Clinical Safety & Effectiveness

Cohort 16 Team 9

Interventions to Reduce Obsolete, Inappropriate or Overutlilzed Tests

CENTER FOR PATIENT SAFETY & HEALTH POLICY

UT HEALTH SCIENCE CENTER™

SAN ANTONIO

The Team

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Aim Statement

- Create a process to easily identify and intervene on obsolete, inappropriate or over-utilized laboratory tests at UHS by May 31, 2015, to promote appropriate patient care, safety and financial responsibility.

- This project will be exemplified by three target tests:
  - **Eliminate/reduce** an **obsolete** test, **CK-MB**, to <50% of baseline data
  - **Reduce inappropriate** inpatient orders of **1, 25-dihyroxyvitamin D** to <50% of baseline data
  - **Reduce overutilization** of **Serum Magnesium** to <50% of baseline data

Background: Laboratory tests and effective utilization

- Studies estimate 20% to 50% of laboratory testing may not be appropriate
  - Testing is redundant
  - Testing is not clinically relevant for the patient
  - Testing is not ordered as per evidence-based practice

- Clinical laboratories are designing quality improvement initiatives and identifying cost reduction strategies by focusing on utilization management of laboratory testing

  - **Strategies for utilization management**
    - Redesign of requisitions
    - Changing standing orders
    - Provider order entry and clinical decision support
    - Physician profiling
    - educational initiatives
    - Implementing admission templates
    - eliminating obsolete tests and
    - instituting testing algorithms

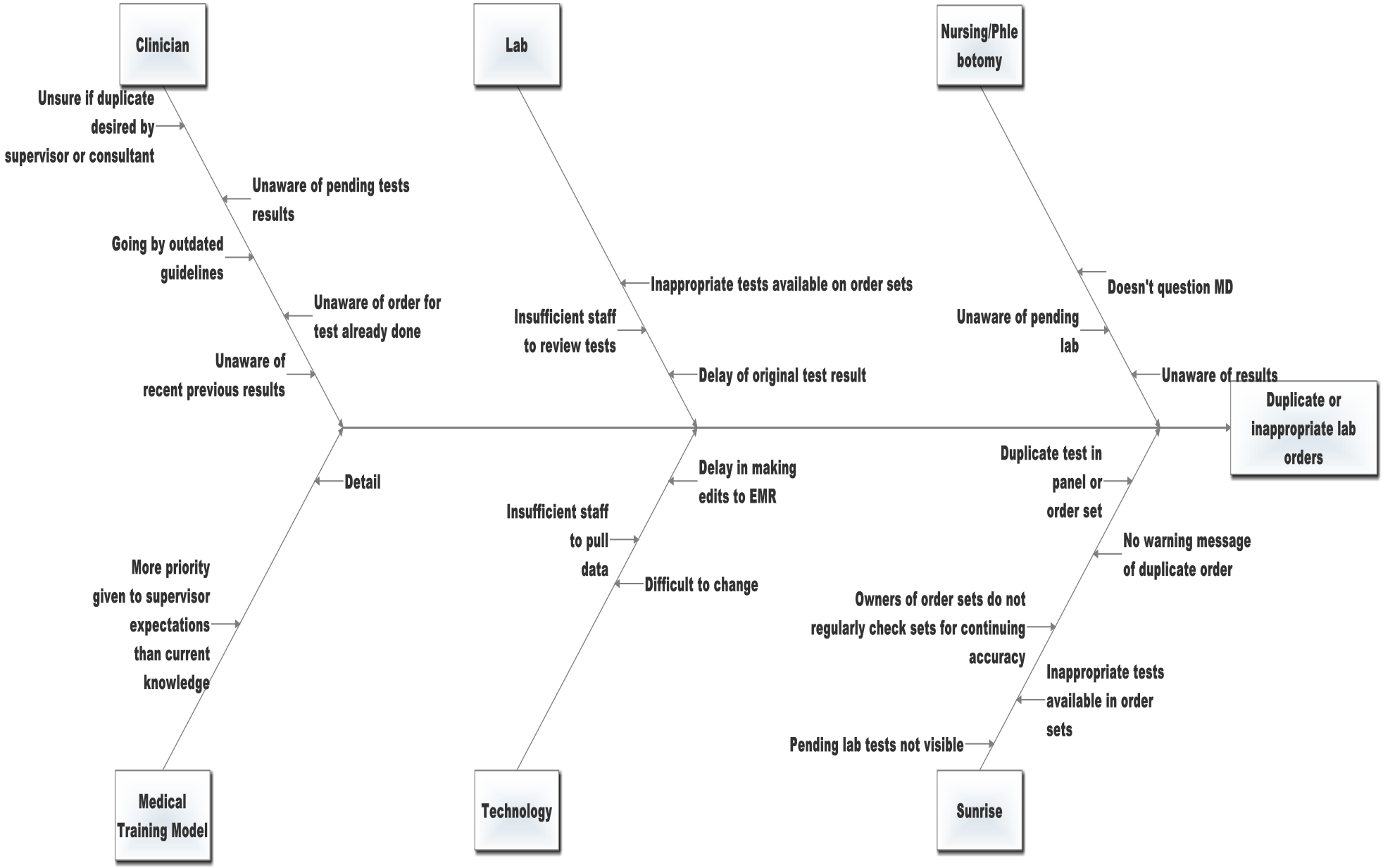
Huck, Amelia, and Kent Lewandrowski. "Utilization Management in the Clinical Laboratory: An Introduction and Overview of the Literature." *Clinica Chimica Acta* 427 (2014): 111-17.

PLAN: Create a Process

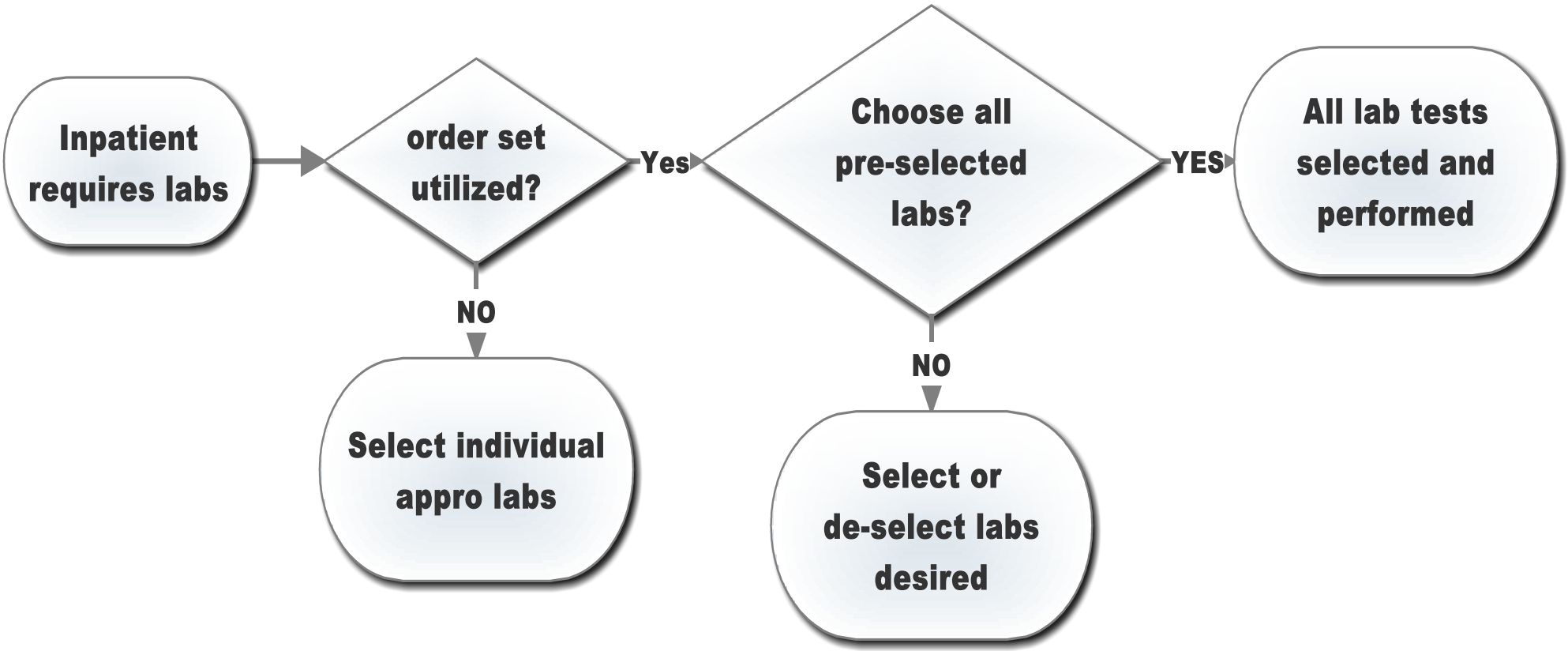
Focus on three groups to improve lab ordering practice at UHS

- **Obsolete Tests**
  - Current literature and practice no longer recommends the use of that test
- **Inappropriate Tests**
  - The test is misordered due to lack of knowledge that a more appropriate test for the patient's clinical situation is available
- **Overutilized Tests**
  - Tests may be clinically pertinent
  - However, the continued re-ordering within a certain time frame is not appropriate

Current Laboratory Test Orders



Current State for Ordering Labs on an order set



ELIMINATION/REDUCTION OF AN OBSOLETE TEST: CK-MB

CK-MB Background
A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines, 2014

