Evaluation of Fever and Infection in Long-Term Care Facilities

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Evaluation of Fever & Infection in LTCF Overview

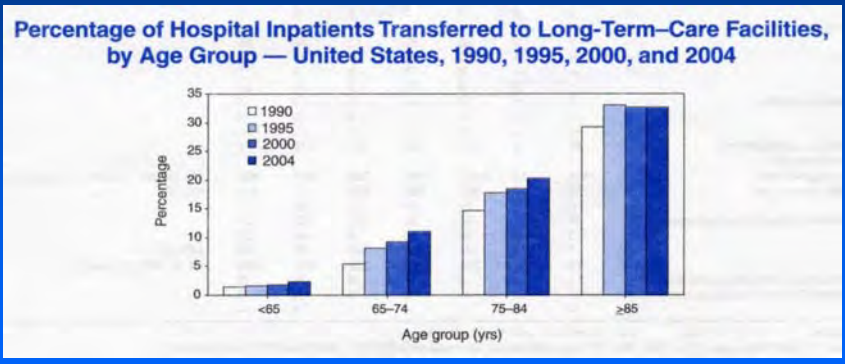
- Prevalence of infection in LTCF
- When to evaluate?
- What general findings might suggest infection?
- What clinical evaluation should be done?
- What diagnostic testing might be useful?
- Evaluation of specific clinical syndromes.
- Relationship to Revised McGeer Criteria

World Population
> 80 years

Year	Percent
1950	7
2013	14
2050	19
2100	28

United Nations. World Population Ageing 2013.

National Discharge Survey
1990-2004



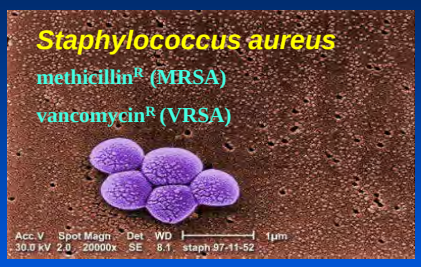
http://www.cdc.gov/nchs/about/major/hdasd/nhds.htm

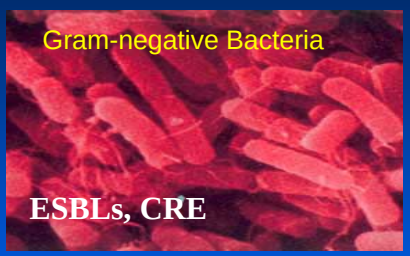
Chronic Care Facilities
Not All The Same

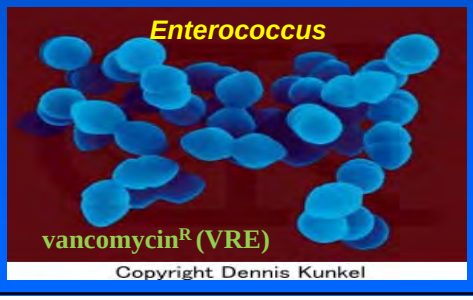
Multiple populations
Many different needs

- Unskilled
- Rehabilitation
- Skilled nursing
- Sub-acute
- Ventilator
- Acute long-term
- Palliative/Hospice
- AIDS/Dementia

Infections in LTCF
Multiple-Drug Resistant Organisms

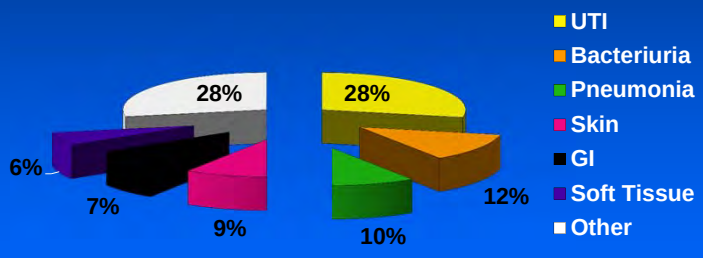






VA LTCF Surveys
How Common Is Infection?

No change types of infection over time
2005 overall rate = 5.2%
2007 overall rate = 5.3%
2009 overall rate = 4.2%*



Tsan L et al. AJIC 2008;36:173 & AJIC 2010; 38:461-466

Nursing Homes Guideline
Evaluation of Fever & Infection

- What should trigger an evaluation?
  - symptoms
  - signs
- What clinical evaluation should be done?
- Who should do the initial evaluation?
- What diagnostic testing is useful?
- What resources are available?

High KP et al. Clin Infect Dis 2009;48:149.

LTCFs vs Hospitals
Remember-Missions & Resources Differ!

