



Department
of Health

Lessons Learned: An Update on ***Candida auris*** Epidemiology

January 16, 2019

Eleanor Adams, MD, MPH
Healthcare Epidemiology & Infection Control Program
New York State Department of Health

Objectives

- Global & U.S. *Candida auris* epidemiology
- *C. auris* epidemiology in New York State
 - Patient characteristics
 - Environmental findings
 - Laboratory findings
 - ***Lessons Learned***

Global *C. auris* Emergence: First Report of *C. auris*, Japan, 2009

***Candida auris* sp. nov., a novel ascomycetous yeast isolated from the external ear canal of an inpatient in a Japanese hospital**

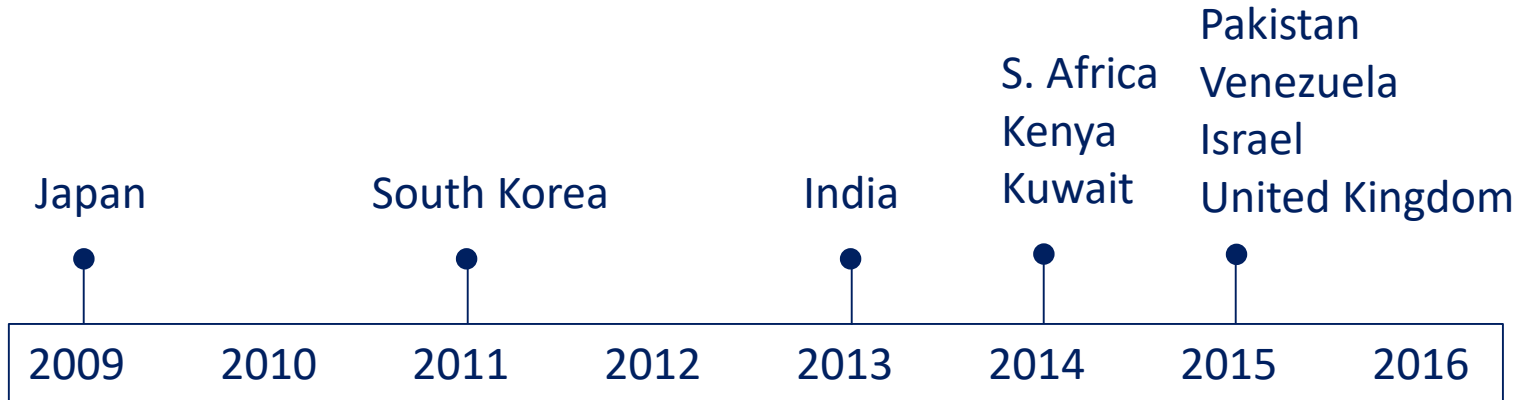
Kazuo Satoh^{1,2}, Koichi Makimura^{1,3}, Yayoi Hasumi¹, Yayoi Nishiyama¹, Katsuhisa Uchida¹ and Hideyo Yamaguchi¹

¹Teikyo University Institute of Medical Mycology, 359 Otsuka, Hachioji, Tokyo 192-0395, ²Japan Health Sciences Foundation, 13-4 Nihonbashi-Kodenmachi, Chuo-ku, Tokyo 103-0001 and ³Genome Research Center, Graduate School of Medicine and Faculty of Medicine, Teikyo University, Otsuka 359, Hachioji, Tokyo 192-0395, Japan

Satoh K, Makimura K, Hasumi Y, et al. *Candida auris* sp. nov., a novel ascomycetous yeast isolated from the external ear canal of an inpatient in a Japanese hospital. *Microbiol Immunol.* 2009;53:41–4.



Global *C. auris* Emergence: Rapid Emergence Since 2009



Global *C. auris* Emergence


Clinical Infectious Diseases

IDSIA
Infectious Diseases Society of America

hivma
hiv medicine association

Issues More Content ▾ Publish ▾ Purchase Advertise ▾ About ▾

All Clinical Infectiou ▾ Advanced Search



Clinical Infectious Diseases
Volume 64, Issue 2
15 January 2017

Article Contents

EDITOR'S CHOICE

Simultaneous Emergence of Multidrug-Resistant *Candida auris* on 3 Continents Confirmed by Whole-Genome Sequencing and Epidemiological Analyses ^{FREE}

Shawn R. Lockhart, Kizee A. Etienne, Snigdha Vallabhaneni, Joveria Farooqi, Anuradha Chowdhary, Nelesh P. Gounder, Arnaldo Lopes Colombo, Belinda Calvo, Christina A. Cuomo, Christopher A. Desjardins, ...
[Show more](#)

Clinical Infectious Diseases, Volume 64, Issue 2, 15 January 2017, Pages 134–140,
<https://doi.org/10.1093/cid/ciw691>

Published: 16 December 2016 **Article history** ▾

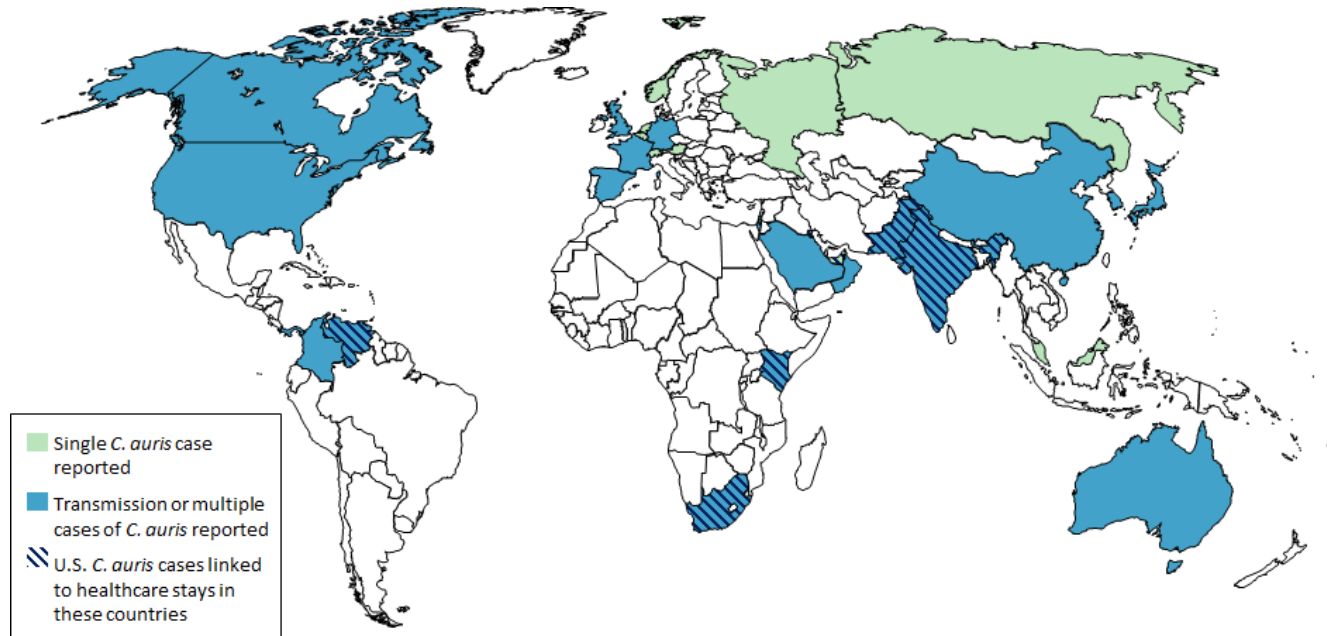
<https://academic.oup.com/cid/article/64/2/134/2706620>



