

# *Acquired Infections in the ICUs Including Neonatal ICU(NICU)Hospital*

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## *ICUs Are Dangerous Places!!!*

- The sickest patients pts. are placed in proximity
- AB are given empirically in large doses
- Devices are everywhere (often pts. have 3, 4 or more)



## The ICU

- Busiest unit in the hospital
- Uses the most sophisticated equipment
- Higher infection rates:

### Severity of illness

- Frequent use of invasive devices
- Staff busy caring for very ill pts.
- Staff move from one pt.. to other without washing hands
- Longer ICU stay prolonging the risk of exposure
- Space limitations, ↑risk of contaminating equipment



## *Sources of Cross Infections in ICUs*

- Hands of staff and attendants
- Assisted ventilation equipment
- Suction and drainage bottles
- IV lines (central and peripheral)
- Urinary catheters
- Wounds and wound dressings
- Disinfectant containers
- Dressing trolleys
- Hand rails
- Phones and computers keyboards



## *Healthcare-Associated Infections in ICU*

- UTI (catheter associated)
- Pneumonias including VAP
- Catheter-related bloodstream infections
- Surgical sites infections
- Clostridium difficile colitis

## *in Resistant Pathogens in ICU*

Bacteria	% Increase (2000 vs. 95-99)
VRE	21
MRSA	29
ESBL K. pneumoniae	0
ESBL E. coli	10
P. aeruginosa R to imipenem	22
P. aeruginosa R to quinolones	53

↑ *in Resistant Pathogens in ICU*

- ICUs have the highest rates of antimicrobial resistance
- ICUs have the highest rates of antibiotic prescription



## *Surveillance of HAI in ICUs*

- Important to maintain a safe environment through QA
- Can lead to the identification of any trends or clusters and the impact of any interventions and allow comparison with benchmarks
- Efforts should concentrate on those infections that have higher morbidity or those that are more common within the unit
- Surveillance to be done in real time so that the information obtained can have an impact in a timely manner
- Routine surveillance cultures are generally not recommended
- Surveillance cx may be valuable when trying to identify a point source during an outbreak

Gaynes RP, Pediatrics 1996;98:357-61

Evans ME, JAMA 1998; 259:248-5

Fulginiti VA, Am J Dis Child 1988;142:19-20 Lau YL,

Pediatr Infect Dis J 1991;10:290-4.



## *Hospital Acquired Infections*

## *Importance of Prevention*

## IC Program

- Decrease morbidity and mortality
- Control cost
- Control transmission of infection to:
  - Other patients
  - Health care workers
  - Visitors



## *Strategies to Reduce Infection Risk*

Assessment of pts. upon admission to ICU for infectious risk:

- Diarrhea
- Rashes or skin lesions
- Recognized communicable diseases
- Known carrier of an epidemic strain of bacterium
- Isolation



## *Hand Hygiene*

Hands are the most common vehicle of transmission of organisms



## *Hand Hygiene*

All visitors and staff should wash their hands:

- Before entering the ICU
- Before and after any pt.. contact
- Before performing any invasive procedures
- Before the use of multi dose vials
- Before administration of IV fluids or medications
- After touching the environmental surfaces
- Whenever soiled

## *Hand Hygiene*

**“HAND HYGIENE” has been recognized as  
the single most important way to prevent the transmission of infectious  
agents**

