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MEDICATION MONITORING: INTRAVENOUS TO ORAL THERAPEUTIC INTERCHANGE PROGRAM

I. BACKGROUND

The oral route of administration may be ideal so long as the medication achieves the desired concentrations in blood and/or the targeted site(s) of action. Patients often start on parenteral therapy, but as their condition improves, they are often candidates for continuation with oral therapy. Available oral formulations have high oral bioavailability and equivalent potency. The conversion from intravenous (IV) to oral (PO) formulations of the same medication while maintaining equivalent potency is known as "sequential therapy".

Much of the beneficial data on IV to PO therapy interchange stem from the conversion of antimicrobial medications. Studies have shown that appropriate conversion from IV to PO antimicrobial therapy can decrease the length of hospitalization without adversely affecting patient outcome and may improve patient care by reducing the risk of intravascular catheter infection because of shorter line dwell times and less endoluminal contamination.[1-8] Additional benefits of IV to PO conversion include reduced hospital cost, greater patient comfort and easier ambulation[9]. Furthermore, the use of oral medications may decrease nursing personnel time.

II. POLICY

This policy outlines IV to PO conversion considerations and specific criteria for the substitution and therapeutic interchange of medications as set forth by the SHC Pharmacy and Therapeutics Committee, the Antimicrobial Subcommittee, and the Antimicrobial Stewardship Team.

III. PROCEDURES

A. If the patient is being considered for an IV to PO conversion, the clinical pharmacist (and/or Antimicrobial Stewardship Team in the case of antimicrobials) can examine the route of therapy and determine if it is clinically appropriate to perform a sequential, parenteral to oral therapy switch.

B. If the patient meets the approved criteria for transition to oral therapy (Section F), the clinical pharmacist will enter the new order using "per Protocol" order mode and enter a standardized i-Vent in the patient's medical record detailing the conversion.

C. *The covering provider will be notified when the sequential switch occurs. The provider has the option to switch back to the intravenous route if parenteral therapy is preferred.*

D. The Antimicrobial Stewardship Team will report findings and feedback to the Antibiotic Subcommittee approximately every year.

E. The Pharmacy Department will review and report findings and feedback for non-antimicrobial medications at departmental meetings every quarter for the first year (2013), then every year thereafter.

F. Criteria for patient eligibility:

Inclusion Criteria	• Patients improving clinically • Tolerating food or enteral feeding • Able to adequately absorb oral medications via the oral, gastric tube, or

	nasogastric tube route • Not displaying signs of shock, not on vasopressor blood pressure support • Taking other medications orally **Additional requirements for antimicrobials:** o Afebrile for at least 24 hours (temperature ≤100°F or ≤37.8°C) o Heart rate ≤90 beats per minute o Respiratory rate ≤20 breaths per minute o Systolic blood pressure ≥90 mm Hg (without vasopressor drugs) o Signs and symptoms of infection improvement according to assessment: • Improving WBC and differential counts • Improving signs and symptoms • Hemodynamically stable • Patient is not septic
Exclusion Criteria	• Persistent nausea and vomiting, diarrhea • Patient with the following GI conditions: o Ileus or suspected ileus with no active bowel sounds o Patient is known to have a malabsorption syndrome o Proximal resection of small intestines o High nasogastric (NG) tube output or requiring continuous GI suction (>500mL/day) o Active GI bleed • Cystic fibrosis • Patients with Grade III or IV mucositis • Wernicke's encephalopathy (for thiamine interchange) • Acute pain (for IV acetaminophen interchange) • Myxedema coma or if endocrine consulting (for IV levothyroxine) **Additional exclusions for antimicrobials:** • Patient has a serious or life threatening infection: o Meningitis, endocarditis, intracranial abscesses, osteomyelitis, septicemia, Legionella pneumonia o Inadequately drained abscesses and empyema o Severely immunocompromised (solid organ transplant, bone marrow transplant)

