Section 6. Infection Control

Purpose: The following recommendations are based on limited published materials concerning infection control information that is specifically applicable to hospital management of a large influx of children (and accompanying adults) affected by a biological disaster. While the principles of infection control are the same for adults and children there are some unique issues in the population which will be highlighted. The very basic infection control guidance that follows is structured to address the infection control needs of two populations of concern in a pediatric emergency:

- Exposed/symptomatic children
- Exposed/asymptomatic children
- Unexposed neonates and mothers

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General Guidelines:

- For all children who are symptomatic owing to a biological event, use applicable HICPAC Guideline (currently: 2007 Guidelines for Isolation Precautions in Hospitals)[1]; recommendations (such as duration of isolation) sometimes differ between adults and children.

- For asymptomatic infants, toddlers, and other children requiring diapering, feeding, toileting, and assistance with hand hygiene, use guidelines that are applicable to day care settings. (See websites: US Department of Health and Human Services, *13 Indicators of Quality Child Care: Research Update, 2002.* www.aspe.hhs.gov/hsp/ccquality-ind02/ [2] and American Academy of Pediatrics, American Public Health Association, and National Resource Center (NRC) for Health and Safety in Child Care, 2002. *Caring for Our Children (CFOC): National Health and Safety Performance Standards: Guidelines for Out-of-Home Child Care Programs, 2nd edition.* http://nrc.uchsc.edu/CFOC/index.html [3]

General Infection Control Measures

Transmission of an infectious agent requires three elements: a source (or reservoir) of infectious agents, a susceptible host with a port of entry receptive to the agent and a mode of transmission for the agent.[1] Modes of transmission vary by type of organism and can be categorized in three major categories: contact (direct or indirect), droplet or airborne. Based on the specific characteristics of an infectious agent, a clinical case definition for exposed/symptomatic and exposed/asymptomatic children will need to be provided or developed.

- Promptly evaluate and separate unexposed and exposed/asymptomatic children as soon as possible from symptomatic children and symptomatic adults.
- While there is a known risk of transmission of infectious agents from infectious children to caregivers, the presence of caregivers (asymptomatic or symptomatic) may be in the best interest of the child (asymptomatic or symptomatic).
- Caregivers have to be instructed in relevant isolation and care procedures as outlined in the hospital infection control manual on exposed/asymptomatic and exposed/symptomatic children.
- Signage should be posted in all relevant areas and fact sheets or parent education sheets handed out.

Infection Control Measures for Exposed/Asymptomatic Children[1]:

- Primary caregivers of exposed children should be considered exposed, as well, and need to be screened for symptoms on a regular basis or when entering the facility.
- If it is in the best interest of a child that potentially infectious caregivers are allowed to visit, then they should use appropriate barrier precautions (e.g. mask) and remain in the patient's room.
- Similarly exposed/asymptomatic children may be cohorted. In very infectious situations, the whole facility may be cohorted.
- Day Care approaches apply for the routine care of children and need to be communicated concisely and understandably to the care givers who accompany the admitted child.[2,3]
- Hand hygiene is paramount. Children and care givers need to be taught how to perform appropriate hand hygiene in a playful manner, such as singing "Happy Birthday" to ensure at least 15 seconds of hand-washing with soap and water
- Hand-washing by children and caregivers should be performed:
    - Before and after eating and giving medication and
    - After diapering, toileting, cleaning, and the handling of body fluids, even if gloves are used.
- As a priority: educate emergency care givers (parents or others) about sanitary considerations and demonstrate specific isolation procedures to children in a playful manner.

