Designing a Surgical Scorecard to Inform and Evaluate Appropriate Perioperative Antibiotic Prophylaxis

OAKLAND UNIVERSITY WILLIAM BEAUMONT

Rehan Tariq, B.S.[1] Paul Chittick, M.D. [2]

[1]Oakland University William Beaumont School of Medicine
[2]Section of Infectious Diseases, Corewell Health William Beaumont University Hospital

Introduction

Surgical site infections (SSI) are dreadful and costly nosocomial complications of surgery.[1,2] These infections are a substantial burden for patients and healthcare systems alike.[1,2,6,7] Consequences of SSI including increased morbidity, mortality, readmissions, and prolonged hospital stay have caused healthcare costs to increase by up to 1.6 billion dollars a year. [1,7,8] Preventing postoperative infections is vital to improving the quality of care of patients and reducing costs associated with postoperative infection caused readmissions or prolonged care.

Perioperative antibiotic prophylaxis (PAP) has been shown to be an effective infection prevention strategy for surgical procedures when antibiotics are administered within a certain time interval.[3,4,9] PAP is the administration of antibiotics prior to, during, or after surgery to prevent infections at the surgical site. Preoperative antibiotic prophylaxis, the administration of antibiotics prior to surgery, in particular, continues to be one of the biggest breakthroughs in SSI prevention.[2,3,4]

Thus, there is a significant need for a quality improvement tool that can inform physicians on how to best utilize PAP to minimize SSIs. It is not shocking that PAP can be inappropriately and excessively used to combat SSIs. [2,3,4] The complexity of choosing the correct antibiotic only bolsters the need for a tool easily accessible to physicians to assist with decision-making.

Aims and Objectives

1. Develop a scorecard to educate physicians and improve antibiotic prophylaxis administration
2. Assess the utility and effectiveness of the scorecard to determine appropriate antibiotic prophylaxis
3. Obtain scorecard feedback from the Surgical Chairs at Beaumont and potentially share data with the Infection Prevention Committee and the Quality/Patient Safety Committee

Methods

We conducted a retrospective study that reviewed surgical procedures at Beaumont Royal Oak during a randomly selected 1-week period with no exclusion criteria. The study will analyze operative prophylaxis, looking at multiple factors of administered antibiotics:

- Choice
- Dosage
- Timing
- Duration

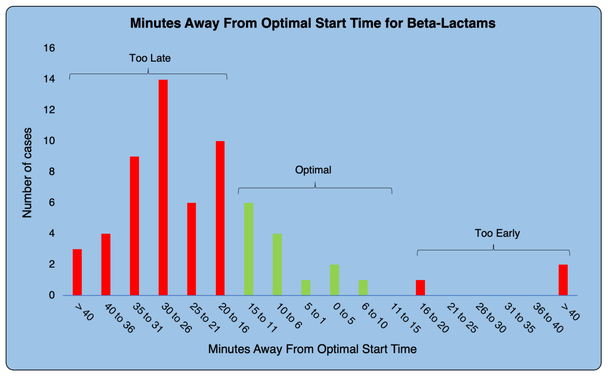
Data collection consisted of reviewing over 60 patient charts in the Epic EMR system to collect the information about the factors listed above for each different type of surgical procedure. Collected data was stored in Sharepoint and organized by surgical type. Data analysis and the creation of the scorecard was completed in Excel.

Table 1.

Criteria for Antibiotic Timing	
Cephalosporins	Start infusion 30-60 minutes before incision
Penicillins	
Flagyl	
Aminglycosides	
Clindamycin	
Fluoroquinolones	Start infusion 60-120 minutes before incision
Vancomycin	

Table 1. The above antibiotic timing administrations were largely derived from current guidelines utilized by Corewell Health,

Graph 1.



Graph 1. Above is the distribution of the number of antibiotics that were administered within multiple time intervals. It should be noted that a majority of antibiotics were administered <30 minutes from optimal time.

