Clinical Pearls for Students

OVERVIEW
Goal - provide you with snippets of clinical advice (we wish we would have known) to help with your transition from the classroom to practice
SESSION STRUCTURE

Five 8 minute “Pearls”

- PEP for Occupational HIV Exposure: What Every Pharmacist Should Know
- Paying Attention to ICU Delirium: Pearls to Maintain Focus
- Antifungal Pharmacokinetics and Pharmacodynamics: What Dose Again?
- Risky Business: Assessing Risk Through Statistics
- Give Your Patients a FAST-HUG

PEP for Occupational HIV Exposure: What Every Pharmacist Should Know

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This is not a PEP talk in the traditional sense...
Objectives

- Understand what PEP regimen is appropriate when a healthcare worker has been exposed to HIV
- Know the most common adverse reactions of PEP therapy
- Identify what follow up steps are necessary in the patient receiving PEP treatment

A True Story

- A 27 yo male dialysis worker gets a needle stick after the needle has been used on an HIV patient...he rushes himself to the local hospital, as he remembers that time is of the essence in getting treatment.
- Chaos ensues. The local hospital does not know what to do, eventually the patient is given one dose of truvada and combivir in the ED and is sent to Walgreens for a prescription for indinavir and combivir.
- More chaos. Walgreens does not stock indinavir and the patient is desperately calling pharmacies trying to find one that can fill his prescription.
- How would you rewrite this man's story?

PEP for HIV: The Basics

- An exposure that might place a healthcare worker at risk for HIV infection is defined as a percutaneous injury (e.g., a needlestick or cut with a sharp object) or contact of mucous membrane or nonintact skin (e.g., exposed skin that is chapped, abraded, or affected with dermatitis) with blood, tissue, or other body fluids that are potentially infectious.
- Body fluids which are considered infectious
  - Blood, visibly bloody body fluids, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, and amniotic fluid, and semen and vaginal secretions
- Body fluids which are NOT considered infectious
  - Feces, nasal secretions, saliva, sputum, sweat, tears, urine, and vomitus (unless visibly bloody)
- Whether or not the person is really exposed or not: washing the affected area is a great first step!
PEP for HIV: The Basics

- HIV PEP should be started immediately (within hours) and be continued for 28 days (4 weeks).
- Pregnancy does not preclude PEP therapy.
- Obtain baseline CBC, SCr, liver enzyme tests (AST, ALT, alk phosphatase, total bilirubin), and HIV antibody testing.
- Follow up with exposed healthcare worker 72 hours post exposure, especially after additional information about the exposure or source person becomes available.

In the Past: PEP for Percutaneous Injuries

- Step 1: Evaluate source
- Step 2: Evaluate exposure
- Step 3: Select treatment

Preferred HIV PEP Regimen

US PUBLIC HEALER SERVICE GUIDELINE

Updated US Public Health Service Guidelines for the Management of Occupational Exposures to Human Immunodeficiency Virus and Recommendations for Postexposure Prophylaxis

PEP is now recommended for ALL occupational exposures to HIV!

Raltegravir (Isentress; RAL) 400 mg PO twice daily
Plus
Truvada, 1 PO daily
[Tenofovir (Viread; TDF) 300 mg + emtricitabine (Emtriva; FTC) 200 mg]

Watch for Stribald (alternative therapy):
Stribild (elvitegravir, cobicistat, tenofovir DF, emtricitabine)
1 pill, once daily dosing

Preferred HIV PEP Regimen

- TRUVADA + Raltegravir (Isentress)
  - Emtricitabine (Emtriva, FTC) + Tenofovir (Viread, TDF); available as TRUVADA
  - emtricitabine 200mg + tenofovir 300mg in one tablet, taken once daily
  - Advantages: well-tolerated, once daily dosing, toxicities rare
  - Disadvantages: side effects (N/V/D, fatigue, rash); careful with tenofovir in patients with renal insufficiency
- Raltegravir (Isentress, RAL)
  - Raltegravir 400 mg tablet, taken twice daily
  - Advantages: well-tolerated, toxicities rare
  - Disadvantages: side effects (N/V, fatigue, insomnia), twice daily dosing

