TRANSMISSION-BASED PRECAUTIONS

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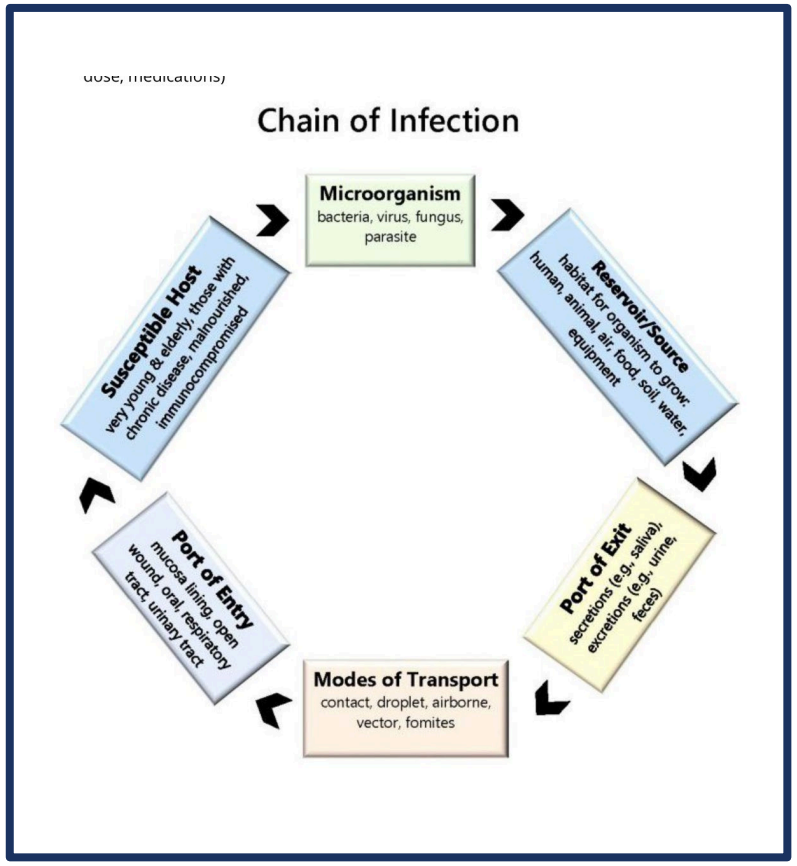
DISCLOSURE

- I, Purisima Linchangco have NO financial disclosure or conflicts of interest with the presented material in this presentation.

OBJECTIVES

1. Review the elements of the Chain of Infection.
2. Define Standard Precautions and enumerate the infection control components of Standard Precautions.
3. Discuss Transmission-Based Precautions and the three main types – Contact, Droplet, and Airborne as well as Syndromic and Empiric Transmission-Based Precautions.

CHAIN OF INFECTION



Transmission of infectious agents within a healthcare setting requires three elements:

I. Sources (reservoir) of infectious agents

II. Susceptible host with portal of entry receptive to the agent

III. Mode of transmission for the agent

CHAIN OF INFECTION

Sources

- Human reservoirs – patients, healthcare personnel and household members and other visitors.
- Inanimate environmental sources – contaminated environmental surfaces/equipment

Susceptible hosts

- Host factors – age, co-morbidities, nutrition, medications, surgical procedures and radiation therapy, and presence of indwelling devices (urinary catheters, endotracheal tubes, central venous and arterial catheters, and synthetic implants).

Modes of transmission

- Contact – Direct, Indirect
- Droplet
- Airborne

STANDARD PRECAUTIONS

Standard Precautions – include a group of infection prevention practices that apply to **all patient care activities**, regardless of suspected or confirmed infection status, in any setting in which healthcare is delivered.

Standard precautions are not only intended to protect the health care personnel but are also used to protect patients by ensuring that healthcare personnel do not carry infectious agents to patients on their hands or via equipment used during patient care.

These include:

hand hygiene, use of personal protective equipment (PPE), environmental cleaning and disinfection, resident placement, respiratory hygiene/cough etiquette, safe injection practices and proper handling of textiles and laundry.

