TuftsMedicine
Tufts Medical Center

Infection Prevention in Modern Healthcare

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No financial disclosures

Objectives

Discuss emerging infection prevention challenges and operational considerations relevant to modern healthcare systems.

Review current infection prevention priorities impacting healthcare delivery and patient safety.

Identify evidence-based strategies to reduce healthcare-associated infections across inpatient and ambulatory clinical settings.

Impact of Changing Policies



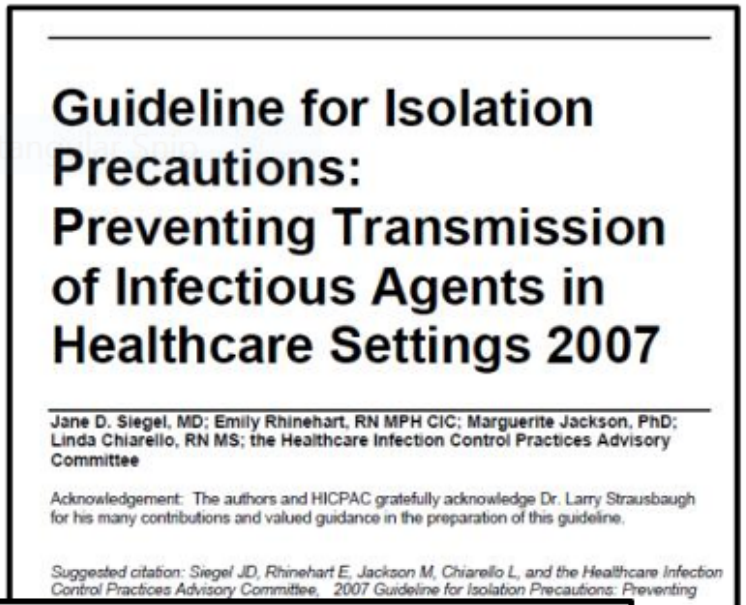
CDC U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION
ADVISORY COMMITTEE ON IMMUNIZATION PRACTICES (ACIP)

HICPAC
HEALTHCARE INFECTION CONTROL PRACTICES ADVISORY COMMITTEE

Federal Advisory Committees

Revision of CDC HICPAC Isolation Guidelines

- Update of CDC Isolation Guidelines **WAS** in process
  - Intended to update approach all respiratory infectious diseases
  - **Move away from "droplet" or "airborne"**



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

Jane D. Siegel, MD; Emily Rhinehart, RN MPH CIC; Marguerite Jackson, PhD; Linda Chiarello, RN MS; the Healthcare Infection Control Practices Advisory Committee

Acknowledgement: The authors and HICPAC gratefully acknowledge Dr. Larry Strausbaugh for his many contributions and valued guidance in the preparation of this guideline.

Suggested citation: Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee, 2007 Guideline for Isolation Precautions: Preventing

CDC Advisory Group Under Fire for Proposed Infection Control Guidelines

— Nurse union, occupational health experts, patients say weaker guidelines help only employers

CDC Weighs Lower Infection Safety Precautions For Healthcare Workers

Judy Stone Senior Contributor

CDC

Expected CDC guidance on N95 masks outrages health care workers

Health workers warn that loosening mask advice in hospitals would harm patients and providers.

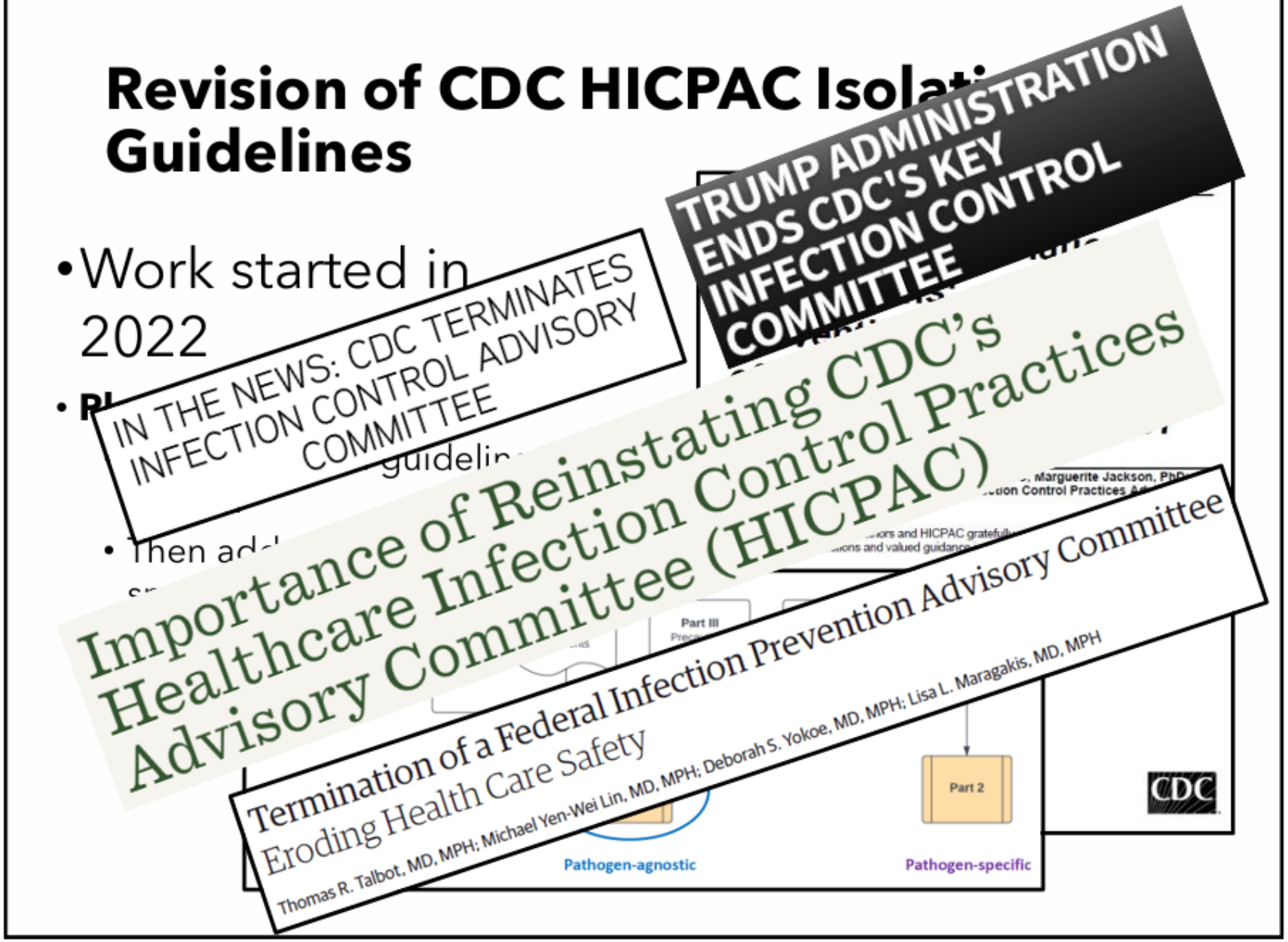
Experts say CDC not getting right advice on hospital infection prevention

Gregg Gonsalves @gregggonsalves · 3h

.@CDCDirector needs to listen to those not reporting directly to hospital C-suites on infection control. #COVID19 @zenei_cortez, @NationalCOSH, @jane_nnu, @gwendystar_, @jbarab, @adamfinkel0, @NohaAboelataMD, @brosseau_lisa

Revision of CDC HICPAC Isolati Guidelines

- Work started in 2022
- Pl
- Then ad



Impact of Changing Policies

POLICY + INITIATIVES

The Disbanding of HICPAC is Part of a Larger, Dangerous Pattern of Undermining Health Protections

The Trump administration cuts a trusted source of infection prevention guidance.

BY GLOBAL BIODEFENSE STAFF – MAY 7, 2025

RFK Jr. removes all 17 members of CDC's vaccine advisory committee

The committee makes recommendations on the safety and efficacy of vaccines.