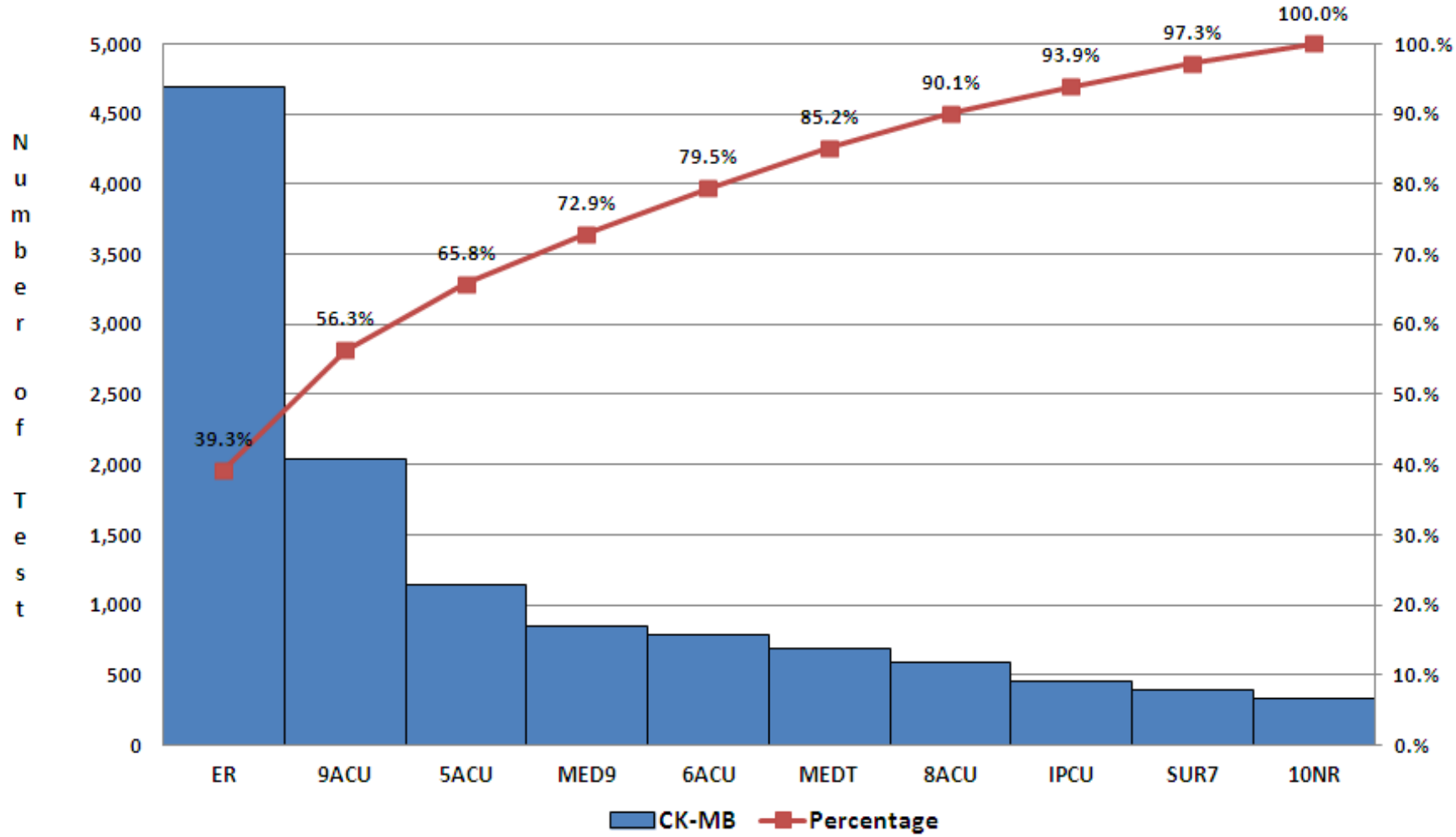
Table 5. Summary of Recommendations for Cardiac Biomarkers and the Universal Definition of MI

Recommendations	COR	LOE	References
Diagnosis			
Measure cardiac-specific troponin (troponin I or T) at presentation and 3—6 h after symptom onset in all patients with suspected ACS to identify pattern of values	I	A	(21, 64, 67-71, 152-156)
Obtain additional troponin levels beyond 6 h in patients with initial normal serial troponins with electrocardiographic changes and/or intermediate/high risk clinical features	I	A	(21, 72-74, 157)
Consider time of presentation the time of onset with ambiguous symptom onset for assessing troponin values	I	A	(67, 68, 72)
With contemporary troponin assays, CK-MB and myoglobin are not useful for diagnosis of ACS	III: No Benefit	A	(158-164)
Prognosis			
Troponin elevations are useful for short- and long-term prognosis	I	B	(71, 73, 165, 166)
Remeasurement of troponin value once on d 3 or 4 in patients with MI may be reasonable as an index of infarct size and dynamics of necrosis	IIb	B	(164, 165)
BNP may be reasonable for additional prognostic information	IIb	B	(87, 88, 167-171)

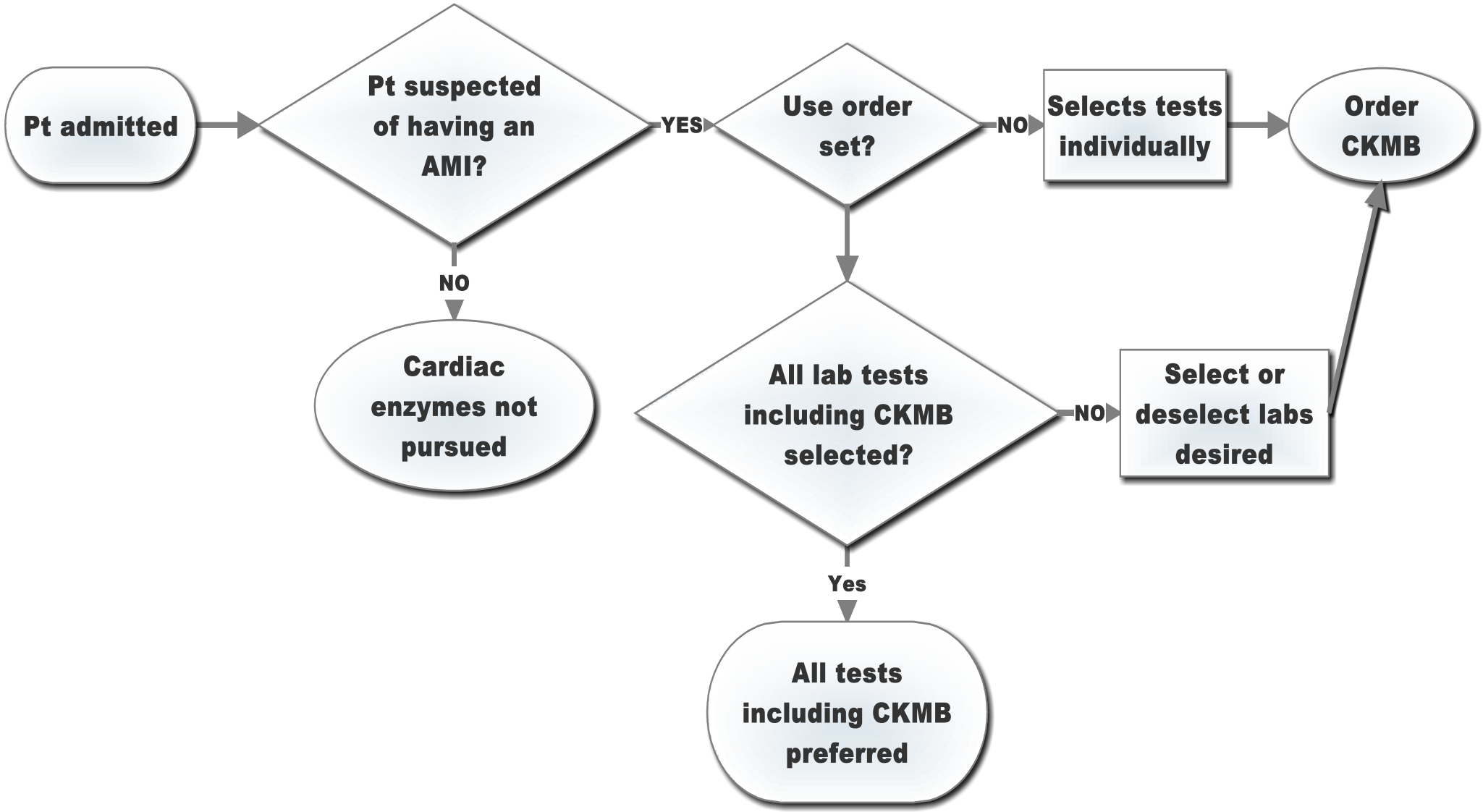
ACS indicates acute coronary syndromes; BNP, B-type natriuretic peptide; CK-MB, creatine kinase myocardial isoenzyme; COR, Class of Recommendation; LOE, Level of Evidence; and MI, myocardial infarction.

Amsterdam, Ezra A et al. (2014) AHA/ACC Guideline for the Management of Patients With Non–ST-Elevation Acute Coronary Syndromes. *Journal of the American College of Cardiology* (14) 06279-2. 10.1016/j.jacc.2014.09.017 JAC 20608

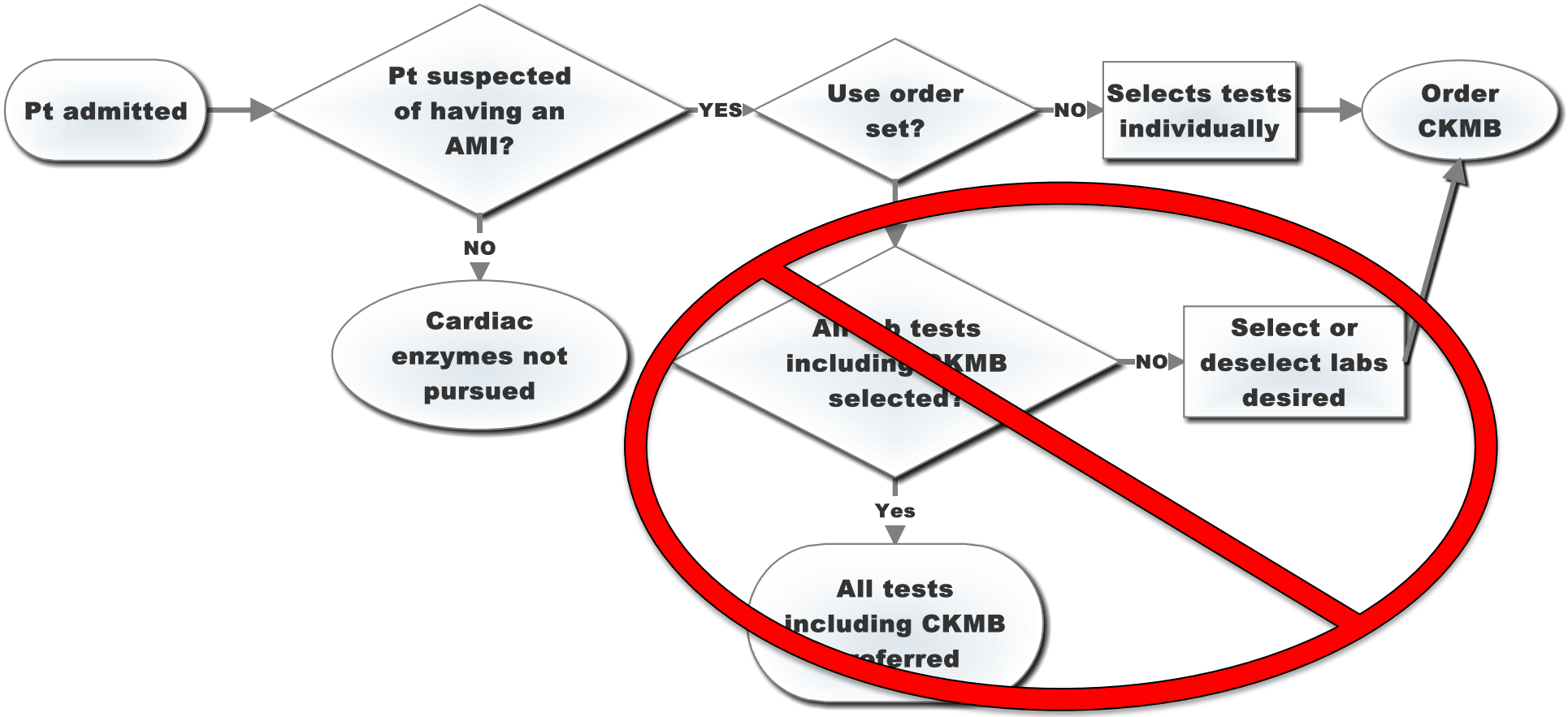
Pre-Intervention Data 2014
UHS Top 10 Highest Use Locations
CK-MB



