

Klarisse Estepa &
Debra Davies

Reducing Unnecessary Calcium Testing in the ED

Risk factors for Hyper/Hypocalcaemia

- Parathyroid complications
- Malignancy
- Medications
- Calcium/Vitamin D Deficient
- Acid base disturbance
- Renal insufficiency
- Acute pancreatitis

Cp	Procedure	Order Information	Start Time	Order Set	Type	Advisory	Remove	Edit
<input checked="" type="checkbox"/>	Electrolytes, Creatinine, Glucose Profile GRL	Na, K, Cl, Creatinine, Glucose Wednesday, 12 June 2019 1423 ST/C GRL	12-Jun 14:23		new			
<input checked="" type="checkbox"/>	CBC GRL	Wednesday, 12 June 2019 1423 ST/C Blood EDTA GRL	12-Jun 14:23		new			
<input checked="" type="checkbox"/>	Bicarbonate, Plasma GRL	Wednesday, 12 June 2019 1423 ST/C Blood Plasma - Bio (Green) GRL	12-Jun 14:23		new			
<input checked="" type="checkbox"/>	Lipase GRL	Wednesday, 12 June 2019 1423 ST/C Blood Plasma - Bio (Green) GRL	12-Jun 14:23		new			
<input checked="" type="checkbox"/>	ALP GRL	Wednesday, 12 June 2019 1423 ST/C Blood Plasma - Bio (Green) GRL	12-Jun 14:23		new			
<input checked="" type="checkbox"/>	ALT GRL	Wednesday, 12 June 2019 1423 ST/C Blood Plasma - Bio (Green) GRL	12-Jun 14:23		new			
<input checked="" type="checkbox"/>	AST GRL	Wednesday, 12 June 2019 1423 ST/C Blood Plasma - Bio (Green) GRL	12-Jun 14:23		new			
<input checked="" type="checkbox"/>	Bilirubin Total GRL	Wednesday, 12 June 2019 1423 ST/C Blood Plasma - Bio (Green) GRL	12-Jun 14:23		new			
<input checked="" type="checkbox"/>	Calcium Total, Plasma GRL	Wednesday, 12 June 2019 1423 ST/C Blood Plasma - Bio (Green) GRL	12-Jun 14:23		new			

Order Selection Order History

Order Options

EM PROTOCOL

Emergency Protocol Laboratory Procedure Options

- CBC
- PT/INR
- aPTT
- Heparin anti-Xa level
- Lytes, Bicarb
- Liver Functions
- Amylase
- Creatinine
- Osmolality
- Urea, Plasma
- Ketones
- Glucose (Plasma)
- POCT Glucose
- Troponin I
- CMV PCR for blood
- ECG PRN
- ABG (Blood Gas - Arterial)
- Stool
- HIV-1 Ag/Ab
- HIV-1 RNA Quant
- Hepatitis B Surface
- Hepatitis B Surface Antibody
- Rubella Immunity
- Chlamydia/GC Detection
- Digoxin
- Lithium
- Phenobarbital
- Phenytoin
- Theophylline
- Valproic Acid
- Microbiology
- C&S
- Blood Culture
- Joint Aspirate
- Throat Swab
- Urine, MSU
- Catheter Urine
- Urethral Swab
- Wound Swab
- Ascitic Fluid
- Conjunctiva
- Ocular Fluid
- Sputum
- Stool
- C.difficile toxin Stool
- Serology
- Hepatitis C Ab
- Hepatitis B Surface Ag
- Hepatitis B Surface Antibody
- Monospot-(EBV)
- Urine
- Endocervical
- Vaginal
- Virology
- Nasopharyngeal Swab
- Other
- CSF Analysis
- AFB - Sputum
- Stool O&P
- Work-Ups
- Basic
- Chest Pain
- Abdominal Pain
- Renal
- Trauma
- Needle Stick Injury
- Seizure
- Toxicology
- Joint Aspirate Protocol - (right click to s...
- PD Fluid
- Radiology
- CT Brain
- CT Brain (Acute Stroke Protocol)
- CT Brain (CTA)
- MR Brain
- MRI/MRA Brain (ATECO carotids)
- MR Neurovascular Angio
- Cerebral Angiogram
- X-Rays
- Shoulder R
- Shoulder L
- Chest (PA,lateral)
- Chest (AP,portable)
- Humerus R
- Humerus L
- Elbow R
- Elbow L
- Wrist R
- Wrist L
- Hand
- Fingers R
- Fingers L
- Abdomen
- Pelvis
- Hip R
- Hip L
- Femur R
- Femur L
- Knee R
- Knee L
- Ankle R
- Ankle L
- Foot R
- Foot L

