

Cost:
Complications in
Vascular Access



Kathy Kokotis RN BS MBA
Director, Global Clinical Development
Bard Access Systems

Cost Determination



Social Costs Hospital Associated Infections

Direct Costs

Fixed costs

- Buildings
- Utilities
- Equipment/Technology
- Labor
 - (laundry, environmental control, administration)

Variable Costs

- Medications
- Food Consultations
- Treatments
- Procedures
- Devices
- Testing
- Laboratory and radiographic
- Supplies

Scott RD. The Direct Medical costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention Division of Healthcare Quality Promotion National Center for Preparedness, Detection, and Control of Infectious Diseases Coordinating Center for Infectious Diseases Centers for Disease Control and Prevention March 2009 CS200891

Social Costs Hospital Associated Infections

Indirect and Intangible Costs

Indirect costs

- Lost/Wages
- Diminished worker productivity on the job
- Short term and long term morbidity
- Mortality
- Income lost by family members
- Forgone leisure time
- Time spent by family/friends for hospital visits, travel costs, home care

Intangible Costs

- Psychological Costs
 - (i.e., anxiety, grief, disability, job loss)
- Pain and suffering
- Change in social functioning/daily activities

Risk of Citing Costs and Rates Variation and Accuracy in Studies



You are presenting/citing what that particular agency, author, or facility is stating

The Difficulty in Cost Determination

- Treatments vary
- Severity of complications vary
- Definitions of complications vary
- Cost calculation methodologies vary

- Fibrin sheath
- Intraluminal clot
- Mural thrombosis
- Venous thrombosis

Each complication is treated differently
Costs will differ by treatment

Variation in type of obstruction and treatment (Example only)
This is not a recommendation for treatment

- Mechanical obstruction
 - Correct mechanical dysfunction
- Obstructions related to drug or parenteral nutrition
 - Low pH—hydrochloric acid
 - High pH—sodium hydroxide or sodium bicarbonate
- Thrombotic obstruction
 - Fibrin sheath—intraluminal thrombolytic drugs

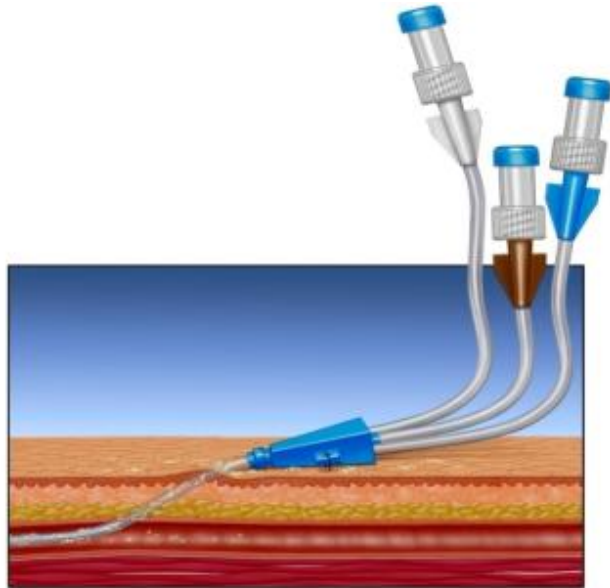
Cost Differs



- Type of catheter
- Type of occlusion
- Treatment of occlusion
- Follow-up management of occlusion
- Example: Replacement of a line to treat obstruction
 - PIV versus PICC

The Difficulty in Cost Determination

- Published costs vary
- Published complication rates vary
- No standard cost model method



Estimated and Reported Rates and Costs Variation in each study

CLA-BSI

Central Line Associated Bloodstream Infection

Determining the cost/rate of complications is difficult

- Variation between patients treated/diagnosed
 - What type of catheter infection is in the study data or did the patients have?
 - What is the definition of an infection?
 - Where did the infection occur (ICU/Floor)?
 - How difficult was the infection to treat?
 - What was the infection treated with?
 - These are just some questions and there are many more

