



Department of Health

## Candida auris & CPOs: Infection Prevention & Control Tips from “The Land of Best Practice”

APIC NY Educational Conference  
Shaping Infection Prevention: Improving Patient Outcomes Through Collaboration  
October 19, 2023

Jane Greenko RN, MPH, CIC, FAPIC  
Healthcare Epidemiology & Infection Control (HEIC) Program  
New York State Department of Health (NYSDOH)

---

---

---

---

---

---

---

---

2

## Disclosure

- This work is supported by the Center for Disease Control (CDC) and Prevention, Public Health Emergency Preparedness (PHEP) Cooperative Agreement #NU90TP922009 of the U.S. Department of Health and Human Services (HHS). The contents are those of the author(s) and do not necessarily represent the official views of, nor an endorsement, by CDC, HHS, or the U.S. Government.



---

---

---

---

---

---

---

---

3

## Objectives

- Describe epidemiology of emerging drug-resistant pathogens: *Candida auris* and carbapenemase-producing organisms (CPOs)—overview/background, public health significance, national & NYS trends
- Review foundational infection prevention & control (IPC) strategies for health care facilities (HCFs)—hand hygiene, isolation precautions, environmental cleaning & disinfection, competencies
- Define best practices for IPC across the health care (HC) continuum—optimizing precautions/ patient placement, surveillance/screening, communication, auditing, role of the environment, stakeholder coordination



---

---

---

---

---

---

---

---



### CDC: Contaminated Eye Drops Outbreak Has Left 3 Dead, 4 With Eyeballs Removed



Source: [https://www.forbes.com/sites/brunofel/2023/05/23/eye-contaminated-eye-drops-outbreak-has-left-3-dead-4-with-eyeballs-removed/?hpid=hp\\_hp-top-table-main-eyes-contaminated-eyes-drops-outbreak-has-left-3-dead-4-with-eyeballs-removed\\_7a-12202304101a](https://www.forbes.com/sites/brunofel/2023/05/23/eye-contaminated-eye-drops-outbreak-has-left-3-dead-4-with-eyeballs-removed/?hpid=hp_hp-top-table-main-eyes-contaminated-eyes-drops-outbreak-has-left-3-dead-4-with-eyeballs-removed_7a-12202304101a)

### Outbreak of Extensively Drug-resistant *Pseudomonas aeruginosa* Associated with Artificial Tears



Downloaded from the CDC Health Alert Network  
February 3, 2023, 10:02 AM EST

#### As of May 15, 2023:

- 81 patients in 18 states (including NY) with VIM-GES-CRPA
  - Most patients reported using artificial tears.
  - Preservative-free, multidose bottles
  - EzriCare Artificial Tears only common product identified across the 4 HCF clusters.

Source: <https://www.cdc.gov/hai/outbreaks/rpqa-artificial-tears.html>

---

---

---

---

---

---

---

---

---

---

---



### DRUG-RESISTANT CANDIDA AURIS

323 clinical cases in 2022  
90% isolates resistant to at least one antifungal  
30% isolates resistant to all three antifungals

Candida auris (*C. auris*) is an emerging multidrug-resistant yeast (a type of fungus). It can cause severe infections and spreads easily between hospitalized patients and nursing home residents.

#### WHAT YOU NEED TO KNOW

- *C. auris*, first identified in 2009 in Asia, has quickly become a cause of severe infections around the world.
- *C. auris* is a concerning drug-resistant fungus:
  - Often multidrug-resistant, with some strains (types) resistant to all three available classes of antifungals
  - Can cause outbreaks in healthcare facilities
  - Some common healthcare disinfectants are less effective at eliminating it
  - Can be carried on patients' skin without causing infection, allowing spread to others

#### CASES OVER TIME

*C. auris* began spreading in the United States in 2015. Reported cases increased 375% in 2018 when compared to the average number of cases reported in 2015 to 2017.