HHS launches 4 new vaccine injury research, reporting initiatives

By Cailey Gleeson · Oct 8, 2026 4:00pm

Department of Health and Human Services (HHS) | Robert F. Kennedy Jr. | National Institutes of Health | VAERS

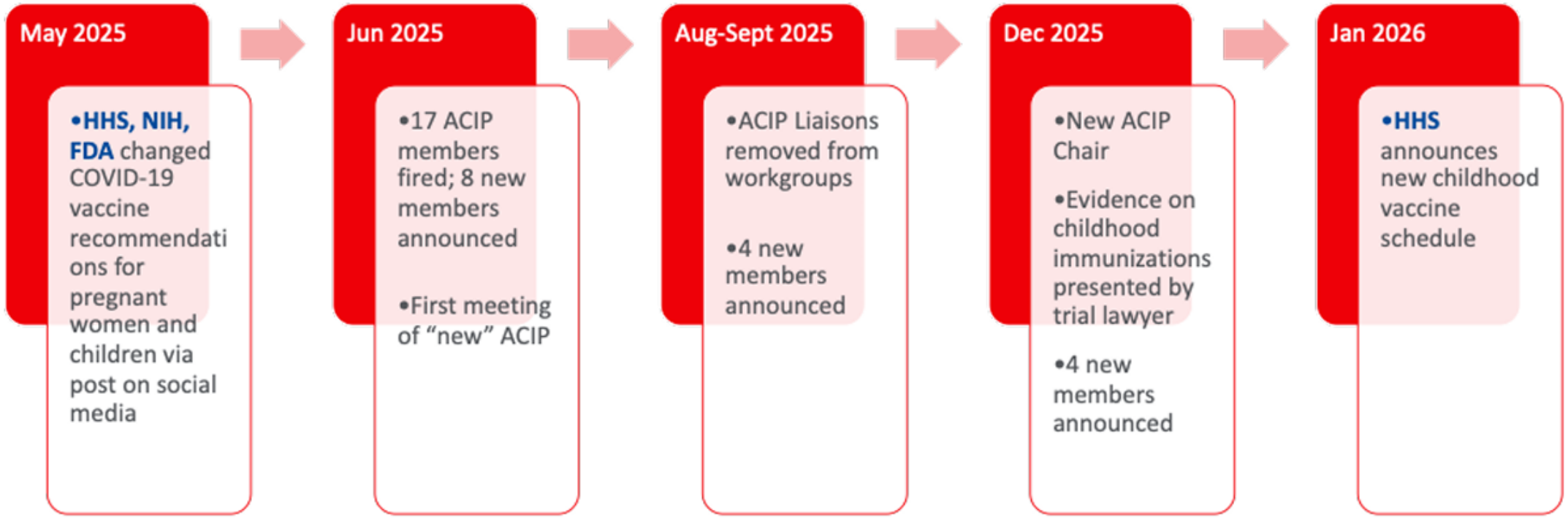
CNN Health | Life, But Better | Fitness | Food | Sleep | Mindfulness | Relationships | Watch | Subscribe | Sign In

HEALTH • 7 MIN READ

Kennedy names new members of CDC vaccine advisory panel days after removing previous advisers

UPDATED JUN 11, 2025

Developing Vaccine Policy (May 2025-present)
Changes to structure and process





HEALTHCARE

Federal court blocks Kennedy's vaccine changes, invalidates vaccine advisory panel

62 BY JOSEPH CHOI - 03/16/26 4:06 PM ET

Professional Organizations are Bridging the knowledge gap, States coming together.

APIC and SHEA announce Joint Healthcare Infection Prevention Advisory Group (HIPAG)

American Academy of Pediatrics depart from CDC. ACOG Withdraws from ACIP, Citing Scientific Integrity Concerns

.

West Coast Health Alliance



Sep 3, 2025

California, Oregon, and Washington to launch new West Coast Health Alliance to uphold scientific integrity in public health as Trump destroys CDC's credibility

What you need to know: In response to recent federal actions that have undermined the independence of the CDC and raised concerns about the politicization of science, California, Oregon, and Washington are beginning the process to provide evidence-based **unified recommendations** to their residents regarding who should receive immunizations and to help ensure the public has access and credible information for confidence in vaccine safety and efficacy.

Governors Public Health Alliance



October 15, 2025

GovAct Press Release: 15 Governors Launch Governors Public Health Alliance to Safeguard Public Health, Strengthen Preparedness, and Coordinate Across Borders

Nonpartisan initiative will be supported by GovAct and help states and territories to coordinate and address health threats across state lines

Northeast Public Health Collaborative



Several Northeastern States and America's Largest City Announce the Northeast Public Health Collaborative

Voluntary Coalition includes Connecticut, Maine, Massachusetts, New Jersey, New York State, Pennsylvania, Rhode Island and New York City

Regional Partnership Brings Together Public Health Agencies and Leaders to Share Expertise, Improve Coordination, and Promote and Protect Evidence-Based Public Health

Work Groups Created to Identify Opportunities for Collaboration Including Public Health Emergency Preparedness, Vaccine Recommendations, Data Collection, Infectious Disease Management and Laboratory Services

Shifting national and Global priorities on Health-care associated infection surveillance and outbreak response.





Data are critical for understanding how the U.S. responds to health needs and disease outbreaks.

In 2025, 46% of CDC databases had “unexplained pauses” and ceased or delayed update.

87% of these pauses databases were vaccine-related. Jacobs JW. Ann Intern Med. 2026 Mar;179(3):425-429.

CMS is removing Childhood, Adolescent and Prenatal Immunization Status from the 2026 Core Set of Quality Measures.

Somes states have joined the Global Outbreak Alert and Response Network as a countermeasure. Full impact of withdrawing from WHO will impact health over decades.

The Antiscience Movement

Small group after Wakefield paper in 1998 claiming that MMR vaccine causes autism, extensive scientific body evidence showing no link*

The movement took needed to re-energize and connected with legalization of vaccine exemptions in California, around the concept of health and medical freedom.

In 2020, this became not only a protest against vaccines and health freedom against masks and now anti-science movement.

*Wakefield, AJ · Murch, SH · Anthony, A · et al.
Ileal-lymphoid-nodular hyperplasia, nonspecific colitis, and pervasive developmental disorder in children
Lancet. 1998; **351**:637-641

Low Vaccine rates and its consequences



JOHANNES EISELE/AGENCE FRANCE-PRESSE — GETTY IMAGES

Measles Outbreak: N.Y. Eliminates Religious Exemptions for Vaccinations

New York, where measles has spread in u Orthodox Jewish communities, joins California and a handful of other states in revoking religious exemptions.

June 14, 2019 . By JESSE MCKINLEY

HEALTHWATCH

Whooping cough wave is still accelerating nationwide. Here's what to know about symptoms and treatment.

HEALTH AND SCIENCE

How polio came back to New York for the first time in decades, silently spread and left a patient paralyzed

PUBLISHED TUE, OCT 4 2022•10:14 AM EDT | UPDATED TUE, OCT 4 2022•1:09 PM EDT

Amid spikes nationally, Oregon measles outbreak grows to state's largest in years

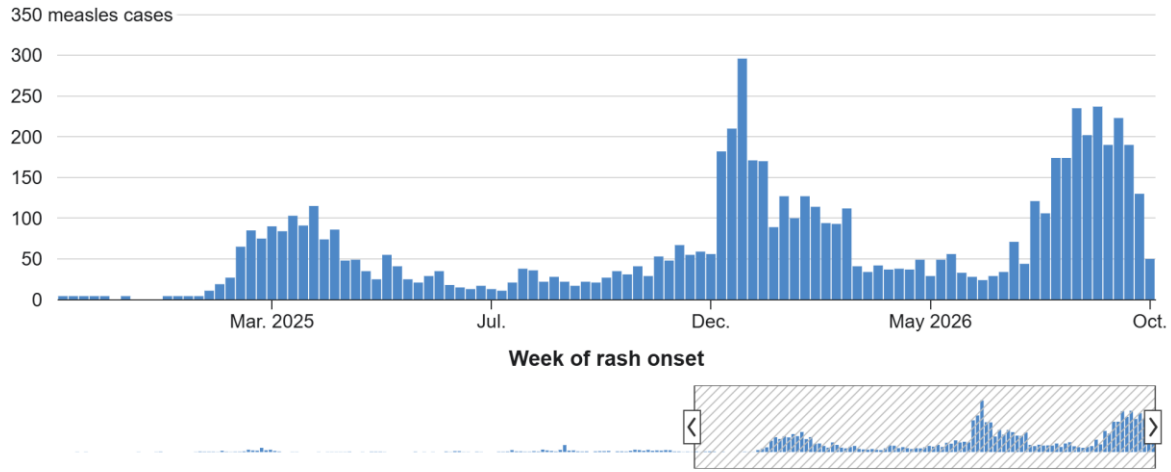
Isabel Funk and Adrianna Rodriguez USA TODAY NETWORK

Published 5:08 a.m. ET Sept. 4, 2024 | **Updated 1:40 p.m. ET Sept. 4, 2024**

Measles in the US.

