

# **PENN CENTER FOR EVIDENCE-BASED PRACTICE:**

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## **Using Rapid Reviews in a Healthcare Provider Organization to Improve the Quality, Safety and Value of Care Delivered**

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**Rapid Review Summit**

Feb 4, 2015

Vancouver, BC, Canada



# Case: Chlorhexidine to Reduce Surgical Site Infections



Chlorhexidine:  
\$13 per patient

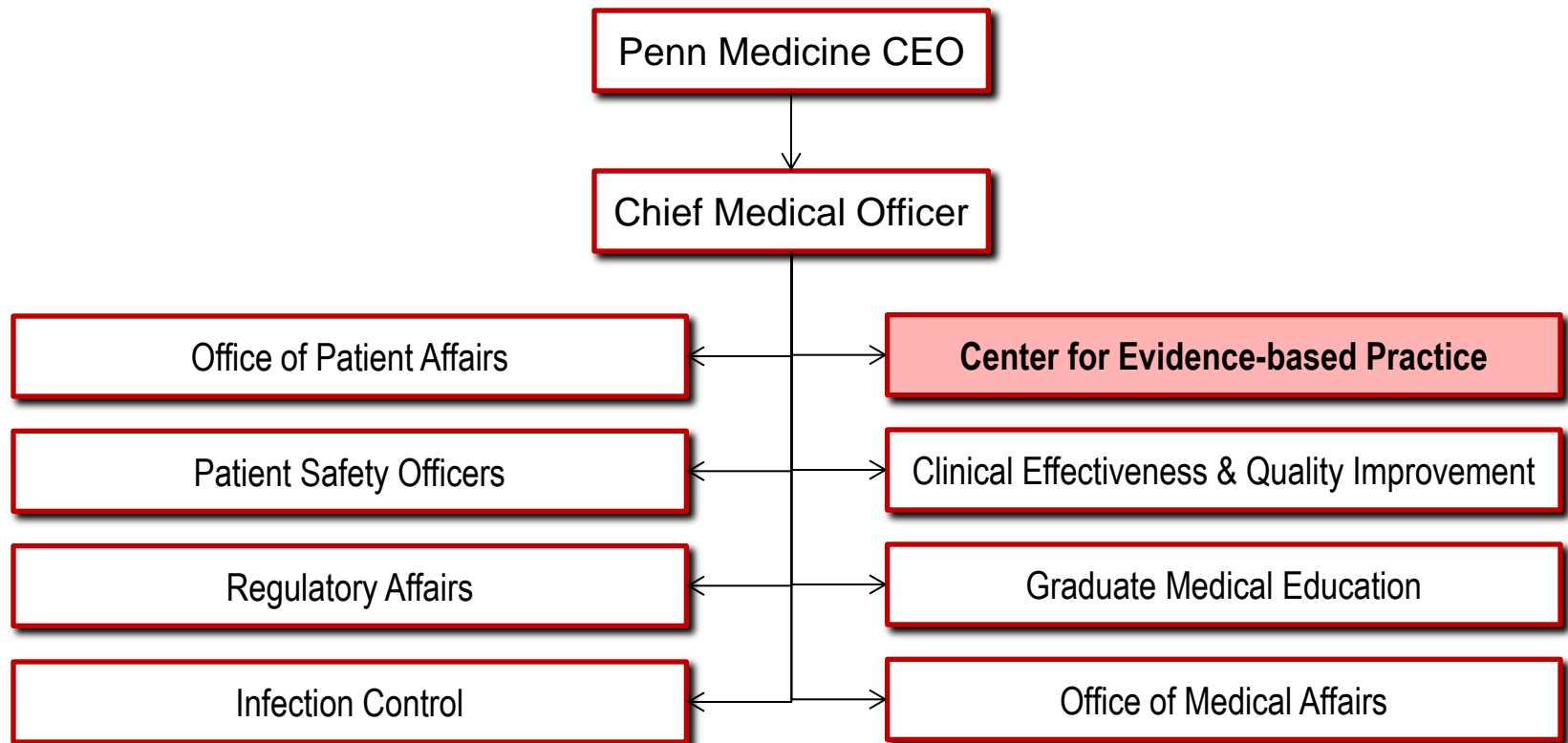


Betadine:  
60 cents per patient

**“To support the quality, safety and value of patient care at Penn through evidence-based practice.”**

- Perform rapid reviews of the medical literature to inform clinical practice, policy, purchasing and formulary decisions in and outside of Penn
- Help translate evidence into practice at Penn through computerized clinical decision support (CDS)
- Offer education in evidence-based decision making to trainees, staff and faculty in and outside of Penn

# Office of CMO Organizational Chart



# CEP Staffing

## ◆ Director and co-director

- Physicians in hospital practice
- Expertise in epidemiology

## ◆ Physician and nurse liaisons

- Represent hospitals and outpatient practices
- Identify topics
- Disseminate results

## ◆ Clinical liaison librarians

## ◆ Three research analysts

- Full-time
- Diverse backgrounds
- Doctoral training

## ◆ Consulting partners

- Biostatistician
- Health economist

## ◆ Approximately 5.5 FTE

# Select Evidence Report Topics

## **Processes of care**

- Routine replacement of peripheral IVs versus replacement only “as needed”
- Post-discharge telephone calls to reduce readmissions

## **Devices**

- Indications for robot assisted surgery
- Automated hand hygiene monitoring systems

## **Drugs**

- Celecoxib versus other NSAIDs for post-operative pain control
- Colchicine to prevent atrial fibrillation and pericarditis after heart surgery

## **Diagnostic Tests**

- Screening tests for risk of hospital readmission
- Screening tests for risk of aspiration

# Technology Categories and Frequencies (2006-2014)

Category	Total
Drug	60 (24%)
Device, Equipment, and Supplies	48 (19%)
Process of Care	31 (12%)
Test, Scale, or Risk Factor	31 (12%)
Medical/Surgical Procedure	26 (10%)
Policy or Organizational / Managerial System	26 (10%)
Support System	14 (6%)
Biologic	13 (5%)
Total	249

