

Laboratory Utilization Initiatives

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Professor and Chair, Dept. of Pathology



Good People. Great Medicine.™



Less is better?

Finance – healthcare changes will reward cost-effectiveness

Patient safety – reduction of anemia and transfusion-associated complications

Resource constraints

- Personnel
 - Aging workforce
 - Pathologists: average age = 55 yrs, average retirement age = 66
 - Technologists: average age = 49.2 yrs in 2010, and 40% of the current workers will retire in 10 years
 - Closure of many MT/CLS programs: 709 programs in 1975, 225 in 2012
 - “Right size”?
 - Thomson-Reuters and other benchmarks
- Space
- Capital equipment

Strategies for Optimizing Lab Utilization

Pathologist-controlled

- In-sourcing of sendout tests ◆
- Implement laboratory procedural changes that reduce utilization ◆
- Pathologist consultation service to provide advice about appropriate test utilization ◆
- Pathologist review of sendout test requests after they are ordered, with intervention for questionable or inappropriate test orders ◆

Multidisciplinary

- Reflex testing algorithms ◆
- IT decision support-test selection, blood utilization ◆
- Creation of IP and OP test formularies, implementation of restricted ordering
- Reduction of duplicate test orders ◆
- Pathologist and/or service or committee review of standing ordersets for appropriateness of lab test components ◆
- Other physician approval of specific sendout tests prior to ordering ◆
- Education about appropriate test selection and blood utilization, targeted to non-pathology residents, faculty, medical students ◆

Reduction in sendout costs



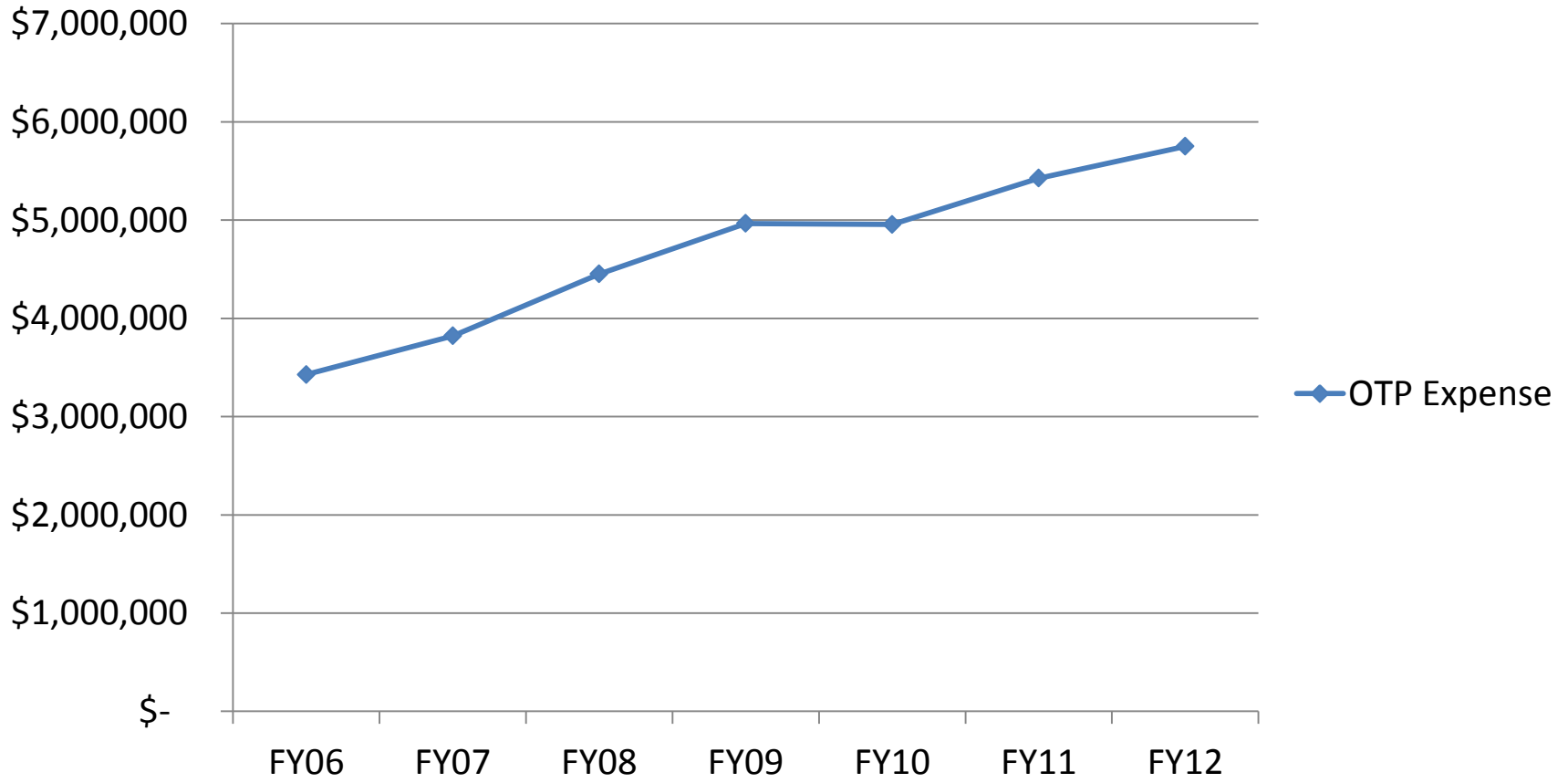
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Growth of clinical lab sendout tests at PSHMC (despite in-sourcing of 58 tests [tests performed in-house = 425])

