Children's Hospital
HSHS St. John's

SAINT JOHN'S PEDIATRIC CHILDREN'S HOSPITAL

Pediatric Intravenous to oral/enteral (IV to PO) Antimicrobial Conversion Policy

I. PURPOSE

Parenteral administration of medications, although sometimes necessary, is associated with risks including infection, phlebitis, and muscle necrosis. Enteral administration is preferred in eligible patients because it is easier, safer, and less costly than parenteral administration. The purpose of this policy is to develop a pharmacist-driven route-of-administration conversion for select antimicrobial medication orders in eligible patients. The advantages of this program are:

1. Provide an oral/enteral dosage form with comparable bioavailability to the intravenous form, which could reduce hospital length of stay
2. Avoid the added risks associated with continued intravenous therapy
3. Lower overall medication and associated costs to the patient and hospital

II. POLICY

This policy outlines pediatric antimicrobial IV to PO conversion considerations for pharmacists as set forth by the Antimicrobial Stewardship Committee and Pharmacy and Therapeutics Committee.

III. DEFINITIONS

- Route conversion- the order modification and dispensing of an oral dosage form in lieu of the intravenous dosage form
- Enteral diet- A diet order which includes enteral feedings (oral or via tube)

IV. RESPONSIBILITY

Inpatient Pharmacy Staff

Medical Staff

V. PROCEDURES

- For NICU patients and patients being consulted by Pediatric Infectious Diseases: call NICU and ID attendings with IV to PO recommendations. Do not automatically change to PO.

- Criteria for switch: (patients must meet all of the inclusion criteria AND none of the exclusion criteria)

- Patients who were excluded due to severity of infection, immunosuppression or other infections outlined in the exclusion criteria 12 to 15 will be referred to Pediatric

Infectious Diseases physicians for further evaluation and recommendation regarding the optimal timing of route conversion.

- All patients who undergo IV to PO/enteral route conversion should not be discharged from the hospital until at least 1-2 doses have been administered and tolerated.

Inclusion Criteria

1. Patients ≥ 2 months of age
2. Receiving enteral nutrition by the oral, gastric or other appropriate enteral tube (tolerating for at least 24 hrs or patient has been tolerating tube feeds at goal for 24 hrs)
3. Able to take medications via oral route or feeding tube
4. Completed a minimum of 48 hours of intravenous therapy of antimicrobial agent listed in Appendix and clinical plan includes continuation of antimicrobial therapy.
5. Signs and symptoms of infection have resolved or are improving (within the past **24 hours** for antibiotic conversion)
    - Afebrile ≥ 24 hours ● WBC ≤ 15,000/mm
6. Infection is at a site where an oral agent will achieve an adequate therapeutic level.
7. Blood culture negative for at least 48 hours.

Exclusion Criteria

1. Patient age < 2 months
2. Antibiotic duration < 48 hours
3. Unable to swallow, refuses oral medication or is strict NPO for a procedure
4. Severe nausea, vomiting or diarrhea (≥ 3 loose stools/day) in the previous 24 hours.
5. Gastrointestinal obstruction, mal-absorption syndrome, motility disorder, or ileus
6. NG tube with continuous suctioning
7. Continuous tube feedings that cannot be interrupted and patient requires a medication known to bind to enteral nutrition formulas
8. Active GI bleed
9. High dose of vasopressor medications (typically in presence of shock)
10. Experienced severe trauma in the last 72 hours
11. Intractable seizures / risk of aspiration
12. Severely immunocompromised / HIV or AIDS
13. Sepsis
14. Neutropenia (ANC < 500)

15. Infections that require IV therapy:
    a CNS infections
    b Complicated pneumonia (with significant pleural fluid, empyema, abscess or pneumatocele)
    c Cystic fibrosis pulmonary exacerbation
    d Endocarditis
    e Bacteremia / Candidemia / Line infection
    f Osteomyelitis
    g Septic arthritis

Order Entry

1. When the physician writes an order for an agent included in the automatic IV to PO conversion policy (see Appendix), the pharmacist will evaluate the patient to determine if criteria are met for automatic conversion. If possible, discuss intention for IV to PO interchange with bedside nurse.
2. If the patient meets the criteria, the pharmacist will discontinue the IV order and enter an order under the physician's name for the equivalent oral regimen.
3. The pharmacist will document this intervention in TheraDoc.
4. Any orders that are changed back to the IV form will be referred for clinical review and discussion with the prescribing physician before attempting another IV to PO conversion.