STANDARD PRECAUTIONS

Components of Standard Precautions:

1. **Hand hygiene** – most healthcare-associated infections (HAIs) are transmitted by the hands of healthcare personnel (hcp), therefore hand hygiene either with alcohol-based hand rub (ABHR) or soap and water is the most important intervention to prevent HAI.
2. **Use of Personal Protective Equipment (PPE)** – Always use PPE when there is a possibility of being exposed to blood and body fluids and use PPE only one time.
3. **Environmental cleaning and disinfection** – use environmental protection agency (EPA) approved products and follow the contact time of the disinfectant product, and always clean and disinfect high touch surfaces often.
4. **Resident placement** – private rooms are the best way to prevent infection spread, if not available cohort residents colonized or infected with the same organism.
5. **Respiratory hygiene and cough etiquette** – staff should not come to work if with respiratory symptoms, always cover your cough, and educate residents to cover their cough.
6. **Safe injection practices** – always use safety engineered sharps devices, do not reuse single-use syringes and needles, only use sharps provided by the facility and as much as possible do not share blood glucose meters.
7. **Proper handling of laundry** – treat all soiled linens as potentially infectious.

TRANSMISSION-BASED PRECAUTIONS

Transmission-Based Precautions - are the 2nd tier of basic infection control and are to be used **in addition** to Standard Precautions for patients with documented or suspected infection or colonization with highly transmissible or epidemiologically-important pathogens for which **additional precautions** *are needed* to prevent transmission.

Extend duration of Transmission-Based Precautions, (e.g. Droplet, Contact) for *immunosuppressed patients* with viral infections due to prolonged shedding of viral agents that may be transmitted to others.

Three main types/categories:

1. Contact,
2. Droplet
3. Airborne

There are infectious diseases with **multiple routes of transmission** therefore, **more than one Transmission-Based Precautions category may be used** e.g. Contact + Droplet+ Standard, Contact + Droplet with N-95 or higher respirators

CONTACT PRECAUTIONS

I. Contact Precautions

Intended to prevent transmission of infectious agents, including epidemiologically important microorganisms, which are spread by:

- **Direct contact** (direct body contact with the tissues or fluids of an infected individuals such through open mucous membranes, open wounds, or abraded skin)

- **Indirect contact** (no direct person to person contact – contact occurs from a reservoir to a host by contaminated surfaces or objects).

Contact Precautions are used for:

1. Patient *infected or colonized with multiple drug resistant organisms* (**MDROs**) *e.g. methicillin resistant staphylococcus aureus (MRSA) , Vancomycin Resistant Enterococci (VRE), Vancomycin Intermediate Staphylococcus Aureus (VISA)/ Vancomycin Resistant Staphylococcus Aureus (VRSA) , Extended Spectrum Beta-Lactamse (ESBLs)*

CONTACT PRECAUTIONS

- In LTCF, used for ill patients with MDRO (e.g. those **totally dependent upon hcp for healthcare and activities of daily living, or ventilator-dependent**) and for residents whose **infections or drainage cannot be contained** , use Contact Precautions in addition to Standard Precautions.
- NOT all patients in long term care facilities (LTCF) with multiple drug resistant organisms (MDROs) are placed on Transmission Based Precautions (TBP), those who are **relatively healthy (e.g. mainly independent**) just **follow Standard Precautions**, make sure to use gloves and gowns for contact with uncontrolled secretions, or pressure ulcer.
- For patients on Contact Precautions such as MDRO colonized or infected patients but **without draining wounds, diarrhea, or uncontrolled secretions**, establish ranges of permitted ambulation, socialization and use of common areas based on their risk to other patients and on their ability to observe proper hand hygiene and other recommended precautions to contain secretions.

2. applied for any patients where the **presence of excessive wound drainage, fecal incontinence, or other discharges from the body** suggest an increased potential for extensive environmental contamination and risk of transmission such as *Clostridioides difficile*, Norovirus, Rotavirus or draining abscesses.

CONTACT PRECAUTIONS

Personal protective equipment (PPE) – Wear **gown and gloves** for all interactions that may involve contact with the patient or the patient's environment. Donning PPE upon room entry and properly discarding before exiting the patient room is done to contain pathogens.

Patient placement – single-patient room is preferred. When a single-patient room is not available, IP (infection preventionist) consultation is recommended to assess the various risks associated with other patient placement options (e.g. cohorting of patients with the same MDRO in the same room, if cohorting is not possible place MDRO patients in rooms with patients who are low risk for acquisition of MDROs and associated adverse outcomes from infection and likely to have short lengths of stay). In multi-patient rooms, >3 feet spatial separation between beds is advised.

