



The Importance of CDI (*C. difficile* infection) and MDRO (Multidrug-Resistant Organism) Surveillance

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Speaker Disclosures

- No conflicts to disclose
- The content of this presentation reflects my opinion and does not necessarily reflect the official position of the CDC



Presentation Objectives

- Discuss trends in post-acute care/long-term care (PAC/LTC) and risks of healthcare-associated infections and antibiotic resistance (HAI/AR)
- Discuss the need for IPC surveillance activities for MDROs and CDI in LTCFs
- Highlight a few national initiatives to support LTC infection prevention and antibiotic stewardship efforts

Demographics of Post-Acute Care: 2016-2017

Setting	Number of Medicare stays	Length of stay in days	# of providers	% For-profit	% Hospital-based	Medicare costs (billions)
Long-Term Acute Care	~125,600	27	411	87%	30%	\$4.7
Inpatient Rehabilitation	~391,000	12.7	1,178	30%	78%	\$7.7
Skilled Nursing Facilities	~2,400,000	35	15,277	85%	3%	\$29.1
Home Health	3,500,000	N/a	11,844	~90%	N/a	\$18.3

Burden of MDROs in Post-Acute Care

The SHIELD Orange County Project -Multi Drug-Resistant Organism (MDRO) Prevalence in 21 Nursing Homes and Long Term Acute Care Facilities in Southern California.

Table 3. Point Prevalence Multidrug-resistant Organism Carriage Among All Residents and Patients Swabbed at Nursing Homes and Long-term Acute Care Facilities

Facility Type	Chart History of Any MDRO N (%)	MDRO Carriage N (%)	MRSA Carriage N (%)	VRE Carriage N (%)	ESBL Carriage N (%)	CRE Carriage N (%)	MDRO Without MDRO History N (%)	Additional MDRO With MDRO History N (%)
Nursing home without ventilator beds								
Median % (range)	17 (6, 26)	58 (44, 82)	36 (24, 62)	15 (2, 34)	26 (0, 54)	0 (0, 2)	55 (42, 72)	8 (2, 18)
Nursing homes with ventilator beds								
Median % (range)	20 (8, 40)	76 (72, 88)	54 (48, 60)	18 (14, 24)	52 (40, 66)	10 (0, 12)	74 (66, 78)	14 (8, 28)
LTACs								
Median % (range)	50 (48, 50)	82 (72, 86)	30 (26, 42)	56 (50, 60)	38 (30, 48)	8 (8, 10)	66 (64, 76)	28 (26, 38)

Abbreviations: CRE, carbapenem-resistant Enterobacteriaceae; ESBL, extended-spectrum β -lactamase-producing *Enterobacteriaceae*; LTAC, long-term acute care facility; MDRO, multidrug-resistant organism; MRSA, methicillin-resistant *Staphylococcus aureus*; VRE, vancomycin-resistant *Enterococci*.

<https://www.ncbi.nlm.nih.gov/pubmed/30753383>

McKinnell JA et al. Clin Infect Dis. 2019; Feb 11. doi: 10.1093/cid/ciz119.

Diagnosis, Management, and Prevention of *Clostridium difficile* Infection in Long-Term Care Facilities: A Review

Andrew E. Simor MD

First published: 03 August 2010 | <https://doi.org/10.1111/j.1532-5415.2010.02958.x> | Cited by: 46

- ❑ More than half of healthcare associated *Clostridium difficile* (*C. difficile*) infection cases occur in long-term care facilities
- ❑ A significant number of individuals admitted to LTC are colonized with *C. difficile*
 - Up to 20% acquire it while in nursing homes
- ❑ Fluoroquinolone antibiotics have been associated with CDI with a more severe strain of *C. difficile*
 - Longer antibiotic exposure carries higher risk

C. difficile infections with onset in nursing homes

□ >100,000 cases of CDI occur in NHs each year

□ Up to 75% of residents with NH-onset CDI received antibiotics

- ~80% occurred within 30-days of hospital discharge
- 18% were hospitalized
- 8% died within 30 days