Department
of Health

Global *C. auris* Emergence

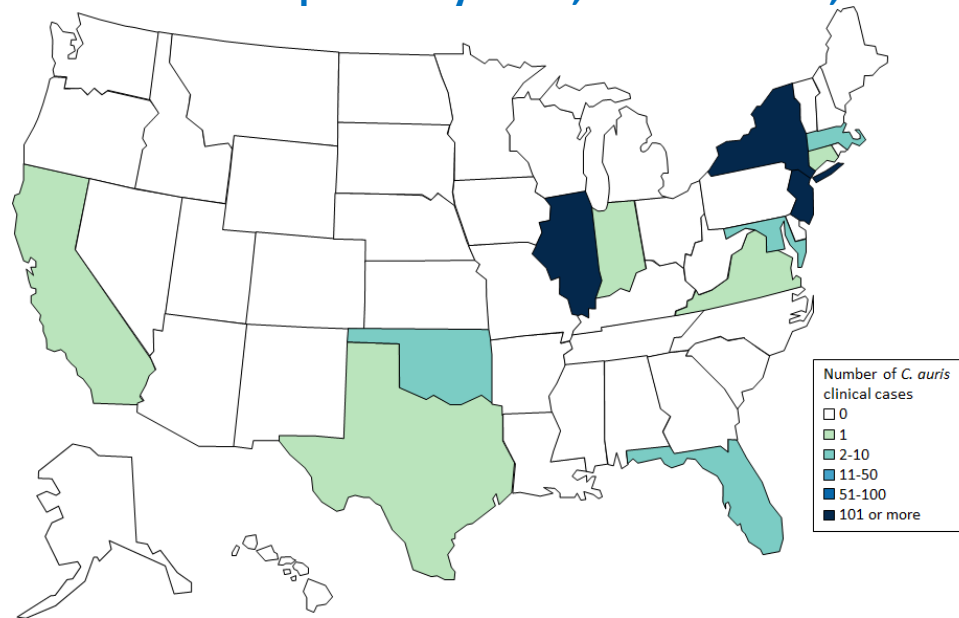
Countries from which *Candida auris* cases have been reported, as of November 30, 2018



Tracking *Candida auris*. Centers for Disease Control and Prevention website. <https://www.cdc.gov/fungal/candida-auris/tracking-c-auris.html>. Accessed September 20, 2018.

C. auris in U.S.

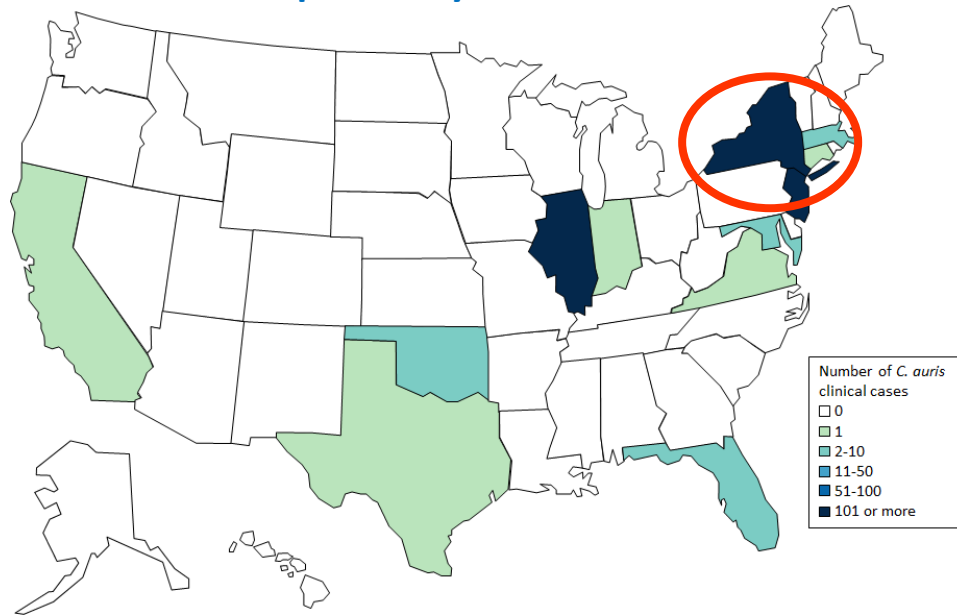
U.S. Clinical Cases of *Candida auris* Reported by State, United States, as of November 30, 2018



Tracking *Candida auris*. Centers for Disease Control and Prevention website. <https://www.cdc.gov/fungal/candida-auris/tracking-c-auris.html>. Accessed September 20, 2018.

C. auris in U.S.

U.S. Clinical Cases of *Candida auris* Reported by State, United States, as of September 30, 2018



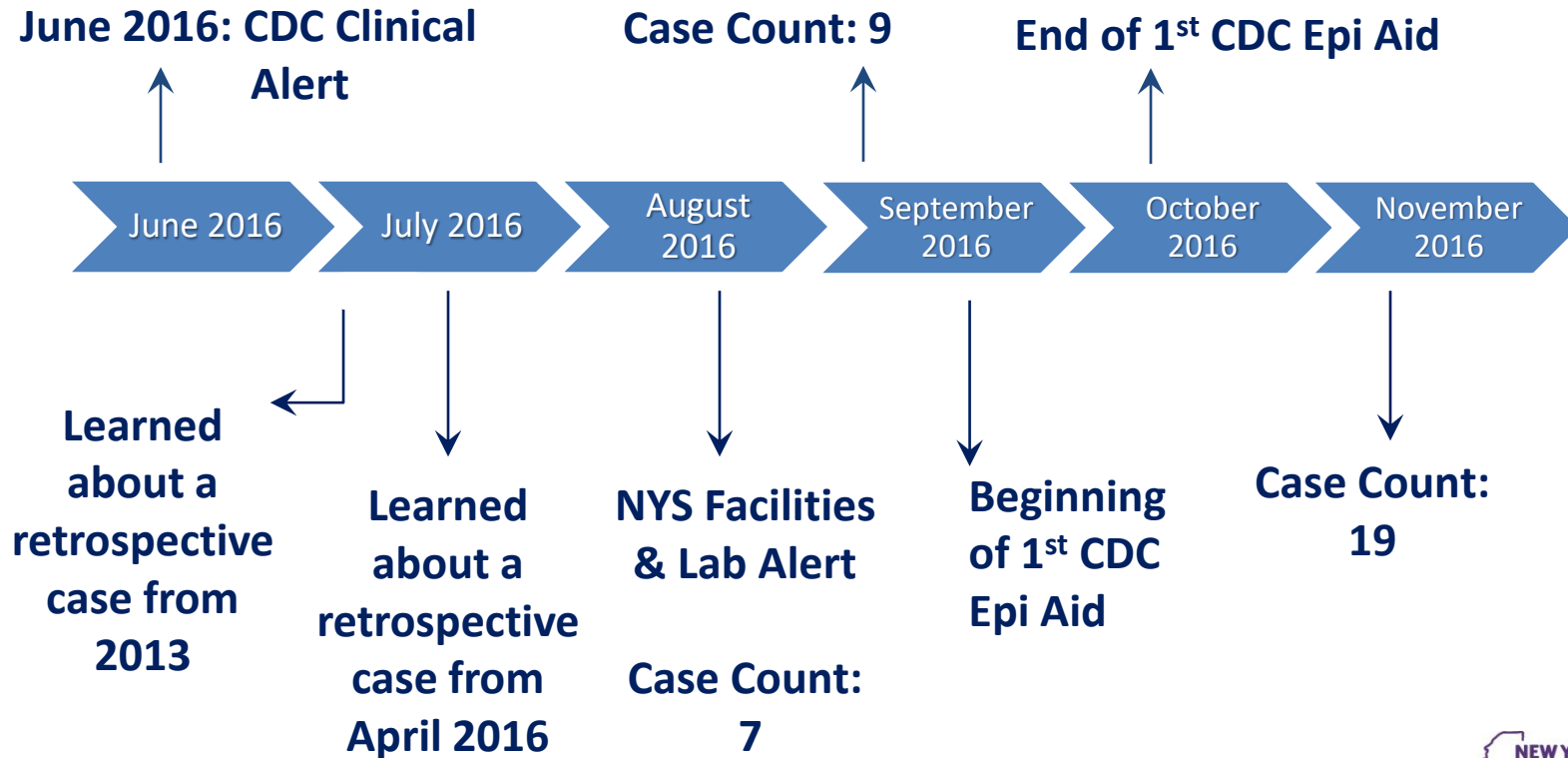
Tracking *Candida auris*. Centers for Disease Control and Prevention website. <https://www.cdc.gov/fungal/candida-auris/tracking-c-auris.html>. Accessed September 20, 2018.