Current State Process: CK-MB Lab Test



Intervention: CK-MB Lab Test

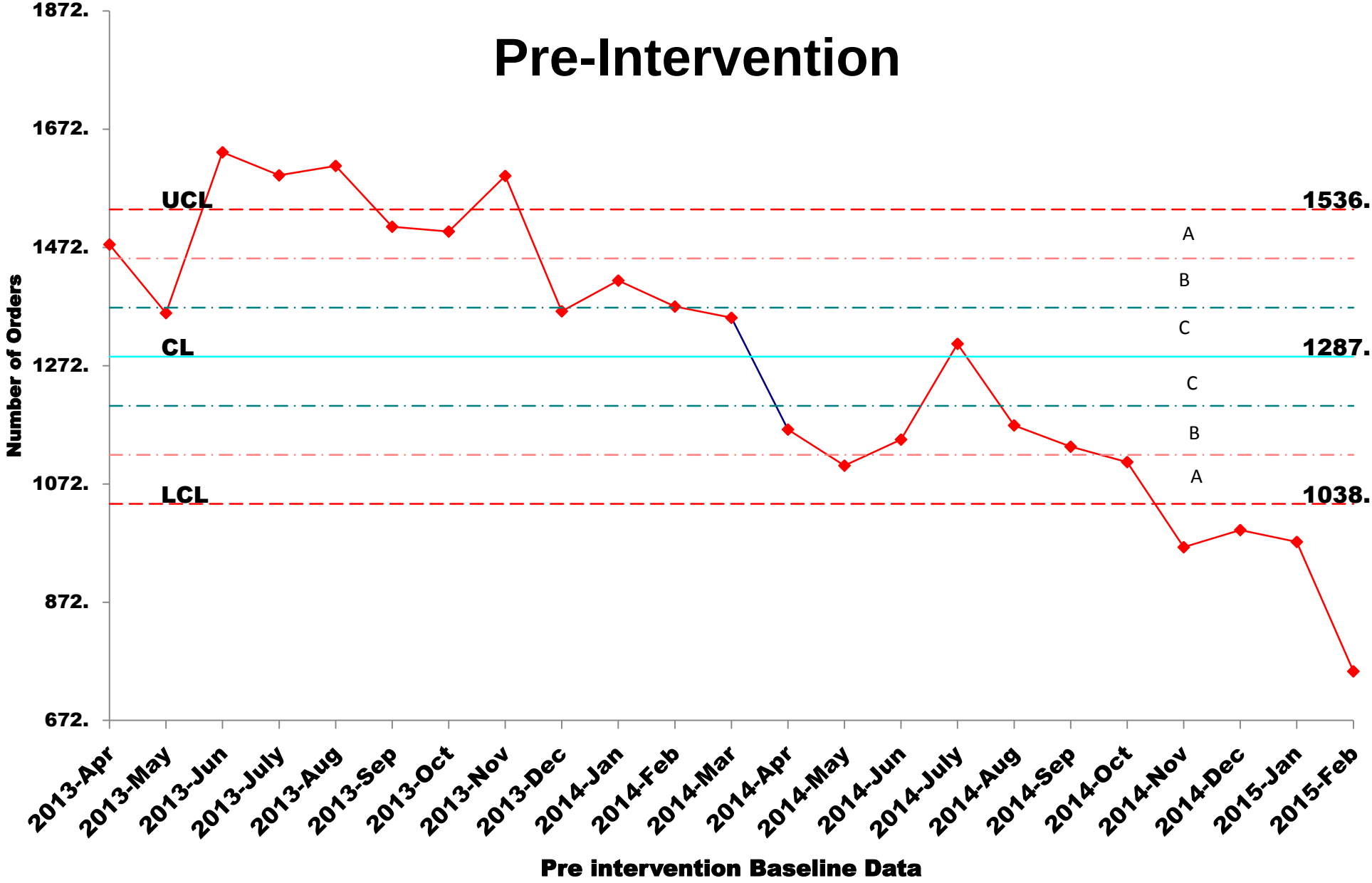


CK-MB was removed from ALL order sets 2/18/15

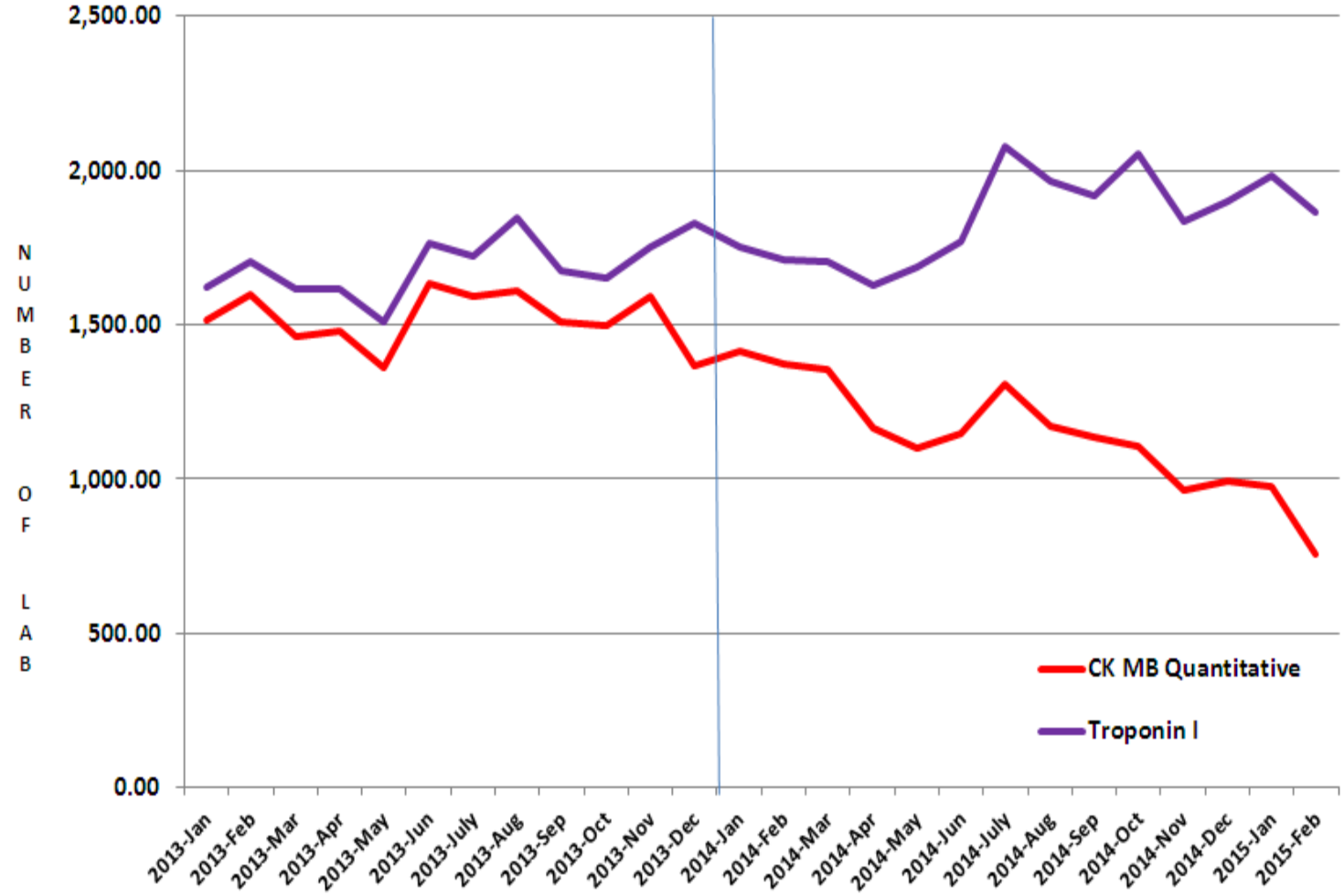
- In combination with prior efforts and interventions of the Lab Utilization Advisory Sub-Committee and the CS&E project, team members
- CK-MB remains as an orderable test, but has to be ordered consciously and not within a order set

UHS Inpatient Lab Orders for CK-MB

Data Source: Sunrise



Pre-Intervention Data
UHS Inpatient Lab Orders for CK-MB and Troponin I
Jan 2013 - Feb 2015



