UCD Implementation of Complete Cardiac Prevention & Rehabilitation Program

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Associate Professor in
Cardiovascular Medicine
Objectives

• Understand the goals of the Million Hearts Initiative.
• Learn our simple A3-based improvement methodology.
• Observe how we performed root cause analysis.
• See how we evaluated possible process improvements.
• Discover how we modified our EMR system.
• See the improvement in our process measurements.
• Take home what you learned from us.
Simple is Beautiful
Our Body of Knowledge is Becoming More Complex

- The growing size of The Certified Six Sigma Black Belt Handbook

<table>
<thead>
<tr>
<th>Edition</th>
<th>Year</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>2005</td>
<td>353</td>
</tr>
<tr>
<td>Second</td>
<td>2009</td>
<td>648</td>
</tr>
<tr>
<td>Third</td>
<td>2015</td>
<td>946</td>
</tr>
</tbody>
</table>
Simplify CI!

- To become embedded in an organization’s culture, continuous improvement must be...
  - Easy to teach
  - Easy to learn
  - Easy to do
Our A3 Document
The Five Phases of Our A3 Method

Referrals to Cardiac Rehab

Cardiac and Vascular Rehabilitation Program
DMAIC Is Embedded in Our A3

Referrals to Cardiac Rehab

Cardiac and Vascular Rehabilitation Program
Phase 1: Problem Definition
The Problem Quadrant

<table>
<thead>
<tr>
<th>PROBLEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Statement: What is the problem or gap?</td>
</tr>
</tbody>
</table>

**Target:**

**Actual:**

**Gap:**

![Control Chart](image)

Control Chart
Defect Free Rate

- Target
- Baseline

Cardiac and Vascular Rehabilitation Program

UC Davis Health
Background: What is Cardiac Rehabilitation

A physician-prescribed, individualized medical intervention:

1. to **recover** from a heart event e.g., heart attack (AMI), coronary revascularization (PCI), cardiac surgery, etc.

2. to **prevent** future adverse events i.e. re-hospitalizations, death
Referrals to Cardiac Rehab

Background: Cardiac Rehabilitation Effectiveness


N=2,471
1987-2010
Mortality risk (HR, 0.58; 95% CI, 0.49-0.68; P < .001)

Proportion of Patients Alive

Cardiac Rehabilitation Participation
- No
- Yes

Follow-up time (years)

Non-Participant 980 739 529 346
Participant 1491 1282 1078 877

P<.001
Background: Cardiac Rehabilitation Underutilization

32,792 MI patients responded to the BRFSS survey (CDC) Q. After you left the hospital following your heart attack did you go to any kind of outpatient rehabilitation?

Figure. Trends in lifetime cardiac rehabilitation participation following acute myocardial infarction from 2005 to 2015.

Peters AE, J Am Heart Assoc. 2018;7:e007664
Background: The Million Hearts Initiative

- Co-led by the Centers for Disease Control (CDC) and the Centers for Medicare Medicaid (CMS).
- Aims to prevent one million heart attacks over 5 years.
- Attainable if 70% of patients complete cardiac rehab.
Background: Cardiac Rehabilitation

Referrals to Cardiac Rehab

Cardiac and Vascular Rehabilitation Program
Referrals to Cardiac Rehab

Background: The Roadmap to Participation

• Milestones:
  o Referral
  o Enrollment
  o Participation

• The first step is referrals.

Ades, PA and et al, 2017: Increasing Cardiac Rehabilitation Participation From 20% to 70%: A Road Map From the Million Hearts Cardiac Rehabilitation Collaborative
Problem Definition: Measurement and Initial Conditions

Referrals to Cardiac Rehab

Target: 50%
Actual: 43%
Gap: 7%

Cardiac Rehab Referral Rate
PCI Only & PCI + AMI

Data Source: UC Davis Health, Quality and Safety
Cardiac and Vascular Rehabilitation Program

Problem Quadrant Finished

PROBLEM
AMI and PCI patients who participate in cardiac rehabilitation (CR) have improved survival and quality of life. The Million Hearts Initiative (CMS + CDC) recommends a CR participation rate of at least 70% by 2022. To reach this level of participation, we must first increase the CR referral rate. We will initially strive for a 50% referral rate.