Outside Tests Purchased Expense



Our Top 20 Sendout Tests

TEST NAME	ANNUAL VOLUME	TOTAL VENDOR COSTS
Chromosomes, Hematology, Bone Marrow	684	259,961.53
BENCE JONES PROTEIN	1010	136,512.32
MICROALBUMIN W/CREATININE	3386	128,873.57
Chromosomes, Congenital, B	270	101,536.39
BORRELIA BURGENDORFERI AB; INDEX FOR CNS INFECTION	249	73,719.12
Complete Ataxia Evaluation	6	72,761.36
BCR/ABL, p210, Quant, Monitor	225	71,113.66
MYOSITIS ASSESSR(TM) PLUS;JO-1 AUTOAB	69	66,761.69
ADENOVIRUS DNA, QUANT.; REAL-TIME PCR	218	63,451.23
Fragile X Syndrome Molecular Analysis	228	63,226.84
HPV DNA, HIGH RISK	972	54,491.01
PML/RARA Quantitative, PCR	122	53,458.05
Epstein-Barr Virus PCR, Quant	575	53,193.66
TTG AB, IGA	2049	51,349.40
Electron Microscopy, Tissue	71	47,929.31
Antinuclear Ab	2816	47,761.36
AML, FISH	172	47,112.64
ASPERGILLUS ANTIGEN	465	46,528.23
STRATIFY JCV(TM) AB;W/REF INHIBITION ASSAY	36	44,199.39
MDS, FISH	160	43,825.71
TOTAL		1,527,766.47

Savings associated with in-sourcing

Specific Test	Annual Vendor Payment	Savings
PCR for CMV	\$233,000	\$72,585
PCR for BK virus	\$191,268	\$119,011
PCR for HIV viral load	\$335,160	\$122,336
Vitamin D	\$246,000	\$183,000
High-resolution HLA typing for bone marrow transplantation	\$248,000	\$200,000

Real-time review of high cost sendout tests

- Primary purpose is to review inpatient high cost sendout tests
 - Limited (most likely no) reimbursement possibility
 - Can schedule sample collection without inconvenience to patient
 - Able to discuss reimbursement and cost issues with team
- Will review outpatient tests when patient is drawn by our outpatient phlebotomy service at the main hospital
 - Balance patient unhappiness with cost and likelihood of reimbursement
 - Difficult to “reject” samples that already have been drawn by clinic.

Process

1. Request identified by Sendouts
2. Query referred to resident on Clinical Pathology Consult Service
3. Resident reviews clinical situation in the EHR and via discussion with clinical service
4. Resident reviews the request with clinical pathology attending on service, then discusses clinical needs/test appropriateness, alternatives, and costs to patient with the clinical team
5. Decision is made based on clinical need and family acceptance of financial responsibility

Three month outcome

- Seven interventions
 - Four pediatric, two neurologic, one GI
 - Two approved (one partially by prioritized multiple tests)
 - One facilitated
 - Patient's family received discount by paying for test directly
 - Laboratory collected specimen and transported
 - Four deferred or never ordered after discussion

Cost savings

- Cost of ordered testing: \$16,062
- Cost of approved testing: \$2,472

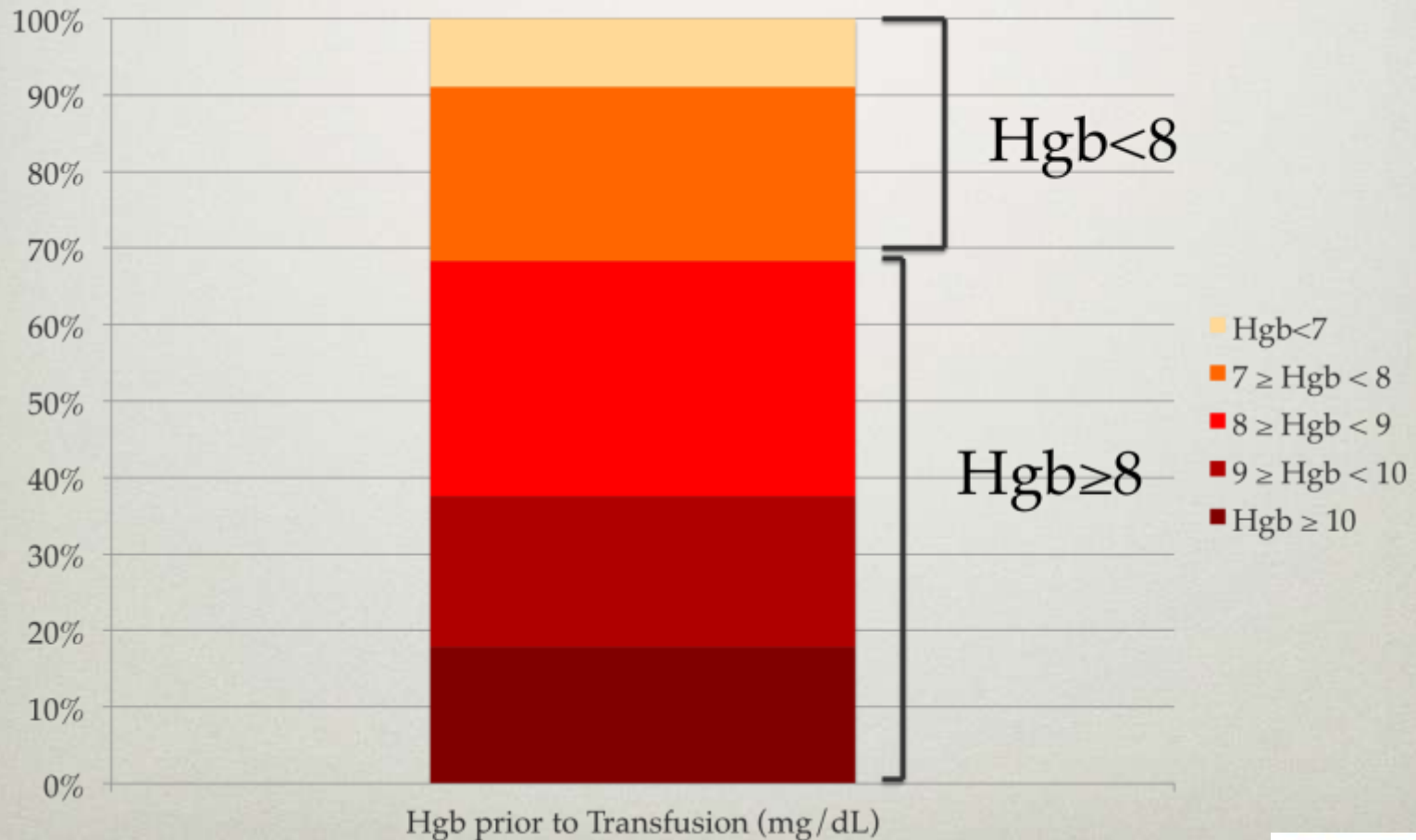
- 3 month cost savings: \$13,590

Annualized savings = 1 job!!

