

Strategies for Preventing Catheter-Associated Bloodstream Infections

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ABSTRACT

Reducing the frequency of hospital associated infections a national priority. Considerable effort has focused on reducing the rate of catheter-associated bloodstream infections (CABSI). While strategies such as the central line bundle have markedly lowered the incidence of infection rates in intensive care units, radiologists frequently place long term central venous catheters in non-ICU patients. Since our institution does not track infection rates outside the ICU, we sought to develop tools which can help guide our process improvement efforts.

PURPOSE

Difficult to track infection rates for Radiology

- Mix of inpatient and outpatient procedures
- Current surveillance program focuses on ICU patients

Quality as conformance with expectation

- Ports and tunneled catheters are placed with expectation that they will not be removed in a few days
- Early removal reflects a failure in the overall process
 - Process used to match catheters with patients
 - Failure in patient selection (planning failure)
 - Process used to place catheters
 - Infection, early malfunction (execution failure)

Leverage billing records

- Develop methods of identifying certain failure modes
- Determine failure rates

METHODS

Data capture

- Procedures were recorded in the Radiology Information System (RIS)
- Procedures identified using CPT coding combinations

Data extraction and analysis

- Starting 6/1/08 identify port and tunneled line placement using CPT codes 36561 and 36558
- Identify port and tunneled line removal using CPT codes 36590 and 36589
- Identify patients who had placement followed by removal
 - Calculate days since placement for each pair
 - Review reports describing removal for each pair
 - History provides reason for catheter removal

REFERENCES

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- Jacobs B, Duncan JR. *Improving quality and safety by minimizing unnecessary variation.* J VIR. 2009; 20:157-163
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RESULTS

Dataset available for analysis

- Between 6/1/08 and 6/25/10
- 2281 portacaths placed and 827 removed
- 1893 tunneled catheters placed and 1200 removed

Cases with placement followed by removal

- 757 tunneled catheters and 321 portacaths

Timeframe and cause for removal

- Early removal associated with infection (Figure 1)
- Infection was the leading cause for early (<30 days since placement) removal with portacaths

Trend data (Figure 2)

- A cluster of tunneled catheter infections in Fall 2009 prompted review by infection control
- Number of tunneled catheters removed for infection in the first 14 days was used as an indicator of potential problems with sterile technique during insertion
- Random fluctuation month to month argues against a systematic breakdown

Individual performance for tunneled catheters

- Rates of early removal for infection was used to assess for operator dependence
- The number of placements by 10 attending radiologists and one physician assistant were used to assess opportunities for an infection
- Percentage of catheters removed for infection within 2 weeks varied little between the different operators

Individual performance for portacaths

- Rates and causes of early removal were also assessed for operator dependence
- Infection rates were low and varied little between operators
- Malfunction rates were also low
- Incision dehiscence rates varied between operators and warrant evaluation for differences in technique

