ASCO Quality Training Program

Development of a Standard Protocol to address the high incidence of clinical and sub-clinical heart failure in our adult Acute Myeloid Leukemia population

Erin McLoughlin, MD
Meredith Mort, PharmD
Katie Ruefer, RN
University of Virginia Medical Center
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University of Virginia Health System

- 612-bed tertiary academic medical center in Charlottesville, VA
  - Inpatient hematology/oncology unit: 35 beds
  - 30-40 acute myeloid leukemia (AML) patients undergo induction chemotherapy annually
- UVA Cancer Center
  - NCI-designated cancer center

Team Members

Erin McLoughlin, MD • Oncology Fellow	Team Leader
Meredith Mort, PharmD • Oncology pharmacy resident	Core Team Member
Katie Ruefer, RN • Assistant Nurse Manager Inpatient Oncology	Core Team Member
Idil Aktan, MD • Cardiology Fellow	Other Team Member
Mohammad Abuannadi, MD • Attending Cardiologist	Other Team Member
Kimberly Chadwell • Technical Director Echocardiography	Other Team Member
Anthony Marino • Internal Medicine Resident	Other Team Member
Joseph Mort • Medical Student	Other Team member
Michael Keng, MD • Assistant Professor of Medicine	QTP Improvement Coach

Problem Statement

Fifteen percent of patients with newly diagnosed Acute Myeloid Leukemia at the University of Virginia receiving anthracycline containing chemotherapy between March 2011-March 2017 had evidence of clinical heart failure within 1 year of induction.

The reported incidence of heart failure in patients who receive similar lifetime doses of anthracyclines in other patient populations is reported to be between 3-5%. This has significant implications for transplant eligibility and long term morbidity and mortality.

Our institution does not have a standard protocol for how to screen, risk stratify or monitor patients for the development of this important treatment side effect. On retrospective review, 31% of our acute leukemia patients completed a standard screening and diagnostic cardiac evaluation based on our proposed ideal standard.

Background Data

- Prior retrospective cohort study
- Inclusion criteria
  - Adult patients (≥18 years) with AML
  - Receiving induction chemotherapy with an anthracycline
  - March 2011 March 2017