Automated Decision Support for Blood Product Utilization Based on AABB Guidelines

- **Recommendation 1:** The AABB recommends adhering to a restrictive transfusion strategy (**7 to 8 g/dL**) in **hospitalized, stable patients** (Grade: strong recommendation; high-quality evidence).
- **Recommendation 2:** The AABB suggests adhering to a restrictive strategy in hospitalized patients with **preexisting cardiovascular disease and considering transfusion for patients** with symptoms or a hemoglobin level of **8 g/dL** or less (Grade: weak recommendation; moderate-quality evidence).
- **Recommendation 3:** The AABB **cannot recommend** for or against a liberal or restrictive transfusion threshold for hospitalized, hemodynamically stable patients with the **acute coronary syndrome** (Grade: uncertain recommendation; very low-quality evidence).
- **Recommendation 4:** The AABB suggests that transfusion decisions be influenced by symptoms as well as hemoglobin concentration (Grade: weak recommendation; low-quality evidence).

Most Recent Hgb Prior To Transfusion-2011



Quality Improvement-Education

Education (changing cognitive error)

- Inspiration (bottom-up approach) more effective than supervision (top-down edict)
- Achieving physician buy-in, involving and collaborating with physicians to change behavior
- Multidisciplinary approach
- Develop guidelines and educational “road show” and training module

Quality Improvement-Education

ORBCON
Ontario Regional Blood Coordinating Network

Bloody Easy *LITE*

Module 1 - Indications for Blood Transfusion

INDEX

- Welcome
- Introduction
- Pre-Transfusion Testing
- Transfusion of Red Blood Cells Introduction
- Transfusion of Platelets Introduction
- Transfusion of Plasma Introduction
- Transfusion of Cryoprecipitate Introduction

Welcome

Learning Objectives

- Define a group and screen.
- Name the type of crossmatch required when an antibody screen is positive.
- List the indications for red blood cells, platelets, plasma and cryoprecipitate.

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SCREEN 2 of 34

Quality Improvement-Education

Bloody Easy Lite Pre-Test

1 1

- A patient has a positive antibody screen. Further investigation shows that the antibody is anti-E (a minor red cell antigen). How long will the crossmatch take?
 - 2 min
 - 5 min
 - 15 min
 - 45 min
 - 90 min
- By how much will the transfusion of 1 unit of RBC in a 70kg non-bleeding adult increase the hemoglobin?
 - 3 g/L
 - 5 g/L
 - 10 g/L
 - 20 g/L
 - 40 g/L
- The TRICC trial randomized critically ill patients to a restrictive vs liberal transfusion threshold. What did the trial conclude?
 - The restrictive group had more cardiac events.
 - The restrictive group had more pulmonary events.
 - Patients with a history of cardiovascular disease in the restrictive group had increased mortality.
 - The trial results should not be applied to patients with unstable coronary syndromes.
 - Younger patients benefited from the liberal transfusion strategy.
- A 33 year old male has been diagnosed with acute myeloid leukemia. He is not bleeding. He has no fever. The INR, PTT and fibrinogen levels are normal. At what platelet count would you provide a prophylactic platelet transfusion?
 - $< 5 \times 10^9/L$
 - $< 10 \times 10^9/L$
 - $< 15 \times 10^9/L$
 - $< 20 \times 10^9/L$
 - $< 25 \times 10^9/L$

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What's New?

Quality Improvement-Decision Support

Automated Decision Support

- Reinforces education
- Does not impede workflow
- Establish a uniform process to track individual performance metrics
- Tool needs to inform about best-practice in real-time

Automated Decision Support-RBCs

	08/13/2012 01:00	07/18/2012 15:00
ABO/Rh	O POSITIVE	
Antibody Scr	NEGATIVE	
Expires at 0600AM on	12/11/2012	
Hgb		13.2

Details for Transfuse Red Cells.

Details | Order Comments | Diagnosis

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It is the physician's responsibility to obtain consent. :

***Priority:** Routine

Product: Red Cells

***Number of units or mLs:**

***Specify units or mLs:**

Rate to transfuse each unit:

***Start date/time:** 11/26/2012 1539

Hold Maintenance Fluids: Yes No

***Indication:**

Special Instructions:

- Hgb < 10.0 g/dL (Coronary Syndrome)
- Hgb < 10.0 g/dL (post CT surgery)
- Hgb < 8.0 g/dL (hemodynamically stable)
- Acute, ACTIVE bleeding
- Heme/Onc patient with standing order
- Other - describe in Special Instructions

Duration:

Duration Unit:

Automated Decision Support-PLTs

	08/13/2012 01:00	07/18/2012 15:00
ABO/Rh	O POSITIVE	
Plts		211

Details for Transfuse Platelets.

Details | Order Comments | Diagnosis

+ **+** **+** **+** **+**

It is the physician's responsibility to obtain consent.: Platelets

***Priority:** Routine

Product: Platelets

***Number of doses or mLs:** 1

***Specify doses or mLs:** Doses

Rate to transfuse each unit:

***Start date/time:** 11/26/2012 1658

Hold Maintenance Fluids: Yes No

***Indication:**

Special Instructions:

Duration:

- Plt <= 10 K/uL
- Plt <= 20 K/uL (bleeding disorder)
- Plt <= 50 K/uL (active bleeding)
- Plt <= 50 K/uL (invasive procedure)
- Plt <= 100 K/uL (bleed in closed space)
- Plt dysfunction (active bleeding)
- Heme/Onc patient with standing order
- Other - describe in Special Instructions

OK Cancel

Automated Decision Support-FFP

	08/13/2012 01:00	06/15/2012 07:00
ABO/Rh	O POSITIVE	
INR		REQUEST CREDITED
PT		REQUEST CREDITED

Details for Transfuse FFP

Details | Order Comments | Diagnosis

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It is the physician's responsibility to obtain consent. i