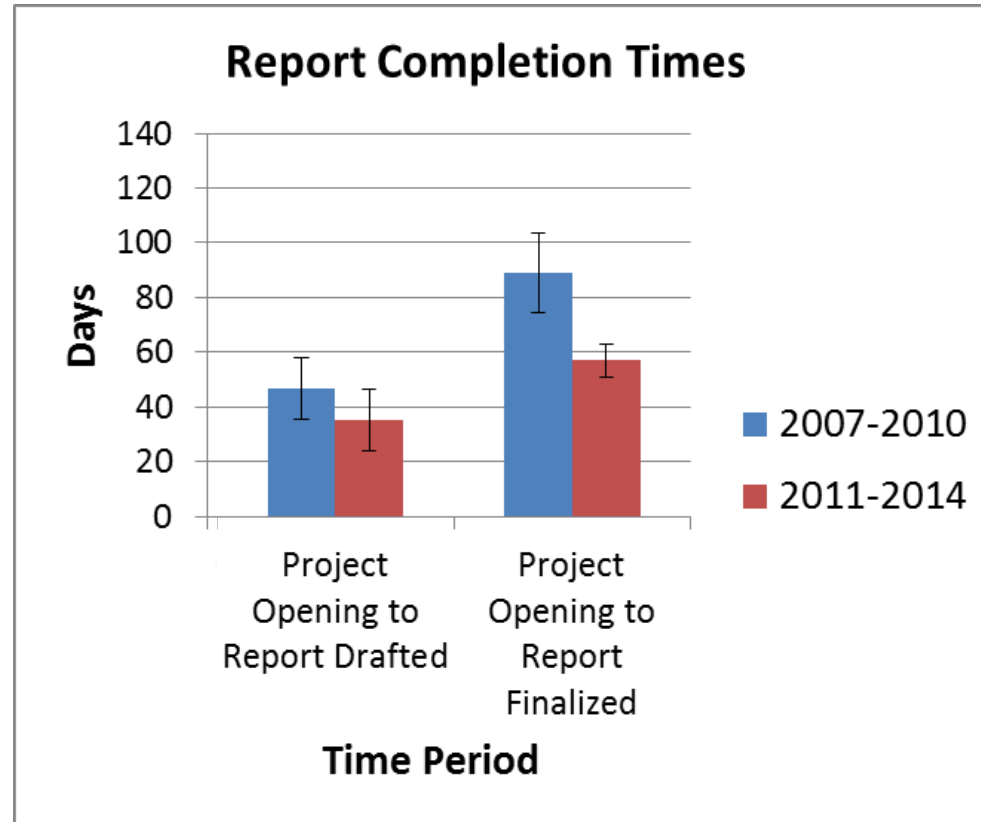
# Requestor Categories and Frequencies (2006-2014)

Category	Total
Clinical Department	72 (29%)
CMO	47 (19%)
Purchasing Committee	35 (14%)
Formulary Committee	22 (9%)
Quality Committee	21 (8%)
Administrative Department	19 (8%)
Nursing	14 (6%)
Ad Hoc Committee	6 (2%)
Other*	13 (5%)
Total	249

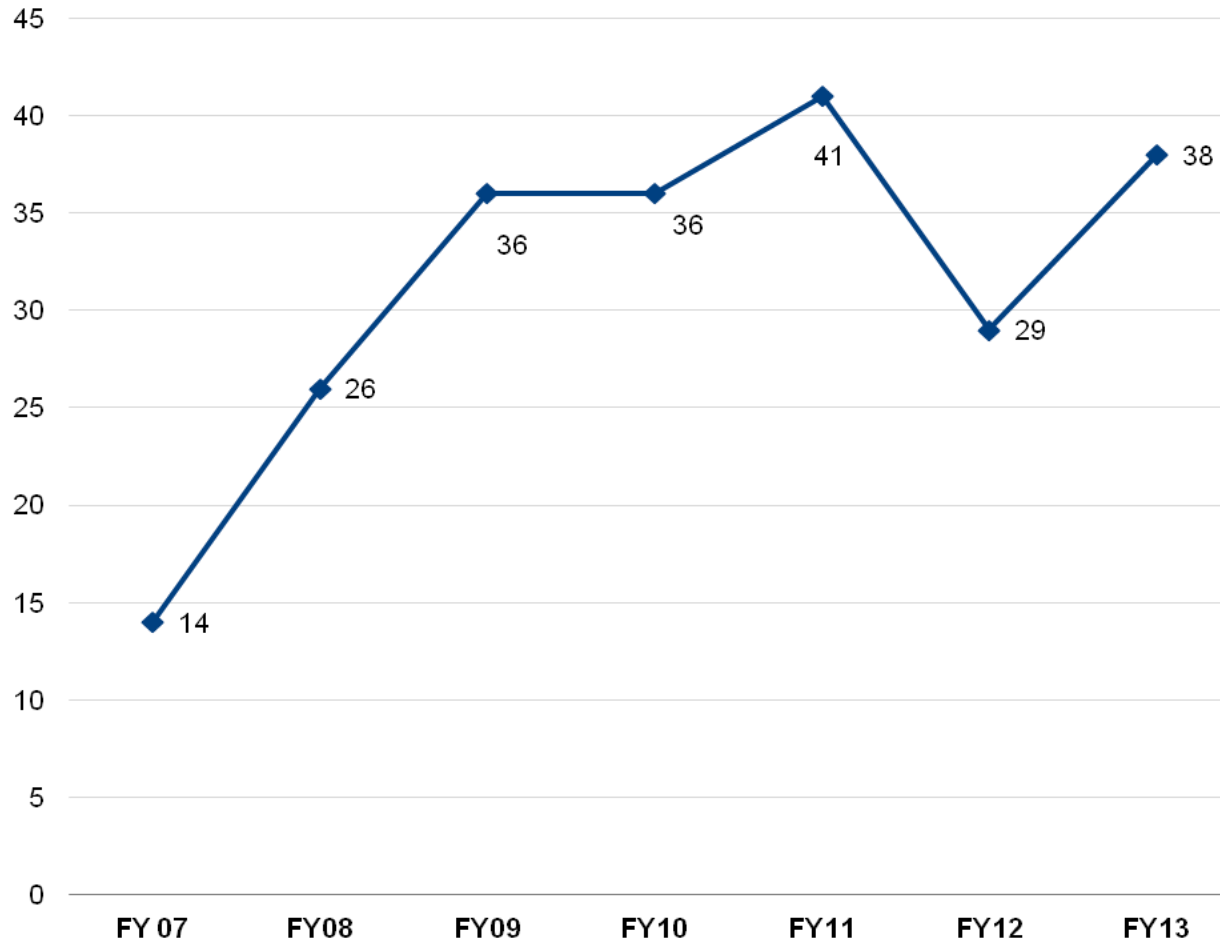
\* Other includes IT committees, Primary Care Networks, CHOP, CEP and Payers



