Eliminating Hospital Acquired Infections

Is it Possible?
Is it Sustainable?
Is it Worth It?

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The Key Message

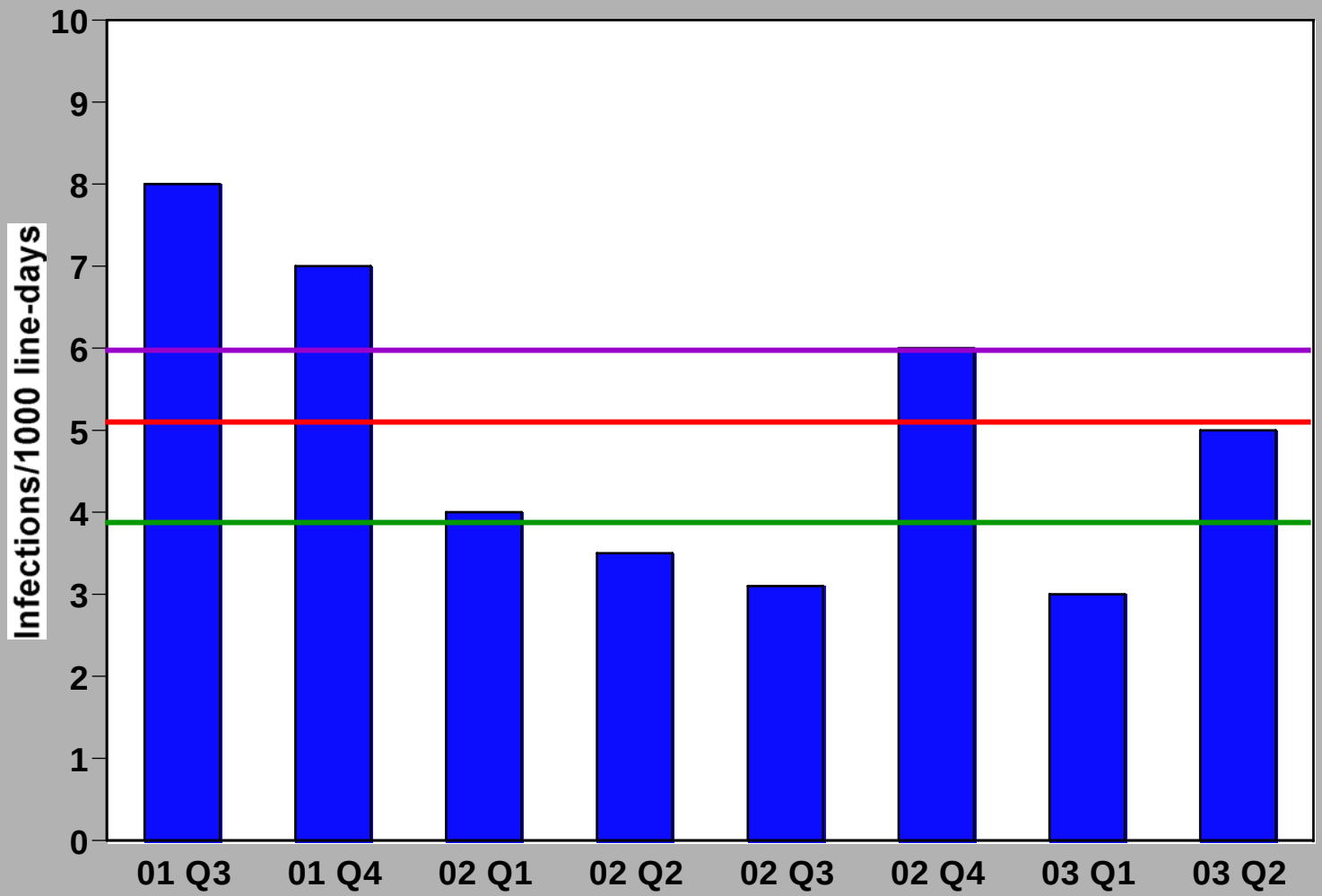
- **The data must not only be reportable, but actionable.**
- **It's not about policies and procedures; it's about processes.**
- **You can come surprisingly close to eliminating hospital acquired infections with standardization as opposed to resources.**
- **Hospital acquired infections are costing hospitals and society millions of dollars, illustrating the conspiracy of error and waste .**

What Did We Know (*or think we knew*) Before?