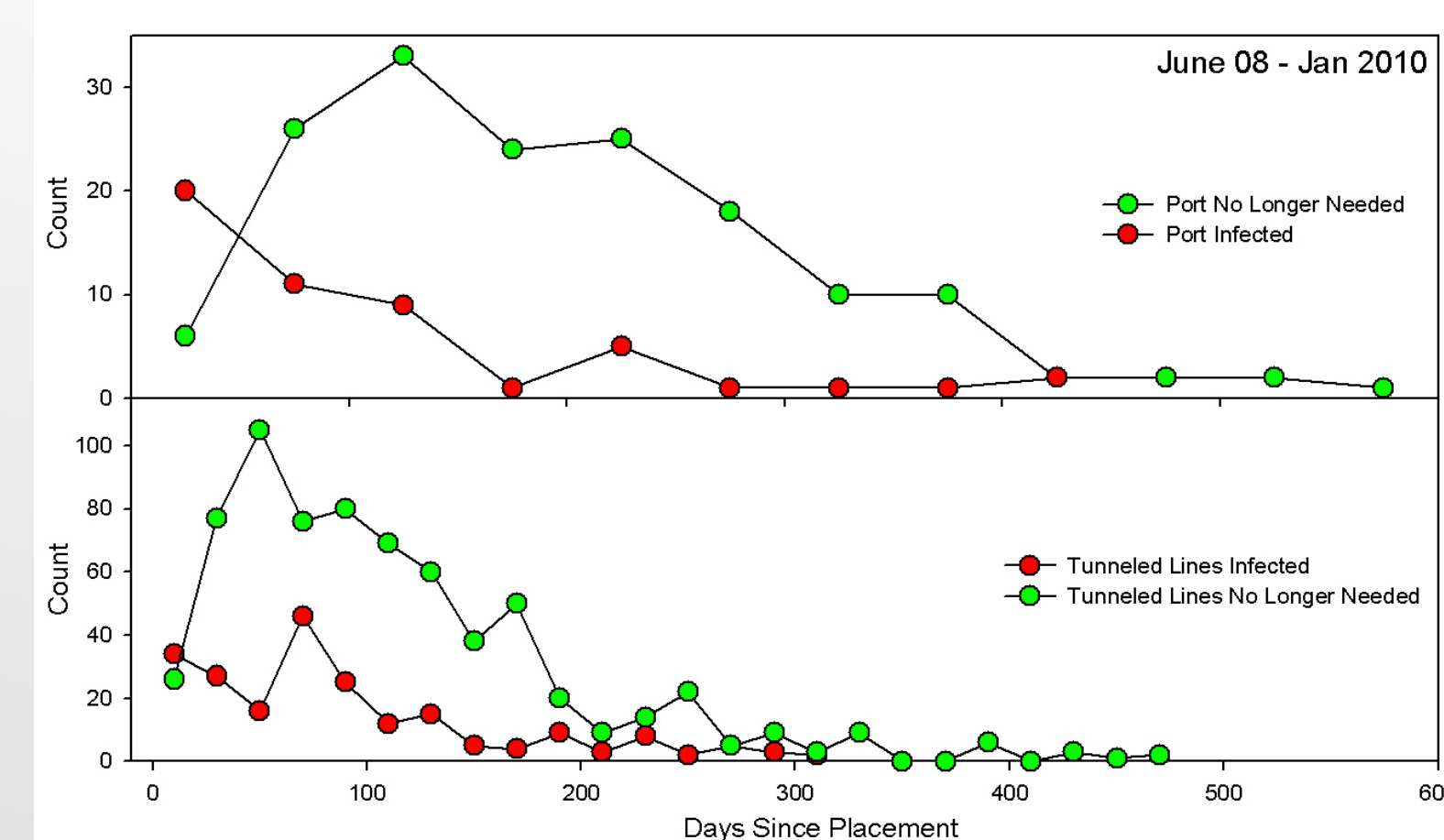


Figure 1. Days since placement and cause for removal. When reports were reviewed to determine the cause for removal, early portacath removal was strongly associated with catheter infection. Tunneled catheters were often removed early for infection but a more common reason was that the catheter was not longer needed.

