

APIC - HICPAC Surveillance Definitions for Home Health Care and Home Hospice Infections

February 2008

Original Authors

APIC Home Care Membership Section 2000
Freda C. Embry, RN, MSN, CIC, Chair 1998-1999
Libby F. Chinnes, RN, BSN, CIC, Chair 2000-2001

HICPAC Ad Hoc Committee

Nancy B. Bjerke, RN, MPH, CIC HICPAC/APIC Facilitator
Russell Olmsted, MPH, CIC, HICPAC
Dr. Kurt Stevenson, MPH, HICPAC
Dr. Philip Smith, HICPAC
Dr. Nalini Singh, MPH, HICPAC
Freda C. Embry, RN, MSN, CIC, APIC
Libby F. Chinnes, RN, BSN, CIC, APIC
Mary Jane Ruppert, APIC
Emily Rhinehart, RN, MPH, CIC, CPHQ, AIG Consultants
Mary McGoldrick, MS, RN, CRNI, Home Care and Hospice
Consultant
Teresa Horan, MPH, NHSN
Mary Andrus, BA, RN, CIC NHSN

HICPAC Members 2006 and 2007

Dr. Patrick J. Brennan, Chair
Vicki L. Brinsko, RN, BA
Dr. Jeffrey Engel
Dr. Steven M. Gordon
Lizzie J. Harrell, PhD
Dr. David A. Pegues
Carol O'Boyle, PhD, RN
Dennis M. Perrotta, PhD, CIC
Harriett M. Pitt, RN, MS, CIC
Dr. Keith M. Ramsey
Dr. Nalini Singh, MPH
Dr. Kurt Stevenson, MPH
Dr. Philip W. Smith
Lillian A. Burns, MPH
Dr. E. Patchen Dellinger
Yvette S. McCarter, PhD
Denise M. Murphy, RN, MPH, CIC
Russell N. Olmsted, MPH, CIC
Barbara M. Soule, RN

Reviewers

Dr. William B. Baine, HICPAC AHRQ
Roslyne Schulman, MHA, MBA, HICPAC AHA
Joan C. Blanchard, RN, BSN, MSS, CNOR, CIC HICPAC
AORN
Rachel L. Stricof, MPH, HICPAC ACET
Sandra Fitzler, RN, HICPAC AHCA

The Association for Professionals in Infection Control and Epidemiology, Inc. (APIC) Home Care Membership Section published ***Draft definitions for surveillance of infections in home health care*** in December 2000. (Embry FC, Chinnes LF. AJIC 2000;28:449-53) As a guidance resource for Infection Control Professionals (ICPs) working in the home health care practice setting, these definitions have been used for seven years. APIC has requested and received support from the Centers for Disease Prevention and Control's (CDC's) Healthcare Infection Control Practices Advisory Committee (HICPAC) to revisit the draft definitions for surveillance of infections in home health care and to expand the application to include home hospice. HICPAC has agreed to support this final document for surveillance purposes.

A healthcare associated infection (HAI) is an infection that develops in a patient who is cared for in any setting in which healthcare is delivered (e.g., acute care hospital, chronic care facility, ambulatory clinic, dialysis center, surgicenter, home) and is related to receiving health care (i.e., was not incubating or present at the time healthcare was provided). In ambulatory and home settings, HAI applies to any infection that is associated with a medical or surgical intervention. Since the geographic location of infection acquisition is often uncertain, the infection is considered to be healthcare *associated*, rather than healthcare *acquired*. (Siegel et al. Fed. Reg. 2004;69(113):99) HAI criteria for home health care and home hospice are essential to the specific anatomical site definitions for HAI. Thus, **home care and home hospice healthcare associated infections (HAIs)** are those infections that were neither present nor incubating at the time of initiation of care in the patient's place of residence. For those infections

appearing in a patient within 48 hours of discharge from a healthcare facility, the infection(s) is reported back to the facility that discharged the patient prior to their home care services.