Infection Control Measures for Exposed/Symptomatic children[1]:

In addition to the points listed under infection control measures for exposed/asymptomatic children the following points apply:

- HICPAC Isolation guidelines apply: appropriate to the nature of the illness/exposure.1
- Cohort as necessary (same exposure/same symptoms) based on space availability.
- Use of surgical face masks as source containment (e.g. during transport) is inappropriate in infants. It may be possible to instruct toddlers in an age-appropriate manner to wear masks if constant supervision is possible. Children over 3 years should be instructed and their compliance evaluated.
- Respiratory hygiene/cough etiquette as an alternative to masking should be emphasized.4

Cohorting of Children in a Hospital Setting:

- Ideally cohort according to age group to accommodate sanitary needs of infants and young children (diapering, toileting, hand hygiene, feeding; cleaning);
- Traumatized children may regress under duress and may require additional help with sanitary needs;
- Smaller group size is associated with a lower risk of infection in child care settings (DHHS document. 16);
- Support infection control by aiming for recommended age appropriate staff-to-child ratios. (see DHHS p. 15: "Staff : Child Ratio and Group Size Indicator)

Environmental Measures for Pediatric Units:

- Establish hand hygiene procedures and ensure adequate supplies of soap, sinks, paper towels and alcohol-based hand sanitizers in patient rooms;
- For infants/young children: establish diapering protocols and distribute to caregivers; 3
- Hospitals without pediatric services have diapering protocols for adults, which should be easy to adapt for infants and children;
- For infants/young children: use the HHS document (or similar) for guidance pertaining to setting up sanitary changing stations;
- For young children: toys should be easy to clean (hard plastic not fuzzy) and not be shared with other children;
  - A sample toy cleaning protocol is attached in the **appendix**.
- For young children: assign individual sleeping mats (if used);
- For infants/young children: adequate clean linens, disposable diapers, changes of clothing;
- Waste/soiled linen collection units should be child safe, adequate in number, constructed to permit hands free use;
- Have cleaning/disinfecting materials stored in a child safe manner;
- Have cleaning/disinfection procedures and schedules in place for toilets, bathrooms, changing stations, sleeping mats, toys, etc;
- Note any restrictions on disinfectant products used and do not use while in direct contact with children;
- Any reusable equipment or toys should be appropriately cleaned following hospital Infection Control procedures, or as recommended for the agent of concern;
- In addition to existing cleaning/disinfection procedures, schedules should also be in place for cleaning/disinfecting changing stations, sleeping mats, toys, and other items and equipment that may become contaminated and a source for passing on infection. A 2-minute contact with household bleach (1/4 cup/gallon tap water) or other Environmental Protection Agency approved agent is recommended for sanitization.3
- Read labels carefully to ensure that cleaning products are nontoxic to children.

Additional Infection Control Measures for Unexposed Neonates

- Whenever possible, keep healthy mothers and their infants together. Cohort mothers and children together as a single unit. Behavioral, emotional and mental discomfort/disorders in the mother may be exacerbated by the emergency environment. When the dyad cannot be kept together, ensure that there is good communication with the family, so that they are aware of where the patients are and what type of care they are receiving.
- Remember in selecting the location for cohorting that newborns require a dry, clean, warm environment to promote thermoregulation and minimize stress. A quiet environment would be best for promoting mother-infant bonding.
- Alternative sites for care of newborns and their mothers may need to be arranged in order to keep the neonate and new mother out of close proximity to infectious patients.
- Caregiver ratios need to be lower for newborns and infants than for older children. See the day care standards that follow as a guide to staff-to-child ratios.

Staff-to-Child Ratio and Group Size Indicator

There are two sources of guidance for staff-to-child ratios and group size. ***Caring for Our Children*** outlines national standards used for child care, however, there are specific state regulations regarding staff child ratio and group size. The ***Caring for Our Children*** standard (ST 002) appears on the left side of the chart that follows. On the right side of the chart, New York State Day Care Center regulations are cited. Either of these may be used for guidance on group size and ratios.