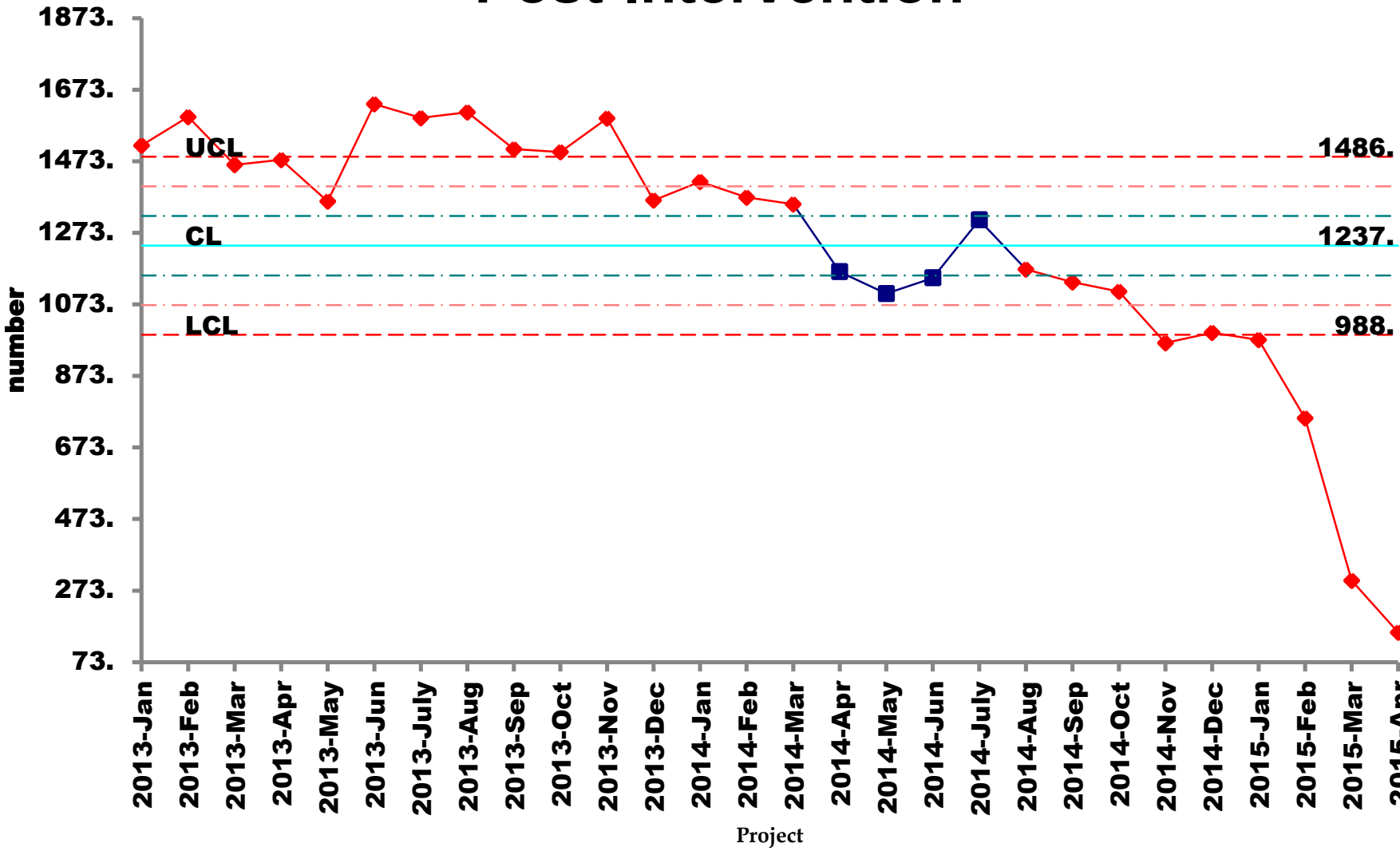
SOURCE: SUNRISE

HEALTH ANALYTICS

UHS Inpatient CKMB Lab Orders

Source: Sunrise

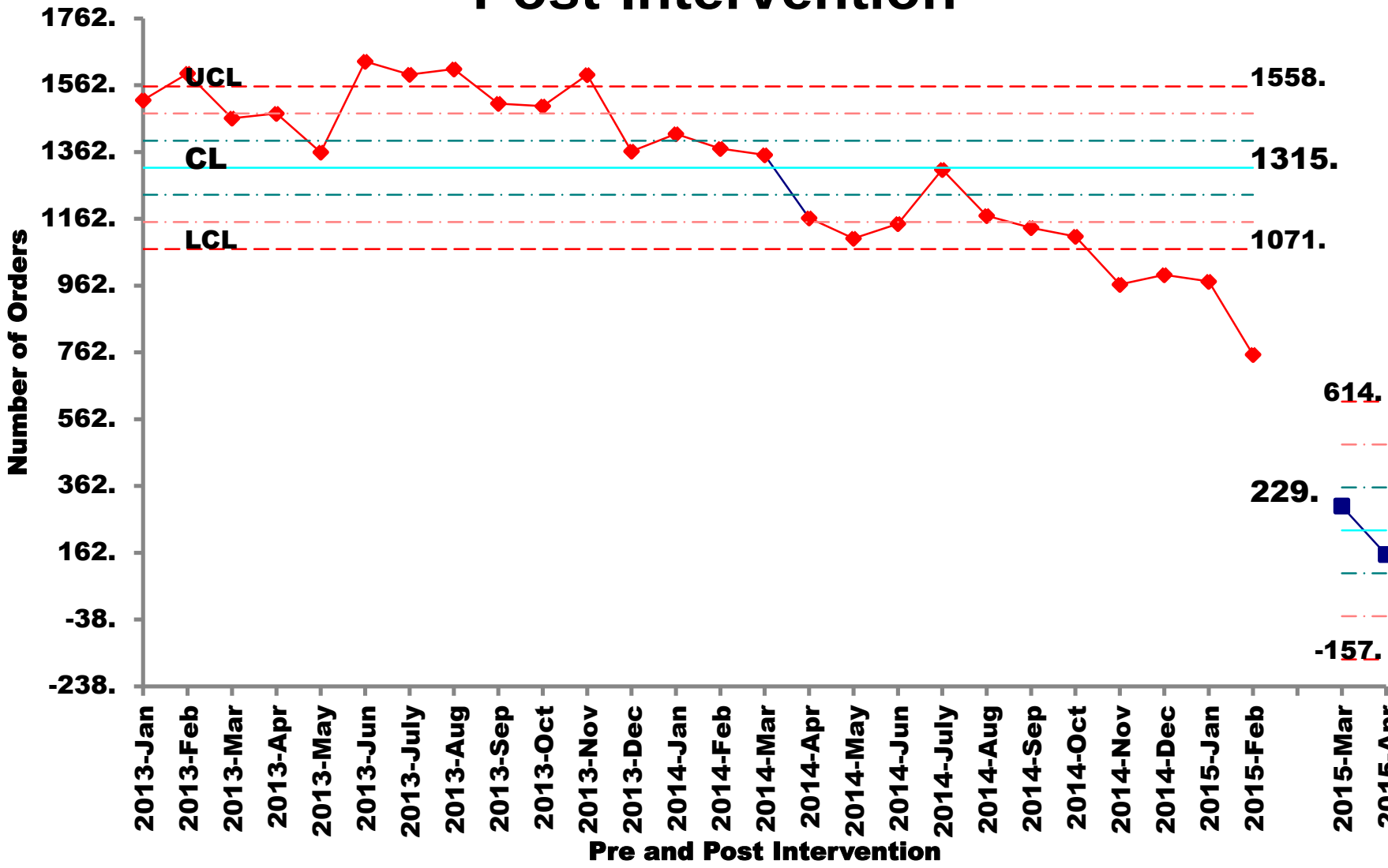
Post-Intervention



UHS Inpatient Lab Orders for CK-MB

Source: Sunrise

Post-Intervention



Reduction of an Overutilized test: Serum Magnesium

Serum Magnesium Background

- **Dietary mineral** essential to many metabolic reactions in the body
  - Carbohydrate and energy metabolism
  - DNA and protein synthesis
  - Nerve and muscle function
  - Ion channel regulation

- **Absorption** occurs throughout intestine and renal secretion or reabsorption balances the store of Mg^{2+} when plasma levels are altered

- Hypomagnesimia occurs more often than hypermagneseima

Jahnen-Dechent, W., and M. Ketteler. "Magnesium Basics." *Clinical Kidney Journal* 5.Suppl 1 (2012): I3-I14. Web.

Serum Magnesium Background: Causes of Hypomagnesemia

- **Dietary deficiency**
- **Decreased absorption**
  - Diarrhea, malabsorbtion & steatorrhea
  - Genetic disorders
  - Pancreatic insufficiency
  - Cholestatic liver disease
  - Intestinal pathology (infection, gluten enteropathy, intestinal obstruction, villous adenoma, IBD)
- **Renal losses**
  - Tubular dysfunction
  - Genetic diseases
  - Diabetes
- **Metabolic diseases**
- **Alcohol abuse**
- **Medications**
  - PPIs, Diuretics, antibiotics (aminoglycosidem amphoteracin, pentamidine), calcineurin inhibitors, Csiplatin, Anti-EGFR therapies
- **Endocrine dysfunction**
  - Hypoparathyroidism, hyperthyroidism, hyperaldosteronism
- **Acute and chronic illness**
  - 7-11% hospitalized patients
  - Up to 61% in Adult SICU patients
  - Up to 70% in Pedi ICU patients
- **Iatrogenic**
  - Chemotherapy, immunotherapy, radiotherapy
  - Transfusion, dialysis, hyperalimentation

Jahnen-Dechent, W., and M. Ketteler. "Magnesium Basics." *Clinical Kidney Journal* 5.Suppl 1 (2012): I3-I14. Web.

Serum Magnesium Background: Monitor for Hypermagnesimia

- End stage renal patients on Mg treatment
- Correction of symptomatic magnesium depletion
- Anti-convulsant in Pre-eclampsia/eclampsia
- Treatment of Torsades de pointes
- Treatment of severe acute asthma that remains after one hour of conventional therapy
  - Measure levels in asthma exacerbation who take diuretics or have coexistent cardiovascular disease
- Correction of electrolyte imbalances in burn patients

Jahnen-Dechent, W., and M. Ketteler. "Magnesium Basics." *Clinical Kidney Journal* 5.Suppl 1 (2012): I3-I14. Web.

Serum Magnesium Background

ROSENBLOOM ET AL., Interventions to Regulate Serum Magnesium Ordering

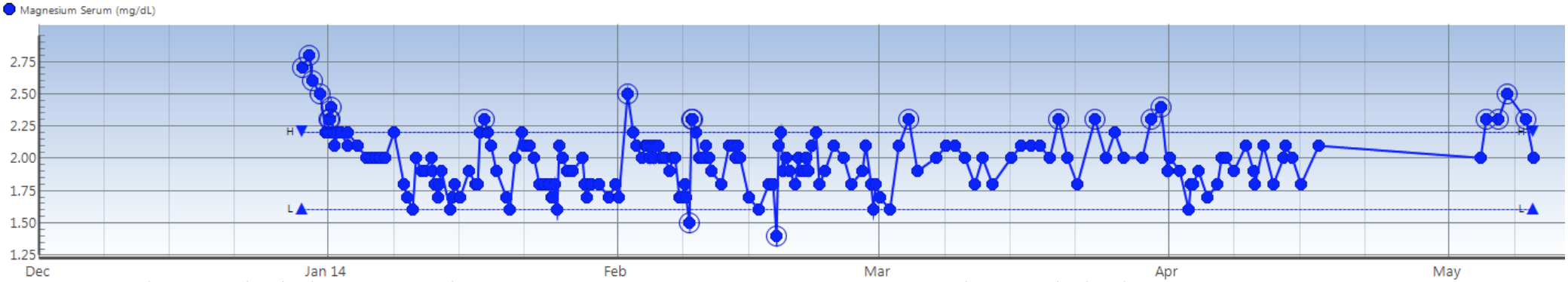
Table 2. Institutional Guidelines for Serum Magnesium Testing

- Routine or repeated magnesium testing is not indicated unless evidence from the clinical evaluation of the patient suggests magnesium deficiency.
- If magnesium is thought to have therapeutic value and the patient does not have renal failure, then simply give it, since serum magnesium levels are not sensitive enough to guide this kind of empirical replacement therapy.
- Healthy-eating persons generally do not require any magnesium supplementation unless their levels are less than 1.0 mg/dL, and repeated magnesium testing is not needed in such individuals, unless new indications arise.
- Almost never give magnesium to someone with significant renal impairment.
- Correct any serum magnesium level for albumin before treating an asymptomatic patient.