Referral Percentages

<table>
<thead>
<tr>
<th>TARGET</th>
<th>ACTUAL</th>
<th>GAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI, &amp; PCI + AMI</td>
<td>50%</td>
<td>43%</td>
</tr>
</tbody>
</table>

Cardiac Rehab Referral Rate
PCI Only & PCI + AMI

Date Source: UC Davis Health, Quality and Safety
A3 with Problem Definition Finished

Referrals to Cardiac Rehab

Increasing Referrals to Cardiac Rehab for AMI and PCI Patients

PROBLEM
AMI and PCI patients who participate in cardiac rehabilitation (CR) have improved survival and quality of life. The Million Hearts Initiative (CMS + CDC) recommends a CR participation rate of at least 70% by 2022. To reach this level of participation, we must first increase the CR referral rate. We will initially strive for a 50% referral rate.

Referral Percentages
<table>
<thead>
<tr>
<th>PCI &amp; PCI + AMI</th>
<th>TARGET</th>
<th>ACTUAL</th>
<th>OAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI &amp; PCI + AMI</td>
<td>50%</td>
<td>43%</td>
<td>7%</td>
</tr>
</tbody>
</table>

ANALYSIS

Cardiac Rehab Referral Rate

PCI Only & PCI + AMI

ACTION

PRIORITY

DATE LAST REVISED: 10/9/2020
Phase 2:
Root Cause Analysis
The Analysis Quadrant

- What causes prevent us from meeting our target?
- What are the “suspected and observed” causes?

ANALYSIS

<table>
<thead>
<tr>
<th>Effect/ Problem</th>
<th>People</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Some Analytical Tools

- **Process Flow Chart** (in progress)
- **Process Flow Chart** (finished)
- **Pareto Chart**
- **Fishbone Diagram** (a.k.a. Ishikawa Diagram)
Process Map Under Construction

Referrals to Cardiac Rehab
Process Mapping in Action

Referrals to Cardiac Rehab
Finished Process Map in Visio

Cardiac and Vascular Rehabilitation Program

Referrals to Cardiac Rehab
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Why is the monument deteriorating?</td>
<td>Harsh chemicals are used in cleaning.</td>
</tr>
<tr>
<td>2. Why the harsh chemicals?</td>
<td>To clean bird droppings.</td>
</tr>
<tr>
<td>3. Why so many birds?</td>
<td>They eat the spiders on the monument.</td>
</tr>
<tr>
<td>4. Why so many spiders?</td>
<td>They eat the gnats.</td>
</tr>
<tr>
<td>5. Why the gnats?</td>
<td>They are attracted by the lighting at dusk.</td>
</tr>
</tbody>
</table>

**5 Whys**

**Problem:** The Washington Monument is deteriorating
Cause and Effect (Fishbone) Diagram

Referrals to Cardiac Rehab
Our Fishbone Diagram

Referrals to Cardiac Rehab
We developed a current state process map, and identified the barriers inhibiting process performance. We then conducted an analysis to identify the root causes of each barrier.
A3 with the Analysis Phase Finished

Increasing Referrals to Cardiac Rehab for AMI and PCI Patients

PROBLEM
AMI and PCI patients who participate in cardiac rehabilitation (CR) have improved survival and quality of life. The Millions Lost Initiative (MHI + CDC) recommends a CR participation rate of at least 79% by 2022. To reach this level of participation, we must first increase the CR referral rate. We will initially strive for a 55% referral rate.

Referral Percentages

<table>
<thead>
<tr>
<th>Target</th>
<th>Actual</th>
<th>OAP</th>
</tr>
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<tbody>
<tr>
<td>PCI &amp; PCI + AMI</td>
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<td>43%</td>
</tr>
</tbody>
</table>

ANALYSIS
We developed a current state process map and identified the barriers inhibiting process performance. We then conducted an analysis to identify the root causes of each barrier.