Alternative Regimens

May combine one drug or drug pair from the left column with one pair of nucleoside/nucleotide reverse-transcriptase inhibitors from the right column

- Raltegravir (Isentress; RAL)
- Darunavir (Prezista; DRV) + Ritonavir (Norvir; RTV)
- Etravirine (Intelence; ETR)
- Rilpivirine (Edurant; RPV)
- Atazanavir (Reyataz; ATV) + Ritonavir (Norvir; RTV)
- Lopinavir/Ritonavir (Kaletra; LPV/RTV)
- Tenofovir DF (Viread, TDF) + Emtricitabine (Emtriva; FTC), available as Truvada
- Tenofovir DF (Viread, TDF) + lamivudine (Epivir; 3TC)
- Zidovudine (Retrovir; ZDV, AZT) + lamivudine (Epivir; 3TC), available as Combivir
- Zidovudine (Retrovir; ZDV, AZT) + Emtricitabine (Emtriva; FTC)
Side Effects

- In unpublished data from 1994-2004, the CDC reports the most common side effects reported by healthcare workers on PEP were nausea (26.5%) and fatigue (22.8%).
- The newer therapies are generally better tolerated, which could increase the likelihood that the exposed worker will complete the full 28 days of therapy.
- Side effects of therapy can be managed without changing the PEP regimen by taking the PEP regimen with meals and prescribing antiemetic, antimotility agents, and/or analgesic agents.

Important Follow Up

- Exposed healthcare workers should be advised to use precautions (e.g., avoid blood or tissue donations, breastfeeding, or pregnancy) to prevent secondary transmission, especially during the first 6–12 weeks after exposure.
- For exposures for which PEP is prescribed, patients should be informed regarding
  - possible drug toxicities and the need for monitoring
  - possible drug interactions
  - the need for adherence to PEP regimens

Important Follow Up

- Monitor patient taking PEP for drug toxicity at baseline and in 2 weeks after treatment initiation.
- HIV antibody testing should be performed at baseline, 6 weeks, 3 months, and 6 months. If a fourth generation HIV Ag/Ab combination immunoassay is used, HIV testing can be modified to baseline, 6 weeks, and be concluded at 4 months after exposure.

<table>
<thead>
<tr>
<th>Test</th>
<th>Time Elapsed Since the Exposure Occurred</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV antibody test</td>
<td>Baseline 2 Weeks 6 Weeks 3 Months 6 Months</td>
</tr>
<tr>
<td>CBC with differential</td>
<td>✔ ✔ ✔ ✔ ✔</td>
</tr>
</tbody>
</table>
What Happened To Our Patient?

- After many unsuccessful calls to neighborhood pharmacies and his local hospital, he came to our ER at Legacy Good Samaritan Medical Center in Portland, Oregon.
- His prescription was changed to Truvada and Raltegravir, and he was able to pick up these meds at his local pharmacy without difficulty.

Apply Your Knowledge

- A physician in your ED is examining a patient with advanced AIDS. While the patient is talking to the MD, the doctor feels some spittle from the patient’s mouth land in his right eye. The MD leaves the patient room and freaks out, “I have AIDS in my eye! AIDS in my eye! Agghhhhh! He turns to you, the pharmacy student.
- “What should I do? I have two small kids at home and a wife,” he says with a sob. Thankfully, you have had a PEP talk at Midyear 2013, so you can tell him:

A. “Sorry buddy, you are a goner, there are some things even pharmacists can’t fix.”
B. “Your risk of exposure means you should definitely double up on truvada and combivir. If some is good, more is definitely better!”
C. “Truvada and raltegravir are the preferred regimen for occupational PEP and you should be started on them straightaway.”
D. “Saliva is not considered infectious unless it is visibly bloody. You’d be the first person in the history of the world to contract HIV this way.”
References and Resources