Product: Fresh Frozen Plasma

***Priority:** Routine

Product: Fresh Frozen Plasma

***Number of units or mLs:**

***Specify units or mLs:**

Rate to transfuse each unit:

***Start date/time:** 11/26/2012 1703

Hold Maintenance Fluids: Yes No

***Indication:**

Special Instructions: PT(INR) > 1.5 (reversal of warfarin)
 Disseminated Intravascular Coagulation
 Clotting factor deficiency
 Other - describe in Special Instructions

Duration:

Duration Unit:

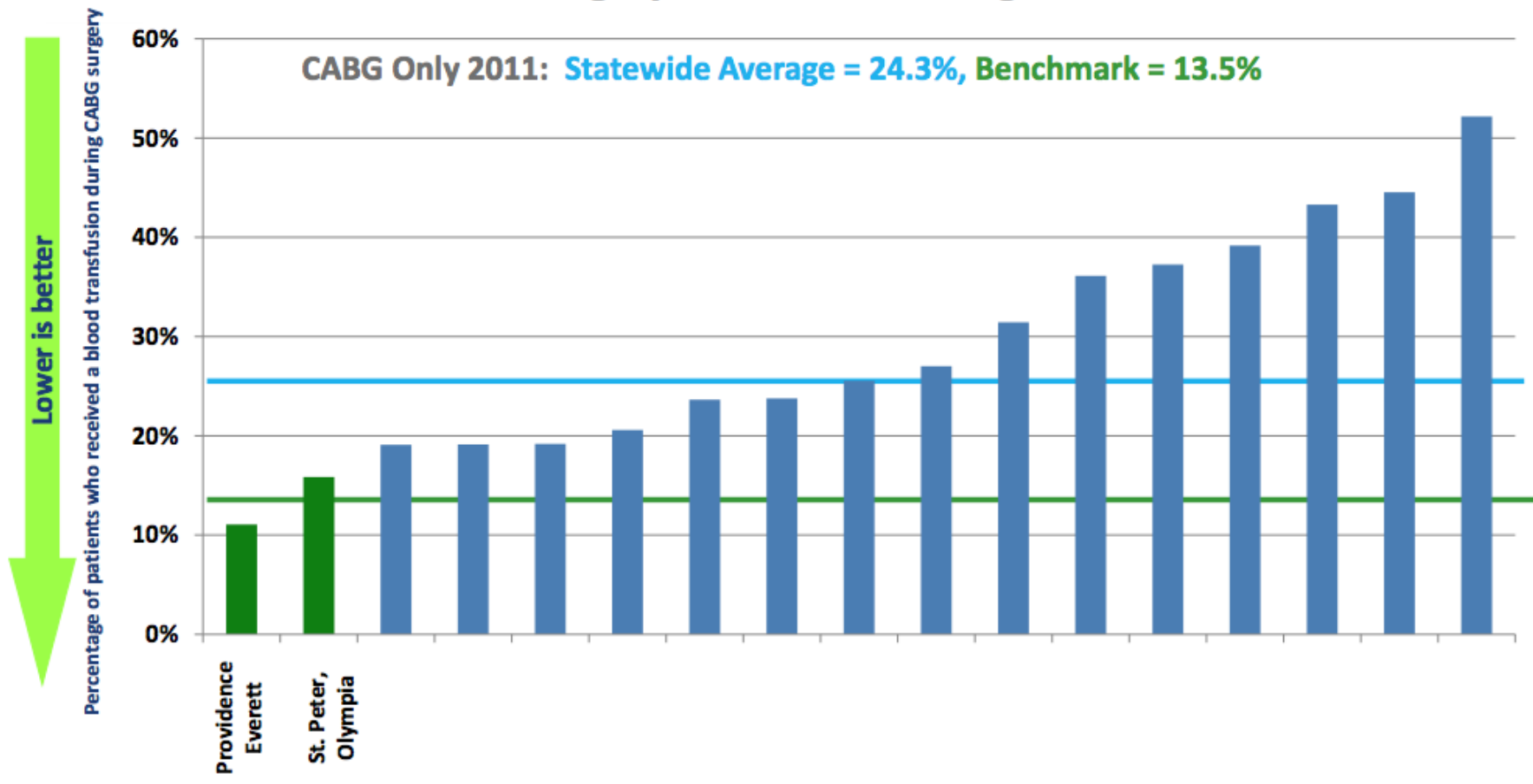
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Quality Improvement-Feedback