LTCFs

- Comfort
- Preservation function
- Prevention illness
- Nurse-centered care
  RN:LPN:CNA=7:13:35 per 100 beds
  Full time MDs < 20%
- MD visits infrequent
- Verbal orders common
- Diagnostics off-site
- Capitation
- Acute issues = transfer

Hospitals

- Diagnosis illness
- Rx acute illness
- MD-directed care
- Daily visits
- Written orders
- Diagnostics on-site
- Fee for service

Smith PW et al. ICHE 2008;29:785

Infection in LTCF
Clinical Evaluation

- How often is it performed/recorded?
  - —received antibiotics (100%)
  - —examined by physician (47%)
  - —examined by RN/LPN (36%)
  - —not examined (17%)
  - —less common large NH, urban, community
  - —does it result in better outcomes?

McFadden JP et al. Br Med J, 1982;284:626;
Mehr DR et al. J Fam Pract 2001;50:931.

When Should Infection Be Suspected in LTCF?

- Generalized findings
  - subjective
    - ✓decline in functional status
    - ✓delirium
  - objective
    - ✓fever
    - ✓non-specific diagnostic findings
- Focal findings
  - predisposing factors
  - organ specific symptoms & signs
  - specific diagnostic findings

Clinical Evaluation for Infection What to Consider?

Infections in LTCF
Why Assess Functional Status?

- Acute change in function
  - infection accounts 77% of episodes
    - increased confusion
    - decreased cooperation
    - decreased po intake
    - incontinence
    - falling, decreased mobility

Berman et al. Age Aging,1987;16:201

Revised McGeer Criteria
Generalized Symptoms

C. Confusion Assessment Method - MS change from baseline
   1. acute onset and fluctuating course
   2. inattention **AND**
   3. Either disorganized thought or altered level of consciousness

D. Acute functional decline
   1. New 3 point increase in total ADL score
      a. 0-4 points per activity (0=independent, 28 = dependent)
      b. 0-28 points per total score (7 activities)
   2. Activities daily living (ADL)
      bed mobility, transfers, locomotion, dressing, eating
      toileting, personal hygiene

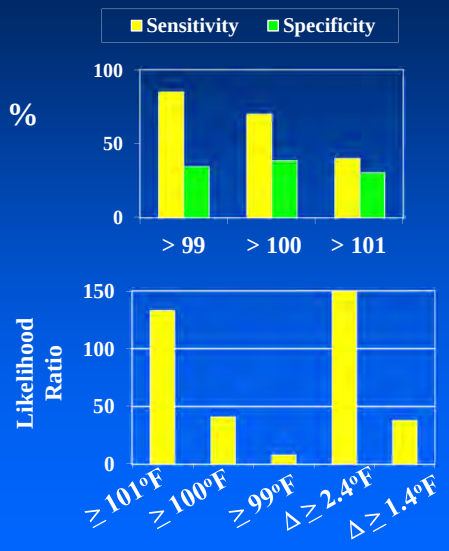
Stone NM et al. ICHE 2012;33:965; Inouye SK et al. Ann Intern Med 1990;113:941; Minimum Data Set 3.0

Fever
What is a Useful Definition?

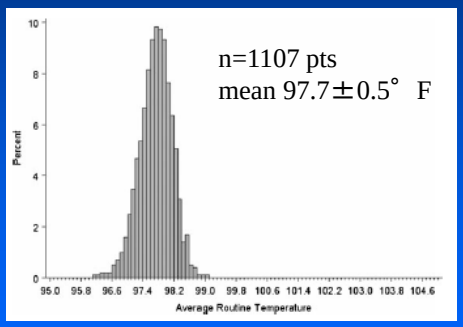
Fever in LTCF Residents
What Threshold Suggests Infection?

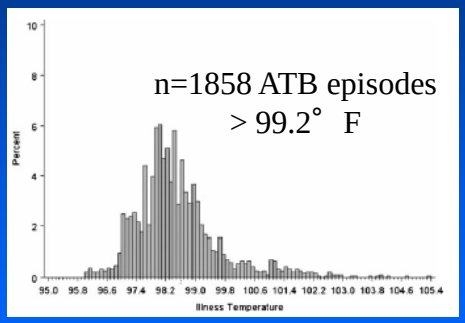
- Three different thresholds
  - **sensitivity**
  - **specificity**
  - **likelihood ratio**
- Suggested definition fever:
  - **≥ 2° F over baseline**
  - **≥ 99° F po or 99.5° F pr**
  - **(repeated measures)**

Castle S. Aging Immunol Inf Dis, 1993;4:67



Temperatures in LTCF Residents Non-Illness vs "Illness"