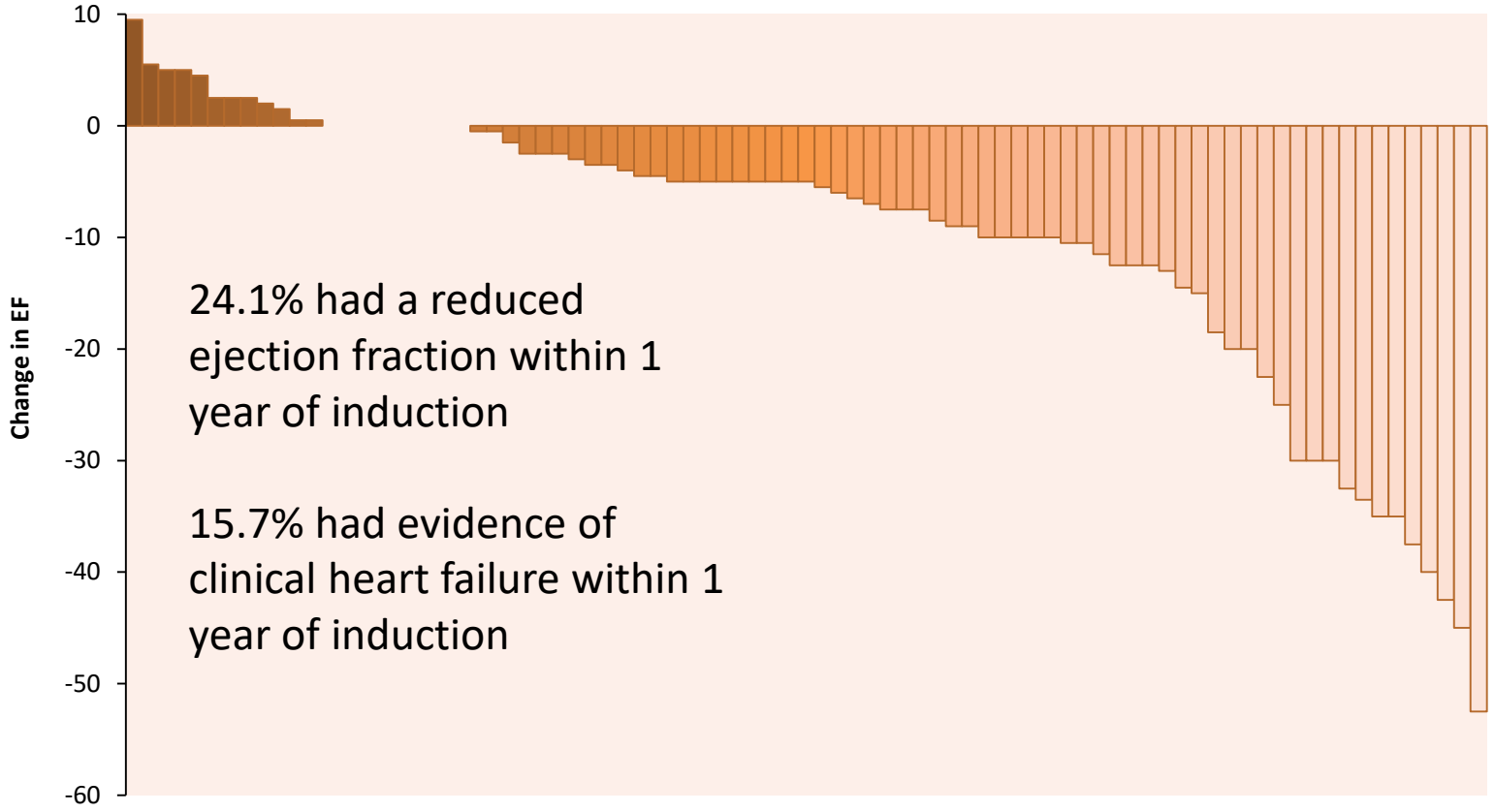
- N= 110 patients

  29 excluded- no follow up ECHO

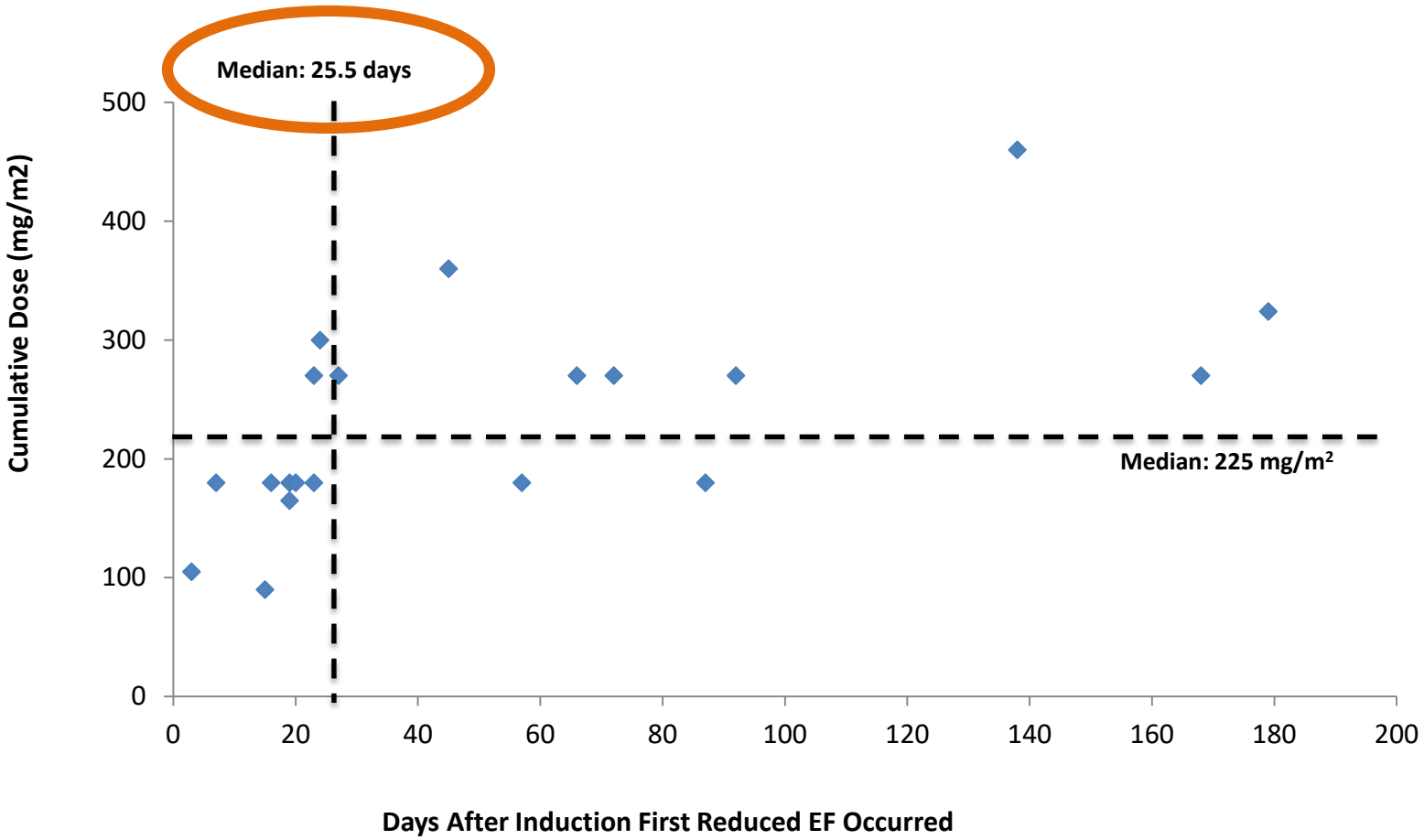
  83 patients included in the study