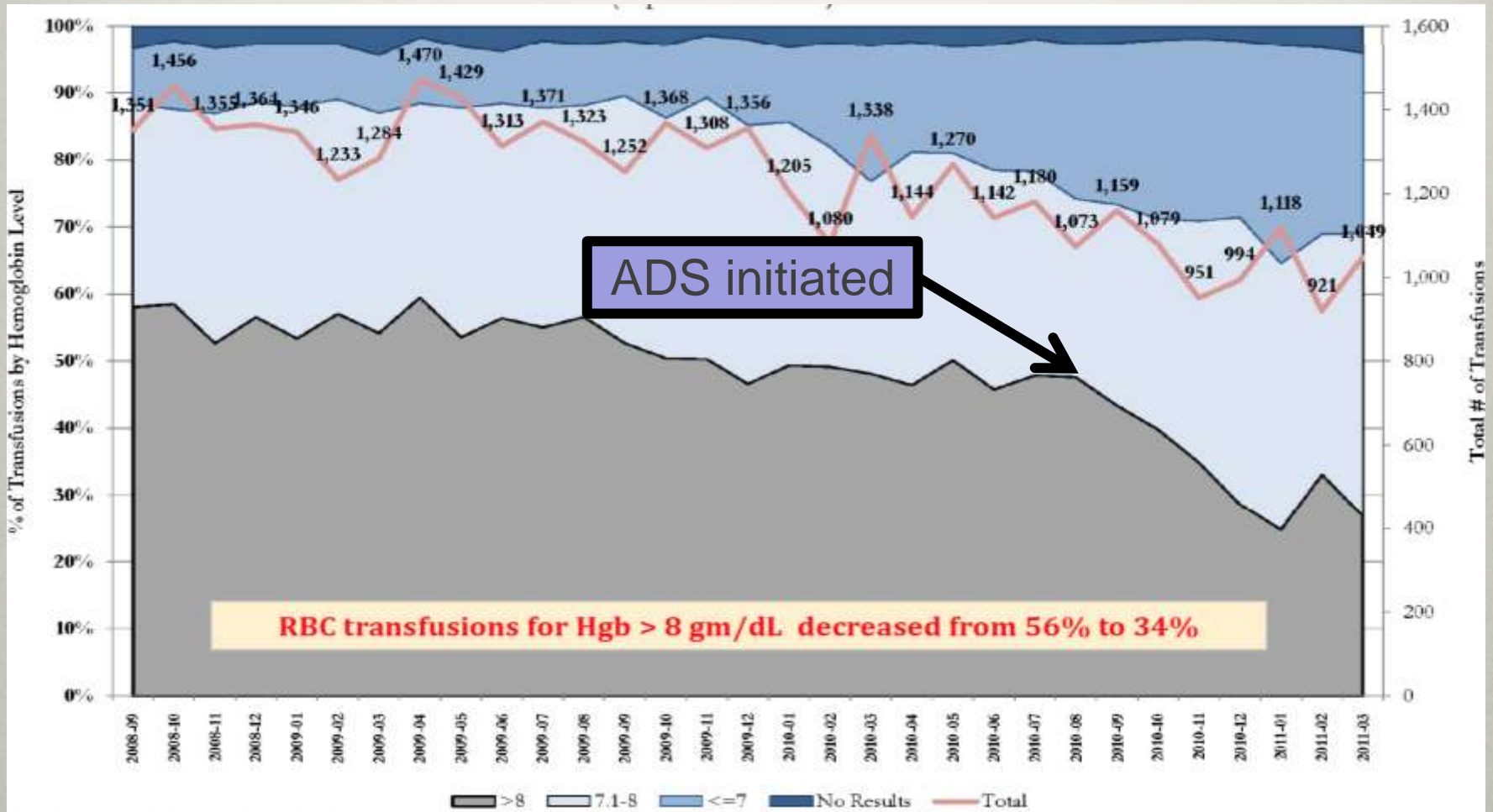
- Essential to long term effectiveness of intervention
- Metrics will be automatically generated by the CQI and tracked through the BUC
- **Design and implement a meaningful tracking output for monitoring and comparing performance measures of utilization practice (by institution, group, floor, center, service, ordering party)**

Quality Improvement-Institutional-level Feedback Illustration (P4P)

Blood Use in Cardiac Surgery: WA State "Average" vs. "Benchmark"



What Can We Expect?



Early Results

	Change in Transfusion Rate, 2012 vs 2011	Product	Estimated Savings on Product (2013)
RBC/Admit	-0.1818766	-5055.0778	-\$1,061,566
PLT/Admit	-0.0288937	-803.07036	-\$409,565
FFP/Admit	-0.1043171	-2899.3902	-\$289,939
TOTAL			-\$1,761,071