Sloane PD et al. J Am Geriatr Soc 2014;62:135

Revised McGeer Criteria General (Constitutional) Signs

A. Fever
   1. Oral single > 37.8°C [>100°F] or
   2. Oral repeated > 37.2°C [99°F] or
   3. Any site* > 1.1°C (2°F) over baseline

High K et al. Clin Infect Dis 2009;48:149-171

Suspected Infection in LTCF
Initial Clinical Evaluation

- Should assess:
  - — presence of fever?
  - — presence of delirium/acute change functional status?
  - — predisposing factors for infection?
  - — presence poor po intake/dehydration risk?
  - — identify potential sources on physical exam:
    - respiratory rate
    - skin (sacrum, perineum, rectum)
    - oropharynx, conjunctivae
    - chest
    - heart
    - abdomen
    - indwelling devices

Suspected Infection in LTCF
Predisposing Factors

Risk Factor	Potential Infection Source
• Immobility	• Pressure Ulcers
• Diabetes	• UTI/skin soft tissue infections
• Prosthetic devices	• Joints, valves, pacemakers
• Urethral catheter	• UTI/Bacteremia (39x risk)
• IV catheters	• BSI/phlebitis

Rudman et al. JAGS,1988;36: 726.

Dehydration
Predictor of Fever?

- poor po intake (82%)
- rising serum Na or BUN/Cr (60%)

Weinberg. JAGS, 1994;42:968
Gross CR et al. Emerg Med 1992;1-:267.

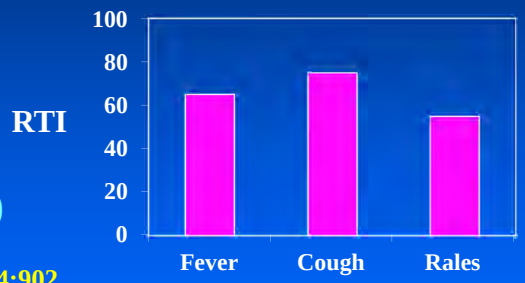
Physical Findings In LTCF
What is Useful in Older Adults?

- Respiratory rate > 25 breaths/min
- Strongly suggests LRTI (80-90%)
- Less common pts without LRTI (3-19%)
- Otherwise little data

McFadden JP et al. Br Med J, 1982;284:626
Mehr DR et al. J Fam Pract 2001;50:931.

Infection in LTCF
Other Useful Clinical Manifestations

- Typical signs/sx likely
  - RTI > UTI
- Pts with CXR (+):
  - RTI Sx (93%)
  - fever ≥ 38°C (44%)



Brooks et al. Arch Int Med,1994;154:902
Mehr D et al. J Fam Pract 2001;50:931.

Suspected Infection in LTCF
When to Pursue Diagnostic Testing

- Review advanced directives (AD)
- Perform diagnostic testing if they:
  - are not prohibited by AD
  - are available (if not, transfer)
  - can be done in a timely manner
  - it would change management
  - if non-performance poses risk to others

What Diagnostic Testing is Helpful? CBC with Differential

- Older adults infected vs no infection

	Infection (RR)
leukocytosis (> 14,000/mm^3)	3.7
neutrophilia (> 90% PMNs)	4.7
⇑ % bands (> 6%)	7.5
⇑ absolute bands (> 1500/mm^3)	14.5

Wasserman et al J Am Geriatr Soc,1989;37:537

Suspected Infection in LTCF Complete Blood Count

- CBC should be done within 12-24h of onset of sx
- A careful assessment for bacterial infection should be done even without fever if:
  - —WBC > 14,000 cells/mm3
  - —bands > 1500 cells/mm3 or > 6%
- Additional testing may not be indicated for bacterial causes if:
  - —no focal clinical findings
  - —no fever
  - —no leukocytosis or left shift

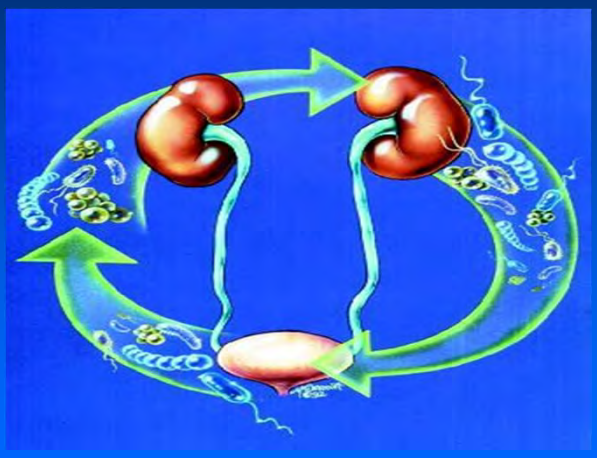
Revised McGeer Criteria
General Findings

B. Complete blood count

1. leukocytosis > 14,000 wbc/mm^3
2. neutrophilia > 90%
3. left shift (>6% bands or $\geq$1500 bands/mm^3)

High K et al. Clin Infect Dis 2009;48:149-171; Stone NM et al. ICHE 2012;33:965.