Background Data

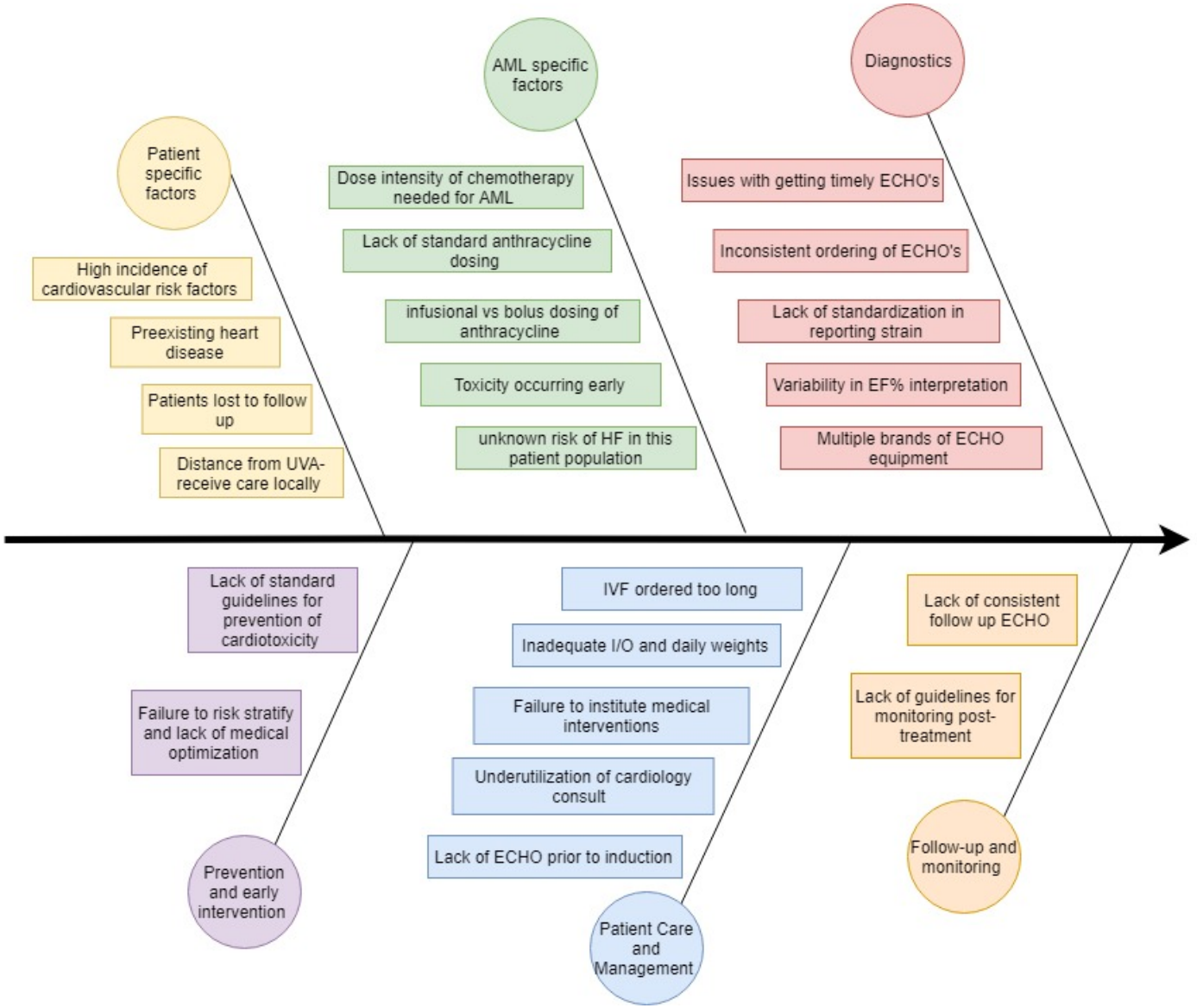
Waterfall plot of absolute difference from baseline to post-induction LVEF