* Normalized by admission, extrapolated to total IP population

CLINICAL LABORATORY TESTING ALGORITHMS

Laboratory Utilization of Thyroid Tests

Dana Timek

Dr. C. Fan

Chris Pederson

Dr. W. Castellani

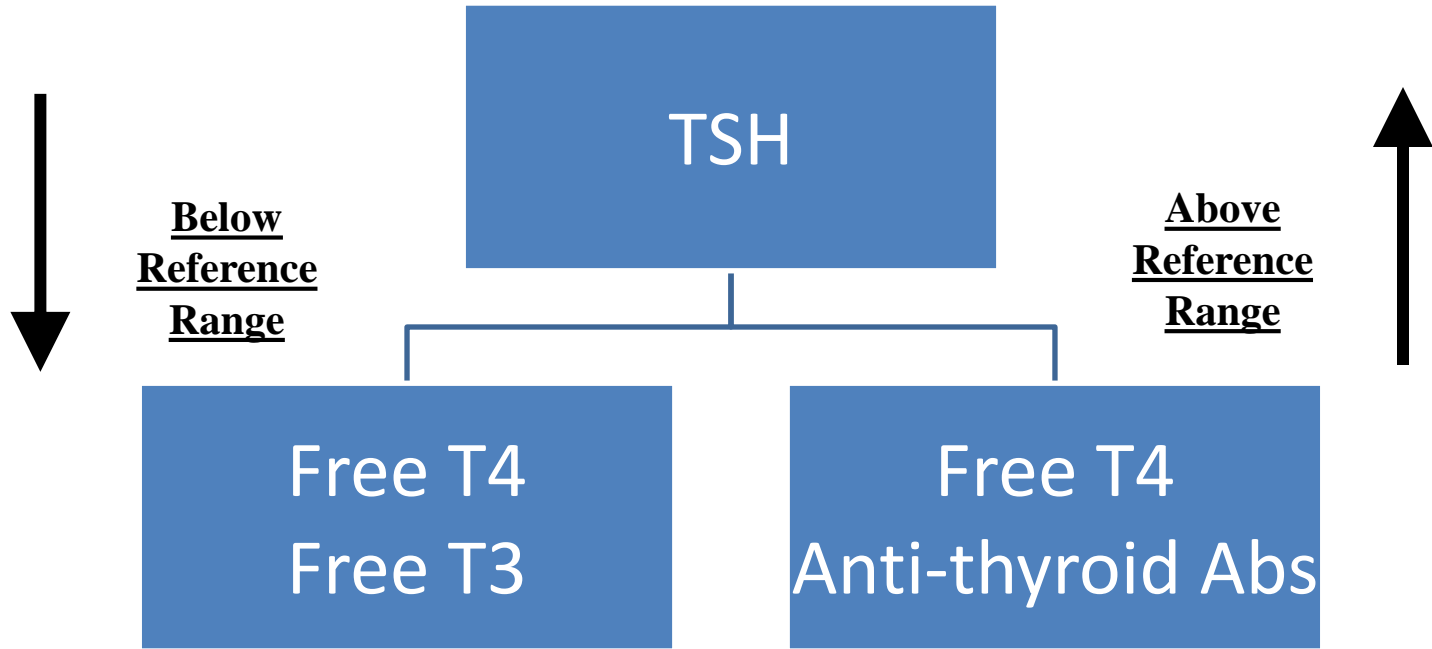
Inpatient Thyroid Tests

Order group description and number of times ordered in past year on inpatients

FREET3	15	FREET4 T3Q TSH	11
FREET3 FREET4	54	FREET4 TOTT4	3
FREET3 FREET4 T3Q TOTT4 TSH	2	FREET4 TOTT4 TSH	16
FREET3 FREET4 T3Q TSH	1	FREET4 TSH	1076
FREET3 FREET4 TOTT4	5	FT4 FT4 *	1
FREET3 FREET4 TOTT4 TSH	11	FT4 FT4 TOTT4 *	1
FREET3 FREET4 TSH	190	FT4 FT4 TSH *	1
FREET3 T3Q	1	T3Q	2
FREET3 T3Q TOTT4	1	T3Q TOTT4	3
FREET3 TOTT4	2	T3Q TOTT4 TSH	7
FREET3 TOTT4 TSH	6	T3Q TSH	1
FREET3 TSH	15	TOTT4	5
FREET4	106	TOTT4 TSH	24
FREET4 T3Q	7	TSH	1464
FREET4 T3Q TBG TSH	1		

William Castellani, MD

Algorithm



Reflex Testing Algorithms

	Annual Volumes
Thyroid Screen	66
Anemia Screen	16
Hypercoagulable Panel	220

Modification of Test Formularies

- Make it difficult to order tests with a high probability of error
 - Cycloserine levels - 20 orders on IPs sent over 2 years during which cycloserine was not available from the hospital pharmacy. Vendor charge = \$145/test.
 - No sample had a detectable level of cycloserine present.
 - No physician who ordered the test more than once, and no patient had a cycloserine level ordered more than once.
 - Cycloserine levels sits adjacent to cyclosporine level on the order screen.
 - Removed from formulary, no orders since.

Modification of Test Formularies

- Elimination of high-sensitivity CRP from IP formulary
 - Predictive marker for arteriosclerotic disease, not needed acutely
 - 734 IP orders between 7/1/11 and 3/31/12, @ \$35.87/test, reduced by 60% (annual savings ~ \$20K).
 - Test remains on the IP stroke orderset (future target).

Test selection: Buffet-style or menu?



Hematopathology Test Selection

Team composed of hematologist/oncologists and hematopathologists defines reflex testing algorithms for evaluation of bone marrow specimens for hematologic and lymphoid diseases.

Memo

Effective March 26, 2012

•Triage and ordering of bone marrow ancillary testing will be performed by a Pathologist in the Special Hematology Laboratory rather than by the physician performing the bone marrow procedure. The ordering process through CPOE for bone marrow evaluation will require a single new order: “Bone Marrow Pathology Consult.” Ancillary testing will then be ordered by the Pathologist based on clinical history, consensus guidelines and communications with the treating physician.

Approved reflex testing - Hematopathology (bone marrow, blood, other samples as appropriate)

New leukemia:

- All: Flow cytometry, cytogenetics.
- If AML: add FISH for PML-RARA. If age < 75 and suspected de novo, add FLT3, NPM1 and CEBPA.
- If ALL: add FISH for BCR-ABL1 and RT-PCR for BCR-ABL1.

AML for followup:

- Day 30: If history of prior positive markers in flow cytometry, cytogenetics, FISH or molecular, order the appropriate test(s) to evaluate for MRD.

ALL for followup:

- All: Flow cytometry.
- If history of prior positive markers in flow cytometry, cytogenetics, FISH or molecular, order the appropriate test(s) to evaluate for MRD.

Possible MDS:

- All: Cytogenetics, AML and MDS flow cytometry, MDS FISH.

MDS for followup:

- All: Cytogenetics.
- If history of prior positive markers in flow cytometry, cytogenetics, FISH or molecular, order the appropriate test(s) to evaluate for MRD.

Possible CML:

- All: Cytogenetics, BCR/ABL1 FISH, BCR/ABL qualitative and p210 quantitative.
- If increased blasts: Flow cytometry.

CML in followup:

- All: Cytogenetics, BCR/ABL p210 quantitative if not ordered on peripheral blood.
- If increased blasts: Flow cytometry.

Possible MPN:

- All: Cytogenetics, JAK2, BCR/ABL1 FISH.
- PRN: Flow cytometry, FISH studies, molecular studies.

Possible lymphoma:

- All: Flow cytometry.

Bone marrow assessment for lymphoma

Charges/Case	Pre	Post	Change	%Change
Lymphoma Total	\$5,701.94	\$5,479.80	-\$222.14	-3.90%
Lymphoma TC	\$4,369.86	\$4,115.90	-\$253.96	-5.81%
Lymphoma PC	\$1,332.09	\$1,363.90	\$31.81	2.39%

Charges/Case	Pre Other	Post Other	Change	%Change
Lymphoma Total	\$1,467.54	\$1,370.80	-\$96.74	-6.59%
	Pre Flow	Post Flow	Change	%Change
	\$2,461.09	\$2,789.40	\$328.31	13.34%
	Pre Chrom	Post Chrom	Change	%Change
	\$1,086.26	\$288.00	-\$798.26	-73.49%
	Pre FISH	Post FISH	Change	%Change
	\$530.40	\$694.00	\$163.60	30.84%
	Pre Mole	Post Mole	Change	%Change
	\$156.66	\$337.60	\$180.94	115.5

Who controls standing ordersets?