Evaluation for Infection in LTCF
UTI



Evaluation of UTI in LTCF Recommendations

- No UA/culture in asymptomatic pts
- Evaluate new onset or worsening sx/signs
- Non-catheterized patients (cystitis)
  - —fever, dysuria, hematuria
  - —frequency or incontinence
- Indwelling urethral catheters evaluate (pyelo)
  - —fever, rigors, delirium, hypotension
  - —obstruction present?

Evaluation of UTI in LTCF Recommendations

- If symptoms present, then…
- Non-catheterized obtain urine by:
  - —men - clean catch, midstream, condom catheter
  - —women - in and out catheter specimen
- Indwelling urethral catheter obtain urine after:
  - —catheter change if present > 14 days
- Minimum lab evaluation UA or dipstick
- Obtain a culture and susceptibilities if:
  - —leukocyte esterase + or pyuria ≥ 10 WBC hpf

Is the UA Helpful?
Pyuria-Asymptomatic Pts

• Young women	32%
• Pregnant women	30-70%
• Diabetic women	70%
• Institutionalized elderly	90%
• Hemodialysis pts	90%
• Short term catheters	30-75%
• Long-term catheters	50-100%

Nicolle et al. Clin Infect Dis 2005;40:643-654.

Pyuria
Other Causes

- Any inflammatory cause
- Tuberculosis (sterile pyuria)
- STDs
- Interstitial nephritis
  legionella, leptospirosis,atheroemboli, granulomatous dis (sarcoid), allergy
- Irritation - stones, catheters

Diagnostic Tests in LTCF
Urinalysis (U/A)

- Pyuria not specific for UTI
  - 30% NH residents + WBC
  - degree pyuria not helpful
  - no pyuria and nitrate = no bacteriuria (NPV 100%)
  - look for a non-urinary source!

Norman, et al J Urol,1986;135:520

Monane, et al J Am Geriatr Soc,1995;43:618

Is a Culture Helpful?
Asymptomatic Bacteriuria

• Young girls	~1%
• Premenopausal married women	5%
• Pregnant women	2-7%
• Diabetic women	8-14%
• Comm-dwelling men > 75 yrs	6-15%
• Comm-dwelling women > 80 yrs	> 20%
• Hemodialysis	28%
• Spinal cord patients	> 50%

Diagnostic Testing in LTCF
Does a (+) Culture = UTI?

- Asymptomatic bacteriuria ($\geq 10^5$ cfu/mL) common
  - without catheters (15-50%)
  - with catheters (100%)
- Untreated asymptomatic bacteriuria-no catheter
  - persists for years
  - no ⇑ morbidity or mortality with no Rx
  - no benefits with Rx
  - risk resistance/side effects with Rx

Nicolle, et al. N Engl J Med,1983;309:1420; Nicolle, et al. Am J Med 1987;83:27
Nicolle LE et al. Clin Infect Dis 2005;40:643.

Bacteriuria in LTCF
UTI = Symptoms!

- What constitutes 'symptomatic' UTI?
  - **fever**
  - **afebrile - 2 or more sx**
  - **new sx or worsening**
  - **CVA tenderness**
  - **dysuria, frequency, urgency**
  - **nocturia, ⇑ incontinence**

Nicolle. ICHE 1993;14:220

- Low-grade temperature elevations (< 100ºF),
- **Single non-specific sx** confusion, anorexia or functional decline
  - **evaluation common**
  - **sx rarely due to UTI**

Berman. Age Ageing 1987;16:201

Revised McGeer Criteria
UTI (No Catheter)

1. Any One of the following:

   a) Acute dysuria OR acute pain/swelling testes, epididymis, or prostate

   b) Fever OR WBC AND

      One or more of the following:

      CVA or SP pain/tenderness
      gross hematuria

      new or marked increase:
      frequency, urgency, incontinence

   c) Two or more new or increased:
      frequency, urgency,
      incontinence, SP pain,
      new gross hematuria.

AND

Revised McGeer Criteria
UTI (No Catheter)

2. Voided urine culture with

a) $\geq 10^5$ cfu/ml any bug (s)

UTI = Localizing S/S and (+) urine culture

If no S/S, (+) UTI Dx if:
blood & urine organisms the same
no alternate source

Pyuria does not differentiate
Sx UTI from ASB

Absence of pyuria excludes UTI Dx

In the absence of a clear source:
Fever or rigors & (+) urine culture often leads to Rx
Evidence suggests that most episodes are NOT from a urinary source

Loeb M et al. Br Med J 2006;351:669-671; Stone NM et al. ICHE 2012;33:965.