Source: <https://www.cdc.gov/fungal/diseases/candida-auris/tracking-c-auris.html>

---

---

---

---

---

---

---

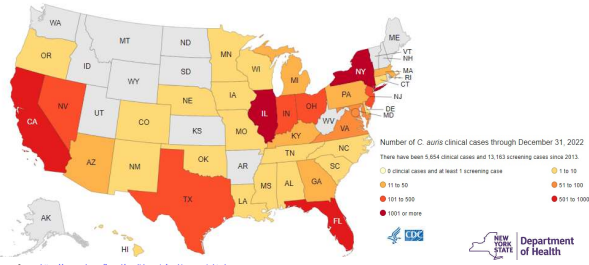
---

---

---

---

### *C. auris*—National Surveillance Data



Source: <https://www.cdc.gov/fungal/candida-auris/tracking-c-auris.html>

---

---

---

---

---

---

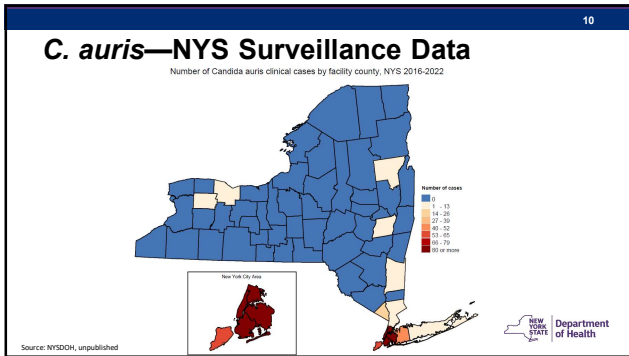
---

---

---

---

---




---

---

---

---

---

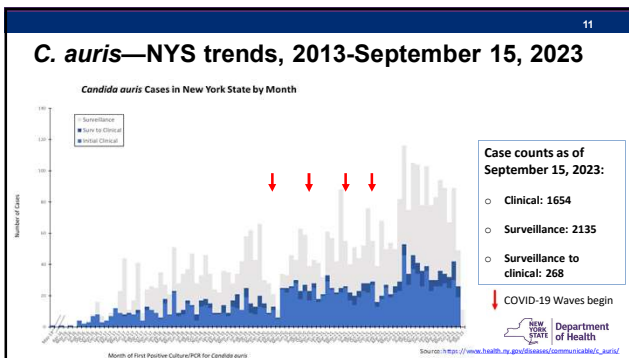
---

---

---

---

---




---

---

---

---

---

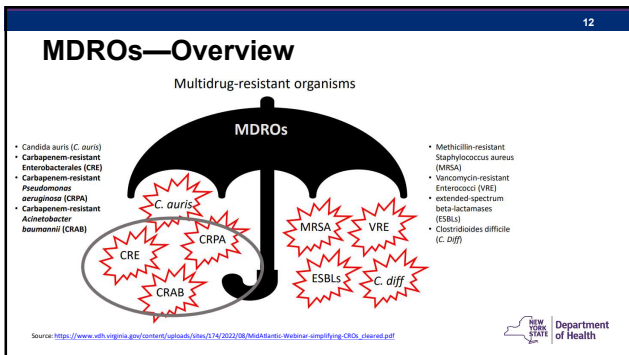
---

---

---

---

---




---

---

---

---

---

---

---

---

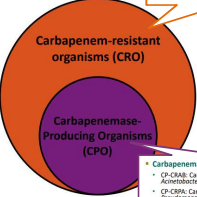
---

---

13

## Carbapenem-resistant (CR) vs Carbapenemase-producing (CP)

- CRO: Carbapenem-Resistant Organism**
  - Any organism resistant to carbapenem antibiotics regardless of having a carbapenemase or not
- CPO: Carbapenemase-Producing Organism**
  - Any organism that produces a carbapenemase making them resistant to carbapenem antibiotics
  - A special subset of Carbapenem-Resistant Organisms




**Carbapenem-Resistant Organisms (CRO)**

- CRAB: Carbapenem-resistant *Acinetobacter baumannii*
- CRPA: Carbapenem-resistant *Pseudomonas aeruginosa*
- CRE: Carbapenem-resistant *Enterobacteriales*
- Example: *Enterococcus coli* ST-508 and *Stenotrophomonas*

**Carbapenemase Producing Organisms (CPO)**

- CP-CRAB: Carbapenemase-Producing Carbapenem-resistant *Acinetobacter baumannii*
- CP-CRPA: Carbapenemase-Producing Carbapenem-resistant *Pseudomonas aeruginosa*
- CP-CRE: Carbapenemase-Producing Carbapenem-resistant *Enterobacteriales*

Source: [https://www.vdh.virginia.gov/content/uploads/2019/07/2022-08/MidAtlantic-WBinar\\_simplifying\\_CRO\\_CPOand.pdf](https://www.vdh.virginia.gov/content/uploads/2019/07/2022-08/MidAtlantic-WBinar_simplifying_CRO_CPOand.pdf)

 Department of Health

---

---

---

---

---

---

---

---

---

---


---

---


14

## Carbapenemase-producing Organisms (CPO)

- Epidemiologically important group of multidrug-resistant organisms (MDROs)
- Subset of carbapenem resistant organisms (CROs)
- ➔ **Urgent threat to public health.**
  - Difficult to treat
  - Associated with high mortality
  - Contain mobile genetic elements
    - Facilitate resistance gene transmission within/between bacterial species & between patients.