Weekly measles cases by rash onset date

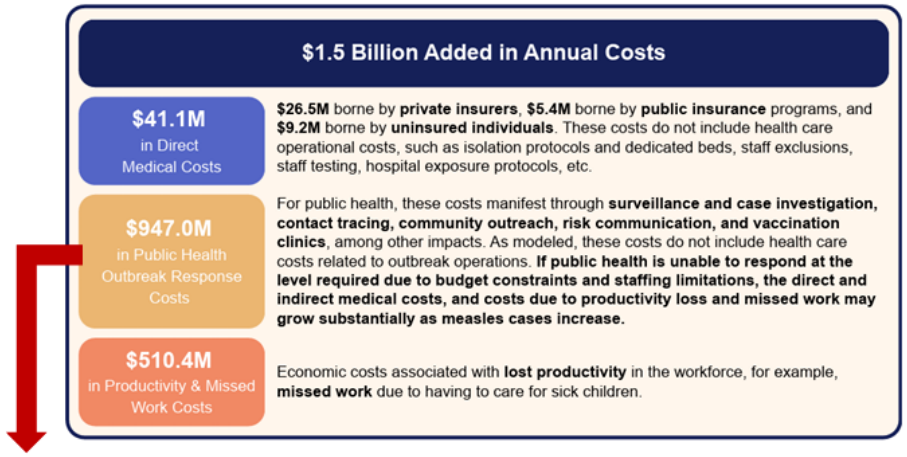
2022–2026* (as of October 15, 2026)



	To date	Full year
Total Cases	**4,410**	**2,289**
Age		
Under 5 years	742 (17%)	584 (26%)
5-19 years	1,856 (42%)	1,018 (44%)
20+ years	1,787 (41%)	674 (29%)
Age unknown	25 (1%)	13 (1%)
Vaccination Status		
Unvaccinated or Unknown	96%	93%
One MMR dose	2%	3%
Two MMR doses	2%	4%

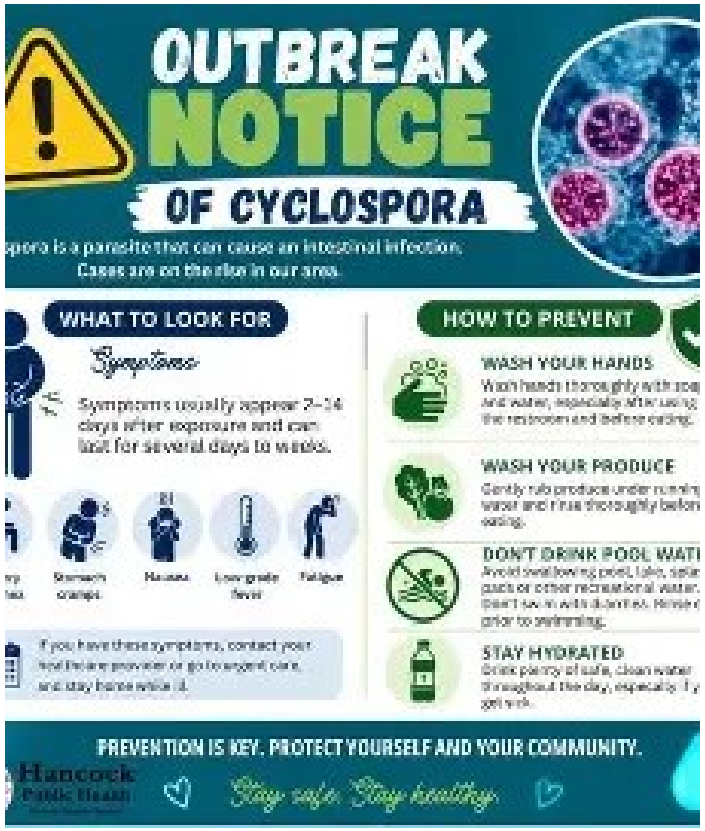
A sustained 1% annual decline in measles, mumps, and rubella (MMR) vaccine coverage could lead to more than 17,000 measles cases, 4,000 hospitalizations, and 36 preventable deaths each year in the U.S.

https://www.medrxiv.org/content/10.64898/2026.02.19.26346619v1
https://commonhealthcoalition.org/



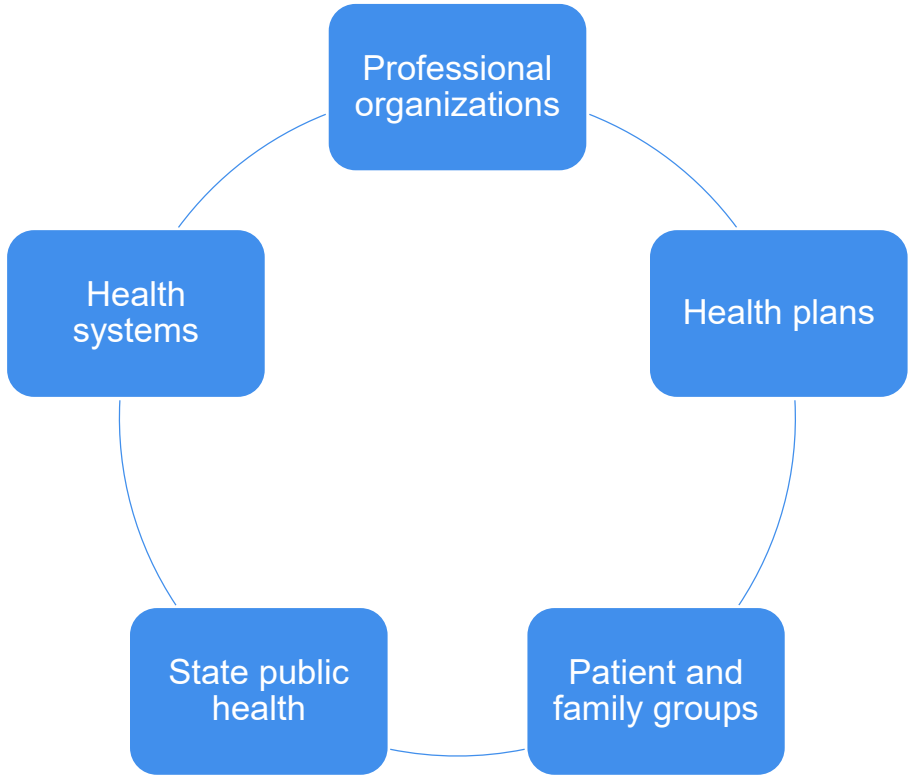
Cyclospora cayetanensis outbreak

Cyclospora outbreak: FDA inspections of overseas food sites are down nearly 35% since 2019. It has heightened safety concerns about imported food. More than 11,000 have been ill, 500 hospitalized and 2 deaths.





What can we influence?



Transmission of Infectious Agents in Healthcare settings

A pathogen must

Leave its reservoir

Source control, screening for disease

Survive in transit

Environmental infection control, air handling.

Be delivered to a susceptible part of the host

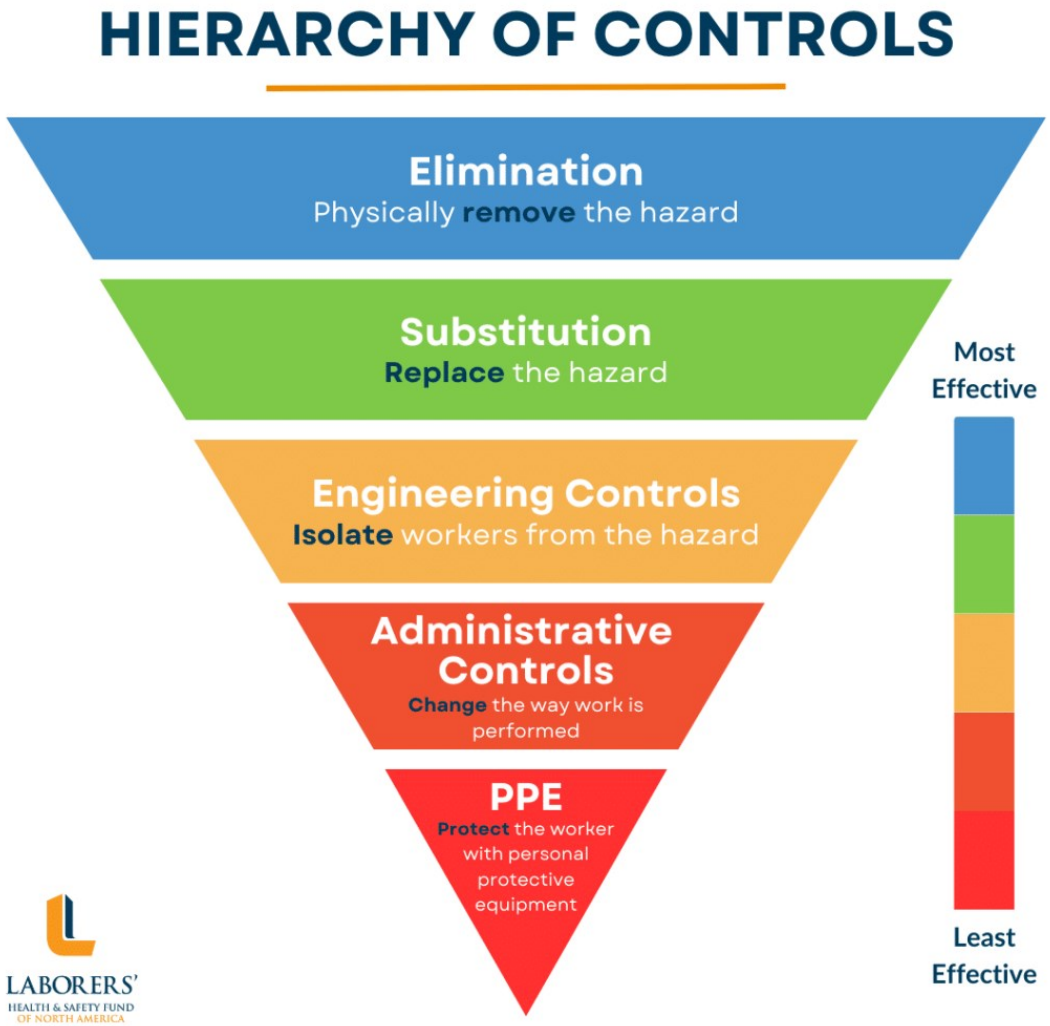
PPE, Hand hygiene, Work practices.