- National Clinicians Post-Exposure Prophylaxis (PEP) Hotline. 1-888-448-4913 (http://www.nccc.ucsf.edu/about_nccc/pepline)
- Centers for Disease Control and Prevention (CDC). 1-800-893-0485.
- National HIV Telephone Consultation Service. 1-800-933-3413
- Mountain Plains Email Clinical Consultation Service for HIV Infection. hivconsultation@UCHSC.edu

PEP for Occupational HIV Exposure: What Every Pharmacist Should Know

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Paying Attention to ICU Delirium:
Pearls to Maintain Focus

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Objectives

- Describe delirium, potential causes, and risk factors
- Discuss various therapeutic options
  - Non-Pharmacological
  - Pharmacological (typical antipsychotics, atypical antipsychotics, dexmedetomidine, etc.)

Delirium

Risk Factors

- There are 4 baseline risk factors that are positively and significantly associated with development of ICU delirium
  - Coma is an independent risk factor
  - Medications
Drugs Contributing to the Delirium Burden

<table>
<thead>
<tr>
<th>Drug Group</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedative Hypnotics</td>
<td>Benzodiazepines (esp. Lorazepam), Propofol</td>
</tr>
<tr>
<td>Analgesics</td>
<td>Opioids, NSAIDs</td>
</tr>
<tr>
<td>Anticholinergics</td>
<td>Atropine, Diphenhydramine, Scopolamine</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>Dexamethasone, Hydrocortisone, Methylprednisolone, Prednisone</td>
</tr>
<tr>
<td>Antiadrenergics</td>
<td>Metaxaepine, Stilbs, TCAs</td>
</tr>
<tr>
<td>Dopamine Agonists</td>
<td>Amantadine, Bromocriptine, Levodopa, Pramipexole, Ropinirole</td>
</tr>
</tbody>
</table>

Red = Most commonly used in ICU setting


Pearl Mnemonics!

IWATCHDEATH
- Infection
- Withdrawal
- Acute metabolic
- Trauma/pain
- CNS pathology
- Hypoxia
- Deficiencies
- Endocrinopathies
- Acute vascular (HTN, shock)
- Toxins/drugs
- Heavy Metals

DELIURIM
- Drugs
- Electrolytes and physiologic abnormalities
- Lack of drugs
- Infection
- Reduced sensory input
- Intracranial problems
- Urinary retention and fecal impaction
- Myocardial issues
- MI, CHF, arrhythmia

Delirium Management

- Prevention & Treatment
  - Underlying etiology
  - Minimize medication-related causes
  - Antipsychotics, α-2 agonists

- Changing views
  - 2002 SCCM Sedation and Analgesia Guidelines vs.
  - 2013 SCCM Pain, Agitation, and Delirium (PAD) Guidelines
Non-Pharmacological Options

- **Early mobilization (+1B)**
  - ABCDE Bundle/Protocols
    - Recommendations not specific to ICU patients (+1C)
    - Sleep protocols
    - Cognitively-stimulating activities
    - Reorientation; repeated input (family, sitter)
    - Range of motion exercises
    - Adequate hydration
    - Minimize noise (ear plugs?)
    - Eye glasses; hearing aids
    - Remove restraints and catheters
    - Scheduled pain protocol

- **Combination with pharmacotherapy (0,C)**
  - No compelling data

When to use Pharmacotherapy?

- No medications with FDA-approved indications
- Unclear benefit from antipsychotics
  - Typical – no evidence for prevention (HOPE-ICU)/treatment
  - Atypical – may shorten duration of delirium and time to extubation
    - This needs more supportive evidence
- Symptoms interfere with patient safety
- Environmental interventions have been exhausted
- Treat underlying etiologies
  - Pain associated with delirium
  - IV opioids for non-neuropathic pain (+1C)
  - Insufficient data on the relationship between propofol and delirium (C)
    - Use over BZDs for continuous sedation in non-delirious patients (+2B)

A Decade Brings New ICU Delirium Pearls ... on the Drugs!