New York State Numbers

- As of January 14, 2019
 - Confirmed cases:
 - Clinical cases: 280
 - Surveillance cases: 391
 - Probable cases: 4
- } Double-counted: 29
(surveillance → clinical)

Lessons Learned

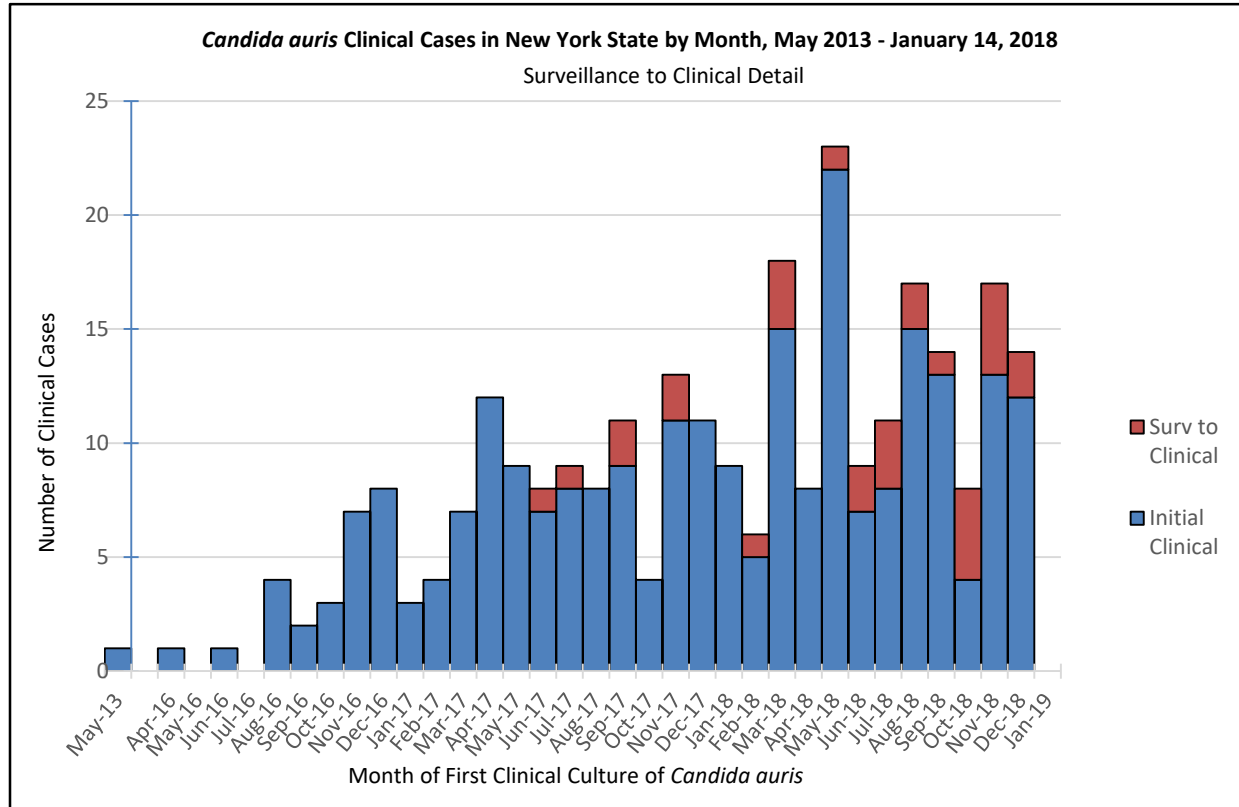
Lessons Learned *C. auris* in New York



Lessons Learned **C. auris** in New York

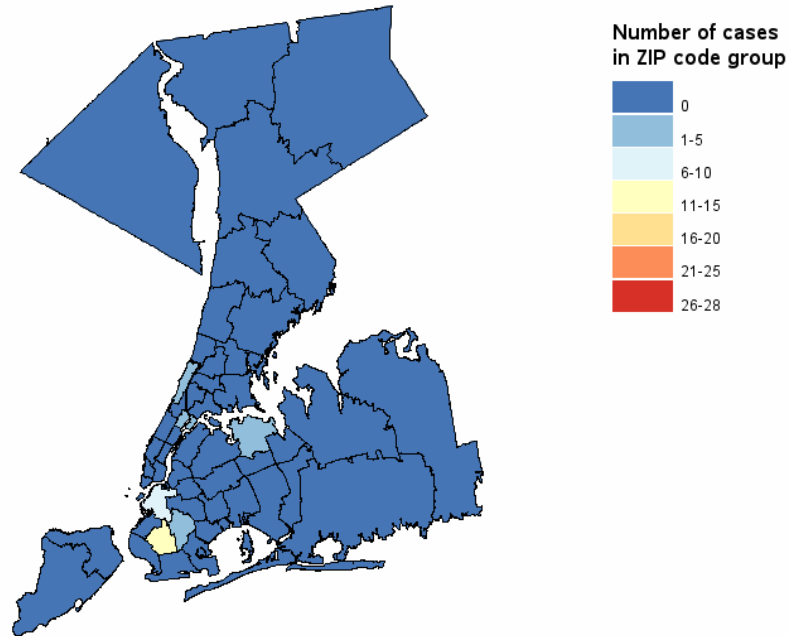
Spread in Healthcare Facilities

Lessons Learned Spread in Healthcare Facilities



Lessons Learned Spread in Healthcare Facilities

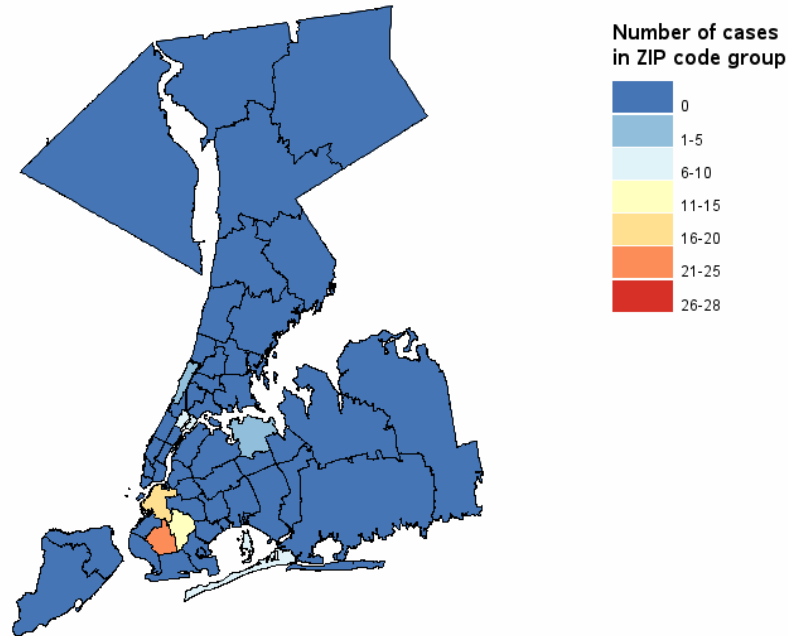
Cumulative number of *Candida auris* clinical cases