Limit transport and movement of patients – outside of the room to medically necessary purposes. When transport or movement is necessary, **cover or contain the infected or colonized areas of the patient's body**. Remove and dispose of contaminated PPE and perform hand hygiene prior to transporting patients on Contact Precautions. Don clean PPE to handle the patient at the transport location.

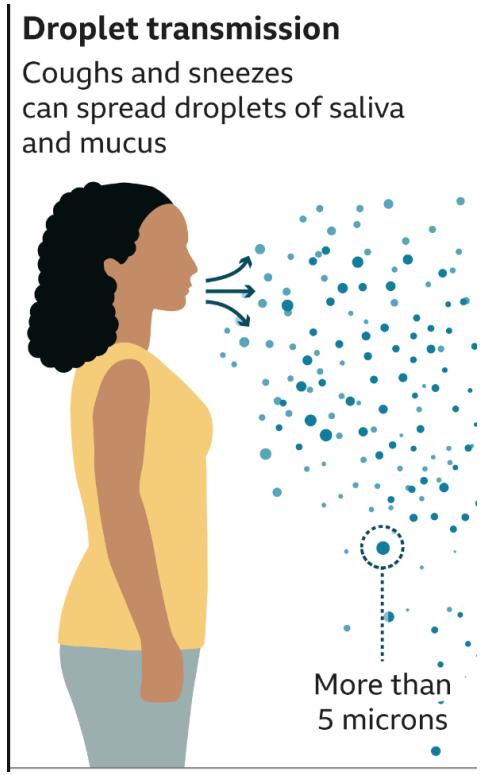
CONTACT PRECAUTIONS

Use disposable or dedicated care equipment (e.g. blood pressure cuffs, stethoscope). If common use of equipment for multiple patients is unavoidable, clean and disinfect such equipment before use on another patient.

Cleaning and disinfection of rooms – ensure rooms are frequently cleaned and disinfected (e.g. at least daily) focusing on frequently-touched surfaces and equipment in the immediate vicinity of the patient

Plan for discontinuation or de-escalation – contact precautions requires room restriction, are generally intended to be time limited and, when implemented, should include a plan for discontinuation.

DROPLET PRECAUTIONS



II. Droplet Precautions

used for patients **known or suspected** to be infected with pathogens transmitted **by respiratory droplets** that are generated by a patient who is **coughing, sneezing, or talking**.

- *respiratory droplets* ***(>5 µm)*** *that* carry infectious pathogens
- transmit infection when they travel directly from the respiratory tract of the infectious individual to susceptible *mucosal surfaces of the recipient (nasal mucosa, conjunctivae, and mouth)*,
- generally travel **over short distances** ***(within 6 ft or 2 meters)***, necessitating facial protection.

Examples of infectious agents that are transmitted via droplet route include:

Bordetella pertussis, Influenza virus, Adenovirus, Rhinovirus, Mycoplasma. pneumonia, group A Streptococcus, and Neisseria meningitidis.

Droplet Precautions can be used together with Contact Precautions with some infectious diseases e.g. Adenovirus pneumonia, Group A Strep on wound or burn and Ebola.

