| Drug | First concentration | Second concentration | Third conc | Dosing units | Commercially available | Comments |
|---|---|---|---|---|---|---|
| Alteplase | 1 mg/mL | | | mg/hour | Yes, comes in a kit with diluent | This concentration is for treatment doses only and does not apply to interventional radiology needs and/or catheter treatments. Available in drug kits of 50 mg or 100 mg vials with diluent included |
| Amiodarone | 1.5 mg/mL | 3.6 mg/mL | | mg/min | Yes | Two concentrations needed, 1.5 mg/mL for peripheral, 3.6 mg/mL for central. Some institutions were using 1.8 mg/mL but still seeing phlebitis. |
| Argatroban | 1 mg/mL | | | mcg/kg/min | Yes | |
| Bumetanide | 0.25 mg/mL | | | mg/hour | Administer undiluted | |
| Cisatracurium | 2 mg/mL[1, 2] | | | mcg/kg/min | Administer undiluted | The package insert (PI) has infusion information using 0.4 mg/mL |
| Dexmedetomidine | 4 mcg/mL | | | mcg/kg/hour | Yes | Only concentration recommended in package insert also commercially available product |
| Dil**TIAZ**em | 1 mg/mL | | | mg/hour | No | Hospira has advantage 100 mg/100 mL (may be similar products)- using the manufacturer vial of 125mg the admixture would be 125 mg in 125 mL unless not accounting for any overfill of the bag |
| **DOBUT**amine | 4000 mcg/mL | | | mcg/kg/min | Yes | Premix bag -considerations may be needed for areas performing diagnostic tests - in addition to what is needed in home care setting. No evidence to dispute 4000 mcg/mL cannot be given via peripheral route |
| **DOP**amine | 1600 mcg/mL | 3200 mcg/mL | | mcg/kg/min | Yes | Premix bags, consider limiting to one bag size of each (250 vs. 500 mL, could reduce inventory needs and errors) |
| **EPINEPH**rine | 20 mcg/mL | 40 mcg/mL | | mcg/kg/min | No | vial size 1 mg/mL or 30 mg/30 mL. The group intentionally made these concentrations different from those for norepinephrine in order to avoid confusion between the two agents. |
| Esmolol | 10 mg/mL | 20 mg/mL | | mcg/kg/min | Yes | 10 mg/mL for peripheral, 20 mg/mL for central. Most institutions use the 10 mg/mL premix but dosing ranges indicate the 20 mg/mL is more appropriate based upon fluid volumes. |
| Fenta**NYL**[4] | 10 mcg/mL | 50 mcg/mL | | mcg/hour | No | Ease of prep, can make 2500 mcg (50 mL) in 250mL to make 10 mcg/mL (need to remove volume of drug and overfill) or use straight drug of 50 mcg/mL |
| Furosemide | 2 mg/mL | 10 mg/mL | | mg/hour | No, and the 10 mg/mL is administered undiluted | This is highly dependent upon using low dose continuous infusions (doses less than 10 mg/hour) or using high doses (20 mg/hour or more) |