----2016Q4

Lessons Learned Spread in Healthcare Facilities

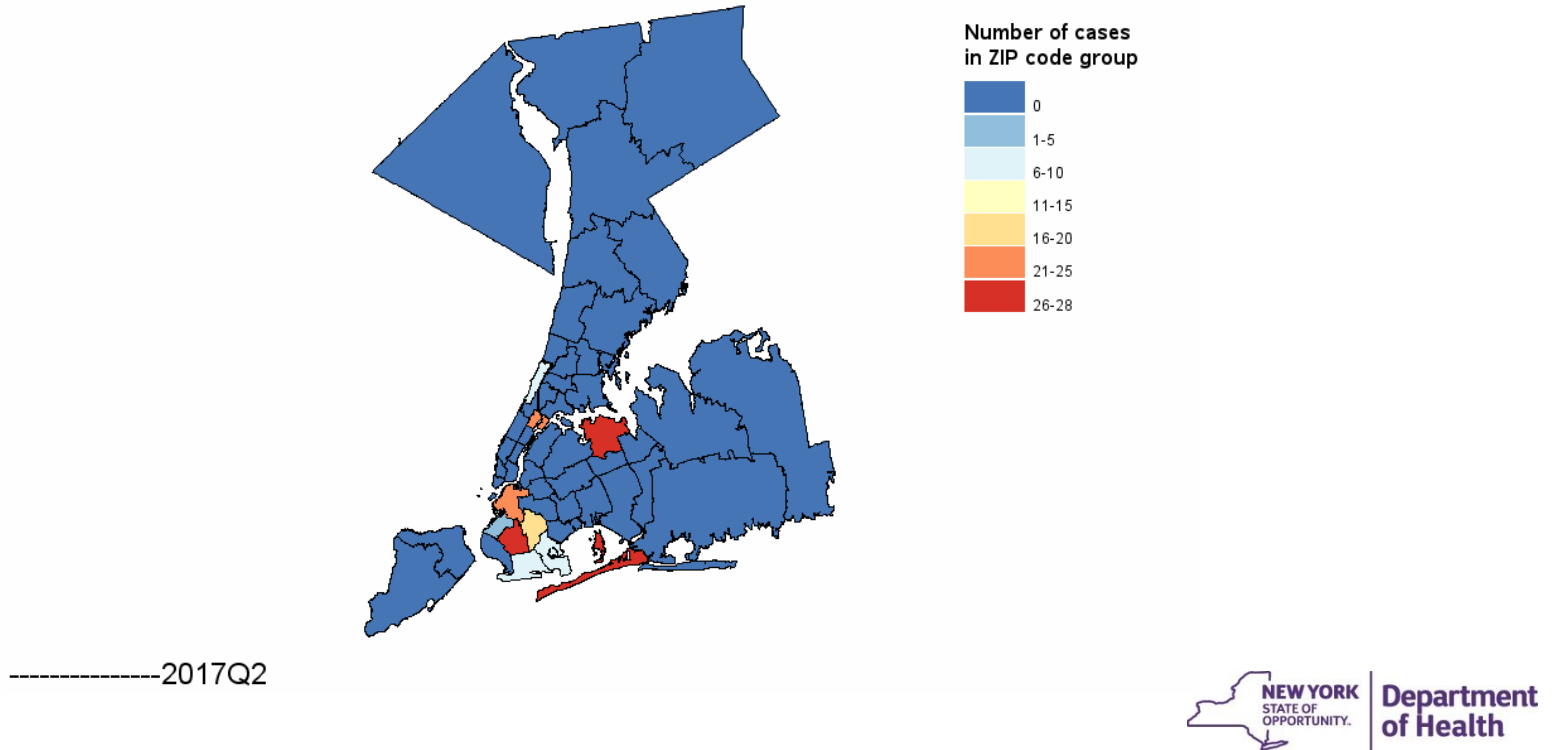
Cumulative number of *Candida auris* clinical cases



-----2017Q1

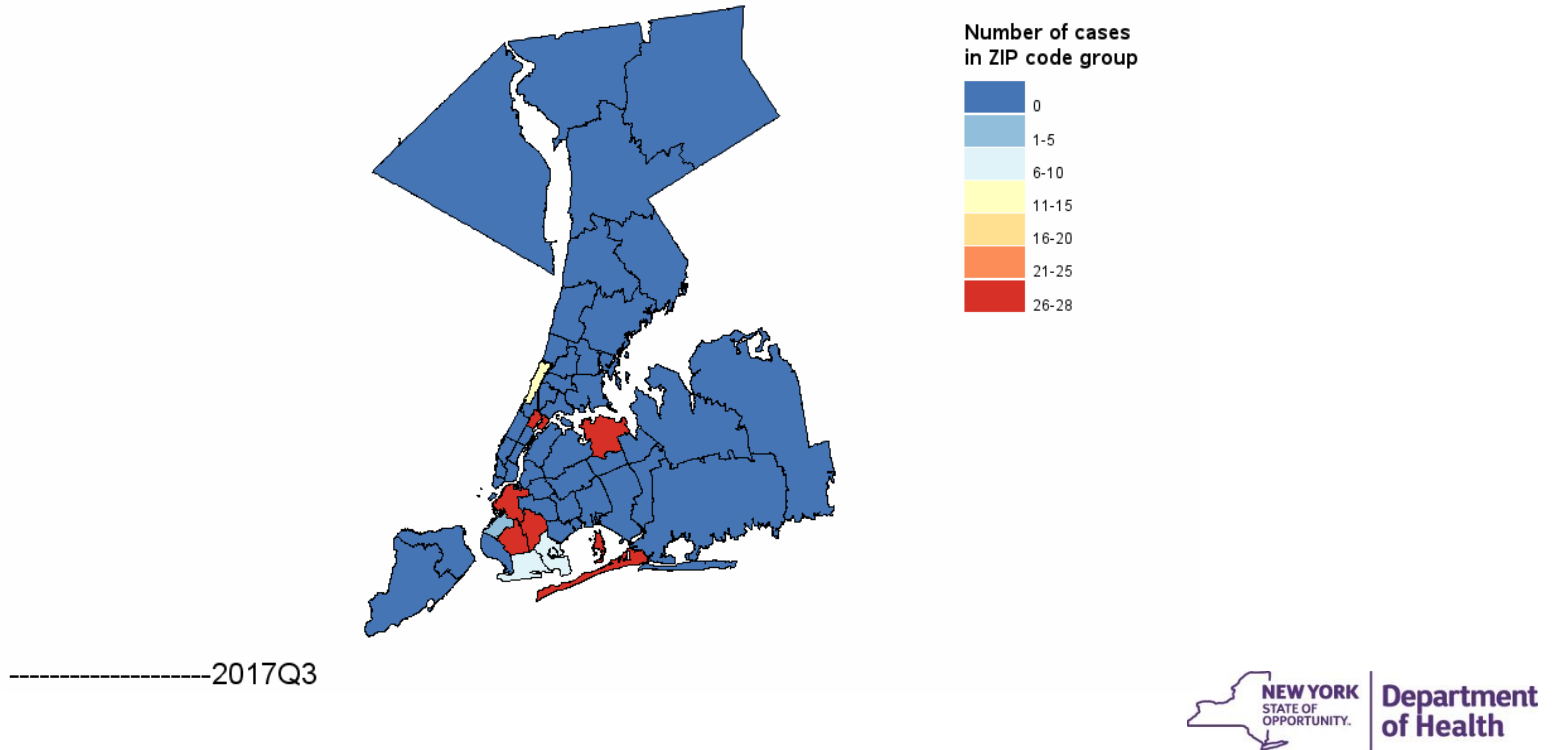
Lessons Learned Spread in Healthcare Facilities