Source: <https://tdc.services.cdc.gov/save/definitions/carbapenemase-producing-organisms.cdc/>

 Department of Health

---

---

---

---

---

---

---

---

---

---


---

---


15

## Targeted Carbapenemases

- Multiple genetic mechanisms can cause resistance
- “The Big Five”:
  - KPC** – *Klebsiella pneumoniae* carbapenemase (most common in U.S.)
  - NDM** – New Delhi Metallo-β-lactamase
  - VIM** – Verona Integron-encoded Metallo-β-lactamase
  - OXA** – Oxacillinase-48-type carbapenemase
  - IMP** – Imipenemase Metallo-β-lactamase



Source: [https://www.cdc.gov/drugresistance/pdf/01news-report/How\\_Germs\\_Fight\\_Back\\_Against\\_Antibiotics.pdf](https://www.cdc.gov/drugresistance/pdf/01news-report/How_Germs_Fight_Back_Against_Antibiotics.pdf)

 Department of Health

---

---

---

---

---

---

---

---

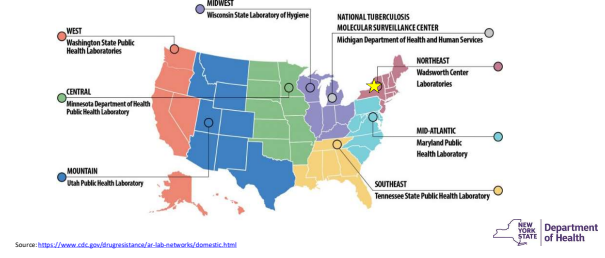
---

---

---

---

### CDC's Antimicrobial Resistance Laboratory Network (ARLN)




---

---

---

---

---

---

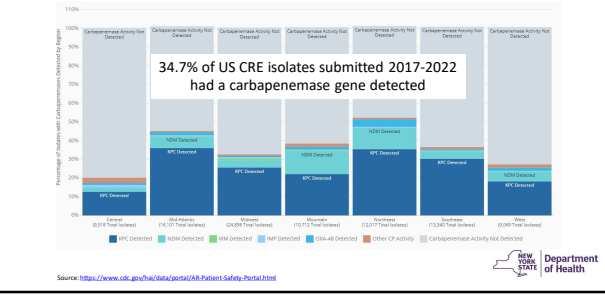
---

---

---

---

### CDC ARLN Data—CP-CRE, 2017-2022




---

---

---

---

---

---

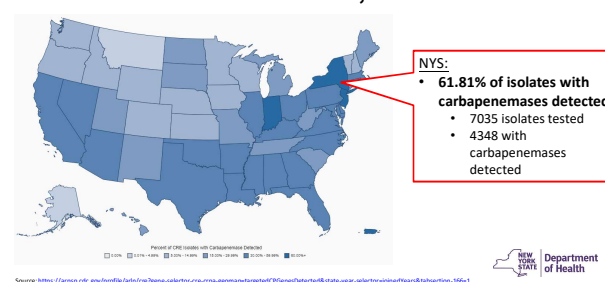
---

---

---

---

### CDC ARLN Data—CP-CRE, 2017-2022




---

---

---

---

---

---

---

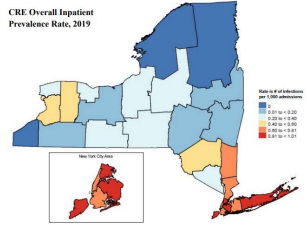
---

---

---



### CRE—NYS NHSN Data, 2019



Source: [https://www.health.ny.gov/statistics/facilities/hospital/hospital\\_acquired\\_infections/2019/docs/hospital\\_acquired\\_infection\\_g1.pdf](https://www.health.ny.gov/statistics/facilities/hospital/hospital_acquired_infections/2019/docs/hospital_acquired_infection_g1.pdf)




