Anti-infective drug shortages: proactive management

The Problem

Unprecedented drug shortages of a variety of agents currently range from short term interruptions to pervasive long lasting events. Some go unnoticed to providers with lots of "behind the scenes" inventory control and proactive purchasing. Published data demonstrate that shortages have caused a ripple effect, resulting in additional medication errors, adverse drug events and untoward outcomes. Unlike others, anti-infective shortages are not uniformly alleviated by simple substitution without a review of susceptibility trends and testing. In recent months, US Hospitals are faced with acute shortages of inhaled pentamidine, intravenous (IV) acyclovir and meropenem IV.

➢ **Pentamidine inhalation** is used to prevent *Pneumocystis jirovecii* pneumonia in severely imunocompromised patients intolerant of other agents.

➢ A**cyclovir IV** is the standard of care for a number of BIDMC clinical pathways, for the prevention and treatment of herpesvirus infections.

➢ **Meropenem IV** is used for the empiric and directed treatment of drug -resistant Gram-negative bacterial infections and for patients allergic to beta-lactams.

Aim/Goal

➢ Aggressively respond to antimicrobial drug shortages when supply/demand curves demonstrate a negative balance.

➢ Utilize evidence-based clinical guidelines, electronic systems and stakeholder providers to develop and implement multifaceted response plans such as identification and as necessary prioritization of at-risk patients,

➢ Although mitigation of the excess costs created by shortages is one concern, the overriding goals are to prevent harm to patients and to protect providers from the effects of antimicrobial drug shortages.

The Team

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The Interventions

A systematic review of the supply/demand for the antimicrobial drugs in shortage was performed, including: analysis of local utilization, identification of key populations at risk, identification and notification of key stakeholder prescribers, assessment of the availability of substitute agents and review of evidence-based practice implications. A multifaceted shortage management response package was developed based on the particulars of each shortage.

The Results/Progress to Date

Active Pentamidine Orders

Acyclovir IV/PO utilization

Carbapenem utilization (Grams)
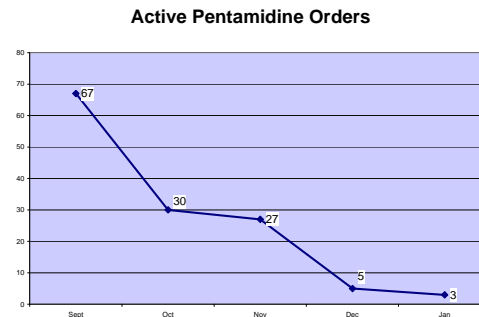
A direct reduction in orders was achieved through modifications to CPOE to facilitate orders for alternate agents with an added requirement for AST/ID approval. A case by case evaluation and algorithm for utilization of alternate agents was performed to allow new starts as needed. Pentamidine is generally considered inferior so a secondary outcome was better prophylaxis.
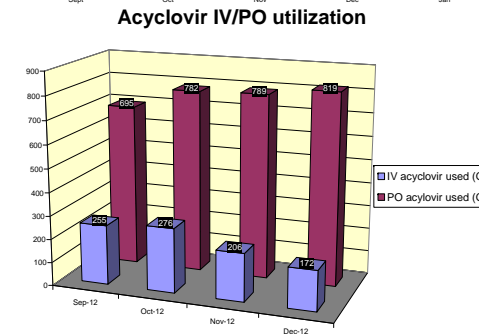
A reduction in utilization of IV acyclovir was achieved by CPOE modification including indication-based dosing, dosing by ideal body weight, dose rounding, active messaging and reduced TAT for CSF HSV PCR results, creation of algorithms and prospective audits and case reviews. A secondary outcome was more evidence based therapy with applied kinetics.
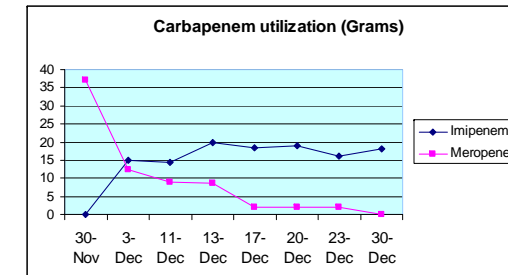
A careful balance of carbapenems had to be maintained to utilize beyond use dating. After Dec 13th, supplies of meropenem had been depleted with a switch to imipenem using cPOE guidance, AST approval with consideration of microbiology results and surrogacy.

Lessons Learned

- The management of antimicrobial drug shortages is complex and highly labor intensive. An unintended consequence is more evidence based practice and improved stewardship.
- System gaps exist between onsite "outpatient" and inpatient medication ordering.
- Best practice medication ordering may be more pervasive

Next Steps

Continued careful reviews of medication ordering for drugs in shortage are a necessity. More stringent restrictions and drug substitution may be in order across clasess.

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