ACTION

PRIORITY

UC Davis Health

DATE LAST REVISED: 10/2/2020
Phase 3: Prioritization of Improvements
Brainstorm solutions and prioritize using a PICK chart.

<table>
<thead>
<tr>
<th>Improvement</th>
<th>Benefit</th>
<th>Effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>4</td>
</tr>
</tbody>
</table>
# Proposed Improvements & Evaluation

## Proposed Improvements

**Example**

<table>
<thead>
<tr>
<th>Label</th>
<th>Proposed Improvements</th>
<th>Benefit</th>
<th>Effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Improvement A</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>B</td>
<td>Improvement B</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>C</td>
<td>Improvement C</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>D</td>
<td>Improvement D</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>E</td>
<td>Improvement E</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>F</td>
<td>Improvement F</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>G</td>
<td>Improvement G</td>
<td>9</td>
<td>1</td>
</tr>
</tbody>
</table>

### PICK Chart

![PICK Chart Image](image_url)

- **Implement**
- **Consider**
- **Possible**
- **Kibosh**

Benefit vs Effort graph with points A, B, C, D, E, F, G.
## Our Brainstorm List

### EPIC Failures

**Proposed Interventions for Root Causes**

<table>
<thead>
<tr>
<th>#</th>
<th>B</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>5/6</td>
</tr>
<tr>
<td>D</td>
<td>8</td>
<td>5/8</td>
</tr>
<tr>
<td>E</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>F</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>G</td>
<td>9</td>
<td>2/3</td>
</tr>
</tbody>
</table>

**Interventions for Root Causes**

- Too much customization
  - Consult with EPIC developers to identify and standardize features currently customized

**Other Notes**

- Lack of knowledge on part of ordering person
- Develop a short cut to bypass DC tab
- Training people to go to DC tab
- C.R. order hard to find
  - Alert to do C.R. referral when patient meets criteria
  - Alert to place C.R. referral in DC tab if P.T. tab spared
- Similar order names/Duplicate orders
  - Merge inpatient C.R. medication order with C.R. referral order
- NPs & PAs unable to route orders to an attending
  - Enable NPs & PAs to add attendings as coprescribers
  - Develop an alert when no attending is selected
Our Pick Chart

Referrals to Cardiac Rehab

Cardiac and Vascular Rehabilitation Program
## Our Prioritized Improvements, Page 1

<table>
<thead>
<tr>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Deliver lectures, rounds, &amp; brief presentations to nurses on Cardiology floor.</td>
</tr>
<tr>
<td>2. Eliminate unnecessary/misleading order types:</td>
</tr>
<tr>
<td>a. Cardiac Rehab Education order</td>
</tr>
<tr>
<td>b. Preventative Cardiology Consult</td>
</tr>
<tr>
<td>c. Cardiac Rehab Program</td>
</tr>
<tr>
<td>3. Modify Cardiac Rehab Referral Order:</td>
</tr>
<tr>
<td>a. Drop-down box with indications</td>
</tr>
<tr>
<td>b. Add service lines</td>
</tr>
</tbody>
</table>
Our Prioritized Improvements, Page 2

<table>
<thead>
<tr>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Add cardiac rehab referral to the discharge order sets for all cardiology service lines.</td>
</tr>
<tr>
<td>5. Enable NPs and PAs to add physician co-signer to cardiac rehab referral.</td>
</tr>
<tr>
<td>6. Convert customized features to standard</td>
</tr>
<tr>
<td>7. Generate automated BPA when criteria met for release of CR referral</td>
</tr>
</tbody>
</table>
We proposed possible interventions for the root causes we identified, and assessed each in terms of benefit vs. effort.
A3, with the Priority Phase Finished

Increasing Referrals to Cardiac Rehab for AMI and PCI Patients

**PROBLEM**
AMI and PCI patients who participate in cardiac rehabilitation (CR) have improved functional capacity and quality of life. The Million Hearts Campaign (MHC) recommends a CR participation rate of at least 70% by 2022. To reach this level of participation, we must first increase the CR referral rate. We will initially strive for a 50% referral rate.

