INFECTION PREVENTION& TRANSPORTATION IN NEONATOLOGY

INFECTION CONTROL IN NICU-LEARNING OBJECTIVES

- Improved hand hygiene compliance
- Barrier precautions/ Barrier nursing
- Reduction of environmental contamination
- Antibiotic restriction policies

Hand Hygiene in Healthcare Settings: An Overview

- Background
- Definitions
- Indications
- Selection of Agents
- Techniques

Guideline for Hand Hygiene in Health-care Settings. *MMWR 2002*; vol. 51, no. RR-16.

So Why All the Fuss About Hand Hygiene?

Most common mode of transmission of pathogens is via hands!

……and the reason for

- Infections acquired in healthcare
- Spread of antimicrobial resistance

Evidence of Relationship Between Hand Hygiene & Healthcare-Associated Infections

- Substantial evidence:
  hand hygiene reduces the incidence of infections

- More recent studies: **rates lower** when antiseptic handwashing was performed

Guideline for Hand Hygiene in Health-care Settings. *MMWR 2002*; vol. 51, no. RR-16.

Definitions

- Hand hygiene
  - Performing handwashing, antiseptic handwash, alcohol-based handrub, surgical hand hygiene/antisepsis
- Handwashing
  - Washing hands with plain soap and water
- Antiseptic handwash
  - Washing hands with water and soap or other detergents containing an antiseptic agent

Guideline for Hand Hygiene in Health-care Settings. *MMWR 2002*; vol. 51, no. RR-16.

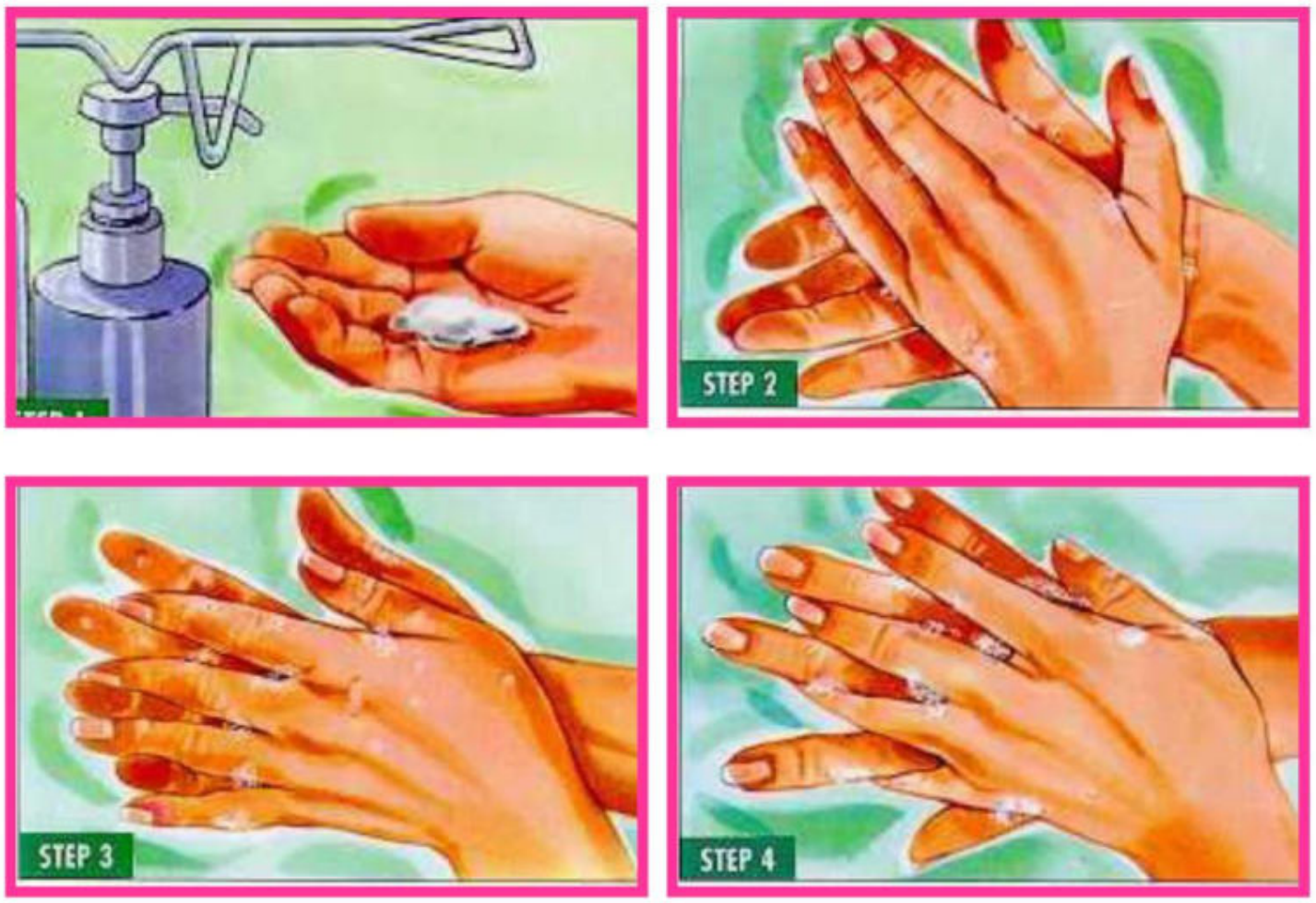
DEFINITIONS

- Alcohol-based handrub
  - Rubbing hands with an alcohol-containing preparation

- Surgical hand hygiene/antisepsis
  - Handwashing or using an alcohol-based handrub before operations by surgical personnel

Guideline for Hand Hygiene in Health-care Settings. *MMWR 2002*; vol. 51, no. RR-16.

Procedural Handwashing



Procedural Handwashing

Why hand washing?

Simply put…hand hygiene saves lives!