Recent exposure to antibiotics

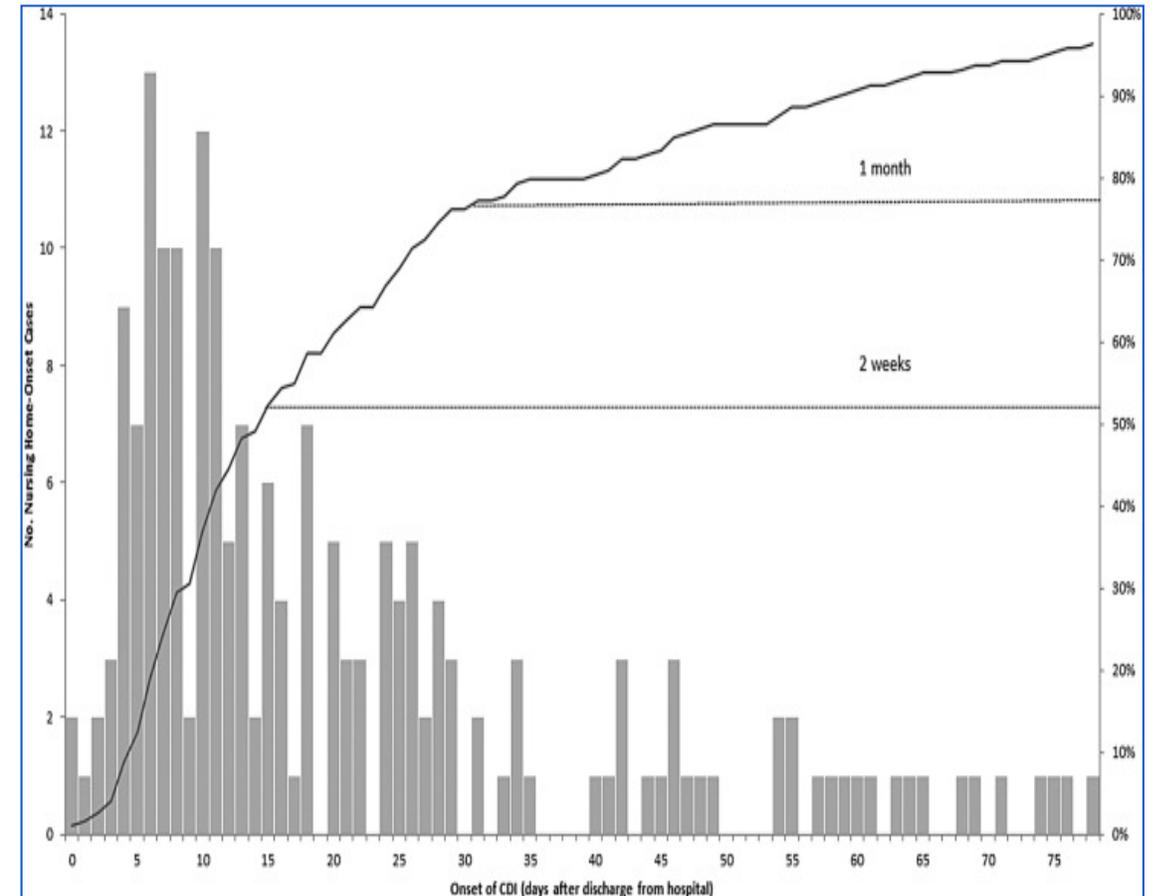


Figure 1

Number of days from hospital discharge to *Clostridium difficile* infection (CDI) onset among cases with hospitalization in 12 weeks prior to *C difficile* positive stool collection date (n = 200)*.

*Figure does not include 14 patients who did not have a hospitalization date available.

Healthcare Drivers of *C. difficile* and MDROs

□ Development

- Antibiotic pressure
 - ❖ Risk for acquisition and infection

□ Spread

- Colonization pressure
- Resident-to-resident transmission through the hands of healthcare personnel
- Contamination of shared equipment/environmental surfaces

Antibiotic Use Drives Resistance

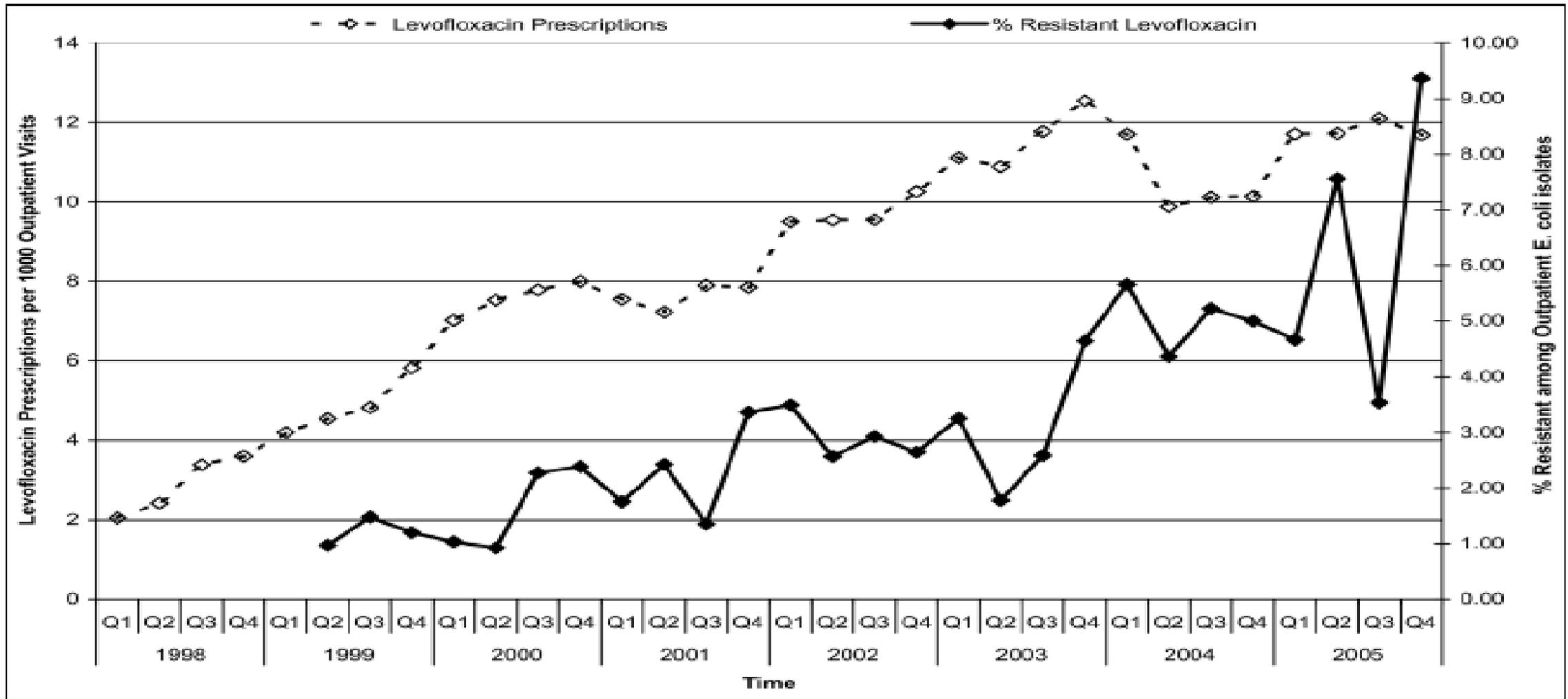
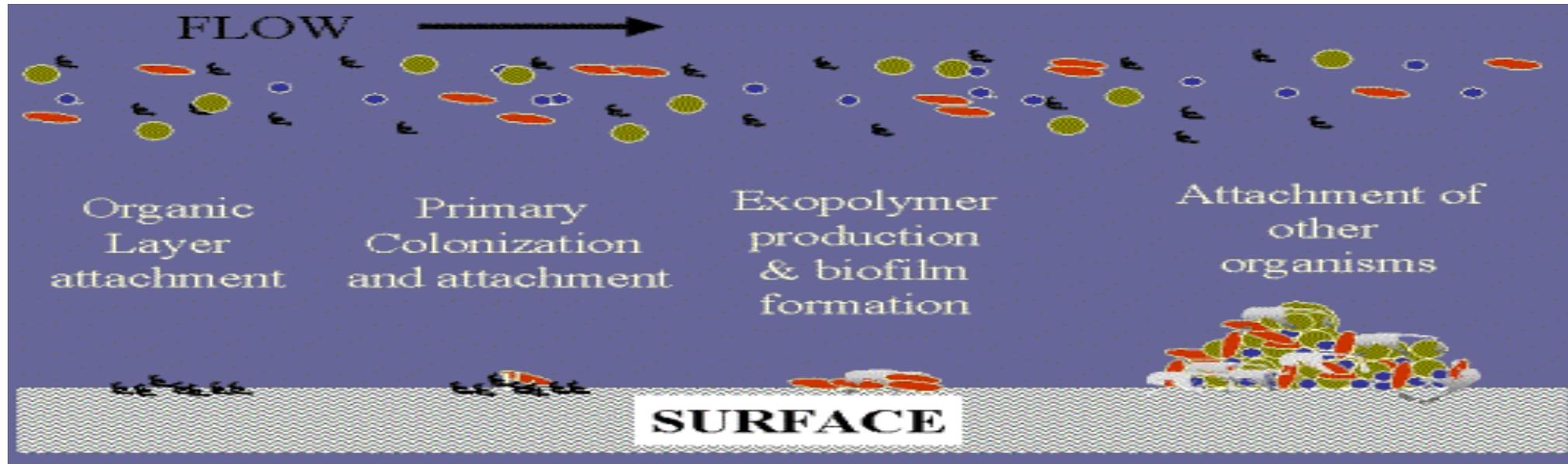