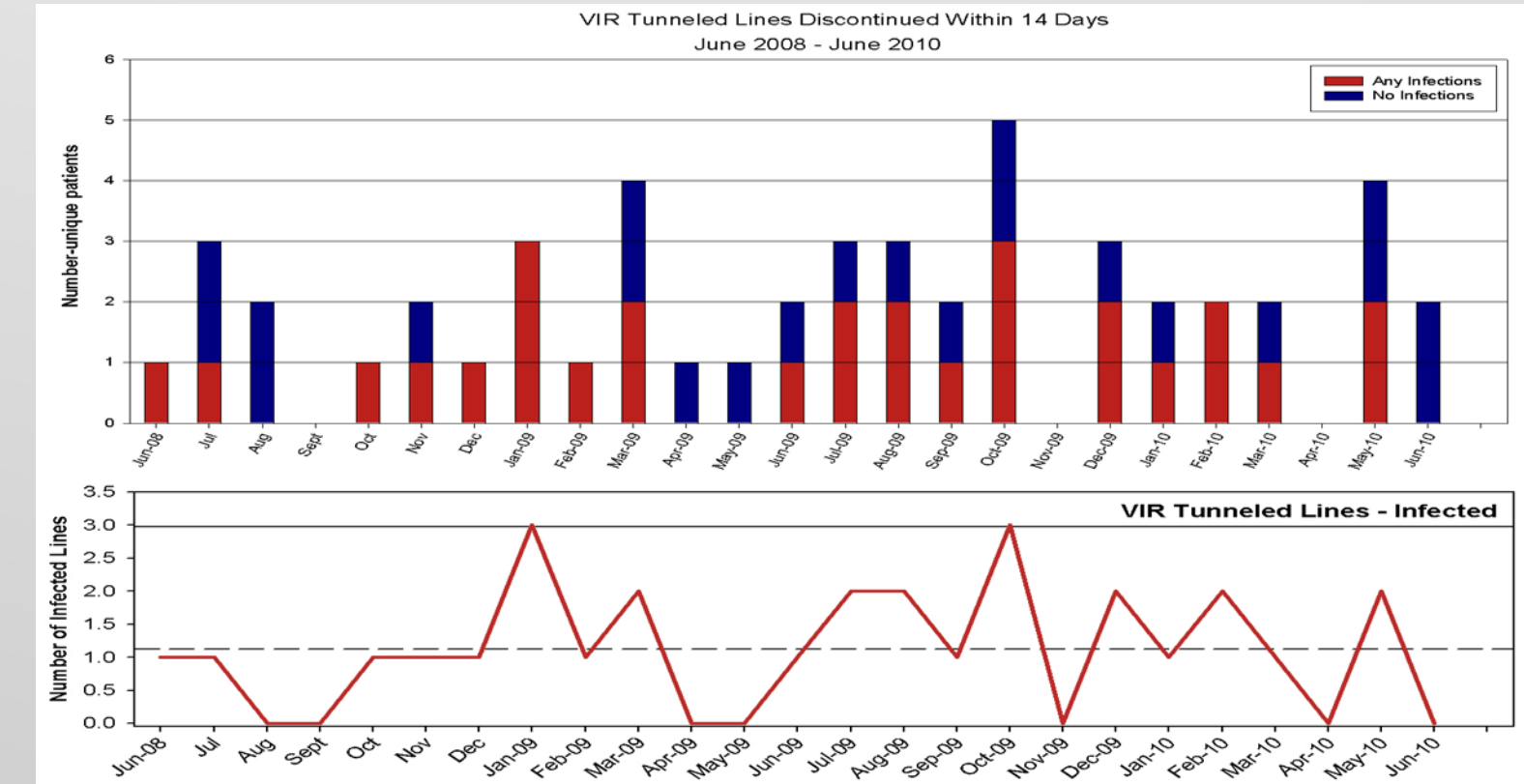


Figure 2. Early removal of tunneled catheters serves as the “canary in the coal mine” for breakdowns in sterile technique. Since the number of catheters placed each month varies little, a simple count was used to analyze the data.