# Report Completion Times in Mean Days by Fiscal Years



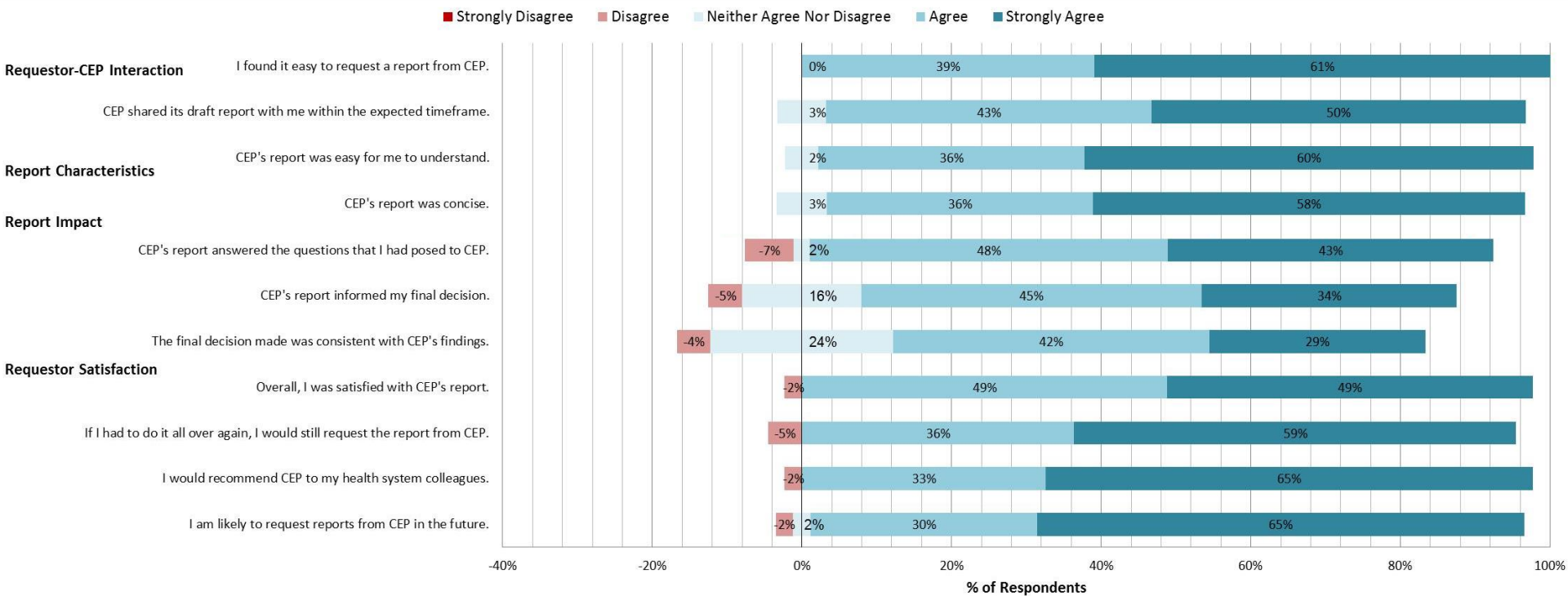
# CEP Reports by Fiscal Year



# Responses to Yes/No Survey Questions

Items	Percentage of respondents responding affirmatively
What factors prompted you to request a report from CEP? (Please select all that apply.)	
My own time constraints	28% (13/46)
CEP's ability to identify and synthesize evidence	89% (41/46)
CEP's objectivity	52% (24/46)
Recommendation from colleague	30% (14/46)
Did you conduct any of your own literature searches before contacting CEP?	67% (31/46)
Did you obtain and read any of the articles cited in CEP's report?	63% (29/46)
Did you read the following sections of CEP's report?	
Evidence Summary (at beginning of report)	100% (45/45)
Introduction/Background	93% (42/45)
Methods	84% (38/45)
Results	98% (43/43)
Conclusion	100% (43/43)

