
TITLE: CRITERIA FOR CONV ERSION OF MEDICATIONS FROM INTRAVENOUS TO ORAL/ENTERAL (IV/PO)

POLICY:

A number of commonly used medications 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. In addition, similar institutions have already implemented IV to PO programs with successful results.

TABLE 1: Conversion, Rounding and Costs

	Conversion		Adult Rounding Oral Doses	Pediatric Rounding Oral Doses	Cost PO (per dose)	Cost IV (per dose)
	IV	PO				
Acetazolamide						
Azithromycin	1	1	--		$1	$4
Chlorothiazide					$0.10	$272
Esomeprazole	1	1	--		$0.23	$41
Famotidine	1	1	--		$0.15	$2
Fluconazole	1	1	--		$1	$8
Lacosamide	1	1	--		$35	$102
Levetiracetam	1	1	--		$1	$136
Levofloxacin	1	1	--		$3	$15
Levothyroxine	1	2			$0.10	$26
Linezolid	1	1	--		$168	$220
Mycophenolate mofetil (Cellcept®)*	1	1	--		$2	$112
Mycophenolate sodium (Myfortic®)*	1000	720	180 mg		$5	$112
	750	540				
	500	360				
	250	180				
Sildenafil					$17	$95
Voriconazole	1	1	Nearest 50 mg or use suspension		$90	$370

* Patients may be converted from mycophenolate mofetil IV to either mycophenolate mofetil oral or mycophenolate sodium. Must check with provider for which agent that will be utilized based upon service or patients history or tolerability prior to making a dosage recommendation.

TABLE 2: Available Oral Dosage Forms and Administration Directions				
	Tablet / Capsule	Crush	Suspension / Powder	Administration Directions
Acetazolamide	250 mg tablet or 500 mg sustained release capsule	No	--	May sprinkle capsule contents.
Azithromycin	250 mg tablet	Yes	200 mg/5mL	
Chlorothiazide	--	--	250 mg/5mL	
Esomeprazole	20, 40 mg delayed release capsule	No	20, 40 mg granules for suspension	Administer 1 hour before meal. Mix granules with 1 tablespoon of water and wait 2-3 minutes for mixture to thicken.
Famotidine	20 mg film coated tablet		40 mg/5mL	
Fluconazole	200 mg tablet	Yes	40 mg/mL	
Lacosamide	50, 100, 150, 200 mg tablet		--	
Levetiracetam	250, 500, 750 mg tablet	No	100 mg/mL	
Levofloxacin	250, 500, 750 mg tablet	Yes	25 mg/mL	• Administer 2 hours before or 2 hours after multiple vitamins, antacids, or other products containing magnesium, aluminum, iron, or zinc. • Tube feeds must be held for 2 hours before and after oral administration. • Suspension: Administer on an empty stomach.
Levothyroxine	25, 50, 75, 88, 100, 112, 150, 175, 200, 300 mcg tablet		--	Administer 4 hours before or after antacids or products containing iron. Administer in the morning 30 minutes before breakfast.
Linezolid	400, 600 mg tablet	Yes	20 mg/mL	• Protect from light. • Suspension: invert gently to mix, do NOT shake.
Mycophenolate mofetil (Cellcept®)*	500 mg tablet or 250 mg capsule	No	200 mg/mL	Administer 1-2 hours before meals.
Mycophenolate sodium (Myfortic®)*	180, 360 mg delayed release tablet	No	--	
Sildenafil	25, 50, 100 mg tablet		2.5 mg/mL	
Voriconazole	50, 200 mg tablet	Yes	200 mg/5mL	• Administer 1 hour before or after a meal.

* Patients may be converted from mycophenolate mofetil IV to either mycophenolate mofetil oral or mycophenolate sodium. Must check with provider for which agent that will be utilized based upon service or patients tolerability history prior to making a dosage recommendation.

PURPOSE:

To establish guidelines for the conversion of intravenous to oral/enteral (IV to PO) medications.

APPLICABILITY:

All Centers

PROCEDURE:

1. All patients taking any of the above intravenous medications (see Table 1) will be identified on a daily basis by the pharmacist, through a computer generated report. This report identifies patients that are receiving one of the above medications AND are afebrile (temperature < 100.4 °C) for 24 hours, have an active diet order, and are receiving other oral medications. These patients also have NOT received anti-emetics within prior 24 hours or receiving vasopressive agents.