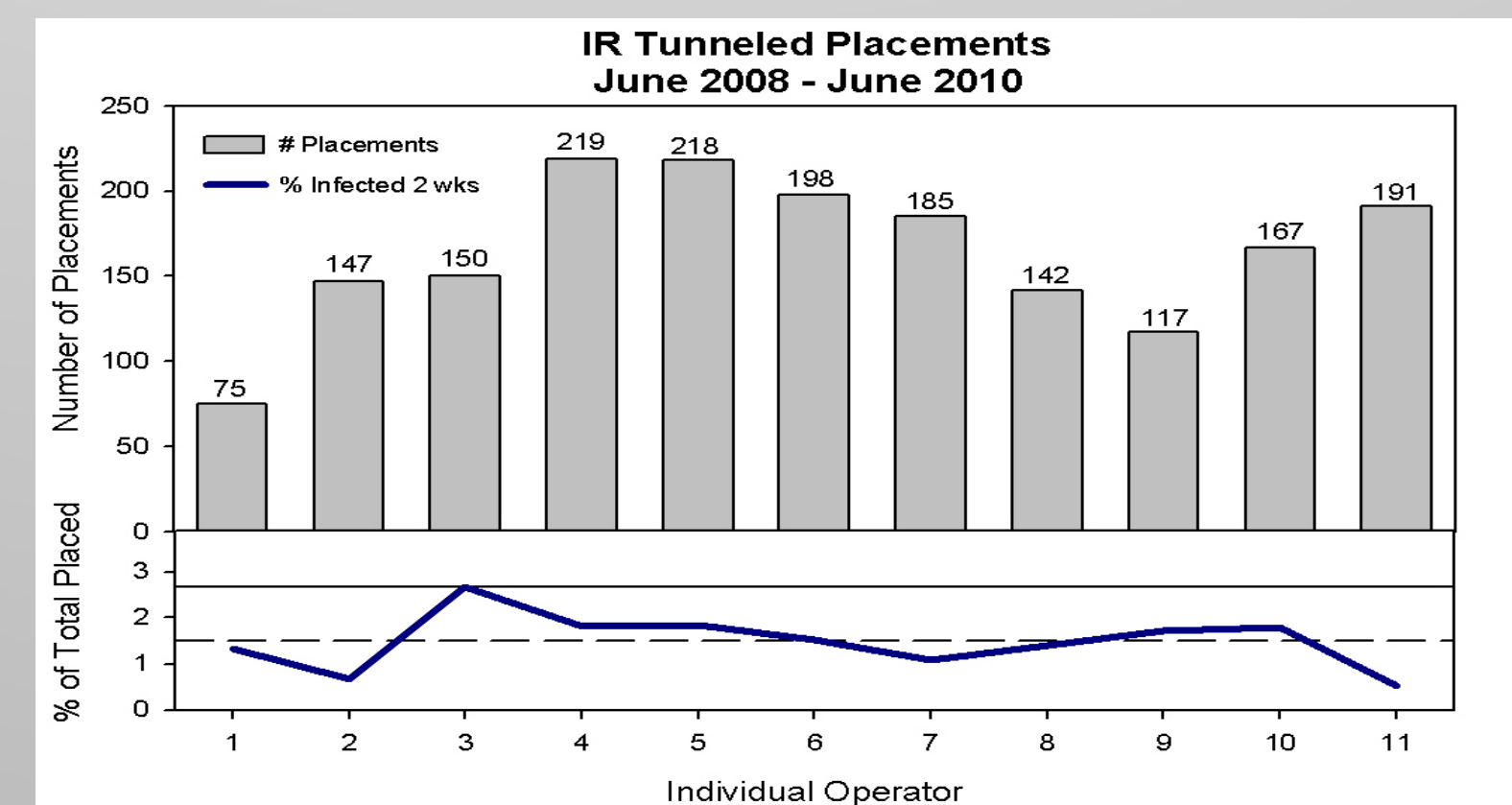


Figure 3. Tunneled catheter procedure volume and rates of early removal for infection separated by operator. Procedure volume varied somewhat between operators but the infection rate was quite stable. This data suggests that the individual protocols for tunneled catheter placement provide reliable results.