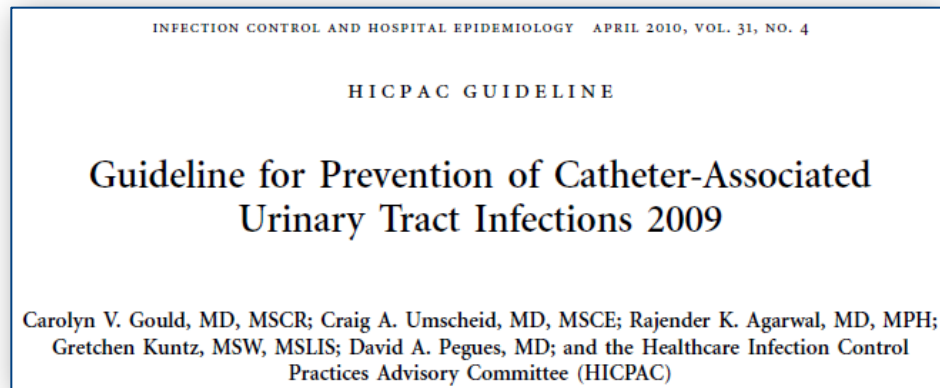
# Responses to Likert Survey Questions



# External Collaborations: CDC and AHRQ

## ◆ Centers for Disease Control and Prevention (CDC)

- Infection control guidelines



## ◆ Agency for Healthcare Research and Quality (AHRQ)

- One of 13 centers nationally awarded an “AHRQ Evidence-based Practice Center” contract
- Perform evidence reviews to inform clinical practice guidelines and other forms of national healthcare policy

# Dissemination and Implementation (FY07-14)

<b>Modes of Dissemination</b>	<b>N</b>
<b>Internal and External Penn Websites</b>	249 (100%)
<b>Indexed in the Cochrane HTA Database</b>	204 (82%)
<b>Reports Published in Peer-reviewed Journals</b>	24 (10%)
<b>Reports Informing Clinical Decision Support</b>	30 (12%)

# Primary CDS Activities at Penn CEP


1. Evaluating and prioritizing new CDS proposals
2. Developing and deploying CDS interventions
3. Cataloguing and evaluating implemented interventions

# CEP CDS Interventions

- ♦ **Over 30 CEP reports have informed CDS interventions embedded in Penn's electronic health records, including:**
  - Venous thromboembolism prophylaxis
  - Foley catheter removal alert
  - Delirium management order set
  - Red blood cell transfusion order set
  - Albumin order set
  - Nurse-driven protocol for vaccine assessment and administration
  - Readmission risk flag
  - Severe sepsis orderset
  - Early warning system for sepsis
  - PICC line orderset
  - Cdiff orderset
  - Target Specific Oral Anticoagulants orderset



# Example 1: CDS to Predict Readmission Risk

<b>◆ Penn Medicine ◆</b> <b>Blueprint for Quality and Patient Safety</b>	
<i>Penn Medicine will eliminate preventable deaths and preventable 30-day readmissions by July 1, 2014</i>	
Imperatives	Priority Actions
<b>Accountability For Perfect Care</b>	<ul style="list-style-type: none"> <li>◆ “Always” events - strive to provide perfect care</li> <li>◆ Implement clear lines of accountability that span inpatient and ambulatory environments</li> </ul>
<b>Patient And Family Centered Care</b>	<ul style="list-style-type: none"> <li>◆ Provide consistent and thorough communication with families &amp; patient regarding plan of care</li> <li>◆ Increase patient and family involvement in UPHS forums that address issues relevant to quality, safety and service excellence</li> <li>◆ Enhance patient-provider partnership through better exchange of information</li> </ul>
 <b>Transitions In Care/Coordination Of Care</b>	<ul style="list-style-type: none"> <li>◆ Ensure all UBCLs implement redesign care processes related to:                             <ul style="list-style-type: none"> <li>— Risk stratification</li> <li>— Interdisciplinary rounding</li> <li>— Discharge hand-off to outpatient care</li> </ul> </li> </ul>
<b>Reducing Unnecessary Variations In Care</b>	<ul style="list-style-type: none"> <li>◆ Eliminate variations in care processes where evidence exists</li> <li>◆ Balance conformity in practice with needs for personalized care</li> <li>◆ Set goals that are positive and proactive</li> </ul>
<b>Provider Engagement, Leadership, And Advocacy</b>	<ul style="list-style-type: none"> <li>◆ Strengthen organizational capacity and capability for continuous improvement</li> <li>◆ Increase involvement of house staff in quality, safety and service excellence efforts</li> </ul>

# Risk Factors for 30 Day Readmission

## **RISK FACTORS FOR HOSPITAL READMISSION**

An Evidence Review from the Penn Medicine Center for Evidence-based Practice

February 2011

Authors: Brian Leas, MS, MA; Craig A. Umscheid, MD, MSCE

Keywords: hospital readmission; risk factors; predictive models

### **EVIDENCE SUMMARY**

1. Systematic reviews and primary studies of 30-day readmission rates have identified several elements of healthcare resource utilization and patient characteristics that are predictive of risk for rehospitalization.
2. Utilization factors associated with readmission include length of stay, number of prior admissions, and previous emergency department visits. Studies have not consistently identified threshold values for these indicators.
3. Patient characteristics associated with readmission include comorbidity, living alone, discharged to home, and payor. Evidence is mixed regarding other factors, including age and gender.
4. Several algorithms for predicting readmission risk have been successfully designed and tested. One of these prediction rules relied solely on an electronic medical record to populate its model.
5. No studies were identified that successfully used electronic medical records to both identify patients at higher risk for readmission and support an intervention to manage high risk patients.



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# Readmission Risk Flag

Eclipsys Gateway | My Applications | Acute Care

My Applications ▶ Acute Care ▶ Patient List

File Registration View GoTo Actions Preferences Tools

16069387 / 53023219  
Garin, Matthew Thomas CONTACT OTHER BMI: 34.1

Allergies: cefepime (84725)

Patient List Orders Results Patient Info Documents Clinical Summary Flowsheets MedView Med Summary CDS

Current List: Silver 11 Select All Patients 32 Visit(s) Save Selected Patients...