Background:

An estimated 1.2 million infections occur annually in approximately 8 million adult and pediatric home health care patients in the US. (Manangan et al. EID 2002;8(3):233-236) The predominant risk factor for a HAI is the presence of a medical device (i.e., catheters). Additionally, 20% of home health care patients require wound management. Patte and others identified an overall, single-day HAI point prevalence rate of 6.1% among a group of patients in France receiving home care, using CDC surveillance definitions developed for acute care; the majority of these HAIs involved the urinary tract. (Patte R JHI 2005;59:148-51) A study of the incidence of complications associated with central venous catheters in over 50,000 patients receiving home infusion found an incidence of 0.26 infections/1,000 catheter days and 0.19 infections/1,000 catheter days associated with the local cannula site and bloodstream infection (BSI) respectively. (Moureau N et al. JVIR 2002;13:1009-16) This incidence is similar to that reported by Gorski: 0.77 infections/1,000 central venous catheter days; however, site definitions used in this investigation differed from those used by Patte. (Gorski LA JIN 2004;27(2):104-11) Still, there are few studies of infectious outcomes among those receiving home care; and despite calls for validation and reproducibility of definitions and methods for surveillance, progress remains limited to date. (Manangan LP et al EID 2002;8:233-6) Therefore, a surveillance system for the home health care and hospice practice settings is essential to better describe the incidence and epidemiology of HAIs among those receiving home care services and hospice care.

Several issues have precluded in-depth validation and study of reproducibility of the draft home health care definitions. (Manangan LP EID 2002;8:233-6) First, a survey of several home care agencies found that just over half of 95 agencies supported a trained, designated ICP to oversee their HAI surveillance program. (Manangan LP ICHE 2000;21:114 (abstr)) Second, patients may be served by more than one care agency and provider of care (i.e., home health care personnel, dialysis staff, family caregiver, etc.), a circumstance that inhibits the capture of outcomes if patients receive care from a provider other than the initial agency. Third, specimen collection and convenient access to both clinical and laboratory data among those patients are often lacking in the home care setting. Finally, reporting, collation, and analysis of outcome indicators and processes may be limited and/or incomplete.

Criteria for infection definitions in acute care health facilities usually include combinations of clinical findings and results of laboratory and other diagnostic tests. Laboratory testing and radiological procedures are performed infrequently for hospice patients due to their limited life expectancy and patients in the home. For these home health care and hospice patient populations, reliance is largely on clinical observations to assess changes in the patient's status, made by the patient's health caregivers and providers, and is the basis for these definitions. As a result, there is an introduction of subjectivity and variability in both observations and associated documentation, which must be acknowledged.

Goals and Purpose of Surveillance:

The goals, purpose and infrastructure of an effective surveillance program have been previously described. (Lee TB et al. AJIC 1998;26:277-88; Friedman C et al. ICHE 1999;20:695-705; CDC. MMWR 2001;50(RR13); Lee TB et al. AJIC 2007;35:427-440) In brief, these remain as stated: to enhance the safety and quality of patient care provided, to reduce morbidity and mortality, and to improve health regardless of the practice setting.

Home health care agencies and home hospices must establish HAI definitions for the purpose of surveillance before initiating a surveillance program tailored to the patient receiving health care in the home environment. Definitions should be consistently used in the collection, analysis, and reporting of infection data. Surveillance definitions of infection are not intended to be used to make clinical decisions

or determine treatments. Definitions developed for the purpose of surveillance may be of limited value in an outbreak investigation as a specific case definition is usually required.

The purpose of surveillance in home health and hospice care is to assess the safety and quality of patient care provided by establishing a baseline at each agency, to monitor trends within the agency, to use findings to improve care, and to prevent HAI and other complications. Valid written definitions enhance consistency, accuracy, and reproducibility of the surveillance data; however, definitions are only one piece of surveillance. As has been learned within acute care practice settings, those who desire interfacility or, in this case, interagency comparison are advised to use caution when attempting to compare outcomes as there are a multitude of variables that can affect accuracy of indicators from one agency to the next. Until a standard set of HAI definitions for home health care and home hospice are finalized and implemented within a surveillance program and surveillance data analyzed, a lack of realistic incidence per site exists. A risk assessment of the population served and range of services provided should be a starting point to identify appropriate process and outcome indicators. (Lee TB et al. AJIC 1998;26:277-88; Lee TB et al. AJIC 2007;35:427-440)

Data collectors should be trained in the written definitions adopted by the agency. Among the limitations to surveillance in home health care and hospice are that assigned surveillance personnel may not have infection control training or access to a trained infection control professional or epidemiologist. Access to consultation with a hospital ICP or other infection control resource would be beneficial to the designated staff responsible for collecting, analyzing, and interpreting the surveillance data. Data also must be analyzed and interpreted. Numerator data (number of infections) may detect problems within an agency, but infection rates should be calculated to monitor meaningful trends. Denominators (population at risk) will also vary based on accessibility of information within each agency and may require novel approaches to capture reliable data for comparison, such as device days/month, patient census, or both. Lastly, information gathered from surveillance must be reported to and be used by those who will be most able to affect and improve the safety and quality of patient care.