What is the current Issue?

- Inefficient and unnecessary ordering of calcium for all patients with CEDIS complaints of abdominal pain.

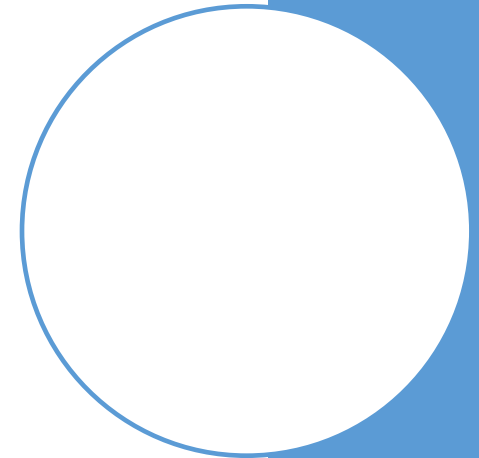
Add Order Order Summary

What did we find?

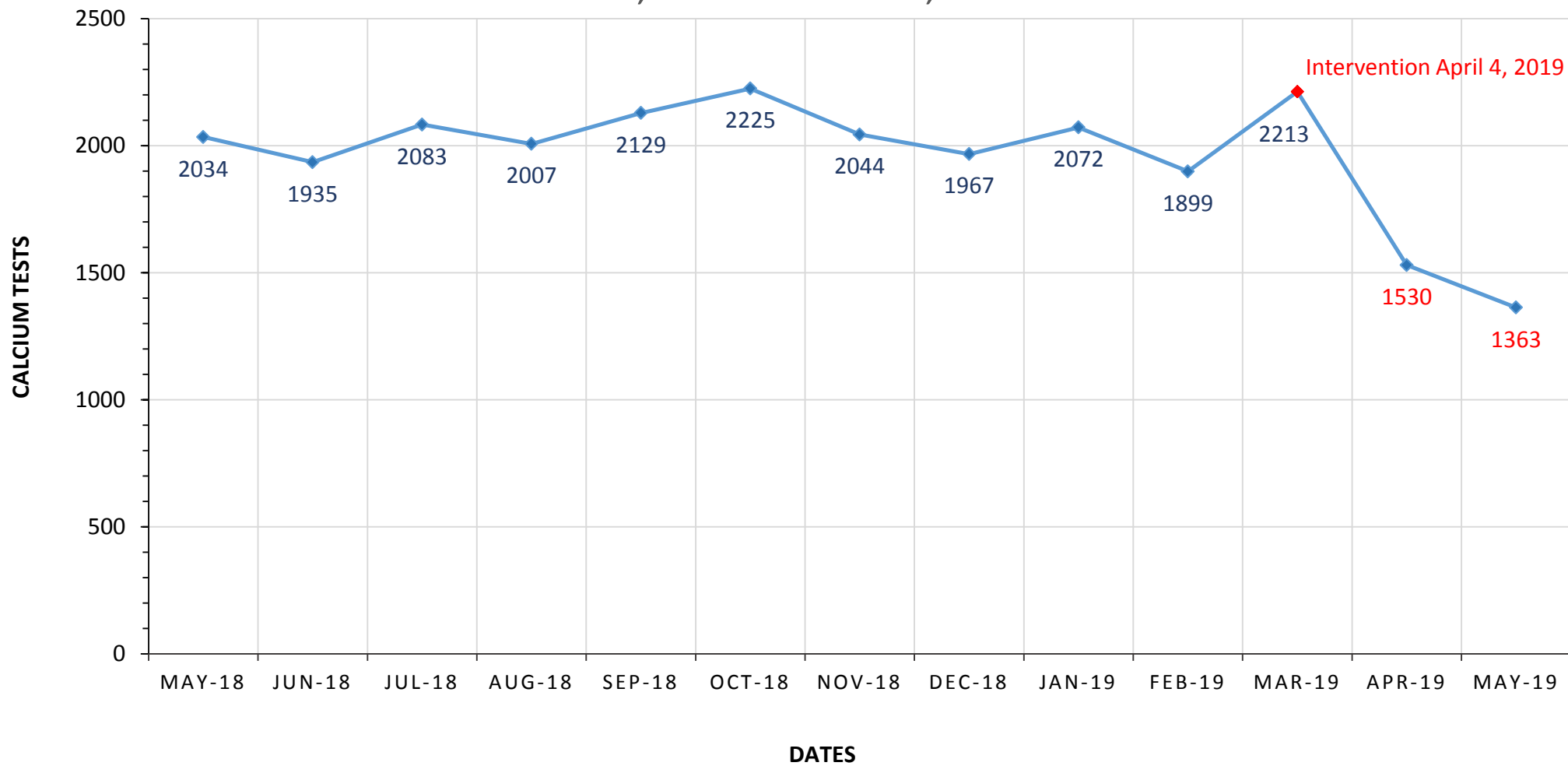
- June 2018-December 2018
 - Monthly Median of 2044 Calcium tests by TGH ED
 - <2.2mmol or >2.6mmol 156 (7.63%) abnormal
 - <2mmol or >2.8mmol 14 (0.68%) critical
 - 2/14 were acted on (0.09%)
- 99% of the time, the Calcium test result did not influence the patients plan of care