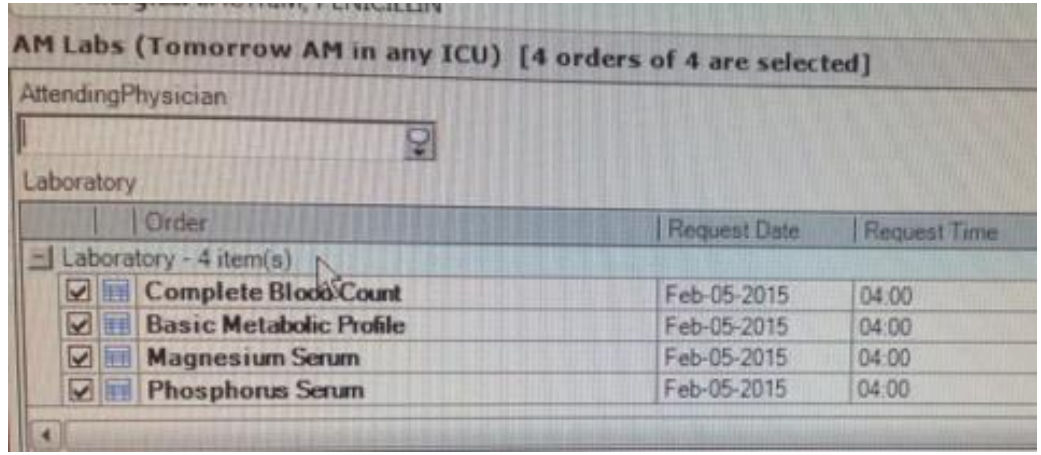
Rosenbloom, S. T. "Interventions to Regulate Ordering of Serum Magnesium Levels: Report of an Unintended Consequence of Decision Support." *Journal of the American Medical Informatics Association* 12.5 (2005): 546-53. Web.

Rose, William D., Julia E. Martin, F. Matthew Abraham, Rebecca L. Jackson, Janet M. Williams, and Erdogan Gunel. "Calcium, Magnesium, and Phosphorus: Emergency Department Testing Yield." *Academic Emergency Medicine* 4.6 (1997): 559-63. Web.

Magnesium Current Ordering Capabilities



* Unlimited ability to order Magnesium as many times as desired daily
  * Example of a patient admitted as an medicine inpatient and the orders/results for magnesium over his admission

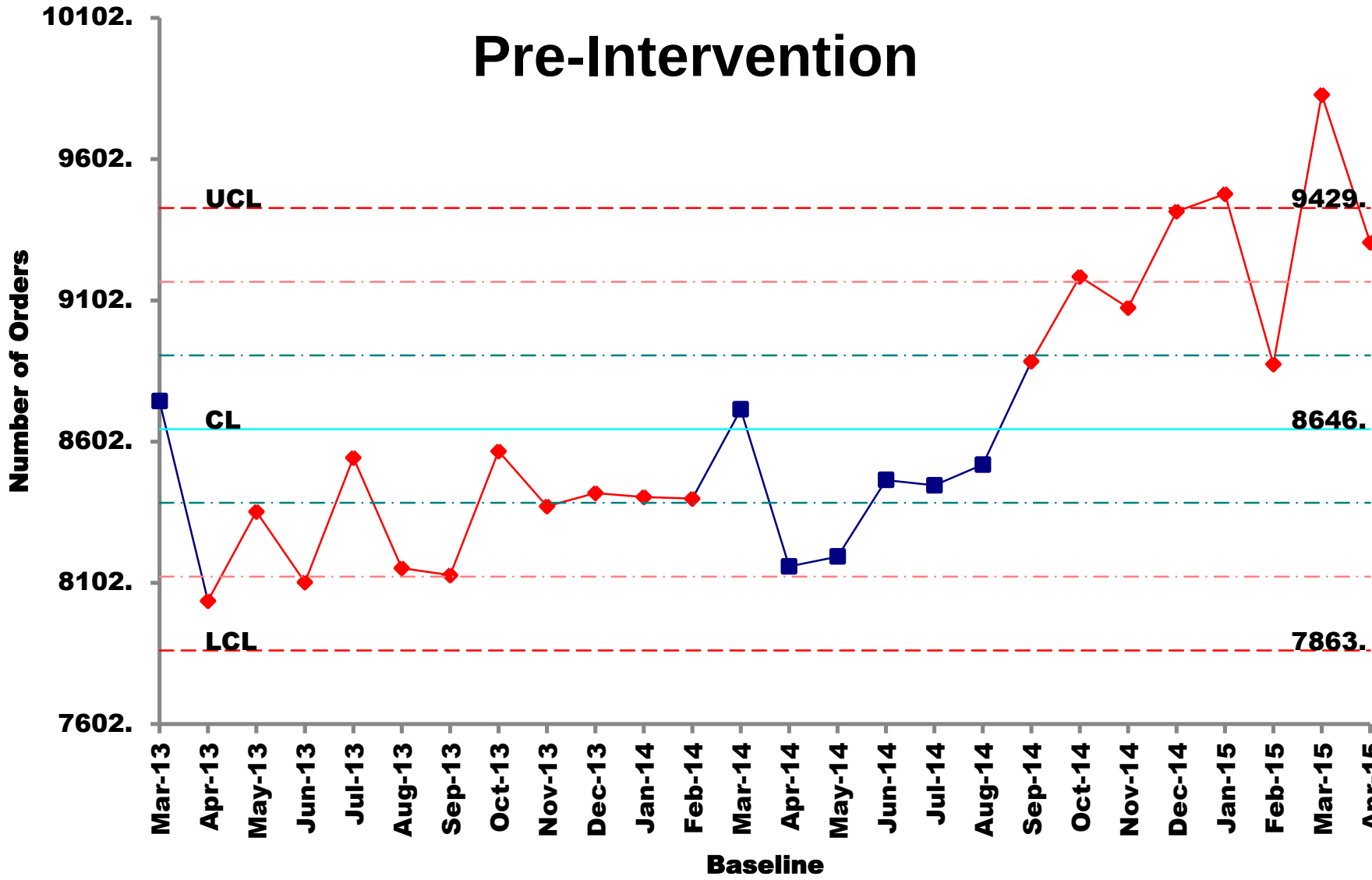


* 206 order sets contain serum Magnesium
  * 89 of the 206 order sets have serum Magnesium pre-checked

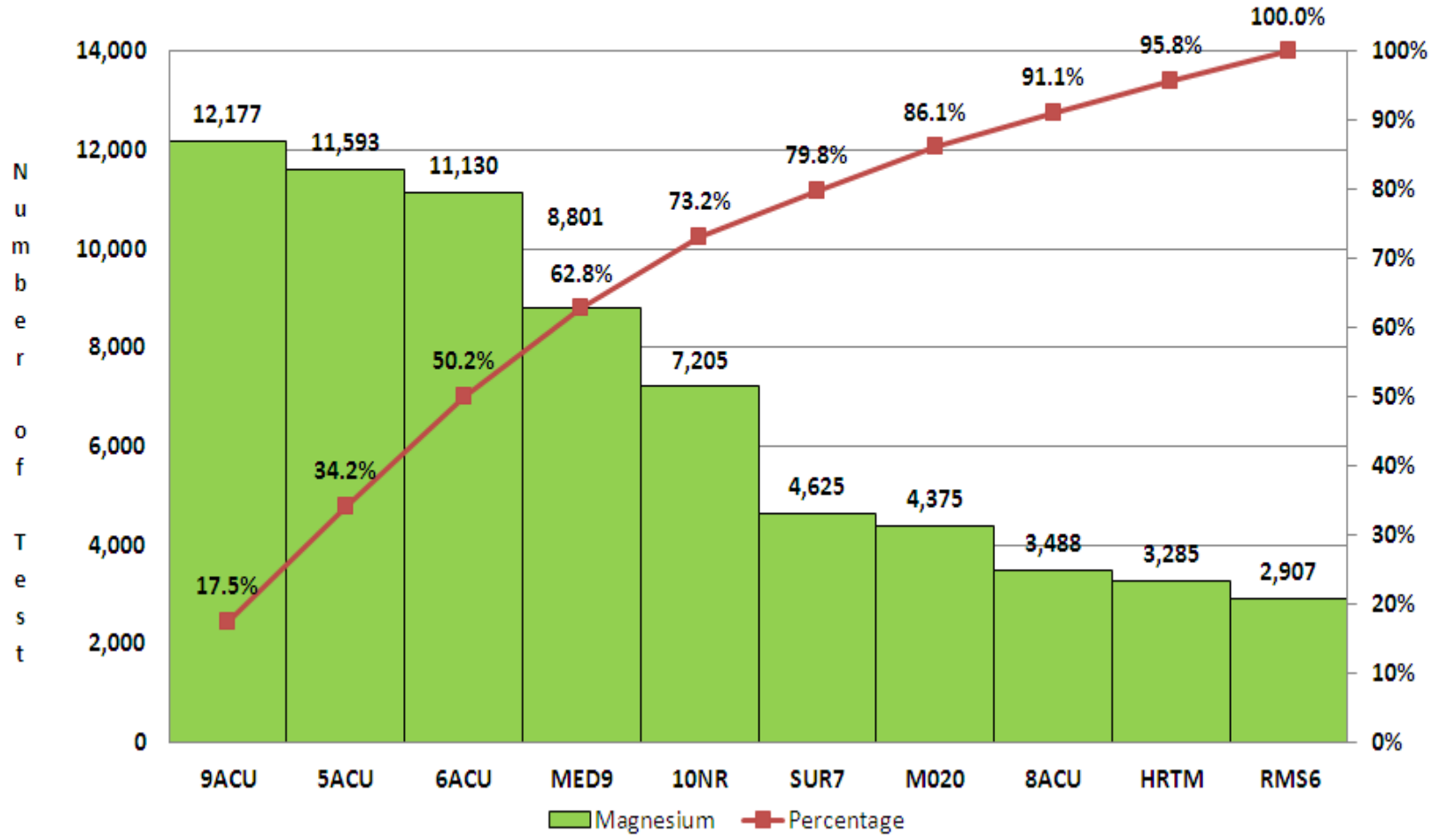
* Clinicians created a "Chem 10" order set which can be embedded in other order sets composed of BMP + Mg+ Phos