The rationale for HAI surveillance among patients receiving home health and hospice care can be assessed with both process and outcome measures.

Process objectives may include, but are not limited to:

- a. Adherence to published standards, conditions and/or recommendations from accrediting bodies, regulatory agencies, and third party payors.
- b. Compliance with hand hygiene practices, provision of recommended immunizations, and management of invasive medical devices (e.g., insertion, maintenance, and securement of catheters) by agency personnel
- c. Appropriateness of medical device use and possibly of antimicrobial therapy
- d. Training and competence of care provided by family or other members of the patient's support system in the home
- e. Evaluation of specific infection prevention and control measures
- f. Impact of education and training to patient and health caregivers
- g. Identification and reporting healthcare associated infections back to the facility (i.e., hospital, ambulatory surgical centers, long term care facility, etc.) where the patient received the care
- h. Identification of possible trends, outbreaks, or newly emergent infectious diseases in the community

Outcome measures should not focus on intercurrent illness (e.g., viral respiratory or gastrointestinal infections) that a patient may develop while receiving home care, but rather those outcomes associated with processes of care provided by the agency's personnel, such as device-associated infections. These outcome measures may include, but are not limited to:

- a. Vascular access device infections
- b. Central line associated bloodstream and local cannula infections

- c. Peripheral line associated bloodstream infections
- d. Catheter associated urinary tract infections
- e. Skin and soft tissue infections (i.e., pressure ulcers or other wounds) acquired during home care

Primary outcome objectives include reductions in morbidity, emergent care, acute care hospitalizations, mortality, and cost.

Terminology:

Home Care Services are health care provided in the home setting by providers of home health care, home hospice, home infusion therapy, and durable medical equipment for the home.

Home Health Care is defined as health care provided to individuals and families in their places of residence for the purpose of promoting, maintaining, or restoring health or for maximizing the level of independence while minimizing the effects of disability and illness, including terminal illness. (Access at: <http://www.cdc.gov/nchs/about/major/nhhcsd/nhhcsdefhomehealth.htm>)

Home Hospice Care is a program of palliative and supportive care services providing physical, psychological, social, and spiritual care for dying persons, their families, and other loved ones. Hospice services are available in both the home and inpatient settings. Home hospice care is provided on part-time, intermittent, regularly scheduled, and around-the-clock basis. Bereavement services and other types of counseling are available to the family and other loved ones. (Access at: <http://www.cdc.gov/nchs/about/major/nhhcsd/nhhcsdefhospicecare.htm>)

Health care professionals include, but are not limited to, physicians, nurse practitioners, clinical nurse specialists, physician assistants, registered nurses, infusion therapists, licensed practical or vocational nurses, ancillary personnel delivering bedside care (e.g., equipment, supplies, nutrition, etc.), respiratory care practitioners, and rehabilitation staff (i.e., physical therapist).

A **surgical site infection** (SSI) occurring within 30 days from the date of surgery is considered a HAI SSI. Infection related to a surgically implanted, nonhuman device are counted as a HAI SSI for up to 1 year from the date of surgery. A SSI meeting these criteria is reported to the facility where the surgery was performed, if information is available. Therefore, a SSI definition is included in the surveillance program for a home care agency as an informational reference to assist the home health and hospice care personnel in identifying the SSI before reporting their findings back to the facility in which the surgical procedure was performed.

Home Infusion Therapy involves the administration of medications using intravenous, subcutaneous, and epidural routes in the home setting. Drug therapies commonly administered via infusion in the home setting include antimicrobials, chemotherapy, pain management, parenteral nutrition, and immune globulin. Providers of home infusion therapy services include registered nurses to ensure proper patient education and training and to monitor the care of the patient in the home, pharmacists, pharmacy technicians, and delivery personnel.

Durable Medical Equipment Services provided in the home include the provision of respiratory therapy equipment and its related supplies (e.g., ventilators, oxygen therapy, continuous pressure airway pressure equipment), enteral therapy products, other medical equipment (e.g., hospital beds), and ambulatory aids. Providers of care may include respiratory therapists, technicians, and delivery personnel.