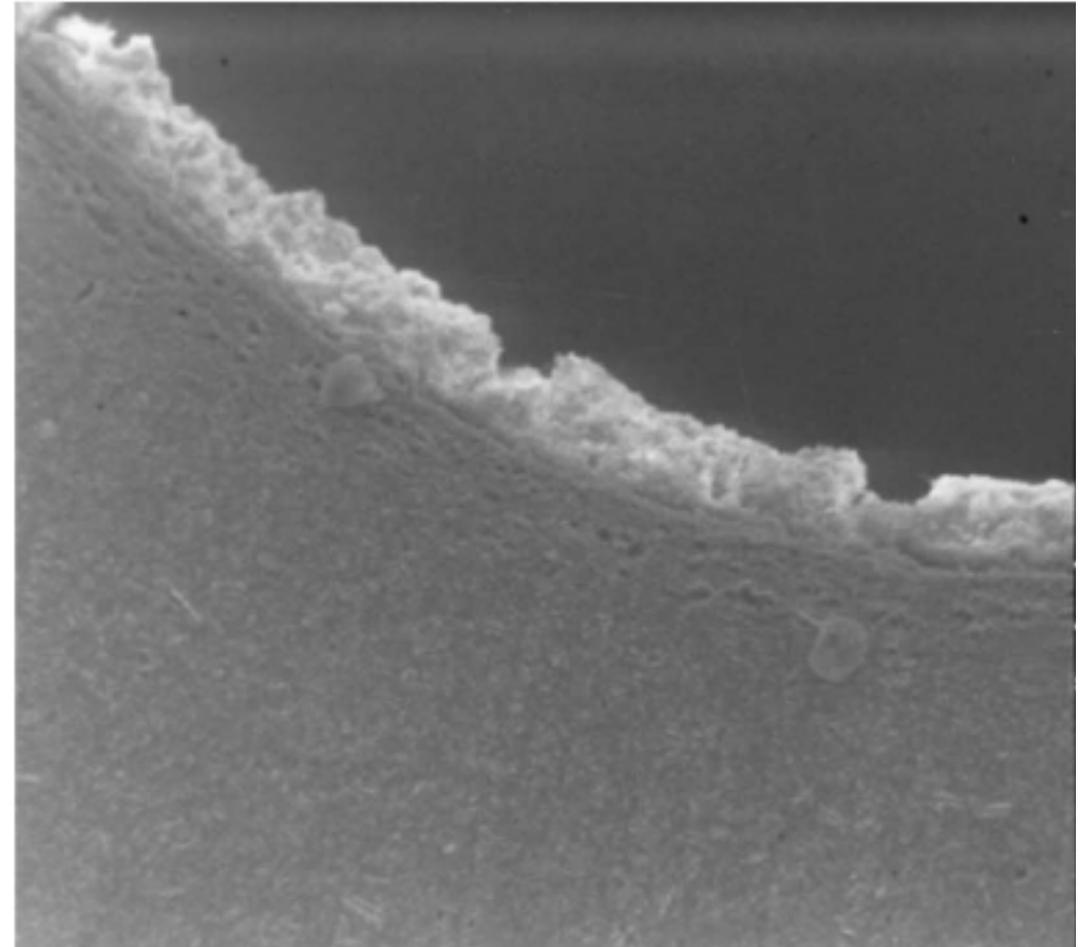
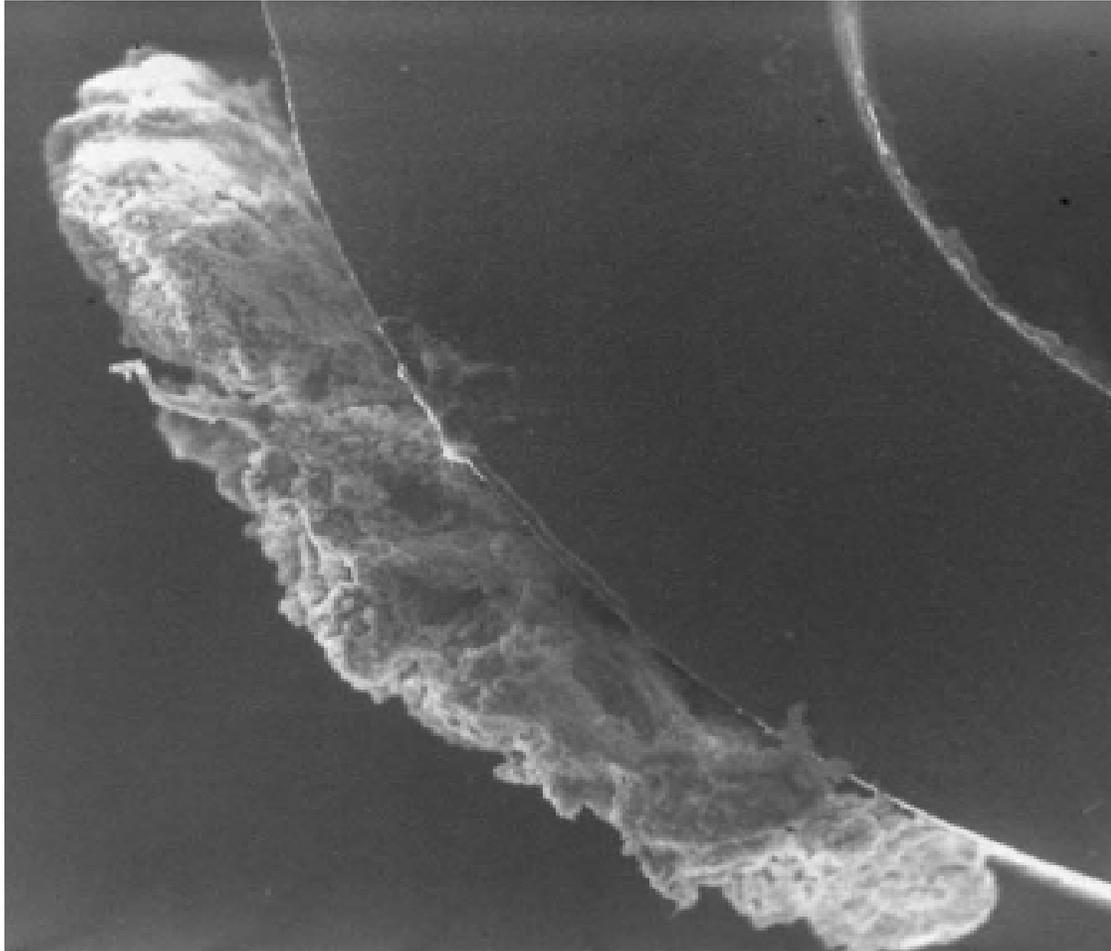
Figure 1 Levofloxacin use and outpatient *Escherichia coli* resistance to levofloxacin versus time.