- Antipsychotics should **not** be used to prevent ICU delirium (-2C)
- There is **no** published evidence that haloperidol reduces the duration of delirium in ICU patients (**No evidence**)
- Atypical antipsychotics **may** reduce the duration of delirium (C)
  - Needs to be validated in sufficiently powered studies
- Antipsychotics are **not** recommended in patients at risk for torsades de pointes (-2C)
Haloperidol

- Competitively blocks central dopaminergic receptors
- Long half-life (18-54 hrs)
- Doses > 10-20 mg/24hrs do not enhance antipsychotic effects
  • Only increases side effects
  • Should use in the smallest possible doses
- Adverse Effects
  • Extra-pyramidal symptoms (lower incidence with IV than PO)
  • QT prolongation
  • Neuroleptic malignant syndrome
- Evidence limited to case reports and anecdotes

With New Guidelines Out, Is There Any HOPE for Haldol?

- The first double-blind, RCT powered to detect a difference in delirium duration due to haloperidol
- Haloperidol did not reduce delirium duration
  • Mechanically ventilated ICU patients
  • Median 5 days (IQR 0-10) vs 6 days [0-11] days; \( p = 0.53 \)
- Not powered to detect if haloperidol reduced sedative needs
- Supports NICE guideline
  • Reserve antipsychotics when non-pharmacologic interventions fail
  • The patient presents a danger to themselves or others (acute agitation)
- Haldol should not be used for treatment/prevention of delirium
- Considerable study flaws complicate the validation of the concluding statements

Atypical Advantage?

- Limited dosage forms
- No differences with respect to outcomes
- Less hypotension/fewer orthostatic effects
- Less likely to cause neuroleptic malignant syndrome
- Lower mortality in dementia-related agitation
- Lower incidence of EPS and QT prolongation (except Geodon®)

### Category

<table>
<thead>
<tr>
<th>Drug</th>
<th>Quetiapine</th>
<th>Olanzapine</th>
<th>Ziprasidone</th>
<th>Risperidone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosage Forms</td>
<td>Oral/ODT</td>
<td>Oral/IM/ODT</td>
<td>Oral/ODT</td>
<td>Oral/ODT</td>
</tr>
<tr>
<td>Anticholinergic Mod/High Mod Low Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QTc (msec) 14.5 6.4 20.6 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedation Mod/High Mod Mod/High</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mod = Moderate • IM = Intramuscular injection • EPS = Extra-pyramidal symptoms • QTc = QT interval corrected
Dexmedetomidine
- Alpha 2-agonist with sedative and analgesic properties
- May reduce the prevalence and delirium duration
- May reduce time to extubation
- Suggested use over BZDs for continuous sedation in delirious and non-delirious patients
- Has not been compared to analgesia-first sedation
- Does not provide deep sedation
- Expensive (~ $500-$1,000/day)
  - May reduce overall healthcare costs/lengths of stay
- Efficacy unclear as single prophylactic agent

Maintain Focus
- Acute brain dysfunction and fluctuating mental status
- Largely unrecognized, but highly prevalent in ICUs
  - Should be regularly screened
- Associated with worse outcomes
  - Can persist and lead to long-term cognitive impairment
- Minimize sedatives/analogesics and avoid benzodiazepines
- Non-pharmacologic therapy should be treatment of choice
  - Optimize environment
- Preferred pharmacologic prophylaxis is a research priority
  - Typical antipsychotics, atypical antipsychotics, dexmedetomidine, etc.

References
Objectives

- Understand the basics of PK/PD concepts.
- Know the new dosing guidelines for fluconazole.
- Introduce new PK/PD directions for echinocandins and azoles.
Basic PK and PD

- Only the free drug concentration matters
- Concentration Dependent
  - AUC/MIC
  - Cmax/MIC
- Concentration Independent
  - % Time over MIC

Patient Case

- 70 year old male
- PMH of Stage 4 pancreatic cancer and Peptic Ulcer Disease
- WBC of 17k, Platelets of 96k
- MAP of 63
- Crcl of 39 ml/ minute, 73.5 kg
- Lethargic
- NKDA
- Questionable Sepsis
- Patient placed on Piperacillin/Tazobactam, Vancomycin, and Fluconazole 200 mg IV daily
- Is the fluconazole dose appropriate?