Hand washing is one of the "most important means of preventing the spread of infection

CDC Guidelines

FLORA ON HANDS

- Coagulase-negative staphylococci
- Staph aureus
- Pseudomonas aeruginosa
- Entercococci
- Candida spp

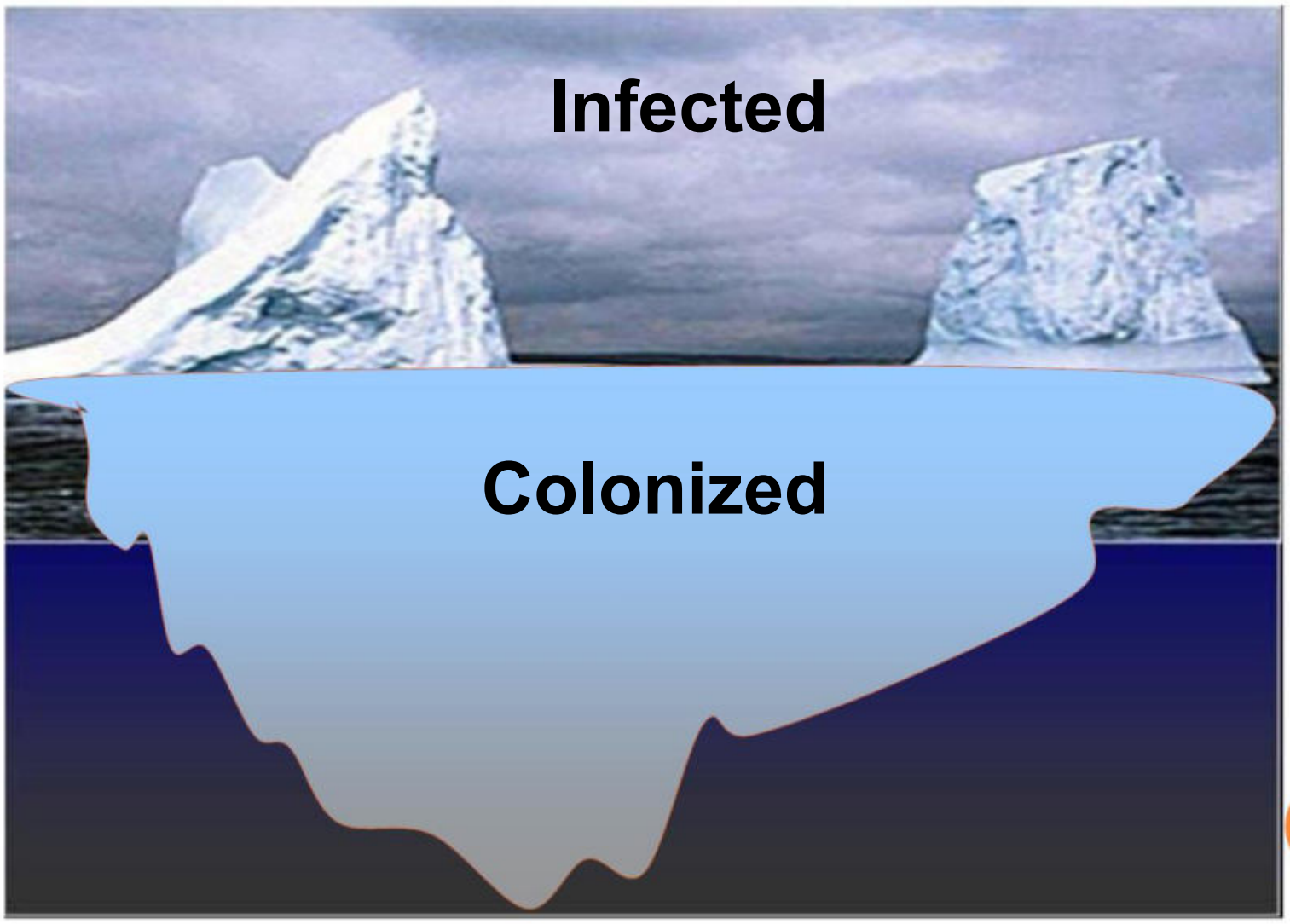
Can be easily removed by handwashing

COLONIZED OR INFECTED: WHAT IS THE DIFFERENCE?

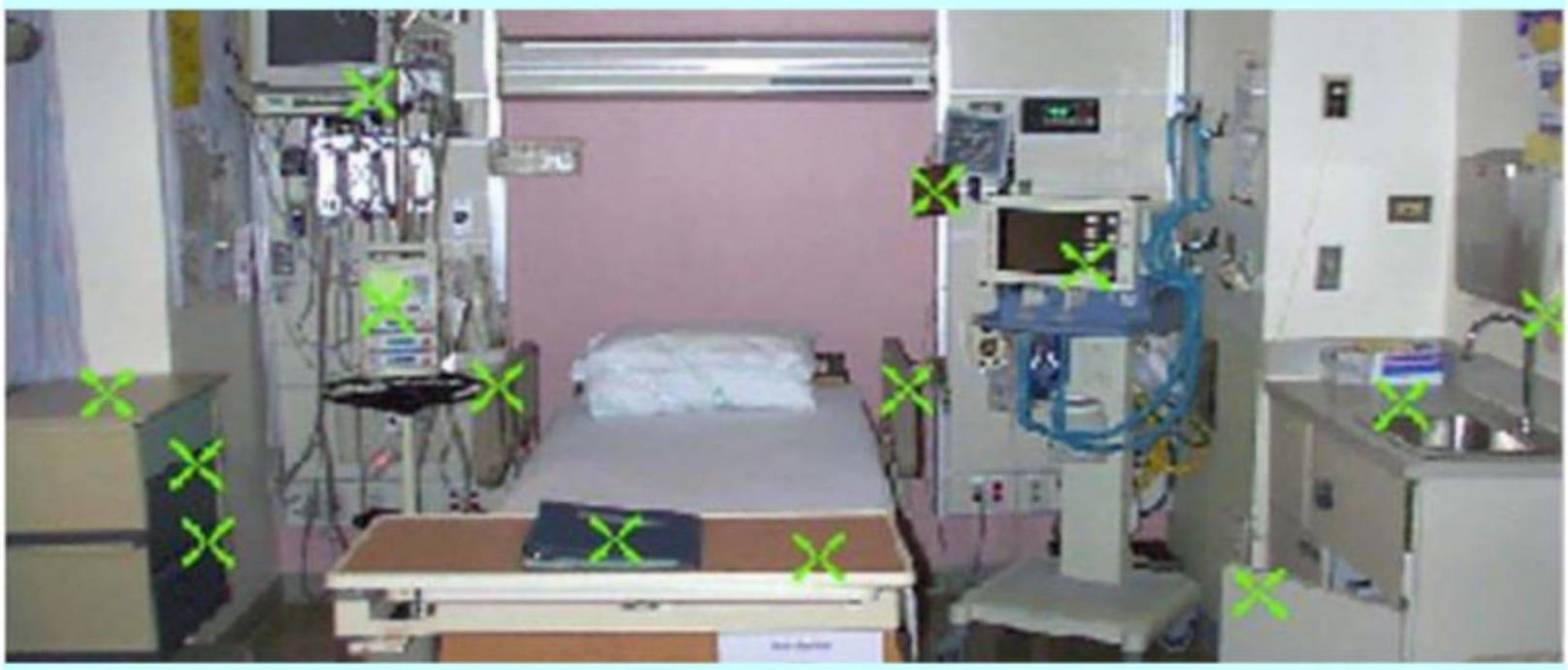
- People who carry bacteria without evidence of infection (fever, increased white blood cell count) are **colonized**
- If an infection develops, it is usually from bacteria that colonize patients
- Bacteria that colonize patients can be transmitted from one patient to another by the hands of healthcare workers