Patient Name	Assigned Location	Provider	Visit Reason	Visit Status	Covering Provider	Covering Nurse	VTE Prophylaxis Status	Readmit Risk	New Orders	To Verify	To Sign
ROZA DENNIS	S11-1106-A	Garin, Matthew Thomas	LOWER GASTROINTESTI...	ADM	Garin, Matthew Thom...	Hutchinson, Elizabeth	✓	■			✓
RITZPATRICK JOHN J	S11-1113-A	Hecht, Todd E	DECOMPENSATED CHF...	ADM	Hecht, Todd E (MD)	Borzomati, Kristen	✓	■			✓
SCOTT TAVON M	S11-1104-A	Miller, Jean C	ABDOMINAL PAIN1091	ADM	Miller, Jean C (MD)	Borzomati, Kristen (RN)	✓				✓
WELLS NADINE	S11-1101-A	Miller, Jean C	ALTERED MENTAL STAT...	ADM	Miller, Jean C (MD)	Sun, Sona (RN)	✓				✓
RICHEY MORT	S11-1116-A	Hecht, Todd E	CHEST PAIN/DIARRHEA...	ADM	Hecht, Todd E (MD)	Sun, Sona (RN)	✓	■			✓
ROBINSON WILLIAM	S11-1118-A	Reinert, Kristy L	CHEST PAIN1027	ADM	Reinert, Kristy L (MD)	Somboonsong, Napa	✓				✓
FOMAN HAROLD K	S11-1104-B	Garin, Matthew Thomas	HYPERTENSICE EMERGE...	ADM	Garin, Matthew Thom...	Hutchinson, Elizabeth	✓				✓
SMITH RICHARD	S11-1124-A	Miller, Jean C	UTI, CELLULITIS 0980	ADM	Miller, Jean C (MD)	Sun, Sona (RN)	✓				✓
WINSTON GAIL	S11-1108-B	Hecht, Todd E	COPD EXACERBATION1...	ADM	Hecht, Todd E (MD)	Hill, Lisa R (RN)	✓				✓
LONG HENRY	S11-1119-A	Crooks, Gary W	PYELONEPHRITIS1082	ADM	Marandola, Elizabeth...	Hutchinson, Elizabeth	✓				✓
SMITH ANGELA	S11-1129-B	Garin, Matthew Thomas	HYPERGLYCEMIA	ADM	Garin, Matthew Thom...	Cox, Bronwyn (RN)	✓				✓
CARTER ASHLEY	S11-1123-B	Reinert, Kristy L	DEHYDRATION1118	ADM	Reinert, Kristy L (MD)	Johnston, Kristin N (R...	✓				✓
TIMBERS TRACY	S11-1105-A	Reinert, Kristy L	RENAL FAILURE PULMO...	ADM	Reinert, Kristy L (MD)	Hill, Lisa R (RN)	✓				
WOOD CHARLOTTE	S11-1109-A	Reinert, Kristy L	FEVER	ADM	Reinert, Kristy L (MD)	Borzomati, Kristen (RN)	✓				✓
HARMON JESSE T	S11-1120-A	Giantonio, Bruce J	ESOPHAGEAL CANCER	ADM	Turowski, Jason B (MD)	Johnston, Kristin N (R...	✓				✓
AKI, OMMOHAMED	S11-1129-A	Reinert, Kristy L	ATRIAL TACHYCARDIAO...	ADM	Reinert, Kristy L (MD)	Somboonsong, Napa	✓				✓
MANNION ERIN K	S11-1117-A	Reinert, Kristy L	MENINGITIS,STREP PHA...	ADM	Reinert, Kristy L (MD)	Somboonsong, Napa	✓				✓
ADAMS LUCY A	S11-1103-B	Garin, Matthew Thomas	ETOH CHEST PAIN1040	ADM	Garin, Matthew Thom...		✓				
MAIORANO MARTIN J	S11-1110-A	Hoteit, Maarouf A	HEPATIC ENCEPHALOP...	ADM	Mecoli, Christopher (...)	Hill, Lisa R (RN)	✓				
ALSTON FLOYD	S11-1112-A	Miller, Jean C	SYNCOPE,CVA, HTN0960	ADM	Miller, Jean C (MD)	Cox, Bronwyn (RN)	✓				✓
CARSON THOMAS	S11-1115-A	Garin, Matthew Thomas	MENTAL STATUS CHAN...	ADM	Garin, Matthew Thom...	Ingram, Brenda (RN)	✓	■			✓
LUCAS BLANCHE M	S11-1105-B	Hecht, Todd E	CONGESTIVE HEART FAI...	ADM	Hecht, Todd E (MD)	Hill, Lisa R (RN)	✓				
PETERSON ROBERT	S11-1128-B	Hecht, Todd E	ANEMIA1054	ADM	Hecht, Todd E (MD)	Cox, Bronwyn (RN)	✓				✓
ROBINS BETTY	S11-1125-A	Hecht, Todd E	DECONDITIONING0985	ADM	Hecht, Todd E (MD)	Somboonsong, Napa	✓				✓
SCHMIDT FRANZ J	S11-1102-B	Dagli, Mandeep S	PRIMARY LIVER CA RIM...	ADM		Borzomati, Kristen (RN)	✓				✓
LAD RAINKANT P	S11-1121-A	Gabriel, Courtney A	LYMPHOMAS	ADM	Lee, Lindsay M (CRNP)	Ingram, Brenda (RN)	✓	■			✓
WITZ JORDON	S11-1130-A	Barton, Todd D	ABDOMINAL PAIN, HIV...	ADM	Whittaker, Stacey-Ann...	Ingram, Brenda (RN)	✓	■			✓

# Example 2: Rapid Reviews on Albumin

## ALBUMIN USE IN THE HEALTHCARE SETTING

*An Evidence Advisory from Penn Medicine's Center for Evidence-based Practice*  
December 2010

Project directors: ..... Prashant Mudreddy, MD and Ingi Lee, MD, MSCE  
Internal review: ..... Kendal Williams, MD, MPH

Keywords: albumin

### Summary

Indications for albumin use included in ≥ 3 guidelines:

- Large volume paracentesis (> 5L ascites fluid removed)
- For the treatment of Type I hepatorenal syndrome along with a vasoactive drug
- Spontaneous bacterial peritonitis if creatinine > 1mg/dl, BUN > 30mg/dl or total bilirubin > 4mg/dl
- Large therapeutic plasmapheresis (> 20mL/kg in single session or 20mg/kg/wk in successive sessions)