DROPLET PRECAUTIONS

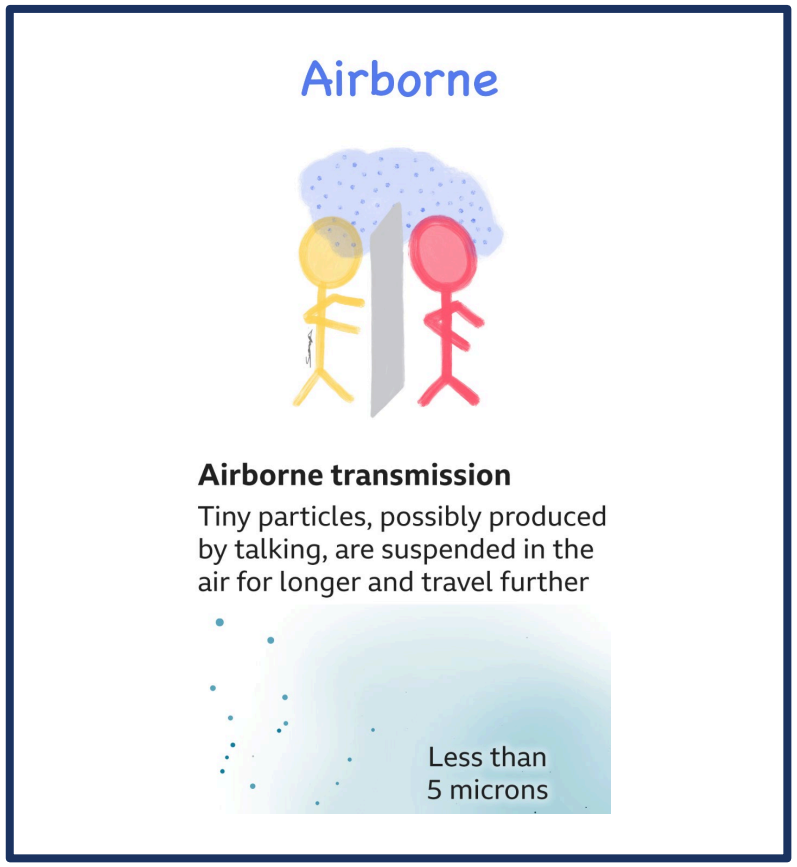
Personal Protective Equipment (PPE) – Don surgical mask (a respirator not necessary) upon entry into the patient room or patient space. with some infectious agents (original recommendation).

COVID-19 pandemic – CDC recommended the use of **eye protection in addition to the use of surgical mask.**

Patient placement – a **single-patient room is preferred**. When a single-patient room is not available, IP consultation is recommended to assess the various risks associated with other patient placement options (e.g. cohorting, keeping the patient in an existing room mate). Spatial separation >3 ft and drawing the curtain between pt beds for patients in multi-bed rooms.

Limit transport and movement of patients – outside of the room to medically-necessary purposes. If transport or movement outside of the room is necessary, instruct patient to wear a **surgical mask** and follow Respiratory Hygiene/Cough Etiquette.

AIRBORNE PRECAUTIONS



III. Airborne Precautions

used for patients **known or suspected** to be infected with pathogens transmitted by the **airborne route**. These infectious agents remain **infectious over *long distances*** when suspended in the air.

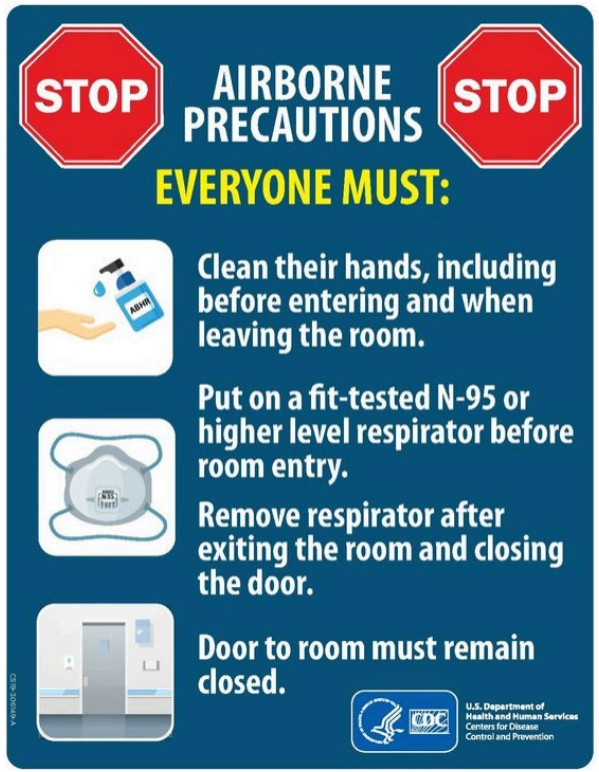
Airborne transmission

- Occurs by dissemination of either by **airborne droplet nuclei or small particles** in the respirable size range **(< 5 µm)** containing infectious agents that remain infective over time and distance.
- Microorganisms carried in this manner may be dispersed over long distances by air currents and maybe inhaled by susceptible individuals **who have not had face to face contact with (or been in the same room) with the infectious individual**.
- Droplet nuclei, particles arising from **desiccation of suspended droplets**, have been associated with airborne transmission and defined as ≤5 **µm in size** (e.g. pulmonary TB or SARS-CoV2) during **high flow oxygen use** or **aerosol generating procedures. .**

Examples of infectious agents that are transmitted via airborne route

Mycobacterium tuberculosis, Rubeola virus (measles), and Varicella (chickenpox).

