

Evaluation of appropriate initiation and de-escalation of piperacillin-tazobactam in hospitalized patients at an acute care hospital

Primary author: Ivy Yang, PharmD

Co-authors: Pavlin Dimitrov, PharmD, BCPS, BCCCP; Kelli Kronsberg, PharmD, BCPS;

Jonathan Cho, PharmD, MBA, BCPS, BCIDP



Background

- Piperacillin-tazobactam is a broad spectrum, commonly prescribed antibiotic
- It has adequate distribution in most parts of the body and tends to be the agent of choice when *Pseudomonas sp.* along with anaerobic coverage is warranted
- Due to the widespread use of this agent, circumstances of overuse, misuse, and resistance are of rising concern
- Focus needs to be placed on appropriate initiation and de-escalation of piperacillin-tazobactam as more information becomes available
- Emphasis should be on assessing patient-specific risk factors for *Pseudomonas sp.*

Objective

The purpose of this medication use evaluation is to assess appropriate use of piperacillin-tazobactam based on patient-specific risk factors, actions taken to de-escalate when warranted, and identify areas for improvement.

Methods

Retrospective medication utilization evaluation

Study Period:

August 1st to September 15th 2021

Inclusion Criteria:

At least 18 years of age, received at least one dose of piperacillin-tazobactam

Method:

Patients were randomly selected from a clinical support software generated list

- Day 1:** demographic data, risk factors, and empiric indication was collected
 - Demographic data include age, gender, creatinine clearance, location in the hospital, and whether they were ever in the intensive care unit (ICU)
 - Risk factor data include previous hospitalization within 90 days, previous IV antibiotic use within 90 days, history of pseudomonas within 6 months, immunosuppressive state, and co-morbidities associated with certain disease states (e.g. COPD for pneumonia)
- Day 3:** definitive indication, relevant positive cultures, and appropriateness of action taken were documented
 - If any patient deceased during the 3 day assessment period, it was noted as well

This research was supported (in whole or in part) by HCA Healthcare and/or an HCA Healthcare affiliated entity. The views expressed in this publication represent those of the author(s) and do not necessarily represent the official views of HCA Healthcare or any of its affiliated entities.

Results

Table 1. Demographics

Characteristics	Analysis Group
Mean age	62 years
Female (%)	37 (42%)
Admitted to ICU	24 (27.3%)
Average CrCl	73 mL/min

Table 2. Pseudomonal Risk Factors

Pseudomonal Risk Factors	Number of Patients (%)
Recent hospitalization for at least 2 days within 90 days	53 (60.2%)
IV antibiotics within 90 days	48 (54.5%)
Immunocompromised	4 (4.5%)
History of Pseudomonas within 6 month	2 (2.3%)