Escape host defenses

Immunizations.

Establish infection

Strategies to Prevent Pathogen Spread



No work while ill.
Reschedule sick patients.

Needless devices, disinfectant with non-irritant options

Environmental cleaning/disinfection, ventilation, air handling, water management.

Symptom screening, signage, policies, education.

Facemask, gown, and use of PPE when indicated.

Strategies to reduce transmission

Occupational Infection Prevention and Control Programs: management of infectious exposures and illnesses.

Detection, treatment and work restrictions.
Ensure healthcare personnel have immunity to vaccine preventable diseases.

Effective immunization programs and policies.

Standard Precautions and Personal Protective Equipment: Risk assessment with use of PPE based upon activities being performed.

Transmission-based Precautions: Used with standard precautions when routes of transmission are not interrupted by standard precautions alone.

Droplet (cough, sneeze,etc. (influenza, pertussis)

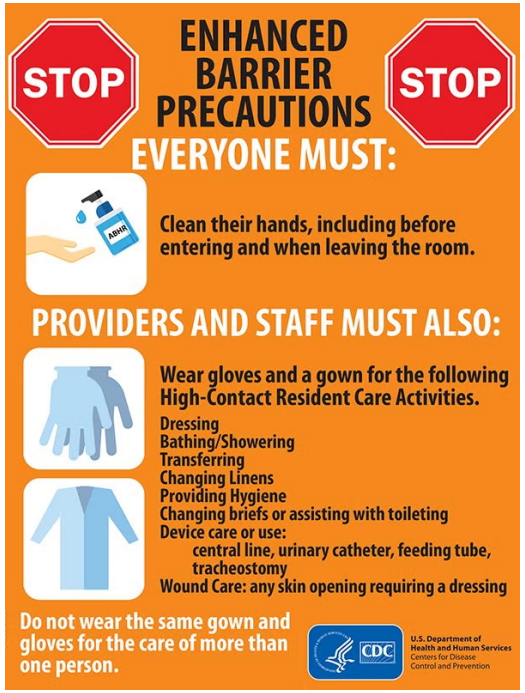
Contact (direct or indirect with patient or patient environment of care)

Airborne spread by particles that remain viable and suspended in the air for prolong periods of time.

Strategies to reduce healthcare-associated

Enhanced Barrier Precautions: Long term care, skilled nursing facilities.
High contact with residents infected or colonized with a multidrug resistant organism and those with have wounds or indwelling medical devices.

PPE training: OSHA requirement.



JAMA Network™

From: **Contamination of Health Care Personnel During Removal of Personal Protective Equipment**

JAMA Intern Med. 2015;175(12):1904-1910. doi:10.1001/jamainternmed.2015.4535

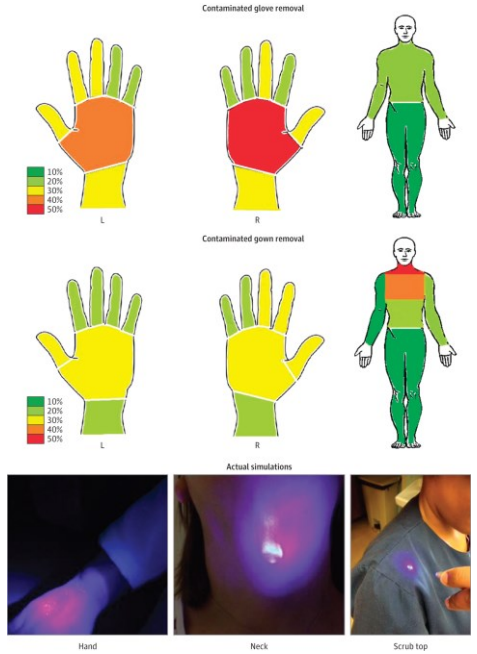


Figure Legend:

Sites of Contamination During Removal of Gloves or Gowns Contaminated With Fluorescent LotionFrequency of contamination by site during contaminated glove removal (n = 234), frequency of contamination by site during contaminated gown removal (n = 201), and contamination on the hands, neck, and scrub top after actual simulations.

Date of download: 10/13/2026

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Your 5 Moments for Hand Hygiene



1	BEFORE TOUCHING A PATIENT	WHEN?	Clean your hands before touching a patient when approaching him/her.
		WHY?	To protect the patient against harmful germs carried on your hands.
2	BEFORE CLEAN/ ASEPTIC PROCEDURE	WHEN?	Clean your hands immediately before performing a clean/aseptic procedure.
		WHY?	To protect the patient against harmful germs, including the patient's own, from entering his/her body.
3	AFTER BODY FLUID EXPOSURE RISK	WHEN?	Clean your hands immediately after an exposure risk to body fluids (and after glove removal).
		WHY?	To protect yourself and the health-care environment from harmful patient germs.
4	AFTER TOUCHING A PATIENT	WHEN?	Clean your hands after touching a patient and her/his immediate surroundings, when leaving the patient's side.
		WHY?	To protect yourself and the health-care environment from harmful patient germs.
5	AFTER TOUCHING PATIENT SURROUNDINGS	WHEN?	Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving – even if the patient has not been touched.
		WHY?	To protect yourself and the health-care environment from harmful patient germs.

World Health Organization | Patient Safety | SAVE LIVES Clean Your Hands



Pathogen Transmission
Impact of COVID-19 Pandemic

General public greater awareness of pathogen transmission:

Emergence of new, visible experts and “experts” in pathogen transmission.

Rapidly changing guidance (as science evolves) was challenging to general public and health care workers.

Preprint release of science both a pro and a con, first time not peer reviewed.

Social media can amplify (perhaps incorrectly) the science risk perception

(recoverability of COVID from cardboard)

Gowns and Gloves for SARS-CoV-2

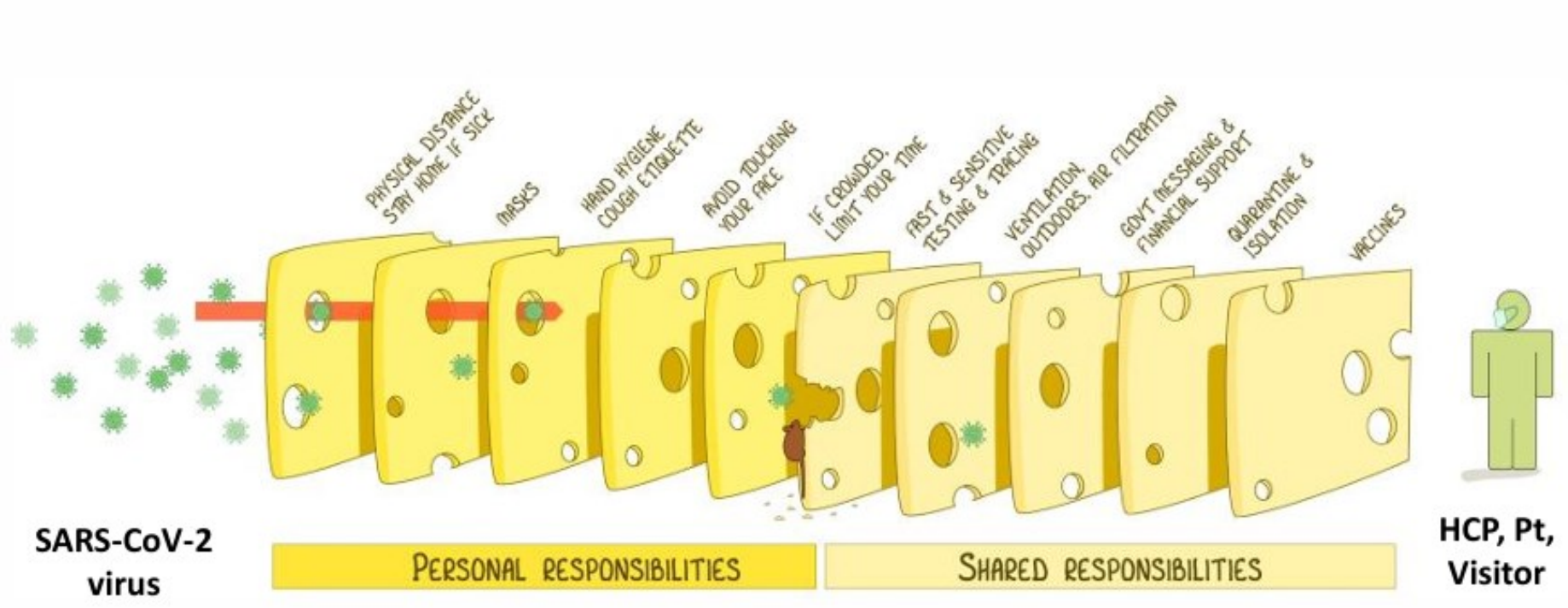
- **Limited evidence to support**
- Aerosols drive transmission, not fomites (gloves not superior to hand hygiene)
  - Lack of RCTs for combined air/contact/eye precautions
- PPE guidelines outdated
- Some hospitals/systems have transitioned without signal of harm



Revisiting the personal protective equipment components of transmission-based precautions for the prevention of COVID-19 and other respiratory virus infections in healthcare

Rabin AS et al. Clin Infect Dis. 2024; 79:585+ Plachouras D et al. Euro Surveill. 2023; 8:2200718.