Pathologist review of OP standing ordersets for appropriateness of lab tests

	<u>order set</u>	<u>number tests initially preselected</u>	<u>number tests finally preselected</u>	<u>difference</u>	<u>% change in preselected tests</u>
1	FCM STD Screening Amb	9	0	-9	-100%
2	FCM Stool Studies Amb	5	0	-5	-100%
3	Endocrinol Adrenal Amb	8(17OHP,ACTH,Aldo,Andro,Cortisol,DHEA, Renin, Electrolytes)	8(same list)	0	0%
4	Endocrinol Gonads Amb	9(HCG,Estradiol,Prog,freeTesto,17OHP,FSH,LH,TotalTesto)	5(removed HCG, estradiol, Prog, freeTesto)	-4	-44%
5	Endocrinol Parathyroid, Ca & Bone Amb	9(albumin,AlkPhos,bone-spec Alk Phos,Ca2+, ion a2+,Phos,PTH,RenalProfile,25-OHVitD)	9 (same list)	0	0%
6	Endocrinol Pituitary Amb	7(ACTH,FSH,GH,IGF1,LH,Prolactin,alpha subunitPituitary glycoprotein hormone)	6(removed alpha subunit Pituitary glycoprotein hormone)	-1	-14%
7	Endocrinol Thyroid Amb	9(freeT3,totalT3,freeT4,TSH,T3 by dialysis,freeT4 by dialysis, totalT4,thyroid abs,thyroid stim lgs)	4(removed T3 by dialysis,freeT4 by dialysis, totalT4,thyroid ab,thyroid stim lgs)	-5	-56%
8	Derm Accutane Amb	3(CBC,Lipid,Liver profile)	3(same list)	0	0%
9	Derm Biologics Amb	4(CBC,CMP,HBsAg,HepCAb)	4(same list)	0	0%
10	ONC Vit D Panel	1(25OHVitD)	1(same)	0	0%
11	Hepatitis B Vaccine	0	0	0	0%
12	Hepatitis A Vaccine	0	0	0	0%
13	HPV Vaccine	0	0	0	0%
14	Urinary Tract Infection Ambulatory	0	0	0	0%
15	Ambulatory GI	0	0	0	0%
16	ID Comprehensive Care	0	0	0	0%
17	Anemia Screen Ambulatory	2 (CBC + Retic)	2(same)	0	0%
18	Endocrinol Diabetic/Lipid Scrn Amb	4 (BMP,Lipid Profile, A1C, ALT)	3 (removed ALT)	-1	-25%
19	Rheumatology FCM	7 (CBC,RF,ANA,Lyme,CRP,UA,ESR)	3 (removed Lyme, CRP, UA, ESR)	-4	-57%
20	FCM Male Comprehensive	0	0	0	0%
21	FCM Female Comprehensive	0	0	0	0%
22	FCM Executive Health Assessment	6 (CBC,CMP,Lipid,TSH,UA,A1C)	5 (removed A1C)	-1	-17%
23	FCM Gastric Bypass	6 (CBC,BMP,Ferritin,Iron,B12,VitD)	6(replace BMP with CMP)	0	0%
24	Hepatitis Serology	0	0	0	0%
25	STD Screening	0	0	0	0%
26	Medicare Annual Ambulatory	0	0	0	0%
27	Medicine GYN Ambulatory	0	0	0	0%
	Total	89		-30	-34%

And finally a word about benchmarks

Welcome Dan! Zander! Friday, December 21, 2012

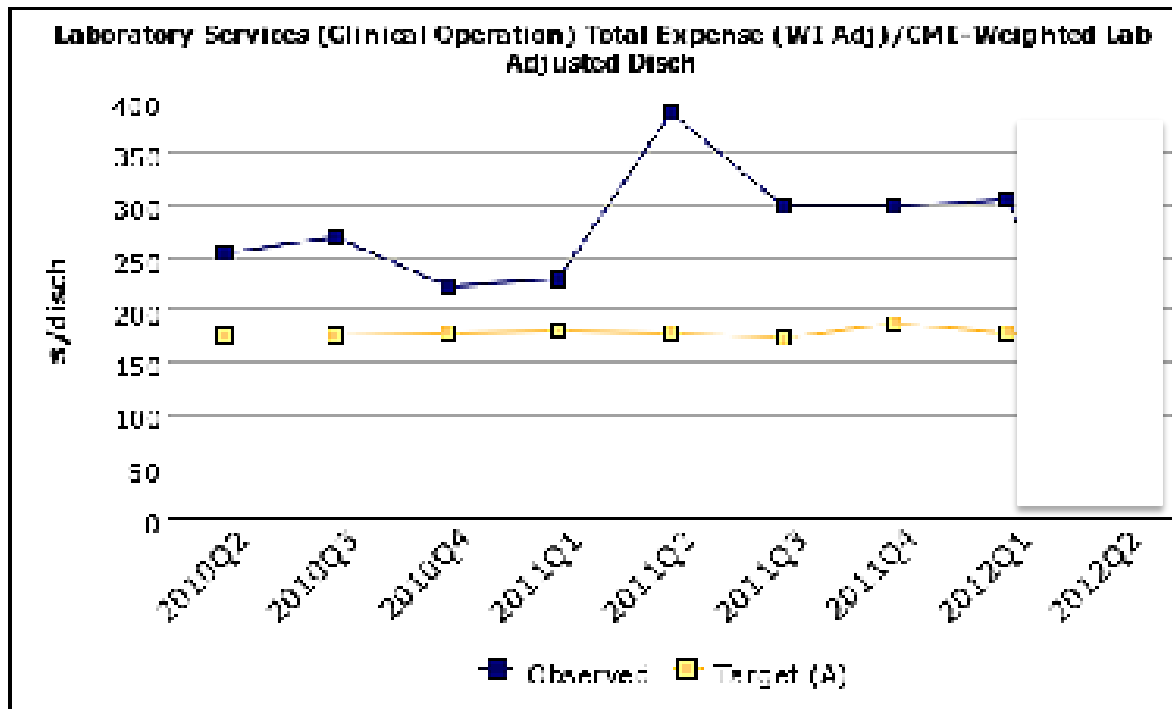
UHC Efficiency Management Report Report Resources

Penn State Hershey Medical Center

Hospital: PENNSTATE

Apr - Jun 2012 (Q2)

Laboratory Services (Clinical Operation) Total Expense (WI Adj)/CMI-Weighted Lab Adjusted Disch



Dr. Zander,

Per your request, below is a listing of the more major items that Karen and I have “cleaned up” since the FY13 budget hearing. There were some other small items but they had very minimal dollar impact. These were the items that caused the metrics to change.