Temporal Association:

Describing an infection as home health and/or hospice healthcare associated does not necessarily indicate that the infection was caused by the home health agency or hospice personnel. The association is temporal (related to a time, place, or event), not causal. In addition, culpability, preventability, and etiology of the organism involved are not part of the definition of a HAI that occurs in the home health care or hospice setting. Because patients are in their own residence and receiving care over a prolonged period of time, many intercurrent illnesses and infections likely reflect exposure to microbes from other family members, visitors, or home environments. Additionally, there are parallels that can be drawn to long term care wherein exposure and infection incidents may not necessarily reflect association with medical devices.

Certain underlying conditions or therapies place patients at greater risk for infection. These conditions or therapies include, but are not limited to, extremes of age, underlying diseases, stress, nutritional status, immunosuppression, trauma, wounds, and burns.

Other elements not directly associated with a person's health status can also make a patient particularly susceptible to infection. Extrinsic factors include socioeconomic status, therapeutic instrumentation (e.g., venous access devices, urinary catheters), therapeutic modalities (e.g., radiation, cancer chemotherapy), lifestyle (e.g., alcoholism, drug abuse), personal hygiene, medications, occupational history, and presence or absence of able and willing caregivers.

Various environmental factors also may contribute to the development of infection in a patient receiving home health care and hospice. Poor sanitation, inadequate plumbing, contaminated supplies and equipment, exposure to the elements (i.e., cold, heat, and water), rodent or insect infestation, and exposure to contagion are all factors that may increase the risk of acquiring infection.

An additional influencing factor in the development of infection is referred to as an agent factor. Agent factors include the number of microorganisms to which an individual is exposed (infectious dose), the ease and mode of transmission, and virulence (ability to cause disease) of the organism.

Criteria for Home Healthcare Associated Infection (HAI):

The evaluation of a suspected infection should include consideration of whether the symptoms are new or acutely worse from the established baselines. Non-infectious causes also must be considered. The definition of infection includes more than a single sign or symptom. Physician diagnosis should be accompanied by compatible signs and symptoms of infection in most cases. Laboratory reports (microbiology and serology findings) alone are not used to define infection, but may be used adjunctively as supportive evidence to confirm infection.

The idea of using a designated temperature for fever is controversial, especially as many elderly persons have minimal or no temperature increase, and not all agencies perform routine temperature checks on every patient in the absence of direct indications. However, for surveillance purposes, fever needs to be specified. Therefore, **fever** is present when the patient's temperature is 2.4 F degrees greater than the baseline temperature. This is important to note since normal temperature in the elderly is usually lower than 98.6 F. An elderly patient can be running a fever at 99.0. (Resident Assessment Instrument /RAI).

Defining **infection** in a patient receiving home health and/or hospice care depends upon a **new** sign(s) or symptom(s) identified by a clinician or other healthcare personnel. Supportive evidence from laboratory or other diagnostic testing can be used to confirm support criteria for a possible HAI.

The following definitions by anatomical site are provided as criteria to identify home and hospice HAIs in those patient populations and are fundamental to establishing a surveillance program. Surveillance programs are geared toward prevention of these adverse outcomes in the patient population.

Urinary Tract Infections (UTI)

Symptomatic Urinary Tract Infections (SUTI)

Symptomatic urinary tract infections (SUTI) can occur without prior instrumentation (e.g., intermittent catheterization), but this is rare.

Catheter-associated Urinary Tract Infections (CAUTI)

Catheter-associated urinary tract infections (CAUTI) are associated with instrumentation of the patient's urinary tract prior to onset. To associate these infections with an indwelling urinary catheter requires presence of an indwelling urinary catheter at the time of or within 7 days before the onset of the symptomatic UTI.

Symptomatic and catheter-associated urinary tract infections must meet **one** of the following criteria:

1. **Two** of the following four signs or symptoms:
 - a. Fever **OR** chills with no other external urinary source noted
 - b. Flank pain **OR** suprapubic pain **OR** tenderness **OR** frequency **OR** urgency
 - c. Worsening of mental **OR** functional status
 - d. Changes in urine character (e.g., new bloody urine, foul odor, increased sediment) **AND** urinalysis or culture is not done
2. **One** of the following two signs or symptoms:
 - a. Fever **OR** chills
 - b. Flank pain **OR** suprapubic pain **OR** tenderness**AND both** bacteriuria (determined by a positive urine culture for a potential pathogen or a positive nitrite assay by dipstick) **and** pyuria (determined by 10 or more wbc/hpf on urinalysis or positive leukocyte esterase assay by dipstick).