Revised McGeer Criteria
UTI (Catheter*)

1. Any One of the following:
   a) Fever, rigors, OR new onset hypotension with NO alternate site of infection
   b) Either acute change MS OR acute functional decline with NO alternate diagnosis AND WBC
   c) New onset SP or CVA pain
   d) Purulent discharge around catheter or acute pain, swelling, tenderness testes, epididymis, or prostate

AND

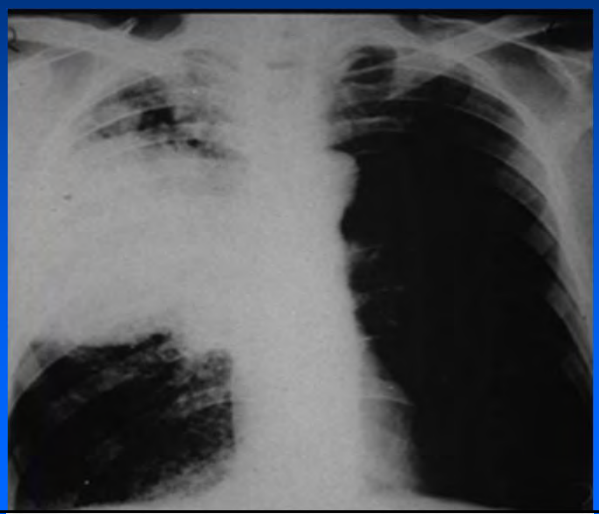
2. Urine has ≥ 10^5 cfu/ml of any organism(s). Obtained after catheter replaced if in > 14 days

* Chronic indwelling catheters

In the absence of a clear source in the catheterized pt:
Acute confusion & (+) urine culture often leads to Rx
Evidence suggests that most episodes are NOT from a urinary source

Other localizing signs consistent with UTI are not necessary for Dx e.g.,
recent catheter trauma
obstruction
new onset hematuria

Evaluation for Infection in LTCF
Respiratory Tract Infection



Respiratory Tract Infection in LTCF Recommendations

- Perform pulse oximetry if RR $\geq$ 25 breaths/min:
  - to document hypoxemia < 90%
  - assist in transfer/management decisions
- Perform CXR to:
  - identify new infiltrate compatible pneumonia
  - identify complications empyema, CHF, masses, effusions

Useful Diagnostics in LTCF Pulse Oximetry

- Hypoxemia (P_aO_2 < 60 mm Hg):
  - predicts severity and mortality in CAP and NHAP
- Hypoxemia (O_2 saturation < 90 %)
  - along with RR > 25 breaths/min
  - predicts impending respiratory failure

Fine,et al. N Engl J Med,1997;336:243; Mylotte, et al. J Am Geriatr Soc, 1998;46:1538; Chan CSB et al. JAGS 2007;55:414.; Kaye KS Am J Med Sci 2002;324:237.

Useful Diagnostics in LTCF Chest Radiography

Mednia-Walpole et al., JAGS,1999;47:1005;
Medina-Walpole et al., JAGS 1998;46:187;
Zimmer, et al. JAGS,1986;34:703;
Chan CSB et al. JAGS 2007;55:414

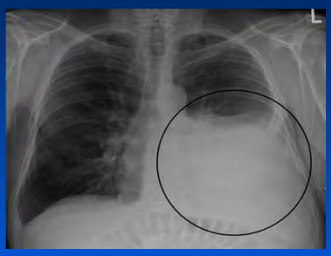
- An infiltrate on chest x-ray
  - most reliable Dx method for pneumonia
  - despite poor film quality
  - lack of prior film
  - predictive hospitalization and death
- CXR confirms 75-90% suspected pneumonia

Useful Diagnostics in LTCF Chest Radiography

- May reveal other conditions
  - multi-lobar involvement, pleural effusions, mass lesions
  - prompt transfer to hospital
  - prompt another procedure
  - change management/prognosis?
- Does CXR improve outcomes?

