

PILOT PROJECT: Criteria for conversion of intravenous to oral/enteral (IV to PO) anti-infectives

Applicability: NYP/C (Milstein Hospital; adult patients)

Purpose: To establish guidelines for the conversion of intravenous to oral/enteral (IV to PO) anti-infectives.

Background Information: A number of commonly used anti-infectives are known to have virtually equivalent bioavailability when given by either the PO or IV routes*. The advantages of oral administration of medications (as opposed to intravenous) include: decreased complications of intravenous therapy (e.g. IV infiltration, line infection), decreased nursing and pharmacy workload, and decreased medication costs. An estimate of the potential cost savings of such a program can be significant (see table). In addition, similar institutions have already implemented IV to PO programs with successful results.

*The exception to this is azithromycin. The oral bioavailability of azithromycin is ~40%. Nevertheless, aside from treatment for community-acquired pneumonia in an ICU patient, oral azithromycin is still recommended for patients able to take oral medications. Azithromycin has a long half-life (11-68 hours) and concentrates intracellularly. In general, tissue concentrations are much higher (10 to 100 times) than corresponding serum concentrations.

Cost Difference and Potential Savings

	PO	IV	2005 IV Cost	Potential % Conversion	Potential Cost Savings
Linezolid (600mg)	\$37.87	\$52.00	\$472,783	40%	\$40,114
Voriconazole (200mg)	\$21.27	\$73.98	\$444,646	30%	\$88,400
Azithromycin (500mg)	\$3.58	\$12.00			
Levofloxacin (500mg)	\$5.60	\$11.73			
Fluconazole (200mg)	\$0.08	\$8.68			

Policy Statement:

All patients taking any of the above intravenous medications will be identified on a daily basis. The pharmacist will then review the patient chart and medication administration record for the criteria listed below. If necessary, the reviewer will confer with the patient's nurse or physician to obtain necessary information. If the inclusion criteria for route change are met without exclusion criteria being present, the pharmacist will notify the physician of the requested change. The physician will then write an order to switch the route of the medication.

IV to PO Conversion

Applicable drugs	Linezolid / Azithromycin / Levofloxacin* / Fluconazole / Voriconazole
Inclusion criteria	<p>The following criteria warrant switching to oral therapy:</p> <ol style="list-style-type: none"> 1. Patient is receiving oral/enteral medications and/or oral/enteral diet already. <ol style="list-style-type: none"> a. If receiving enteral nutrition, patient is tolerating feeds. 2. Patient is hemodynamically stable. 3. The patient's clinical condition is improving and fever curve and/or WBC count are trending down on IV therapy. 4. Patient adherence to oral therapy is anticipated.
<p>* Levofloxacin: Oral administration of levofloxacin requires temporal separation from administration of Mg⁺², Ca⁺², Al⁺³-containing antacids, sucralfate, calcium supplements, and iron products due to adsorption of the levofloxacin limiting its oral bioavailability. Separate the administration times of these products from oral levofloxacin by <u>at least 2 hours</u>.</p>	
Additional specific inclusion criteria for documented indications	<p>Additional specific criteria should be met prior to switching therapy in patients:</p> <ol style="list-style-type: none"> a. Bacteremia: Afebrile X 24hrs, blood cultures negative X 48hrs, and received IV therapy for at least 3 days. b. Septic arthritis / osteomyelitis: Afebrile X 24hrs, received IV therapy for at least 5 days, negative repeat cultures (if recultured), and with adequate drainage where appropriate c. Draining abscess: Afebrile X 24hrs. d. Non-draining abscess: Determination of adequacy of PO antibiotic therapy should be based on clinical judgment. e. Candidemia/Invasive Candidiasis: Afebrile X 24hrs, blood cultures negative X 72 hrs, and received IV therapy for at least 3 days. f. Invasive Aspergillosis / other invasive fungal infections: Received IV therapy for at least 7 days. <p>The following indications warrant immediate switch to oral therapy if not initiated with oral:</p> <ol style="list-style-type: none"> a. Urinary tract infections b. Skin and soft-tissue infections c. Prophylaxis (e.g. for Candidiasis or Aspergillosis)
Exclusion criteria	<ol style="list-style-type: none"> 1. Antibiotics are for the following indications: <ol style="list-style-type: none"> a. Meningitis b. Endocarditis/endovascular infections c. Sepsis (evidence of infection and two or more of the following criteria: temperature $\geq 38^{\circ}\text{C}$ (100.4°F) or $\leq 36^{\circ}\text{C}$ (96.8°F), heart rate ≥ 90 beats/min, respiratory rate ≥ 20 breaths/min or PaCO₂ of ≤ 32 mmHg, and white-cell count of $\geq 12,000/\text{mm}^3$ or $\leq 4,000/\text{mm}^3$ or >10 percent immature neutrophils). 2. Patient is NPO (including medications) 3. Patient can not adequately absorb oral medications <ol style="list-style-type: none"> a. Severe diarrhea b. Uncontrolled vomiting c. GI obstruction/motility disorder d. Malabsorption syndrome e. Continuous gastric suctioning f. On paralytics

References

1. Ramirez J. Early discharge strategies: role of transitional therapy programs. In: Owens R, Ambrose PG, Nightingale CH, eds. Antibiotic Optimization: Concepts and Strategies in Clinical Practice. Boca Raton, FL: Taylor & Francis Group;2005:431-451.
2. Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. Clin Infect Dis 2007;44:S27-72.