NOTE: Asymptomatic urinary tract infections are not included in these definitions.

Respiratory Tract Infections

Influenza-like Illness (ILI)

An **Influenza-like Illness (ILI)** must meet **both** of the following criteria:

1. Fever
2. Presence of **three** of the following six signs or symptoms:
 - a. Chills
 - b. New headache **OR** eye pain
 - c. Myalgia
 - d. Malaise **OR** loss of appetite
 - e. Sore throat
 - f. New **OR** increased cough

NOTE: This diagnosis will usually be made during influenza season: October through March, except in an influenza pandemic.

NOTE: During influenza season, if criteria for influenza-like illness **AND** upper **OR** lower respiratory tract infection are met at the same time, the infection should be recorded only as an influenza-like illness.

Lower Respiratory Infections (LRI) (i.e., Bronchitis, Pneumonia)

The patient has not had a chest film **OR** the chest film did not confirm pneumonia **AND three** of the following seven signs or symptoms are present:

1. New **OR** increased cough
2. New **OR** increased sputum production

3. New **OR** increased purulence of sputum
4. Fever
5. Pleuritic chest pain

6. New **OR** increased physical finding on chest examination
 - a. Rales
 - b. Rhonchi
 - c. Bronchial breathing
7. Change in status or breathing difficulty
 - a. New **OR** increased shortness of breath
 - b. Respiratory rate >25 per minute
 - c. Worsening mental or functional status

NOTE: Noninfectious causes, such as congestive heart failure, should be ruled out.

NOTE: If the patient has a chest x-ray interpreted as pneumonia, probable pneumonia, or the presence of an infiltrate, and meets the above criteria for LRI, it is counted as Pneumonia.

Bloodstream Infections (BSI)

Primary Bloodstream Infection (BSI)

Primary bloodstream infection (BSI) includes laboratory-confirmed bloodstream infection (LCBSI) and clinical sepsis (CSEP). A positive blood culture alone may be used to define bacteremia.

Laboratory-confirmed bloodstream infection (LCBSI)

Laboratory-confirmed bloodstream infection (LCBSI) must meet **one** of the following three criteria:

1. Patient has a recognized pathogen cultured from one or more blood cultures **AND** organism cultured from blood is not related to an infection at another site.
2. Patient has at least **one** of the following three signs or symptoms:

- a. Fever
- b. Chills
- c. Hypotension

AND signs and symptoms and positive laboratory results are not related to an infection at another site

AND common skin contaminant (e.g., diphtheroids, *Bacillus* spp., *Propionibacterium* spp., coagulase-negative staphylococci, or micrococci) cultured from two or more blood cultures drawn on separate occasions

3. Patient aged <1 year has at least **one** of the following four signs or symptoms:

- a. Fever
- b. Hypothermia
- c. Apnea
- d. Bradycardia

AND signs and symptoms and positive laboratory results are not related to an infection at another site

AND common skin contaminant (e.g., diphtheroids, *Bacillus* spp., *Propionibacterium* spp., coagulase-negative staphylococci, or micrococci) cultured from two or more blood cultures drawn on separate occasions

NOTE: When an organism that is isolated from a blood culture is compatible with a related infection at another site, the bloodstream infection is classified as a secondary bloodstream infection

NOTE: Infections related to intravascular access devices are classified as primary, even if localized signs of infection are present at the access site.

Clinical Sepsis (CSEP)

Clinical sepsis (CSEP) must have at least **one** of the following clinical signs with no other recognized cause:

1. Fever
2. Hypotension (systolic pressure <90 mm Hg)
3. Oliguria (<20 mL/hr)
4. Hypothermia
5. Apnea
6. Bradycardia

AND blood culture is not done **OR** no organisms detected in blood

AND no apparent infection at another site

AND physician institutes treatment for sepsis

AND hospital admission for clinical sepsis and/or death due to clinical sepsis

IV Catheter Site Infection

See **Skin and Soft Tissue Infection**

Skin and Soft Tissue Infections

Cellulitis/soft tissue/non-surgical wound/decubitus ulcer/foreign body site (e.g., gastrostomy, jejunostomy, tracheostomy)/around foreign bodies (e.g., PEGs, drains, catheters) infections must meet at least **one** of the following two criteria:

1. Purulent drainage at the wound, skin or soft tissue site **OR**
2. **Four** or more of the following six signs or symptoms with no other recognized cause:
 - a. Fever **OR** worsening mental or functional status
 - b. Pain **OR** tenderness at the affected site
 - c. Localized swelling at the affected site
 - d. Redness at the affected site
 - e. Heat at the affected site
 - f. Serous discharge at the affected site

Fungal Skin Infection

A **fungal skin infection** must meet **both** maculopapular rash **AND** either physician diagnosis **OR** laboratory confirmation must be present.