Biofilm Formation on Device Surfaces



- ❑ Biofilm: An collection of bacteria within a sticky film that forms a community on the surface of a device
- ❑ Antibiotics can't penetrate the biofilm
 - Bacteria in the biofilm are sheltered from the antibiotic and develop resistance

Biofilm on an Indwelling Catheter



Colonization vs. Infection

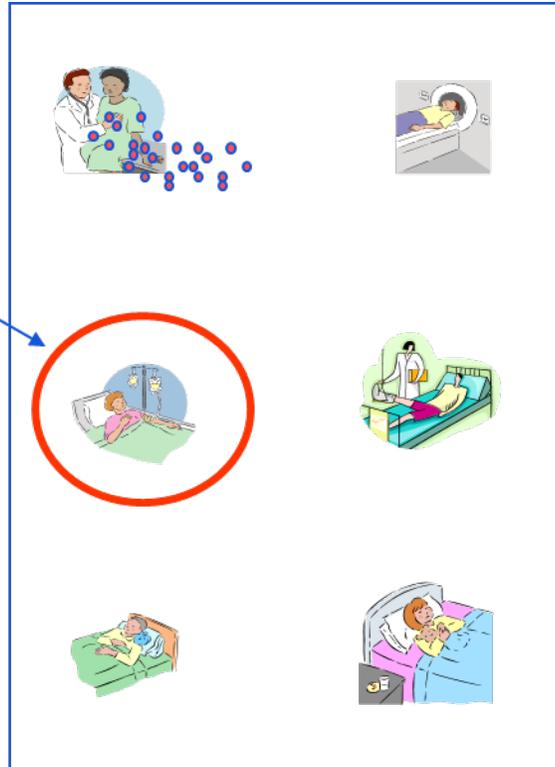
- ❑ **“Colonizing” bacteria may not be harmful, even when they are antibiotic-resistant**
 - ❑ Example: CRE cultured from a rectal swab may not harm the colonized person
- ❑ **Only when bacteria invade our bodies and cause signs/symptoms of illness do we need treatment with antibiotics**
- ❑ **Separating colonization from infection can be difficult**
 - ❑ Examples: Bacteriuria in an older adult; respiratory secretions from a person on a ventilator
- ❑ **However, both colonized and infected people can serve as a source for spreading resistant organisms**

