

Place your institution name here
Drug Use Evaluation

Title **An Evaluation of Name of Antimicrobial Agent Use in Adult/Pediatric Inpatients**

Project Committee: Place name of individuals at your institution involved in the DUE including individuals collecting data.

Research Question **Example:** How is piperacillin/tazobactam being utilized in the adult and pediatric inpatient services at the XX?

Background

Background **Provide some background information on antimicrobial you are evaluating, this should include its antimicrobial activity, indication and dosing.**

Example:

Piperacillin/tazobactam is a parenteral β -lactam/ β -lactamase inhibitor combination that demonstrates *in vitro* activity against a broad spectrum of gram-positive, gram-negative, aerobic and anaerobic strains of bacteria, including methicillin-sensitive *S. aureus*, *S. epidermidis*, *S. pneumoniae*, *E. faecalis*, *E. faecium*, *H. influenzae*, *M. catarrhalis*, *E. coli*, *E. cloacae*, *E. aerogenes*, *C. diversus*, *C. freundii*, *M. morgani*, *K. pneumoniae*, *K. oxytoca*, *N. meningitidis*, *S. marcescens*, *P. mirabilis*, *P. vulgaris*, *P. aeruginosa*, *S. maltophilia*, *Acinetobacter spp.*, and *Bacteroides spp.* Piperacillin inhibits bacterial cell wall synthesis by binding to penicillin binding proteins. Tazobactam inhibits a wide variety of bacterial β -lactamases by irreversibly binding to the enzyme's catalytic site. This prevents hydrolytic action on piperacillin's β -lactam ring and increases piperacillin's antibacterial activity. Piperacillin is effective against most gram-positive organisms such as *S. pneumoniae*, and gram-negative organisms including *Pseudomonas spp.* The addition of tazobactam broadens the coverage of the antibiotic combination to include anaerobic bacteria and other pathogens that commonly produce β -lactamases such as *E. coli* and *K. pneumoniae*. This combination is particularly useful for empiric treatment of polymicrobial infections such as complicated intra-abdominal infections, diabetic foot infections, and other infections that require broad empiric coverage.

Piperacillin/tazobactam has good penetration into the lungs, intestinal mucosa, skin, muscle, uterus, ovary, prostate, gall bladder, and bile, but has poor CSF penetration. It has a half life of ~ 1 hour. Both piperacillin and tazobactam are renally eliminated, with ~ 20% of piperacillin being eliminated in the feces. The recommended adult dosage at the XX hospital in patients with normal renal function is 3.375 g to 4.5 g every 6 hours. In patients with CrCl 20-40 mL/min, the dose should be reduced to 2.25 g every 6 hours (3.375 g every 6 hours for *Pseudomonas* infections). In patients with CrCl < 20 mL/min, the dose should be reduced to 2.25 g every 8 hours (2.25 g every 6 hours for *Pseudomonas* infections). In patients undergoing intermittent hemodialysis, the dose should be reduced to 2.5 g every 12 hours (2.25 g every 8 hours for *Pseudomonas* infections). The recommended pediatric dosage at XX hospital is 80-100 mg/kg of the piperacillin component every 8 hours. Common adverse drug reactions related to piperacillin/tazobactam use include diarrhea, constipation, nausea, vomiting, headache, and hypersensitivity reactions. Serious, but rare, adverse effects such as agranulocytosis, interstitial nephritis and Stevens-Johnson Syndrome have been reported.

At the XX, piperacillin/tazobactam is a formulary agent.

Objectives

Place your objectives here.

Example:

1. To describe indications for the use of piperacillin/tazobactam in adult and pediatric inpatient

services.

2. To evaluate the appropriateness of piperacillin/tazobactam indication, dosing, and duration of therapy.

3. To estimate the incidence of adverse events directly associated with piperacillin/tazobactam.

Methods

Describe your methods here. This should include timeframe for data collection, sample size, patient population to be evaluated, how you will identify patients (e.g. pharmacy database) and what information will be collecting and source of your information (e.g. paper chart, electronic medical record, pharmacy computer system).

Study design

Example:

A retrospective chart review will be conducted to include adult and pediatric inpatients receiving piperacillin/tazobactam between January 1, 2010 and July 31, 2010.

Data will be collected using a data collection form, and all patient identifiers will be de-identified. All collected patient data, including demographic data, antibiotic regimens, microbiology data, indications, etc., will be analyzed.

Inclusion Criteria

Adult and pediatric inpatients who received piperacillin/tazobactam between January 1, 2010 and July 31, 2010 for a total target sample size of 100 patients.

Exclusion Criteria

- Adult and pediatric oncology patients
- Piperacillin/tazobactam course duration <24 hours.

Data Collection

Patient demographics, antibiotic regimens and dosing, indication for piperacillin/tazobactam use, radiographic data, microbiological data and adverse events will be collected from pharmacy order entry system, computerized physician order entry system, electronic patient record, and patient's paper chart.

