Towards Higher Value Care
Things We Do For No Reason
National Conference for Nurse Practitioners 2017
April 19, 2017

Hospital Medicine 2017

Disclosures - None

“I am not a crook!”
Objectives

By the conclusion of this talk, you will be able to:
- Summarize why providing high-value care is difficult
- Name 3 low value practices
- Plot a path towards high-value care

National Health Expenditures, 2014
Over $3.0 trillion

- U.S. health care spending grew 5.3% in 2014
  - Coverage expansion
  - Prescription drugs (up 12%)
- $9,523 per person
- 17.5% of the Gross Domestic Product
- Hospital spending increased 4.1% to $971.8 billion

Adjusted Distribution of Physician’s Average Part B Spending per Hospitalization

- 485,016 hospitalizations
- 21,963 physicians
- 2837 acute care hospitals
- Total adjusted Part B spending:
  - > 40% higher among physicians in the highest spending quartile compared with the lowest
  - $1055 vs $743 per hospitalization
- Higher-spending physicians
  - slightly older
  - more likely to be female


Association Between Adjusted Physician-Level Spending and Patient Outcomes Among Hospitalist Physicians

Overall 30-day mortality rate was 11.0%.


From: Eliminating Waste in US Health Care

Donald M. Berwick, MD, MPP; Andrew D. Hackbarth

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Why do we order unnecessary tests?

- Doctors have a “limited understanding of diagnostic and nondrug therapeutic costs”
- Patient expectations
- Insufficient understanding of the operating characteristics of tests
- Inability to retrieve previous results
- Economic incentives (self-referral)
- Defensive medicine
- Learned behaviors


Outpatient Interventions- 1990

- Academic Primary Care Setting
- Intervention- 26 weeks
  - Displayed the charge for the test and the total charges for the day
- Control
  - No charges displayed
- Primary outcome
  - Number of tests ordered and charges for tests per patient visit

March 21, 2017

Tests per Visit and Testing
Charges per Visit

<table>
<thead>
<tr>
<th>Test Category</th>
<th>All Physicians</th>
<th>Residents</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preintervention</td>
<td>Tests (n)</td>
<td>Control group</td>
<td>1.72 ± 0.76</td>
</tr>
<tr>
<td></td>
<td>Intervention group</td>
<td>1.83 ± 0.82</td>
<td>1.87 ± 0.96</td>
</tr>
<tr>
<td>Charges ($)</td>
<td>Control group</td>
<td>154.78 ± 21.99</td>
<td>155.09 ± 21.11</td>
</tr>
<tr>
<td></td>
<td>Intervention group</td>
<td>154.60 ± 27.62</td>
<td>154.99 ± 21.13</td>
</tr>
<tr>
<td>% Difference</td>
<td>Control group</td>
<td>-0.3</td>
<td>-0.3</td>
</tr>
<tr>
<td></td>
<td>Intervention group</td>
<td>-0.3</td>
<td>-0.3</td>
</tr>
</tbody>
</table>

Outpatient Interventions - Outcomes

- Intervention ordered 14% fewer tests per patient visit compared to control
- Charges were 13% lower
- After intervention discontinued, the effect waned

Displaying the Denominator of the Value Equation
Hypothesis

• Ordering behavior by physicians will be affected by displaying the cost information of laboratory tests at the point of ordering
• Physicians will order fewer tests
  – Inexpensive tests that are unnecessarily repeatedly ordered
  – Expensive tests that are unnecessary

Methods

• Determined most frequently ordered and most expensive lab tests in 2007
  – 35 most frequent
  – 35 most expensive
• Randomized to “active” tests or controls at the level of the test
• For active tests, the cost was displayed on the computerized order entry system
  – FY 2008 Medicare allowable cost*