Indications for albumin use included in ≥ 2 guidelines:

- Post-operative period to control ascites and peripheral edema after liver transplantation, if all the following criteria are met: albumin < 2.5 mg/dL, pulmonary capillary pressure < 12mm of Hg, Hct > 30%
- Nephrotic syndrome if albumin < 2 g/dL with hypovolemia and/or pulmonary and peripheral edema exists
- Burns after initial 24 hours if > 30-50% body surface area involved
- Malnutrition in patients who cannot tolerate enteral nutrition and meet the following criteria: diarrhea > 2 L/day, albumin < 2 g/dL, continuing diarrhea despite short chain peptides and mineral formulas, no other cause to explain diarrhea



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## ALBUMIN USE IN HEPATORENAL SYNDROME AND LARGE VOLUME PARACENTESIS

A Systematic Review from the University of Pennsylvania Health System Center for Evidence-based Practice

August 2009

Ingi Lee, MD MSCE, Rajender Agarwal, MD MPH, and Kendal Williams, MD MPH

### EVIDENCE SUMMARY

- There is no current evidence on the role of albumin in the diagnosis of HRS.
- In evaluating the efficacy of albumin in the management of HRS, there are no head to head comparisons of albumin vs. no albumin, and 1 OBS study comparing albumin + terlipressin vs. terlipressin. Based on evidence of very low quality, albumin when used in conjunction with terlipressin may have added benefits in increasing complete response rates but does not impact survival; however further studies are likely to change this estimate.
- 16 RCT, including 3 RCT comparing albumin vs. no albumin, evaluated the efficacy of albumin in the management of complications from large volume paracentesis. Based on evidence of low quality, albumin use did not significantly improve renal function, but further research may change this estimate.
- There is no current evidence that albumin use decreases mortality, readmissions, overall complications, HE, infections, or bleeding in cirrhotic patients with ascites undergoing paracentesis.

Keywords: albumin, hepatorenal syndrome, paracentesis



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# Albumin CDS Intervention

Albumin Infusion -

S11-1103-A

10738078 / 69627010

56y (24-Jun-1956)

Female

Allergies: albuterol, Albuterol Sulfate, DOBUTamine, Reglan, v...

Albumin Order Set- [0 orders of 2 are selected]

Relevant Results

BUN: 24;

Combined Measurements

Height (inches)	Height (cm)	Weight (lb)	Weight (kg)	BSA
70	177.8	175	79.4	1.97

Per national guidelines, the following indications are consistent with appropriate and evidence-based use. Inappropriate and injudicious albumin use is costly and potentially harmful. If your intended indication is not listed, and you feel albumin is still indicated, your clinical reasoning must be documented below.

☐

Diagnosis of Hepatorenal Syndrome

Diagnosis includes the withdrawal of all diuretics followed by volume expansion with albumin dosed at 1 g/kg (max 100 grams/day) for 3 days.

☐

Management of Hepatorenal Syndrome

Albumin dosing should be 25-50 grams / day. Consider the use of vasopressin or other vasoconstrictors such as octreotide as well.

☐

Therapeutic Paracentesis

Dosed as 8-10 g of albumin per liter withdrawn. Albumin is not necessary if paracentesis is less than 5 L unless Serum Creatinine is greater than 1.5 mg/dl.

☐

Management of Spontaneous Bacterial Peritonitis

Albumin 1.5 g/kg on day 1 of treatment followed by albumin 1 g/kg on day 3 if creatinine > 1 mg/dl, BUN > 30 mg/dl, or total bilirubin > 4 mg/dl.

☐

Post Liver Transplant to Control Ascites and Edema. (HUP ONLY)

Albumin 5% ( 250 ml) = 12.5 gm; Albumin 5% (500 ml) = 25 gm

Albumin 25% (50 ml) = 12.5 gm; Albumin 25% (100 ml) = 25 gm

☐

Plasmapheresis

Albumin 5% is the only approved concentration for Plasmapheresis

☐


Other

COMPREHENSIVE REVIEW FOR ALBUMIN INDICATIONS. PLEASE CLICK BUTTON ON THE RIGHT TO ACCESS WEBSITE ----->

----->

Albumin Infusion

	Order	Dose	Units	Route	Frequency	Priority	Start Date	Stop Date	Infuse Over
<input type="checkbox"/>	albumin 25% IVPB -		Gram(s)	intraVENOUS piggyback	Once	Routine	T		1 hour(s)
<input type="checkbox"/>	albumin 5% IVPB -		Gram(s)	intraVENOUS piggyback	Once	Routine	T		1 hour(s)

 Penn Medicine

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Figure: Interrupted time series of albumin ordering 12 months pre and post albumin CDS implementation