AIRBORNE PRECAUTIONS



Personal Protective Equipment (PPE) – fit-tested NIOSH-approved N95 or higher level respirator for health care personnel prior to room entry. A *respiratory protection program* that includes education, fit-testing, and user seal checks is required.

Patient Placement – require an **airborne infection isolation room (AIIR**). In settings where AIIR room is not available, masking the patient and placing the patient in a private room with the door closed will reduce the likelihood of airborne transmission.

Restrict susceptible hcp from entering the room (specific for measles or varicella) – if other immune healthcare personnel are available.

Limit transport and movement of patients outside of the room to medically necessary purposes. If transport or movement outside is necessary, instruct patients to wear a **surgical mask**, and observe Respiratory Hygiene/Cough Etiquette.

Immunize susceptible persons as soon as possible following unprotected contact (measles and varicella)

PATIENT TRANSPORT FOR ALL TRANSMISSION BASED PRECAUTIONS TYPES

- Limit transport and movement of patients outside of their room
- Any patients with infected areas (wound, rash, etc) must be contained/covered
- PPE is NOT worn by the transporter during patient transport
- When patients must leave their room and travel to another department or location, there must be a good hand off communication among staff about the type of isolation. This may include verbal, written and/or electronic notifications.

DISEASES USING MORE THAN ONE TRANSMISSION-BASED PRECAUTIONS

Some diseases have *multiple routes of transmission* therefore, *more than one Transmission-Based Precautions category* may be used. When used singly or in combination, TBPs are always used **in addition** *to* Standard Precautions.

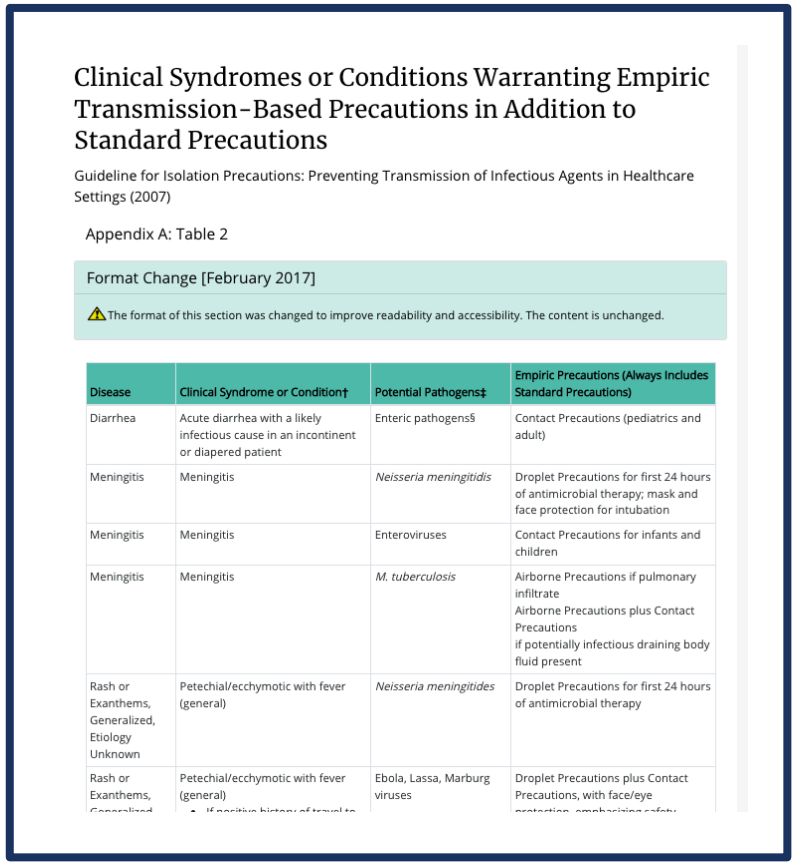
Examples:

- Varicella and Disseminated Herpes-zoster - Airborne + Contact + Standard
- SARS-CoV1 – Airborne + Contact + Droplet + Standard
- SARS-CoV2 - Droplet + Contact + Airborne (aerosol generating procedure) + Standard
- Monkeypox – Contact + Droplet + Airborne + Standard

When to discontinue TBP – consider the type of organism and other factors such as whether the resident still has signs and symptoms of infection, if antibiotic therapy has been completed by the resident, and if wound is completely healed before shifting to standard precautions.