35 most Frequent Labs Randomized to Control vs. Display

<table>
<thead>
<tr>
<th>Controls</th>
<th>Cost Displayed “Active”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Glucose</td>
<td>1. Hgb</td>
</tr>
<tr>
<td>2. Serum Potassium</td>
<td>2. ABO</td>
</tr>
<tr>
<td>3. PTT</td>
<td>3. UA</td>
</tr>
<tr>
<td>4. LDH</td>
<td>4. PTT/INR</td>
</tr>
<tr>
<td>5. CPK</td>
<td>5. Retic Count</td>
</tr>
<tr>
<td>6. BMP</td>
<td>6. Urine Ev</td>
</tr>
<tr>
<td>7. Triage</td>
<td>7. Phosphate</td>
</tr>
<tr>
<td>8. Blood culture</td>
<td>8. Serum sodium</td>
</tr>
<tr>
<td>9. Urine culture</td>
<td>9. CBC</td>
</tr>
<tr>
<td>10. Lactic acid</td>
<td>10. Iron</td>
</tr>
<tr>
<td>11. CK-MB</td>
<td>11. Magnesium</td>
</tr>
<tr>
<td>12. Lipid panel</td>
<td>12. CBC overall</td>
</tr>
<tr>
<td>13. Vanc level</td>
<td>13. Saccharide culture amboic</td>
</tr>
<tr>
<td>14. CBC</td>
<td>14. CMP</td>
</tr>
<tr>
<td>15. Tranquilizer</td>
<td>15. Trasplatin</td>
</tr>
<tr>
<td>17. Microalbumin</td>
<td>17. Sodium Calcium</td>
</tr>
<tr>
<td>18. Tacrolimus</td>
<td>18. Tacrolimus</td>
</tr>
</tbody>
</table>
35 most Expensive Labs
Randomized to Control vs. Display

Controls                  Cost Displayed “Active”
2. T cell counts         2. HIV Viral Load
3. ACTH                  3. VD 1.25
4. CYTOMEG- DNA- AMPLIFICATION 4. Aldosterone
5. HEV- DNA- AMPLIFICATION 5. BNP
6. Urine immunobilization 6. Chlamydia DNA Amplification
7. CYTOMEG- DNA - QUANT 7. Enterovirus DNA Amplification
8. HEPATITIS B- DNA - QUANT 8. Granulosa DNA Amplification
9. HEPATITIS C- DNA - QUANT 9. VD 2.25
10. Immature platelet fraction 10. Urine catecholamines
11. TOTAL TESTOSTERONE 11. Serum immunobilization
12. SELENIUM 12. Vitamin D (Thiamine)
13. PROLACTIN 13. CG 125
14. CORTISON 14. CGA
15. CIDACTIN 15. Gastrointental Bands
16. ERYTHROPOIETIN 16. Streptococcal Bands
17. FSH 17. Streptococcal Bands
18. IFTSH

Examples of Prices

- Frequent Labs
  - Blood Gas: $28.25
  - TSH: $24.53
  - CMP: $15.44
  - BMP: $12.36
  - Hgb: $3.46

- Expensive Labs
  - Hep C Genotype: $238.62
  - BNP: $49.56
  - Hep C Quant: $41.43
  - SPEP: $32.62
  - FSH: $27.14

Methods- Display format presented to providers via CPOE

<table>
<thead>
<tr>
<th>Tests</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home-8 LAB</td>
<td>$3.37/each</td>
</tr>
<tr>
<td>Home-8 LAB - AM Lab</td>
<td>$3.37/each</td>
</tr>
<tr>
<td>Home-8 LAB - STAT</td>
<td>$9.37/each</td>
</tr>
<tr>
<td>Home-8 With Automated Differential LAB</td>
<td>$11.35/each</td>
</tr>
<tr>
<td>Home-8 With Automated Differential LAB - AM Lab</td>
<td>$11.35/each</td>
</tr>
<tr>
<td>Home-8 With Automated Differential LAB - STAT</td>
<td>$11.35/each</td>
</tr>
</tbody>
</table>
Methods

- Baseline period (11/10/08-5/9/09)
  - No costs displayed on POE
- Intervention period (11/10/09-5/9/10)
  - Costs displayed for the “active” tests only
- Providers unaware