- **Our results were average and average is ok.**
- **CLABs/ HAI are inevitable. It is the price you pay for sophisticated, complex care.**
- **CLABs/HAI are benign and readily treated with antibiotics.**
- **CLABs /HAI are a common accompaniment of complex care and covered in outlier payments.**

Problems With Bench Marking

The Difference Between Reporting and Actionable Data



Where Would You Want to Have a Central line Placed?

	Unit 1 Teaching	Unit 2 Community	Unit 3 AMC
Rates	5/1000 line-days	5/1000 line-days	4/1000 line-days
# of Infections	25	1	28
Line-days	500 lines X 10 days	50 lines X 4 days	360 lines x 19 days
Deaths	10 (40%)	0 (0%)	7 (25%)
Risk	1 in 20	1 in 50	1 in 13

What Does *5.1 infections/ 1000 line days* Really Mean??

- **37 patients / total of 49 infections**
- **193 lines were employed (5.2 lines / patient)**
- **1753 admissions**
- **1063 patients had central access for more than 12 hours**
- **1 out of 22 patients with a central line became infected.**
- **We were reporting only half the actual infections (not including femoral line infections!!)**
- **Two-thirds of the infections involved virulent organisms. Twenty percent were MRSA**
- **19 patients died (51%)**

Journal of Quality and Patient Safety 2006;32:479

What Not to Do?

- **Don’t blame**
- **Don’t form another committee**
- **Resist the temptation to meet / embrace the desire to act**
- **Make everybody responsible (not just the infection control officer !)**
- **At the start, there are no right answers**

Toyota Production System Rules in Use

- **Activity (specified as to content sequence, timing, location, expected outcome)**
- **Connections (direct and unambiguous)**
- **Pathways (predefined, simple and direct)**
- **Improvement (highly specified under the guidance of a mentor, at the level of the work, toward an ideal)**

The Rules of TPS Applied to Healthcare

- **Work (line placement and maintenance) should be highly specified such that variations/problems are immediately apparent.**
- **When problems (CLABs) are encountered, they should be solved to root cause in real time by the people doing the work.**
- **When a worker cannot solve a problem, they invoke the help chain to solve the problem.**

PPC™

Current Conditions

Decode: 37 CLABS (July 2002-June 2003)

PRHI Central Line Data

Observations of Dressing Changes

Root Cause Analysis

Solve to root cause in real time the origins of CLABS in MICU / CCU

Eliminate CLABS In MICU/CCU In 90 days

Counter Measures Generated By the People That Do The Work

Reassess Results

Generate Additional Counter Measures

Variation in the Course of Work (Line Placement)

- No standard pre-procedure checklist
- Informed consent in 25% of procedures
- Eight different ways to “gown and glove”
- Six different ways to “prep and drape”
- Four different approaches to central veins
- Five different insertion kits
- 55% of procedures were documented

Variation in the Course of Work (Line Maintenance)

- No specified role
- No standardized definitions of “site at risk”
- No standardized dressing kit
- No standardized procedure for dressing change
- No standard record of line location and duration.

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Understanding Problems Leads to Solutions

Real Time Problem Solving	Countermeasures
• Introducer linked and rewired	• Dysfunctional catheters should be replaced, not rewired
• Fem line in place > 96 hrs	• Replace all femoral lines within 12 hours
• Patient transferred with line in place for 21 days	• Replace line present on transfer
• Infected Groshon catheter	• Subclavian or PICC line preferred

	Traditional Approach FY 03	PPC Approach FY 04 Year 1	PPC Approach FY 05 Year 2	PPC Approach FY 06 Year 3
ICU Admissions (n)	1753	1798 (+45)	1829 (+76)	2,141 (+388)
Atlas Severity Grade	1.9	2.0	2.1	2.2
Age (years)	62 (24-80)	62 (50-74)	65 (39-71)	64 (56-76)
Gender (M/F)	22/15	3/3	4/7	2/ 2
Central lines employed (n)	1110	1321* (211)	1487* (377)	1998*
Line-days	4687	5052*	6705*	9006*
Infections	49	6*	11*	4*
Patients Infected	37	6*	11*	4*
Rates (infections/ 1000 line-days)	10.5	1.2*	1.6*	0.44*
Deaths	19	1 *	2 *	2*
Reliability (# of lines placed to get 1 infection)	22	185*	135*	500*

