

#### Improving Life on Nutrition Support



#### Venous Access and Complications in Home Parenteral Nutrition



## Objectives

- Name/describe the types of IV access used in PN therapy.
- Describe the etiology of line infections and the most common pathogens associated with them
- List other major complications associated with central lines
- List the preventative measures that can be taken to avoid line infections/complications.
- Name/describe the types of IV caps that are used on IV lines



## Long Term: PICC Lines

- Long (14-20") line placed above antecubital fossa, extending into central circulation
- For mid range therapy (6-12 weeks)
- X Ray confirmation necessary: preferred position in distal SVC or SVC/RA junction
- Inserted at bedside with/without US guidance or via IR
- Easy to remove: at bedside or in home setting
- Higher risk occlusion, dislodgement, malposition than Tunneled CVCs









## Long Term: Tunneled Catheters

- Long line surgically tunneled under skin, extends into central circulation
- For long term therapy
- X Ray confirmation necessary
- Catheter tubing extends out from the skin level (approximately 1 foot extension)
- Brand names: Groshong, Hickman (adult), Broviac (pediatric)
- Requires experienced MD to insert
- Can be used for PN



#### **Tunneled Catheter**





## Tunneled

- Hickman<sup>™</sup>
   (BARD)
- Broviac<sup>TM</sup>
   (BARD)
- Groshong<sup>™</sup> (BARD)



#### Hickman® Cuffs

#### VitaCuff Antimicrobial Cuff





## Device Tips



#### Hickman



Groshong



#### Groshong® Valve

#### BARD® Groshong®



Negative pressure opens valve inward, permitting blood aspiration.

Positive pressure opens valve outward, allowing infusion.

At neutral pressure, valve remains closed, reducing risk of air embolism, blood reflux and clotting.

Three-way valve reduces risk of air embolism, blood reflux and clotting

Tip-first placement allows measuremnt of catheter to size during implantation for more accurate tip placement

Unique design virtually eliminates use of heparin, minimizes nursing time required for maintenance and improves costeffectiveness of therapy

> Silicone material offers superior biocompatability to improve indwelling and catheter time



## Long Term: Implanted Ports

- Short catheter (6") surgically placed under the skin of the chest or abdomen extending into central circulation
- Indicated for long term, intermittent therapy
- Port access using a non coring needle: Huber
- Weekly Huber needle change required
- Best used for intermittent therapies (chemotherapy, antibiotics)
- Seldom inserted for PN alone



#### Ports

 M.R.I.<sup>™</sup> Low-Profile Implanted Port
 (BARD Access Systems)





## Port a Cath Accessing



## Catheter Complications

- CRBSI's
- Occlusions
- Thrombosis



#### Catheter Related Blood Stream Infections

#### Setting

#### Infections/1000 catheter days

- Pediatric ICU  $\rightarrow$  7.9
- Medical ICU  $\rightarrow$  6.1
- Surgical ICU  $\rightarrow$  5.6
- Coronary ICU  $\rightarrow$  4.8
- Home Infusion  $\rightarrow$  1.0



#### Cost of CRBSI's

- 80,000 CRBSIs in ICU's.
- Based on average of 5.3 per 1,000 catheter days..... ...*Estimated* 250,000 CRBSI's annually in US hospitals
- Attributable mortality is 12-25%
- Estimated cost: \$34,508-\$56,000 per line infection
   \$296 mill-2.3 billion per year in US!!!

CDC, Morbidity and Mortality Weekly Report (MMWR) Aug 9, 2002



## Etiology of a Line Infection.....

#### Medscape® www.medscape.com





#### Biofilm: What is it ???

• BIOFILM!





#### **CRBSI** Pathogens

#### **Common Pathogens Associated with CRBSI's....**

➤ Staph Epidermis....