Results

Data from the Entire Hospital
1,166,753 labs analyzed

2 Tail Fisher’s Exact Test
P= 0.0047

<table>
<thead>
<tr>
<th>Test</th>
<th>Cost (Average)</th>
<th>Cost (Median)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMP</td>
<td>$12.36</td>
<td></td>
</tr>
<tr>
<td>CMP</td>
<td>$15.44</td>
<td></td>
</tr>
<tr>
<td>Ionized Ca</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBC w/diff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnesium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Delta cost= Baseline period minus display period

BMP ($12.36)
Primary Outcome Measure: Overall Cost Savings in 6 months

- Active group: $486,460 reduction
  - 10% reduction from baseline
- Control group: $53,267 increase
  - 2.4% increase
- Total cost savings: $433,193

Conclusions

- Simple method to decrease the use of inexpensive but frequently ordered tests
  - Did not just result in work-arounds
  - Providers were not incentivized
- Saves the healthcare system money

Table 4. Utilization changes between the baseline and intervention periods

<table>
<thead>
<tr>
<th>Test</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anteroposterior chest x-ray</td>
<td>-0.5</td>
</tr>
<tr>
<td>Abdominal x-ray</td>
<td>1.29</td>
</tr>
<tr>
<td>CT head</td>
<td>1.74</td>
</tr>
<tr>
<td>Renal ultrasound</td>
<td>10.98</td>
</tr>
<tr>
<td>Vascular ultrasound</td>
<td>1.08</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>2.84 ± 4.41</td>
</tr>
<tr>
<td>Control group</td>
<td></td>
</tr>
<tr>
<td>Ultrasound extremity</td>
<td>4.88</td>
</tr>
<tr>
<td>Posterior and lateral chest</td>
<td>-2.36</td>
</tr>
<tr>
<td>CT abdomen with contrast</td>
<td>-10.54</td>
</tr>
<tr>
<td>Abdominal ultrasound</td>
<td>-3.66</td>
</tr>
<tr>
<td>CT chest with contrast</td>
<td>3.55</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>-3.04 ± 6.47</td>
</tr>
</tbody>
</table>

*p = 10 for comparison between active group and control group averages (Student’s t-test)
Things We Do For No Reason

1. NG Lavage for UGI Bleed
2. Urine lytes (FeNa, FeUrea) for AKI
3. Prophylactic anticonvulsants for new brain lesion
4. Reflexively transfuse cardiac patients with PRBC for HCT < 30%
5. Daily CXR in the ICU
6. CK-MB testing
7. Observing patients after IV to PO antibiotic switch
8. Using nebs over MDI with spacer
9. US for AKI
10. Seafood Allergy as a risk factor for IV contrast reaction
11. Treatment length for UTI and PNA
12. Head CT for Delirium
13. Hansel stain for AIN
14. K+ > 4 in ACS
15. Carotid Doppler for Syncope evaluation
16. Checking serum and RBC folate levels

Case 1

• Pt DV*, a 45 year-old man with a h/o active HCV, alcoholism, bilateral AKA, CLD, and a penchant for building Deaths, presents with AMS.
• No h/o hepatic encephalopathy (HE)
• What is the best way to diagnose the cause of his AMS?

What is the best way to diagnose the cause of his AMS?

A. Perform psychometric tests
B. Check serum venous ammonia levels
C. Test using the critical flicker frequency
D. Evaluate for other likely causes of confusion
E. Use the Force
Tests to Diagnose HE in cirrhotic patients

- Results of survey of 600 GE in Bavaria (165 or 27.5% responded).
- CFF is critical flicker frequency


Critical Flicker Frequency

- This test measures the frequency at which the patient perceives that a fused/single light becomes a flickering light.
- The device causes a stepwise decrease in frequency from 60 to 25 Hz.
- This is done multiple times (usually 8–10) to allow calculation of the mean and standard deviation.
- It may also be performed in reverse, where the patient determines the frequency at which a flickering light becomes continuous or ‘fused’.
- CFF threshold of 38-39Hz (lower associated with increased severity of HE)