Colonization Pressure on Risk of Acquisition

- ❑ Colonization pressure: High burden of other MDRO carriers on a unit will increase the risk of MDRO acquisition for others
- ❑ Studies have demonstrated the impact of colonization pressure on acquisition of *C. difficile*
- ❑ Both asymptomatic carriers and clinically infected individuals contribute to the reservoir for transmission on a unit

Colonization Pressure: *C. difficile* Infection (CDI)

CDI pressure
=1 × days in unit



Unit A

Fewer patients with active CDI
=lower risk of acquiring CDI

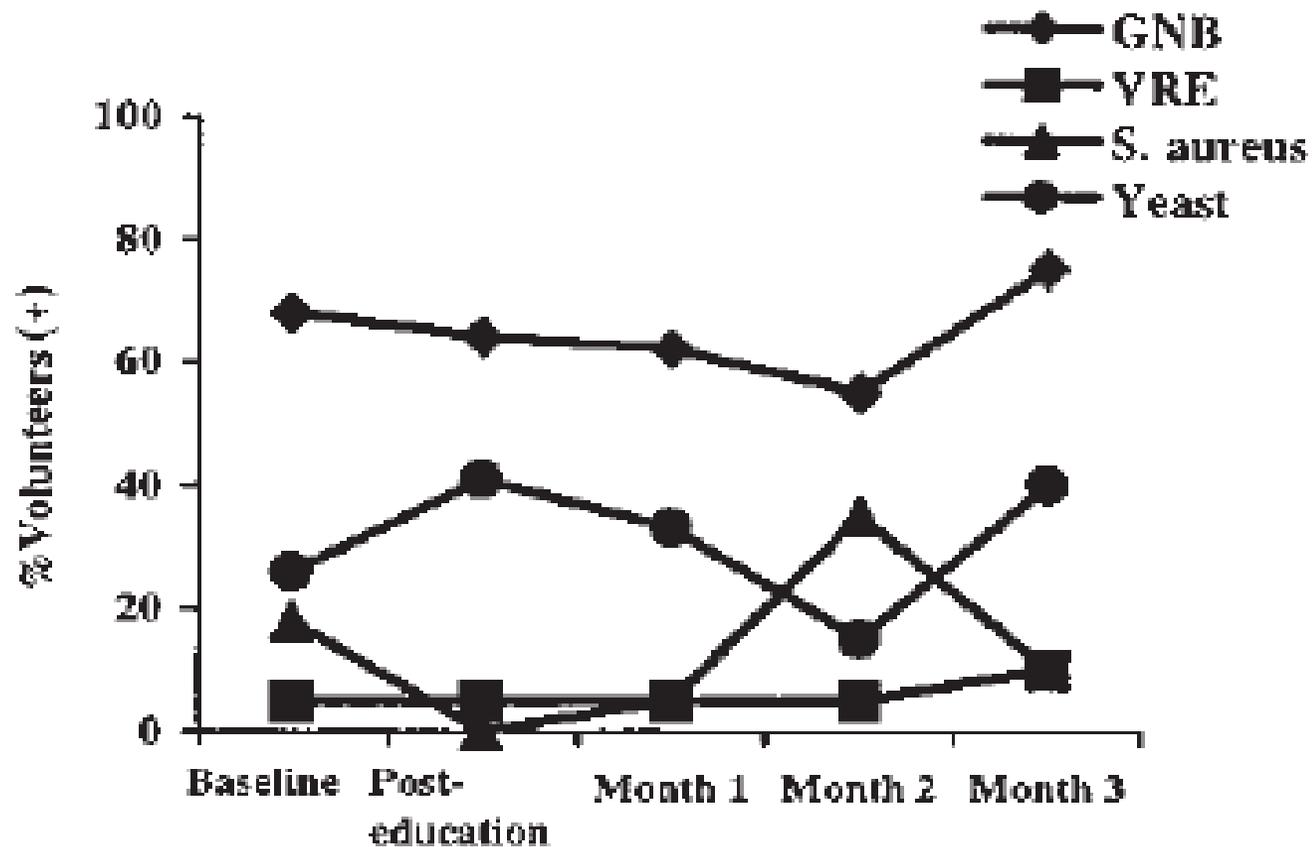
CDI pressure
