Catheter-Related Bloodstream Infection Reduction Program

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Purpose and Rationale
This project focuses on adherence to appropriate recommendations for antibiotic prophylaxis in patients undergoing interventional radiology procedures.

Antibiotic prophylaxis is an integral component of many surgeries. In Interventional Radiology, antibiotic prophylaxis is vital to prevent sepsis or septic shock. There are published guidelines for antibiotic prophylaxis.

National Patient Safety Goal Number 7 is to "reduce the risk of health care-associated infections".

This project involves review of a sampling of procedures where antibiotic prophylaxis is normally indicated by reading through the dictated report and determining whether antibiotics were given. An education program to distribute these guideline will be implemented, then a re-sampling of radiology reports will again be undertaken.

Project Resources
Ryan JM, Ryan BM, Smith TP. Antibiotic Prophylaxis in Interventional Radiology. J Vasc Interv Radiol 2004; 15:547-556.

Project Measure

Numerator # of cases where antibiotic prophylaxis was in compliance with guidelines
Denominator # of cases where antibiotic prophylaxis was appropriate

Baseline data collection
Make a plan for selecting cases. Using CPT codes, PACS or RIS data, identify a list of IR procedures for which antibiotic prophylaxis would be appropriate based on the published guideline. The attached table can be used as a reference to assist in case selection.

The number of cases required will vary based on the patient demographics typical of your practice. A reasonable target would be to end up with 75 procedures. A pre-determined strategy should be followed to ensure that an unbiased sample is obtained. For example, consecutive cases can be drawn from a specific time point until the target number is reached. Alternatively, one could select the first 5 or 10 cases performed on consecutive days of the week until the target is reached, every third case, etc. You might choose to select a certain percentage of outpatients vs. inpatients, cases done at various clinical locations, cases from procedure teams, etc. To draw effective comparisons, however, at least 10 cases must be selected for each subgroup to be analyzed. Once your sampling parameters have been determined, however, stick to them strictly.

Obtain the radiology reports for each selected case. From the report, record the following variables: whether antibiotics were administered, antibiotic type, dose given, time given, time of start of procedure.

Data Analysis

Now review each case and categorize it as in compliance or not. Compliance is defined as documentation of having given the appropriate antibiotic at an appropriate dose, within the appropriate time frame relative to the start of the procedure.

The time that the antibiotics are given for outpatients should be compared to the time stamp that on the radiology report for the start of the procedure. For inpatients, the time interval from the start of the procedure to administration of the last dose should be calculated (3 hours is recommended).

The goal is to achieve high compliance with the policy. There may always be cases for which some deviation from the policy is medically appropriate, so 100% compliance may not be reasonable or desirable. It is reasonable, however, to set a goal of 100% compliance.

Calculate an overall compliance rate as defined in the metric. Then, spend some time looking at the non-compliant cases and categorize the reason(s) for non-compliance—were antibiotics not given? Were they given at the wrong dose or at the wrong time? Was the relevant information not documented in the report?

For purposes of this project, inadequate document should be treated as a case of noncompliance. Consulting the medical record or nursing notes will help determine whether the failure was one of behavior or of documentation.

Factors Potentially Influencing Performance

After analyzing the data, identify places where there is room for improvement. Reflect on your setting and practice and identify factors that may have influenced your results. Then, design an intervention intended to improve performance.

Possible contributors may include:

1. Lack of radiologist knowledge/awareness of current guidelines. Alternatively, the radiologist(s) may be aware of the guidelines but ignore them because they disagree with the policy. An appropriate intervention here might be an educational program about the current guidelines/policy, including reviewing and seeking buy-in with the current recommendations or altering the policy through group deliberation.

2. Inadequate clinic or hospital procedures. Here, analyze your workflow and design an intervention that will increase the likelihood of compliance.

3. Failure to document. Here, an appropriate intervention might be educational or might involve environmental or procedural prompts to improve documentation.

Only one intervention should be made in any one project cycle. This allows conclusions to be drawn about the effectiveness of the intervention. If multiple changes are made simultaneously, you will be unable to determine which of them were responsible for improvements (or deteriorations).

Post Intervention Data Collection

Plan to collect data again six months after baseline and then every six months for the duration of the project (one to three years is typical). In the interim, implement your intervention.

Make sure that cases are collected, tallies are performed and metrics are analyzed the same way as at baseline. The only exception to this would be to adjust the number of cases identified if more cases are needed for analysis or to correct a problem identified with the baseline data collection procedure. If so, once the data collection procedure has been corrected, use it consistently going forward.

You may want to make a chart or graph of your performance on the metrics to identify trends and patterns. Review the data with your project team after every six month collection period. If you are meeting your goals, no further changes may be necessary. However, you should plan to take steps to institutionalize whatever changes contributed to successful performance. If additional improvement is possible, look at your processes again and design additional interventions.

Once performance has stabilized or you feel the project is well underway, consider selecting and launching another PQI project.

Commonly Used Antibiotics for Prophylaxis in IR	
Procedure	**Suggested Prophylaxis**
Angiography	Not routine
Angioplasty	Not routine
Stent placement	Not routine
Peripheral or dialysis access thrombolysis	Not routine
Uterine fibroid embolization	1 g cefaxolin IV
Hepatic chemoembolization	1.5 – 3 g ampicillin/sulbactam IV
Splenic embolization	1 g ceftriaxone IV
Renal embolization	1 g ceftriaxone IV
Tips	3 g ampicillin/sulbactam IV
Tunneled central venous access	1 g cefaxolin IV
Endograft	1 g cefaxolin IV
Biliary drainage	3 g ampicillin/sulbactam IV
Cholecystectomy	1 g ceftriaxone IV
Gastrostomy	1 g cefaxolin IV
Nephrostomy	1 g ceftriaxone IV
RF ablation	1 g cefaxolin IV
Solid organ embolization: Many interventional radiologists use prophylaxis primarily against contamination by skin pathogens. For this, cefaxolin is satisfactory. If coverage is required against additional microorganisms, the antibiotic regimen needs to be adjusted accordingly. Benefits of prophylaxis have never been validated for IR procedures in randomized controlled clinical trials. For high risk cases (i.e., procedure duration > 2 hours, arterial sheath left in >24 hours, closure device used <1 week) – single dose 1 g cefaxolin IV. Alternative to cefaxolin is Vancomycin 1 g IV for serious anaphylaxis to penicillin or cephalosporin allergy, or for patients infected with methicillin resistant *Staphylococcus aureus.* Cefaxolin is active against *S aureus* and *S epidermidis*. Ceftriaxone, cefoperazone, or cefoxitin are active against E coli, Klebsiella, enterobacter, pseudomonas, and clostridia. Ampicillin/sulbactam has enhanced activity against *enterococcus* over cephalosporin. Cefotetan (or ampicillin, gentamicin and metronidazole) are active against gram-negative bacteria, anaerobes, enteroccoi, *B fragilis*. Vancomycin, cefazolin, cefoxitin, ceftazidine, cefuroxime need adjustment if continued in patients with renal dysfunction.	

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