Table 1. West Haven Criteria for Grading of Mental Status

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No signs or symptoms</td>
</tr>
<tr>
<td>1</td>
<td>Trivial lack of awareness</td>
</tr>
<tr>
<td></td>
<td>Drowsy or listless</td>
</tr>
<tr>
<td></td>
<td>Impaired attention span</td>
</tr>
<tr>
<td>2</td>
<td>Lethargy or apathy</td>
</tr>
<tr>
<td></td>
<td>Minimal disorientation for time or place</td>
</tr>
<tr>
<td></td>
<td>Stable personality change</td>
</tr>
<tr>
<td></td>
<td>Inappropriate behavior</td>
</tr>
<tr>
<td></td>
<td>Impaired performance of subtraction</td>
</tr>
<tr>
<td>3</td>
<td>Somnolence to semistupor, but responsive to verbal stimulation</td>
</tr>
<tr>
<td></td>
<td>Confusion</td>
</tr>
<tr>
<td></td>
<td>Gross disorientation</td>
</tr>
<tr>
<td>4</td>
<td>Coma (unresponsive to verbal or noxious stimuli)</td>
</tr>
</tbody>
</table>

Why Ammonia Levels May Not Correlate with HE

- Site and phlebotomy technique used to obtain blood samples
  - Rapid lab analysis on ice
  - Fist clenching (prolonged causes false +)
  - Use of tourniquet (prolonged causes false +)
  - Arterial vs. venous sampling (probably not that different)
  - Fasting or not

- Other etiologies for increased ammonia

  - Ge PS, Runyon BA. Serum ammonia level for the evaluation of hepatic encephalopathy. JAMA 2014;312:643-4.

17 Patients

(A) During HE episode
(B) Immediately after the complete resolution (grade 0)
(C) 48 h later with the patients still in grade 0 HE


Severity Study

- Consecutive admitted CCF pts with cirrhosis
  - 9/98 to 12/99
  - Enrolled regardless of MS

- Excluded
  - Currently drinking (in last month)
  - MS change due to something else
  - On HD
  - Informed consent not obtained

- 30 (25%) had grade 0
- 27 (22%) had grade 1
- 23 (19%) had grade 2
- 28 (23%) had grade 3
- 13 (11%) had grade 4

Author's Conclusions

- Single level has little clinical utility in the diagnosis of HE
- Substantial overlap in the total ammonia levels by grade of HE
**Review Conclusions**

- Diagnose HE in pts with CLD by clinical presentation and not on ammonia levels
- Normal ammonia level does not exclude HE
- Elevated ammonia level does not diagnose HE
- In patients with established HE, follow serial bedside assessment not ammonia trends
- Blood ammonia levels correlate poorly with the grade of HE
- Ammonia levels are helpful in ALF

Ge PS, Runyon BA. Serum ammonia level for the evaluation of hepatic encephalopathy. JAMA 2014;312:643-4.

**Feldman’s Conclusions**

- Make sure the sample is obtained correctly
- Don’t check NH3 in CLD pts
- Consider checking NH3 in AMS without known CLD

**Ammonia Bibliography**

Case 2 - PIV

- DV has been in the hospital for 4 days.
- The nurse asks if the PIV needs to be changed.
- What is your best response?

Change the PIV?

A. Absolutely. We don’t want him to develop phlebitis or bacteremia.
B. No, we can watch for clinical signs.
C. I’m sure we have a protocol. Please consult it.
D. We may need to use the forehead vein.

Routine vs. Clinically Indicated

- Routine- Q3-4 days
- Clinical Indications
  - Blockage
  - Pain
  - Redness
  - Infiltration
  - Swelling
  - Leakage
  - Phlebitis
  - Bacteremia
**CDC Guidelines- 2011**

- There is no need to replace PIV more frequently than every 72-96 hours  
  – Category 1B
- No recommendation regarding replacement of PIV in adults only when clinically indicated.  
  – **Unresolved issue**
- Replace PIV in children only when clinically indicated  
  – Category 1B


**The Lancet Article- 2012**

**Routine versus clinically indicated replacement of peripheral intravenous catheters: a randomised controlled equivalence trial**