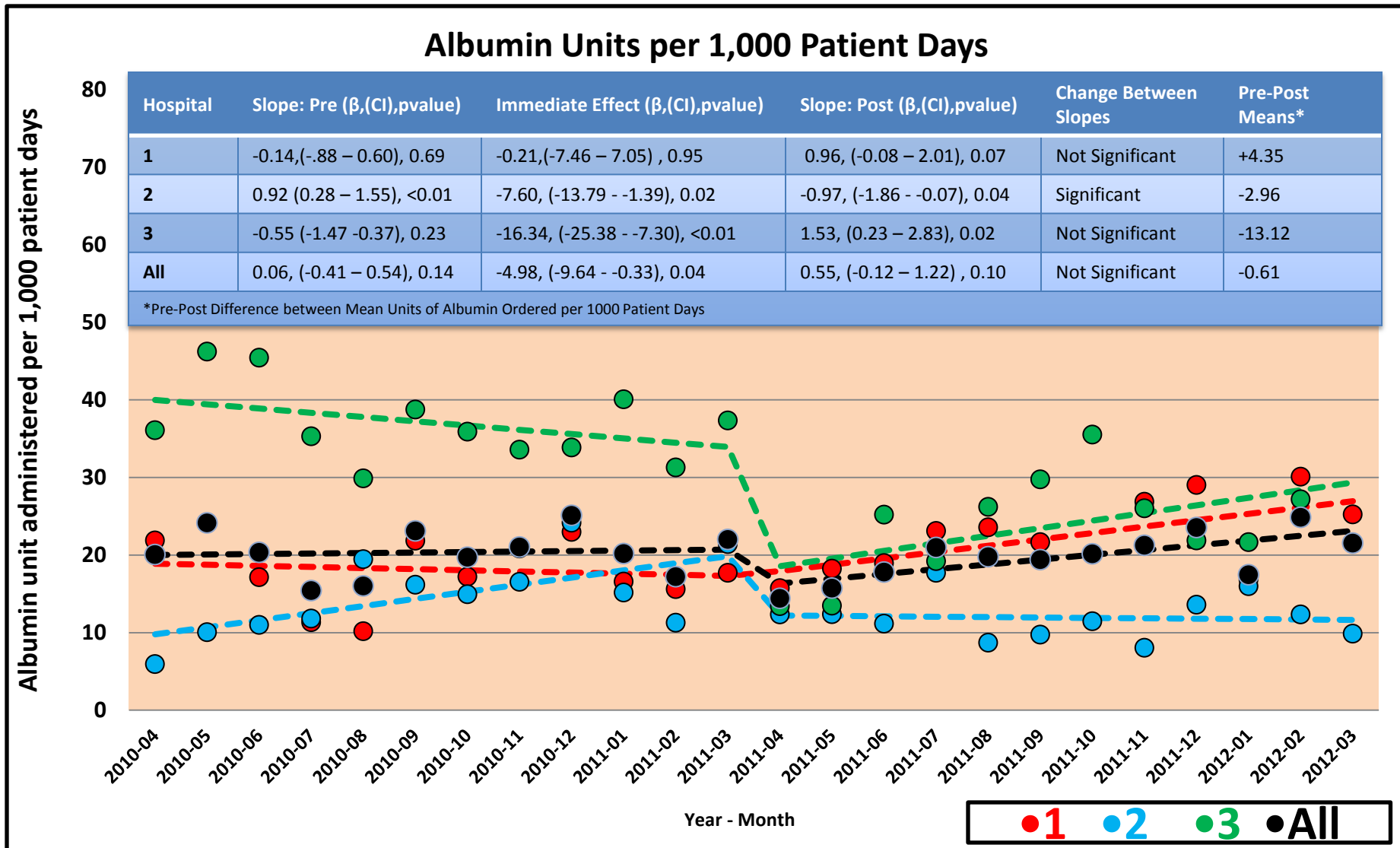
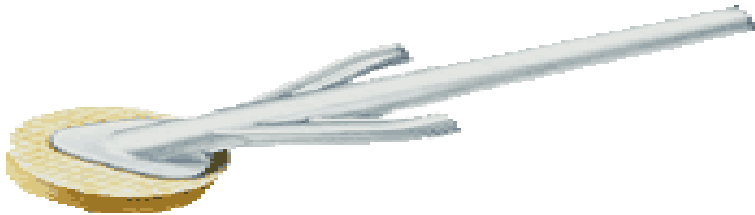


Table: Appropriateness of albumin administration 3 months pre and post CDS implementation at Hospital 3

	Pre	Post	P-value
Instances of Albumin Use (n)	237	133	
Total Appropriate Albumin Instances (n)	172	113	
Proportion of Appropriate Albumin Instances	72%	85%	<0.01
Total Albumin given	10998g	5400g	
Total Appropriate Albumin	8473g	4850g	
Proportion of Appropriate Grams	77%	90%	<0.01