**Hands could not be made completely free of bacteria**

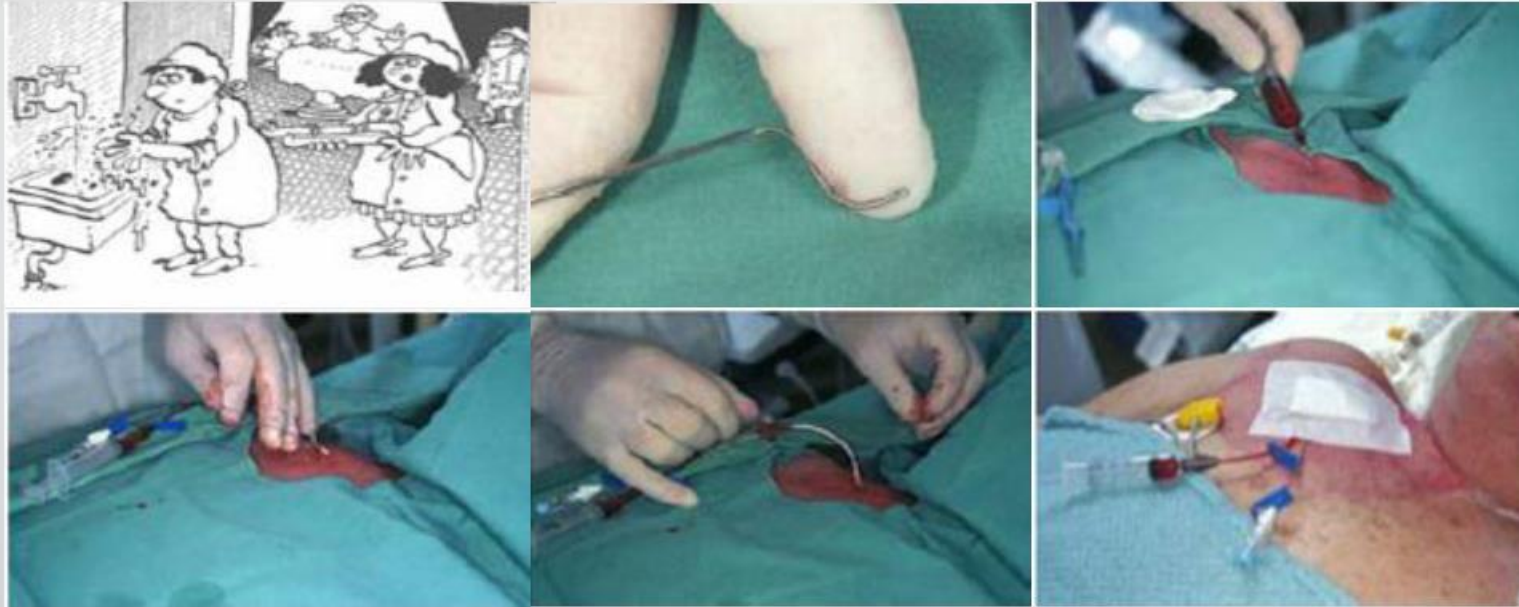


**The idea of rubber gloves was introduced**

**Gloves for very low birth wt.**

**No artificial nails**

## *Proper IV Care Practices*



Use aseptic techniques (cap, mask, sterile gown, sterile gloves, large sterile sheet) for CVC or guide wire exchange

## *Respiratory Care to Prevent VAP*

- Elevate head of beds (30-45)
- Periodically drain condensate collecting in tubing of MV
- Decontaminate hands after handling fluid
- Change tubing, nasal prongs and masks between pts.
- Disinfect, rinse with sterile water and air-dry nebulizers
- Use sterile fluid for nebulization and dispense fluid aseptically
- Handle multi dose medication vials according to manufacturer instructions



## *Personal Protective Equipment PPT*

- Gloves according to need: sterile vs. non sterile
- Gloves for handling respiratory secretions or objects contaminated with respiratory secretions
- Change gloves and decontaminate hands
- Wear a gown when contact with respiratory secretions anticipated
- Change gowns before moving to next pt.
- Disposable masks



## *Protection of ICU Personnel*

- All staff should be offered hepatitis B vaccine upon employment
- Orientation should include:
  - Basic infection control concepts
  - Hand hygiene
  - Management of sharp objects
  - Associated risk of disease transmission
  - Training including formal and informal IC lectures

## *Standard Precautions*

- Wash hands before and after patient contact
- Wear gloves when touching contaminated surfaces or items
- Wear a mask and goggles for spills
- Carefully handle used patient care equipment
- Use care when handling sharps
  - *Applied for "ALL" patients*

## *Environmental Factors and Design Issues*

### *Space*

- Beds: at least 2.5-3 m in ICUs apart to allow movement of staff and equipment and to reduce risk of cross contamination
- Sharp containers within easy access
- Privacy partitions made of material easily cleaned weekly and any time it becomes soiled
- If used, curtains should be changed weekly and in between pts.