~ Bacteria can be transmitted even if the patient is not infected ~

The Iceberg Effect



The Inanimate Environment Can Facilitate Transmission



~ Contaminated surfaces increase cross-transmission ~

Abstract: The Risk of Hand and Glove Contamination after Contact with a VRE (+) Patient Environment. Hayden M. ICAAC. 2001. Chicago, IL.

HAND WASHING…

- Hand washing is the no.1 prevention against spread of i fe tio , i side a d outside the hospital setti g…It is the cornerstone of infection control practice and education for anyone who works in health care
  - Summit Medical Center, Oakland, California
- Hand washing can the first line of defense against many i fe tious diseases …the AMA urges ot o ly professionals but public also to adopt hand washing as an important personal priority.
  - American Medical Association House of Delegates Resolution 409

DURATION FOR DIFFERENT TYPES OF HANDWASHING

- Two minutes
  - before entering the unit
  - before performing any procedure
  - after handling any infected baby or secretions
- 15 seconds
  - before and after touching every baby
  - after touching unsterile surfaces and fomites

Guideline for Hand Hygiene in Health-care Settings. *MMWR 2002*; vol. 51, no. RR-16.

Type of Hand Hygiene

- When hands are visibly dirty, contaminated, or soiled, wash with non-antimicrobial or antimicrobial soap and water. Thereafter, use an alcohol-based handrub
- If hands are not visibly soiled, use an alcohol-based handrub for routinely decontaminating hands.

Handwash followed by hand rub theoretically superior!

Guideline for Hand Hygiene in Health-care Settings. *MMWR 2002*; vol. 51, no. RR-16.

Selection of Hand Hygiene Agents: Factors to Consider

- Efficacy of antiseptic agent
- Acceptance of product by healthcare personnel
  - Characteristics of product
  - Skin irritation and dryness
- Accessibility of product
- Dispenser systems

Guideline for Hand Hygiene in Health-care Settings. *MMWR 2002*; vol. 51, no. RR-16.

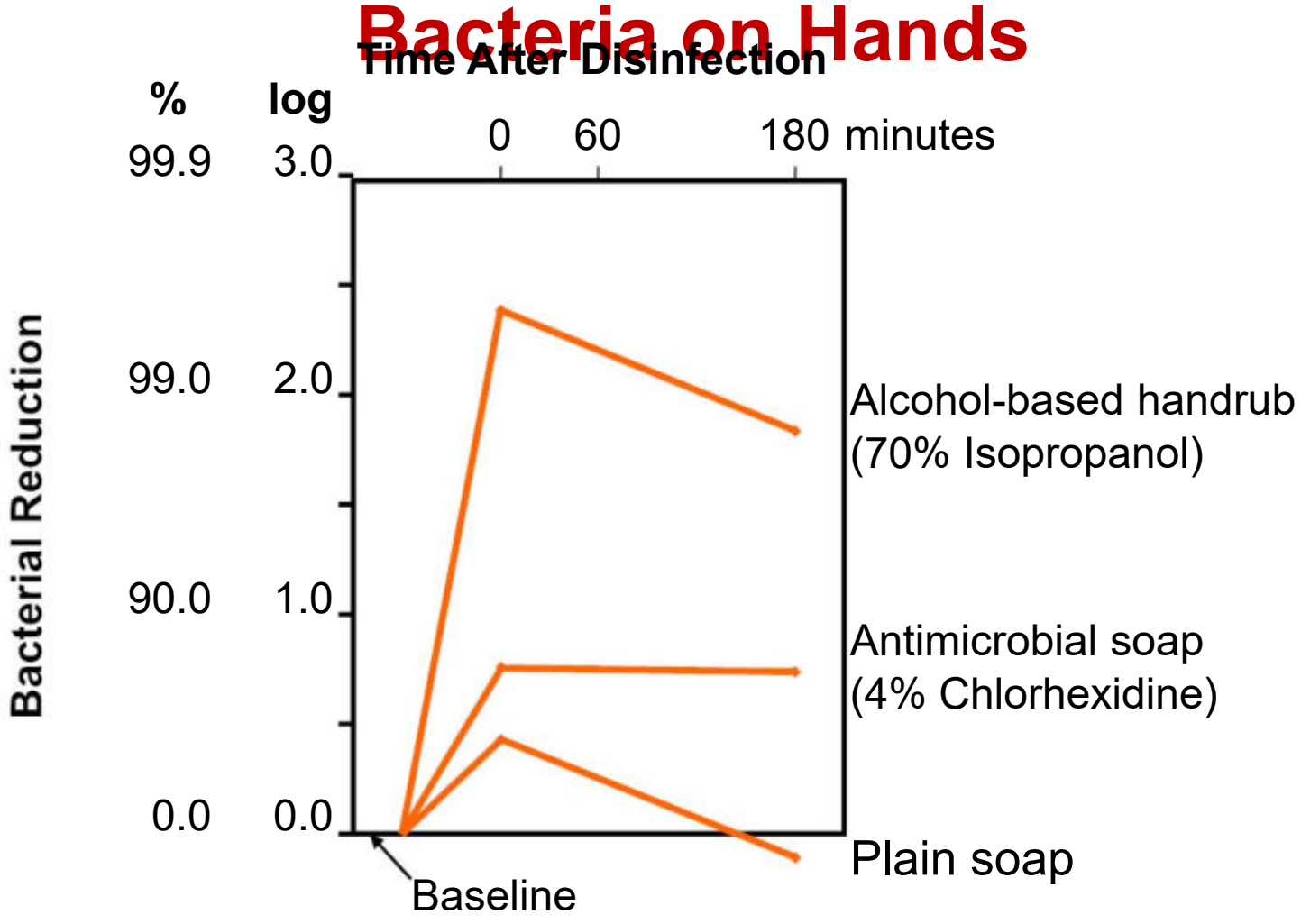
Efficacy of Hand Hygiene Preparations in Killing Bacteria