UHS Inpatient Serum Magnesium Orders

Source: IDX



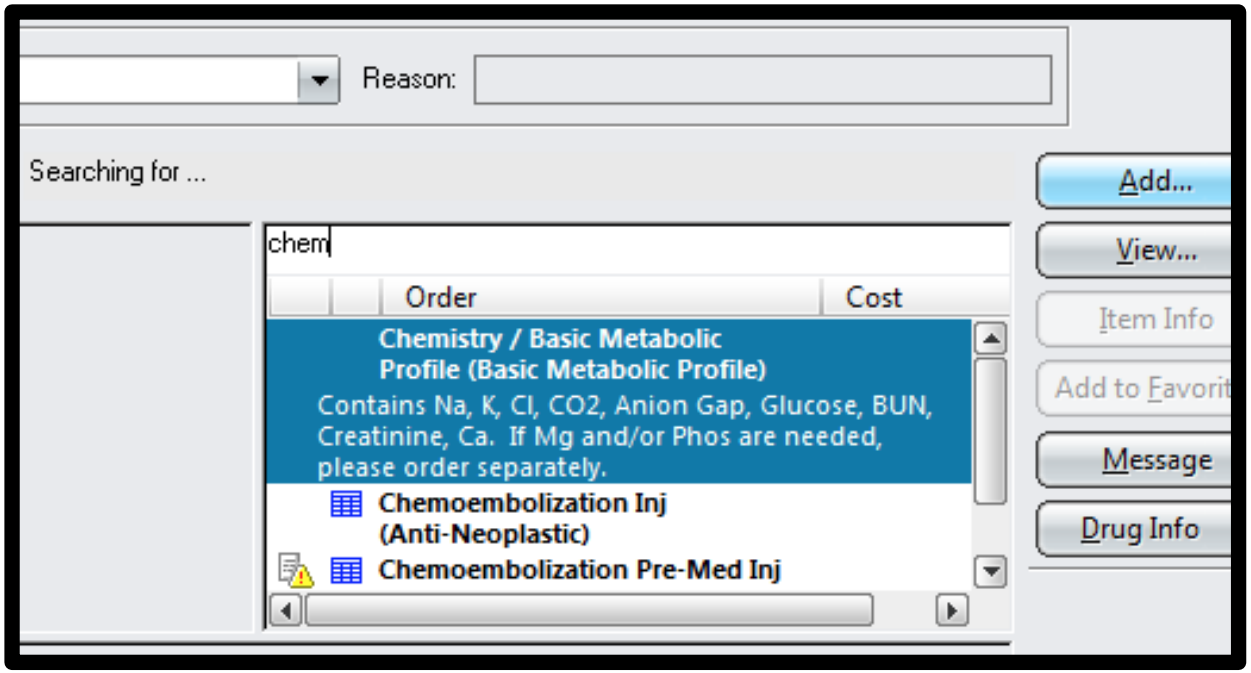
2014 Pre-Intervention Serum Magnesium Data
UHS top 10 Highest Use Locations

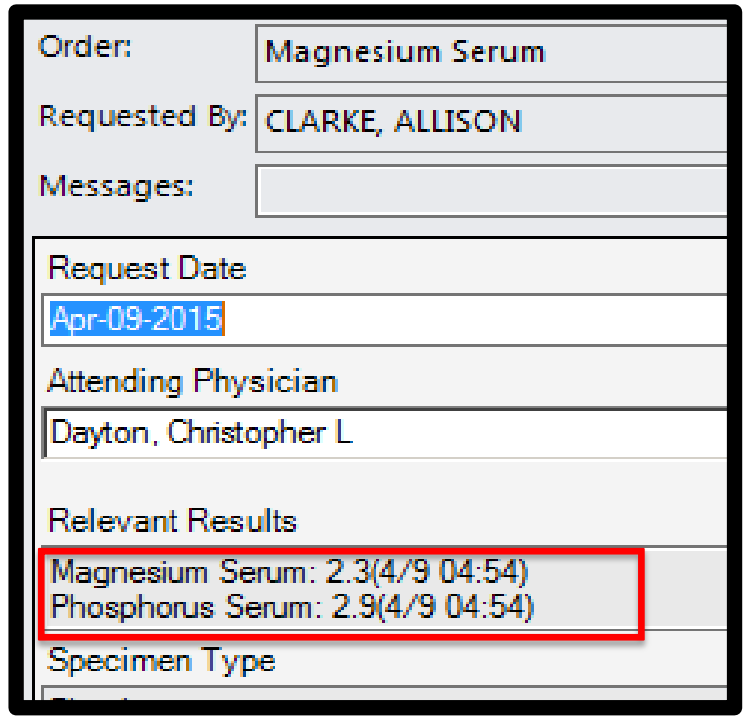


Serum Magnesium Interventions to Reduce Over Utilization

State Pre-intervention	Intervention	Date implemented
Clinicians created a “Chem 10“ order set (BMP + Mg + Phos) Was created by 14 different services Can be embedded in other order sets (i.e. admitting orders)	Remove “Chem 10” order sets Replace with options to order BMP, Mg and Phos Clinicians can order each separately if truly desired	Removed 7 order sets 4/14/14 Removed last remaining 7 order sets 4/9/15
No alert of prior order entries or results	Clinical decision support tool (CDST) as an informational alert To alert ordering physicians of pending serum magnesium orders Will provide physician ordering, the Magnesium results that were performed within the last 24 hours	4/9/15
Unlimited order capability daily	Limit the maximum times magnesium can be ordered per day to 6 times a day (q 4hours) A notification will alert when a new order is placed that will tell them the ordering capability is exceeded.	4/9/15

Interventions: Examples



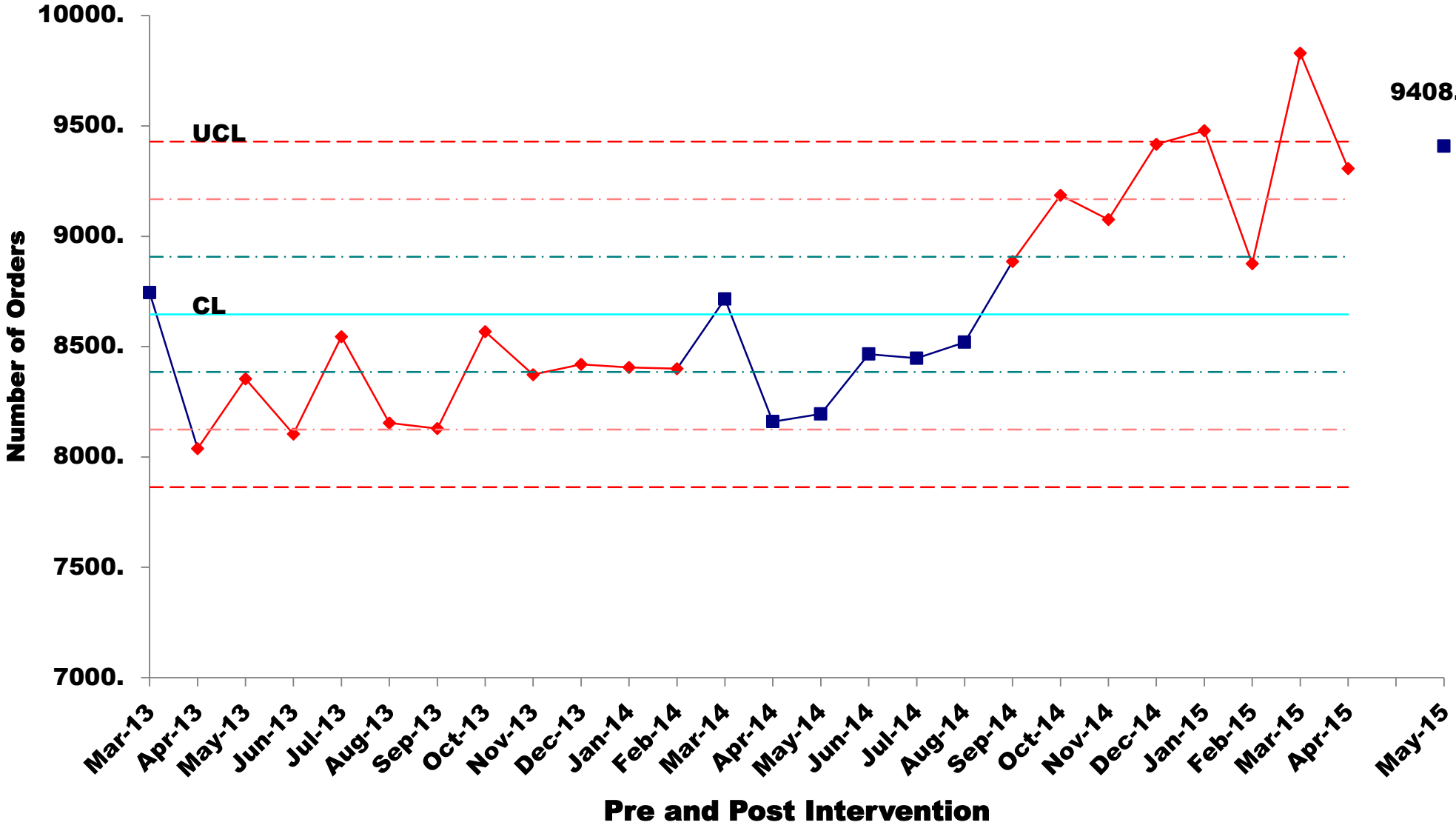


- Remove “Chem 10” order set
- Replaced within existing order sets as BMP, Mg & Phos to be ordered individually
- Search for Chem reveals Chem profile and instructions to order Mg and Phos individually if needed

- Placed an informational alert
- Shows time and results of last time Mg & Phos ordered