Data Collection Endpoints:

Data will be collected until discontinuation of piperacillin/tazobactam, patient discharge from the hospital or patient death.

Definitions

Empiric therapy: antibiotic therapy initiated prior to the first positive culture

Directed therapy: antibiotic therapy directed at final organisms

One piperacillin/tazobactam treatment course: a dose at least 24 hours apart for a duration of at least 24 hours

Concomitant antimicrobials: antibiotics administered for at least 24 hours while simultaneously receiving piperacillin/tazobactam

Statistical Analysis

Descriptive statistics will be used to describe the endpoints listed above.

Unit of analysis: one course of piperacillin/tazobactam therapy

Results

Summarize results of your findings here.

**I.
Patient
Demographics**

**Example:
Table IA: General Patient Demographics**

Antibiotic Allergies n = XX		Patient's Age (Yrs) N=XX		Gender, n (%) N=XX	
Penicillin		Mean		Female	
Cephalosporin		Median		Male	
Carbapenem		Range			
Other antibiotics					

Table IB: Breakdown of Piperacillin/Tazobactam Courses by Location

Courses, n (%) N=XX					
Floor		ICU		Step-Down	

Table IC: Breakdown of Piperacillin/Tazobactam Courses by Service

Courses per Service, n (%) N=XX			
Medicine		Surgery	

**II.
Indications for
Piperacillin/
Tazobactam
Therapy**

Table IIA: Initiation of Therapy

Courses, n (%) N=XX	
Empiric	
Directed	

Table IIB: Indications for Piperacillin/Tazobactam Therapy

Indication N=120	n (%)	Empiric vs. Directed n (%)	Primary Service, n (%)
Pulmonary Total cultures (sputum, BAL, nasotracheal aspirate)			
Intra-abdominal Total cultures (bile, abdominal abscess, peritoneal fluid)			

Skin and Soft Tissue Total Cultures			
Urinary Tract Infection/Pyelonephritis Total Cultures			
Fever Unknown Origin Total cultures (blood, urine)			
Other Source			

Table IID: Reason for Discontinuation of Piperacillin/Tazobactam Therapy

No. of Piperacillin/Tazobactam Courses N=XX	n (%)
Completed course	
Changed to oral therapy	
Changed to narrower agent	
Organism resistant	
Patient expired	
Patient discharged home on piperacillin/tazobactam	
Culture negative/Other	

**III.
Initial
Piperacillin/
Tazobactam
Dosing**

Table IIIA: Dosing based on Renal Function

Piperacillin/Tazobactam Initial Regimen	No. of Piperacillin/Tazobactam Courses, n (%) N=XX
Appropriate	
Inappropriate <ul style="list-style-type: none"> ▪ Under-dose ▪ Over-dose 	
Piperacillin/Tazobactam Subsequent Regimen	No. of Subsequent Piperacillin/Tazobactam, n (%) N=XX
Appropriate	
Inappropriate <ul style="list-style-type: none"> ▪ Under-dose ▪ Over-dose 	

**IV.
Duration of
Piperacillin/
Tazobactam
Therapy**

Table IVA: Duration of Piperacillin/Tazobactam Therapy

Duration of Treatment	No. of Piperacillin/Tazobactam Courses, N=XX n (%)	Empiric vs. Directed n
1-3 days		
4-7 days		
8-10 days		
11-14 days		
>14 days		

**V.
Concomitant
Antimicrobials**

Table VA: Concomitant Antibiotics

(administered for at least 24 hours while simultaneously receiving piperacillin/tazobactam)

Agent	Number of Courses, n=XX n (%)

**VI.
Piperacillin/
Tazobactam-
Related
Adverse
Effects**

Summarize any piperacillin/tazobactam related adverse events here.

Conclusions

Place your conclusions of the study results here. Make it simple and brief.

Recommendations

Recommendations should be very specific and should include ideas on how improve problematic use of antimicrobial identified in this DUE.

Example:

- Restrict a particular antimicrobial to Infectious Diseases prior approval
- Routine review of all piperacillin/tazobactam orders at 72 hours or automatic stop orders
- Development of piperacillin/tazobactam guidelines if your institution does not have one in place
- Development of the piperacillin/orderset
- Education

Limitations

State limitations of the study here.

References

1. Johnson CA, Halstenson CE, Kelloway JS, et al: Single-dose pharmacokinetics of piperacillin and tazobactam in patients with renal disease. *Clin Pharmacol Ther* 1992; 51:32-41.
2. Schoonover LL, Occhipinti DJ, Rodvold KA, et al: Piperacillin/tazobactam: A new beta-lactam/beta-lactamase inhibitor combination. *Ann Pharmacother* 1995;29:501-14.