Herpes Simplex or Zoster Infection

A **herpes simplex or zoster infection** must meet **both** a vesicular rash **AND** either physician diagnosis **OR** laboratory confirmation must be present.

Surgical Site Infections (SSI)

A **surgical site infection (SSI)** occurring within 30 days from the date of surgery is considered a HAI SSI. Infection related to a surgically implanted, nonhuman device is counted as a HAI SSI for up to 1 year from the date of surgery. A SSI meeting these criteria is reported to the facility where the surgery was performed, if information is available. Therefore, SSI definitions are included in the surveillance program for the home health and hospice care agency to assist in identifying the SSI before reporting their findings back to the facility where the surgical procedure was performed.

A **surgical site infection (SSI)** must meet the following criteria:

1. Infection occurs within 30 days after the operative procedure if no implant is left in place **OR** within one year if implant is in place and the infection appears to be related to the operative procedure **AND**

2. **Two** of the following seven signs or symptoms:
 - a. Purulent drainage from the incision OR drain
 - b. Pain or tenderness
 - c. Localized swelling
 - d. Redness
 - e. Heat
 - f. Spontaneous dehiscence of the incision
 - g. Fever

NOTE: Surgical site infections should be considered healthcare associated infections and reported to the facility where the surgery was performed.

Eye, ear, nose, and mouth infections

Conjunctivitis

Infective conjunctivitis must meet **one** of the following two criteria:

1. Pus from one or both eyes
2. Redness with or without itching or pain

NOTE: Both trauma and allergies must be ruled out.

Ear Infection

An **ear infection** must meet **one** of the following two criteria:

1. Physician diagnosis
2. New purulent drainage fluid in the middle ear accompanied by ear pain or tympanic redness

Sinusitis

Sinusitis must meet at least **one** of the following three criteria:

1. Physician diagnosis
2. Organisms cultured from purulent material from the sinus cavity
3. **One** of the following four signs or symptoms with no other recognized cause:
 - a. Fever
 - b. Pain **OR** tenderness over the involved sinus
 - c. Headache
 - d. Purulent exudates **OR** nasal obstruction

Oral Infection

Oral infections must be physician diagnosed.

NOTE: Oral thrush is the presence of white patches in the oral cavity.

Gastrointestinal Infections

Gastroenteritis

Gastroenteritis must meet **one** of the following three criteria:

1. Two or more loose watery stools in 24 hours above what is normal for the patient
2. Two or more vomiting episodes in 24 hours
3. **Both** a stool culture positive for a gastrointestinal pathogen **AND** any of the following four signs or symptoms:
 - a. Nausea
 - b. Vomiting

- c. Abdominal pain or tenderness
- d. Diarrhea

NOTE: Non-infectious causes, such as tube feeding or medication side effects, must be ruled out.

***Clostridium difficile*-Associated Diarrhea (CDAD)**

***Clostridium difficile* associated diarrhea (CDAD)** meets **both** of the following criteria:

1. Two or more loose watery stools in 24 hours above what is normal for the patient
2. A positive assay for *Clostridium difficile* toxin

NOTE: Report suspected ***Clostridium difficile*-Associated Diarrhea (CDAD)** to the healthcare facility from which the patient was discharged.

REFERENCES

Association for Practitioners in Infection Control and Epidemiology, Inc. (APIC) and Missouri Alliance Home Care (MAHC). **Home Care Handbook of Infection Control**. Chinnes L, Dillon A, Fauerbach L eds. 2002.

Centers for Disease Control and Prevention (CDC). Guidelines for evaluating surveillance systems. **MMWR** 1988;37(S-5):1-18.

Centers for Disease Control and Prevention (CDC). National nosocomial infections surveillance system (NNISS). Nosocomial infection rates for interhospital comparison: limitations and possible solutions. **Infect Control Hosp Epidemiol** 1991;609-612.