| Drug | First concentration | Second concentration | Third conc | Dosing units | Commercially available | Comments |
|---|---|---|---|---|---|---|
| Heparin | 100 units/mL | | | units/hour or units/kg/hour[3] | Yes | This comes in a commercially available bag, also recommend stocking one bag volume. This concentration is for treatment, systemic anticoagulation and is not for line patency, arterial-lines, etc. Hospitals should try to standardize the dosing units, however we recognize that weight based and flat dose is used in practice given indication. Please just try to be clear for nursing on the eMAR and in the smart pump programming to prevent errors |
| **HYDRO**morphone[4] | 0.2 mg/mL | 1 mg/mL | 5 mg/mL (based upon high dose requirements) | mg/hour | No | This is for hydromorphone infusions NOT via PCA pump infused on other continuous devices. Only consider the 5 mg/mL for patients with high dose needs. PCA concentrations will be in phase III of the project |
| Insulin (regular) | 1 unit /mL | | | units/hour, DKA protocols may require units/kg/hour | No | compounded - 100 units in 100 mL NS or 250 units in 250 mL. We do not endorse using 0.1 units/mL in OB protocols as this is a signficant error potential when pharmacies are compounding and the 1 unit/mL can be easily titrated |
| Isoproterenol | 4 mcg/mL | | | mcg/min or mcg/kg/min[3] | No | We recommend standardizing dosing units but understand current protocols may use flat dosing or weight based dosing units. A second concentration may be needed by heart transplant centers |
| Labetalol | 5 mg/mL | | | mg/min | No | Typically the normal dosing ranges warrant the higher 5 mg/mL concentration |
| Lidocaine | 8 mg/mL | | | mg/min | Yes | Based upon typical doses the 4 mg/mL concentration doesn't seem to be clinically needed. However this could have an operational impact on bags in ACLS crash carts |
| **LOR**azepam | 1 mg/mL | | | mg/hour | No | 100 mg in 100 mL or 50 mg in 50 mL -- very consistent concentration amongst everyone. If institutions use 2 mg/mL (straight drug), this is very viscous |
| Morphine[4] | 1 mg/mL | 5mg/ml based upon high dose requirements | | mg/hour | Yes | The 1 mg/mL is commercially available. These are NOT concentrations for PCA pump and for other continuous infusion pumps used in the ICU |
| Midazolam | 1 mg/mL | | | mg/hour | No | consistent across the board, 10 mL of 5 mg/mL vials so no waste (50 mg in 50 mL or 100 mg in 100 mL) |
| Milrinone | 200 mcg/mL | | | mcg/kg/min | Yes | commercial - most using 200 mcg/mL. Ambulatory heart failure patients -- hospitals may need to add another concentration for outpatient needs |
| Ni**CAR**dipine | 0.1 mg/ml | 0.5 mg/mL | | mg/hour | Yes - 0.1 mg/mL | does come as 0.1 mg/mL commercially available. Chose 2 concentrations the 0.1 mg/mL can be use peripherally, the 0.5 mg/mL only CENTRALLY and fluid restricted patients |

| Drug | First concentration | Second concentration | Third conc | Dosing units | Commercially available | Comments |
|---|---|---|---|---|---|---|
| Nitroglycerin | 200 mcg/mL | | | mcg/min | Yes | the 400 mcg/mL has been on and off the shortage list |
| Nitroprusside | 200 mcg/mL | 500 mcg/mL | | mcg/kg/min | No | Vials are 50 mg, 1 vial 50 mg in 250 mL = 200 mcg/mL, 1 vial 50 mg in 100 mL = 500 mcg/mL |
| Norepinephrine | 16 mcg/mL | 32 mcg/mL | 128 mcg/mL | mcg/kg/min | No | 4 mg in 250 mL = 16 mcg/mL, 8 mg in 250 mL = 32 mcg/mL, 32 mg in 250 mL = 128 mcg/mL. The higher concentration is needed for hospitals with large trauma centers and/or severe fluid restriction in critically ill with high dosing needs |
| Phenylephrine | 80 mcg/mL | 400 mcg/mL | | mcg/kg/min | No | 10 mg, 50 mg, 100 mg vials , 20 mg in 250 mL (80 mcg/mL), 100 mg in 250 mL (400 mcg/mL). The higher concentration is for central line use only and is needed for hospitals with large trauma centers and/or severe fluid restriction in critically ill with high dosing needs |
| Propofol | 10 mg/mL | | | mcg/kg/min | Yes | |
| Rocuronium | 10 mg/mL[1] | | | mcg/kg/min | Administer undiluted | |
| Vasopressin | 0.2 unit/mL | 1 unit/mL | | units/min or units/kg/min[3] | No | Concentration recommended now by manufacturer with new product - these concentrations are for cardiac/vasopressor indications. We recommend standardizing dosing units but understand current protocols may use flat dosing or weight based dosing units. Phase 2 will be Diabetes Insipidus concentrations |
| Vecuronium | 1 mg/mL[1] | | | mcg/kg/min | No | 10 mg vials, typically dilute with NS |

ISMP's List of Error-Prone Abbreviations, Symbols, and Dose Designations
Use mcg for Microgram https://www.ismp.org/tools/errorproneabbreviations.pdf

1. Paralytics are recommended to be administered as straight drug. The reason for this is consistency between the operating room and the intensive care unit. In addition further compounding in the pharmacy is a potential source of additional errors.

2. This is a concentration that differs from the package insert, therefore infusion related calculations will differ from the PI

3. We recommend trying to standardize dosing units but understand some protocols may use "flat" dosing while others may require weight based dosing.

4. These concentrations are for continuous infusions not delivered by a PCA device. PCA concentrations will be determined in stage III of the project