Good → Better → Best

Plain Soap | Antimicrobial soap | Alcohol-based handrub

Plain soap is just not enough

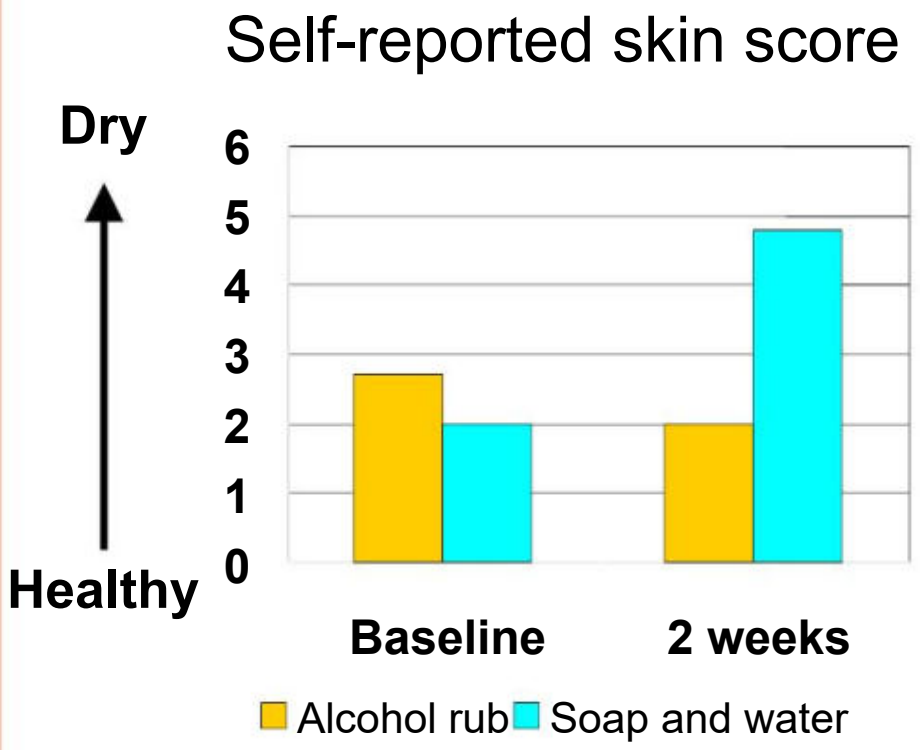
Ability of Hand Hygiene Agents to Reduce Bacteria on Hands

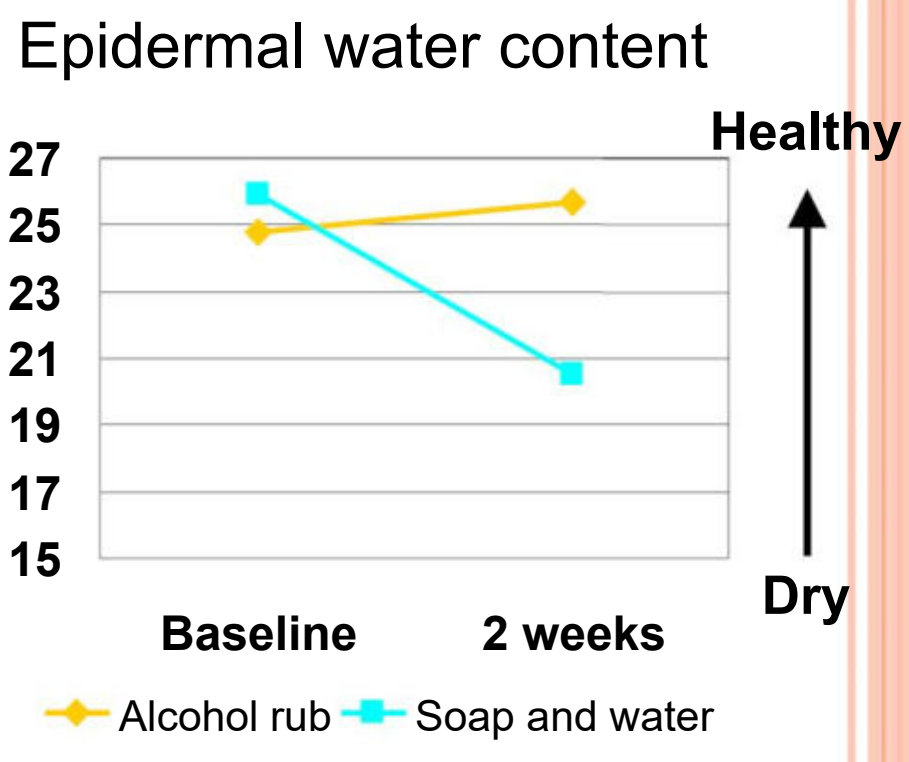


Adapted from: *Hosp Epidemiol Infect Control*, 2nd Edition, 1999.

Effect of Alcohol-Based Handrubs on Skin

Condition





~ Alcohol-based handrub is less damaging to the skin ~

Boyce J, *Infect Control Hosp Epidemiol* 2000;21(7):438-441.

Time Spent Cleansing Hands: one nurse per 8 hour shift

- Hand washing with soap and water: 56 minutes
  - Based on seven (60 second) handwashing episodes per hour
- Alcohol-based handrub: 18 minutes
  - Based on seven (20 second) handrub episodes per hour

~ Alcohol-based handrubs reduce time needed for hand disinfection ~

Voss A and Widmer AF, *Infect Control Hosp Epidemiol* 1997:18;205-208.