What is the goal?

- Reduce overall Calcium testing in the ED by 40%
 - 2028 monthly average for TGH ED
 - Almost 25000 yearly Calcium tests at TGH ED
 - Projected savings of \$18000/year using TGH data
(0.40 x 25000 x \$1.80)



TOTAL MONTHLY CALCIUM TESTING TGH ED MAY 1, 2018 MAY 31, 2019

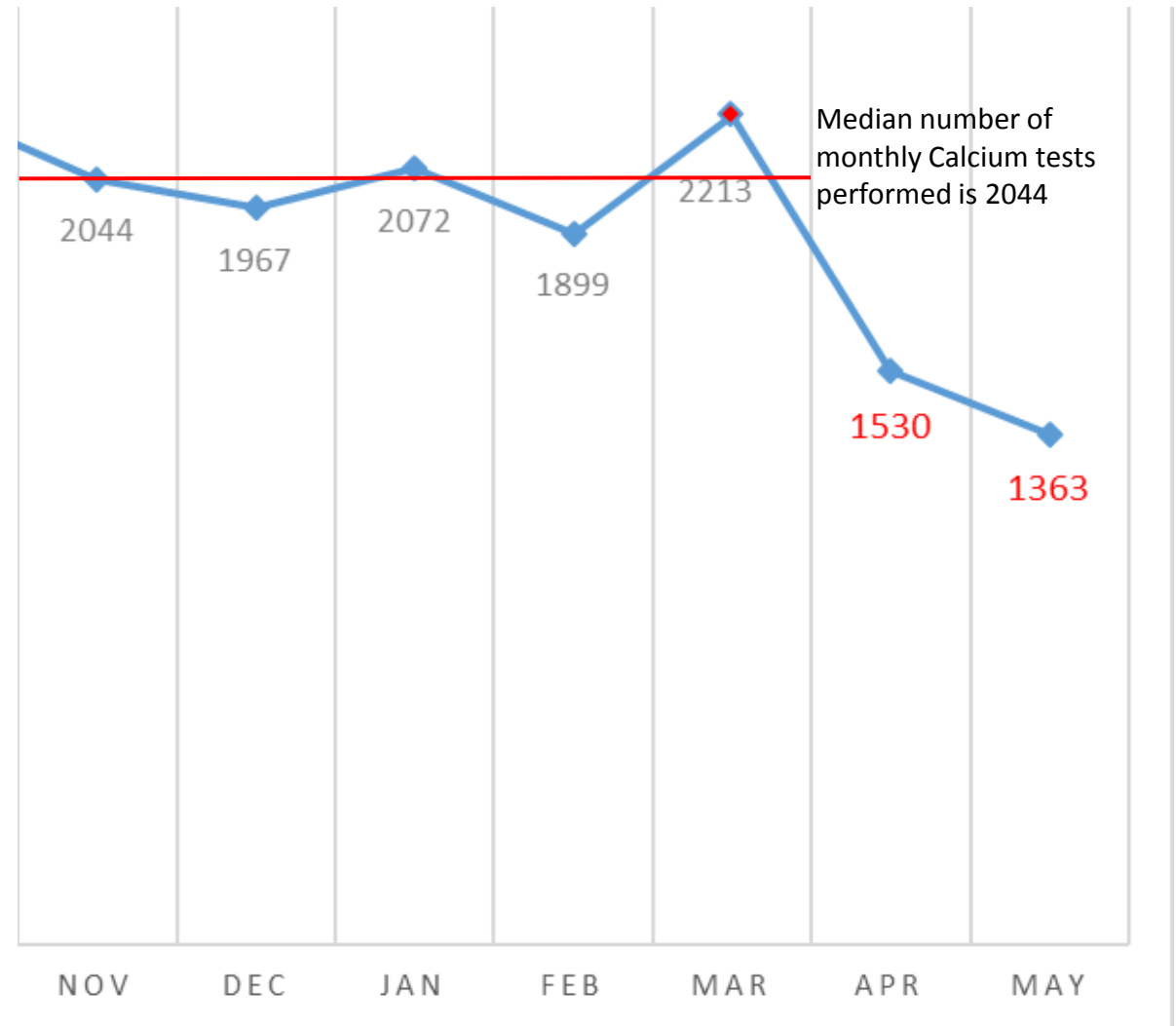


Evaluation

Monthly median Calcium tests by TGH ED is 2044.

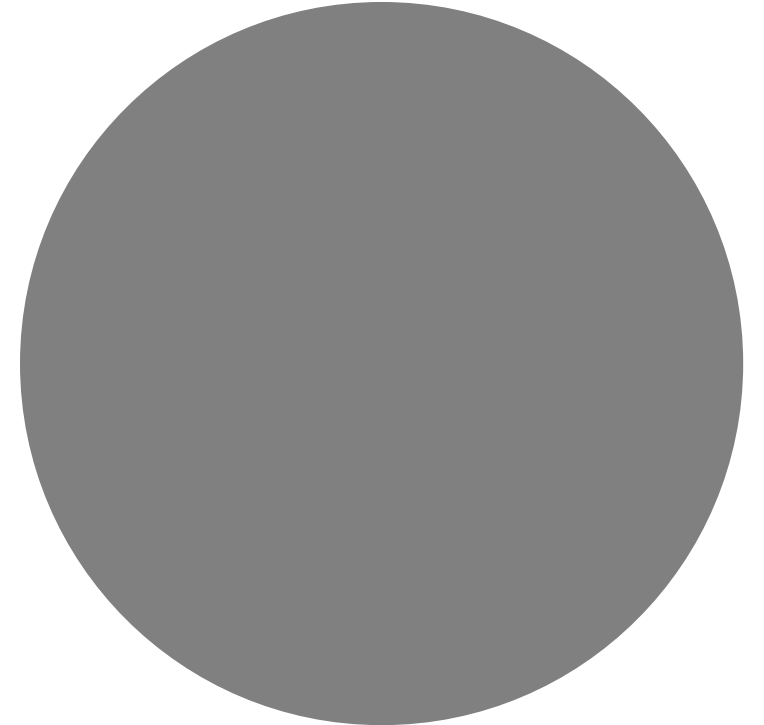
The incidence in May represents a 33% reduction (1195 tests) across 2 months from the pre-intervention Median.