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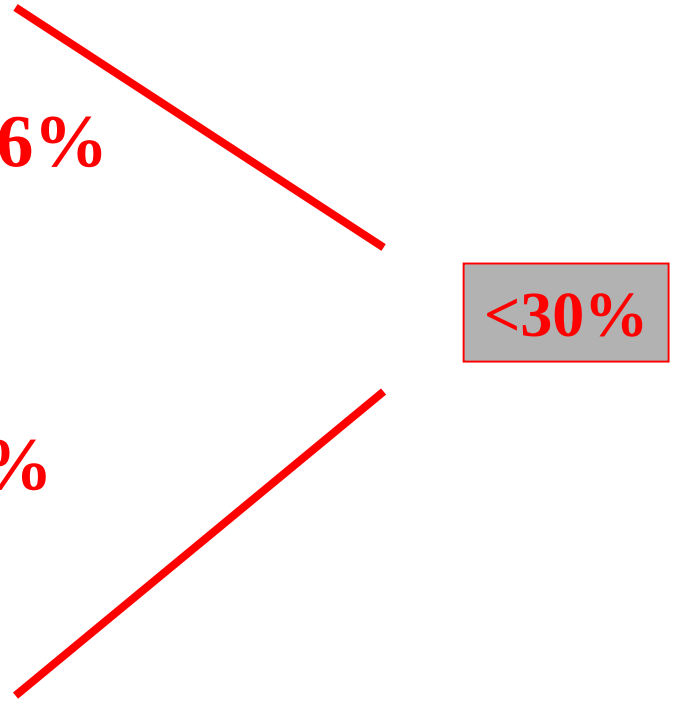
Additional Countermeasures

Real Time Problem Solving	Countermeasures
• Line Skills	• Education / Credentialing
• Lines for a long time	• Antibiotic coated catheters
• Difficult access	• *Site Rite/ SonoSite* ultrasound • Micropuncture kits • Vascular access team
• Accessing the line	• Antibiotic locks

Why Did We Slip?

- Informed consent 84%
- Pre-procedure checklist 96%
- Scrub/Gown/Glove 98%
- Drape/Prep 98%
- Site Selection/ Success 72%
- Line Dressing 100%
- Line Maintenance 98%



Observations of Variation In PICC Placement

- Line repositioning
- Delays in confirmation of position
- “Pistoning” and “Sizing”
- Line manipulation during flushing
- Line used for blood draws rather than infusion
- We are using more and more PICC without proper technique and training of nurses

Central Line Training Module

Workers have to be given the training necessary to be successful

- 1 hour didactic with test
- “The Perfect Line Placement ” Video
- Two Hours in the “Line training Simulator”
- Inter disciplinary (residents/fellows/nurses)

The Conspiracy of Error and Waste

- **What is the cost of a CLAB in human and financial terms?**
- **What does society pay for healthcare associated infections (HAI)?**
- **Do hospitals and physicians make money on HAIs ?**

Case 1:

- **37 year old video game programmer, father of 4, admitted with acute pancreatitis secondary to hypertriglyceridemia.**
- **Day 3: developed hypotension, and respiratory failure**
- **Day 6 : fever and blood cultures positive for MRSA secondary to a femoral vein catheter in place for 4 days.**
- **Multiple infectious complications requiring exploratory laparotomy and eventually tracheostomy**
- **Day 86: Discharged to nursing home**
- **Highmark Select Blue**

The Impact of CLABs on Gross Margin

	DRG 204/2721 (n=3)	DRG 191 (n=3)	DRG 483 (n=2)	Case 1
	Acute pancreatitis	Pancreatitis w cc	Pancreatitis w trach	
Revenue ($)	5,907	99,214	125,576	200,031
Expense	5,788	58,905	98,094	241,844
Gross Margin	119	40,309	27,482	-41,813
Costs attributable to CLAB				170,565
LOS	4	38	41	86

Case 3

- **49 year old obese female was admitted for elective surgical gastroplasty.**
- **She developed respiratory distress post operatively and was intubated for respiratory failure.**
- **On day 22, blood cultures were positive for *Staph epidermidis, enterococcus fecaelis, and Candida*.**
- **The right femoral line tip grew all three organisms. The line was in place for 16 days.**
- **On hospital day 48, she was transferred to a SNF.**
- **Medicare/ Three Rivers**

The Impact of CLABs on Gross Margin

	DRG 288 (n=10)	DRG 483 (n=3)	Case 3
	Procedures for obesity	Trach w obesity surgery	
Revenue	22,023	153,566	101,521
Expense	12,100	148,969	117,626
Gross Margin	9,923	6,597	-16,105
Costs attributable to CLAB			41,009
LOS	6	51	47

The Losses Attributable to CLABs are Staggering

- Average Payments: $64,894
- Average Expense: $91,733
- Average Loss from Operations: -$26,839
- Total Loss from Operations:-$1,449,306
- In only 4 cases did the hospital make money!
- The cost of the additional care averaged 43% of the total costs of care
- Average LOS: 28 days (7-137)
- Only three patients were discharged to home.