Note: risk factors are not mutually exclusive

Figure 1. Initial Indications

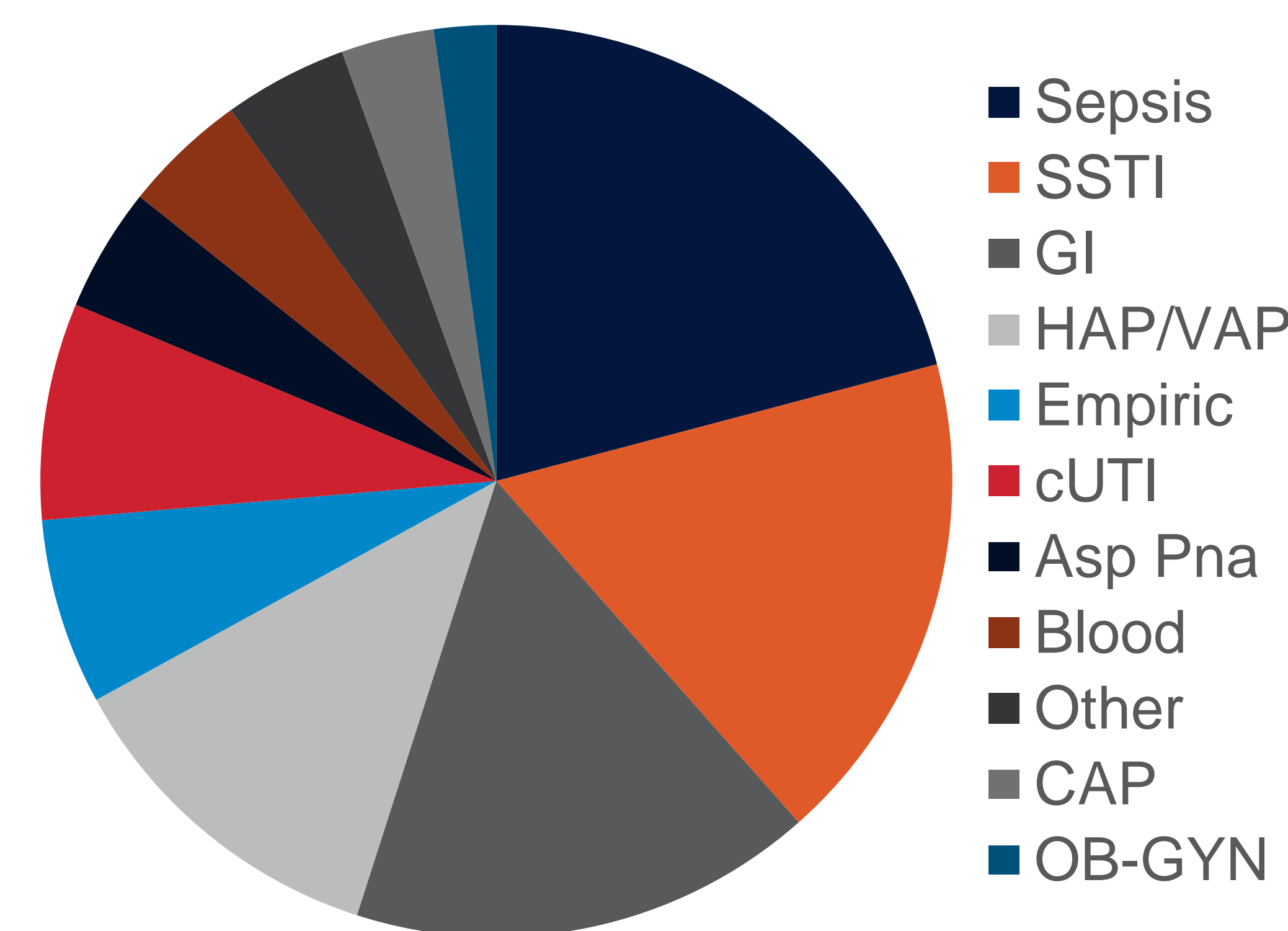