Centers for Disease Control and Prevention (CDC). National nosocomial infections surveillance system report, data summary from January 1992 to June 1992. **AJIC** 2002;30(8):458-475.

Centers for Disease Control and Prevention (CDC). Guidelines for the prevention of intravascular catheter-related infections. **MMWR** 2002;51(No.RR-10):1-29.

Centers for Disease Control and Prevention (CDC). National nosocomial infections surveillance system report, data summary from January 1992 to June 1993. **AJIC** 2003;31(8):481-498.

CDC definitions of nosocomial infections. In Mayhall CG, ed. **Hospital Epidemiology and Infection Control**. St Louis: Mosby, 2004.

Dalby DM et al. Risk adjustment methods for Home Care Quality Indicators (HCQIs) based on the minimum data set for home care. **BMC Health Services Research** 2005;5:7

Danzig L, Short L, Collins K, Mahoney M, Sepe S, Bland L, Jarvis W. Bloodstream infections associated with a needleless intravenous infusion system in patients receiving home infusion therapy. **JAMA** 1995;23:1862–1864.

Di Fiore JM, Arko MK, Miller MJ, Krauss A, Betkerur A, Zadell A, Kenney SR, and Martin RJ. Cardiorespiratory Events in Preterm Infants Referred for Apnea Monitoring Studies. **Pediatrics** 2001;108:1304 –1308.

Do AN, Banerjee R, Barnett B, Jarvis W. Bloodstream infection associated with needleless device use and the importance of infection control practices in home health care setting. **JID** 1999;179:442-4428.

- Embry F, Chinnes L. Draft definitions for surveillance of infections in home health care. *AJIC* 2000;28:449-453.
- Emori I, Culver D, Horan T. National Nosocomial Infections Surveillance System (NNIS): Description of surveillance methods. *AJIC* 1991;19: 259–267.
- Ferrell BA et al. Pressure ulcers among patients admitted to home care. *J Am Geriatr Soc* 2000 Sep;48(9):1042-7.
- Friedman M. Designing an infection control program to meet JCAHO standards. *Caring* 1996; 15:18–25.
- Friedman M, Rhinehart E. Improving Infection Control in Home Care: From Ritual to Science-based Practice. *Home Healthcare Nurse* 2000;2:99-106.
- Friedman M, Rhinehart E. **Putting Infection Control Principles into Practice in Home Care.** Philadelphia, PA: Mosby/Abrutyn, 2000.
- Garner J, Jarvis W, Emori T, Horan T, Hughes J. CDC definitions for nosocomial infection. *AJIC* 1988;16:28–40.
- Goldmann D, Pier J. Pathogenesis of infections related to intravascular catheterization. *Clin Microbiol Rev* 1993;6:176–192.
- Gorski L. Central venous access device outcomes in a homecare agency: a 7-year study. *J Infus Nurs* 2004;27(2):104-11.
- Kellerman S, Shay D, Howard J, Goes C, Feusner J, Rosenberg J, Vugia D, Jarvis W. Bloodstream infections in home infusion patients: The influence of race and needleless intravascular access devices. *J of Peds* 1996;129:711–717.
- Kunin C, McCormack R. Prevention of catheter-induced urinary tract infections by sterile closed drainage. *NEJM* 1966;274:1155–1162.
- Lee T, Baker O, Lee J, Scheckler W, Steele L, Laxton C. Recommended practices for surveillance. *AJIC* 1998;26:277–288.
- Lee TB, Montgomery OG, Marx J, Olmsted RN, Scheckler WE. Recommended practices for surveillance: Association for Professionals in Infection Control and Epidemiology (APIC), Inc. *AJIC* 2007;35:427-440.
- Lee T, Baker-Montgomery O. Surveillance. In **APIC Text of Infection Control and Epidemiology.** J. Pfeiffer, ed. APIC: Washington, DC, 2000.
- Leuhm D, Fauerbach L. Task force studies infection rates, surgical management, and foley catheter infections. *Caring* 1999;18(11):30-34.
- Long C, Anderson C, Greenberg E, Woomer N. Defining and monitoring indwelling catheter-related urinary tract infections. *Home Healthcare Nurse* 2002;20(4):255-262.
- Lorenzen A, Itkin D. Surveillance of infection in home care. *AJIC* 1992;20:326–329.
- Madigan EA et al. An examination of the most frequent adverse events in home care agencies. *Home Health Nurse* 2004 Apr;22(4):256-62

Manangan LP et al. Feasibility of national surveillance of health-care-associated infections in home-care settings. *EID* 2002;8(3):233-6.