UHS Inpatient Serum Magnesium Lab Orders

Source: IDX



For the future of Magnesium

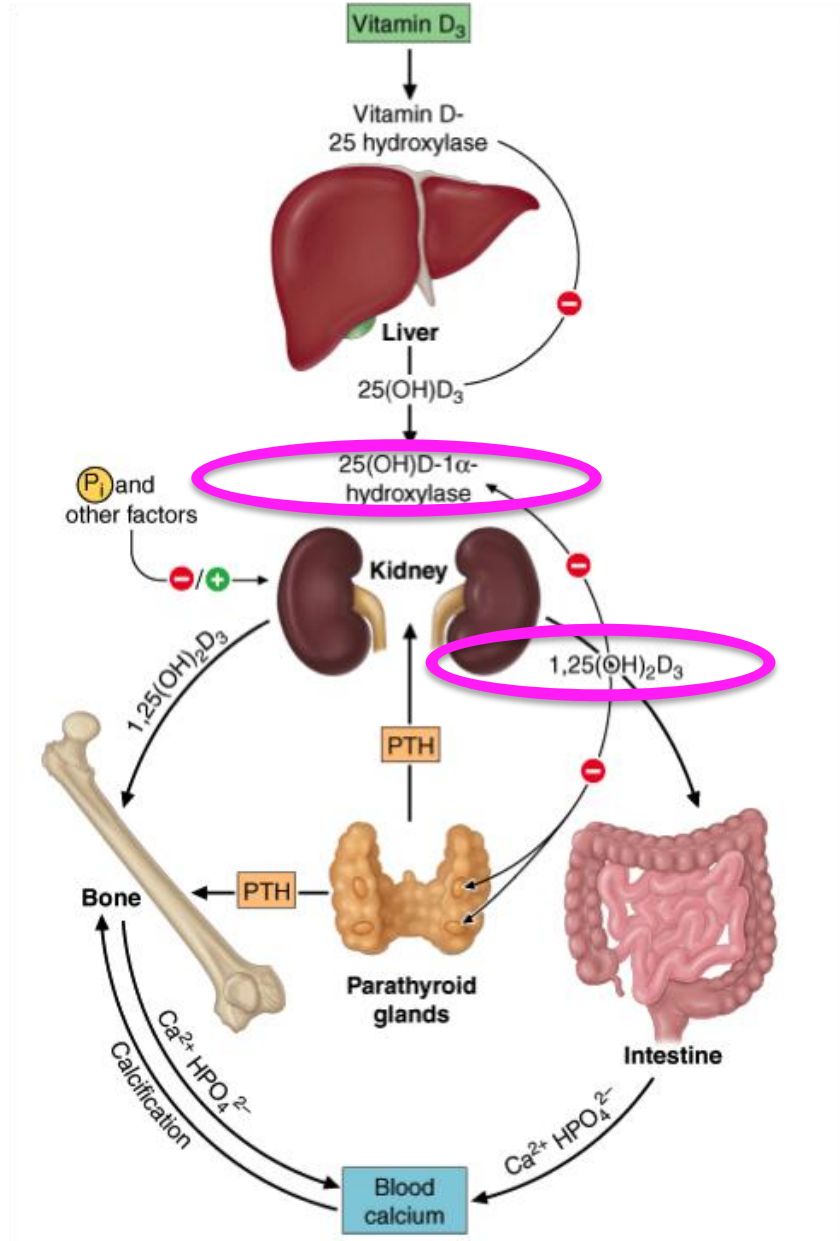
- Currently, Magnesium remains pre-checked in 89 of 206 order sets
  - Important examples where Magnesium is pre-checked includes:
    - “A.M. labs Hartman”
      - used by other services in the new tower since Hartman no longer exists
    - “A.M. labs (tomorrow for any ICU)”
- Next logical step to attain goal would be to talk with clinical services that have Magnesium pre-checked in order sets to determine proper utilization and remove pre-checked status upon agreement

REDUCTION OF A POTENTIALLY INAPPROPRIATE TEST: 1,25(OH) VITAMIN D

Vitamin D Background

- **Vitamin D, 25-Hydroxy**
  - This test is appropriate for assessment of vitamin D status, including general population screening for deficiency
  - It can also be used for assessment of hypocalcemia

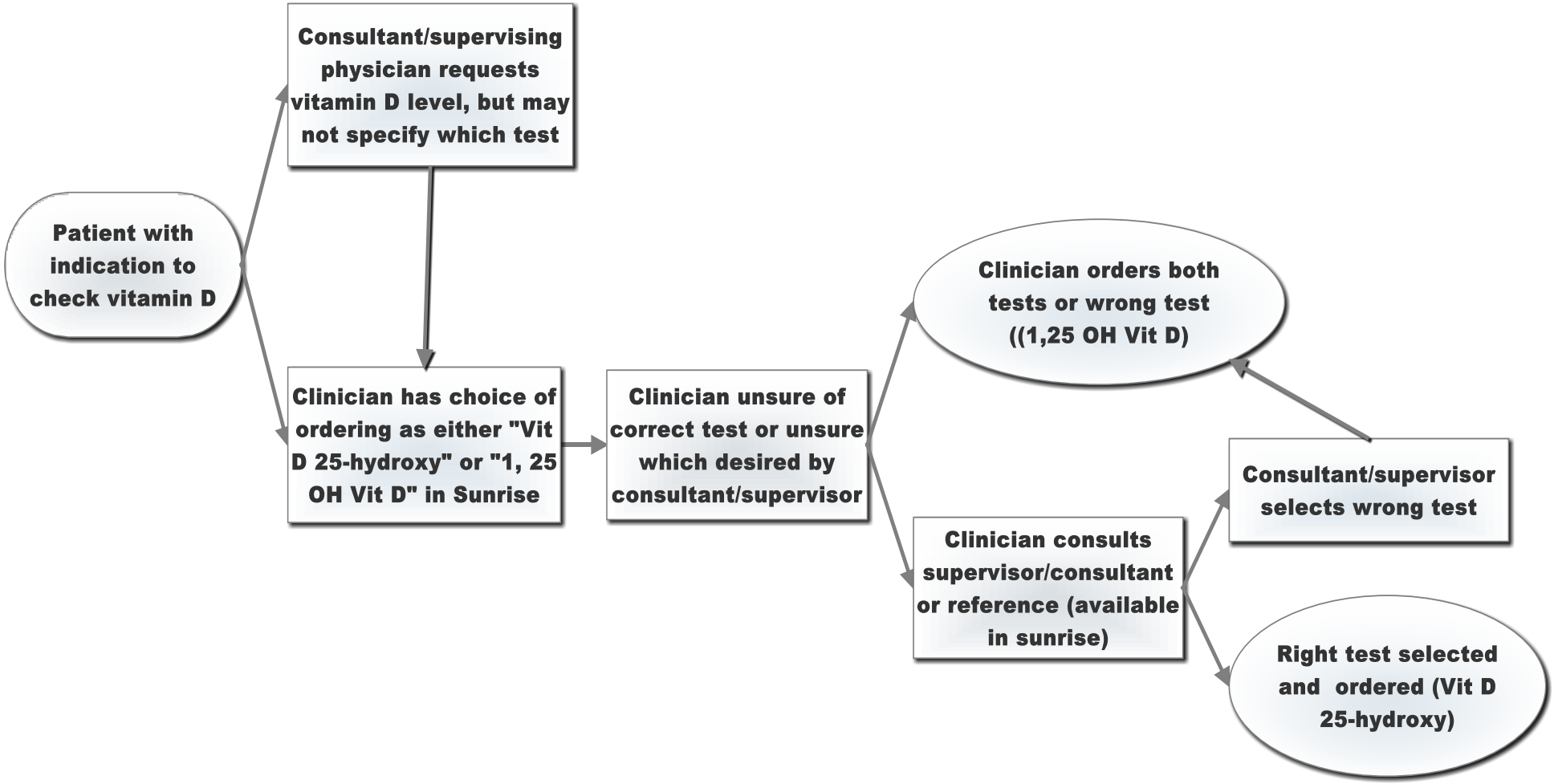
- **Vitamin D, 1,25-Dihydroxy**
  - This test is primarily indicated during patient evaluations for hypercalcemia and renal failure
  - It should not be used to diagnose vitamin D deficiency



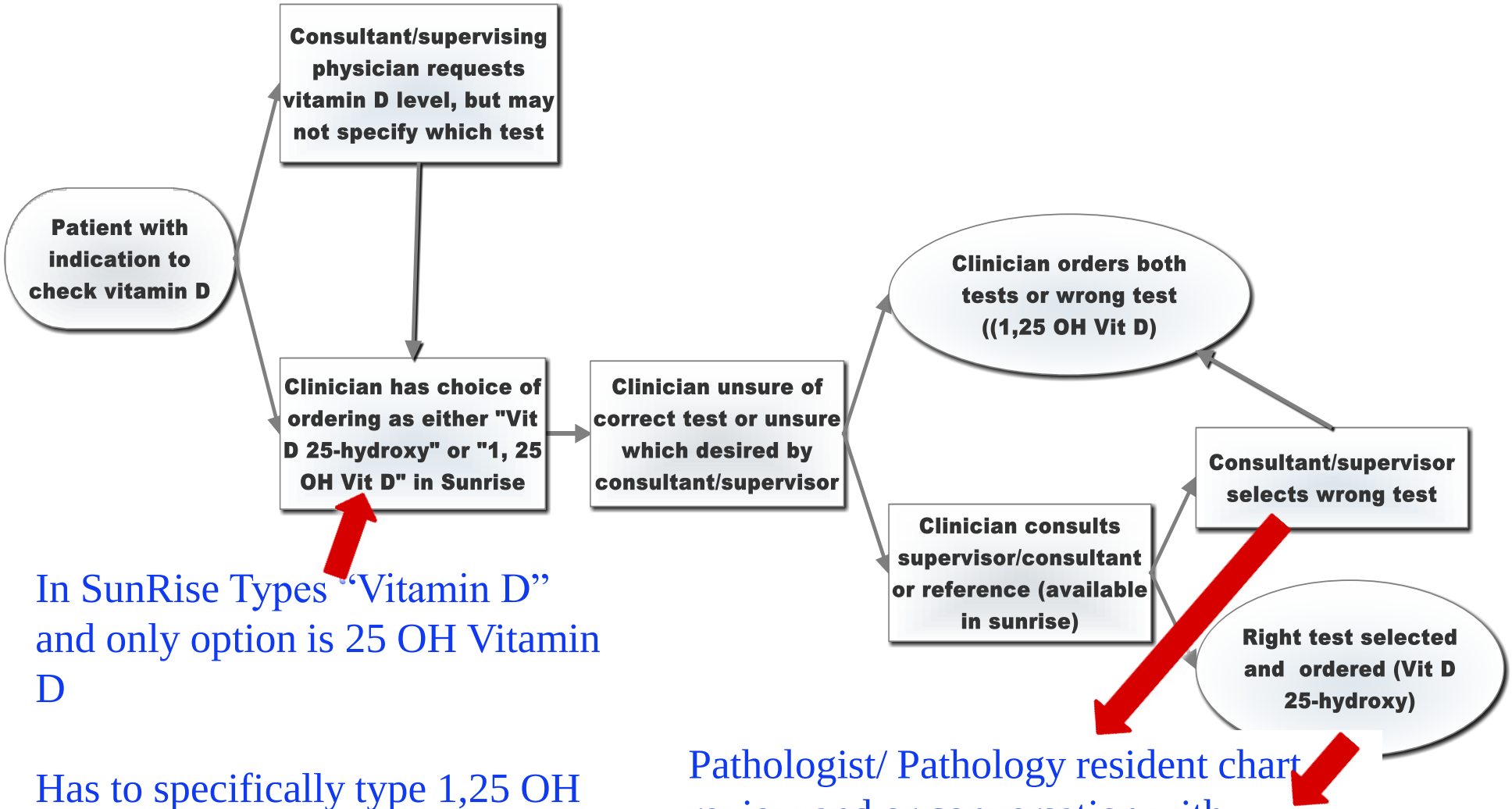
Source: Fauci AS, Kasper DL, Braunwald E, Hauser SL, Longo DL, Jameson JL, Loscalzo J: *Harrison's Principles of Internal Medicine*, 17th Edition: http://www.accessmedicine.com

Holick, M. F., N. C. Binkley, H. A. Bischoff-Ferrari, C. M. Gordon, D. A. Hanley, R. P. Heaney, M. H. Murad, and C. M. Weaver. "Evaluation, Treatment, and Prevention of Vitamin D Deficiency: An Endocrine Society Clinical Practice Guideline." *Journal of Clinical Endocrinology & Metabolism* 96.7 (2011): 1911-930. Web.

