

Infection Control: Long Term Care

**Infectious Disease Epidemiology Section
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Your taxes at work

Infection Control in LTC

- **LTC Provide**

- Residence
- Social activities
- Medical care

Some conflicting needs for IC & social interaction

Ex: Confused patients roaming around facility

- **Infection control pgm required by federal regulation**

- IC committee not required
- QA committee required

- **Guidelines**

- *Smith PW, Rusnak PG. APIC guideline for infection prevention and control in the long-term care facility. Am J Infect Control 1991;19:198–214*
- *McGeer A, Campbell B, Emori TG, et al. Definitions of infection for surveillance in long-term care facilities. Am J Infect Control 1991;19:1–7*

Risk Factors for Infection in the Elderly

Elderly at High Risk of Infection: Alterations of Mechanical Barriers to Infection

Eye

- **Decreased tears to flush**
- **Decreased lysozyme (bacteriocidal enzyme)**
- **Diminished blink reflex > dryness**

Oral cavity

- **Dental caries, periodontal disease**
- **Salivary production depressed**
- **Altered tongue performance > potential for aspiration**

Elderly at High Risk of Infection: Alterations of Mechanical Barriers to Infection

Respiratory System

- **Microaspiration and increased tracheobronchial tree colonization**
 - Increased chest diameter /rigidity, weakening of respiratory muscles
 - Weakened cough
 - Low lysozyme /low local IgA in nasal mucosal secretions
 - Decreased cilia action from nasopharynx to bronchioles
 - Decreased mucociliary escalation (swallowing)
- **Alteration of mucociliary transport**

Elderly at High Risk of Infection: Alterations of Mechanical Barriers to Infection

Respiratory System cont.

- Collapse of lower airways
- Decreased alveolar macrophage
- Decreased elastic tissue surrounding alveoli
- Fibrous connective tissue ↑ of rib cage: ↓ broncho-pm movement, ↓ air exchange, ↑ residual air

At end of expiration, 80 year old has 50% more air left in lungs than 25 year old

Elderly at High Risk of Infection: Alterations of Mechanical Barriers to Infection

Gastrointestinal System

- Diminished saliva production & antibacterial components
- Delayed esophageal emptying, increased risk of aspiration
- Decrease or loss of gastric HCl production (30%)
susceptibility to enteric infections (*Salmonella, Vibrio*)
- Changes of fecal flora, bacterial overgrowth in small bowel
- Decreased intestinal mobility: degenerative changes in
connective tissue and neurons
- Reduced production of mucus/mucous epithelial cells & cell
lining

Elderly at High Risk of Infection: Alterations of Mechanical Barriers to Infection

Genitourinary System

- **Changes in kidney structure & function to decreased urine production**
- **Relaxation of female pelvic floor reduces bladder emptying efficiency**
- **Collection of residual urine or incontinence**
- **Postmenopausal atrophic vagina with low pH & increased colonization**
- **Bladder outlet obstruction: urethral stricture, neurogenic bladder, prostatic hypertrophy > colonization, chronic bacteriuria, overflow incontinence**
- **Loss of bactericidal prostatic secretions**
- **Alterations of bladder mucosal lining, phagocytic cells, secretory IgA**
- **Alteration of normal mechanical barrier urinary drainage catheters**

Elderly at High Risk of Infection

Skin and Mucosal Surfaces

- Thinning of epidermal /dermal layers
- Loss of skin elasticity and strength
- Decreased production of sebum and fatty acids w antifungal and antibacterial properties
- Colonization facilitated by increase of skin pH
- Decreased sweat gland production of lysozyme
- Loss of connective tissue, elastic fibers, subcutaneous fat and blood vessels
- Lower oxygen in skin > risk for breakdown / healing delay
- Skin breakdown from peripheral neuropathies of chronic diseases (diabetes)

Elderly at High Risk of Infection

Phagocytic Polymorphonuclear

- PMN leukocyte random migration & opsonization normal
- Older macrophage not well stimulated by "foreign" antigens
- Loss of antimicrobial enzymes in the phagocytes
- PMN leukocyte intracellular enzymes slowed by delayed activation
- PMN leukocyte delayed activation > cell-mediated immunity impairment

Elderly at High Risk of Infection

Diminished functions of T and B lymphocytes

- Decrease in number & % of peripheral blood T lymphocytes
- Alteration of T-cell subsets, including helper and suppressor
- Prolonged T-cell life in postmature state
- Diminished response to mitogens and allogenic cells
- Decreased response to heterologous antigens
- Diminished delayed hypersensitivity response

Elderly at High Risk of Infection

Diminished functions of T and B lymphocytes cont.