Bottom line: Each patient's cost will differ

CLA-BSI Rate USA (2001-2009) Decreasing

2001

3.64 CLABSI/1,000
central line days
(ICU)

- Estimated 43,000 ICU (USA) year
- Estimated range 27,000 – 67,000 year (ICU)

2009

1.65 CLABSI/1,000
central line days (ICU)
1.14 CLABSI/1,000
central line days
(ward)

- Estimated 18,000 ICU (USA) year
- Estimated range 12,000 – 28,000 year (ICU)
- Estimated 23,000 inpatients (USA) year
- Estimated range 17,000 – 37,000 (USA) year inpatient wards

CLA-BSI (USA) Costs Vary by Study as cited by The Joint Commission (2012)

- Non-inflation-adjusted costs associated with CLABSIs have varied from \$3,700 per infection to \$36,441 (USD) per infection
- A recent CDC estimate set the cost of each CLABSI at \$16,550.47 (USD)

The Joint Commission. *Preventing Central Line–Associated Bloodstream Infections: A Global Challenge, a Global Perspective*. Oak Brook, IL: Joint Commission Resources, May 2012. <http://www.PreventingCLABSIs.pdf>

CLA-BSI Cost Argentina Vary by Analytical Approach (Example)

Year Published	LOS	Antibiotic Cost	Cost	Patients	Country
2003 Rosenthal	11.9	\$1,913 (USD)	\$4,882.42 (mean)	142 BSI 142 Control	Argentina

*1

A Common analytical approach for measuring the cost of HAIs by infection site usually employs some type of observational epidemiologic study in which a group of patients not infected with a specific microorganism is compared to a group of infected (or exposed) patients *2

*1 Rosenthal VD (2003) The attributable cost, length of hospital stay, and mortality of central line-associated bloodstream infection in intensive care departments in Argentina: A prospective, matched analysis. American Journal of Infection Control , Volume 31 , Issue 8 , 475 - 480

* 2 Scott RD. The Direct Medical costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention Division of Healthcare Quality Promotion National Center for Preparedness, Detection, and Control of Infectious Diseases Coordinating Center for Infectious Diseases Centers for Disease Control and Prevention March 2009 CS200891

CLA-BSI Reported Cost Range

Vary by what year data collected and reported or re-reported

Author	Range of \$ estimates based on 2007 CPI for inpatient hospital services for CLA-BSI
Scott	\$7,288 - \$29,156 (USD)

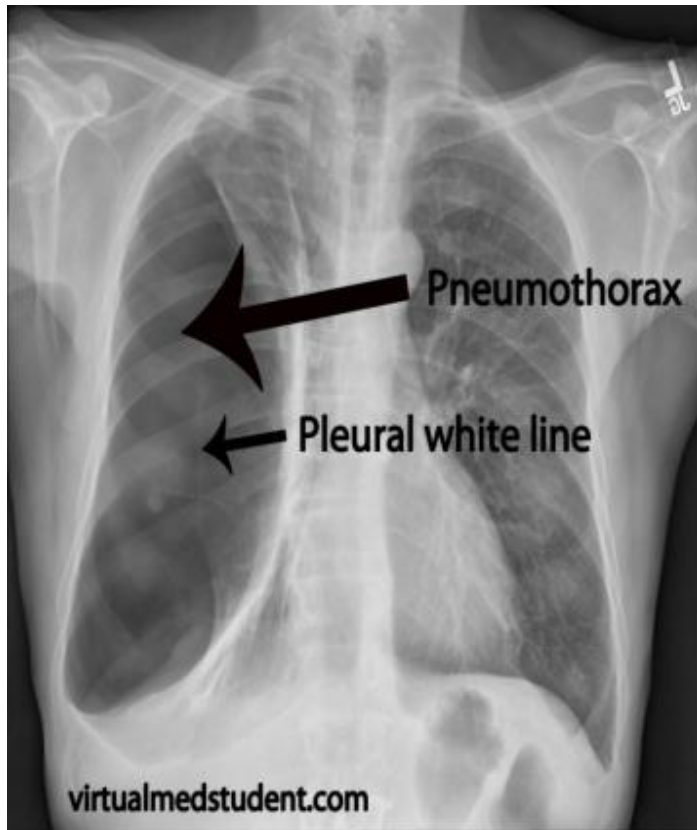
The cost estimates for CLABSI were taken from a cost-effectiveness analysis to measure the impact of using maximal sterile barriers to prevent CLABSI conducted by Hu et al. In evaluating the literature, the study authors developed a range of estimates for the attributable cost of CLABSI (\$5,734 to \$22,939 in 2003 dollars) that would be representative of all hospitalized patients.