Magaziner, et al, JAGS 1991;39:1071; Medina-Walpole et al., JAGS 1998;46:187

Useful Diagnostics in LTCF
CXR – Other Conditions



Revised McGeer Criteria
Pneumonia

All of the following criteria must be met:

1. CXR positive for:
   a) pneumonia or new infiltrate
2. One or more resp S/S
   a) cough new/increased
   b) sputum new/increased
   c) 02 sat < 94% or reduced 3% from baseline
   d) abnl lung exam new or changed
   e) pleuritic chest pain
   f) RR > 25 breaths/min
3. One or more constitutional S/S

Absence of other conditions that could account for Sx, e.g., CHF

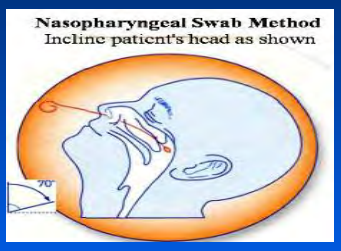
Lim WS et al. Eur Respir J 2001;18:362-368; Stone NM et al. ICHE 2012;33:965.

Respiratory Tract Infection in LTCF Sputum Gram Stain & Culture

- No data sputum data improves outcome
- Sputum ordered in 5-10% of pneumonia pts
- Sputum samples adequate/purulent in:
  - < 30% of residents, and < 50% of specimens
- Obtain sputum if available/purulent
- Consider urine antigen pneumococcus/legionella serotype 1

Geckler, et al J Clin Microbiol, 1977;6:396; Marrie, et al. J Am Geriatr Soc,1986;34:697; Bentley, et al. Rev Infect Dis,1981;3:871; Magaziner, et al, JAGS 1991;39:1071

Respiratory Tract Infection in LTCF Outbreaks - Recommendations



- For a suspected URI outbreak obtain:
  - NP swabs from symptomatic pts.
  - submit for rapid testing
- PCR now available:
  - influenza, other viruses
  - bacteria

Gomolin, et al. J Am Geriatr Soc,1995;43:71; Arden, et al. Arch Intern Med,1988;148:865

Respiratory Tract Infection in LTCF Viruses - Recommendations

- Influenza A can cause serious outbreaks
- Attack rates ~ 20-70%
- Complications are frequent
- Reduce morbidity and mortality by:
  - isolation
  - immunization
  - chemoprophylaxis
- Other viruses associated outbreaks
  - RSV, parainfluenza, coronaviruses, metapneumovirus, & rhinovirus

Bradley SF et al. ICHE 1999;20:629; Falsey AR et al. Clin Infect Dis 2006;42:518.

Infections in LTCF Respiratory Etiologies

• Viral*	influenza*, RSV*, parainfluenza, adenovirus, rhinovirus, metapneumovirus
• Bacterial	*S. pyogenes**, *S. pneumoniae* *Chlamydia pneumoniae* *Mycoplasma pneumoniae* *Hemophilus influenzae* *Chlamydia psittacosis* *Bordetella pertussis* *Mycobacterium tuberculosis*

Infections in LTCF
Primary & Secondary SSTIs

SSTI in LTCF
Primary Infections

- Group A streptococci, *S. aureus*
  - most frequent pathogens isolated
- Avoid superficial swabs cultures
- Culture pus or obtain deep tissue/biopsy
  - if initial Rx fails or unusual organism suspected.
- Tissue may be helpful in:
  - diabetic complications
  - presence of fluctuance
  - antibiotic failure

Sachs et al. Arch Intern Med,1990;150:1907; Lertzman BH et al. Drugs Aging 1996;9:109; Livesley NJ et al. Clin Infect Dis 2020;35:1390. Smith PW et al., ICHE 1999;20:358.

SSTI in LTCF
Secondary Wound Infections

- Always colonized with bacteria –
- Avoid superficial swab cultures
- Needle aspirates from ulcer margins:
  - low yield
  - technically difficult
  - poor specificity
- Tissue/surgical debridement optimal
- Osteomyelitis suspected?
  - MRI most sensitive
  - bone biopsy with histopath more specific

Nicolle, et al Clin Microbiol Rev,1996;9:1; Sapico et al. Diag Microbiol Infect Dis,1986;5:31; Nicolle, et al. Can J Infect Control,1994;9:35; Livesley NJ et al. Clin Infect Dis 2020;35:1390. Smith PW et al., ICHE 1999;20:358.

Revised McGeer Criteria
Cellulitis/Soft Tissue/Wound Infection

One of the following criteria met:

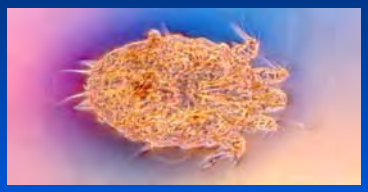
1. Pus present at a wound, skin, or soft tissue site.
2. Four or more new or increasing signs or sx at the site
   a) heat
   b) redness
   c) swelling
   d) tenderness or pain
   e) serous drainage
   f) one constitutional S/S

One or more beta hemolytic streptococcal infections may suggest an outbreak

Use NHSN SSI criteria

Superficial cultures of pressure ulcers are not sufficient for Dx

Infections in LTCF
Scabies



SSTI in LTCF
Scabies

- Cluster of unexplained rashes
  - residents
  - staff
- Transmission
  - person-to-person
  - fomites
- Clinical diagnosis difficult
  - identify all unexplained rashes
  - scrape for mites, eggs, or feces prior to any steroid use.
- Misdiagnosis pseudooutbreaks/psychogenic scabies

Haag. Geratrics,1993;48:45; Degelau. Infect Control Hosp Epidemiol,1992;13:421; Heukelbach J et al., Lancet 2006;367:1767; Chosidow O. NEJM 2006;354:1718.