=5 × days in unit



Unit B

More patients with active CDI
=higher risk of acquiring CDI

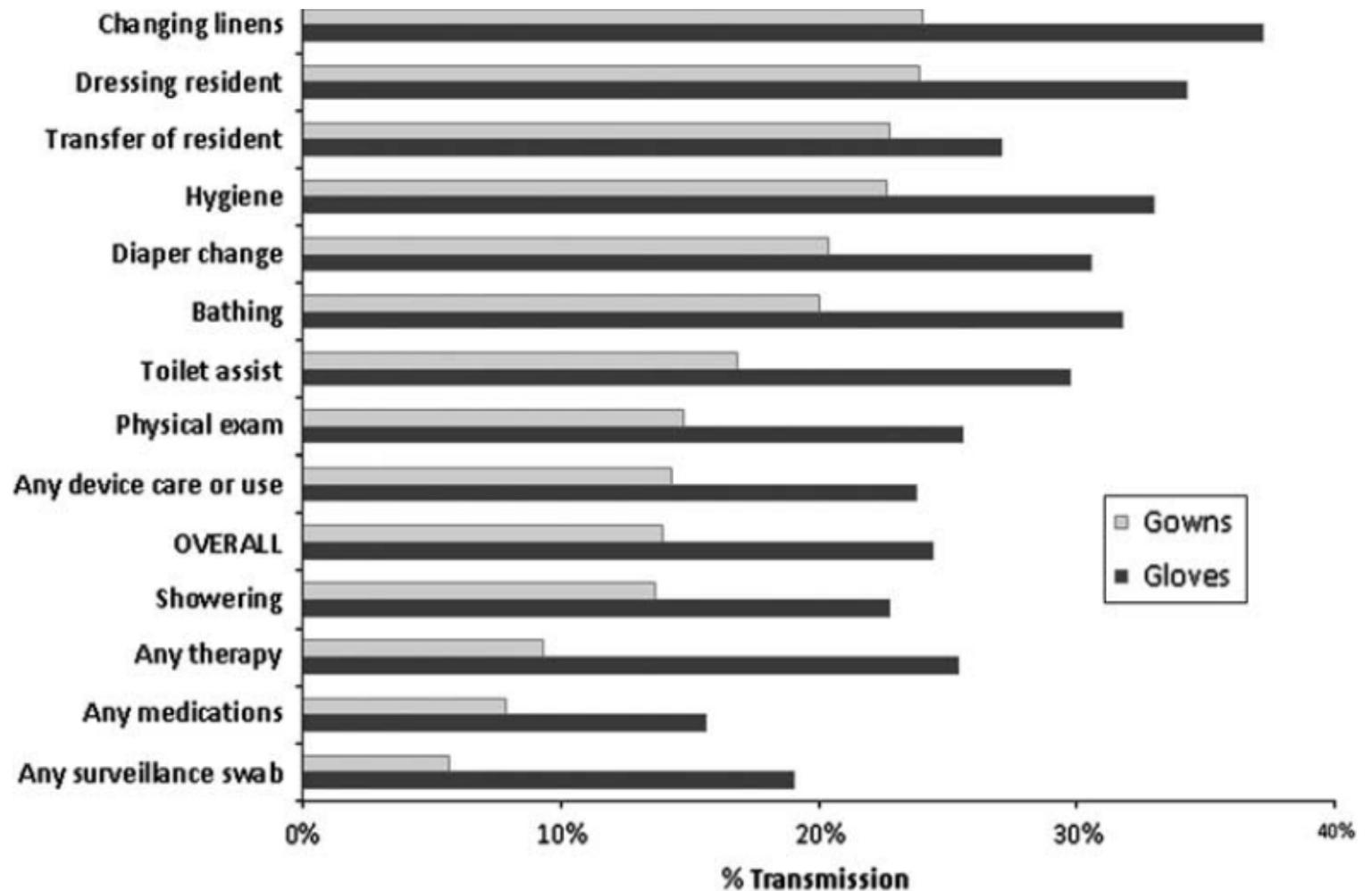
Bacterial Contamination of the Hands of Healthcare Personnel Prior to Hand Hygiene in a Long-Term Care Facility



- Cultured the hands of healthcare personnel (HCP) immediately after direct care to residents
- Gram negative bacteria were the most common bugs cultured from hands of staff
- Most Gram neg. bacteria live in the GI tract or colonize the urine

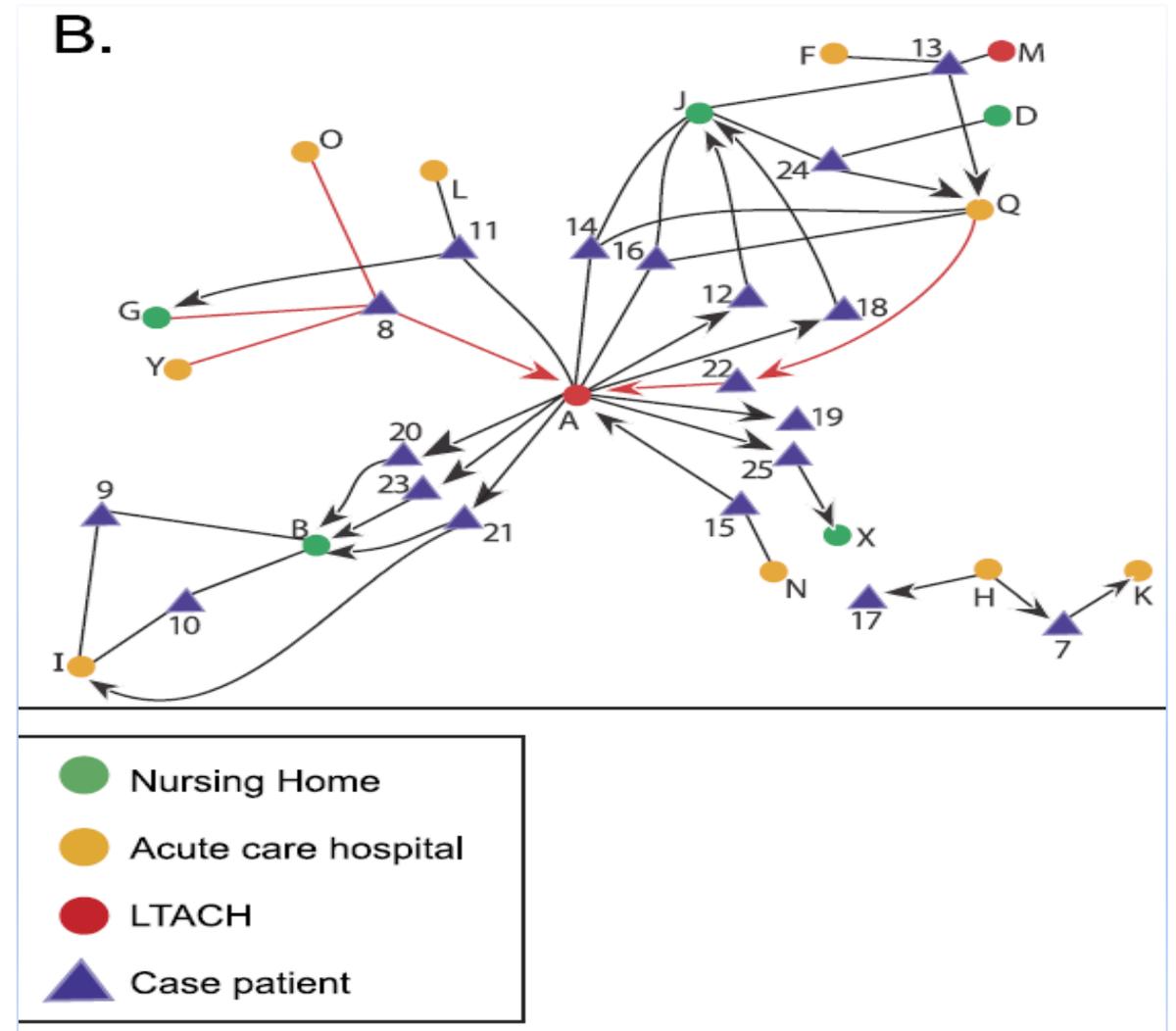
MRSA Contamination of Healthcare Personnel Hand/Clothes in a Long-Term Care Facility