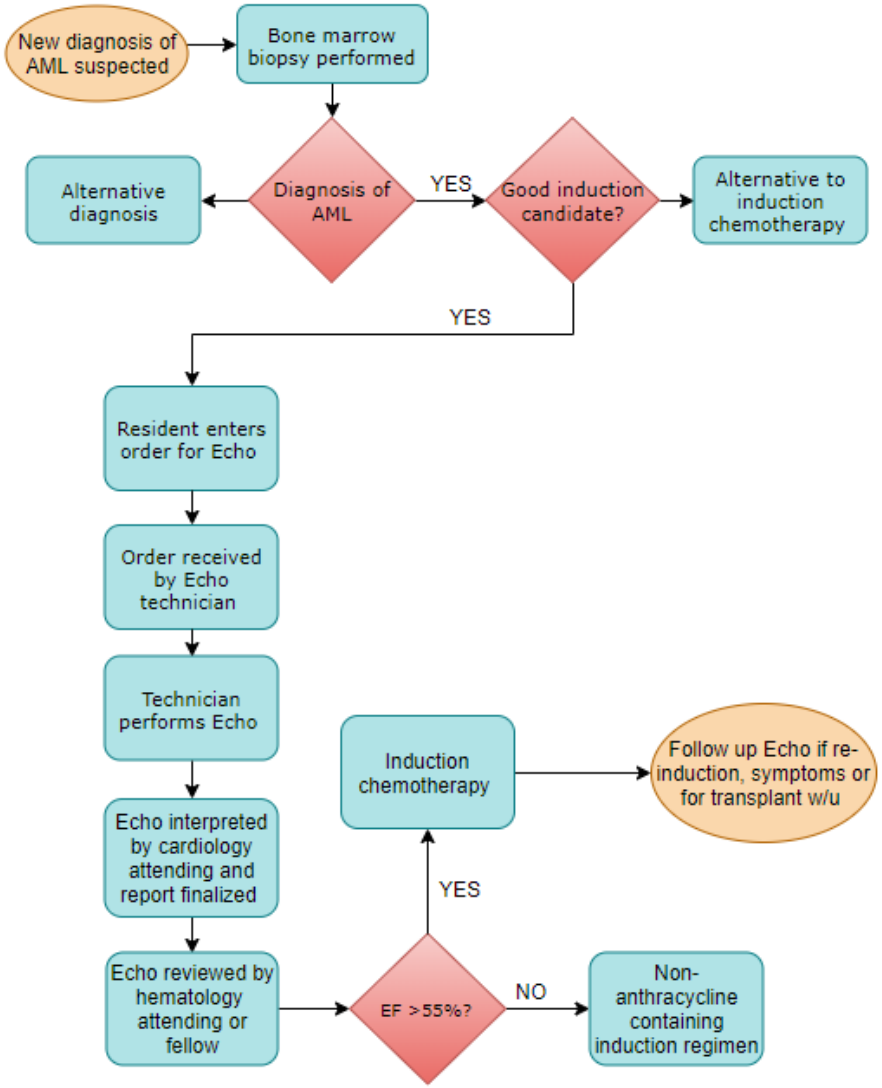
Background Data



Cause & Effect Diagram



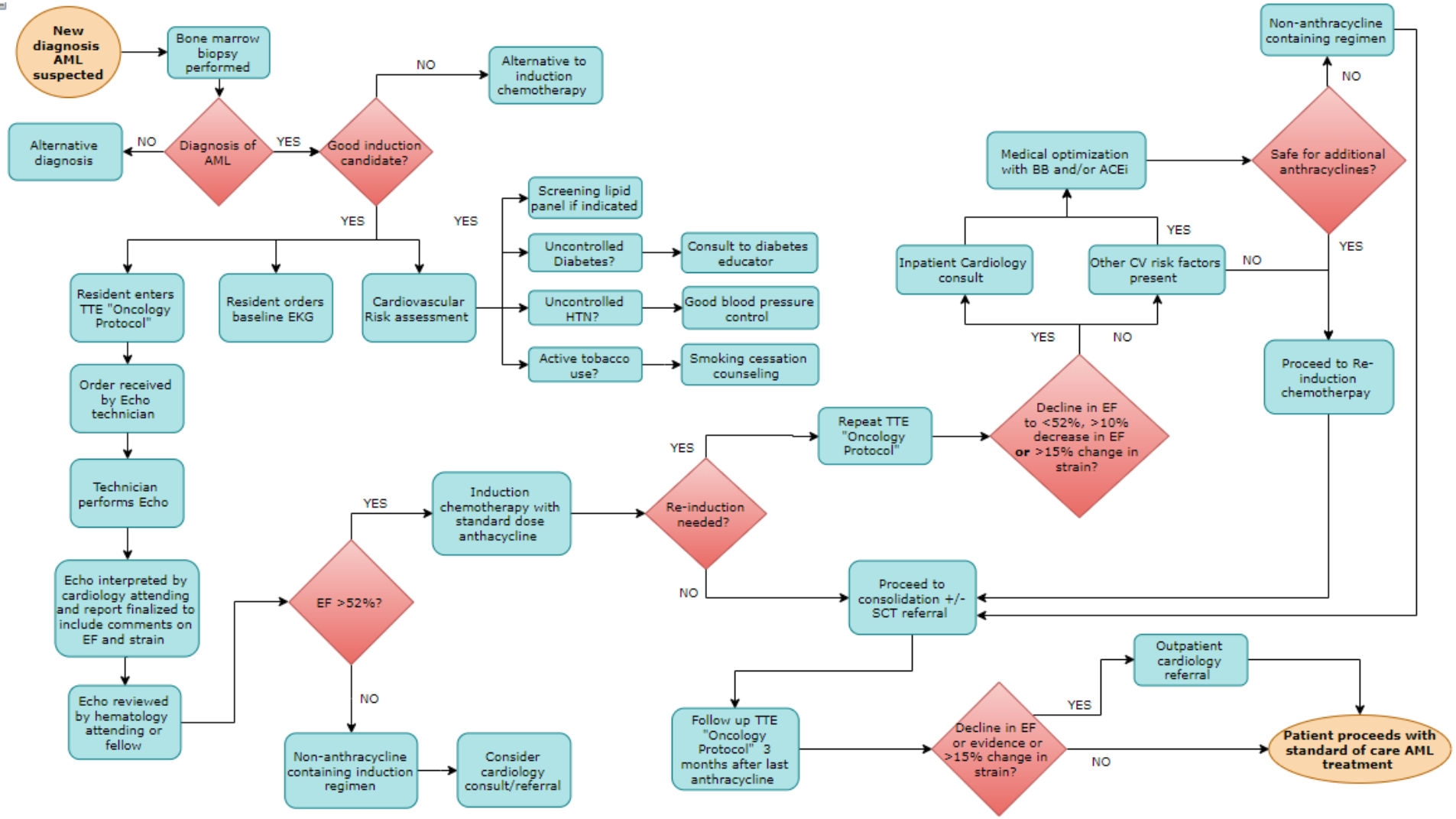
Process Map- Current State



Measures

- Measures:
  - Process- 9 agreed upon components of an “ideal standard” for our AML patients
    - Correct diagnostic work up prior to induction, standard anthracycline dosing
  - Outcome measure= reduced EF events
- Patient population:
  - Baseline AML patients receiving induction chemotherapy 01/2016- 07/2017
  - N= 39 patients
- Data source: Review of electronic medical records (EPIC)
- Calculation methodology:
  - Numerator: number of times a variation from the standard occurred
  - Denominator: total number of times a variation from the standard occurred
- Data collection frequency: plan to evaluate new AML patients on a rolling basis