Low Mortality

Lines saved in 90% cases

Treated with Vanco systemically and possibly antibiotic lock

Staph Aureus

Higher Mortality

Often treated with Penicillins or derivatives

If MRSA, much less likely to save line



## CRBSI Pathogens (cont)

Gram Neg Bacillus GI Source/water ( i.e. E.Coli)

Resp Source: Klebsiella (treated with Cephalosporins) and Pseudomonas (variety of antibiotics can be used depending on Sensitivity) Attempts to treat usually made before line removal

- ➤ Candida
  - Higher Mortality
  - Catheter almost always removed
  - Treated with Ampho, Ambisome, Fluconazole



Dr Barry Farr University of Virginia Health Systems OLEY Conference 2003

#### Diagnosis of a CRBSI

Pull the line and culture the tip of the Catheter! But what if we really need to save the line? 2.Blood Culture peripherally and from CVL Indicative of CRBSI if..... a) Cx from CVL has 5-10x more colonization than peripheral or b) Cx from CVL grows positive 2 or more hours before peripheral \*Up and coming... Intraluminal swab and Cx.



#### Prevention of CRBSI's

#### • Prophylactic Antibiotic Locks

- \* Vanco, Amikacin, Ceftaz, Cefazolin in Heparin or NS
- \* dosed at 100-5,000x MIC (Minimum Inhibitory Concentration)
- \* allowed to dwell 12-24 hrs
- \* Stability of 72 + hrs at 37° C

\*\*CDC does not recommend because of risk of resistant organisms

#### • Ethanol Locks:

\* 25-98 % solution of Ethanol instilled into

catheter and withdrawn after 1-2 hours.

\* Has shown great promise in preventing infection,

but is only being used in patients with a history of multiple line infections



#### On the Horizon.....

Showing promise in the future:

- Tetrasodium EDTA
- Sodium Citrate
- Ethanol/Trisodium Citrate
- \*\*Mostly studied in dialysis catheters because of both antimicrobial and antithrombolic properties
- Taurolidine (Europe)





#### Innovations in Line Care

#### • BioPatch®

## •Tegaderm<sup>™</sup> CHG (3M)







#### Swab Cap<sup>™</sup> and Curos Port Protectors <sup>™</sup>

For use on a swab-able tuer access valve as a disinfecting cleaner prior to line access and to act as a physical barrier to contamination between line accesses. Source and the accesses Use exerptically. For single use only Peeel-

Remove protective cover by pulling tab. Do not remove Swab Cap from white plastic holder.

LUER ACCESS VALVE DEIMPECTION CAP Contains 70% IPA SINGLE USE ONLY Laterx Free DEHP Free

Hold luer access valve in one hand while pushing and twisting the *Swab* Cap in a clockwise direction onto the luer access valve.

Protect.

Twist

**To Remove** 

for acces

to valve

After SwabCap has been twisted into place, gently pull white plastic holder off luer access valve.

Two-handed removal must be used to make sure luer access valve is not removed unintentionally. Grasp luer access valve and twist *SwabCepr* 

counter clockwise away from valve. Remove and discard. Inspect luer access valve to verify that it's connected accurally to the catheter. Valve is ready for access.

No further swabbing is necessary efter removal.

EXCELSION MEDICAL

integraterianis Tell Free 000-057-0220 Real Companyaliani Misin Prone 752-770-7020 Nas, Naplana, NJ 07752 Fax 732-779-7000 www.excelsionnedicsi.com E-mait info@excelsionnedicsi.com Port Protector

Hospital acquired bloodstream infections challenge our U.S. healthcare system with extended lengths of stay, increased cost of care, rising patient mortality and basic concerns for patient safety.

At a time when our healthcare system is facing the reduction of reimbursement for the treatment of these infections, the new and innovative **Curos<sup>•</sup>** Port Protector provides healthcare providers and patients with a new confidence in patient I.V. care.

The Curos™ Port Protector. Simply Changing Infection Control Practice.

Luer-activated, needleless I.V. injection ports are always exposed to potential contamination. They are unprotected prior to and following each port access procedure.

The Curos<sup>w</sup> Port Protector, a simple disposable medical device, guards against infection by providing healthcare providers the ability to keep luer-activated injection ports always "protected and clean."

Curosis dramatically more effective than a standard alcohol swab in reducing bacterial counts\* and it potentially reduces patients' exposure to the risk of hospital acquired I.V. bloodstream infections. Curos also works to help maintain hospital infection control protocols.