Figure 2. Empiric Use - Day 1

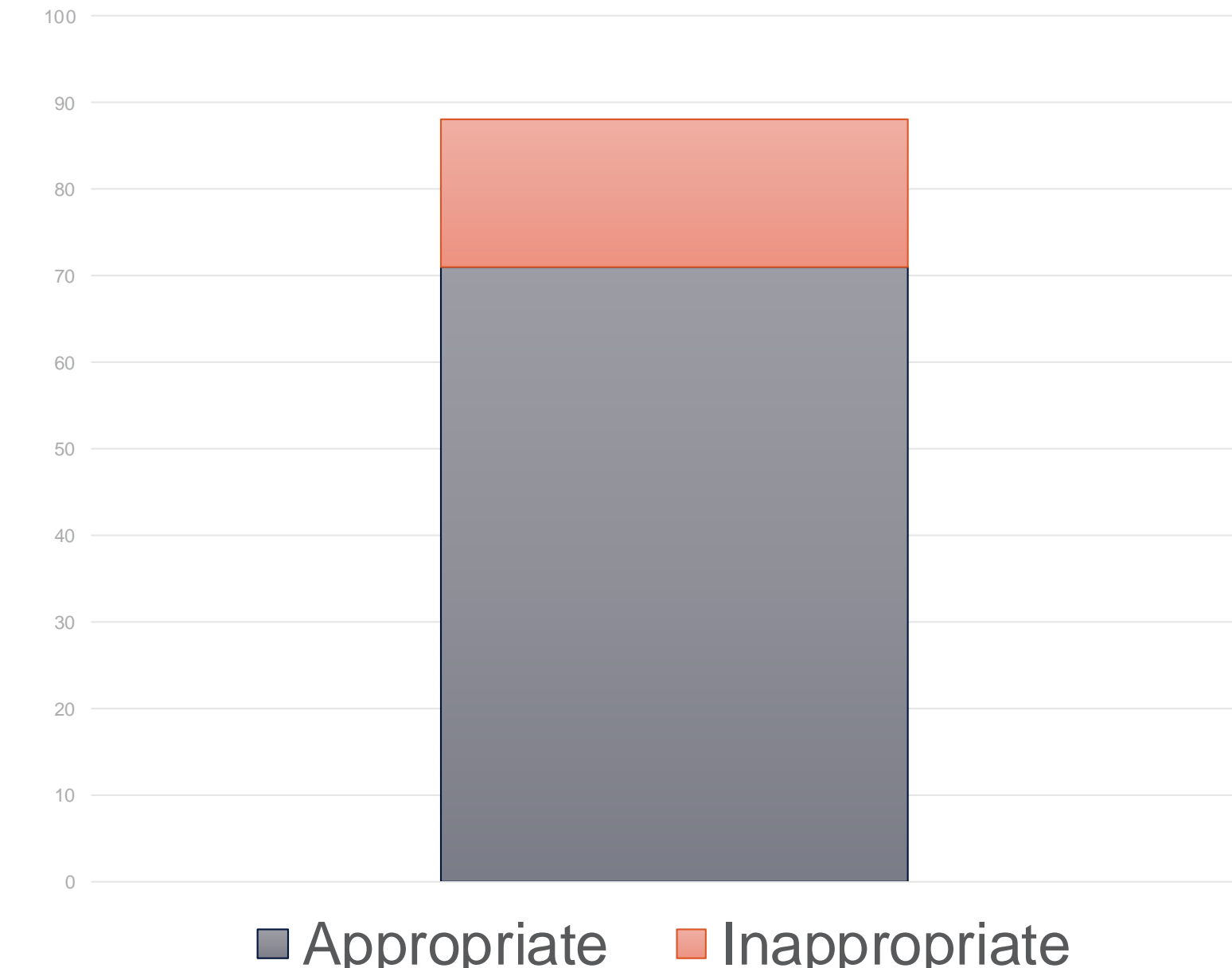
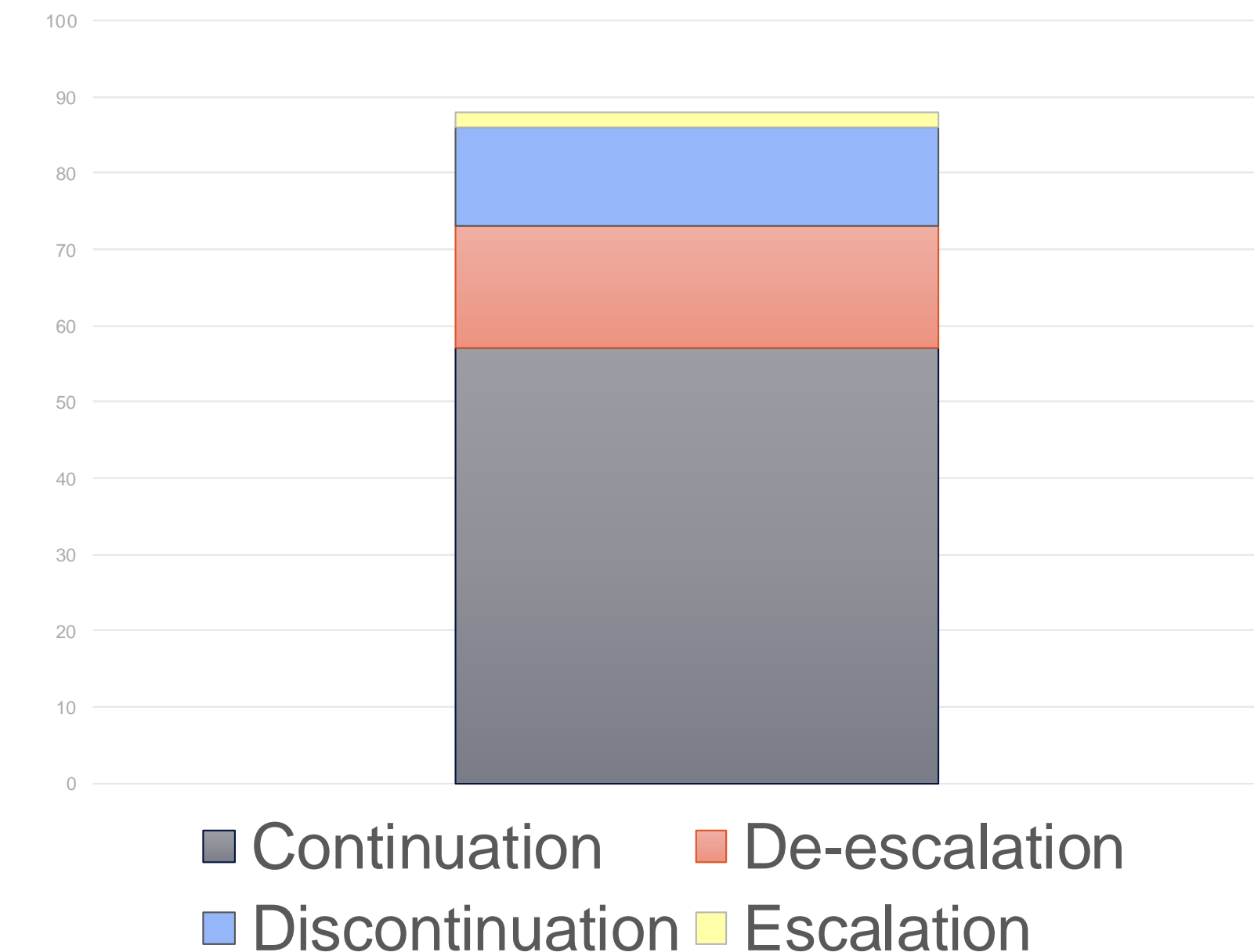