Recommended Hand Hygiene Technique

- Handrubs
  - Apply to palm of one hand, rub hands together covering all surfaces until dry
  - Volume: based on manufacturer
- Handwashing
  - Wet hands with water, apply soap, rub hands together for at least 15 seconds
  - Rinse and dry with disposable towel

Guideline for Hand Hygiene in Health-care Settings. *MMWR 2002*; vol. 51, no. RR-16.

Reasons for noncompliance

- Handwashing agents cause irritation and dryness
- Sinks are inconveniently located/lack of sinks
- Lack of soap and paper towels
- Too busy/insufficient time
- Understaffing/overcrowding
- Patient needs take priority

Adapted from Pittet D, *Infect Control Hosp Epidemiol* 2000;21:381-386.

GLOVING

- Wear gloves when contact with blood or other potentially infectious materials is possible
- Remove gloves after caring for a patient
- Do not wear the same pair of gloves for the care of more than one patient
- Do not wash gloves

Remember the glove is for the patient also !!!

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EDUCATION/MOTIVATION PROGRAMS

- Monitor healthcare workers (HCWs) adherence with recommended hand hygiene practices and give feedback
- Implement a multidisciplinary program to improve adherence to recommended practices
- Encourage patients and their families to remind HCWs to practice hand hygiene

Guideline for Hand Hygiene in Health-care Settings. *MMWR 2002*; vol. 51, no. RR-16.

Administrative Measures to Improve Hand Hygiene

- Make improved hand hygiene an institutional priority
- provide appropriate administrative support and financial resources
- Place alcohol-based handrubs at entrance to patient room, or at bedside
- Provide HCWs with pocket-sized containers

Guideline for Hand Hygiene in Health-care Settings. *MMWR 2002*; vol. 51, no. RR-16.

Performance Indicators

- Monitor and record adherence to hand
- Provide feedback to healthcare workers about their performance
- Monitor the volume of alcohol-based handrub used per 1,000 patient days
- Monitor adherence to policies on wearing artificial nails

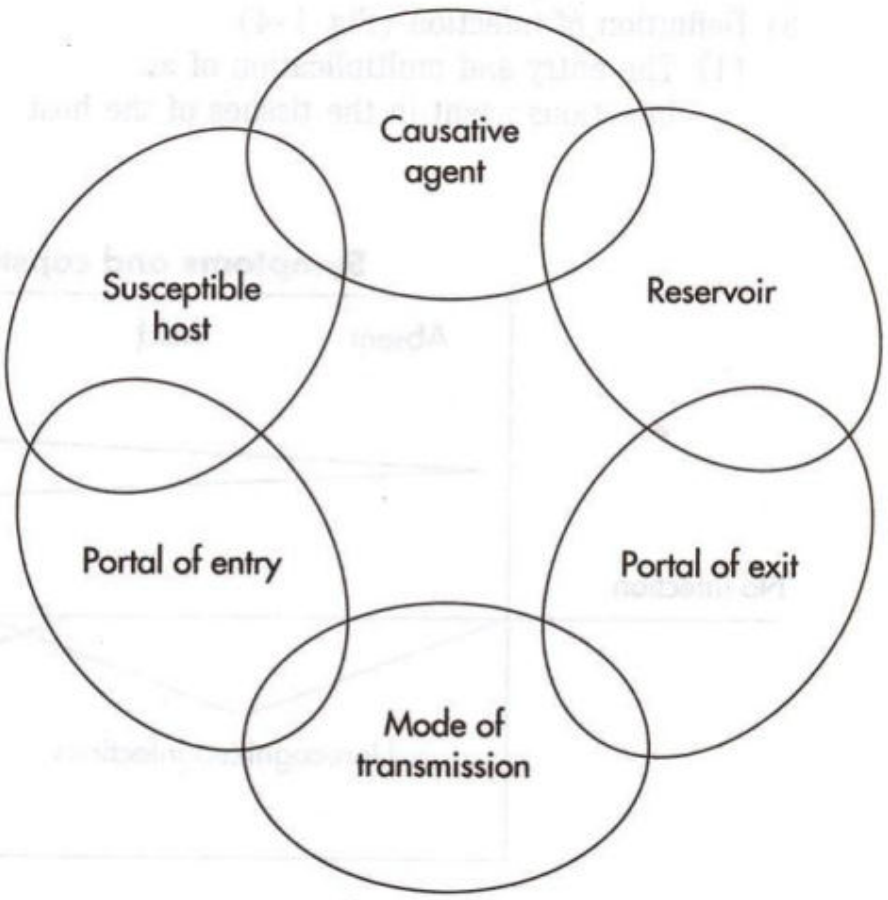
Guideline for Hand Hygiene in Health-care Settings. *MMWR 2002*; vol. 51, no. RR-16.

SUMMARY
ALCOHOL-BASED HANDRUBS:
WHAT BENEFITS DO THEY PROVIDE?

- Require less time
- More effective for standard handwashing than soap
- More accessible than sinks
- Reduce bacterial counts on hands
- Improve skin condition

BARRIER NURSING

CHAIN OF INFECTION



The interaction between all the six elements of the chain determine whether an infection will result

INFECTION CONTROL

- Sources of microorganisms can include:
  - Patients
  - Health care workers
  - Visitors
- These sources can include:
  - Persons with acute illness or infection
  - Those who are carriers, and
  - Those who are colonized with microorganisms (harbor the organism without showing any apparent illness)
- Inanimate objects such as furniture and medical equipment can also be sources of microorganisms.

OBJECTIVE – BARRIER NURSING

The main aim is to create a barrier to the passage of infectious pathogenic organisms between the contagious patient and other patients and staff in the hospital

WHAT DOES IT CONTAIN?

- Ensure that patient care items, bedside equipment, and frequently touched surfaces receive daily cleaning
- USE DEDICATED
  - Thermometer
  - B/P cuff
  - Stethoscope
  - Oxygen source & tubing
  - Suction tubings
  - Antibiotics & other medications
  - Resuscitation kit
  - Baby tray
- They must be cleaned daily

BARRIER NURSING CONTD…

- BN reduces but does not completely eliminate the possibility of infection
- BN is only effective if used correctly and at all times where contact may occur
- The use of Barrier Nursing does not replace basic hygiene measures such as hand-washing, it is still very essential to prevent transmission.