The Swiss Cheese Respiratory Virus Defense Recognizing that No Single Intervention is Perfect

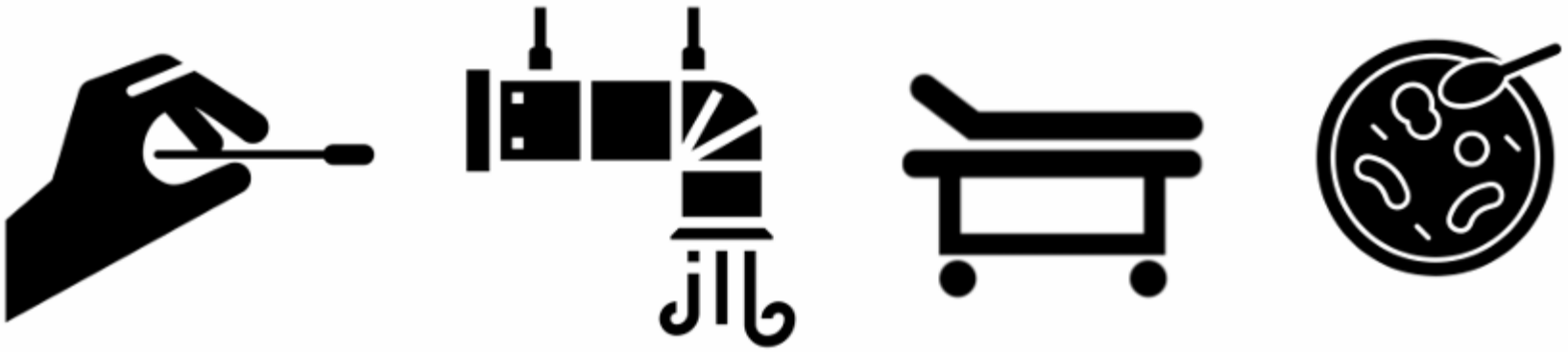


Each intervention (layer) has failings (holes) Multiple layers reduce their impact

Figure drawn by Dr. Ian M. Mackay (2020) at https://twitter.com/MackayIM/status/1319901144836026368/photo/1

Assessing Pathogen Transmission: Environmental Detection

- Detection of a variety of items:
  - Bioaerosols
  - Pathogen DNA/RNA (PCR testing)
  - Culturable pathogen
- Assessment at various distances from patient
- Assessment of surfaces
- Assessment related to specific activities



Preventing Transmission of Multidrug Resistant Organisms (MDROs)

Many Healthcare Associated Pathogens Among Concerning MDROs



2019 Antibiotic Resistance Threats Report | Antimicrobial Resistance | CDC

Emerging MDROs –Many Commonalities



Carbapenem-Resistant Enterobacterales (CRE)



Multidrug-Resistant *Pseudomonas aeruginosa*



Carbapenem-Resistant *Acinetobacter* (CRA)



Candida auris

Gram-negative bacteria | **Yeast**

- Opportunistic pathogens that can colonize multiple mucosal surfaces
- Cause a variety of infections (e.g., urinary tract, wound, bloodstream, pneumonia)
- Infections often affect the "sickest of the sick" – patients with serious underlying conditions, indwelling devices, and residence in or frequent admission to healthcare facilities
- Limited treatment options
- Can be challenging to identify (e.g. carbapenemase detection in gram-negative bacteria, lack of routine species identification for yeast from non-sterile sites)

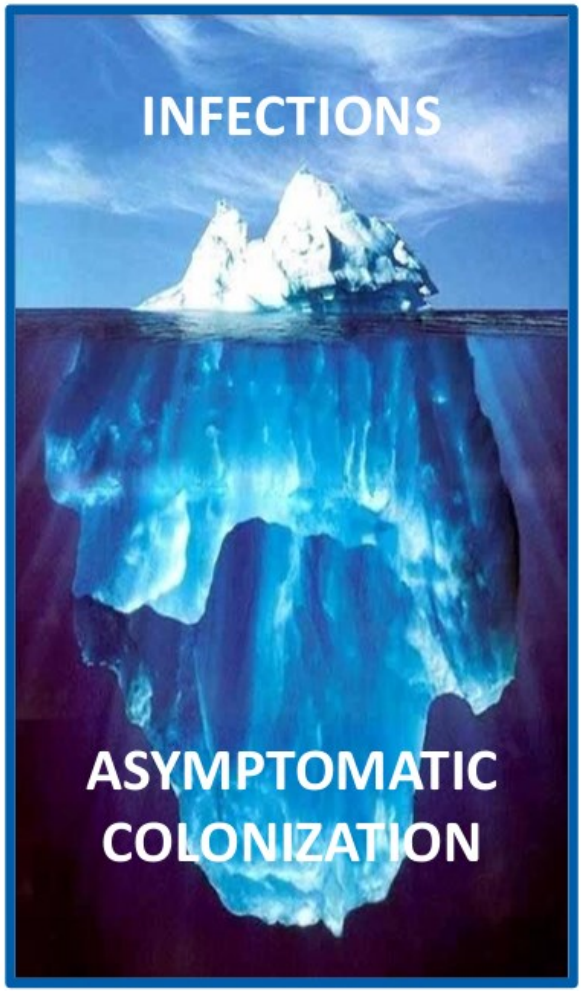
2019 Antibiotic Resistance Threats Report | Antimicrobial Resistance | CDC

Colonization

Infections are only a fraction of the total burden

Colonized Patients

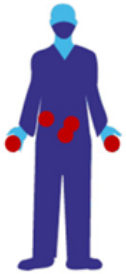
- Carry an MDRO on or in their body without showing signs or symptoms of infection
- Identified with screening tests
- Time to decolonization often prolonged