Caring for Our Children Standards*		
Age of Children	Child-to-Staff Ratio	Maximum Group Size
Birth-12 months	3:1	6
13-24 months	3:1	6
25-30 months	4:1	8
31-35 months	5:1	10
3 years olds	7:1	14
4 year olds	8:1	16
5 year olds	8:1	16
6-8 year olds	10-1	20
9-12 year olds	12:1	24

NYS Day Care Licensing Standards**		
Age of Children	Child-to-Staff Ratio	Maximum Group Size
Under 6 weeks	1:3	6
6 weeks – 8 months	1:4	8
18 - 36 months	1:5	12
3 years	1:7	18
4 years	1:8	21
5 years	1:9	24
Thru 9 years	1:10	20
10 – 12 years	1:15	30

* From US Department of Health and Human Services web site: *13 Indicators of Quality Child Care: Research Update, 2002.* http://aspe.hhs.gov/hsp/ccquality-ind02/#Staff1 *accessed June 15, 2005.*
**From NYS Office of Children and Family Services web site: Child Day Care Centers http://www.ocfs.state.ny.us/main/becs/regs/418-1_CDCC_regs.asp#s8

According to ***Caring for Our Children***, when there are mixed age groups in the same room, the child-to-staff ratio and group size shall be consistent with the age of the majority of the children when no infants or toddlers are in the mixed age group. When infants or toddlers are in the mixed age group, the child:staff ratio and group size for infants and toddlers shall be maintained.

Similarly, NYS Day Care Regulations state that children under three years of age may not participate in mixed age groups except that for limited periods of time at the beginning and end of the child day care center's daily operation. Infants may never be placed in mixed age groups. When toddlers are cared for in mixed age groups, the staff/child ratio and maximum group size applicable to children aged 18 months to 36 months must be followed. When children three years of age or older are cared for in mixed age groups, the staff/child ratio and maximum group size applicable to the majority of the children in the group must be followed, unless the difference in age between the youngest and oldest child in the group is more than two years, in which case the staff/child ratio and maximum group size applicable to children two years older than the youngest child in the group shall apply.

Smaller group size is associated with a lower risk of infection in child care. The risk of illness in children between the ages of one and three years of age increases as the group size increases to four or more, whereas children in groups of three or fewer have no more risk of illness than children cared for at home (Bartlett, Orton, & Turner, 1986; Bell, Gleiber, Mercer, Hifer, Guinter, Cohen, Epstein, & Narayanan, 1989). The risk of repeated ear infections increases in one- to six-year-old children who attend child care in groups of more than six children (Hardy &Fowler, 1993).

The risk of Haemophilus influenza infections increases for children one year of age or older in a child care setting with four or more children, and the risk of infection peaks in settings with 21 or more children. Smaller child care centers, not just those with smaller class sizes, have lower rates of disease. Outbreaks of Hepatitis A occur at the rate of 3% in centers that enroll less than 20 children but 53% in those that enroll 51 or more children (Hadler, Erben, Francis, Webster & Maynard, 1982). Children in small child care centers in France had two to three times the risk of repeated infections (e.g., upper respiratory tract infections, otitis media, conjunctivitis) than children in family child care settings with no more than three children (Collet, Burtin, Kramer, Bossard & Ducruet, 1994).

Lower child-to-staff ratios reduce the transmission of disease. Although there is little research available that examines the relationship between particular child-to-staff ratios and children's health (a major gap that needs to be addressed), the research that is available suggests that fewer children per adult reduces the transmission of disease because caregivers are better able to monitor and promote healthy practices and behaviors (Bredekamp, 1990; Hayes, Palmer, & Zaslow, 1990).

References:

1 Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee, *2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings, June 2007.* http://www.cdc.gov/ncidod/dhqp/gl_isolation.html

2 US Department of Health and Human Services web site: "*13 Indicators of Quality Child Care Research Update 2002*" http://aspe.hhs.gov/hsp/ccquality-ind02

3 American Academy of Pediatrics, American Public Health Association, and National Resource Center (NRC) for Health and Safety in Child Care (2002). *Caring for Our Children (CFOC): National Health and Safety Performance Standards: Guidelines for Out-of-Home Child Care Programs, 2nd edition* http://nrc.uchsc.edu/CFOC/index.html

4 http://www.cdc.gov/flu/professionals/infectioncontrol/resphygiene.htm

5 http://www.ocfs.state.ny.us/main/becs/regs/418-1_CDCC_regs.asp#s8