# Back to Our Case: Chlorhexidine



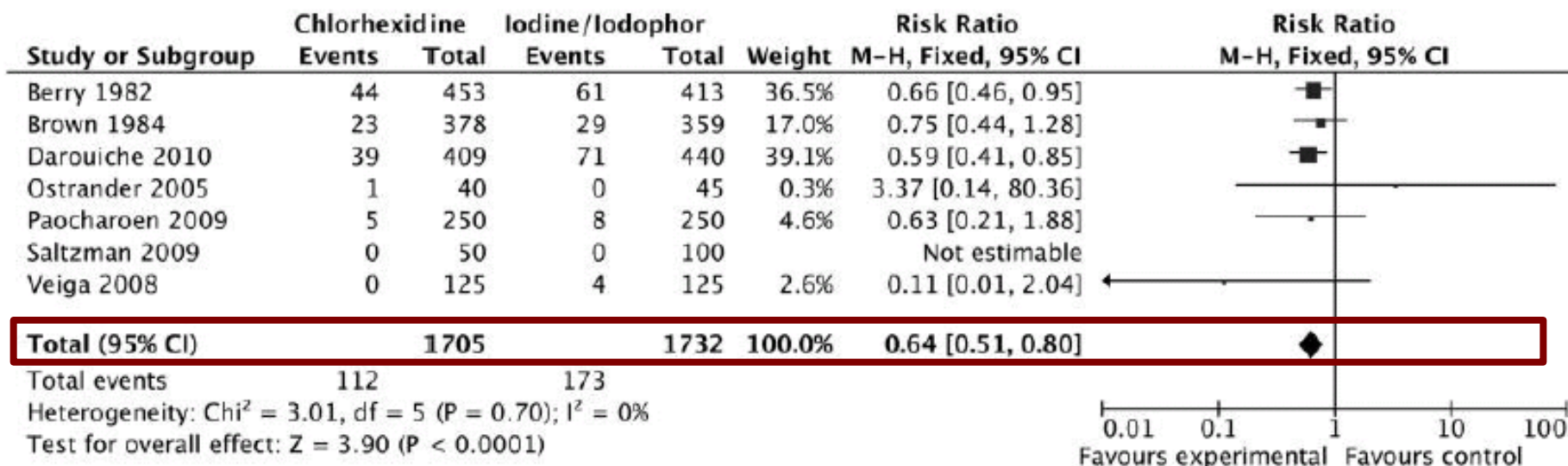
Chlorhexidine:  
\$13 per patient



Betadine:  
60 cents per patient



# Chlorhexidine Evidence Review

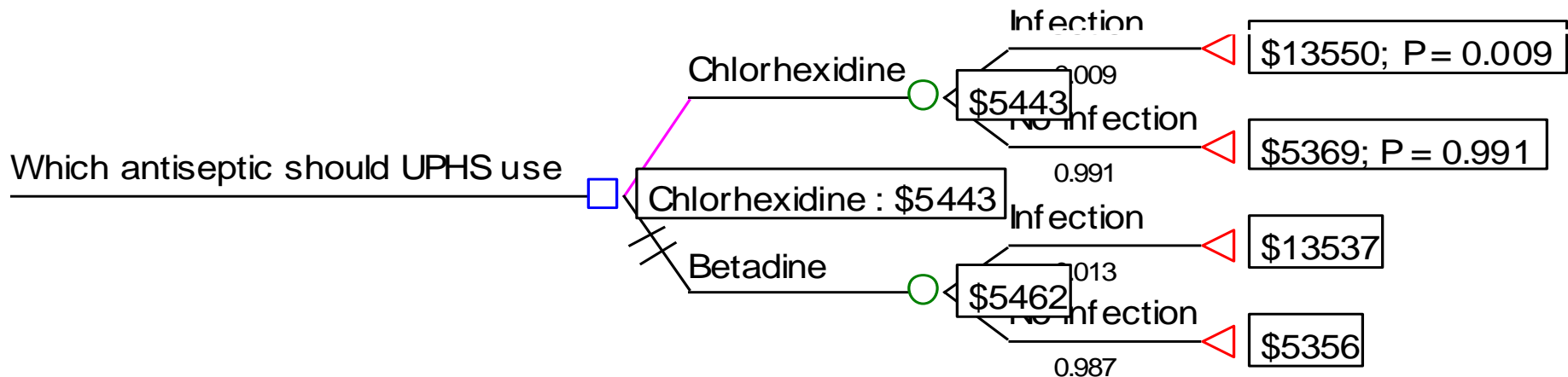


Lee I, Agarwal RK, Lee BY, Fishman NO, Umscheid CA. *Infection Control and Hospital Epidemiology*. 2010; 31(12): 1219-29.

# HUP Surgical Site Infection Data – FY07

Type of Cases	Number	Cost per case
Infected	285	\$13,537
Uninfected	21,584	\$5,356

## Decision Analysis - Assume 25% reduction



Analysis suggested annual hospital savings of \$415,511 with Chlorhexidine

# Conclusions

- ◆ Evidence-based decision making impacts quality, safety and value of care delivered to patients.
- ◆ Rapid reviews play an integral role in evidence-based practice at the organizational level
- ◆ Penn Medicine's Center for Evidence Based Practice (CEP) is one of only a few academically based centers in the US with internal and external funding to support such work.
- ◆ Penn's CEP is enthusiastic about collaborating in the domains of operations, research and education to improve the quality, safety and value of care thru a systems approach to evidence-based practice.

# Discussion

craig.umscheid@uphs.upenn.edu

The screenshot shows the website for the Center for Evidence-based Practice (CEP) at Penn Medicine. The top navigation bar includes links for Departments & Services, For Patients, Research & Trials, Education, and Find a Doctor. A search bar is also present. The main header features the Penn Medicine logo and the title 'Center for Evidence-based Practice'. Below this is a banner image with various medical-related icons. The left sidebar contains a menu with links to Home, News & Announcements, About Us, Evidence Reports, UBCL, Clinical Decision Support, Education, Research, Resources, and Contact Us. The main content area is divided into three sections: 'Mission', 'News', and a detailed description of the CEP Analyst position. The 'Mission' section states that the CEP's goal is to support healthcare quality and safety at UPHS through evidence-based medicine. The 'News' section includes a link to a 'CEP Staff Position Available' and a date of '01/11/2011'. The detailed description of the CEP Analyst position outlines the role's responsibilities, including preparing evidence reviews and disseminating findings, and lists required skills such as systematic reviews, meta-analyses, and computer skills.

Penn Medicine

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Search the UPHS site

Center for Evidence-based Practice

Center for Evidence-Based Practice

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**Mission**

The mission of CEP is to support healthcare quality and safety at the University of Pennsylvania Health System (UPHS) through the practice of evidence-based medicine. To that end, the Center summarizes scientific evidence for UPHS decision making about high impact drugs, devices and processes of care, and is charged with building evidence-based collaborative enterprises with outside organizations.

**News**

[CEP Staff Position Available](#)

01/11/2011|  
Healthcare Technology Assessment Analyst - Center for Evidence-Based Practice  
University of Pennsylvania Health System

The mission of the University of Pennsylvania Health System (UPHS) Center for Evidence-Based Practice (CEP) is to support the quality, safety and value of patient care at UPHS through evidence-based practice. The CEP Analyst position is at the core of these translational activities, and is accountable for preparing evidence reviews to inform high impact clinical policy at UPHS. Secondary accountabilities include the dissemination and implementation of findings from the review process. Applicants should have experience in performing systematic reviews and meta-analyses, computer skills including expertise with Microsoft Office, statistical software

**Related Links:**

- [University of Pennsylvania Health System](#)
- [University of Pennsylvania's School of Medicine](#)
- [Clinical Effectiveness & Quality Improvement \(Intranet Access Only\)](#)
- [Center for Evidence-based Practice \(Intranet Access Only\)](#)

<http://www.uphs.upenn.edu/cep/>