- ❑ Evaluated ~950 different interactions between HCP and MRSA colonized residents
- ❑ Used cultures of gowns/gloves to mimic transmission
- ❑ Morning/evening care bundled together increased transmission
- ❑ Presence of chronic wounds increased transmission



Healthcare Social Networks Drive MDRO Spread

- Transfers of patients colonized or infected with MDROs drives transmission across healthcare facilities
- Post-acute care facilities likely amplify the regional burden of MDROs
 - Longer length of stay
 - Increasing acuity of care
 - Decreased staff: patient ratios
 - Gaps in IPC programs and practices



Why do we need to do
surveillance for MDROs and
CDI again?

So, why is Surveillance for MDROs and CDI important?

Case Example: Patient DEF's Story...

- 70 year old admitted from a Long-Term Acute Care Hospital A (LTACH) to your Nursing Home AB
 - Had a complicated hospital history including back surgery, prolonged ICU stay, multiple courses of antibiotics
 - Spent 5 weeks in the LTACH A for ventilator-weaning, antibiotics and wound care
- Transferred to your Nursing Home AB with a tracheostomy, PEG tube, indwelling urinary catheter and partially healing sacral pressure ulcer with a wound vac.

Thoughts - What are this resident's risk factors for being colonized or acquiring an MDRO?

Case Example, continued

- ❑ One week into Nursing Home AB admission, and became unresponsive. He was immediately transferred to Hospital A's ED
- ❑ At Hospital A (across the street), he develops a fever, increased oxygen requirements and increased purulent respiratory secretions; X-ray shows a new infiltrate
- ❑ That same week, he suddenly develops diarrhea
- ❑ The MD orders a stool culture and culture from tracheostomy secretions show:
 - Stool culture, *C. difficile* positive
 - Trach secretions, *Klebsiella pneumoniae* positive, $>10^5$ cfu/ml

And the story goes on...

Drug	Result
Amikacin	Intermediate
Ampicillin	Resistant
Amp/Sulbactam	Resistant
Aztreonam	Resistant
Cefazolin	Resistant
Cefepime	Resistant
Ceftazidime	Resistant
Ceftriaxone	Resistant
Cefuroxime	Resistant
Gentamicin	Resistant
Levofloxacin	Resistant
Meropenem	Resistant
Piperacillin/Tazobactam	Resistant
Tobramycin	Resistant
Trimethoprim/Sulfa	Resistant

CDC Infection Control Assessment and Response (ICAR) Activity, 2015-2018

- CDC funding and technical support to state and local health departments
- Structured approach for assessing current infection prevention and control (IPC) programs
- Opportunity for health departments to expand their outreach to healthcare facilities
- Health departments serve as an IPC resource for healthcare facilities

The screenshot shows the CDC website page for Healthcare-associated Infections (HAIs). The page header includes the CDC logo and the text "Centers for Disease Control and Prevention CDC 24/7: Saving Lives. Protecting People.™". A search bar is located in the top right corner. Below the header is a navigation menu with letters A-Z and a hash symbol. The main content area is titled "Healthcare-associated Infections (HAIs)" and includes a breadcrumb trail: "Healthcare-associated Infections > Preventing HAIs". There are social media icons for Facebook, Twitter, and a plus sign. The section "Infection Control Assessment Tools" is highlighted. The text below this section explains that the tools are designed to prevent the spread of infection in healthcare settings and that they were developed by CDC for awardees under the Epidemiology and Laboratory Capacity (ELC) Infection Control Assessment and Response (ICAR) Program. A list of four assessment tools is provided, each with a PDF icon and file size: "Infection Control Assessment Tool for Acute Care Hospitals" (433 KB), "Infection Control Assessment Tool for Long-term Care Facilities" (253 KB), "Infection Control Assessment Tool for Outpatient Settings" (337 KB), and "Infection Control Assessment Tool for Hemodialysis Facilities" (278 KB). A note at the bottom states that for outpatient settings, the previously released Guide to Infection Prevention for Outpatient Settings and its companion Checklist (available at <http://www.cdc.gov/HAI/settings/outpatient/outpatient-care-guidelines.html>) have been revised and made consistent with the Outpatient Settings Infection Control Assessment Tool. While the same infection prevention elements are included in both the checklist and assessment tool, the facility demographics sections differ slightly. The assessment tool is intended for health department use to complete ELC activities whereas the checklist is intended primarily for healthcare facility use.