- Increased frequency of autoantibody production
- Abnormal production of lymphokines
- No change in # of circulating B cells but loss of normal response
- Decrease in antibody production may be due to alterations in
 - T lymphocytes (helper and suppressor)
 - Macrophages
 - B lymphocytes

**Common
LTCF Associated
Infections in the Elderly**

UTI

- Most common infection
- Clinical manifestations nonspecific
 - classic UTI (fever, dysuria, frequency, suprapubic /flank pain),
 - ALSO confusion, failure to eat, failure to get up / move
- Clean-catch urine difficult to obtain
- Prevalence
 - elderly, noncatheterized= 15%-50%
 - with long-term in-dwelling catheters; prevalence of asymptomatic bacteriuria = 100%
- Most common cause of bacteremia; 33% of BSI caused by UTIs
- Acquisition of catheter-associated UTI > * 3 increased mortality

Pressure Ulcers

- Pressure ulcers = soft-tissue lesions, ↓ blood supply > cell death
- Severity: inflammation > ulceration
- Infection =
 - Purulent tissue /drainage (regardless of culture results)
 - Serosanguinous drainage, pain, swelling, heat, induration, or erythema around lesion
- Colonization = positive culture alone
- To culture a pressure ulcer:
 - Clean surrounding skin with antiseptic
 - Clean necrotic tissue with sterile water
 - Aspirate deep drainage or insert sterile swab deep into wound

Pressure Ulcers

- Pressure ulcer 2nd leading site of infection in LTCFs - Prevalence 2%-23%
- Complications: sepsis, osteomyelitis, gangrene, joint deformities
- Risk factors
 - Wetness/dampness; improper positioning; poor hygiene; improper lifting techniques; restraints, casts, or braces
 - Decreased mobility, impaired circulation
- Pathogens
 - Polymicrobial (aerobic & anaerobic)
 - Common organisms: *Proteus spp.*, *E. coli*, *Enterococci*, *Staphylococci*, *Pseudomonas*, *Bacteroides fragilis*, *Peptostreptococcus*, *Clostridium perfringens*

Pressure Ulcers: Prevention

- Nursing measures: regular positioning/ turning; personal hygiene, dressings
- Debridement of necrotic tissue (by surgical, mechanical, or chemical means) and regular dressing changes
- Private room desirable when:
 - Lesion draining and not covered by dressing
 - Dressing does not contain drainage
 - Confused resident will not leave dressing in place
- Masks /goggles not indicated except irrigation
- Gowns if soiling with drainage likely
- Gloves when touching drainage
- Contaminated dressings into biohazardous waste
- Change dressings regularly

Pneumonia

- 3rd common site of infection
- Mortality rate 30-50%
- Risk factors: emphysema, chronic bronchitis, COPD
- Most pneumonias due to aspiration
- Pathogens:
 - Pneumococcus, most common bacterial cause
 - *H. influenzae*, other *H.spp*, *S.aureus*
 - Gram- bacilli (Enterobacteriaceae, Pseudomonas, *K. pneumoniae*, Legionella)
 - Growing problem in institutionalized
 - Throat flora changes with aging: ↑ Gram-
- Transmission
 - Endogenous flora /aspiration: *S. aureus*, pneumococci
 - Droplet
 - *L. pneumophila* if aerosolized: air conditioning, cooling towers, showerheads

Pneumonia Prevention

- Pneumococcal vaccine for adults with chronic illnesses and > 65 years old
- Influenza vaccine HCW & frequent visitors /volunteers annually
- Physical activity, regular deep-breathing exercises
- Discourage smoking
- Prevention with residents on ventilators or with tracheostomies:
 - Standard precautions
 - Sterile gloves for all manipulations at tracheostomy site
- Suctioning only when needed to ↓ substantial secretions
- Standard precautions

Pneumonia Prevention

- Reduce aspiration:
 - Encourage mobility
 - Discontinue or decrease use of sedatives
 - Avoid bulk laxatives to debilitated or dysphagia residents causing esophageal plugs and aspiration. Drink full glass of water immediately after taking laxative
 - Feed residents slowly with adequate fluids
 - Check nasogastric tube placement before each feeding; elevate head of the bed during feedings and 30 mn after
 - Clean, disinfect, and maintain respiratory therapy equipment, including medication nebulizers

Tuberculosis

- High prevalence of TB infection among elderly (20-50%) → high incidence of TB among elderly. (Most TB disease is reactivation of old infection)
- Outbreaks of TB in LTCFs are uncommon
- Diagnosis made late
 - Elderly fewer and symptoms less marked (?)
 - Other pulmonary symptomatology prevents TB suspicion
 - Radiographic findings atypical
- Microscopic identification of AFB presumptive, confirm w culture
- Patients w sputum smear positive for AFB, cavitory disease are most contagious

Tuberculosis Prevention

- Screening:
 - Identification of residents with TB infection at admission
 - Mantoux two-step technique recommended
 - If screening test positive → chest X-ray as baseline
 - Induration ≥ 10 mm suggestive of TB infection
- INH preventive therapy for 6 months for LTBI
 - Consider risks of INH hepatitis
- Residents with positive PPD not treated: monitor closely for pulmonary symptoms BUT no need for systematic chest X-rays
- Active pulmonary TB disease: Airborne precautions
 - Private room with negative pressure
 - Air exhausted out of HEPA filtered before re-circulation
 - Particulate respirator masks: N95 +
 - Precautions maintained sputum smear negative
 - During transportation: wear surgical mask (not a respirator)