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CLA-BSI Estimated Hospital Cost

Vary by how the study was conducted?

Number of Patients with CLA-BSI	41 patients out of 1,132 patients
Rate of CLA-BSI (prospective study)	3.6/1,000 catheter dwell days
Infection control	Antimicrobial impregnated catheters
Estimated cost range	\$6,732-\$18,352 (USD)
Estimated cost CLA-BSI	\$11,971
CLA-BSI LOS in ICU	2.41 days (0.08-3.09 days)
CLA-BSI LOS	7.54 days (3.99-11.09 days)
Number of CVC's for CLA-BSI patients	Mean 3.9 per patient
Number of CVC's for non CLA-BSI patients	Mean 1.9 per patient
Number of catheter days for CLA-BSI patients	33 days per patient
Number of catheter days for non CLA-BSI patient	9.2 days per patient



**Estimated and Reported
Rates and Costs vary**

Pneumothorax

Pneumothorax Estimated Rates Vary

- Who, what, where, why questions
 - Ultrasound use
 - Clinician skill
 - Emergency insertion
 - Fluoroscopy
 - Patient medical history and anatomy
 - Number of attempts for cannulation
 - Type of insertion site and catheter
 - Patient current status

Estimates cited
Rates Vary 1% to 6%

Tsotsolis N. (2015) Pneumothorax as a complication of central venous catheter complication Ann Transl Med 3(3)40

Pneumothorax Estimated Treatment Cost

- Observation and additional length of stay
- Oxygen
- Aspiration with needle or cannula
- Follow up ultrasound / chest x-ray/ CT scan
- Placement of a catheter / valve
- Tube thoracostomy

Vary by procedures
Vary by Treatments

Tsotsolis N. (2015) Pneumothorax as a complication of central venous catheter complication Ann Transl Med 3(3)40
Loiselle A (2013) Managing Iatrogenic Pneumothorax and Chest Tubes Journal of Hospital Medicine Vol 8 |
No 7 | July 2013

Iatrogenic Pneumothorax

Federal Register (2012)

- 4,467 cases reported to CMS
- \$39,128 (USD) average cost for entire stay

Federal Register /Vol. 77, No. 170 / Friday, August 31, 2012 /Rules and Regulations

Authors and organizations vary in numbers reported

Loiselle (2013)

- \$17,000 (USD) / Four day LOS

Loiselle A (2013) Managing Iatrogenic Pneumothorax and Chest Tubes Journal of Hospital Medicine Vol 8 | No 7 | July 2013

Central Line Complication Summary

Incidence Rate
(per SIR Central Venous Access CPG)³

Complication	NEVER Event (IPPS HAC reportable) ¹	PPC Code ²	Estimated HAC Cost ²	PICC Lines	Subclavian & Jugular Lines
CLABSI*	X	54	\$12,455	1%	1% - 3%
Air Embolism	X	48	\$9,350	Not Listed	1%
Pneumothorax	X	49	\$4,136	0%	1% - 3%
Thrombosis		16	\$8,607	3%	4%
Hemothorax		8	\$5,165	0%	1%
Perforation		42	\$3,215	Not Listed	0.5% - 1%
Hematoma		64	\$712	1%	1% - 3%
Wound Dehiscence		64	\$712	1%	1%
Phlebitis		64	\$712	4%	Not Listed
*Procedure induced sepsis					
Arterial Injury		64	\$712	0.5%	Not Listed

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- Fuller, R. L., McCullough, E. C., & Averill, R. F. (2011). A new approach to reducing payments made to hospitals with high complication rates. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, 48(1), 68-83.
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