Process Map- Ideal State



Baseline Data

Based on the 9 proposed components of an ideal standard protocol for cardiac evaluation, we calculated the percentage of patients for which the standard was achieved (defined as documentation of at least 80% of the individual measures) to be **23%**.

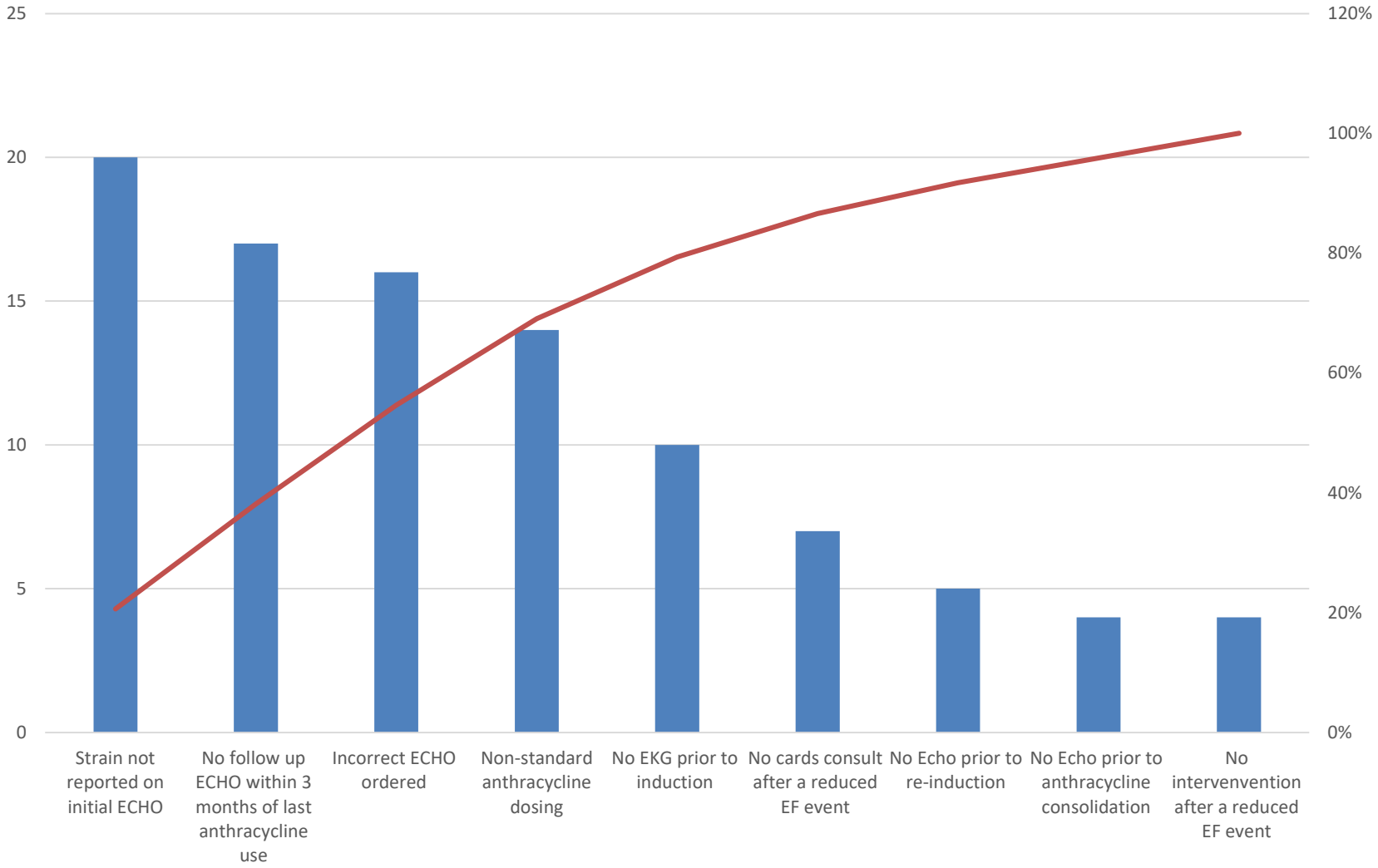
To narrow our scope, we then chose 6 of our 9 initial measures that would be easy to assess in shorter intervals of time. We evaluated the percentage of patients who hit at least 80% of all 6 standards, when applicable.

Based on our review, **31%** of our acute leukemia patients completed a standard screening and diagnostic cardiac evaluation based on our proposed ideal standard.