\*Tests conducted at an independent laboratory confirmed Curos achieved -5 log reduction in bacterial counts compared to -3 log reduction with a standard alcohol swat A summary of these studies is available on request.



#### Catheter Occlusion

- 90% of CVL occlusions are thrombolytic in nature
- \* Unique to TPN patients: Lipid or mineral occlusions.



#### **Catheter Stabilization**

#### Important for Keeping Catheter from Moving!!









#### Grip Lock®

#### Stat Lock ®

Cath Secure®

Hub guard®



#### **Treatment for Occlusions**

For Thrombolytic Occlusions: CathFlo Activase® (Alteplase) For ≥ 30 kg : 2mg in 2ml (sterile H20)

For < 30 kg : 110% internal volume of catheter ( not to exceed 2mg in 2ml)



## Treatment for Occlusions , cont

# For Lipid Occlusions: 3.0 ml of 70% Ethanol or NaOH

## • For Mineral Occlusions: 3.0 ml of 0.1N HCL



## Other CVL Complications:

- Venous Thrombosis Causes:
  - a) Stasis
  - b) Injury to vessel wall by trauma,
  - infection or irritation by chemo or TPN
  - c) hypercoagulability
- Sx: Pain, edema, erythema
- \*May lead to pulmonary embolism, cerebral anoxia,
  - **Diagnosis/Treatment:** 
    - a) Venography
    - b) Anticoagulants, ? Clot lysis



### Other CVL Complications, cont.

• SVC Syndrome (rare):

**Causes:** 

a) clot/fibrin

b) tumor pressing against SVC

**Diagnosis/Treatment** 

- a) Radiographic confirmation
- **b**) anticoagulation
- c) seek alternative access
- d) supportive treatment of symptoms



#### IV Line Caps...

- What is a Split Septum???
- What is a MV???
- What is a PPMV???
- What is a Neutral Valve???





#### Split Septum Caps

• Interlink (Baxter)



• Q Syte (BD)





## MV and PPMV Caps

#### **Mechanical Valve**

- CLAVE (ICU Medical)
- Clearlink (Baxter)
- SmartSite (Alaris)
- Safesite (B Braun)

#### **Positive Pressure Valve**

- MaxPlus (Medegen)
- CLC2000 (ICU Medical)
- Posi-Flow (BD)
- UltraSite (B Braun)



- SmartSite Plus (Alaris)
- Flolink( Baxter)















#### **Neutral Valve**

• InVision Plus (Rymed)



• MicroClave(ICU Medical)





#### More Innovations.....

#### • Baxter V-Link



•"The first **antimicrobial** IV connector with a unique coating designed to help prevent microbial contamination and growth of pathogens in the device."\*



#### **Preventing Catheter Related Complications**

## • EDUCATION IS THE KEY!





#### **Preventing Catheter Related**

- Know the type of catheter the patient has.
  Is it a midline or a PICC? Where is the tip?
  Is it a Hickman or a Groshong?
- Follow manufacturer's recommendations for catheter flushing and maintenance
- Chlorhexidine to cleanse insertion sites
- Transparent semi permeable membrane dressing changes *at least once per week*



#### **Preventing Catheter Related Complications**

- Know what kind of cap is on the end of the catheter and follow manufacturer recs.
- Is it a split septum, mechanical valve or PP mechanical valve cap??
- *Scrub* caps with an alcohol wipe for 15 seconds before each connection. Friction!!
- Know the signs and symptoms of potential complications.



## SAVE THAT LINE!!!!!!

- Scrupulous hand hygiene before and after contact with all vascular access devices and prior to insertion.
- Aspetic technique during catheter insertion and care
- Vigorous friction to hubs. Vigorous friction with alcohol wherever you make or break a connection to give medications, flush, change tubing or access injection port or add on device.
- Ensure Patency- flush all lumens with adequate amount of saline or heparinized saline to maintain patency per institution policy.

AVA (Association for Vascular Access)



#### Conclusion



## Thank you for you attention