**Summary**

**Background** The safety of peripheral intravenous catheters and their role was examined for 72-96 h.

**Method**

- Multicenter  
  – 3 hospitals in Queensland, Australia  
- Randomized  
  – Stratified by hospital  
  – Concealed before allocation
- Intention to treat
- Non-blinded
- Adults (≥18 years) with an IV catheter of expected use longer than 4 days

Outcomes

Primary outcome
• Phlebitis within 48 h after removal
  – The equivalence margin was set at 3%
  – 5-part definition

Secondary endpoints
• Catheter-related bloodstream infections
• Local infections
• All bloodstream infections
• Catheter tip colonization
• Infusion failure
• Catheter numbers used
• Therapy duration
• Mortality
• Costs

Important Inclusions/Exclusions

• Inclusion
  – PIV inserted in any clinical area
    • Including ED and OR
  – Inserted by any nurse or doctor or by IV insertion teams

• Exclusion
  – PIV inserted in an emergency
  – Bloodstream infection
  – Planned removal within 24 h
  – Already in situ for more than 72 h

Results
CRBSI

Rate between 0.0% and 0.3%

Infiltration
US Implication

- 37 million patients admitted to hospitals each year in USA
  - If one third (12.5 million) needed a catheter for more than 3 days
- Clinically indicated replacement would
  - prevent around 2.5 million unnecessary IV insertions
  - save up to 1 million hours of staff time
  - over 5 years would save around $400 million


Take Home

- PIV must be aseptically inserted, carefully maintained, assessed daily and removed as soon as possible
- Insertion site should be inspected at each shift change and the catheter removed if clinically indicated
- Don’t put a PIV if it is not needed
- Don’t routinely switch out PIVs

Bibliography- PIV

Bibliography- PIV


Case 3

- DV is transferred out of the MICU after treatment for a COPD exacerbation
  - CO₂ retention caused his AMS
- He was treated with steroids, NIPPV, and bronchodilators
- The sub-I continues the PPI that was started in the ICU for ulcer prophylaxis.

The sub-I asks if he should have continued the PPI for a floor pt? Your best response is...

A. Please stop it. There is no proven benefit.
B. There may be some benefit, but not enough to justify doing it for everyone.
C. We should consult GI.
D. Definitely, and we should use an IV PPI.
E. Do you work for a pharmaceutical company?
Acid-Suppressive Medication Use and the Risk for Nosocomial Gastrointestinal Tract Bleeding

- Outcome: nosocomial GI bleeding
  - Occurring outside of the ICU
  - Any overt GI bleeding (hematemesis, nasogastric aspirate containing "coffee grounds" material, melena, or hematochezia)
  - Occurring more than 24 hours after hospital admission
- Secondary outcome: clinically significant nosocomial GI bleeding


Acid-Suppressive Medication Use and the Risk for Nosocomial Gastrointestinal Tract Bleeding

- Cohort study
  - propensity matched generalized estimating equation was used to control for confounders
- Patients admitted to an academic medical center from 2004 through 2007
- ≥ 18 years of age, hospitalized ≥ 3 days
  - not admitted for GIB
- Acid-Suppressive Meds (ASM)
  - order for a proton pump inhibitor
  - order for a histamine-2-receptor antagonist.


- 79,287 admissions in analytic cohort
- ASM ordered in 45,882 (59%)
  - PPI 81%
  - H2-blocker 29%
- Matched cohort
  - 18,983 pts each arm

Acid-Suppressive Medication Use and the Risk for Nosocomial Gastrointestinal Tract Bleeding

- Primary outcome occurred in 224 admissions (0.29%)
- Secondary outcome of clinically significant GI bleeding occurred in 176 admissions (0.22%).
- OR switch from unadjusted to adjusted


Number Needed to Treat

- 770 patients would need to be treated with acid-suppressive medication to prevent 1 episode of nosocomial GI bleeding
- 834 to prevent 1 episode of clinically significant nosocomial GI bleeding.
- ASM use was associated with a 37% reduction in the odds of nosocomial GI bleeding.