American J. Med Quality 2006

Eliminating CLABs

- **Is it Possible?**

  Unquestionably, but not without each individual accepting responsibility

- **Is it Sustainable?**

  Not without training and teamwork

- **Is it Worth It?**

  - No patient wants one

  - We lose substantial amounts on each CLAB

  -The loss is fully attributable to the costs of the CLAB

Eliminating VAP

- **July2005:**

  We implemented “real time” problem solving around every VAP case

- **October, 2005:**

  We implemented countermeasures developed by the people doing the work (AGH VAP Bundle)

- **July, 2006:**

  We assessed improvement compared to data from the previous 2 years

The Losses Attributable to Ventilator associated Pneumonia are Equally Staggering

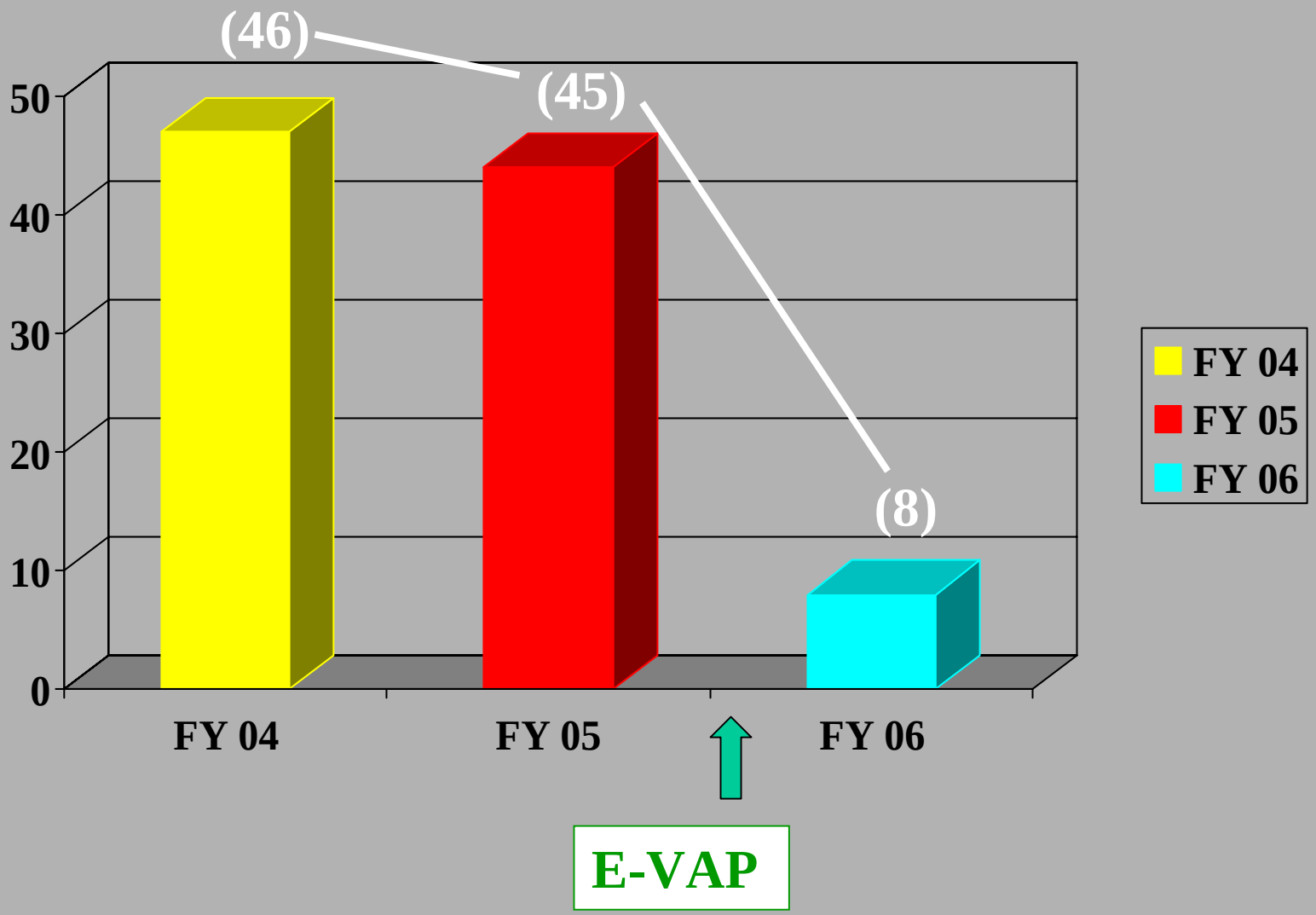
- **Average Payments: $62,883**
- **Average Expense: $87,318**
- **Average Loss from Operations: -$24,435**
- **Total Loss from Operations:-$2,419,065**
- **The average payments were twice that for a similar care without VAP ($33,569)**
- **Average LOS: 34 days versus 17 days**
- **32% of patients died and 43% underwent tracheotomy.**