Revised McGeer Criteria Scabies

Both of the following criteria met:

1. A maculopapular and/or itching rash

AND

2. One of the following:
   a) physician diagnosis
   b) scraping or biopsy +

   OR

   c) epidemiological linkage to a case of scabies with lab confirmation

Rule out noninfectious skin conditions such as eczema, allergy, and irritation.

Epi link = common source exposure, temporally related onset, & geographic proximity

Infections in LTCF Viral Skin Infections

- Herpes viruses (HSV & VZV)
  - diagnose by clinical presentation
  - scrape for giant cells by Tzanck prep
  - define virus by PCR or culture

McGeer Criteria - Unchanged Herpes Virus Skin Infections

1. Herpes simplex

Both of the following criteria met:

a) vesicular rash

AND

b) either physician diagnosis OR lab confirmation

2. Herpes zoster

Both of the following criteria met:

a) vesicular rash

AND

b) either physician diagnosis OR lab confirmation

Reactivation of H. simplex and H. zoster not considered an HAI

Primary herpes viral skin infections uncommon

Infections in LTCF Fungal SSTIs

- Mucocutaneous fungal infection
  - KOH prep is sufficient unless refractory to Rx
  - Send culture for drug-resistant species.

Revised McGeer Criteria
Fungal Oral/Perioral/Skin Infections

1. Oral candidiasis

Both of the following criteria met:

a) presence of raised white patches on inflamed mucosa OR plaques on oral mucosa

AND

b) medical or dental diagnosis

2. Fungal infection

a) characteristic rash or skin lesions

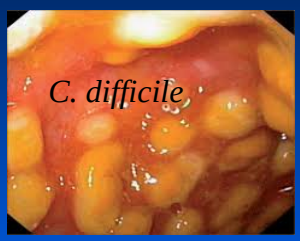
AND

b) either medical provider dx or lab confirmed smear, culture or bx

Mucocutaneous candida infections are due to comorbid conditions or antibiotics.

Non-candidal fungal infections rare & outbreaks uncommon.

Evaluation for Infection in LTCF
Diarrhea & Gastroenteritis



Infections in LTCF Gastroenteritis Etiologies

- Toxin-mediated disease

non-foodborne*	*Clostridium difficile**
food-borne	*Escherichia coli* 0157:H7
	Staphylococcus aureus
	Clostridium perfringens
	Bacillus cereus

Infections in LTCF Gastroenteritis Etiologies

- Non-invasive disease

viral*	norovirus*, rotavirus
parasitic	*Giardia lamblia*

- Invasive disease

bacterial	*Salmonella, Shigella*
	Campylobacter
parasitic	*Entamaeba histolytica*

GI Infections in LTCF Recommendations

- Small intestine/gastroenteritis (watery diarrhea)
  - if no outbreak, no lab evaluation is required
  - pts should be followed closely for volume repletion
  - if symptoms persist > 7 days or are severe, stool may be submitted for giardia and other protozoa.
- Colitis (fever, cramps, +/- diarrhea, +/- blood or WBCs)
  - especially if antibiotics < 30 days
  - evaluate for C. difficile toxin in stool
  - if negative and no prior antibiotics submit stool for invasive enteropathogens
- Intraabdominal infections/abscesses 2nd to gi pathology
  - uncommon and severe. Transfer warranted.

GI Infections in LTCF Diarrhea - Stool Evaluation

- *Clostridium difficile*-associated diarrhea
  - sporadic cases
  - outbreaks
- Dx should be suspected if:
  - antibiotic therapy in prior 30 days with
  - ≥ 3 watery or unformed stools in 24 hrs

Laboratory Tests
Diarrhea - Stool Evaluation

- Fecal WBCs
  - not an effective marker for *C. difficile*
  - not sensitive (60-75%)
  - not specific (30-39%)
- Sx invasive diarrhea with negative *C. difficile* toxin
  - fever, cramps and/or bloody diarrhea
  - *Campylobacter, Salmonella, Shigella* or ETEC

Johnson et al., Clin Infect Dis,1998;26:1027; Bennet. Infect Control Hosp Epidemiol,1993;14:397; Simor AE et al. ICHE 2002;23;696.; Smith PW et al. ICHE 2008;29:785.