---

---

---

---

---

---

---

---

### CDC Strategies for Prevention and Response to Novel & Targeted MDROs

**Interim Guidance for a Public Health Response to **Contain** Novel or Targeted Multidrug-resistant Organisms (MDROs)**

**Public Health Strategies to **Prevent** the Spread of Novel and Targeted Multidrug-resistant Organisms (MDROs)**

Source: <https://www.cdc.gov/hai/intrdc-guides/containment-strategy.html>, <https://www.cdc.gov/hai/intrdc-guides/prevention-strategy.html>




---

---

---

---

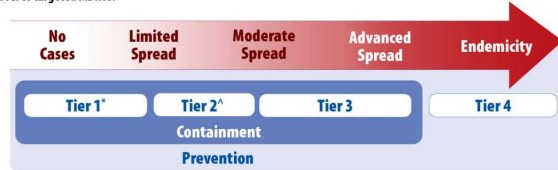
---

---

---

---

Figure 1. Relationship between epidemic stages, response tiers, containment response, and prevention activities for novel or targeted MDROs.



Organism or resistant mechanism that have

\*Never (or very rarely) been identified in the United States and for which experience is extremely limited are Tier 1.

^Never (or very rarely) been identified in a public health jurisdiction but are more common in other parts of the U.S. are Tier 2.

Source: <https://www.cdc.gov/hai/intrdc-guides/index.html>




---

---

---

---

---

---

---

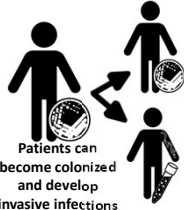
---



### Why Are We Concerned About *C. auris* & CPOs?



Highly drug-resistant



Patients can become colonized and develop invasive infections



Lives on surfaces for long time & spreads in healthcare settings



Source: Adapted from Ostrowsky, CDC. A Candida auris Update. Grand Rounds presentation, June 7, 2022, Flushing, NY.

---

---

---

---

---

---

---

---

### IPC Strategies

- "Basics"—Foundational:
  - Asepsis
  - Hand hygiene
  - Standard & Transmission-based Precautions (TBP)
  - Personal protective equipment (PPE) use & availability
  - Environmental IC—cleaning and disinfection
- "Best Practices"/Next Level:
  - Colonization screening:
    - Point Prevalence Studies (PPS)
    - Admission/discharge screening
  - Auditing practices
  - LTC settings – Enhanced Barrier Precautions (EBP)
  - Communication/coordination among continuum partners



Photo: NYSDOH (J. Greenlee)



Source: <https://www.cdc.gov/hcu/mro-guides/implementation-strategy.html>

---

---

---

---

---

---

---

---

### Response—Healthcare Facilities (HCFs)



- Collect case details and risk factors (e.g., healthcare, travel)
- Contact tracing and testing to find more cases
- IPC basics:
  - PPE & TBP
  - Hand hygiene
  - Environmental IC—cleaning and disinfection
    - Patient/resident care environment
    - Shared medical equipment



Source: Adapted from Kogut, NYSDOH. Candida auris 101. Presented September 20, 2022.

---

---

---

---

---

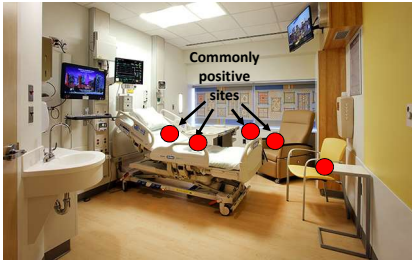
---

---

---



### Challenge: *C. auris* in the HCF Environment



- Can survive for months
- Some common disinfectants don't work
- Need EPA List P or K product
- Contact time is key



Source: Adapted from [https://emergency.cdc.gov/handbook/2017/index\\_081117\\_tackling\\_urgent\\_emerging\\_microb\\_g\\_patient\\_care01.pdf](https://emergency.cdc.gov/handbook/2017/index_081117_tackling_urgent_emerging_microb_g_patient_care01.pdf)

---

---

---

---

---

---

---

---

---

---

### Basics: Environmental IC



- Know who's responsible for cleaning the patient/resident's immediate environment
- Know which product to use & follow manufacturer's instructions for use
- Focus on high-touch surfaces & shared equipment
- What about porous items/surfaces? Electronic equipment?
- Dedicate equipment for single patient with MDROs



Photo: NYSDOH (J. Greenko)  
Source: <https://www.cdc.gov/infectioncontrol/pdf/50a/IPC-m04-EVS-508.pdf>

