# β-blocker, Intravenous (Metoprolol, Labetalol, Esmolol) Administration of First Dose in SPH CSICU

## Site Applicability

PHC – SPH CSICU

## Practice Level:

**Specialized:** limited to Registered Nurses in **CSICU** who have completed the certification package.

## Requirements

Providers are responsible for ordering medication type, amount, frequency and maximum dosage.

## Need to Know:

- In the early recovery period after cardiac surgery, IV beta- blockers may be used to manage tachyarrhythmia and hypertension. β-blockers prevent catecholamines from binding to β-adrenergic receptors throughout the body; thereby reducing heart rate and blood pressure.

| Receptor | Location | Normal response to stimulation | Effects of beta-blockers |
|---|---|---|---|
| β – 1 | Heart | • Positive chronotrope<br>• Positive inotrope<br>• Automaticity<br>• Rate of conduction | ↓HR, contractility, MvO2<br>↓BP<br>↓Irritability<br>↓AV conduction |
| β - 2 | Bronchioles<br>Blood vessels<br>GI tract | • Bronchodilation<br>• Vasodilation of muscle vasculature | • Bronchoconstriction<br>• Vasoconstriction of muscle vasculature<br>• Relaxation of GI smooth muscle |
| | Other | • Drives K+ intracellular<br>• Renin release | Serum K+<br>↓Blood pressure |

- β-blockers are a negative inotrope and are not usually administered to patients with cardiac index (CI) 2.2 or less, or to patients who require IV inotropes to keep their Cardiac Index over 2.2.
- Patients with asthma are at higher risk for developing bronchospasm and should be given non-cardioselective β-blockers (i.e. labetalol) with caution.
- Before initiating IV β-blockers, assess for and treat possible contributing factors for tachycardia and/or hypertension:
    - Hypothermia
    - Hypovolemia
    - Pain/anxiety/substance withdrawal
    - Hypoxia/hypercarbia
    - Use of β-1 agonists - (epinephrine, NORepinephrine, DOBUTamine, DOPamine)

**Approved Medications:**

| Medication | Blocks | Indications ( main uses) | Typical Doses |
|---|---|---|---|
| Labetalol | α-1, β-1, β-2 | Hypertension | ***Power plan order***<br>5 to 10 mg IV repeat Q 5 minutes until target HR/BP met<br>***Max 50 mg/24h.**<br>**Hold if HR less than 60** |
| Metoprolol | β-1 selective | Hypertension, SVT, tachycardia, control ventricular response in A fib/flutter | 1 to 2 mg IV may repeat every 2 to 5 mins until target HR/BP met (max 15 mg) |
| Esmolol | β-1 | Short-acting test of Beta-blocker tolerance | 10 to 20 mg IV push Q5MIN up to a total of 1 mg/kg in DIVIDED doses until target HR/BP met |

# Protocol

## Assessment:

1. Initial Assessment:
    - HR, BP, hemodynamic status (including Cardiac output/Cardiac Index, Ejection Fraction, history of COPD/asthma, any signs of ischemia, arrhythmias, increased bleeding.
    - Review patient status with charge nurse.
    - Ensure that there is a spare temporary pulse generator available at bedside. Check battery status.
2. Ongoing Assessment post intervention:
    - Effectiveness of intervention:

| The common targets are: |
|---|
| • HR 60 to 70 bpm or as indicated by MD |
| • SBP: 90 to 120 mmHg or as indicated by MD |
| • Cardiac Index over 2.2 (without inotropic support) or as indicated by MD |

    - Assess HR & BP Q15 minutes x 3 then Q1H
    - Assess hemodynamic status 30 minutes after administration of beta-blocker & PRN.
    - Ensure that there is a spare temporary pulse generator and cables available either at the bedside or in the room. Check battery status.

## Interventions:

1. Ensure there is a Physician order
2. Review patient hemodynamics/History to determine whether IV Beta blocker use is appropriate:
    - HR
    - BP
    - Hemodynamic status; including Cardiac Output /Cardiac Index and preload
    - Ejection Fraction
    - History COPD/asthma
3. Administer medication at appropriate rate.

4. Notify Physician if doses seem ineffective after 2 to 3 doses or if max ordered dose reached
5. If HR less than 60 **after** administration of beta-blocker and patient hemodynamically unstable initiate temporary pacing at the following settings:

| **Epicardial wires** | **Mode/Rate** | **mA** | **Sensitivity** | |
|---|---|---|---|---|
| AV | DDD – 70 bpm | Atrial: 10<br>Vent: 10 | Atrial: 0.5<br>Vent: 2.0 | Atrial tracking: ON<br>***If patient is in AF – turn A tracking OFF*** |
| Ventricular | VVI – 70 bpm | Vent: 10 | Vent: 2.0 | N/A |
| Atrial | AAI – 70 bpm | Atrial: 10 | Atrial: 0.5 | N/A |

6. **If CI falls below 2.2 or systolic BP less than 90 mmHg:**
    - Hold subsequent doses of IV beta- blocker
    - Notify MD and request alternative medication to manage HR or BP
    - Consider initiating positive inotrope to increase CI over 2.2 & systolic BP over 90 mmHg

**Documentation:**

**Cerner:**

1. Document vital signs in Adult Critical care Quick View
2. Document medication in MAR and “add comment “as needed to capture patient assessment

## References:

1. Lexicomp Online Lexi-Drugs Product Monograph: Labetalol, Metoprolol and Esmolol**:** Accessed October, 2023. Wolters Kluwer Health
2. Parenteral Drug Therapy Manual-Providence Health Care. (Oct, 2023) Metoprolol, Labetolol and Esmolol Monograph

**Persons/Groups Consulted:**

Cardiac Surgery SPH

Cardiac Anesthesia SPH

CSICU Pharmacist

CSICU staff

**Author:**

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