GOOD NICU PRACTICES

- PREVENT ENTRY OF MICROBES INTO NICU
- PREVENT PROLIFERATION OF MICROBES
- PREVENT SPREAD OF MICROBES
- PRACTICES – PROTECTS NEWBORN FROM DEVELOPING INFECTION

PREVENT ENTRY OF MICROBES

- MAINTAINING A CLEAN ENVIRONMENT OUTSIDE NNN—
  - LABOUR ROOM
  - BUFFER ZONE
- ENTRY RESTRICTIONS–
  - FAMILY MEMBERS
  - ENTRY OF INFECTED BABIES
  - PERSONNEL OF NURSERY
  - PERSONNEL OF ALLIED SERVICES

- **HAND WASHING** –*SINGLE MOST IMPORTANT INTERVENTION*
- **GOWNS / MASKS /SLIIPERS**
- **AIR CHANGES**
  - **12 AIR CHANGES /HOURS**
  - **0.5 BACTERRIAL FILTER**

-

PREVENT PROLIFERATION OF MICROBES IN NNN

- EQUIPMENT DISINFECTION
- GOOD HOUSE KEEPING—
  - FLOORS
  - WALLS
  - FANS
  - REFRIGERATOR
  - SINKS
  - BUCKETS

PREVENTION OF SPREAD OF MICROBES BETWEEN BABIES

- PREVENT OVER CROWDING—*4-6 FEET SPACE*
- STAFFING PATTERN—
  - 1 :1 MULTI DRUG RESISTANT ORGANISM
  - 1:2 SUSPECTED SEPSIS,SEPSIS WITH ORGANISMS SUSCEPTIBLE TO WIDE RANGE OF DRUGS.
  - 1:3 SEPTIC BABIES RECEIVED AB AND PRESENTLY NON – INFECTIOUS
  - 1:4 STABLE BABIES
- HAND WASHING
- DISPOSABLE
- LAMINAR FLOW
- PROHIBITING OF STOCK SOLUTIONS

FOMITES- *UNDERESTIMATED*

- FILES
- STETHOSCOPES
- EXAMINATION TRAY
- PENS
- COFFEE/TEA MUGS
- TELEPHONES

PROTECT NEW BORNS FROM DEVELOPING INFECTIONS

- BREAST FEEDS/MILK
- INVOLVEMENT OF MOTHER
- EARLY DISCHARGE POLICY
- CORD CARE
- SKIN CARE
- HANDLING OF PARENTERAL FLUID/ DRUGS
- HANDLING OF INVASIVES LINES AND TUBES
  - PERIPHERAL LINES
  - CENTRAL LINES
  - REMOVING LINES
- MINIMIZE HANDLING.

ASEPETIC PRECAUTIONS DURING PROCEDURES

HAND WASHING BEFORE

- INTRAVENOUS LINES
- ET SUCTIONING
- ET INSERTION , LP, DVET, CENTRAL LINE INSERTION----
  SAME SANCTITY AS SURGICAL PROCEDURE

PRACTICES ENABLE BETTER ADMINISTRATION

- ENVIRONMENT SURVEILLANCE
- RECORD OF POSITIVE CULTURE.
- MOTIVATING THE STAFF.

NEONATAL TRANSPORT

- INDICATIONS
- BEST transport method: in-utero transport
- Monitoring during transportation
- Complications

Neonatal Transport - Goal

- Taking Right New born at the Right Time , By Right Personnel, to the Right Place, By the Right form of Transport, and receive the Right Care Throughout .

INDICATIONS

- Need for higher care
- Need for high frequency
- Need for iNO
- Need for ECMO
- Need for hypothermia/whole body cooling/head cooling
- Need for cardiac procedure
- Lack of NICU bed/expertee/equipment

Neonatal transport :ideal

- A dedicated transport team consisting of Ambulance personnel, Paediatrician Respiratory therapist, Neonatal Nurse
- Adequate equipment dedicated for the transport of the infant only.
- Governmental and private medical facilities agreeing upon a fixed set of transport guidelines that are on par with the rest of the world.

Neonatal Transport - Practical constraints

- Facilities are scarce and not easily available
- Families have poor resources
- Organized transport services are not available.
- No health provider is available to accompany the baby
- Mostly self-transport (Taxi/Rickshaw/public transport)
- Facilities are not fully geared up to receive sick neonates
- Communication systems are non existent or inefficient

Prepare well before transport

- Assess – necessity
- Correct Hypothermia
- Write a Note
- Encourage mother to accompany
- Arrange a care provider to accompany

Prepare for transport

Check ID, compare with mothers folder.

IV fluids (Neonatalyte)

History

Reason for transfer

Escorts?

MONITORING

COMPLICATIONS

Hypothermia

- **Extremely vulnerable infants include:**
  - Low birth weight
  - Those requiring prolonged resuscitation

High risk neonate: Complications during transport

- Hypoxia
- Hypoglycaemia
- Hypothermia
- Hyperbilirumenaemia
- Hypovolaemia
- Heavy sedation
- Infection

Ensure warm transport

- Skin to skin care (Kangaroo Mother Care)
- Cover the baby
- Transport incubator
- Improvised containers

Neonatal Transport - Equipments

Communication

- Explain the condition,
- the prognosis
- the reasons for referral of the baby to the family.
- Explain where to go and indicate whom to contact.
- Inform the referral facility beforehand, if possible.

History of Regionalized Transport

- Medical transports date back as early as Ceasar
- • First transport isolette (1893)
- • Newborn inter-hospital transport--1920's
- • Chicago Dept. of Health System--1940's
- • Assisted ventilation on transport--1950's (France)
- • Modern transport--1970's (Usher, Canada)

ROTCH-PUTNAM INCUBATOR(CIRCA 1893)

DR. CHAPIN, in closing, said he was quite in sympathy with the general trend of the discussion as to the importance of securing an ideal condition at the dairy, but until these conditions had been attained in actual practice, other methods were of value. Sterilization, or anything else, is worthy of consideration which will retard the fermentation of milk. The objections raised by Dr. Rotch would apply equally to Pasteurization and Sterilization by heat.