Diagnostic Data

Reason for Variation from Ideal Standard	# of times variation occurred
Strain not reported on Echocardiogram report	20
No follow up ECHO within 3 months of last anthracycline use	17
Incorrect ECHO ordered	16
Non-standard anthracycline dosing	14
No EKG prior to induction	10
No cardiology consult after a reduced EF event	7
No ECHO prior to re-induction	5
No ECHO prior to anthracycline consolidation	4
No medical intervention after a reduced EF event	4
	Total: 97

Diagnostic Data

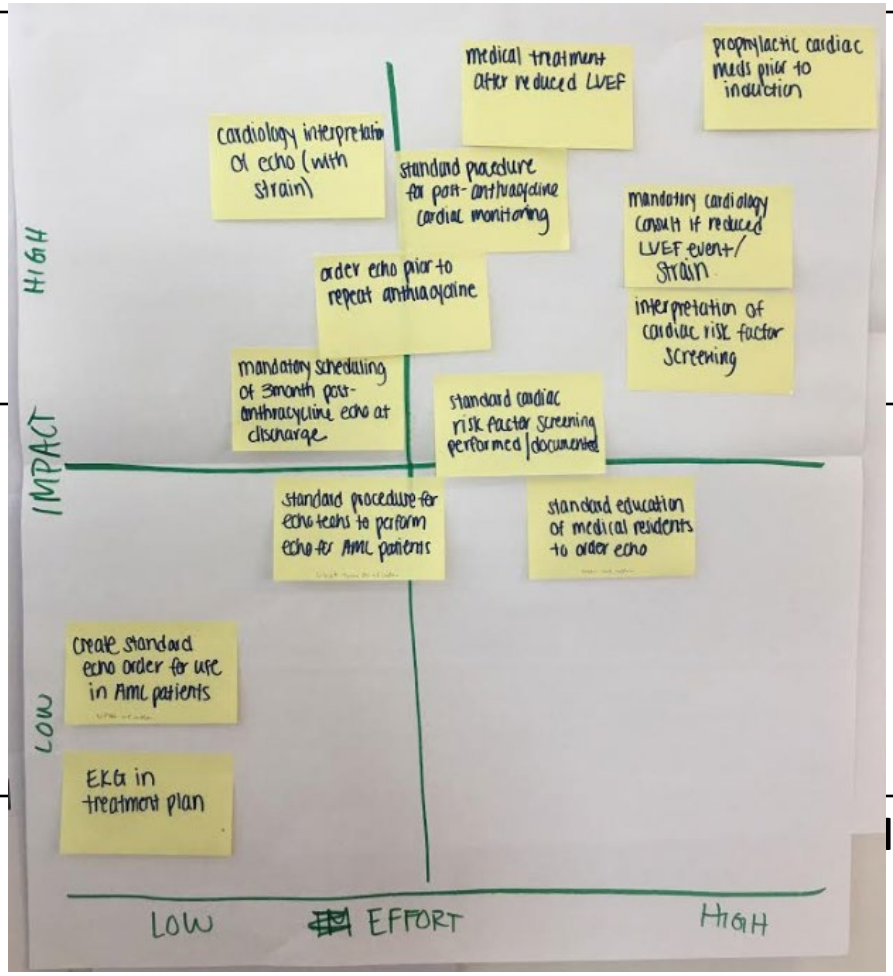


Priority/Pay –Off Matrix

High

Impact

Low



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PDSA Plan (Test of Change)

Date of PDSA Cycle	Description of Intervention	Results	Action Steps
November 5th 2018- January 30th 2019	1. Education to the Internal Medicine Residents on correct Echocardiogram to order and why 2. Standardization of ECHO reports	Ongoing	

PDSA Cycle

Given the limited timeline for our proposed PDSA cycle we again limited our scope to look at only 4 of the components of our proposed standard protocol

1. Was the Echocardiogram ordered correctly?
2. Did the Echocardiogram report strain in a standardized way?
3. Was an EKG obtained prior to the start of chemotherapy?
4. Did the patient receive standard anthracycline dosing per UVA guidelines? (This was a previously implemented intervention)

New baseline: 50% of patients had 100% compliance with these 4 proposed measures

Revised Aim Statement

By January 30, 2019, 75% of newly diagnosed AML patients at UVA will have 100% compliance with the first 4 of the proposed measures of our standard screening/diagnostic cardiac evaluation prior to undergoing induction chemotherapy.