VI. REFERENCES

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2. Przybylski KG, Rybak MJ, Martin PR, et al. A Pharmacist-Initiated Program of Intravenous to Oral antibiotic Conversion. Pharmacotherapy. 1997;2:271-76.
3. Dellit TH, Owens RC, McGowan JE, et al. Infectious Diseases Society of American and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship. Clinical Infectious Diseases. 2007;44:159-77.
4. Agwuh KN, MacGowan A. Pharmacokinetics and pharmacodynamics of the tetracyclines including glycylcyclines. Journal of Antimicrobial Chemotherapy. 2006;58:256-65.
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VII. APPENDIX: Route Conversion and Cost

Antibiotic	Conversion		Bio-availability	Cost IV ($) (per dose)	Cost PO ($) (per dose)	Notes
	Intravenous Dose	Oral / Enteral Dose				
Ampicillin	25 – 50 mg/kg q6h	Amoxicillin 45 mg/kg q12h	74 – 92%	1.41/1g 2.31/2g	0.11/250mg of 250/5 susp 0.065/250mg of 400/5 susp	Dose based on ampicillin/ amoxicillin component.
Ampicillin/ sulbactam	25 – 50 mg/kg q6h	Amoxicillin/clavulanate 45 mg/kg q12h	74 – 92%	1.10/1.5g 2.05/3g	0.41/875mg 0.83/875mg of 400/5 susp	Dose based on ampicillin/ amoxicillin component.
Azithromycin	1	1	40 – 50%	2.09/500mg	0.98/250mg 2.42/250mg susp	Although azithromycin has low bioavailability, it is well distributed into tissues
Cefazolin	CAP: 50 mg/kg q8h SSTI: 33 mg/kg q8h	Cephalexin CAP: 25 mg/kg q6h SSTI: 12.5 mg/kg q6h	90%	0.81/1g	0.24/500mg 1.26/500mg susp	
Ciprofloxacin	10 mg/kg/dose q8 – 12h	15 mg/kg/dose q8 – 12h	50 – 80%	1.67/200mg 1.76/400mg	0.15/250mg 0.14/500mg 0.42/750mg 3.37/250mg susp 6.75/500mg susp	Avoid concurrent divalent and trivalent cation administration 2 hrs before or 6 hrs after. **Avoid administration with tube feeds**
Clindamycin	1	1	90%	4.02/300mg 6.16/600mg 7.52/900mg	0.67/300mg 0.83/450mg 4.30/300mg susp	Max 1800 mg/day PO
Doxycycline	1	1	99 – 100%	17.22/100mg	0.84/100mg 9.03/100mg susp	Avoid concurrent divalent and trivalent cation administration 1 hr before or 4 hrs after. **Avoid administration with tube feeds**
Fluconazole	1	1	> 90%	3.04/200mg 3.82/400mg	1.11/100mg 1.63/200mg 2.63/100mg of 10/1 susp 1.39/100mg of 40/1 susp	
Levofloxacin	1	1	99%	1.42/250mg 2.03/500mg	0.15/250mg 0.20/500mg 0.32/750mg 10.11/250mg susp	Avoid concurrent divalent and trivalent cation administration 1 hr before or 4 hrs after. **Avoid administration with tube feeds**
Linezolid	1	1	100%	28.57/600mg	3.26/600mg 78.63/600mg susp	
Metronidazole	1	1	100%	0.97/500mg	0.27/250mg 1.75/250mg of 50/1 susp 1.16/250mg of 100/1 susp	
Rifampin	1	1	~ 90%	69.31/600mg	0.74/150mg 0.6/300mg	

sulfamethoxazole/ trimethoprim	1	1	90 – 100%	11.32/10mL vial	0.2/ 400/80mg 0.1/ 800/160mg 1.72/10mL	
Voriconazole (**maintenance dose only**)	8 mg/kg q12h 4 mg/kg q12h	9 mg/kg q12h 200 mg q12h	45 – 65%	28.72/200mg	18.61/200mg 5.43/50mg 37.53/5mL	

*For doses that include multiple interval options, continue the original interval when converting to PO