Primary transmission routes



Colonized and infected patients contaminate their environment



Healthcare Personnel
Hands and Clothes



Mobile Medical Equipment



Environment



Wastewater
Premise Plumbing

Colonization

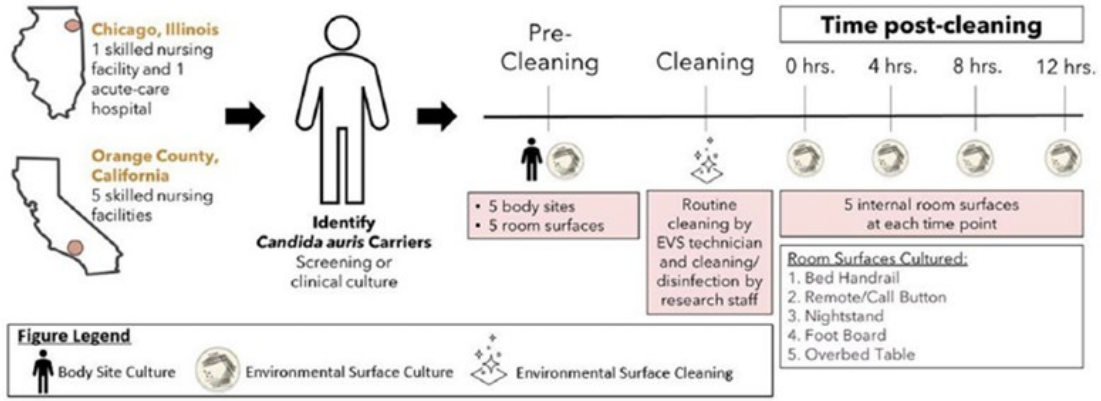
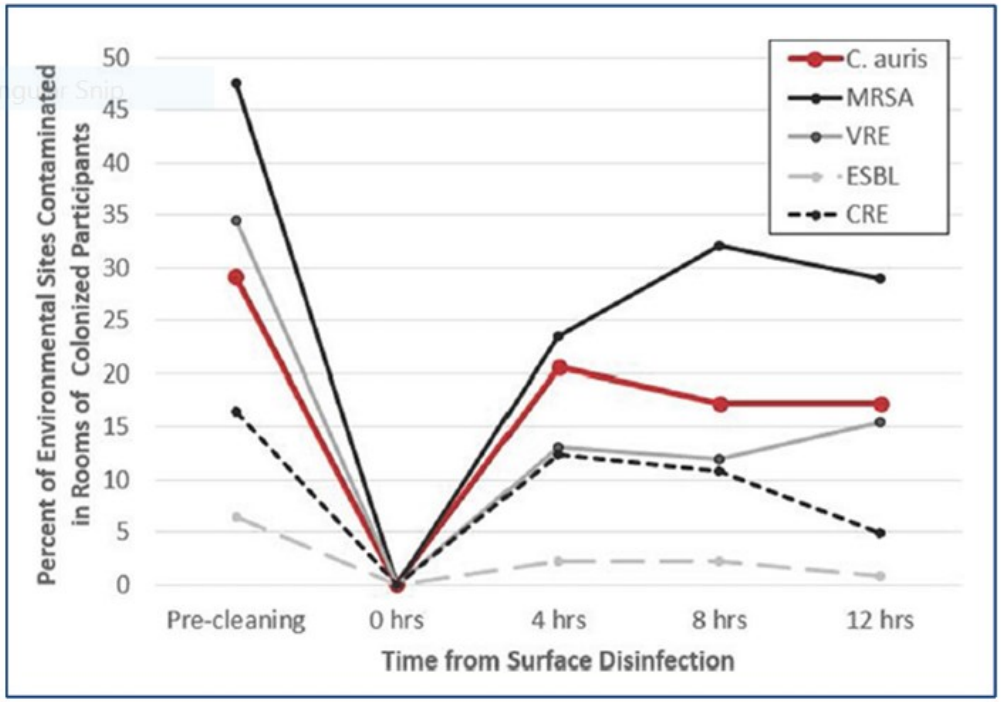
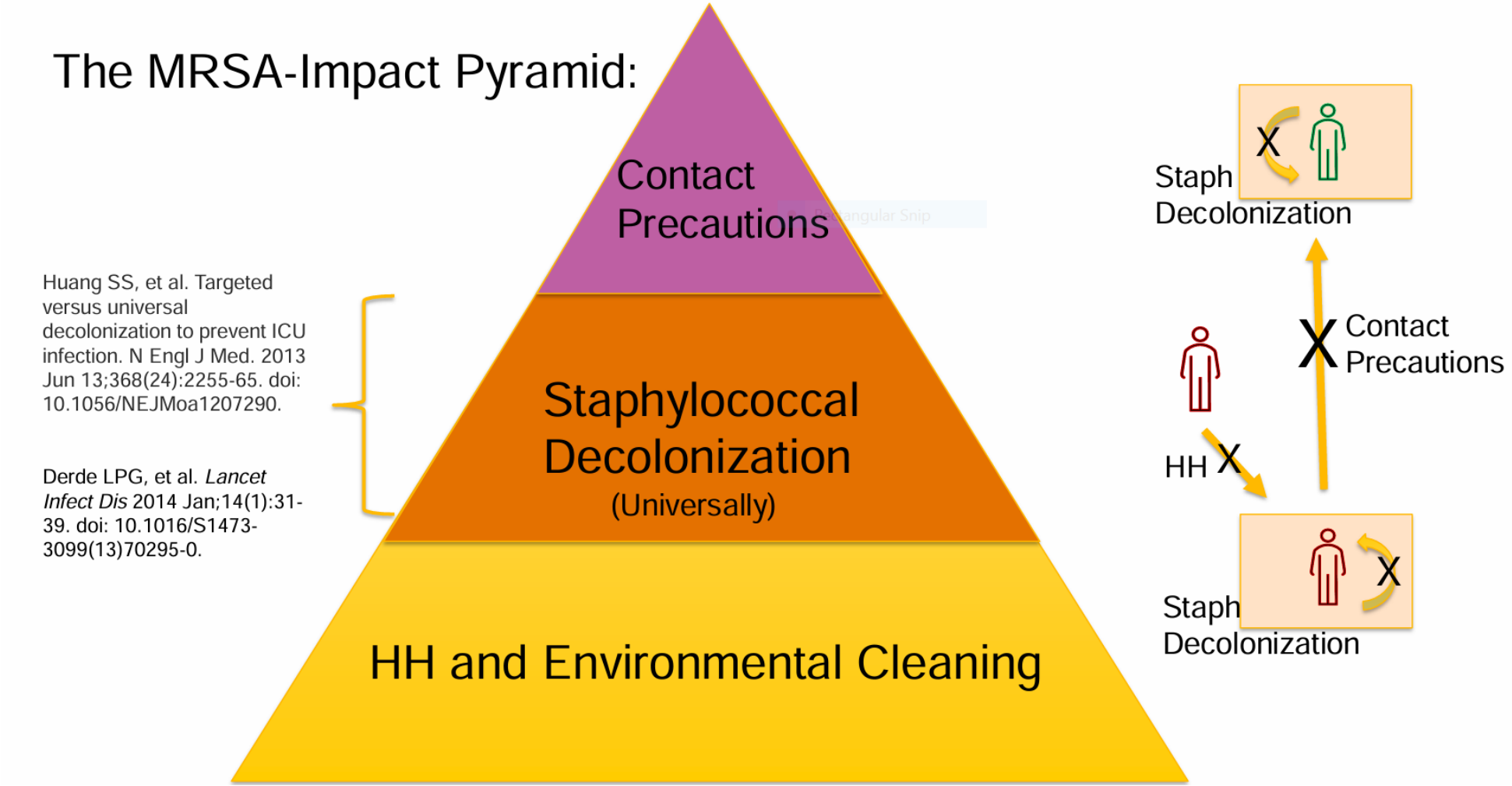


Figure 1. Sampling workflow overview.



Sansom, S.E., et. al. 2024. Clinical Infectious Diseases, 78(5), pp.1276-1284.

Decolonization is a core infection-prevention strategy for MRSA

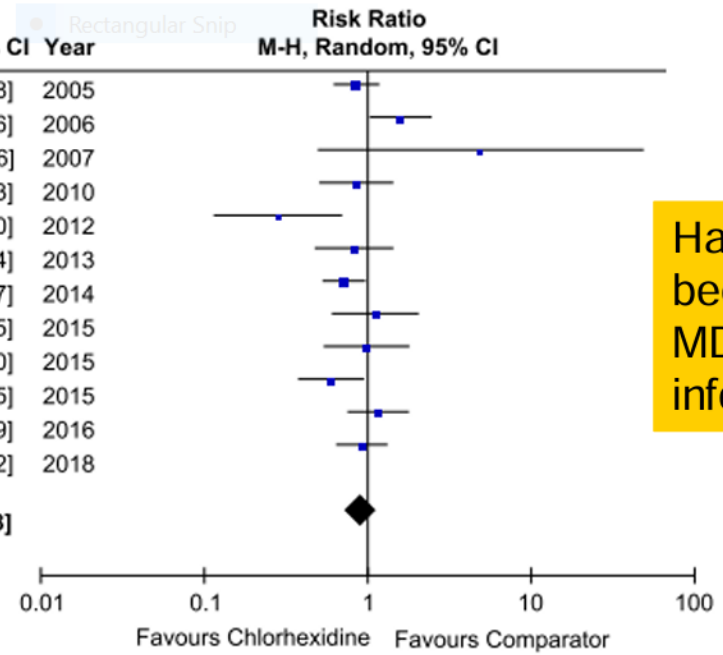


What about Gram-negative Decolonization?

Study or Subgroup	Chlorhexidine Events	Total	Comparator Events	Total	Weight	Risk Ratio M-H, Random, 95% CI	Year
Camus 2005	44	130	50	126	12.4%	0.85 [0.62, 1.18]	2005
Gould 2006	55	1421	30	1232	9.8%	1.59 [1.03, 2.46]	2006
Bleasdale 2007	2	11	1	27	0.7%	4.91 [0.49, 48.76]	2007
Evans 2010	25	286	26	253	8.2%	0.85 [0.50, 1.43]	2010
Montecalvo 2012	6	1832	21	1808	3.9%	0.28 [0.11, 0.70]	2012
Climo 2013	23	3970	27	3842	7.7%	0.82 [0.47, 1.44]	2013
Martinez-Reséndez 2014	56	327	84	351	12.9%	0.72 [0.53, 0.97]	2014
Boonyasiri 2015	19	189	18	199	6.8%	1.11 [0.60, 2.05]	2015
Noto 2015	20	4488	22	4852	6.9%	0.98 [0.54, 1.80]	2015
Cassir 2015	22	150	43	175	9.3%	0.60 [0.37, 0.95]	2015
Dicks 2016	35	152	30	151	9.9%	1.16 [0.75, 1.79]	2016
Urbancic 2018	55	2145	59	2117	11.5%	0.92 [0.64, 1.32]	2018
Total (95% CI)		**15101**		**15133**	**100.0%**	**0.89 [0.73, 1.08]**	
Total events	362		411				