Azoles

- Concentration Dependent
  - AUC/MIC
- Fluconazole AUC/MIC= 25
  - New IDSA Candidemia Guidelines
    - 12 mg/kg loading dose
    - 8 mg/kg daily maintenance dose
  - Lack of Compliance?
New Azoles

- Posaconazole and Voriconazole
- Posaconazole has limited absorption that varies with frequency and the content of the stomach.
- Voriconazole - non linear pharmacokinetics
  - Genetic differences in 2C19
- Place for Therapeutic Drug Monitoring
- Voriconazole
  - Drawn after 2-3 days of therapy
  - Trough Concentrations between 2-6 mg/L
- Posaconazole
  - Critical patients to check absorption

Amphotericin B

- Interesting amphiphilic molecule
- Concentration Dependent
  - Cmax/ MIC of 40

So More drug= More Kill

- Not exactly
- AmBiLoad trial
  - 3 mg/kg vs 10 mg/kg in invasive aspergillosis patients
  - No difference in efficacy outcomes
  - Limit to solubility in plasma
**Echinocandins**

- Concentration Dependent: AUC/MIC and Cmax/MIC
  - AUC/MIC of 250
    - 24 hour AUC in the tissue
  - Cmax/MIC of 10
    - In the plasma
- What to use Empirically?
  - Fluconazole vs an Echinocandin
  - Candida species prevalence
  - *Candida albicans* versus *Candida glabrata* and *Candida krusei*

**Exception to the Rule**

- Paradoxical effect seen at higher doses
  - Possibly due to increase in chitin
  - Only seen in *in vitro* models
  - Questionable if happens in humans
    - High dose Caspofungin vs Standard treatment regimen study
- Some studies some promise for longer frequencies
  - Every 48 hours
  - Weekly?

**What happened to our patient**

- 200 mg IV Fluconazole is only 2.73 mg/kg per day.
  - Below the IDSA candidemia guideline recommended dose
- Called the MD to change the dose
  - Went with a 800 mg loading dose
  - Stayed with the 200 mg maintenance dose
  - Maintenance dose needed to be adjusted down due to renal function.
## References


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## Antifungal Pharmacokinetics and Pharmacodynamics: What Dose Again?

**Bryan White, Pharm.D.**  
Pharmacist  
St. Francis Hospital; Columbus, GA

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## Risky Business  
Assessing Risk Through Statistics

**Cody A. Parsons, Pharm.D.**  
PGY-1 Pharmacy Practice Resident  
MedStar Washington Hospital Center  
Washington, D.C.
Objectives

- Interpret and apply the following measures of association
  - Absolute Risk (AR)
  - Absolute Risk Reduction (ARR)
  - Relative Risk (RR)
  - Relative Risk Reduction (RRR)
  - Odds Ratio (OR)
  - Hazards Ratio (HR)
  - Number Needed to Treat (NNT)
  - Number Needed to Harm (NNH)

Assessing Risk

- Study Example
  - Randomized trial comparing aspirin (ASA) + clopidogrel versus ASA + placebo

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Outcome With Event (Stroke)</th>
<th>Outcome Without Event</th>
<th>Total Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA + clopidogrel</td>
<td>212</td>
<td>2,372</td>
<td>2,584</td>
</tr>
<tr>
<td>(experimental)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASA + placebo</td>
<td>303</td>
<td>2,283</td>
<td>2,586</td>
</tr>
<tr>
<td>(control)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example:

- Control group (n=2586)
  - \( \frac{212}{2586} = 0.0821 = 8.21\% \) = Absolute risk of stroke in control group
- Experimental group (n=2584)
  - \( \frac{303}{2584} = 0.1172 = 11.72\% \) = Absolute risk of stroke in experimental group
Absolute Risk Reduction (ARR)

- Difference in event outcome rates
- Defines % of patients spared event with experimental treatment
- Formula: 
  \[ \text{ARR control} - \text{ARR experimental} = \text{reduction of AE} \]

Example:
\[ _____ - _____ = 3.5\% \]

ASA+clopidogrel reduced stroke by an additional 3.5%

Relative Risk (RR)

- Ratio of the incidence of event
- Proportion of original risk present when patients receive experimental treatment
- Formula:
  \[ \frac{\text{ARR experimental group}}{\text{ARR control group}} \]

Example:
\[ _____ \div _____ = 0.70 \]

The risk of stroke with ASA+clopidogrel was about 70% that of ASA+placebo.