Cumulative number of *Candida auris* clinical cases



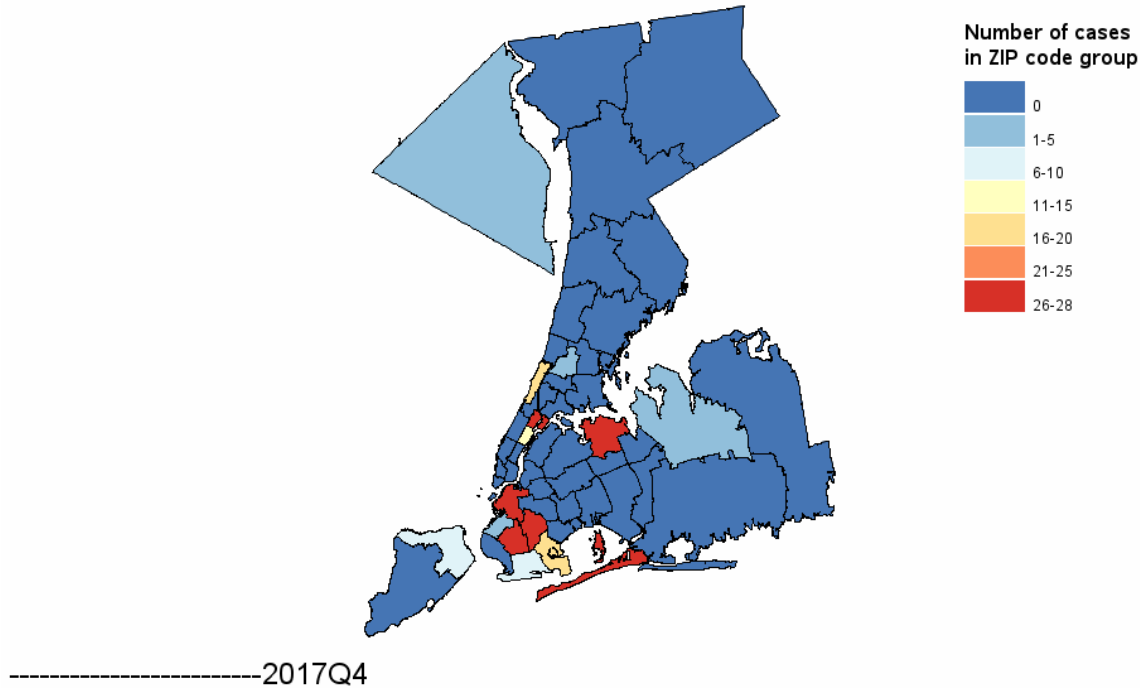
Lessons Learned Spread in Healthcare Facilities

Cumulative number of *Candida auris* clinical cases



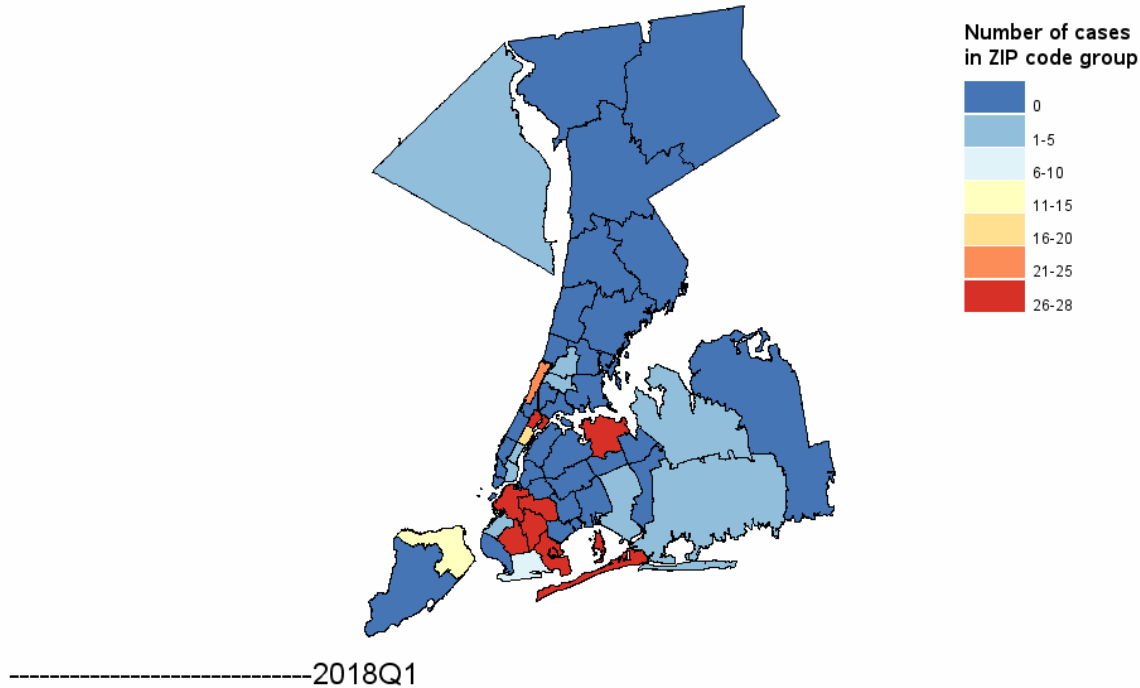
Lessons Learned Spread in Healthcare Facilities

Cumulative number of *Candida auris* clinical cases



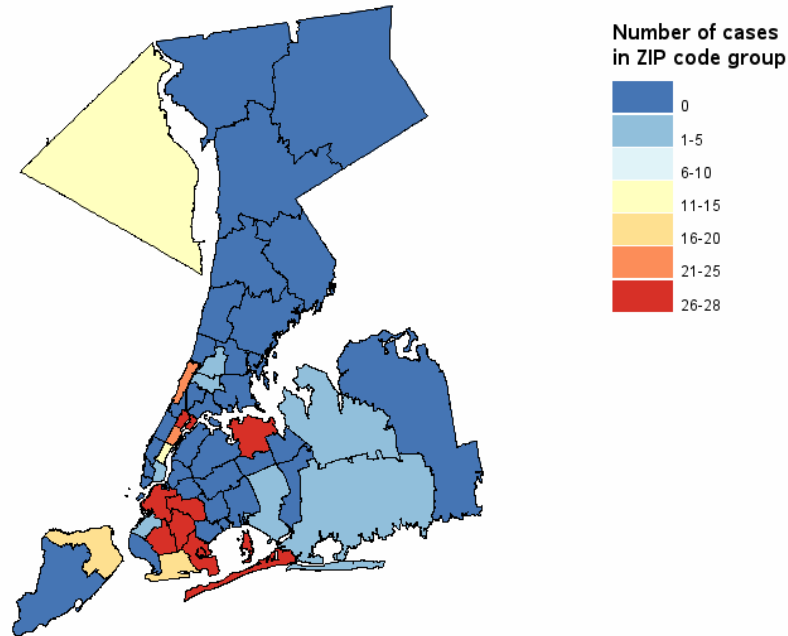
Lessons Learned Spread in Healthcare Facilities

Cumulative number of *Candida auris* clinical cases



Lessons Learned Spread in Healthcare Facilities

Cumulative number of *Candida auris* clinical cases



-----2018Q2

Lessons Learned Spread in Healthcare Facilities

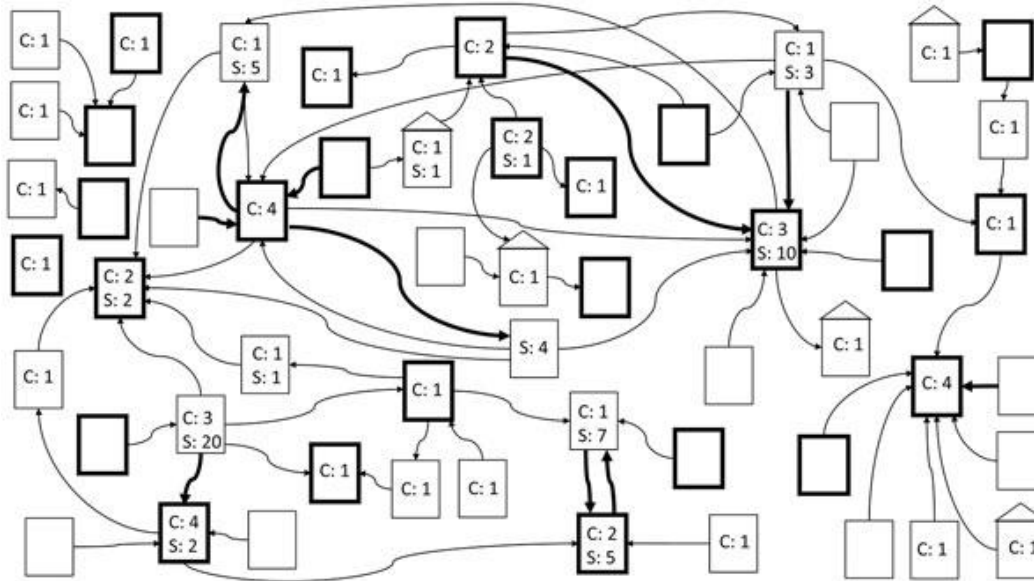
- Data from first 51 clinical cases in NYS
 - 31 (61%) in Long Term Care Facility (LTCF) immediately before hospital admission
 - 19 of 31 (61%) in LTCFs with ventilator beds