Influenza

- Influenza affects the elderly twice as often as the young
- Case fatality rates ~ 30% in LTCFs
- Rapid antigen test is available for influenza A
- Viral cultures for purpose of national surveillance of strains
- Complications in elderly:
 - Primary influenza pneumonia
 - Secondary bacterial pneumonia, after 1-4 day improvement

Influenza Prevention

- During a community outbreak, monitor personnel closely, encourage to remain home if influenza
- Perform surveillance for respiratory infections during influenza season
- Outbreak control measures. Private room is not necessary
 - During epidemics, infected residents may be cohorted
 - Standard precautions + droplet precautions
 - If resident contaminates environment with copious respiratory secretions: Gown
- Amantadine or rimantidine to treat infected residents
- Amantadine/rimantidine prophylaxis for 2 weeks after vaccination

Influenza Prevention

- Yearly immunization of HCW & residents before influenza season
 - clinical trial demonstrated significant ↓ patient mortality and influenza-like illness in LTCFs that vaccinated staff compared
- Amantadine or rimantidine prophylaxis sometimes recommended as supplementary
 - If resident not immunized, amantadine po daily for duration of epidemic (usually 6-8 weeks)
 - Not cost-effective alternative to immunization
 - Approximately 70% effective against A, not B
 - Side effects (insomnia, dizziness and difficulty concentrating)
 - Residents with impaired renal function or seizure disorders

Gastro-Intestinal

- Viral diarrhea
- Bacterial diarrhea:
 - Toxin mediated: *C. difficile*, *C. botulinum*, *S. aureus*
 - Invasive: Campylobacter, Salmonella, Shigella, *E. coli O157:H7*

	Viral	Bacte/Invasive	Bacte/Toxin
Onset	usually abrupt	gradual	abrupt
Duration	1-5 days		
Fever	±	+++	
Nausea	+(Noro)	±	+++
Abd. Cramp	+	+	-
Stools	large watery	watery	watery
Blood/mucus	-	+	-
WBC	N	+PMN	
Stool culture	N bacte	+	N bacte
Toxin assay			<i>C.difficile</i>

Gastro-Intestinal

- Diarrhea occurs frequently in the elderly
- Prevalence of diarrhea: 1-10% in residents of LTCFs
- Increased antibiotic use → develop *C. difficile* diarrhea and pseudomembranous colitis
- Risk of rotavirus infection due to decrease /disappearance of rotavirus antibodies in patients > 70 years
- Elderly have greater tendency to become Salmonella carriers after Salmonella infections
- High severity in elderly
 - Profuse watery diarrhea → dehydration
 - Salmonella food poisoning unusually severe, CFR 10%
 - Viral gastroenteritis may be severe

Gastro-Intestinal: Prevention

- Standard precautions
- Proper food handling and serving techniques
 - Hold food at proper temperatures
 - Cook food thoroughly
 - Avoid use of contaminated equipment
 - Good personal hygiene for food handlers
- Private room if resident's hygiene is poor
- Gowns if soiling with feces likely

Gastro-Intestinal: Prevention Cont.

- Incontinent residents securely diapered to prevent environmental contamination
- Antibiotics, antimotility agents and absorbents used sparingly because these may lengthen duration, cause complications (*C.difficile*), or induce carrier state (Salmonella)
- Fluid replacement, preferably with oral fluids
- Temporarily eliminate milk products from diet, because damage to mucosa may lead to temporary lactose intolerance

Scabies

- Diagnosis overlooked because of confusion & ↑ dry, pruritic skin
- Ongoing visual assessment by caregivers important for early detection
- Scabies outbreaks relatively common in LTCFs
 - Not a reportable disease
 - Annual rate of scabies outbreaks in LTCF = 4%-17%
 - Attack rates of direct care giver: 38%-69%
- Generalized dermatitis = Norwegian scabies
 - Extensive scaling & crusting
 - More mites ⇒ highly contagious situation even with casual contact
- Contaminated linens /clothing of bedridden resident ⇒ high transmission

MRSA

- MRSA tends to colonize and/or infect debilitated residents
- Transfer of patients with MRSA: acute-care facilities ↔ LTCFs
- Close living conditions /level of personal care required for many residents ⇒ acquisition rate (Ex: 5%-10% /year)
- Per year among residents: 90
- Colonization before invasive infection
- Once prevalent in a facility, MRSA extremely difficult to eradicate
- Direct contact, hands of personnel

VRE

- VRE tends to colonize debilitated resident
- Infrequent cause of infection in LTCF
- Transfer of the patients with VRE: acute-care facilities
⇔ LTCFs
- Risk of VRE infections in LTCF low
- Main transmission is hands
- Immediate environment of colonized with VRE often contaminated
- No evidence that colonization of HCW has a role