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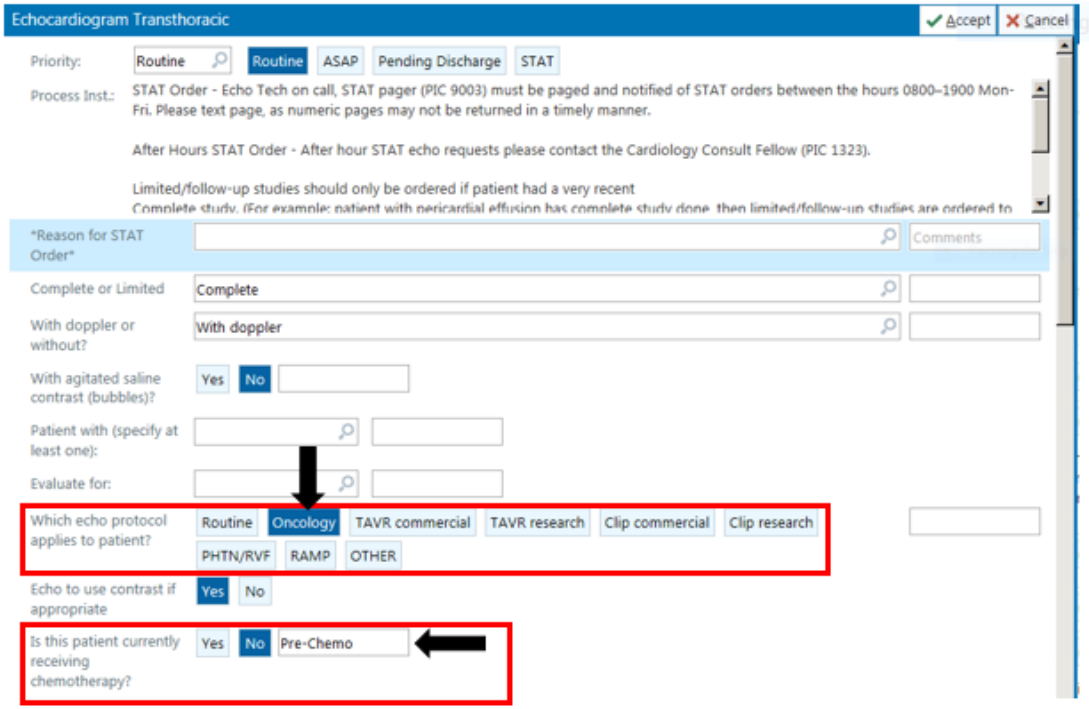
PDSA Cycle Intervention Part #1

Admitting a newly diagnosed AML patient?

Background: Approximately 24% of AML patients (2011-2017) experienced a reduction in EF within 1-year of receiving induction chemotherapy.

GOAL: Every newly diagnosed AML patient should receive a screening TTE with oncology protocol before receiving induction therapy (see below):



This will direct cardiology to include measurements of EF and strain on the final report.

Why? To standardize the screening cardiac evaluation of our AML patients. We aim to better understand the high incidence of decreased EF (which affects future treatment eligibility, e.g. stem cell transplantation) as well as plan for future interventions to medically optimize patients before and after oncology treatments.

Questions: Erin McLoughlin (emm8jd) or Anthony Marino (am7hq)

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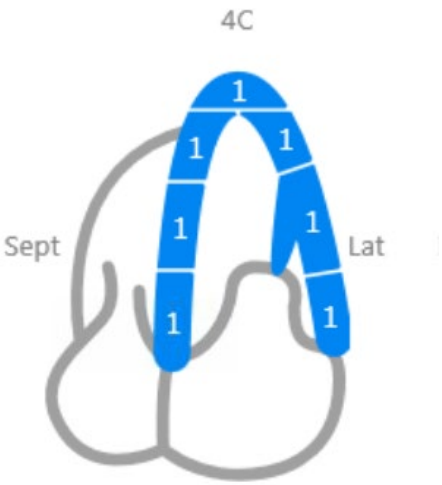
PDSA Cycle
Intervention Part #2

Procedure Name

93306 - TTE COMPLETE W/ STRAIN

Cardiovascular Findings

Left Ventricle	Normal cavity size and wall thickness. Ejection fraction is 55 - 60%. Global and segmental wall motion within normal limits. The Global Longitudinal Strain value is within normal limits. Normal left ventricular diastolic function. Normal left atrial pressure.
Right Ventricle	Normal cavity size and ejection fraction.
Left Atrium	Normal cavity size.
Right Atrium	Normal cavity size. Volume appears normal.
Aortic Valve	Aortic valve is trileaflet. No regurgitation.
Mitral Valve	Normal valve structure. Trace regurgitation. No stenosis.
Tricuspid Valve	Normal valve structure. Trace regurgitation. There is no evidence of pulmonary artery systolic pressure elevation. No evidence of tricuspid valve stenosis.
Pulmonic Valve	Normal valve structure. No regurgitation. No stenosis.
Pericardium	Pericardium is normal.
Ascending Aorta	Normal aortic root, size and contour.
IVC/SVC	The IVC demonstrates a diameter of <21 mm and collapses >50%; therefore, the right atrial pressure is estimated at