Vitamin D Current State Ordering Process



Vitamin D Current State Process after interventions June 2013



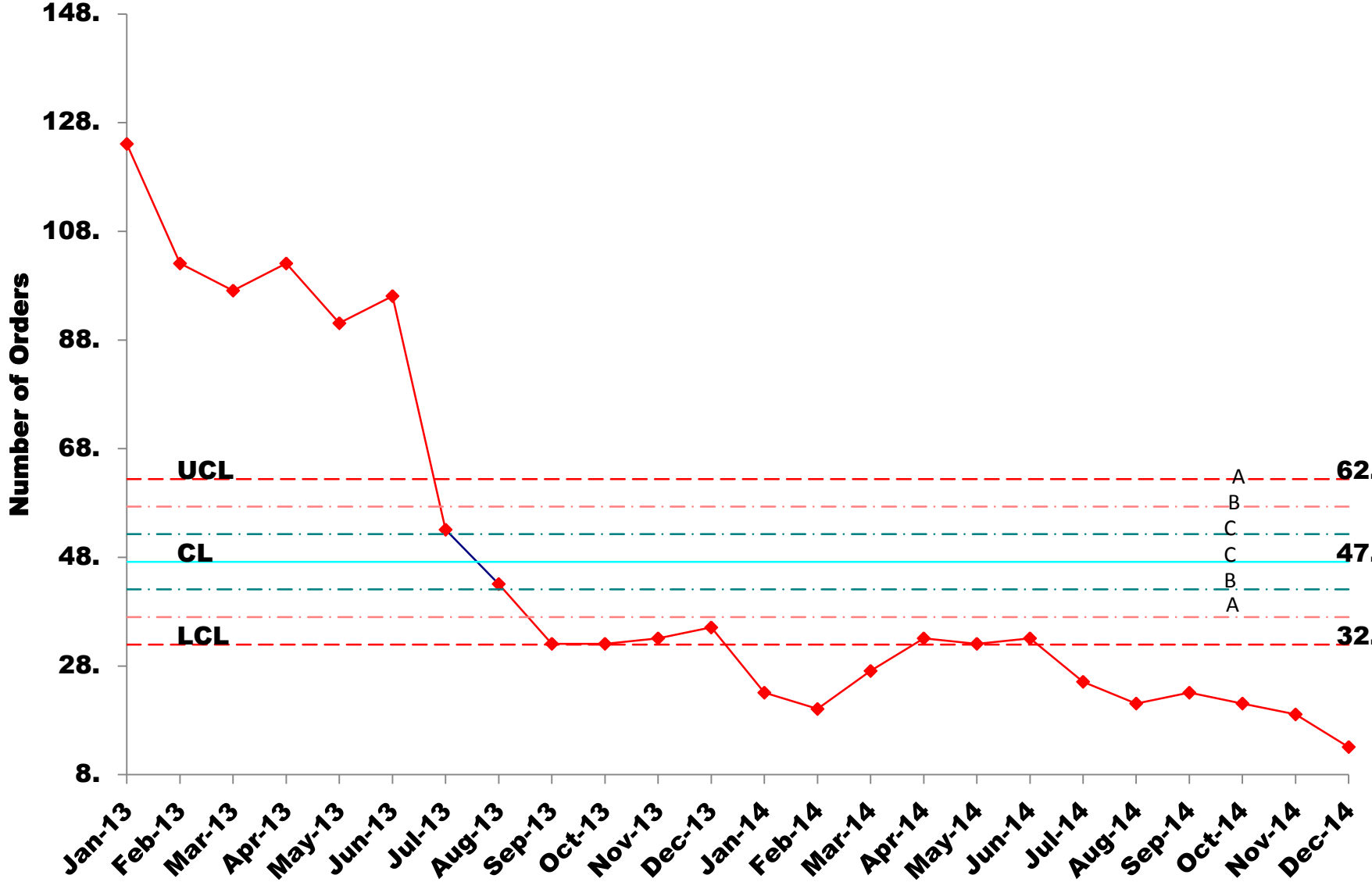
In SunRise Types "Vitamin D" and only option is 25 OH Vitamin D

Has to specifically type 1,25 OH to get 1,25 OH Vitamin D

Pathologist/ Pathology resident chart review and or conversation with ordering clinician for appropriateness of Vit 1,25 OH orders

UHS Inpatient Lab Orders for Vit D (1-25) Dihyroxy

Data Source: ARUP



Prior intervention June 2013- Renamed Vit D 1,25 to 1,25 OH Vitamin D.
Will not be visible if type in Vitamin D & Pathologist review for appropriateness of all orders

Vitamin D 1-25 OH & Lessons learned from prior interventions

- This intervention was unknown to most laboratory staff
- Data had not been collected to confirm that intervention was effective
- In the future, better documentation of interventions and tracking of data to confirm effectiveness of interventions is needed

Return on Investment for CKMB and Mg

CKMB HARD SAVINGS

2014 Annual Variable Cost - $42,156.80
(*Annual 2014 Volume* 7528 x *Variable Cost per test* $5.60)

2015 Annual Variable Cost - $13,766.80
(Annualized 2015 Volume 2460 x Variable Cost per Test $5.60)

Annual Potential Cost Savings - $42,1566.80-$13,766.80 = $28,380.80

Mg HARD SAVINGS

More work to be done….

Return on Investment/Gains

SOFT SAVINGS/GAINS

- Decreased Turnaround Time
- Increased Physician Satisfaction
- Re-Deploying staff to other laboratory testing duties/ increased productivity
- Increased Efficiency
- Cost Avoidance of Inappropriate Ordering and Patient Results
- Avoiding duplicate orders on same patient

Act: Sustaining Results

Planned process (still in development), led by UHS Laboratory Utilization Advisory Subcommittee (LUASC)

- **Continue to monitor ordering practices at UHS**
  - Follow up on previous interventions
  - Identify additional obsolete/inappropriate/over-utilized tests
  - Monitor ordering trends that may signal changing practice

- **Interventions, as appropriate**
  - Order set management
    - Regular Review of Order Sets (Annual by creating service)
    - Standardized process for approval of new order sets before implementation
    - Remove “pre-checked” labs from order sets where appropriate
  - Employ clinical decision support tools (CDST) to assist in computerized physician order entry (CPOE) process
  - Remove obsolete tests from Sunrise Orderable Lists
  - Remove from Lab Formulary
  - Establish testing guidelines and algorithms

- **Feedback from LUASC to clinicians**

Act: Sustaining the results

- **Communication and education of clinical providers**
  - **Clinical decision support tool (CDST):** "Soft Stop" to educate ordering physicians
  - **Memo from CEO/CMO to educate about *The Choosing Wisely* Campaign**
    - An initiative of the ABIM Foundation
    - American Society of Clinical Pathologists has joined the campaign for appropriate test utilization
      - Determined a list of tests that laboratories should focus on for appropriate lab test utilization (including CK-MB)
    - Demonstrate UHS involvement in this initiative
      - Order the right test, at the right time, on the right patient
  - **Present to Hospital Performance Council** to communicate improvements to and engage clinical providers
    - Introduce physicians to lab utilization initiatives and accomplishments
    - Improve the system for laboratory test ordering

Did we meet our goals in our aim statement?

- **Create a process** to easily identify and intervene on obsolete, inappropriate or over-utilized laboratory tests at UHS by May 31, 2015, to promote appropriate patient care, safety and financial responsibility.
- This project will be exemplified by three target tests:
  - **Eliminate/reduce** an **obsolete** test, **CK-MB**, to <50% of baseline data
  - **Reduce inappropriate** inpatient orders of **1, 25-dihyroxyvitamin D** to <50% of baseline data
  - **Reduce overutilization** of **Serum Magnesium** to <50% of baseline data

Conclusions: Did we meet our aim?

Create a process to easily identify and intervene on obsolete, inappropriate or over-utilized laboratory tests at UHS by May 31, 2015.

- **Framework has been created, but the process still needs to be finalized**

Eliminate/reduce an obsolete test, CK-MB, to <50% of baseline data

- **Baseline mean of CK-MB was 1315 tests ordered/performed**
- **Mean for post intervention (March & April) was 229 = 83% reduction in tests ordered/performed**

Reduce overutilization of Serum Magnesium to <50% of baseline data

- **Baseline mean of Mg was 8648 tests ordered/performed**
- **Mean post intervention was ___?__= _____% reduction in tests ordered/performed**

Reduce inappropriate inpatient orders of 1, 25-dihyroxyvitamin D to <50% of baseline data

- **Previous interventions made which were not common knowledge**
  - **Led to reduced inappropriate orders of Vit D 1,25; Served as an example of success**
- **Lesson learned: Interventions need to be documented, communicated, and followed over time to ensure desired effect is achieved and sustained**

Barriers/ Lessons Learned

- Acquiring data takes considerable time and effort
  - Lack of standardization of processes between departments (Medical records, IT, Laboratory, Clinical)
  - Process should be streamlined

- IT support is essential
  - Data acquisition, order set management
  - Clinical decision support tools (CDST) for “Soft or Hard Stops”
  - Other modifications to CPOE process to support appropriate test ordering

- Process for order set creation, approval and review needs to be streamlined
  - Improvements needed in process for regular review of existing order sets and approval of new ones
    - Appropriateness based on guidelines and evidence based medicine
    - At least annually
  - Create policies and identify roles (key clinical depts with “ownership” of each order set)

- Further work is needed to finalize this process across departments
  - LUASC has representation from all key departments and will lead process
  - Need support of administration

Team 9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Thank you!

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