Relative Risk Reduction (RRR)

- Difference between the likelihood of event in the two groups
- Formula:
  \[ 1.0 - \text{Relative Risk} \]

Example:
\[ 1.0 - _____ = 0.30 \]

ASA+clopidogrel reduces the relative risk of stroke by 30% compared with ASA+placebo.

Let’s say the baseline risk of TIA and minor stroke is 10.8%, then it is reduced to 7.56% with ASA+clopidogrel.
Odds Ratio (OR)

- Odds is the proportion of patients with event ÷ proportion without it
- Compares two odds
- Formula:
  \[
  \text{Odds of event with experimental group} = \frac{\# \text{ with event}}{\# \text{ without}}
  \]
  \[
  \text{Odds of event with control group} = \frac{\# \text{ with event}}{\# \text{ without}}
  \]
- Example:
  \[
  \left(\frac{\# \text{ with event}}{\# \text{ without}}\right) \times \left(\frac{\# \text{ with event}}{\# \text{ without}}\right) = 0.133
  \]

The odds of stroke with ASA+clopidogrel is 0.133 times lower than the odds of stroke with ASA+placebo.

The odds of stroke are 13.3% lower with ASA+clopidogrel.

Hazards Ratio (HR)

- Chance of event occurring in the experimental arm as a ratio to that of the control arm
- Represents increased risk to experience event
- Example HR = 0.68

- Interpretation
  - HR of 2 = twice as many treated patients are having an event compared to the control group
  - HR of 0.5 = treated patients are likely to experience event at half the rate of the control group

ASA+clopidogrel treated patients are likely to have a stroke at 68% the rate of ASA+placebo treated patients

Number Needed to Treat (NNT) / Number Needed to Harm (NNH)

- NNT
  - # of patients that must be treated to prevent 1 adverse event or produce 1 positive outcome
- NNH
  - # of patients who need to be treated to cause 1 additional adverse event
- Formula
  \[
  \text{NNT/NNH} = \frac{1}{\text{ARR}}
  \]
- Example:
  \[
  1 + \frac{1}{\text{ARR}} = 28.4
  \]

For every 28.4 people treated with ASA+clopidogrel, 1 stroke event will be prevented.
Which to Present?

Absolute Risk Reduction (ARR)
&
Number Needed to Treat/Harm (NNT/NNH)

References & Resources

References


Helpful Drug Information Resources


Risky Business
Assessing Risk Through Statistics

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PGY-1 Pharmacy Practice Resident
MedStar Washington Hospital Center
Washington, D.C.
Give Your Patients a FAST-HUG

Charles Darling, PharmD, BCPS
Emergency Medicine Pharmacist
Greenville Memorial Hospital, Greenville, SC

Objectives
- List the seven components of FAST-HUG
- Select the best therapy based on patient specific parameters

Not that type of hug!
FAST-HUG

- Mnemonic device highlighting general considerations in all ICU patients
- Feeding
- Analgesia
- Sedation
- Thromboembolic prophylaxis
- Head-of-bed elevation
- Stress Ulcer Prophylaxis
- Glucose control

Feeding

- Should be initiated within first 24-48 hours of admission
  - Parenteral should not be started until day 7 of no nutrition
- Oral > enteral > parenteral
  - If the gut works, use it!
- Typically require 25-35 mg/kg day
  - Critically ill patients may require more calories
- Monitoring
  - Pre-albumin
    - Not accurate in critically ill patients
  - BUN
    - Marker of possible over-feeding

Analgesia

- Pain assessment in ICU can be difficult
  - Mechanical ventilation/ sedation
- Alternative ways to assess for pain
  - Grimacing
  - Tachycardia
  - Elevated blood pressure
- Medications for pain
  - NSAIDs
  - Acetaminophen
  - Opioids
Analgesia