DESCRIPTION OF A NEW INCUBATOR.*

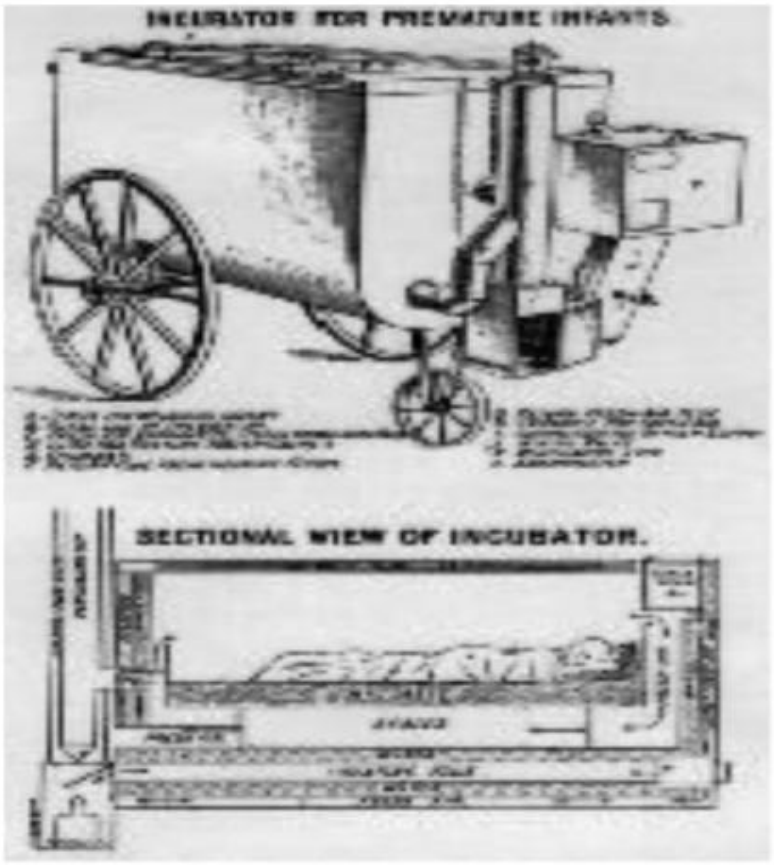
BY T. M. ROTCH, M.D.

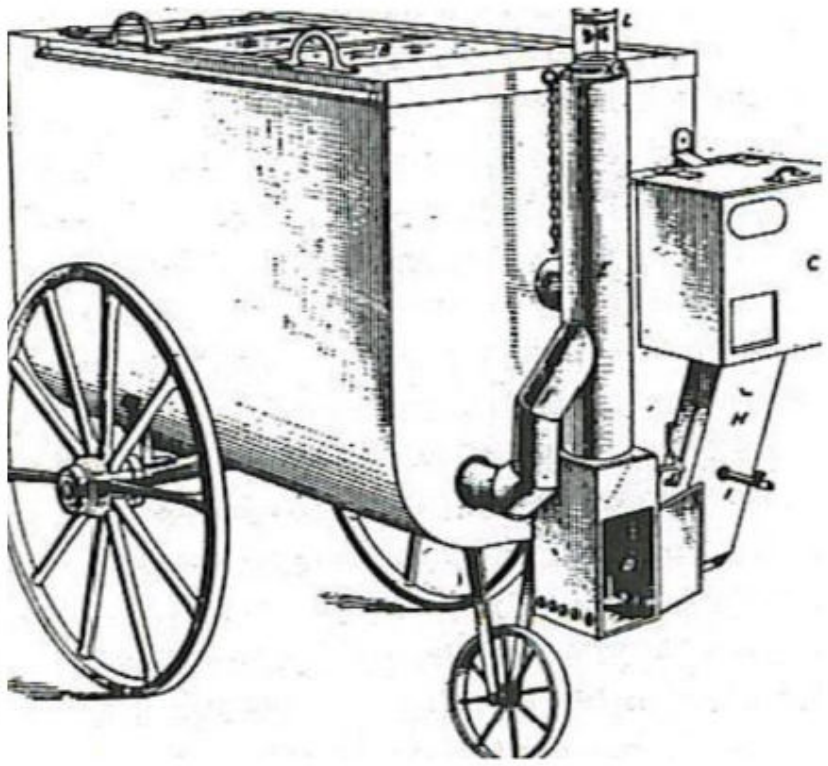
Boston, Mass.

DR. ROTCH said that children born before the seventh month are almost always lost when treated by the usual methods, and even with the aid of such incubators as have been heretofore devised. This, he thought, was a needless sacrifice of infant life. His object in calling attention to the subject at present was to describe a new form of incubator, which had none of the disadvantages of older ones, while possessing many new and useful features. Some of the more important requirements of such an apparatus are:

(1) It must be so constructed as to admit of thorough cleansing and disinfection. (2) It must be portable so that it may be brought quickly, preferably from a central station, to any house where it may be needed. (3) Provision must be made for thorough and automatic ventilation. (4) The external air must be modified before it is admitted to the incubator. (5) It must be so arranged that the temperature of the incubator can be easily and accurately adjusted to any point desired by the individual physician. (6) The air should be clean, for it takes very little to destroy the life of these prem-

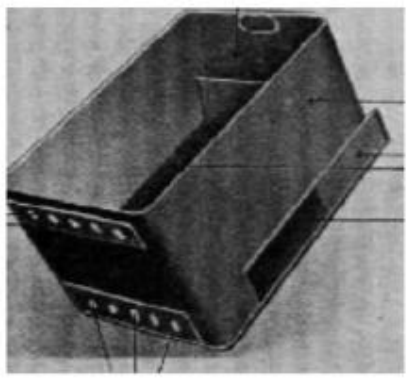
* Read before the American Pediatric Society, West Point, N. Y., May 26, 1892.