Other important NNT

- ASM and hospital-acquired *C difficile* Infection
  – number needed to harm of 533
- ASM and hospital-acquired pneumonia
  – needed to harm of 111

Take Home

- NNH for c dif and PNA < NNT for GIB
- Recommend against prophylactic ASM use in patients outside of the ICU
- Need to figure out a subset for whom ASM NNT is < NNH

Choosing Wisely - ABIM Foundation

JAMA IM – “Less Is More”
ACP Curriculum

SGIM Bottom Line Evidence

Journal of Hospital Medicine Series
UCSF High Value Care Committee

Johns Hopkins DOM HVCC Committee Goals and Members

- **Goals**
  - Increase the value of care our patients receive
  - Make high value care part of the DOM culture
  - Reduce diagnostic testing or treatments that do not improve care but do increase costs

- **Multidisciplinary participation (JHH/Bayview)**
  - Medicine Faculty
  - Medicine Fellows
  - Medicine Residents
  - Nursing
  - Administrators
  - Pharmacy
  - Radiology
  - Pathology faculty and residents
  - IT

DOM HVCC - Approach

- **Identify** low-value practices within the DOM
  - Members vote on projects
- **Convene** relevant stakeholders
  - Nursing, Pharmacy, Lab, Radiology, IT
- **Develop** interventions
- **Measure** the impact of the interventions
- **Disseminate** approach within the institution and nationwide
C. diff Testing
Intervention and Results

C. Diff Background

- Asymptomatic colonization of patients with C. diff is increasing
- Treatment of colonized patients
  - Unnecessary antibiotic administration
  - Rising hospitalization costs
  - Poor quality metrics for the hospital (MHAC)
- Positivity rate approximately 13%
- HEIC, DOM HVCC, and Lab collaboration

POE message activated on 12/17/15
Attention Providers

DON’T TEST your patient for C. difficile infection if:
• < 3 unformed stools/day
• Laxatives within past 48 hours

If test negative: DON’T RETEST within 7 days

If test positive: DON’T RETEST for cure

DOM HVCC/Micro Lab/ASP/HEIC

C. Diff Testing

<table>
<thead>
<tr>
<th>Year</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpt 2015</td>
<td>479</td>
<td>510</td>
<td>471</td>
<td>487</td>
</tr>
<tr>
<td>Inpt 2016</td>
<td>307</td>
<td>365</td>
<td>381</td>
<td>351</td>
</tr>
<tr>
<td>Outpt 2015</td>
<td>143</td>
<td>122</td>
<td>146</td>
<td>137</td>
</tr>
<tr>
<td>Outpt 2016</td>
<td>131</td>
<td>129</td>
<td>158</td>
<td>139</td>
</tr>
</tbody>
</table>

• POE message activated on 12/17/15
• Medicine Matters One Minute Guide (OMG) on 3/18
• Screensaver debuted around 3/15
• 28% drop in inpt C. diff testing
• No change in outpatient
HVCC Projects

- Inpatient folate testing (70%)
- Inappropriate telemetry use (50%)
- Inpatient Hepatitis C PCR/genotype testing (35%)
- Asymptomatic bacteriuria testing & treatment (6%)
- Inappropriate inpatient testing for C diff (28%)
- Excessive type and screen (ABO) lab testing
- Daily labs
- Admitting bundle: UA, CXR, ECG
- Echo

Website: www.providersforresponsibleordering.org
Twitter: @BayviewPRO
Take the PRO Pledge today
Sonali Palchaudhuri sonali@jhmi.edu

High Value Practice Academic Alliance

- Consortium of academic medical centers
- Cross-institutional quality improvement, research, and education related to value
- Launched June 6, 2016 by Johns Hopkins School of Medicine
- 70 partner academic institutions
What do you do next week?

- Join PRO!
- Participate in the HVPAA
- Don’t check ammonia in CLD pts
- Don’t routinely change PIVs
- Don’t prescribe PPIs for GI ulcer prophylaxis on the wards

What do you do over the next few months?

Write a TWDFNR article for JHM

LF@jhmi.edu
TWDFNR@hospitalmedicine.org
What do you do over the next few years?

- Create a HVC Committee in your institution!