

Liver Transplant Program

MEDICATIONS AND PHARMACY

I. Purpose

To detail the medication management for post transplant situations. Nephrotoxic and hepatotoxic drugs should be avoided.

II. Policy

A. Pre- and Intraoperatively

1. Standard Prophylaxis

- a. Vancomycin – 1 gram IV on call to OR x 1 (given within 1 hour of surgery) (remembering to adjust dosing for renal insufficiency)
- b. Zosyn (piperacillin/tazobactam) – 4.5 grams IV on call to OR x 1
- c. Solumedrol – 250 mg IVPB on call to OR x 1

2. If Penicillin Allergic

- a. Vancomycin – 1 gram IV on call to OR x 1 (given within 1 hour of surgery)
- b. Levofloxacin – 750 mg IV on call to OR x 1 (given within 30 minutes of surgery)
- c. Flagyl (metronidazole) – 500 mg IV on call to OR x 1
- d. Solumedrol – 250 mg IVPB on call to OR x 1

3. If hospitalized during the organ offer

- a. Vancomycin – 1 gram IV on call to OR x 1 (given within 1 hour of surgery)
- b. Meropenem – 500 mg on call to OR IV x 1
- c. Ambisome – 3-5 mg/kg on call to OR IV x 1
- d. Solumedrol – 250 mg IVPB on call to OR x 1

B. Post-Operative ICU Medications

1. Nystatin 5 mL 4 times a day – per NGT while intubated
2. Mycelex (Clotrimazole) troche 4 times a day – once extubated
3. Bactrim SS – one table by mouth daily or 20 ml NG daily (10 ml = 80/400)
4. Ganciclovir (Cytovine®) 5 mg/kg/day – IVPB daily
5. Continue medications received pre- and intraoperatively as follows (check medication orders for the patient to confirm those given):
 - a. Vancomycin – 1 gram IVPB every 12 hours x 48 hours
 - b. Zosyn – 4.5 grams IVPB every 8 hours x 48 hours

- c. Ambisome – 3-5 mg/kg IVPB daily x 48 hours
- d. Metronidazole – 500 mg IVPB every 6 hours x 48 hours
- e. Meropenem – 500 mg IVPB daily x 48 hours
- f. Levofloxacin – 750 mg IVPB daily x 48 hours

C. >48 Hours Post-Op & Outpatient Prophylactic Medication Profiles

1. Fungal Prophylaxis

- a. *Who* – all patients
- b. *How Long* – continue for 3 months post transplant or for 1 month after treatment for rejection
- c. *Route*
 - 1) Nystatin swish and swallow 5 mL every 6 hours for 3 months – OR
 - 2) Mycelex (Clotrimazole) troche – 10 mg 4 times a day
- d. *Labs* – not routinely needed
- e. *High-Risk Pre-Transplant Protocol*
 - 1) Patients who are hospitalized pretransplant are at increased risk of fungal infection post transplantation. These high-risk patients include:
 - a) acute liver failure patients
 - b) hospitalized ESLD patients who are awaiting transplantation
 - c) patients on hemodialysis or ultrafiltration
 - d) patients receiving retransplantation
 - 2) Micafungin (Micamine) – 50 mg IV daily until transplanted, then clotrimazole troches per protocol

2. PCP (pneumocystis carinii) Prophylaxis

- a. *Who* – all patients
- b. *How Long* – continue for 6 months post transplant or for 1 month after treatment for rejection
- c. *Route*
 - 1) Bactrim SS – 1 PO every day, starting on day 1 – OR – Bactrim DS TIW
 - 2) in case of sulfa allergy
 - a) pentamidine – 300 mg inhalation monthly – or
 - b) dapsone – 100 mg PO every day
- d. *Labs* – not routinely needed

3. CMV Prophylaxis

CMV disease is a major contributor to post-transplant morbidity. This is either caused by transferring CMV to our recipients through the donor liver, reactivation of latent disease, or primary infection. Patients who are at increased risk for developing CMV infection will receive prophylaxis.

- a. *Who* – all patients
- b. *How Long* – continue for 3 months
- c. *Route* – IV gancyclovir while NPO, then PO Gancyclovir (1 gram TID)
- d. *Labs* – check CMV PCR at 3 and 6 months post transplant or if symptomatic

- e. *Refractory CMV* – If the CMV PCR does not decrease, use Cytogam 150 mg/kg IV on day #1 followed by Cytogam 100 mg/kg IV for 2 weeks then reassess
- f. *Donor/Recipient Match:*

Donor	Recipient	Treatment
positive	negative	Gancyclovir – 1 g TID
positive	positive	Gancyclovir – 1 g TID
negative	positive	Gancyclovir – 1 g TID
negative	negative	Gancyclovir – 1 g TID