Changes:

- Blood Bank:
 - Normalize out nursing FTE costs, apheresis supply expenses and billable statistics related to apheresis due to Action OI requiring the elimination of all apheresis services.
 - Normalize out FTE for managers w/budgetary responsibilities per Action OI rules
 - Normalize out a portion of an FTE due to that FTE supporting OP patient registration
 - Normalize out a portion of an FTE due to that FTE supporting bench teaching
- AP (Cytology, Histology and Molecular (AP per Action OI definition)):
 - Normalize out FTEs for managers w/budgetary responsibilities per Action OI rules
 - Normalize out a portion of an FTE due to that FTE supporting transcription services
 - Normalize out the Decedent Care per Jeff Lerman
- CP (HCT, ATL, Special Hem, Phlebotomy, SPA, Micro, HLA, Virology and PSU Lab):
 - Normalize out FTEs for managers w/budgetary responsibilities per Action OI rules
 - Normalize out a portion of an FTE due to that FTE supporting OP patient registration
 - Normalize out a portion of an FTE due to that FTE supporting bench teaching
 - Corrected a multi-year over accrual of reference testing expenses
 - Have mostly corrected the reference lab test counts – continuing to work on this.

Chris Morrow

And finally a word about benchmarks

Welcome Dan! Zander! Friday, December 21, 2012

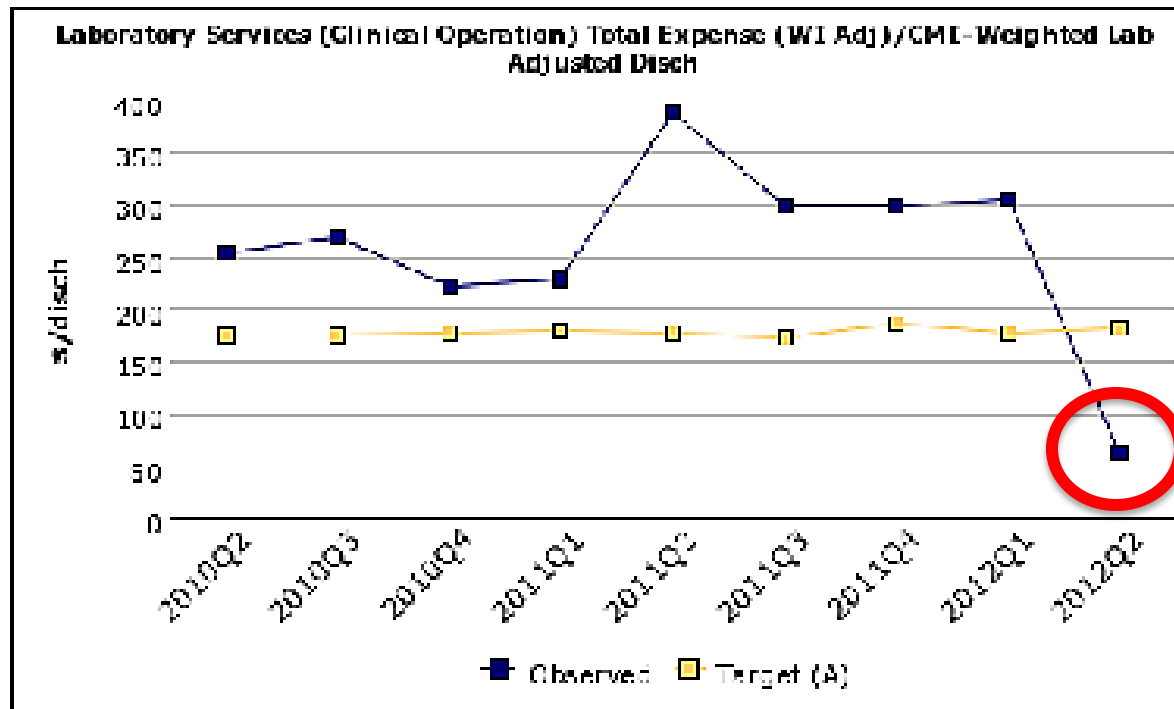
UHC Efficiency Management Report Report Resources

Penn State Hershey Medical Center

Hospital: PENNSTATE

Apr - Jun 2012 (Q2)

Laboratory Services (Clinical Operation) Total Expense (WI Adj)/CMI-Weighted Lab Adjusted Disch



Internal CP Data Summary - Includes HCT, ATL, Special Hem, Phleb, Factor, SPA, Micro, HLA, Virology and PSU Lab

	Jun_09 YTD FTES	Jun_10 YTD FTES	Jun_11 YTD FTES	Actual FY12 YTD FTES	FY12 Annualized	
Total FTE Equivs (Removed Managers / Supervisors responsible for budget and OP Registration FTES)	151.87	154.00	153.41	161.52	161.52	Normalized
Total Paid Hours	315,890	320,320	319,093	335,962	335,962	
Primary Units					2,659,656	
Total Billed Primary Units per Lab FTE					16,466	
Normalized Hours Paid / 100 Primary Units					12.63	

Action OI Benchmark Data - Standard Total Operating Beds 401 - 600

	HMC	25th %ile	50th %ile	75th %ile	Lab % ile	FTEs Needed to achieve 50th %ile
Total Billed Tests per Lab FTE	16,466	13,576	14,764	17,555	65.25	
Hours Paid per 100 Billed Test	12.63	11.66	14.05	15.33	35.16	18.13

Action OI Benchmark Data - Standard Major Teaching Hospitals

	HMC	25th %ile	50th %ile	75th %ile	Lab % ile	FTEs Needed to achieve 50th %ile
Total Billed Tests per Lab FTE	16,466	12,135	15,395	17,725	61.50	
Hours Paid per 100 Billed Test	12.63	11.61	13.45	16.78	38.88	10.46



Big dogs

- Blood utilization ADS
- Large-scale insourcing of tests

Little dogs

- Modifying test formularies
- Real-time review of sendout tests
- Orderset interventions

Algorithms

Acknowledgements



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