- Many ICU patients require IV pain control
  - Opioids are most effective
- May be given by continuous infusion and bolus
  - Patient controlled analgesia (PCA)/Epidural (common in rib fractures)
- Beware side effects
  - Respiratory depression
  - Constipation
  - Tolerance does NOT develop
  - Hypotension
  - Rash
  - Morphine

Sedation

- Mechanical ventilation (MV) often requires sedation
  - MV is uncomfortable
- Propofol most common agent used
  - Propofol Infusion Syndrome (PRIS)
    - Cardiac failure, renal failure, rhabdomyolysis
    - Hypertriglyceridemia
    - Hypotension
- Avoid benzodiazepine infusions if possible
- Beware over sedation
  - Don’t sedate just to quiet a patient!
  - Daily sedation holiday
  - May shorten ICU length of stay (LOS)

Thromboembolic Prophylaxis

- Thrombosis can occur between 13-31% of patients not receiving prophylaxis
  - May be higher in trauma patients
- Heparins are most often used
  - Unfractionated heparin 5000 units Q8-12 hours
  - Enoxaparin 30mg Q12 hrs or 40mg Q24 hrs (may be preferred in trauma)
    - Remember to assess renal function!
  - Dalteparin 5000 units Q24 hrs
- Heparin induced thrombocytopenia (HIT)
  - Platelets drop ≥50% or below absolute count <100,000
  - Occurs 5-7 days after initiation
Head-of-bed Elevation

- Bed inclined >45 degrees
- Many benefits
  - Gastroesophageal reflux
  - Lower rates of nosocomial pneumonia (HCAP/VAP)
  - Less aspiration

Stress Ulcer Prophylaxis

- Goal: Prevent stress related gastrointestinal hemorrhage
- Most ICU patients will require prophylaxis
  - Mechanical ventilation
  - Coagulation abnormalities
- Other indications
  - History of gastric ulcers
  - Multiple trauma
  - Glasgow Coma Score <10
  - Spinal cord injury

Stress Ulcer Prophylaxis

- Therapy options (new guidelines due out in early 2014)
  - H2RAs: adjust for CrCl <50 mL/min
    - Ranitidine 150 mg BID
    - Famotidine 20 mg BID
    - Avoid Cimetidine if possible (CYP)
  - PPIs (pantoprazole, lansoprazole)
    - Pantoprazole 40 mg Qday
    - Lansoprazole 30 mg Qday
    - Only use if patient has and indication for PPI use (PUD, Hx of GI bleed)
- Adverse reactions
  - CNS disturbances (H2RAs)
    - Anxiety, confusion, agitation
  - C. difficile infections (PPIs)
Glucose Control

- Many patients in ICU will have hyperglycemia
  - Mostly stress induced due to acute illness
  - Corticosteroids
  - Diuretics

- Hyperglycemia associated with adverse outcomes in ICU
  - Increased hospital and ICU lengths of stay
  - Increased risk for infections

- OLD practice
  - The tighter the better (80-110 mg/dL)

Glucose Control

- NICE trial
  - Compared ranges of glucose control
    - 81-108 mg/dL vs. <180 mg/dL
  - Mortality
    - 27.5% in intensive control group
    - 24.9% in conventional control group
    - P=0.02
  - No difference
    - ICU or hospital LOS
    - Mechanical ventilation days
    - Renal replacement therapy

Glucose Control

- NEW practice
  - Achieve glucose levels <180 mg/dL

- Insulin
  - Most effective way to control glucose in ICU setting
  - Sliding scale
    - Effective, but more resource intensive
  - Basal insulin (glargine, detemir)
    - Use if hyperglycemia is expected to occur for many days
    - Calculate by the amount of SSI patient has been getting in 24 hrs
  - Transitioning off continuous infusion (if stable)
    - Calculate rate from past 6-8 hours x3 (24 hrs)
    - Administer long acting insulin 2 hours before infusion is stopped
References


Give Your Patients a FAST-HUG

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Questions