Eliminating VAP: How Did We Do It?

- **Step 1: Elevate the head of the Bed 30°**
- **Step 2: Chlorhexidine mouthwash BID**
- **Step 3: Change vent tubing weekly**
- **Step 4: Change suction catheter daily**
- **Step 5: provide a hook for hanging resuscitation bag**
- **Step 6: Check endotracheal cuff pressure**

Total Added Cost: $17/ ventilated patient

The Results with VAP



Savings Are Likely to Far Exceed the Costs of Intervention

Cost of the Intervention	$10,897 (for all patients)
Nominal Savings	$16,010 (per one case)

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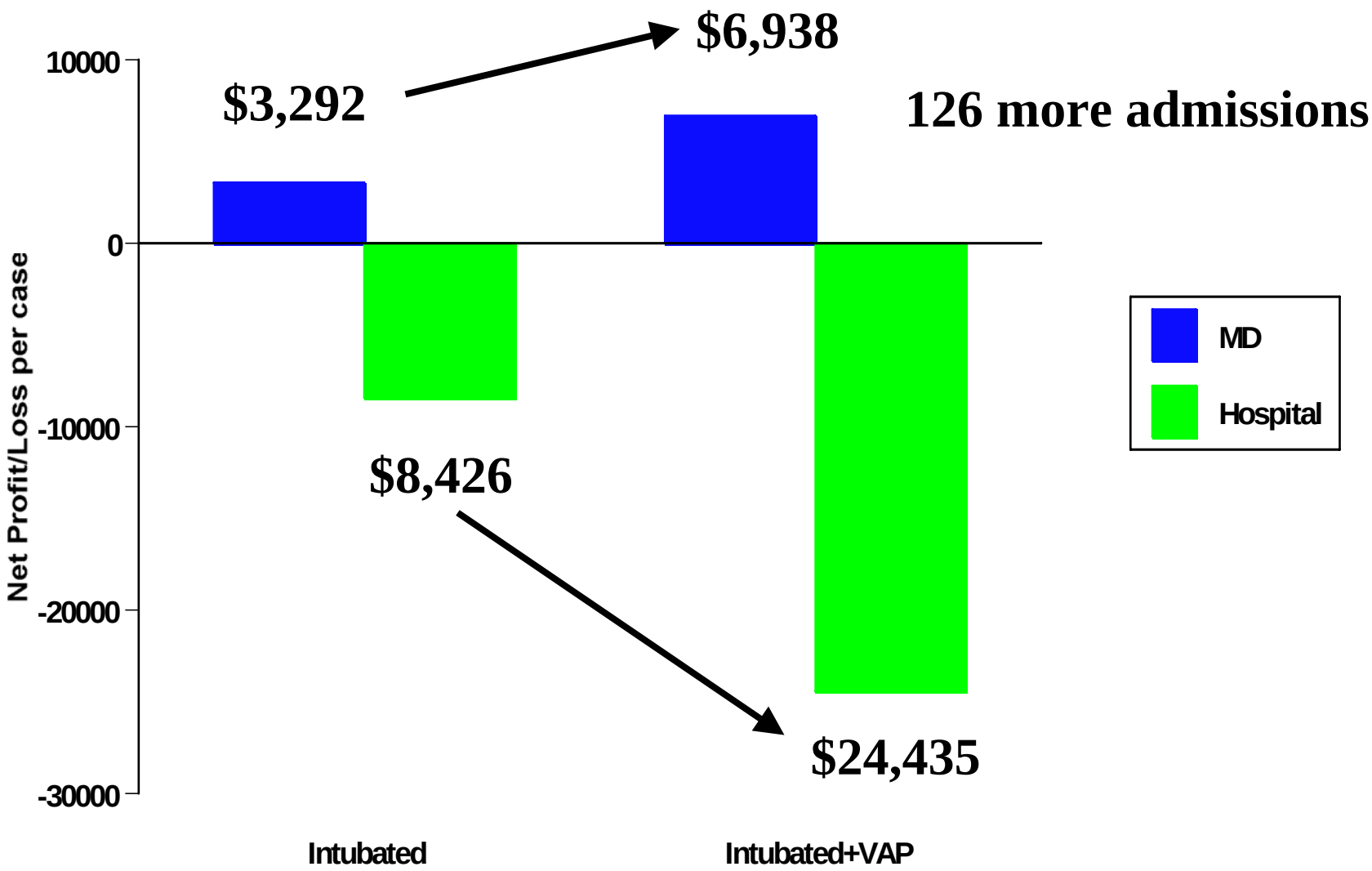
No. of prevented VAP cases	Nominal Savings	Cost of the Intervention	Actual Savings
1	$16,010	$10,897	**$5,113**
2	$32,020	$10,897	**$21,123**
10	$160,098	$10,897	**$149,201**