---

---

---

---

---

---

---

---

---

---

### Best Practice: Auditing



- NOT the same as monitoring competency
- Routine compliance/daily practice:
  - Hand hygiene
  - PPE use
  - Environmental cleaning & disinfection
    - Surfaces
    - Shared medical equipment
- Communicate findings with staff
  - > Opportunities for improvement



Photo: NYSDOH (J. Greenko)  
Source: <https://www.cdc.gov/infectioncontrol/pdf/50a/IPC-m02-training-audit-508.pdf>

---

---

---

---

---

---

---

---

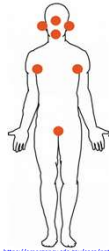
---

---



### Challenges: "Clearance"

- CDC does not recommend routine reassessments of *C. auris* colonization status ("Clearance"):
  - Patients/residents in HCFs
  - Require complex medical care (e.g., ventilator support)
- Colonization persists for a long time
- Repeat colonization swab results may fluctuate between *C. auris* +/-
- Consider reassessment:
  - If patient/resident's clinical status improves significantly
  - In consultation with public health department.



[https://emergency.cdc.gov/food/food-safety/2019/08/2019-08-20-antibiotic-resistant-yeast-candida-auris\\_muchlonger\\_resistant\\_yeast](https://emergency.cdc.gov/food/food-safety/2019/08/2019-08-20-antibiotic-resistant-yeast-candida-auris_muchlonger_resistant_yeast)  
 New York State Department of Health

Source: <https://www.cdc.gov/fungal/candida-auris/c-auris-infection-control.html>

---

---

---

---

---

---

---

---

### Case Study #2: CPO, Part I

- NYSDOH epidemiologist received an ARLN alert and contacts you for information
- Case has NDM carbapenemase from wound cx
- Long-term vSNF resident, no travel history

Now what?




---

---

---

---

---

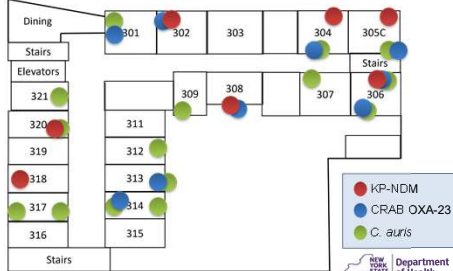
---

---

---

### Case Study #2: CPO, Part I continued

- NY vSNF IPC Response:**
- Cohorting
  - Using EBP
  - Screening/ repeat PPS



Source: Adapted from Ostrowsky et al. Working Together: A Tale of Carbapenemase-Producing Organism Investigations in Three New York City Nursing Homes. IDWeek, Washington DC, October 2-6, 2020. (poster)

---

---

---

---

---

---

---

---

### Challenges: When to Discontinue TBP?

- No de-colonization regimen for *C. auris* or CPOs
- Duration of/timing to discontinue TPB:
  - UNRESOLVED ISSUE**
  - ❑ "The decision to discontinue Contact Precautions (CP) for an individual with history of CRE colonization/infection should be made in consultation with public health<sup>A</sup>."
  - ❑ Continue CP or EBP for the entire duration of ALL inpatient & LTC facility stays\*.
- Admission/discharge & IPC practices of HCFs across continuum:
  - ❑ Acute care, LTCF/VSNF, assisted living/other congregate settings, ambulatory care

Source: <https://www.cdc.gov/eid/content/cdr/cdr0118/cre-disinfection.html>, <https://www.cdc.gov/fungal/diseases/auris/0-auris-infection-control.html>




---

---

---

---

---

---

---

---

### Best Practice: EBP

**STOP ENHANCED BARRIER PRECAUTIONS STOP**  
EVERYONE MUST:

- Clean their hands, including before entering and when leaving the room.

**PROVIDERS AND STAFF MUST ALSO:**

- Wear gloves and a gown for the following High-Contact Resident Care Activities:
  - Diapering
  - Bedding movement
  - Transferring
  - Changing linens
  - Providing hygiene
  - Changing bed/wraps/inserts with soiling
  - Device care in room
  - Controlling
  - Tracheostomy
  - Wound care and skin opening requiring a dressing
- Do not wear the same gown and gloves for the care of more than one person.