Systolic Function	
Global Strain	-18.89 %

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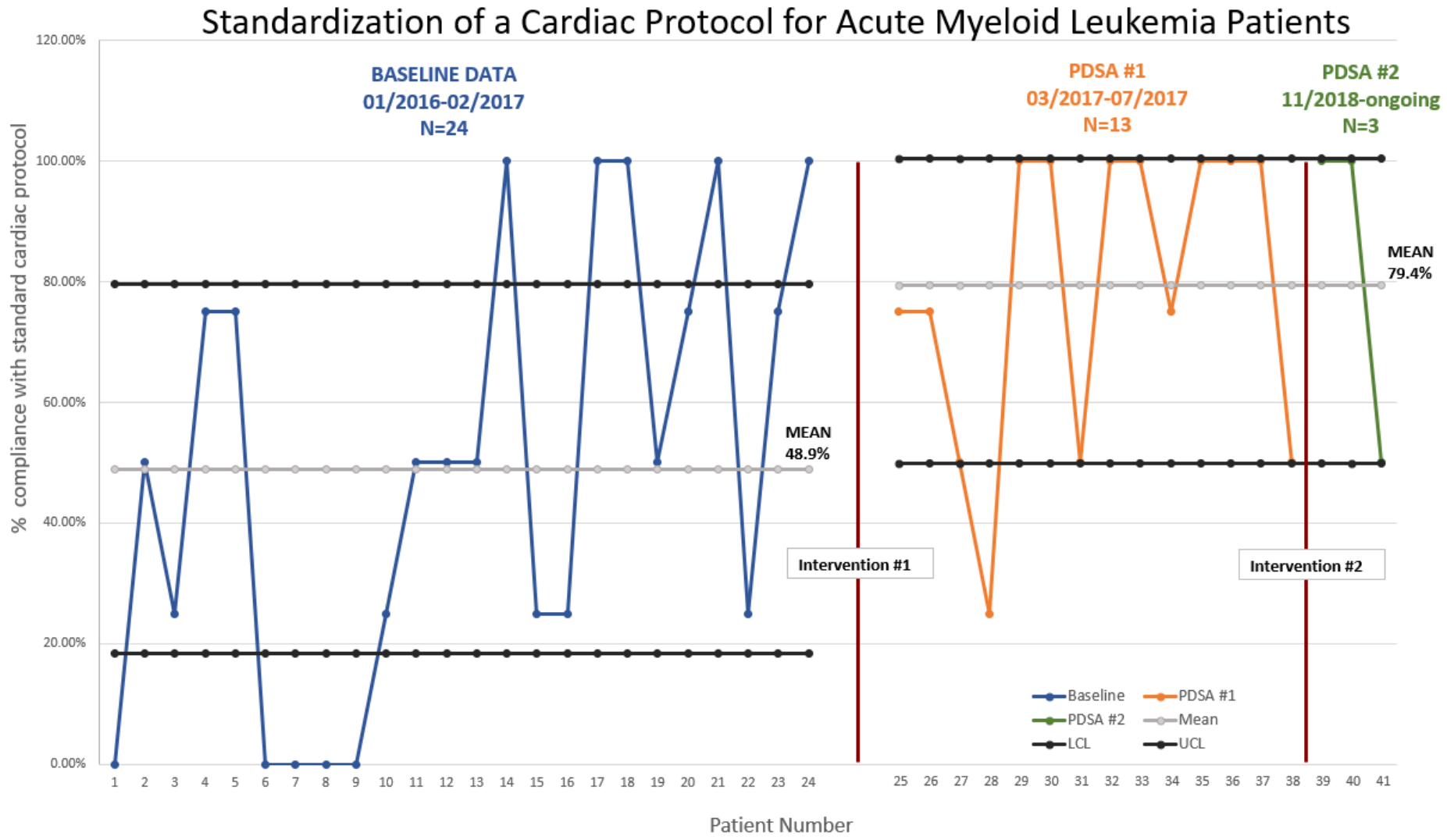
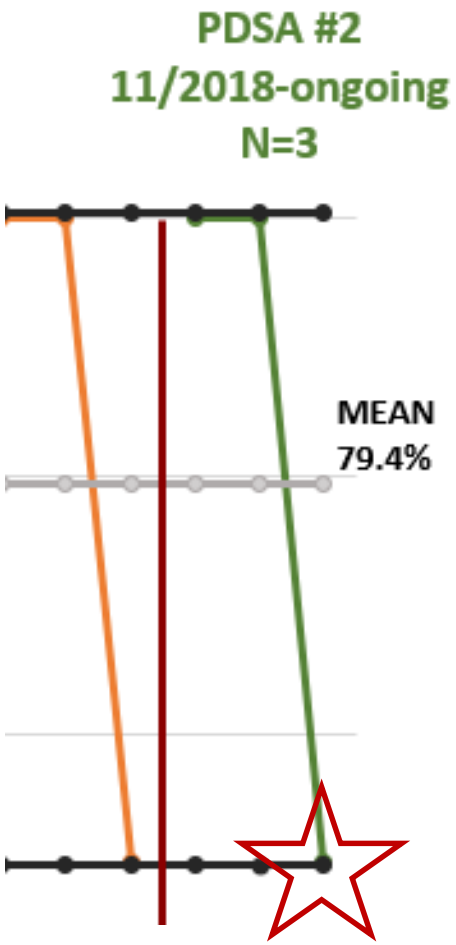
Change Data


Standardization of a Cardiac Protocol for Acute Myeloid Leukemia Patients
BASELINE DATA
01/2016-02/2017
N=24
PDSA #1
03/2017-07/2017
N=13
PDSA #2
11/2018-ongoing
N=3
MEAN
48.9%
MEAN
79.4%
Intervention #1
Intervention #2
% compliance with standard cardiac protocol
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41
Patient Number
Baseline
PDSA #1
PDSA #2
Mean
LCL
UCL

Next Steps/Plan for Sustainability

- What happened to patient #3?
  - No EKG before induction chemo
    - Add to reminder sheet in resident work room?
    - Add EKG to treatment plan?
  - ECHO was not ordered correctly BUT was still reported and done correctly because of our two part intervention



Conclusions

- So far too soon to tell!
- We have some easy low hanging fruit we can tackle
- Will plan to expand out each PDSA cycle to include more of the core measures of our standard cardiac protocol