Figure 3. Action Taken - Day 3



Discussion

- The most common indication for initiating piperacillin-tazobactam was sepsis (21.6%), followed by skin and soft tissue infections (18.2%), abdominal peritoneal infections (17.0%), hospital/ventilator-acquired pneumonia (11.4%), empiric (6.8%), and complicated urinary tract infections (5.7%)
- Inappropriately piperacillin-tazobactam initiations, according to the pre-defined criteria, largely consisted of abdominal peritoneal infections
- Inability to de-escalate was closely associated with the lack of cultures
- On day 1, 80.7% of piperacillin-tazobactam initiations were appropriate based on pre-defined patient-specific risk factors and clinical judgement
- Raveh et al. found that the appropriateness rate of piperacillin-tazobactam use in their study hospital was 90%¹ whereas Antoine et al. determined the appropriateness was 71% in the four hospitals they examined²
- This value highly varies between different institutions and largely depend on the patient and health care professional population
- On day 3, 42% of orders were de-escalated or discontinued, 56% of orders were continued, and 2.3% of orders were escalated. 80.7% of actions taken were deemed appropriate
- Within the patients examined for this evaluation, only 37.5% had positive cultures where 4.5% lead to de-escalation or discontinuation

Conclusion

The majority of piperacillin-tazobactam orders were initiated appropriately and interventions were routinely made by pharmacists on day 3 of therapy; however, more surveillance and a structured de-escalation protocol would further aid in this process. Antimicrobial stewardship and the importance of the pharmacists' role in its implementation continues to be an integral part of patient care and antimicrobial resistance containment measure. It is important to use broad spectrum antibiotics appropriately and de-escalate when clinically indicated. Areas of focus for improvement include proper usage and continual monitoring for intervention opportunities.

References

- Raveh D, Muallem-Zilcha E, Greenberg A, Wiener-Well Y, Schlesinger Y, Yinnon AM. Prospective drug utilization evaluation of three broad-spectrum antimicrobials: cefepime, piperacillin-tazobactam and meropenem. *QJM*. 2006;99(6):397-406. doi:10.1093/qjmed/hcl050
- Antoine TL, Curtis AB, Blumberg HM, et al. Knowledge, attitudes, and behaviors regarding piperacillin-tazobactam prescribing practices: results from a multicenter study. *Infect Control Hosp Epidemiol*. 2006;27(11):1274-1277. doi:10.1086/507973