Martone W, Gaynes R, Horan T, Danzig L, Emori T, Monnet D, Stroud L, Wright G, Culver D, Banerjee S. National Nosocomial Infections Surveillance (NNIS) semiannual report, May 1995. *AJIC* 1995;23:377–385.

McCarthy PL, Jekel JF, Stashwick CA, Spiesel SZ, Dolan TF, Sharpe MR, Forsyth BW, Baron MA, Fink HD, Rosenbloom ML, Etkin T, and Zelson JH. Further Definition of History and Observation Variables in Assessing Febrile Children. *Pediatrics* 1981;67:687-693

McDonald LC and Ad Hoc *Clostridium difficile* Surveillance Working Group. Recommendations for Surveillance of *Clostridium difficile*-Associated Disease. *Infect Control Hosp Epidemiol* 2007;28:140-145.

McGeer A, Campbell B, Emori T, Hierholzer W, Jackson M, Nicolle L, Peppler C, Rivera A, Schollenberger D, Simor A. Definitions of infection for surveillance in long-term care facilities. *AJIC* 1991;19:1–7.

McGoldrick M. Infection Surveillance, Identification and Reporting. **Home Care Infection Prevention and Control Program**. GA: Home Health Systems, 2007.

Missouri Home Care Alliance. Infection Surveillance Project. 2004
www.infectioncontrolathome.org/bc_group_rate.htm.

Moureau N, Poole S, Murdock M, Gray S, Semba C. Central venous catheters in home infusion care: outcomes analysis in 50,470 patients. *J Vas Intervent Radiol* 2002;13(10):1009-16.

National Healthcare Safety Network (NHSN) Manual Patient Safety Component Protocol
Access: http://www.cdc.gov/ncidod/dhqp/pdf/nhsn/NHSN_Manual_Patient_Safety_Protocol052407.pdf

Patte R et al. Prevalence of hospital-acquired infections in a home care setting. *J Hosp Infect* 2005 Feb;59(2):148-51.

Perlman J and McGowan JE. Temperature Regulation: Issues of Hypothermia and Hyperthermia in Neonatal Resuscitation. Baltimore, MD. The Johns Hopkins University School of Medicine lecture.

Rhinehart E. Infection control in home care. *EID* 2001;7(2):208-11.

Rhinehart E, McGoldrick M. **Infection Control in Home Care and Hospice**. MA: Jones and Bartlett, 2006.

Rosenheimer L, Embry F, Sanford J, Silver S. Infection surveillance in home care: device-related incidence rates. *AJIC* 1998;26(3):359-363.

Schantz M. Infection control comes home. *Home Health Care Management and Practice*. 2001;13(2):126-133.

Schantz M. Infection control in the home. *Caring* 2002 Aug;21(8):40-3.

Schmitt BD. Fever in Childhood. *Pediatrics* 1984;74:929-936.

Shaughnessy PW et al. Improving patient outcomes of home health care: findings from two demonstration trials of outcome-based quality improvement. *J Am Geriatr Soc* 2002 Aug;50(8):1354-64.

Skiest D, Grant P, Keiser P. Nontunneled central venous catheters in patients with AIDS are associated with lower infection rate. *J Acquired Immune Deficiency Syndrome* 1998;17(3):220-226.

Sturkey EN et al. Improving wound care outcomes in the home setting. *J Nurs Care Qual* 2005; 20(4):349-55.

Tokars J, Cookson S, McArthur M, Boyer C, McGeer A, Jarvis W. Prospective evaluation of risk factors for bloodstream infection in patients receiving home infusion therapy. *Ann of Intern Med* 1999;131(5):340-351.

White M. Infection and infection risks in home care. *Infect Control Hosp Epidemiol* 1992;13:535–539.

White M, Ragland K. Surveillance of intravenous catheter–related infections among home care clients. *AJIC* 1993;21:231–235.

World Health Organization: Department of Reproductive Health and Research (RHR) Thermal protection of the newborn: a practical guide (WHO/RHT/MSM/97.2) Geneva 1997

Wong ES. Centers for Disease Control (CDC). Guideline for Prevention of Catheter-associated Urinary Tract Infections. *Infection Control* 1981;10:3-10.

Woomer N, Long C, Anderson C, Greenberg E. Benchmarking in home health care: a collaborative approach. *Caring* 1999;18(11):22-28.