2. The pharmacist will then review the patient chart and medication administration record for the criteria listed below (Table 2)if applicable.
   A. If necessary, the reviewer will confer with the patient's nurse or physician to obtain necessary information.
   B. If the inclusion criteria for route change are met, without exclusion criteria being present, the pharmacist will notify the physician of the requested change and provide an appropriate oral dose.
      a. This may be completed verbally or via text message
      b. Patient *Smith* MRN *1234567* Please consider switching from IV to PO *linezolid* as its bioequivalent. Dose *Linezolid 600 mg Q12*. Thanks, *Pharmacists name your ext.*your pager number*.
   C. The physician will then write an order to switch the route of the medication.

TABLE 3: Criteria for IV to PO Conversion	
Medications	**Linezolid / Levofloxacin* / Fluconazole / Voriconazole**
Inclusion Criteria	The following criteria warrant switching to oral therapy: 1. Patient is receiving oral/enteral medications and/or oral/enteral diet already. a. If receiving enteral nutrition, patient is tolerating feeds. 2. The patient's clinical condition is improving and fever curve and/or WBC count are trending down on IV therapy. 3. Patient adherence to oral therapy is anticipated.
***** 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 and tube feeds from oral levofloxacin by at least 2 hours.	
Additional specific inclusion criteria for documented indications	1. Additional specific criteria should be met prior to switching therapy in patients: 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. 2. The following indications warrant immediate switch to oral therapy if not initiated with oral: a. Urinary tract infections b. Skin and soft-tissue infections c. Prophylaxis (e.g. for Candidiasis or Aspergillosis)
Exclusion Criteria	1. Antibiotics are for the following indications: a. Meningitis b. Endocarditis/endovascular infections c. Sepsis (evidence of infection and two or more of the following critieria: temperature 38ºC (100.4ºF) or 36ºC (96.8ºF), heart rate 90 beats/min, respiratory rate 20 breaths/min or PaCO2 of 32 mmHg, and white-cell count of 12,000/mm3 or 4,000/mm3 or >10 percent immature neutrophils). 2. Patient is NPO 3. Patient cannot adequately absorb oral medications a. Severe diarrhea b. Uncontrolled vomiting c. GI obstruction/motility disorder d. Malabsorption syndrome e. Continuous gastric suctioning f. Receiving neuromuscular-blocking agents (e.g., cisatracurium, pancuronium, rocuronium, vecuronium) 4. Patient is in shock state (e.g., receiving high dose vasopressors). that would decrease enteric absorption

Medications	**Levetiracetam/Lacosamide**
Inclusion Criteria	The following criteria warrant switching to oral therapy: 1. Patient is receiving oral/enteral medications and/or oral/enteral diet already. a. If receiving enteral nutrition, patient is tolerating feeds. 2. Patient adherence to oral therapy is anticipated.
Exclusion Criteria	1. Patient is NPO 2. Patient cannot adequately absorb oral medications a. Severe diarrhea b. Uncontrolled vomiting c. GI obstruction/motility disorder d. Malabsorption syndrome e. Continuous gastric suctioning f. Receiving neuromuscular-blocking agents (e.g., cisatracurium, pancuronium, rocuronium, vecuronium) 3. Patient is actively seizing or considered at high risk of recurrent seizures 4. Patient is receiving pentobarbital 5. Patient is in shock state (e.g., receiving high dose vasopressors) that would decrease enteric absorption

Medications	**Esomeprazole**
Inclusion Criteria	The following criteria warrant switching to oral therapy: 1. Patient is receiving oral/enteral medications and/or oral/enteral diet already. a. If receiving enteral nutrition, patient is tolerating feeds. 2. Patient adherence to oral therapy is anticipated.
Exclusion Criteria	1. Patient is NPO 2. Patient is receiving a continuous esomeprazole drip 3. Patient cannot adequately absorb oral medications a. Severe diarrhea b. Uncontrolled vomiting c. GI obstruction/motility disorder d. Malabsorption syndrome e. Continuous gastric suctioning f. Receiving neuromuscular-blocking agents (e.g., cisatracurium, pancuronium, rocuronium, vecuronium) 4. Patient is in shock state (e.g., receiving high dose vasopressors) that would decrease enteric absorption

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.

GUIDELINE DATES:

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