McGeer Criteria –Unchanged Gastroenteritis

One criteria must be met:

A. Two or more loose or watery stools above pt baseline in 24 hrs

B. Two or more episodes of vomiting in 24 hrs

C. **Both** of the following

1. Stool specimen + for bacterial or viral pathogen

AND

1. At least **one** compatible gi symptom such as: nausea, vomiting, pain, diarrhea

Exclude non-infectious causes of symptoms due to medications or gallbladder disease

Revised McGeer Criteria
Norovirus Gastroenteritis

Both criteria must be met:

A. Two or more loose or watery stools above pt baseline **OR** two or more episodes of unexplained vomiting in 24 hrs

B. Stool specimen + for norovirus by EM, ELISA, or molecular test (PCR)

- In an outbreak, confirm the cause
- No confirmation, assume Dx by Kaplan Criteria

All criteria must be met:

a) vomiting > 50% affected

b) mean (median) incubation period 24-48 hrs

c) mean (median) duration illness 12-60 hrs

d) no bacterial cause ID'd

Lopman BA et al. CID 2004;39:318-324. Kaplan JE et al. Ann Intern Med 1982;96:756-761.

Revised McGeer Criteria
Clostridium difficile Infection

Both criteria must be met:

1. Diarrhea = 3 or more loose or watery stools above pt baseline within 24 hrs, or the presence of toxic megacolon by x-ray
2. One of the following:
   A. Stool + for toxin A or B, or by PCR.
   B. PMC found at endo-scopy, surgery, or by biopsy

1. Primary episode

a) no prior episode or

b) > 8 wks prior

2. Recurrent episode

a) ≤ 8 wks prior and sx had resolved

McDonald LC et al. ICHE 2007;28:140-145.

Bloodstream Infection in LTCF Recommendations

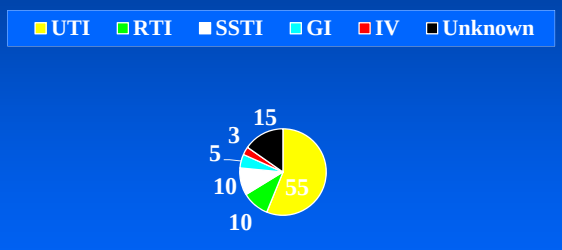
- Blood cultures not recommended for most pts unless;
  - highly suspected
  - access to laboratory diagnostics is rapid
  - physician response to + cultures is rapid
  - capacity to administer IV antibiotics is available
  - re-assess advanced directives
  - alters care decisions esp transfer

Diagnostic Tests Blood Cultures

- **Bloodstream infection (BSI) infrequent**
  - **5-40 BSI per 100,000 pt days**
  - **Only 6% infections complicated by BSI**

Nicolle. Clin Microbiol Rev1996;9:1

Secondary BSI (%)



Muder, et al. Clin Inf Dis,1992:14:647

Diagnostic Tests
Blood Cultures

- Most older adults have fever T≥100°F (85%)
- Mortality from BSI
  - overall rates (20-35 %)
  - highest in bacteremic pneumonia (50 %)
  - predictors WBC > 20k, hypotension
- With appropriate Rx, 50% die within 24 hrs
- Does early ID of BSI improve survival?

Muder, et al. Clin Infect Dis,1992;14:647; Mylotte JM et al. Clin Infect Dis 2002;35:1484.; Setia U et al., Arch Intern Med 1984;144:1633.

Diagnostic Tests
Blood Cultures (BCs)

- In selected settings, BCs may help establish:
  - diagnosis of polymicrobial sepsis:
    - suspected urosepsis with a catheter
    - stage 3 or 4 pressure ulcers
  - suspected infection and severity illness warrants transfer, but care given in NH

Nicolle, et al. Infect Ctrl Hosp Epidemiol, 2000;21:537
Nicolle, et al. Infect Ctrl Hosp Epidemiol, 1993;14:220
Downton, et al. Age Ageing,1987;41:41.
Mylotte JM. Infect Control Hosp Epidemiol 2005;26:833.

Infections in LTCF Transfers

- Unstable/aggressive Rx a goal
- Diagnostic tests not available
- Appropriate monitoring cannot be done
- Appropriate Rx (route, frequency, type) not possible
- Comfort measures cannot be assured
- Infection control measures not possible

Nursing Homes Evaluation of Fever & Infection

- Fever/function predictive infection
- Local signs/symptoms can be helpful
- Focus on most common syndromes
- Diagnostic tests can be useful
- Know the most common pathogens
- Establish when to transfer