Heterogeneity: Tau² = 0.06; Chi² = 22.10, df = 11 (P = 0.02); I² = 50%

Test for overall effect: Z = 1.17 (P = 0.24)

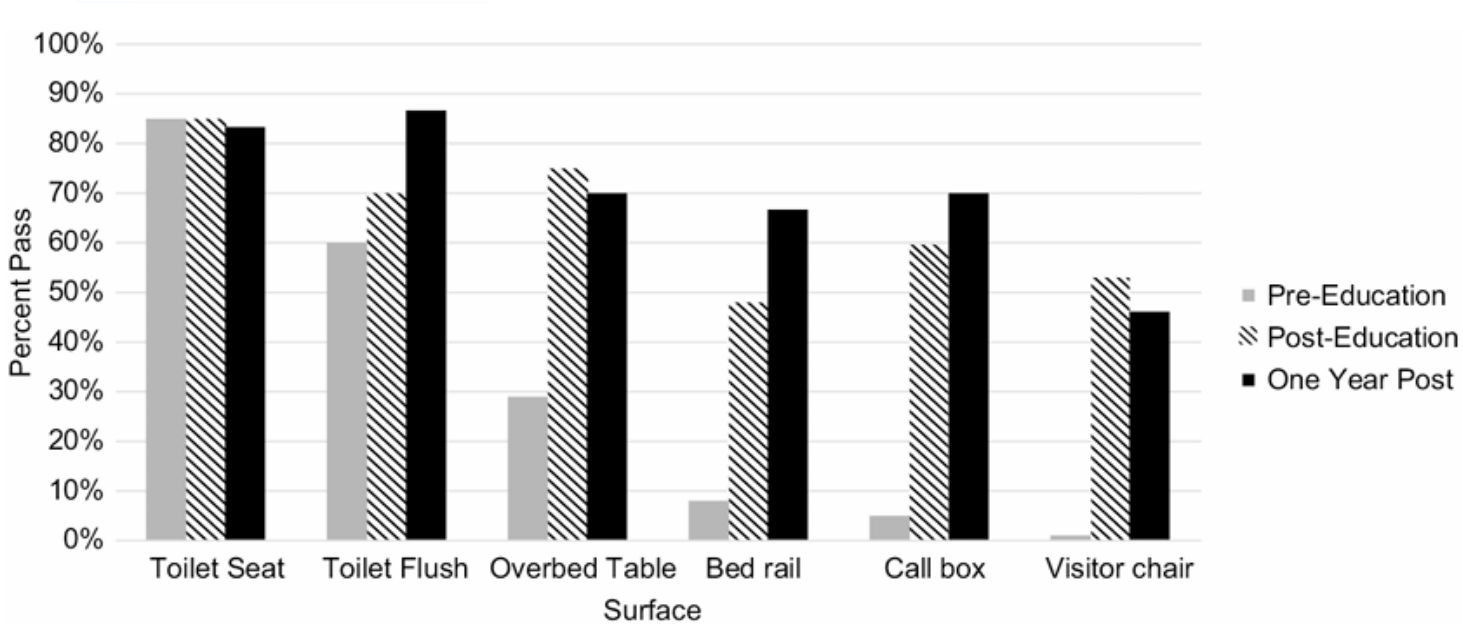


Has generally NOT been shown to impact MDRO-GNR infections:

Environmental service worker empowerment and team building with infection control

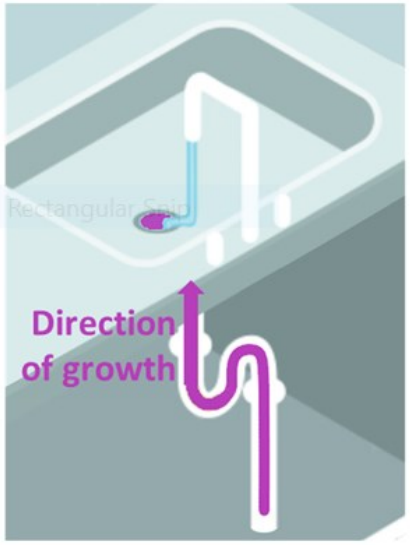
- Interactive trainings
- Hand hygiene, PPE use, isolation precautions, cleaning protocols, strategies to overcome barriers

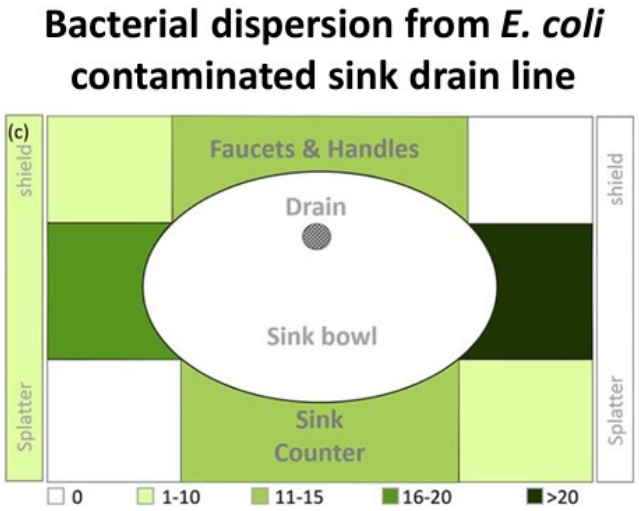
Sustained improvement in hospital cleaning associated with a novel education and culture change program for environmental services workers



Martin EK, et al. Infection Control & Hospital Epidemiology. 2019;40(9):1024-1029. doi:10.1017/ice.2019.183

Spread of MDROs from Wastewater Plumbing





Seeded from patient sources

Plumbing conducive to biofilm formation

Splashes and sprays from sink and shower drains, toilets, and hoppers disperse bacteria into splash zone

https://www.cdc.gov/healthcare-associated-infections/php/toolkit/water-management.html Kotay SM, et al. 2019. doi.org/10.1128/AEM.01997-18,

Modifiable Factors Influencing Transmission from Premise Plumbing

- Splash guards/no supplies in splash zone
- Not discarding nutritive liquids or patient waste in sink

Decreased risk

- Fast draining sinks
- Faucets offset from drain
- Cleaning sink and splash zone daily
- In an outbreak, EPA-registered disinfectants with label claim for biofilm may augment other IPC measures

Post-Acute Care and MDROs: Data for PPE as Prevention:

12 nursing homes split into 2 groups: Cluster-randomized by facility:

- Group 1: Standard precautions, passive surveillance MDROs
- Group 2: Gown/gloves for care of patients with urinary catheters and/or feeding tubes*, active surveillance for MDROs, Staff education/HH
  - NOT isolated – continued to attend group activities, meals etc
  - TBP in both groups per NH policy (ie yes isolation for C. auris or influenza for example)

FINDINGS:

- Less MDRO prevalence in patients with devices in intervention NHs
- Less MRSA acquisition
- Less clinically diagnosed UTIs

Mody L, et al. A Targeted Infection Prevention Intervention in Nursing Home Residents with Indwelling Devices: A Randomized Clinical Trial. JAMA Internal Medicine 2015;175:714-23..

Outpatient setting-Infection Control challenges:

- Alignment across settings, standardization at scale: inpatient ≠ outpatient
- Limited guidance by professional societies
- Regulatory compliance challenges (e.g., The Joint Commission [TJC] standards, Manufacturer's Instructions for Use [MIFU])
- Programs often under-funded/resourced (e.g., FTE, infection preventionists)
  - APIC staffing tool likely underestimates true burden/need
- Cost savings difficult to illustrate to C-suite or motivate stakeholders (vs. revenue-generating procedures, volume)
- Perception of risk may be lessened

Talbot TR et al, ICHE 2025 Apr 28;46(7):1-19

Communicable Disease Transmission :

- Symptom screening tools (syndromic)
- Variable adherence to standard precautions
- Implementation of transmission-based precautions



  - Caution with blanket implementation of precautions informed by inpatient experience & resources

- Advocate for frontline PPE availability
- Opportunities to safely de-escalate without signals of harm
- Exposure tracking – across settings, EMRs
- Surveillance challenges – short clinic visits, high patient volume

The unintended burden of transmission-based precautions for suspected COVID-19 in the ambulatory setting

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Prioritize high-risk / common IP breach areas

- Procedural spaces
- Injection safety
- HLD & sterilization: device reprocessing, MIFU adherence, storage
- Point-of-care testing
- Environmental cleaning
- Vulnerable populations, e.g., severe immunocompromise
- Medication preparation
- Hand hygiene

CDC Strategies for Targeted MDROs: Prevention



- **Long-term endeavors**
  - Improve detection and infection prevention practices
  - Focus most resources in 'influential' facilities
- **Apply to all stages of spread**
- **Led by health departments in collaboration with partners**
- **Elements include**
  - Healthcare facility education
  - Improve core infection control practices
  - Detect colonized individuals
  - Improved interfacility communication

https://www.cdc.gov/hai/mdro-guides/index.html.