EDC | <https://www.cdc.gov/eid/content/cdr/cdr0118/cre-disinfection.html>

- Use of gown and gloves during high-contact resident care activities
- No private room required
- Residents can participate in group activities
- Intended to be used for resident's entire length of stay

Source: <https://www.cdc.gov/eid/content/cdr/cdr0118/cre-disinfection.html>




---

---

---

---

---

---

---

---

### Case #3: CPO, Part II

- ❑ Multiple ARLN alerts identified over 8 month period at your hospital:
  - 15 individuals with CRPA blaVIM from urine
    - Male (86.7%)
    - Private residence (86.7%)
    - Specimen collected as inpatient (6.7%)
- ❑ No hospital-based epidemiologic links identified

### What do you think?

Hospital IPs notified NYSDOH of an outpatient urology practice common among cases




---

---

---

---

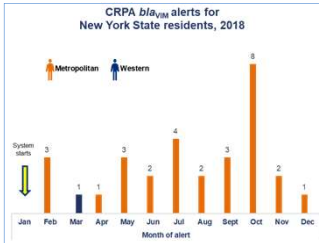
---

---

---

---

### Case #3: CPO, Part II continued



- Of 1336 CRPA tested, 30 (2.2%) CRPA *bla*<sub>VIM</sub>
  - County A (70.0%)
  - WGS, n=26:
    - *bla*<sub>VIM2</sub>, MLST111 (88.5%)
  - SNP analysis, n=18:
    - Highly Related Group:
      - 9/18 (50%) 0-4 SNPs
      - All urology patients

	A	B	C	D	E	F	G	H	I
A	+	+	+	+	+	+	+	+	+
B	+	+	+	+	+	+	+	+	+
C	+	+	+	+	+	+	+	+	+
D	+	+	+	+	+	+	+	+	+
E	+	+	+	+	+	+	+	+	+
F	+	+	+	+	+	+	+	+	+
G	+	+	+	+	+	+	+	+	+
H	+	+	+	+	+	+	+	+	+
I	+	+	+	+	+	+	+	+	+

Source: Kogut, Greenko et al. Detection of a Cluster of Carbapenem-resistant *Pseudomonas aeruginosa* with a Novel Resistance Mechanism among Persons Receiving Outpatient Urology Care, New York, 2018. SHEA Spring 2019, Boston, MA, April 24-26. (presentation)




---

---

---

---

---

---

---

---

---

---

---

---

### Basics: Infection Control Assessment

- Multiple opportunities for cross-contamination
- Dispensing from bulk containers
- Single patient use item used for multiple patients
- Concerns with high-level disinfection of cystoscopes:
  - Unclear separation of clean and soiled equipment
  - Disinfection processes lacked sterility monitoring



Photo Credit: NYSDOH (J. Greenko)

Kogut, Greenko et al. Detection of a Cluster of Carbapenem-resistant *Pseudomonas aeruginosa* with a Novel Resistance Mechanism among Persons Receiving Outpatient Urology Care, New York, 2018. SHEA Spring 2019, Boston, MA, April 24-26. (presentation)




---

---

---

---

---

---

---

---

---

---

---

---

### Summary

- ARLN novel mechanism cluster detection & investigation
- WGS to inform epidemiologic investigations in HC settings
- MDRO transmission in all care settings
- Need to strengthen IPC across the HC continuum

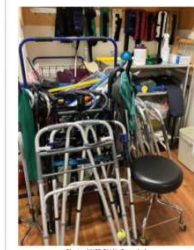


Photo: NYSDOH (J. Greenko)




---

---

---

---

---

---

---

---

---

---

---

---

### Parting thoughts...

- Do we have these organisms present?
  - If no, how do we know that?
  - If yes, how are we monitoring for spread?
- Are we connected to/communicating with our:
  - Lab to enable surveillance?
  - Facility team for appropriate IPC
  - Referring HCFs
  - Transport agencies?
  - Public health partners?
  - Patients/residents & caregivers?

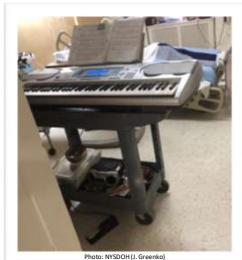


Photo: NYSDOH (J. Greenko)




---

---

---

---

---

---

---

---

### Questions/Discussion



Photo: NYSDOH (J. Greenko)




---

---

---

---

---

---

---

---

Thank you!

[jane.greenko@health.ny.gov](mailto:jane.greenko@health.ny.gov)

631-851-3656

- Many thanks to:
- Sarah Kogut NYSDOH
  - Belinda Ostrowsky CDC
  - NYSDOH HEIC
  - NYSDOH Wadsworth Center
  - Local Health Departments
  - APIC NY
  - Facility IPs & frontline HCP (all of you)




---

---

---

---

---

---

---

---