## *Infection Control Measures in the NICU*

- Proper nursery design with optimal space 150 sq. m
- Incubators or heating beds spacing of 6 feet
- One sink for every 2 pts.
- Positive pressure ventilation from ceiling to floor with 6 to 15 air exchanges per h is optimal
- Filters should be at least 90% efficient
- Access to isolation rooms
- Special protection during constructions

## *Environmental Factors and Design Issues In ICUs*

- Windows should remain closed to control airborne risks
- Plants and flowers should not be allowed in ICU
- Sinks (elbow or foot operated) should be placed near the ICU entrance and at key points within the unit
- Sinks assigned for hand washing should not be used to wash instruments
- Waterless hand rub dispensers at entrance and each bedside
- Visitors should be assessed for
- communicable diseases



## *For Non-ICU Staff*

- Street coats and white coats must be removed
- Hands should be washed upon entering ICU
- Proper procedures followed when attending the pt.
- Hands should be washed before leaving the unit

## *Employees in the ICU*

- Represent a possible vehicle for transmission of infectious agents
- Should be immune to rubella, measles, polio, Hep B, and influenza
- Employees who have herpetic whitlow, varicella, measles, and rubella should be excluded from work
- RSV, adenovirus, para influenza, and influenza cause significant illness in the vulnerable NICU pts. & cause outbreaks
- Avoid admissions of pts. with contagious dis or place in isolation room

Pelke S, Arch Pediatr Adolesc Med 1994;148:1016-20

Agbayani M, Am J Dis Child 1981;135:650-2

Webster J. Cochranne library, 2006

## *Employees in the ICU*

- Wear proper attire
- Routine use of gown for staff and visitors has not been shown to decrease HAI
- Gowns should be used for isolation and when soiling is possible
- Wearing of employee scrubs is of no IC benefit

Pelke S, Arch Pediatr Adolesc Med 1994;148:1016-20

Agbayani M, Am J Dis Child 1981;135:650-2

Webster J. Cochranne library, 2006

## *Visitations in the ICU*

- Policies should be flexible and liberal but safe
- Parents and immediate family mb should always be encouraged to visit
- ICU should have policies that will identify visitors with contagious Dis
- A trained HCW should interview parents at a site outside of the nursery to assess the health of visitors
- No persons with symptoms consistent with an acute contagious illness should be allowed to visit

## *Visitors to the ICUs*

- Should perform appropriate hand hygiene
- Not contact with pts. other than the one they are visiting
- Should not handle pt. care equipment
- Visitor restrictions may be necessary during community outbreaks, particularly RTI such as influenza or RSV

## *Environmental Cleaning*

- Cleaning with the hospital approved cleaning agent
- All surfaces must be wiped with a damp cloth to remove dust and dirt
- Cleaner/disinfectant should be identified by the IC team
- In the nursery iodophors chlorine and quaternary ammonium
- Phenolics should be used with extreme caution because absorption through the skin can cause  $\uparrow$  bil
- Appropriate high-level disinfection or sterilization of equipment

## *Environmental Cleaning*

### **Terminal**

- When pts. are discharged a thorough cleaning of the bed and bedside equipment must be completed

### **Scheduled**

- Total cleaning of all areas, including store clean and soiled storage areas, should be done at least every 1-2 wks.
- Separate mops and cleaning utensils used for ICU
- Cleaning equipment should be wiped and properly stored when not in use

## *We can only prevent what we can understand!!!*

The following should be available in all ICUs:

- Histograms about frequency of common pathogens
- Time-trended surveillance data on BSI, VAP and catheter-associated UTIs
- Data on ICU-specific antimicrobial susceptibility patterns

Education about risks of NI should continue even for the most experienced staff members (physicians and nurses)



## *Basic Components of a Good IC Program*

- Maintain surveillance and control of problem pathogens (MRSA, VRE, ESBL)
- Oversee surveillance and control of device-related infections
- Monitor compliance and adequacy of isolation practices
- Supervise and promote employee health
- Monitor needle stick injuries (Hep B, C, D; HIV)
- Prevent TB transmission
- Detect and control outbreaks
- Provide meaningful “feedback” to clinicians



## *HAI in the ICU: Conclusion*

- Advances in medical Rx of the critically ill have resulted in significant improvements in survival and quality of life
- Some of the same technologic advances can also place the pt. at significant risk for HAI
- understanding the risks and utilizing these technologies in the most judicious manner can provide the safest environment for pts.

## *Efforts to Protect the Vulnerable ICU Pts*

- Optimal infection control practices
- Good hand hygiene and good nursery design
- Prudent use of invasive interventions with particular attention to early removal of invasive devices after they are no longer essential
- Judicious use of antimicrobial agents, with an emphasis on targeted rather than broad-spectrum antibiotics and appropriate indications

Brady M, AJIC 2005;33:268