The Incentives Are Not Aligned with Outcomes



Eliminating MRSA

- **MRSA surveillance program**
- **Worker Safety and Patient safety**
- **Admission/discharge/ LOS cultures**
- **Define the reservoir, not just the infections**

The Losses Attributable to MRSA Infections are Equally Staggering, but More Complex…

- 236 infections over 4 years
- Average Payment: $40,302
- Average Expense: $54,065
- Average Loss from Operations: -$13,763
- Total Loss from Operations:-$3,234,343
- Average Age: 63 years
- Average LOS: 31 days
- Most common DRG: CV (24%), GI (16%), ID(15%), Neuro (13%), Pul (11%)

The Costs and the Losses Do Not Stop There

- 49% readmitted (116 patients)
- 415 additional admissions
- LOS: 37 days (15,355 bed-days)
- Additional Loss per case: -$15, 929
- Additional Loss : -$1,847,747
- Total Operating Loss (including re-admissions): -$5,082,090

Eliminating MRSA Transmission

- **MRSA Surveillance Program (Oct 2004)**
- **8 month pilot project**
- **2,141 ICU admissions screened in FY06**
- **95% compliance with admission/discharge cultures**
- **139 new carriers identified**
- **Transmission rates (CCU/MICU) have declined to 0.94%**

MRSA Surveillance Data FY 2006

UNIT	CCU	MICU	Total
ADMISSIONS	1,325	816	2,141
ADMIT CULTURES	1,290 (97%)	749 (92%)	2,039 (95%)
NEGATIVE ADMIT CULTURES	1,166	599	1,765
PRESENT ON ADMISSION (Previously unknown)	70	69	139 (6.8%)
KNOWN POSITIVE	54	81	135 (6.3%)
DISCHARGES	1,323	813	2,136
DISCHARGE CULTURES (On negative admit cultures w/ 24 hr minimum LOS)	1,230 (93%)	679 (83%)	1,909 (89%)
CONVERTERS	12 (0.0098)	6 (0.0088)	18 (0.0094)

MRSA Infection Data
FY 2004 vs. FY 2006

Fiscal Year	CCU & MICU	Other Units
2004	22	56
2006	3 (-86%)	87 (+55%)

FY04	11 deaths
FY06	1 death

Cost Effectiveness

- **Surveillance costs = $50,680/year**
- **Savings/ MRSA infection prevented = $15,544**
- **We needed to prevent 4 new MRSA infections to recover the costs of surveillance.**
- **We prevented 19 infections and 10 deaths**

CCU/MICU and HAI
A Big Return on Investment

- **Total Operating Improvements**
  - **CLAB= $1,235,765 (2 years)**
  - **VAP= $1,003,162 (1 year)**
  - **MRSA= $ 295,342 (1 year)**
- **Highmark PFP = $3,100,000 (2 years)**
- **HAI elimination Initiatives = +$5,634,269**
- **Investment = $85,607**
- **388 additional ICU admissions**
- **57 lives saved**