**ANALYSIS**
We developed a current state process map, and identified the barriers inhibiting process performance. We then conducted an analysis to identify the root causes of each barrier.

**ACTION**
We proposed possible interventions for the root causes we identified, and assessed each in terms of benefit vs. effort.

**OWNER**

**TEAM MEMBERS**

**DATE LAST REVISED:** 10/5/2020

UC Davis Health
Phase 4: Action Plan
The Action Quadrant

**ACTION**

- Which actions will address the most important causes?
- What experiments and/or changes can we make to test our hypotheses? (Develop a plan)

<table>
<thead>
<tr>
<th>What</th>
<th>Who</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>
Building an Action Plan

Referrals to Cardiac Rehab

- Attending to Attending Handoff

**What**

- Have surgeon and anesthesiologist hand off patient to ICU or OR
- Design T2R view in EMR (based on professional exchange)
- Train people on professional exchange screen

**Who**

- Raj and Kumar

**When**

- To CPIA on 1/17
- Fiona
- TBD 1/16

- And decide what type of patient to be picked up in ICU
# Action Plan

<table>
<thead>
<tr>
<th>What?</th>
<th>When?</th>
<th>Who?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Referrals to Cardiac Rehab</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>What?</strong></td>
<td><strong>When?</strong></td>
<td><strong>Who?</strong></td>
</tr>
<tr>
<td>Action Item</td>
<td>Target Date</td>
<td>Action Owner</td>
</tr>
<tr>
<td>1. Deliver lectures, rounds, &amp; brief presentations to nurses on Cardiology floor.</td>
<td>9/26/2019</td>
<td>Javier, Lue, Xuan, Armon</td>
</tr>
</tbody>
</table>
| 2. Eliminate unnecessary/misleading order types:  
  a. Cardiac Rehab Education order  
  b. Preventative Cardiology Consult  
  c. Cardiac Rehab Program | 9/1/2019 | Eddie, Deb Brinkman |
| 3. Modify Cardiac Rehab Referral Order:  
  a. Drop-down box with indications  
  b. Add service lines | 7/19/2019 | Armon |
Based on our assessment, we decided upon the following interventions, and developed a plan to implement them:

1. EPIC modifications
   a) Removal of obsolete CR orders in EPIC
   b) Addition of cosign requirement for advance practice clinicians (PAs/NPs)
   c) Listing of CMS-qualifying diagnoses in the EPIC order
   d) Addition of pre-populated CR Order set for patients who are electronically identified as having a PCI during the hospitalization. This made the CR order an opt-out proposition, rather than opt-in.

2. Education and Presentation
   a) Medical staff education (CCU, Ward, Hospitalist, Family Medicine, CT Surgery)
   b) CR indications & order instructions cards, and brief (2-3 min) training bi-weekly to house staff rotating in Cardiology services

**Action Plan**

<table>
<thead>
<tr>
<th>What?</th>
<th>Action Item</th>
<th>When?</th>
<th>Who?</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Deliver lectures, rounds, &amp; brief presentations to nurses in DB.</td>
<td>9/9/2019</td>
<td>Javier, Lue, Xuany, Armon</td>
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<td>Armon</td>
<td></td>
</tr>
<tr>
<td>D, E</td>
<td>Add cardiac rehab referral to the discharge order sets for all cardiology service lines.</td>
<td>9/1/2019</td>
<td>Armon, EPIC unassigned</td>
</tr>
<tr>
<td>F</td>
<td>Enable NPs and PAs to add physician co-signer to cardiac rehab referral.</td>
<td>9/1/2019</td>
<td>Armon, Beth, Cooper</td>
</tr>
<tr>
<td>H</td>
<td>Convert customized features to standard</td>
<td>9/1/2019</td>
<td>Eddie, Javier, Paul</td>
</tr>
<tr>
<td>C</td>
<td>Generate automated EPIR when criteria met for release of CR referral</td>
<td>9/1/2019</td>
<td>Armon, EPIC unassigned</td>
</tr>
</tbody>
</table>
A3 Completed, or Is It?