- 4. **Hepatitis B Prophylaxis** – see section UTSW-24.OLT – Hepatitis B Virus

D. Other Medication Guidelines – medications which may be required

1. **Alprostadil (PGE-1)**

- a. *Description/Mechanism of Action.* Alprostadil (Prostin VR®) is a vasodilatory prostaglandin of the E type (PGE-1). Pharmacologic actions include vasodilation, inhibition of platelet aggregation, inhibition of gastric secretions, and stimulation of intestinal smooth muscle. Proposed mechanisms responsible for reversal of hepatocellular damage in primary nonfunction of liver allografts may include increased blood flow to the liver via hepatic artery dilation, enhanced regeneration ability of the liver, inhibition of platelet aggregation, enhanced endothelial cell integrity, and immunosuppressive properties.
- b. *Transplant Uses.* Primary liver graft nonfunction or delayed function, acute liver failure, donor liver factors: older donor, significant fat content, long ischemic time.
- c. *Pharmacokinetics.* When given intravenously, the majority (70-80%) of drug is metabolized by the pulmonary vascular bed in a single pass through the lungs and its metabolites (less active) are excreted by the kidneys. It has a half-life of approximately 5-10 minutes and therefore must be administered by continuous infusion.
- d. *Dosing and Administration.* The initial infusion rates cited in the literature start at 0.2 mcg/kg/hr. Doses are titrated slowly to 0.6 mcg/kg/hr, patient tolerance permitting. The dosage range is 0.2-0.6 mcg/kg/hr (approximately 10-40 mcg/hr); however, doses up to 2.5 mcg/kg/hr (approximately 200 mcg/hr) have been used. The optimal dose has not been established.
- e. *Drip concentration* Initial suggested drip concentration is 1000 mcg/250ml NS (4 mcg/ml). This is stable for 24 hours, refrigerated.
- f. *Route.* Continuous IV infusion via central line recommended.
- g. *Length of therapy.* 4 to 7 days or more depending on response. It has been infused for up to 28 days as cited in the literature. Infusions may be discontinued without tapering.

- h. *Adverse Effects:* More common: abdominal cramps, diarrhea, headache, fever, swelling and parasthesias of hands or feet, hypotension, hypertension. Less common: Flushing, bradycardia, reflex tachycardia, edema.
 - i. *Patient Care and Monitoring Guidelines:* Routine BP, HR, Temp, Respiratory monitoring at least every 4 hours, more frequently upon initiation of treatment (q15min x 1 hour, then q1h x 3 hours). Monitor injection site q4h for edema, inflammation, pain if peripheral infusion site is used. The infusion may be discontinued without tapering. Endpoint of therapy has not been firmly established. Improvement in transaminase and coagulation parameters, bile flow, and encephalopathy are assessed.
2. **Ulcer/GERD**
 - a. Nexium – 40 mg PO daily
 3. **Vitamins**
Multivitamin with 1mg folic acid (prenatal vitamin) PO daily (indefinitely)
 4. **Anemia**
Ferrous sulfate – 325 mg PO TID (for 3 months)
 5. **Osteoporosis**
 - a. Cholecalciferol – 400 U PO daily (800 U total/day)
 - b. Calcium carbonate – 1 gm PO BID (Ca⁺⁺ supplementation to equal 1200-1500 mg/day total intake)
 - c. Risedronate – 5 mg daily in high risk patients (assessed in clinic)
 6. **Bowel Program**
 - a. Docusate – 250 mg PO BID (for 3 months)
 - b. Bisacodyl – 10 mg PR PRN
 - c. MOM – 30 ml PO BID PRN
 7. **Blood Pressure**
 - a. Amlodpine – 2.5-10 mg/day
 - b. Metoprolol – 25-200 mg BID or Atenolol 25-100 mg daily
 8. **Sleep**
 - a. Diphenhydramine – 25-50 mg PO qHS PRN insomnia
 - b. **avoid benzodiazepines**
 9. **Nausea**
 - a. Metoclopramide – 10 mg po/IV q6h prn
 - b. Alternatives: scopolamine, ondansetron, droperidol
 10. **Phosphate Supplementation**
 - a. Phos-NaK Power Concentrate – each packet contains

- 1) Sodium – 160 mg
- 2) Potassium – 280 mg
- 3) Phosphorus – 250 mg

11. **Magnesium Supplementation**

- a. MagTab SR – 84 mg daily to TID depending upon need
- b. Alternative if having diarrhea: Magnesium – 133mg/Protein tabs: 2 TID-QID

12. **Hyperkalemia**

- a. *Acute*. kayexalate – 15-30 gm po
- b. *Chronic*. Fludrocortisone – 0.1 mg PO daily
- c. avoid potassium supplementation

13. **Pain Management**

- a. Hydromorphone (Dilaudid) PCA, then oxycodone or hydromorphone PO
- b. Avoid excess acetaminophen (i.e., Vicodin, Percocet), Demerol
- c. **Do not use NSAIDs**

14. **Lipid Management**

- a. prn, depending upon situation
- b. Pravachol is the preferred statin

III. Procedure/Intervention(s) – N/A

IV. Documentation (Documents & Forms) – N/A

V. Other Related Policies/Procedures

1. UTSW-21.OLT – Immunosuppressive Management
2. UTSW-24.OLT – Hepatitis B Virus

VI. References

A. CMV

1. <http://www.fda.gov/medwatch/SAFETY/2003/valcyte.htm> - 2003 Safety Alert: “Valcyte (valgancyclovir HCl tablets)”

B. Alprostadil (PGE₁)

1. Tancharoen S, Jones RM, Angus PW, et al. Transplant Proc 1992; 24:2248-2249
2. Greig PD, Woolf GM, Sinclair SB, et al. Transplantation 1989; 48:447-453
3. Greig PD, Woolf GM, Abecassis M, et al. Transplant Proc 1989; 21:2385-2388
4. Greig PD, Woolf GM, Abecassis M, et al. Transplant Proc 1989; 21:3360-3361
5. Abecassis M, Falk JA, Makowka L, et al. J Clin Invest 1987; 80:881-889
6. Sinclair SB, Greig PD, Blendis LM, et al. J Clin Invest 1989; 84:1063-1069