Data from first 212 Clinical Cases

Healthcare Exposure Prior to Current Admission, Prior 90 Days	Number of Cases (n)	Percentage (%)
Acute Care Hospital	185	79%
Long Term Care Facility (Nursing Home)	74	31%
None	32	15%
Community	14	6%
Long Term Acute Care Hospital	6	3%
Other	3	1%

Lessons Learned Spread in Healthcare Facilities

Epidemiological Links Between Healthcare Facilities Affected by *C. auris*, New York State, 2013-2017



Lessons Learned Spread in Healthcare Facilities

**Facilities Through Which a Patient with *C. auris* Has Passed,
90 Days Prior to Diagnosis as of January 14, 2019**

Facility Type	# Facilities
Hospitals	57
Nursing Homes	96
LTACH	1
Hospice	2
Total	156

Lessons Learned Spread in Healthcare Facilities

Intense NYS Efforts

- Incident Management System activation
- Case finding
- Hired additional staff
- Roundtable with healthcare leadership
- Webinar for NYC hospitals and nursing homes
- Required infection control self-assessment survey for all NYC hospitals and nursing homes
- On-site reviews of all hospitals and nursing homes in Brooklyn and Queens to assess compliance with infection control requirements
- Point prevalence studies, environmental surveys & educational infection control assessments

The Value Added from Candida auris Point Prevalence and Environmental Studies in New York State

Table 1: Point Prevalence Studies at Healthcare Facilities

Facility Type (NYC)	Facilities	# Sites	% Positive for C. auris
Hospitals	18	297	5.6
Nursing Homes	1	52	2.6
Long-term Care	16	1454	6.1
Other	16	100	7.1
Total	51	1603	5.6

Figure 1: Clinical Cases - NYC Epidemiologic Curve

Conclusions

- The value added from these studies was significant, including the identification of C. auris in multiple facilities, the implementation of infection control measures, and the identification of environmental reservoirs.

Recommendations

- The Department of Health should continue to monitor for C. auris in New York State and provide technical assistance to healthcare facilities.

Lessons Learned Spread in Healthcare Facilities

Point Prevalence Surveys (PPS) in New York State

- As of March 25, 2018, 81 point prevalence surveys & environmental surveys had been conducted at 55 healthcare facilities
 - PPS:
 - 4268 samples were collected from 2344 individuals
 - 144 (6.1%) individuals had a positive *C. auris* culture
 - 125 (5.3%) individuals had a positive *C. auris* PCR test

Lessons Learned Spread in Healthcare Facilities

Facility Type (N=55)	# Patients <i>C. auris</i> Positive	# Total Patients Tested	% Positive for <i>C. auris</i>
Hospitals (N=22)	36	767	5.0
LTACHs* (N=1)	1	35	2.9
LTCFs** (N=30)	88	1404	6.3
<i>Ventilator LTCFs</i> (N=16)	<i>86</i>	<i>1120</i>	<i>7.7</i>
<i>Non-Ventilator LTCFs</i> (N=14)	<i>2</i>	<i>284</i>	<i>0.7</i>
Co-located Hospital & LTCF*** (N=2)	17	138	12.3

Lessons Learned Spread in Healthcare Facilities

Facility Type (N=55)	# Patients C. auris	# Total Patients Tested	% Positive for C. auris
Hospitals (N=22)	LTCFs** (N=30)	88	1404
LTACHs* (N=1)	Ventilator LTCFs (N=16)	86	1120
LTCFs** (N=30)	Non-Ventilator LTCFs (N=14)	2	284
Ventilator LTCFs (N=16)			
Non-Ventilator LTCFs (N=14)			
Co-located Hospital & LTCF*** (N=2)	17	138	12.3

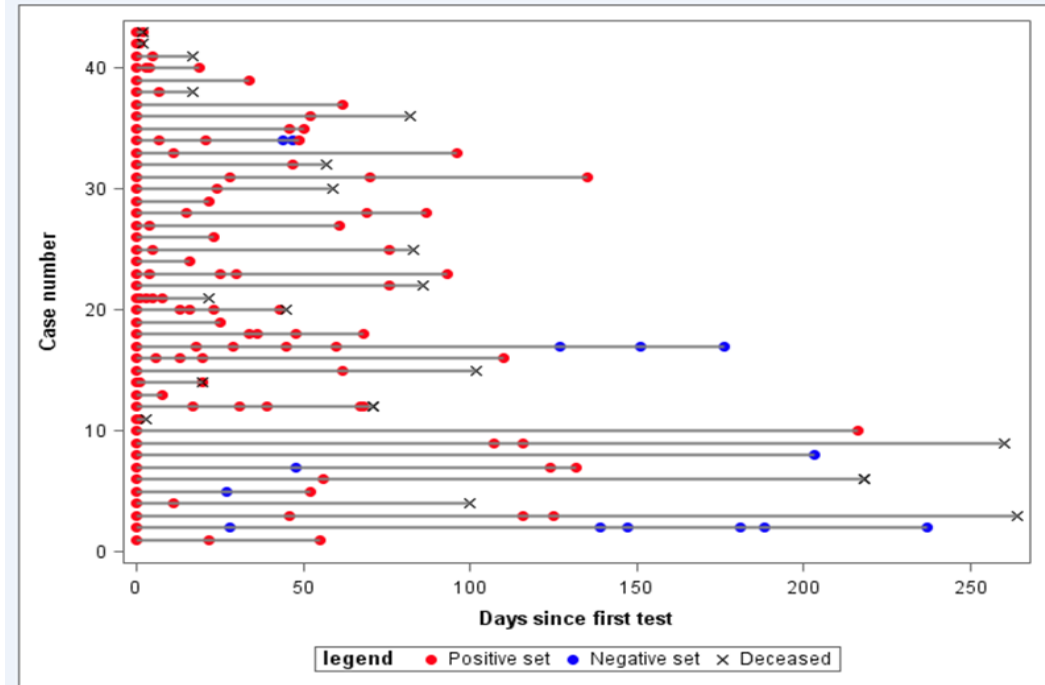
Lessons Learned **C. auris** in New York

Persistent Colonization

Lessons Learned Persistent Colonization

Follow-up Cultures for Clinical *C. auris* Cases, by Case

- Data from first 43 clinical patients in NYS
 - 2 deemed to be “cleared”
 - 19/43 (44%) expired