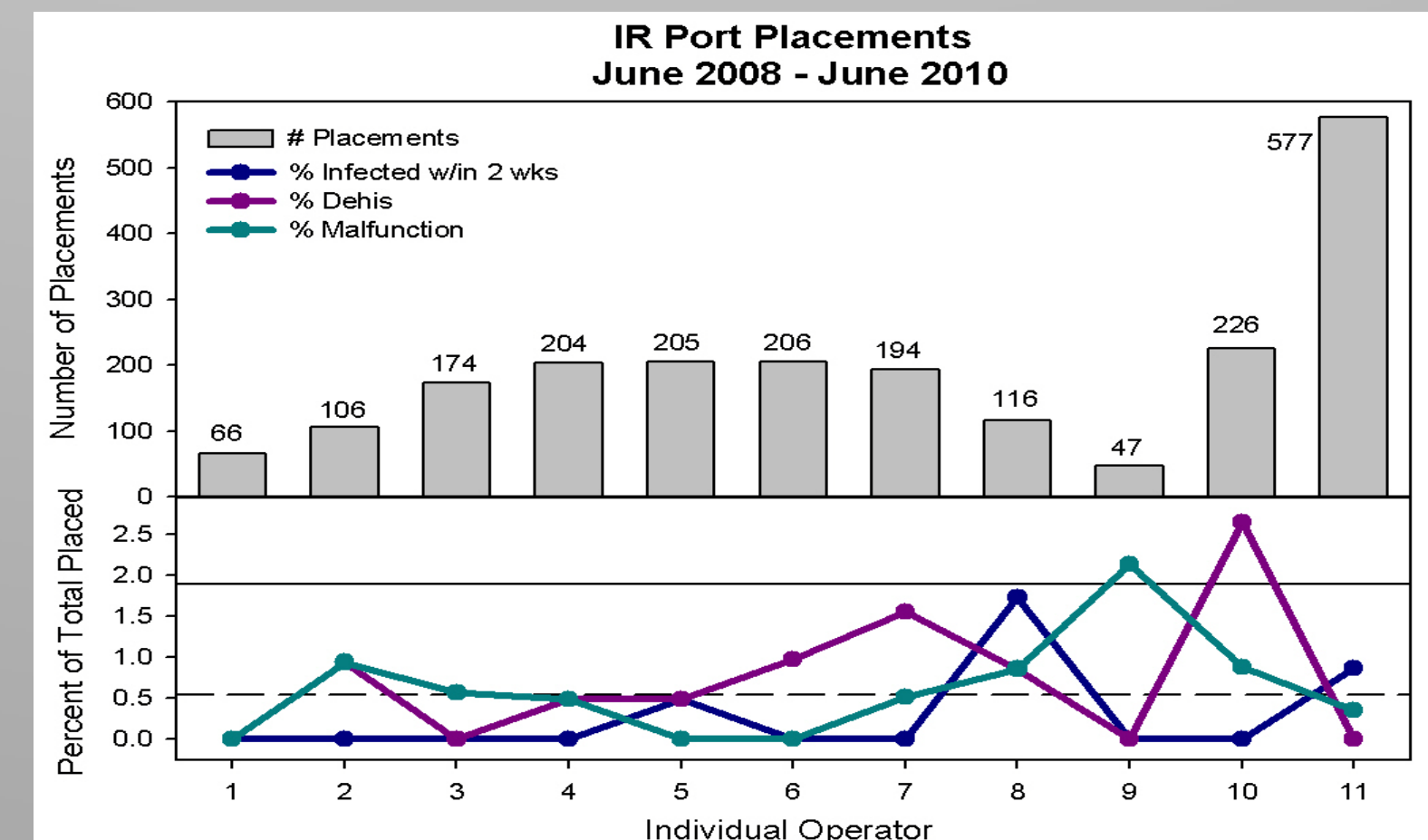


Figure 4. Portacath procedure volume and rates of early removal for infection and other problems by operator. Procedure volumes are more variable. Rates of different failure modes also differ and this suggests that individual protocols for portacath placement might yield more reliable results if standardized.