G. Intravenous to Oral Dose Conversion, Pricing, and Bioavailability

Medication	Intravenous Dose	Oral Equivalent	Oral Bioavailability[10,11]
Famotidine	20mg q12h ($0.87/dose)	20mg q12h ($0.08/dose)	45%[1]
Pantoprazole	40mg daily ($3.49)	40mg daily ($0.22/dose)	77%
		Lansoprazole 30mg daily ($2.18) Lansoprazole ODT 30mg daily ($5.83) * restricted to feeding tube use only	>80%
Acetaminophen • Do not interchange if for acute pain	1000mg q6h prn ($10.94/1gm)	1000mg q6h prn ($0.05/dose)	85-98%

[1] Serum levels do not consistently correspond to the FAMOTIDINE dose or the degree of gastric acid inhibition

Multivitamins	10 mL daily ($6.70)	1 tablet daily ($0.04)	-
Thiamine • Do not interchange if for Wernicke's Encephalitis	100mg daily ($9.63)	100mg daily ($0.02)	5%
Folic acid	1mg daily ($0.04/dose)	1mg daily ($0.02)	75-90%
Potassium Chloride	20mEq daily ($1.26)	20meq daily ($0.35)	-
Levothyroxine • Do not interchange if for myxedema coma or if endocrine consulting	0.05mg daily ($51.85/dose)	0.1mg daily ($0.15/dose)	40-80% *Reminder: proper conversion is usually 1:2 IV to PO, unless otherwise noted, e.g. endocrine recommendations
Metoclopramide	10mg q6hr prn ($0.40/dose)	10mg q6h prn ($0.11/dose)	80%
Ondansetron	4mg q6h prn ($0.63)	Tablet ($0.18) ODT	56%

H. Antimicrobial Intravenous to Oral Dose Conversion

Medication	Intravenous Dose	Oral Equivalent
Azithromycin	250 mg IV daily ($7.03/dose)	250 mg PO daily ($2.25/dose)
	500 mg IV daily ($7.03/dose)	500 mg PO daily ($3.65/dose)
Ciprofloxacin	200 mg IV every 12 hours ($1.64/dose)	250 mg PO every 12 hours ($0.10/dose)
	400 mg IV every 12 hours ($2.62/dose)	500 mg PO every 12 hours ($0.31/dose)
	400mg IV every 8 hours ($2.62/dose)	750mg PO every 12 hours ($0.41/dose)
Clindamycin	600mg IV every 8 hours ($12.66/dose)	300mg PO every 6 hours ($0.18/dose)
Doxycycline	100mg IV every 12 hours ($10.76/dose)	100mg PO every 12 hours ($0.79/dose)
Fluconazole	100 mg IV daily ($4.84/dose)	100 mg PO daily ($0.11/dose)
	200mg IV daily ($4.84/dose)	200 mg PO daily ($0.15/dose)
	400 mg IV daily ($5.54/dose)	400 mg PO daily ($0.30/dose)
Levofloxacin	750 mg IV daily ($4.60/dose)	750 mg PO daily ($0.48/dose)
Linezolid	600 mg IV every 12 hour ($108.84/dose)	600 mg PO every 12 hours ($86.87/dose)
Metronidazole	500 mg IV every 8 hours ($1.11/dose)	500 mg PO every 8 hours ($0.19/dose)
Moxifloxacin	400 mg IV daily ($8.40/dose)	400 mg PO daily ($14.23/dose)
Rifampin	600 mg IV daily ($32.66/dose)	600 mg PO daily ($1.94/dose)
Trimethoprim / Sulfamethoxazole (TMP/SMX)	5-15mg TMP/kg/day in 3-4 divided doses ($9.15/vial)	1 double strength = 160 mg TMP ($0.14/tablet) 1 single strength = 80 mg TMP ($0.06/tablet)

IV. REFERENCES

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V. DOCUMENT INFORMATION

A. Original Author/Date
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B. Gatekeeper
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C. Distribution
This procedure is kept in the Pharmacy Policies and Procedure Manual

D. Review/Revision History:
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E. Approvals
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