A monthly 33% reduction in testing (675 Calcium tests) and applying a \$1.80 per test cost, projected 12 month savings of \$14,580 for the organization will be seen.



- Trend the data 6 months post intervention
 - see if the 40% reduction goal is achieved, or a plateau in trend of calcium testing at TGH ED
- Potential areas to explore
 - perception for blood tests being ordered versus what's actually on the provider order entry (survey)
 - Follow up abnormal values with a chart audit of interventional results (post intervention)
 - Consideration for medical directives for calcium ordering
 - Critically assess the need for blood test within each panel under the care provider order entry
 - Follow the same data post intervention multisite for assessment of improvement

Moving Forward



References

- Ahn SW, Kim TY, Lee S, et al. Adrenal insufficiency presenting as hypercalcemia and acute kidney injury. *Int Med Case Rep J* 2016; 9:223.
- Blizzard RM, Chee D, Davis W. The incidence of parathyroid and other antibodies in the sera of patients with idiopathic hypoparathyroidism. *Clin Exp Immunol* 1966; 1:119.
- Cholst IN, Steinberg SF, Tropper PJ, et al. The influence of hypermagnesemia on serum calcium and parathyroid hormone levels in human subjects. *N Engl J Med* 1984; 310:1221.
- Dickerson RN, Alexander KH, Minard G, et al. Accuracy of methods to estimate ionized and "corrected" serum calcium concentrations in critically ill multiple trauma patients receiving specialized nutrition support. *JPEN J Parenter Enteral Nutr* 2004; 28:133.
- Goltzman D, Cole DEC. Hypoparathyroidism. In: *Primer on the Metabolic Bone Diseases and Disorders of Bone Metabolism*, 6th ed, Favus MJ (Ed), American Society of Bone and Mineral Research, Washington DC 2006. P.216.
- Hammoud D, El Haddad B, Abdallah J. Hypercalcaemia secondary to hypervitaminosis a in a patient with chronic renal failure. *West Indian Med J* 2014; 63:105.
- Iqbal AA, Burgess EH, Gallina DL, et al. Hypercalcemia in hyperthyroidism: patterns of serum calcium, parathyroid hormone, and 1,25-dihydroxyvitamin D3 levels during management of thyrotoxicosis. *Endocr Pract* 2003; 9:517.
- Lowe H, Cusano NE, Binkley N, et al. Vitamin D toxicity due to a commonly available "over the counter" remedy from the Dominican Republic. *J Clin Endocrinol Metab* 2011; 96:291.
- Meric F, Yap P, Bia MJ. Etiology of hypercalcemia in hemodialysis patients on calcium carbonate therapy. *Am J Kidney Dis* 1990; 16:459.
- Muls E, Bouillon R, Boelaert J, et al. Etiology of hypercalcemia in a patient with Addison's disease. *Calcif Tissue Int* 1982; 34:523.
- Neufeld M, Maclaren NK, Blizzard RM. Two types of autoimmune Addison's disease associated with different polyglandular autoimmune (PGA) syndromes. *Medicine (Baltimore)* 1981; 60:355.
- Sternlicht H, Glezerman IG. Hypercalcemia of malignancy and new treatment options. *Ther Clin Risk Manag.* 2015;11:1779–1788. Published 2015 Dec 4. doi:10.2147/TCRM.S83681