DISCUSSION

Conformance with expectation as a measure of quality

- Early removal of long term catheters serves as a trigger tool
- Trigger prompts investigation into the cause for early removal

Data indicates that early infections are uncommon

- Especially true for portacaths
- Low failure rate despite training new residents each month and new fellows each year
- Reliable system in place
 - Pre-procedure evaluation
 - Maximum sterile barriers, chlorhexidine prep, standardized training on sterile technique

Opportunities for improvement

- Portacath incision dehiscence
- Coding the reason for catheter removal
- Now a standard field in report template

CONCLUSIONS

Conformance with expectation as a reliability index

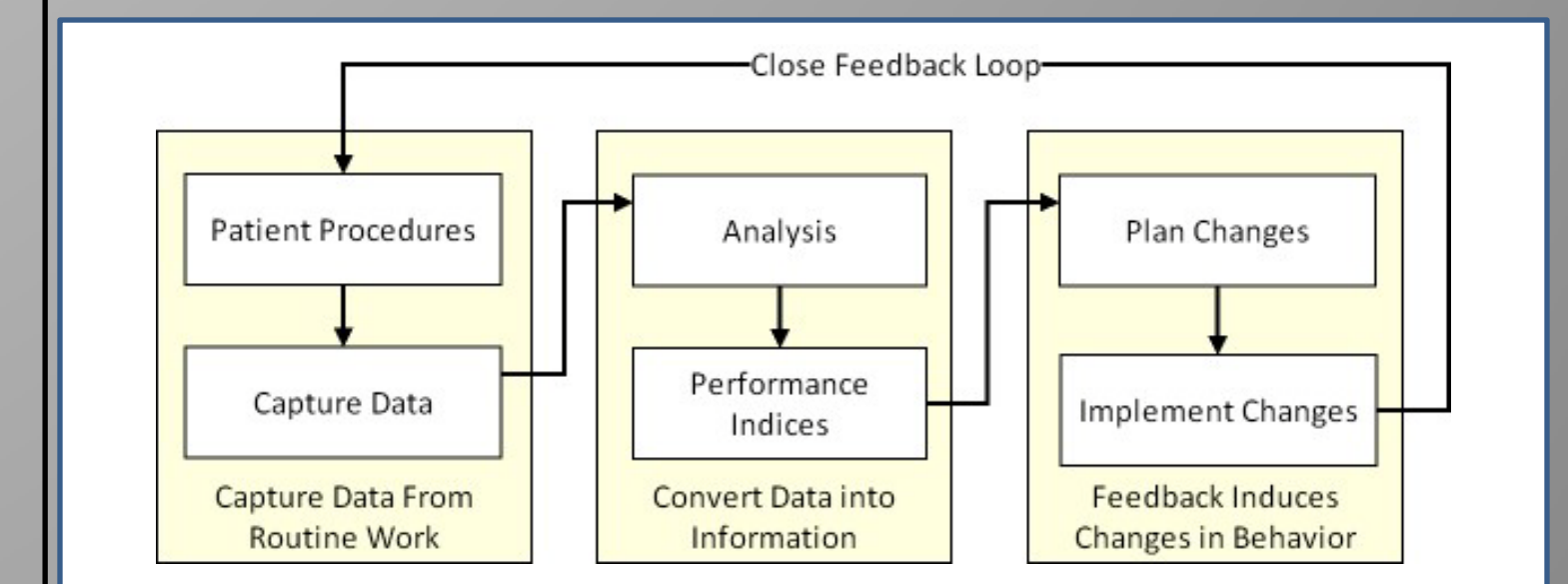
- Long term catheters have an implied warranty
- Should meet the patient’s needs for >14 days
- Early removal is analogous to a warranty repair

Billing records are a reliable source of performance data

- Can infer system performance from patterns within the data
- Procedures readily identified using CPT codes
 - Can use ICD-9 codes to identify the reason for catheter removal and make the process more efficient
- Expect that other practices could readily calculate these same measures
- Can examine historical data to assess the impact of protocol changes such as switching to chlorhexidine and discontinuing the routine use of pre-procedure antibiotics

Improvement depends on data, analysis and feedback

- “Cannot improve what you cannot measure”
- Clear need for reliable and robust performance measures



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