Increasing Referrals to Cardiac Rehab for AMI and PCI Patients

**Owner:**

**Problem:**
AMI and PCI patients who participate in cardiac rehabilitation (CR) have improved survival and quality of life. The Million Heart Initiative (MHI + CQI) recommends a CR participation rate of at least 70% by 2023. To reach this level of participation, we must first increase the CR referral rate. We will initially strive for a 50% referral rate.

**Referral Percentages**
- **Target:** 50%
- **Actual:** 49%
- **Gap:** 1%

**Team Members:**

**Analysis:**
We developed a current state process map and identified the barriers inhibiting process performance. We then conducted an analysis to identify the root causes of each barrier.

**Priority:**
We proposed possible interventions for the root causes we identified and assessed each in terms of benefit vs. effort.

**Action Plan:**
1. **Goals:**
   - Increase CR participation rate to 50% by December 2020.

2. **Interventions:**
   - **Operational changes:**
     - Update CR referral protocol.
     - Implement CR referral electronic order sets.
   - **Training:**
     - Provide training for medical staff.
   - **Engagement with communities:**
     - Increase CR referral rates in community settings.

**Date Last Revised:** 10/02/2020

UC Davis Health
Phase 5: Continuous Improvement
Check the Control Chart for Results

Cardiac Rehab Referral Rate
PCI Only & PCI + AMI

Referrals to Cardiac Rehab

Cardiac and Vascular Rehabilitation Program
Whoops! What Happened?

Cardiac Rehab Referral Rate
PCI Only & PCI + AMI

Data Source: UC Davis Health, Quality and Safety

UCDavison HEALTH
Cardiac and Vascular Rehabilitation Program

Referrals to Cardiac Rehab
A Little Education Goes a Long Way!

Cardiac and Vascular Rehabilitation Program

Referrals to Cardiac Rehab
Our Most Recent A3

Cardiac and Vascular Rehabilitation Program

Referrals to Cardiac Rehab

Increasing Referrals to Cardiac Rehab for AMI and PCI Patients

**Problem**
AMI and PCI patients who participate in cardiac rehabilitation (CR) have improved survival and quality of life. The most recent American Heart Association (AHA) guidelines recommend CR participation for at least 20% of patients. To achieve this level of participation, we want to increase the CR referral rate. We will initially strive for a 50% referral rate.

**Analysis**
We developed a current state process map and identified the barriers inhibiting process performance. We then conducted an analysis to identify the root causes of each barrier.

**Priority**
We proposed possible interventions for the root causes we identified and assessed each in terms of benefit vs. effort.

**Action**
Based on our assessment, we identified the following interventions and developed a plan to implement them:

1. **EPIC modifications**
   - Renaming of discharge CR orders to EPIC
   - Addition of documentation for advanced practice clinicians (APCs)
   - Listing of 0705-qualifying diagnoses in the EPIC order
   - Addition of pre-populated CR Order set for patients
   - Computerized order entry for automatic ordering of PCI during the hospitalization. This made the CR order an optional order, rather than an order.

2. **Education and presentation**
   - Matched staff education (CCU, IM, Cardiology, CT Surgery)
   - CR indications & order instructions cards and brief (2-3 min) training bi-weekly to house staff rotating in Cardiology services

**Team Members**

**Owner:**

**PE Coaches:**

**Target End Date:** 10/1/2020

**Date Last Revised:** 10/8/2020

UC Davis Health
Referrals to Cardiac Rehab

Our Results

Cardiac and Vascular Rehabilitation Program
What’s Next?

- Enrollment in Cardiac Rehabilitation
- Participation in Rehab
- Assess the Impact on Survival and Quality of Life
Wise Words from Chef Martin Yan

Referrals to Cardiac Rehab

"If Yan can cook, so can you!"
If UC Davis Health can improve, so can you!

- Try our simple A3 method
  - Define your problem
  - Analyze the root causes
  - Prioritize your interventions
  - Develop an action plan
  - Continuously monitor your process