For a complete list of the type of Precaution to use for the Different Diseases and the duration of precaution, please check this CDC weblink https://www.cdc.gov/infectioncontrol/guidelines/isolation/appendix/type-duration-precautions.html

SYNDROMIC AND EMPIRIC TRANSMISSION-BASED PRECAUTIONS



Clinical Syndromes or Conditions Warranting Empiric Transmission-Based Precautions in Addition to Standard Precautions

Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings (2007)

Appendix A: Table 2

Format Change [February 2017]

⚠ The format of this section was changed to improve readability and accessibility. The content is unchanged.

Disease	Clinical Syndrome or Condition†	Potential Pathogens‡	Empiric Precautions (Always Includes Standard Precautions)
Diarrhea	Acute diarrhea with a likely infectious cause in an incontinent or diapered patient	Enteric pathogens§	Contact Precautions (pediatrics and adult)
Meningitis	Meningitis	*Neisseria meningitidis*	Droplet Precautions for first 24 hours of antimicrobial therapy; mask and face protection for intubation
Meningitis	Meningitis	Enteroviruses	Contact Precautions for infants and children
Meningitis	Meningitis	*M. tuberculosis*	Airborne Precautions if pulmonary infiltrate Airborne Precautions plus Contact Precautions if potentially infectious draining body fluid present
Rash or Exanthems, Generalized, Etiology Unknown	Petechial/ecchymotic with fever (general)	*Neisseria meningitides*	Droplet Precautions for first 24 hours of antimicrobial therapy
Rash or Exanthems,	Petechial/ecchymotic with fever (general)	Ebola, Lassa, Marburg viruses	Droplet Precautions plus Contact Precautions, with face/eye

Syndromic and Empiric TBP - are applied at the time of initial contact **while test results are pending** based on the clinical presentation and most likely pathogen.

- used at the time a patient develops symptoms or signs of transmissible infection or arrives at a healthcare facility for care.

CDC's list of certain clinical syndromes and conditions carry a sufficiently high risk to warrant their use of empirically while confirmatory tests are pending.

https://www.cdc.gov/infectioncontrol/guidelines/isolation/appendix/transmission-precautions.html

Examples:

Diarrhea – acute, prob infectious etiology and pt is incontinent and/or diapered, place resident on Contact and Standard precautions while waiting for the test results.

Vesicular rash – prob varicella, disseminated herpes zoster (shingles), place patient on Contact, Airborne, and Standard precautions while waiting for the test results. If resident has localized shingles affecting only 1or 2 adjacent dermatomes – only need Contact Precautions.

REFERENCES:

- Chain of Infection Components – https://www.cdc.gov/niosh/z-draft-under-review-do-not-cite/safetyculturehc/module-2/3.html
- COVID-19 Pandemic: A World in Turmoil 2. Understanding the Chain of Infection - https://www.atrainceu.com/content/2-understanding-chain-infection
- Standard Precautions for All Patient Care - https://www.cdc.gov/infectioncontrol/basics/standard-precautions.html
- A Unit Guide to Infection Prevention for Long-Term Care Staff - https://www.ahrq.gov/hai/quality/tools/cauti-ltc/modules/resources/guides/infection-prevent.html
- Guidelines for Isolation Precautions: Preventing Transmission of Infectious agents in Healthcare Setting (2007) - https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html
- Transmission-Based Precautions - https://www.cdc.gov/infectioncontrol/basics/transmission-based-precautions.html
- A Pandemic Paradigm Shift in Our Understanding of Transmission. https://www.infectioncontroltoday.com/view/a-pandemic-paradigm-shift-our-understanding-transmission
- Preventing the Spread of Novel or Targeted Multidrug-resistant Organisms (MDROs) in Nursing Homes through Enhanced Barrier Precautions webinar. https://emergency.cdc.gov/coca/calls/2019/callinfo_102419.asp