Healthcare-associated Infections

- Data and Statistics
- Types of Infections
- Diseases and Organisms
- Preventing HAIs
 - Targeted Assessment for Prevention (TAP)
 - State Policy Resources
 - ELC Activities
 - Guidelines and Recommendations
 - Toolkits
 - Basic Infection Control and Prevention Plan for Outpatient Oncology Settings
 - Outpatient Care Guide
 - Tools for Protecting Healthcare Personnel
- Infection Control Assessment Tools**
 - CDC HAI Commentaries
- Map: HAI Prevention Activities
- Research
- Patient Safety
- Outpatient Settings
- Laboratory Resources

Healthcare-associated Infections (HAIs)

[Healthcare-associated Infections](#) > [Preventing HAIs](#)

[f](#) [t](#) [+](#)

Infection Control Assessment Tools

The basic elements of an infection prevention program are designed to prevent the spread of infection in healthcare settings. When these elements are present and practiced consistently, the risk of infection among patients and healthcare personnel is reduced.

The Infection Control Assessment Tools were developed by CDC for awardees under the [Epidemiology and Laboratory Capacity \(ELC\) Infection Control Assessment and Response \(ICAR\) Program](#) to assist health departments in assessing infection prevention practices and guide quality improvement activities (e.g., by addressing identified gaps). These tools may also be used by healthcare facilities to conduct internal quality improvement audits.

Assessment tools were developed for the following healthcare settings: acute care (including hospitals and long-term acute care hospitals), outpatient, long-term care, and hemodialysis. Select the assessment tool below that is specific to your setting.

- [Infection Control Assessment Tool for Acute Care Hospitals](#) [PDF - 433 KB]
- [Infection Control Assessment Tool for Long-term Care Facilities](#) [PDF - 253 KB]
- [Infection Control Assessment Tool for Outpatient Settings](#) [PDF - 337 KB]
- [Infection Control Assessment Tool for Hemodialysis Facilities](#) [PDF - 278 KB]

NOTE: For Outpatient settings, the previously released [Guide to Infection Prevention for Outpatient Settings](#) and its companion [Checklist](#) (available at: <http://www.cdc.gov/HAI/settings/outpatient/outpatient-care-guidelines.html>) have been revised and made consistent with the [Outpatient Settings Infection Control Assessment Tool](#). While the same infection prevention elements are included in both the checklist and assessment tool, the facility demographics sections differ slightly. The assessment tool is intended for health department use to complete ELC activities whereas the [checklist](#) is intended primarily for healthcare facility use.

<http://www.cdc.gov/hai/prevent/infection-control-assessment-tools.html>

Connect with your State Healthcare-Associated Infections (HAI) Program

State-based HAI prevention

State-based HAI Prevention Activities

WA OR ID MT ND MN WI MI NY ME VT NH MA RI CT NJ DE MD DC

CA NV UT CO KS MO IL IN OH WV VA PA NC SC GA FL TX LA MS AL

AK HI Puerto Rico

SUCCESS STORIES
Many states are showing impressive progress in reducing HAIs.

CDC RESOURCES FOR STATES
CDC tools and technical assistance support state efforts to prevent HAIs.

Epidemiology and Laboratory Capacity

<http://www.cdc.gov/hai/state-based/index.html>

Check out CDC Guidance on IC in Long-Term Care

Nursing Homes and Assisted Living (Long-term Care Facilities [LTCFs])



Nursing homes, skilled nursing facilities, and assisted living facilities, (collectively known as long-term care facilities, LTCFs) provide a variety of services, both medical and personal care, to people who are unable to manage independently in the community. Over 4 million Americans are admitted to or reside in nursing homes and skilled nursing facilities each year and nearly one million persons reside in assisted living facilities. Data about infections in LTCFs are limited, but it has been estimated in the medical literature that:

- 1 to 3 million serious infections occur every year in these facilities.
- Infections include urinary tract infection, diarrheal diseases, antibiotic-resistant staph infections and many others.
- Infections are a major cause of hospitalization and death; as many as 380,000 people die of the infections in LTCFs every year.



Clinical Staff Information

Fact sheets, guidelines, reports, and resources

Resident Information

Fact sheet, patient safety and other information

Prevention Tools



[The Core Elements of Antibiotic Stewardship for Nursing Homes](#)



The Department of Health and Human Services has developed a strategy to address infections in Long-term Care Facilities in Phase 3 of the [National Action Plan to Prevent Health Care-](#)

<http://www.cdc.gov/longtermcare>

Check out the **Free** CDC Nursing Home IP Training Course

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Nursing Home Infection Preventionist Training

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ID 3814

If you wish to earn continuing education (CME, CNE, or CEUs), you must first register for the *Nursing Home Infection Preventionist Training Course* by selecting the blue Register button at the top right of this page. Select the Show More link below for information about the course, including tips and resources to guide you in completing modules and obtaining continuing education (CE).

Program Description:
This course will provide infection prevention and control (IPC) training for individuals responsible for IPC programs in nursing homes so they can effectively implement their programs and ensure adherence to recommended practices by front-line staff. The course will include information about the core activities of an effective IPC program, with a detailed explanation of recommended IPC practices to prevent pathogen transmission and reduce healthcare-associated infections and antibiotic resistance in nursing homes. Additionally, this course will provide helpful implementation resources (e.g., training tools, checklists, signs, and policy and procedure templates).

Learning Objectives:
At the conclusion of the session, the participant will be able to:

https://www.train.org/cdctrain/training_plan/3814

Thank you!!

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