Results

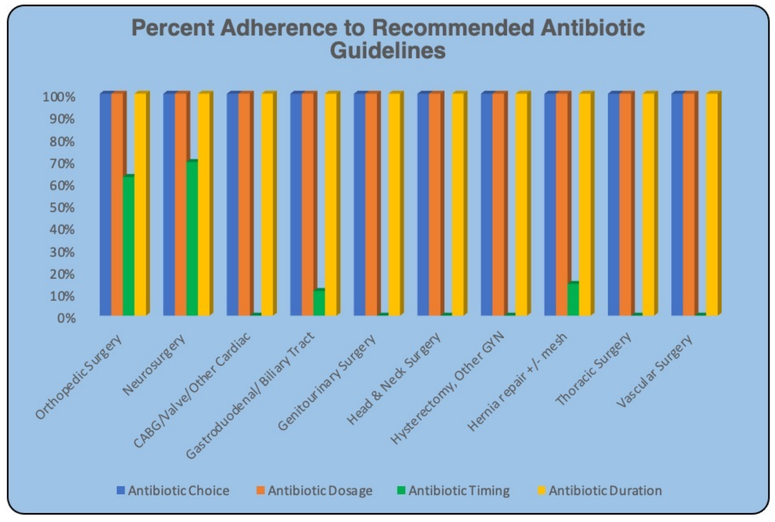
Table 2.

ANTIMICROBIAL OPERATIVE PROPHYLAXIS SCORECARD						
Service/Surgery Type	Procedures	Choice	Dosage	Timing	Duration	Overall
CABG/Valve/Other Cardiac	3	☺	☺	☹	☺	☹
Gastroduodenal/Biliary Tract	9	☺	☺	☹	☺	☹
Genitourinary	4	☺	☺	☹	☺	☹
Head & Neck	3	☺	☺	☹	☺	☹
Hysterectomy, Other GYN	2	☺	☺	☹	☺	☹
Neurosurgery	13	☺	☺	☹	☺	☹
Orthopedic surgery	16	☺	☺	☹	☺	☹
Thoracic Surgery	4	☺	☺	☹	☺	☹
Vascular surgery	2	☺	☺	☹	☺	☹
Hernia repair +/- mesh	7	☺	☺	☹	☺	☹

Table 2. If the appropriate drug was used for 80% of all procedures for that specific surgical type, a needs improvement image 😐 is depicted for that type of surgery. Likewise, if the timing of drug administrations was appropriate only 40% of the time for all procedures belonging to that specific surgical type, a failure image ☹ would be depicted.

Definitions	
>90%	☺
70-90%	😐
<70%	☹

Graph 2.



Graph 2. The timing of drug administration for all surgical types was calculated to be appropriate <70% of the time. For example, only 1 of the 7 procedures classified as hernia repair with or without mesh administered antibiotic prophylaxis in a timely manner. Thus, this calculation led to a 14% level of adherence.

Conclusion

After conducting a retrospective chart review that focused on collecting information from over 60 patient charts, I developed the Antimicrobial OR Prophylaxis Scorecard (Table 2.)
The most notable findings demonstrated by this scorecard, graph1, and graph 2 include:

- the timing of antibiotic administration for all the surgical types listed in the procedure were outside the recommended time frame.
- For all surgical types: the drug choice, drug dosage, and drug duration was appropriate for greater than 90% of the time
- An overwhelming number of antibiotics were administered within 30 minutes of incision time, with some antibiotics being administered less than 5 minutes before incision time.

Limitations

Admittedly, the sample size utilized to develop this scorecard could have been larger. However, the overwhelming lack of appropriate timing of antibiotic administration warrants further attention. Additional investigation can reveal crucial information regarding the causes of or barriers to inadequate timing of antibiotics. Such information can be used to not only improve timing of antibiotics, but also significantly reduce the number of surgical site infections.

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