Molecular Epidemiology and Genomic Sequencing

What Molecular Epidemiology Is

Molecular epidemiology is a branch of epidemiology that uses **biological markers**, especially DNA and RNA, to study the origins, spread, and risk factors of disease.

Key goals include:

Identifying sources of outbreaks (e.g., tracing a foodborne pathogen to a specific facility).

Understanding transmission chains within communities or hospitals.

Detecting emerging variants with increased transmissibility or virulence.

Modern sequencing technologies include:

Next-generation sequencing (NGS) for high-throughput whole-genome data

Long-read sequencing for structural variation

Targeted sequencing for specific genes or regions

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HAI Outbreak Investigation. A case study KPC-Klebsiella — A Hidden 14-Month Outbreak

What Happened

Month 0: Index patient develops infection with KPC-producing K. *pneumoniae* infection following ERCP.

Months 1–12: Additional infections across different wards and time periods. No clear epidemiologic cluster recognized

Month 14: Outbreak finally recognized after multiple infections accumulate. WGS confirms clonal outbreak strain of KPC-producing K. pneumoniae ST258 — carbapenem-resistant, source traced to contaminated duodenoscope

14
Months undetected

17
Patients Infected

5
Deaths Attributed

Sundermann et al. Clin Infect Dis 2022 (PMID 34791136)

What EDS-HAT Would Have Done

With Prospective WGS

Month 0 — Index Case: KPC-Kp detected after ERCP. Isolate sequenced

Month 1 — Alert: Patient 2 isolate sequenced → ≤3 SNPs from Patient 1. EHR review confirms shared ERCP endoscope. Alert triggered to IP&C

EDS-HAT Scope experience:
9 endoscope-linked outbreaks identified across the institution. Cluster size of ~2 patients. Implicated endoscopes immediately removed from service.

1 month	2	15
Time to detection	Cluster size	Infections prevented

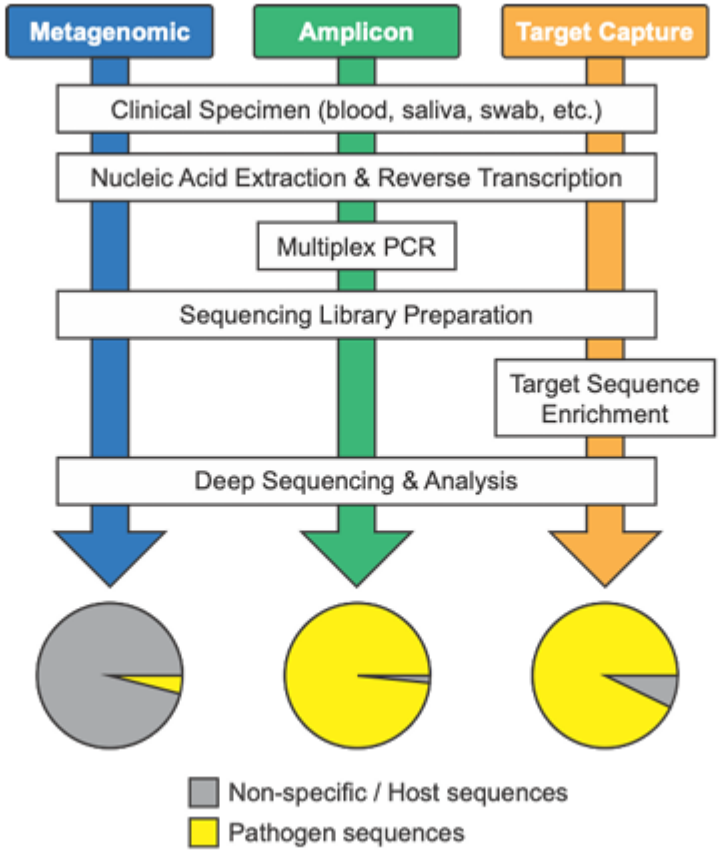
Prospective WGS would have potentially detected this outbreak at 2 patients (vs. 17). Scopes removed within weeks, not 14 months.

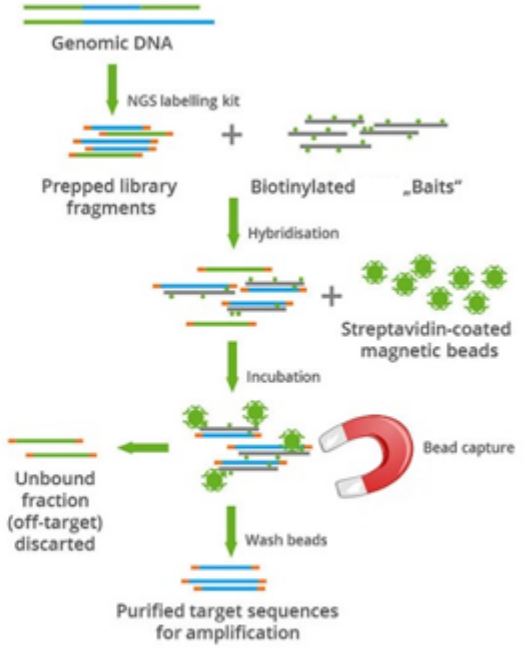
EDS-HAT Enhanced detection system for Healthcare associated transmission

Molecular Epidemiology and Genomic Sequencing









Molecular Epidemiology and Genomic Sequencing for Hospital-Acquired Infection Tracking

- Main goal: Identify or rule out epidemiologic relationship among hosts based on genotypic characteristics of the interacting microbes.
- Technical & analytical skills / resources remain a bottleneck
- High upfront infrastructure costs
- No standardized reimbursement or billing model for routine WGS
- Requires dedicated bioinformatics expertise
- No consensus on best-practice methods (eg. SNP thresholds)

Conclusions.

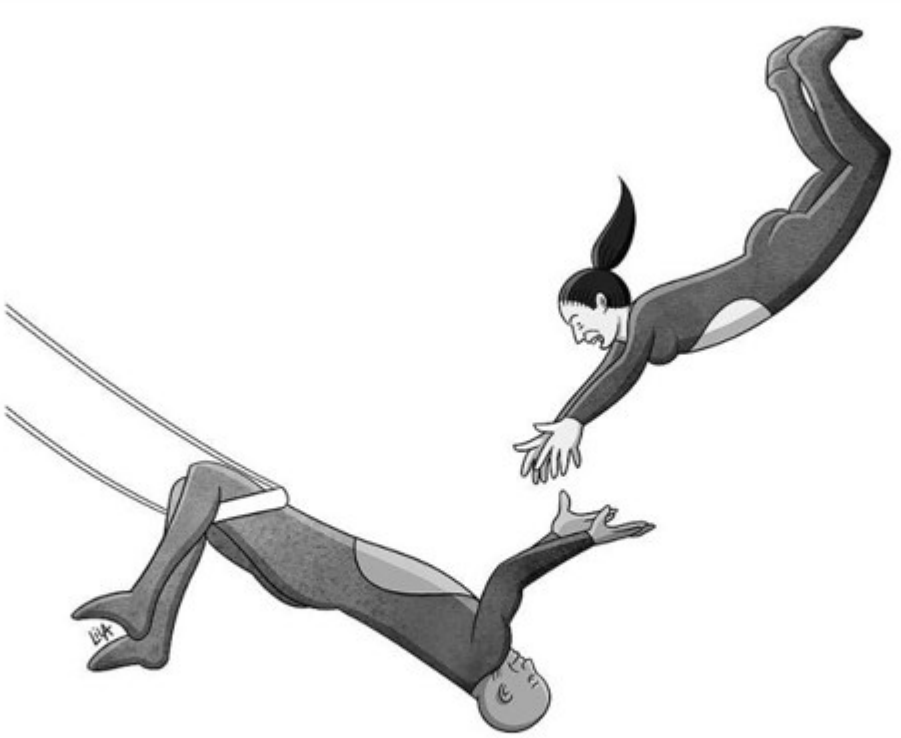
- Current environment may not rely in the expertise and transparency from the scientific community, but professional societies are joining forces.
- Greater patient trust through transparent safety practices.
- Vaccinations safe lives.
- Understanding transmission of organisms in healthcare is key to preventing HAI, protecting the healthcare worker and visitors. No one intervention is 100% effective.
- Enhance workforce readiness via training and competency verification.
- Improve operational efficiency by standardizing prevention protocols. Have to weigh degree of protection of an intervention with unintended consequences.

Conclusions.

- High levels of adherence to core infection control measures are necessary to prevent spread
- Enhanced actions before and after a case is identified can mitigate spread.
- Genomic sequencing as a HAI Surveillance tool may become the norm, currently there are barriers to implementation.

Science is our strength, patience is our challenge - Communication, compassion, and trust are necessary. “ Dr. Grace Lee”

Questions?



"Wait—did you wash your hands?"

Ash L. New Yorker