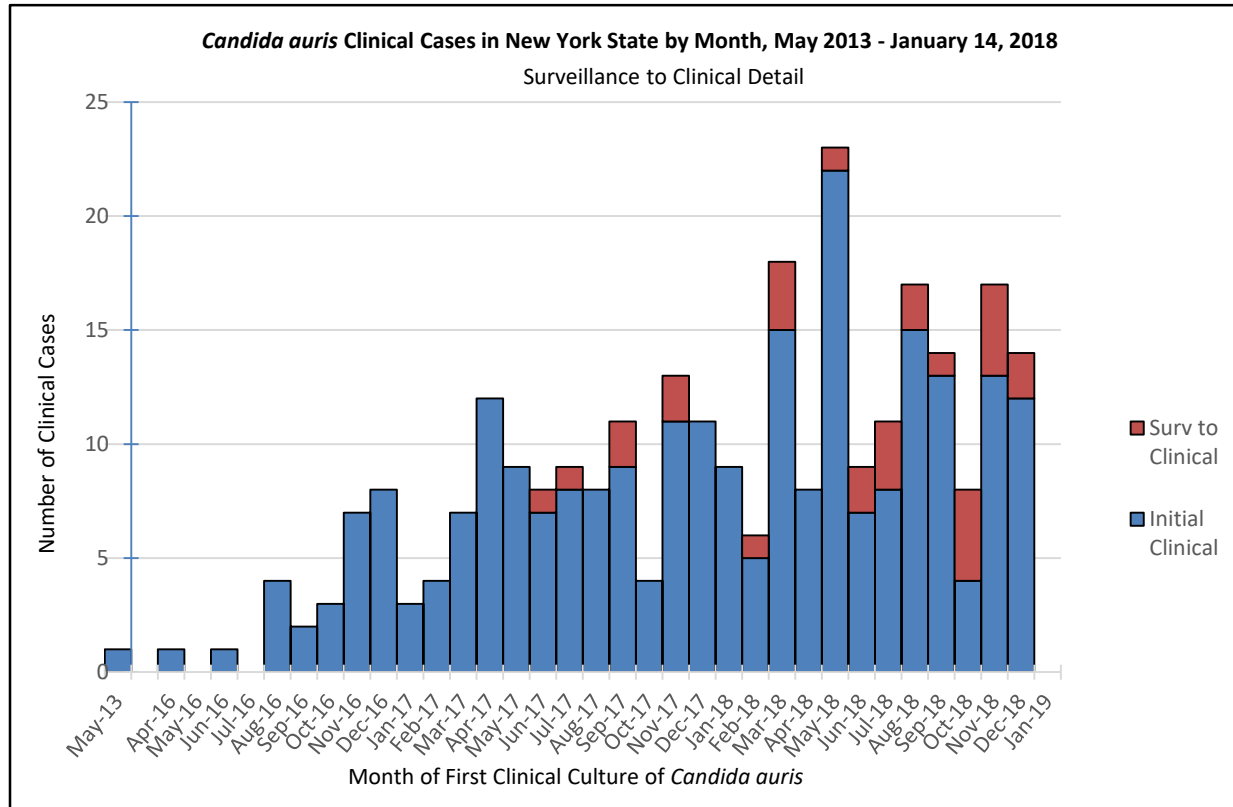


Adaptation of Table from: Adams E, Quinn M, Tsay S, et al. *Candida auris* in Healthcare Facilities, New York, USA, 2013–2017. *Emerg Infect Dis.* 2018;24(10):1816-1824. <https://dx.doi.org/10.3201/eid2410.180649>

Lessons Learned **C. auris** in New York

Colonized Patients are Becoming Infected

Lessons Learned Spread in Healthcare Facilities



Lessons Learned **C. auris** in New York

Persistence in the Environment

Lessons Learned Persistence in the Environment

Environmental Surveys (ES) in New York State

- As of March 2018, 81 point prevalence surveys & environmental surveys had been conducted at 55 healthcare facilities
 - ES:
 - 2896 environmental samples collected
 - 86 (3.0%) samples positive for *C. auris* by culture
 - 257 (8.9%) samples positive by PCR
 - Many were from surfaces or equipment deemed to be “clean”

Lessons Learned Persistence in the Environment

- *C. auris* recovered from multiple sites within patient & procedure rooms:
 - Call bells
 - TV remotes, telephones
 - Window sills
 - Curtains
 - Light cords
 - Ventilators
 - Blood pressure cuffs
 - PPE carts
 - Medication carts
 - Clean supply carts
 - Housekeeping carts
 - IR suite equipment
 - OR equipment

Lessons Learned Persistence in the Environment



Journal of
Clinical Microbiology



[Advanced Search](#)

[Home](#)

[Articles](#)

[For Authors](#)

[About the Journal](#)

[Subscribe](#)

Survival, Persistence, and Isolation of the Emerging Multidrug-Resistant Pathogenic Yeast *Candida auris* on a Plastic Healthcare Surface

Rory M. Welsh, Meghan L. Bentz, Alicia Shams, Hollis Houston, Amanda Lyons, Laura J. Rose, Anastasia P. Litvintseva

DOI: 10.1128/JCM.00921-17

Welsh R, Bentz M, Shams A, et al. Survival, Persistence, and Isolation of the Emerging Multidrug-Resistant Pathogenic Yeast *Candida auris* on a Plastic Healthcare Surface. J Clin Micro. 2017;55(10):2996-3005.



Department
of Health

Lessons Learned **C. auris** in New York

Vulnerable Hosts

Lessons Learned Vulnerable Hosts

- Currently, 57% of clinical cases are males
- Clinical cases have multiple underlying conditions

Age Range (Years)	# Cases (%)
<1	1 (0%)
1-18	0 (0%)
19-44	25 (9%)
45-64	85 (30%)
>64	169 (60%)

Lessons Learned Vulnerable Hosts

- Clinical cases through August 20, 2018
 - Blood and urine majority of first positive sites
 - Variety of sites

First Positive Site	Count	%
Blood	119	56
Urine	40	19
Wound/skin	18	8
Respiratory site	17	8
Other	9	4
Bile	4	2
Catheter tip or segment	3	1
Ear	2	1
Total	212	100

Lessons Learned Vulnerable Hosts

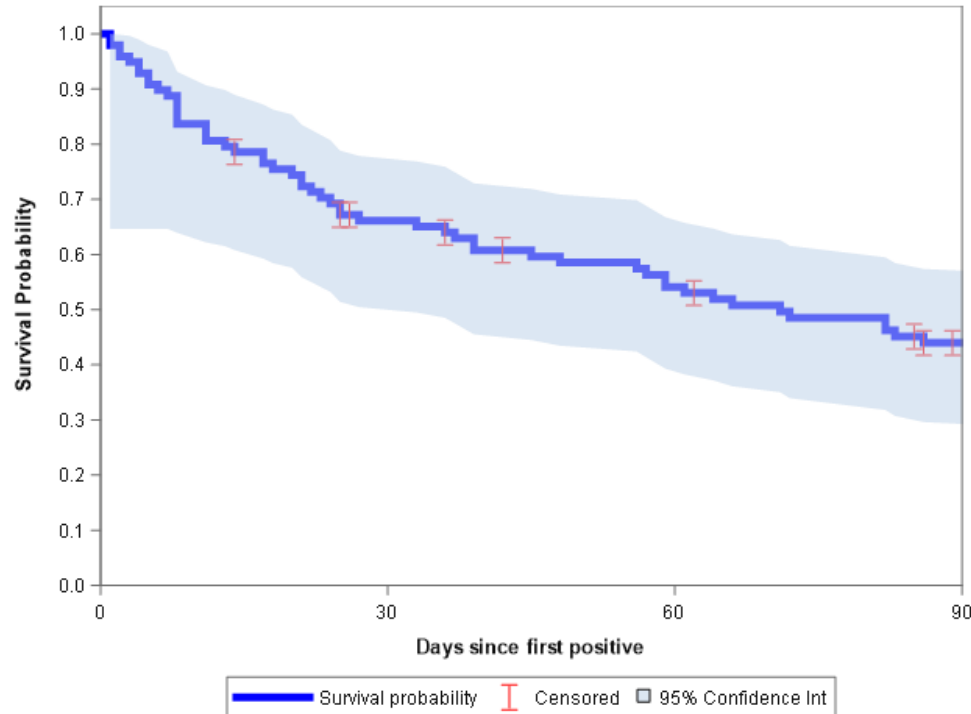
We ARE NOT seeing large numbers of patients with <i>C. auris</i> who:	We ARE seeing large numbers of patients with <i>C. auris</i> who:
Are children	Are over the age of 65
Are neutropenic	Have wounds, lines, or drains
Are in the community	Are on ventilators
Do not have co-morbid medical conditions	Are nursing home residents with frequent hospitalizations

Lessons Learned **C. auris** in New York

High Mortality

Lessons Learned High Mortality

Probability of Survival, All Cases Combined



Probability of surviving past:

