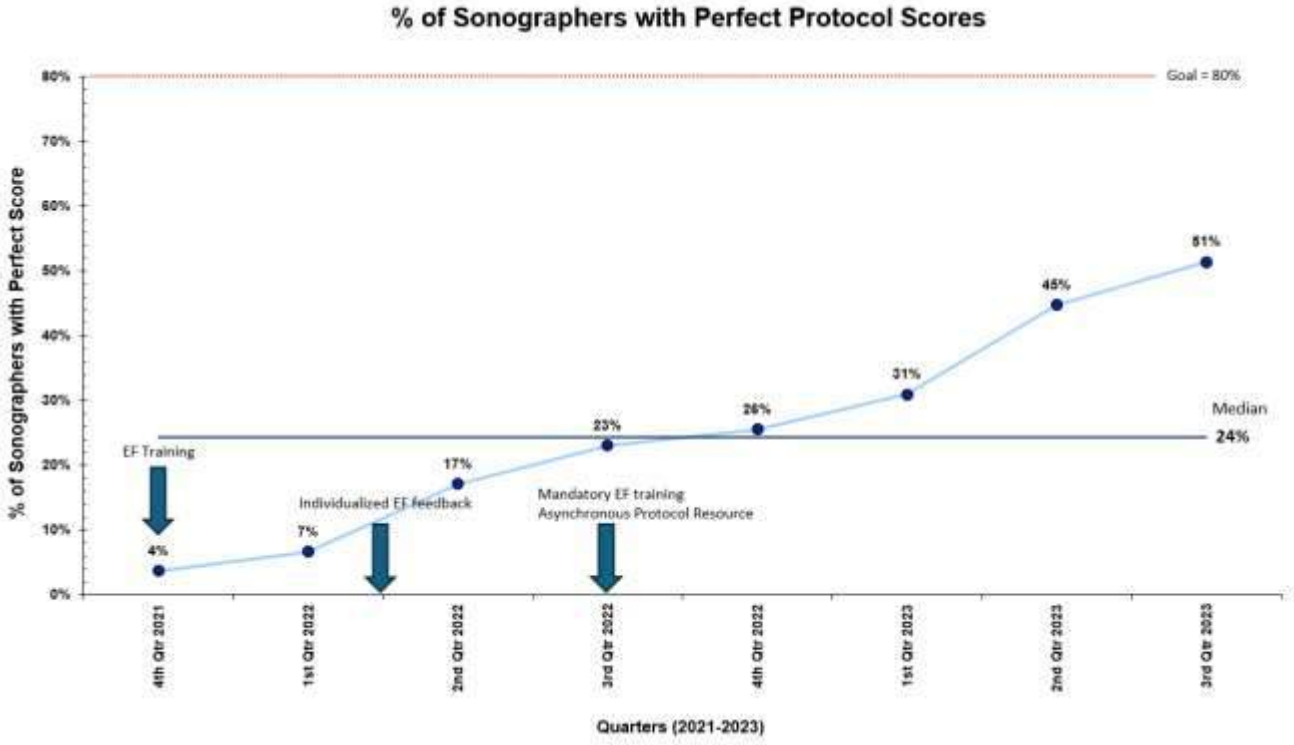

Rates of pre-operative echocardiographic diagnostic errors in patients undergoing congenital heart surgery
Rate of diagnostic errors, %
30%
25%
20%
15%
10%
5%
0%
Project initiation
10.00%
14.39%
8.57%
3.73%
4.23%
8.05%
3.85%
7.75%
5.49%
1.91%
4.09%
3.21%
2.14%
2.27%
0.71%
1.49%
1.41%
0.67%
1.28%
2.11%
0.00%
0.64%
1.17%
0.64%
n=140 Q3 2020
n=132 Q4 2020
n=140 Q3 2021
n=134 Q4 2021
n=142 Q1 2022
n=149 Q2 2022
n=156 Q3 2022
n=142 Q4 2022
n=164 Q1 2023
n=157 Q2 2023
n=171 Q3 2023
n=156 Q4 2023
Total number of surgical cases per quarter
Clinically significant diagnostic errors
All diagnostic errors

SUSTAINING IMPROVEMENT

- Set expectations for data sharing plan
- Creating a scorecard / dashboard
- Creating standard work
- Education and training
- Auditing and monitoring

STANDARDIZATION

AUDITING AND FEEDBACK



EDUCATION, TESTING AND TRAINING

Can a Teaching Intervention Reduce Interobserver Variability in LVEF Assessment

A Quality Control Exercise in the Echocardiography Lab

Amer M. Johri, MD, Michael H. Picard, MD, John Newell, BA, Jane E. Marshall, RDCS, Mary Etta E. King, MD, Judy Hung, MD

Boston, Massachusetts

Educational Intervention to Reduce Outpatient Inappropriate Echocardiograms

A Randomized Control Trial

R. Sacha Bhatia, MD, MBA,* David M. Dudzinski, MD, JD,† Rajeev Malhotra, MD,† Creagh E. Milford, DO,† Danita M. Yoerger Sanborn, MD,† Michael H. Picard, MD,† Rory B. Weiner, MD†

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DECREASE EF VARIABILITY BY 5/6 AREA- LENGTH METHOD

Variable	Phase I	Phase II	Phase III	Phase IV
LV length (diastole)	4.1 ± 3.6	2.8 ± 2.0***	2.6 ± 2.2***	2.9 ± 2.2***
LV length (systole)	6.3 ± 6.0	3.6 ± 2.8***	3.1 ± 2.9***	3.7 ± 4***
LV area (diastole)	9.1 ± 7.4	6.6 ± 6.5*	6.4 ± 9.4*	5.3 ± 5.8***
LV area (systole)	12.2 ± 8.9	12.0 ± 11.8	8.4 ± 12.5*	7.5 ± 8**
LV volume (diastole)	10.7 ± 8.4	7.6 ± 6.3**	7.4 ± 9.7**	6.9 ± 6.4**
LV volume (systole)	14.5 ± 10.5	13.2 ± 11.6	9 ± 11.8***	10.1 ± 9.2**
LV EF (percent error)	17.1 ± 17.3	16.4 ± 19.9	15.2 ± 16.6	10.8 ± 13.5*
EF difference from expert reader	5.9 ± 4.7	4.7 ± 3.7*	4.4 ± 3.3**	3.9 ± 3.4***

*** denotes significant change from baseline/phase I (*p<0.05, **p<0.01, ***p<0.001)**

LEVERAGING TECHNOLOGY

Video-Based Deep Learning for Automated Assessment of Left Ventricular Ejection Fraction in Pediatric Patients

Charitha D. Reddy, MD, Leo Lopez, MD, David Ouyang, MD, James Y. Zou, PhD, and Bryan He, BS, *Palo Alto, Los Angeles, and Stanford, California*

Reddy et al. JASE, 2023

SUMMARY

- QI is integral to Echo Lab operations
- Education and training
- Standard work
- Leverage technology
- Allocate resources
- Collaboration & new technology

IT TAKES A VILLAGE !

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