The Obstetrical Bag Transport Incubator (1922)

De Lee & Welde Transport Incubators (1920's)



Novel Therapies & Equipment: Available during transport

- ELBW (surfactant, thermoregulation)
- • Inhaled Nitric Oxide
- • ECMO
- • Ventilators (HFOV)
- • Brain Cooling
- MRI Transport Incubator
- • Capnography
- • Wireless internet and more
- • Telemedicine (consults, ECHO, U/S)
- • Cong. Heart defects/transport to Cath lab

PEDIATRICS

OME HELP FEEDBACK SUBSCRIPTIONS BROWSE / SEARCH TABLE OF

EDIATRICS Vol. 109 No. 1 January 2002, pp. 158-161

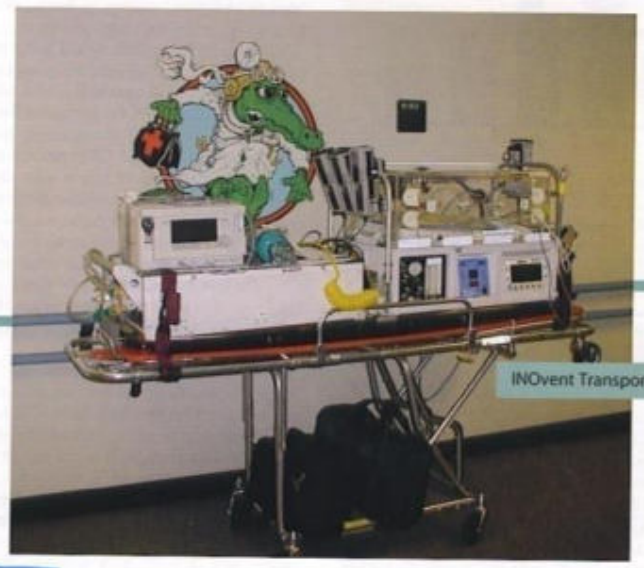
XPERIENCE AND REASON

Use of Inhaled Nitric Oxide During nterhospital Transport of Newborns With Hypoxemic Respiratory Failure

bbreviations: iNO, inhaled nitric oxide • ECMO, ctracorporeal membrane oxygenation • NO, nitric oxide • PPI ersistent pulmonary hypertension of the newborn • FDA, US ood and Drug Administration • ppm, parts per million • FAA, ederal Aviation Administration • CHD,congenital diaphragma ernia • HFOV, high-frequency oscillatory ventilation

Transporting Neonates with Nitric Oxide: The 5-Year ShandsCair Experience

Nate M. Jesse, Lynn Drury, and Michael D. Weiss, MD



INOvent Transport Delivery System

Traditionally, hypoxic respiratory failure in the newborn has been treated with supplemental oxygen, conventional mechanical ventilation, sedation, and high-frequency oscillatory ventilation. Despite appropriate management with these treatment modes, care for critically ill newborns often requires more invasive measures, including extracorporeal membrane oxygenation (ECMO). Although it may be life saving, ECMO requires cannulation and anti-coagulation, which introduces significant risk of morbidity.

ECMO: On Transport

ECLS started at referring hospital

- **Time is of the essence**
- **Must weigh benefit vs. risks and costs**
- **Team to include surgeons, neonatologists, perfusionists, RRT's, ECMO nurses**
- **Need to be equipped, self-sufficient for 24h**
- **Cornish (Wilford Hall Air Force Base) first to use portable ECMO on isolette (1987 & 1991) C-9 aircraft**
- **Now 16 year military experience (Wilson, *Pediatrics, 2002)***

High Frequency Ventilation during transport

- **To treat severe RDS/ ARDS**
- **Minimizes barotrauma**
- **Uses low TV & high rates**
- **NICU units NOT portable**
- **Transport models being developed & tested**

The state of pediatric interfacility transport: Consensus of the Second National Pediatric and Neonatal Interfacility Transport Medicine Leadership Conference

GEORGE A. WOODWARD, MD, MBA, ROBERT M. INSOFT, MD, ANTHONY L. PEARSON-SHAVER, MD, MHSA, DAVID JAIMOVICH, MD, RICHARD A. ORR, MD, C. ROBERT CHAMBLISS, MD, THOMAS J. ABRAMO, MD, CARL BOSE, MD, MARY A. GOMEZ, RN, MSN, FRANCINE WESTERGAARD, RN

Interfacility transport of pediatric and neonatal patients for advanced or specialty medical care is an integral part of our medical delivery system. Assessment of current services and planning for the future are imperative. As part of this process, the American Academy of Pediatrics and the Section on Transport Medicine held the second National Pediatric and Neonatal Transport Leadership Conference in Chicago in June 2000. Ninety-nine total participants, representing 25 states and 5 international locations, debated and discussed issues relevant to the developing specialty of pediatric transport medicine. These topics included: 1) the role of the medical director, 2) benchmarking of neonatal and pediatric transport programs, 3) clinical research, 4) accreditation, 5) team configuration, 6) economics of transport medicine in health care delivery, 7) justification of transport teams in institutions, and 8) international transport/extracurricular transport opportunities. Insights and conclusions from this meeting of transport leaders are presented in the consensus statement.

as well as representatives from the American Academy of Pediatrics (AAP) and Association of Air Medical Services. That physician leadership retreat resulted in a consensus statement regarding current practices in pediatric interfacility transport (PIT), educational experiences with PIT, consideration of the development of standards for PIT, and the promotion of high quality care during PIT (1). Multiple documents regarding pediatric transport were available at that time; however, there had not been an intellectual retreat to evaluate and discuss standards for PIT. Pediatric transport has benefited and grown from its roots in the emergency medical system (EMS) and the interfacility transport of adult patients, in both modalities and issues of patient care. Primarily, neonatal transport systems preceded dedicated pediatric and combined pediatric/neonatal programs. Pediatric transport literature in the 1970s focused on the neonatal transport patient, personnel, and system, while the literature of the 1980s and 1990s included more pediatrics, system issues, team composition, and mode of transport discussions (2–7). With the development of pediatric critical care medicine as a distinct specialty, pediatric critical care transport re-

MCQS: INFECTION CONTROL

- To perform hand hygiene activity, the **minimal** time needed using **alcohol based handrub** is

  10 Sec b) 20 Sec c) 30 sec d) 40 sec

- To perform hand hygiene activity, the **minimal** time needed using **soap and water** is

  10 Sec b) 20 Sec c) 30 sec d) 40 sec

- **H**ow many **moments for hand hygiene exist** according to WHO

  a)4 b) 5 c) 6 d) 7

- What is the most frequent source responsible for health care-associated infections?

  a) The hospital's water system b) The hospital air

  c) Germs already present on or within the patient d) The hospital environment

- Which of the following require hand hygiene actions (hand rub/hand washing)?
- Before touching a patient Y / No
- Immediately after body fluid exposure Yes / No

- After exposure to the immediate surroundings of a patient Yes / No
- Immediately before a clean/aseptic procedure Yes / No
- After touching a patient Yes / No