2 days = 96%

7 days = 89%

30 days = 66%

60 days = 54%

90 days = 44%

Lessons Learned **C. auris** in New York

Antifungal Drug Resistance

Lessons Learned Antifungal Drug Resistance

- Lockhart 2016: 54 isolates from Pakistan, India, South Africa, Venezuela, and Japan
 - Susceptibility testing
 - 93% resistant to fluconazole, 54% to voriconazole, 35% to amphotericin B, 7% to echinocandins, 6% to flucytosine
 - 41% resistant to ≥ 2 classes, 2 isolates resistant to 3 classes

Lessons Learned: Antifungal Drug Resistance

Antifungal susceptibility data for first *Candida auris* isolates from 51 clinical cases, New York, USA, 2013–2017

Antifungal	Tentative resistance breakpoint	MIC ₅₀	MIC range	No. (%) resistant
Fluconazole	>32	>256	8.00 to >256	50 (98)
Caspofungin	>2	0.060	0.03–0.25	0
Micafungin	>4	0.120	0.06–0.25	0
Anidulafungin	>4	0.250	0.12–0.50	0
Amphotericin B	>2	1.500	0.50–4.00	15 (29)
Flucytosine	NA	0.125	0.125–0.25	NA

Infection Prevention and Control Measures are
Challenging...
But They Work!

What Are The Recommendations?

Infection Control & Prevention	Environmental Cleaning
Hand Hygiene Private Patient Rooms	Use EPA-Registered Hospital Grade Disinfectant Effective Against <i>C. difficile</i> spores (“List K”)
Isolation/Cohorting <ul style="list-style-type: none"> - Contact Precautions - Dedicated equipment - Attention to transporting 	<ul style="list-style-type: none"> - Attention to contact times - Attention to high touch surfaces & moveable equipment
Reporting & Interfacility Communication	
Screening of Contacts & CDC Recommended Groups	
Lab Identification	

Importance of Interfacility Communication

- We have been tracking admissions, discharges, and transfers
- Numbers are growing too large for tracking to be feasible
- ***This means that interfacility communication will become even more important!***
- Infection preventionists need to be involved in discharges and transfers
- Pay special attention to after-hours/weekend discharge and transfer procedures
- Inadequate communication might result in regulatory action

Long-Term Care Facilities

- Infection control and home environment
 - “Modified” Contact Precautions*
 - Allow resident to leave room
 - Discuss with NYSDOH
- Need for alcohol-based hand rub in locations that allow for use upon room entrance and exit

* NYSDOH Resource: Transmission Based Precautions in Long Term Care Facilities Memo
Available at: https://www.health.ny.gov/diseases/communicable/c_auris/providers/

Transmission-Based Precautions Signage

Facility

Nursing homes & Hospitals:

- “We can’t have the diagnosis on the door...we can get cited.”
- **Default signage: “See Nurse”**

Pertinent Factors/ Data:

- CMS (42 C.F.R. section 483.10), signage restrictions **do not apply to “the CDC isolation precaution transmission based signage** for reasons of public health protection, as *long as the sign does not reveal the type of infection*” (CMS State Operations Manual, Appendix PP)*.
- **Bottom line: Signs can be more informative**

*Diagnosis, organism, or resident identifiers (e.g., name, bed number) should not be disclosed on for Transmission-Based Precautions Signs.

NYSDOH Resource

Table 1: Pros and Cons of Various Types of Transmission-based Precautions Signs*

Description	Pros	Cons	Comments
Signs stating the type of precautions (e.g. "Contact Precautions")	Easily recognizable and meaningful for healthcare providers	Not meaningful for visitors – might need additional language such as "Visitors: see nurse"	
Signs stating the type of precautions but without the word "precautions" (e.g. "Contact", "Droplet")	Likely recognizable and meaningful for healthcare providers; might be less alarming to visitors than signs with the word "precautions"	Not meaningful for visitors – might need additional language such as "Visitors: see nurse"	
Signs stating the type of precautions (e.g. "Contact Precautions") and providing detailed information about what those precautions entail (e.g. pictures of PPE to be worn)	Easily recognizable and meaningful for healthcare providers; remind healthcare providers what needs to be done while caring for the resident	Might be confusing or alarming for visitors and might need additional language such as "Visitors: see nurse"; might result in a large, obtrusive, and/or cluttered sign	
Signs with language such as "See nurse before entering"	Useful for visitors; may be less alarming than signs that are more explicit about precautions	Might not be understood to indicate Transmission-Based Precautions by healthcare providers	NYSDOH staff have witnessed healthcare providers entering rooms with these types of signs without using PPE because the signs were not recognized as indicating Transmission-Based Precautions. If these types of signs are chosen, the facility should ensure that all healthcare providers and other staff receive effective, periodic training on the meaning of the signs. Regardless of sign type, adherence should be monitored.
Signs consisting of colored dots to indicate which type of precautions are required	Unobtrusive	Not meaningful for visitors – might need additional language such as "Visitors: see nurse"; might not be understood to indicate Transmission-Based Precautions by healthcare providers; not useful for healthcare providers who are color-blind	
Signs consisting of symbols to indicate precaution types (e.g. a water drop to indicate Droplet Precautions)	Unobtrusive and relatively easy for healthcare providers to remember	Not meaningful for visitors – might need additional language such as "Visitors: see nurse"; might not be understood to indicate Transmission-based Precautions by healthcare providers	

* Legal questions regarding signage content and ensuring such signage complies with CMS and HIPAA requirements should be directed to facility counsel.

Pros and Cons of various types signage

- See the nurse
- "Contact precautions"
- Each precaution
- Verbal description
- PPE
- Pictures of PPE

Where do we go from here?

- **Targeted admission screening**
 - Currently ongoing in at least 3 facilities
 - May need to be expanded as laboratory capacity for rapid testing grows
 - Goal: prevent *C. auris* endemicity and transmission within high acuity units such as vent units and ICUs
- **Focus on preventing spread beyond NYC Metropolitan area**

***Lessons Learned:* Summary**

C. auris:

- Emerged independently multiple times
- Spread rapidly among healthcare facilities in NYC area
- Individuals can be colonized for many months
- Colonized individuals can develop infections
- It is affecting individuals who are vulnerable hosts
- High mortality rate among infected individuals
- Can persist in the healthcare environment
- Potential for antifungal drug resistance

***Lessons Learned:* Summary**

C. auris:

- **We have learned how *C. auris* is transmitted**
- **Extensive infection control efforts in NYS to identify cases and optimize infection control interventions do work**
- **Local health department staff, hospital and nursing home staff, and federal agency staff are wonderful partners willing to assist with NYS efforts**
- **The more we know, the better!**

Acknowledgements

Hospital, LTACH, & Nursing Home Infection Preventionists, Nurses, Environmental Services Staff, Laboratorians, Administrators

- NYSDOH

- Belinda Ostrowsky
- Debra Blog
- Monica Quinn
- Emily Lutterloh
- Karen Southwick
- Jane Greenko
- Rafael Fernandez
- Sudha Chaturvedi
- Richard Erazo
- Ronald Jean Denis
- Sarah Kogut

- NYSDOH

- Rutvik Patel
- Elizabeth Dufort
- Barbara Bright-Motelson
- Robert McDonald
- Nina Ahmad
- Karyn Langguth
- Valeria Haley
- Sudha Chaturvedi
- YanChun Zhu
- Wenxuan Yang
- Erin Gustufson

- CDC

- Karlyn Beer
- Tom Chiller
- Nancy Chow
- Janet Glowicz
- Brendan Jackson
- Alex Kallen
- Ana Litvintseva
- Shawn Lockhart
- Abimbola Ogundimu
- Eugenie Poirot
- Sharon Tsay
- Snigdha Vallabhaneni
- Rory Welsh

- NYCDOHMH



References

1. Adams, E, Quinn M, Tsay S, et al. *Candida auris* in Healthcare Facilities, New York, USA 2103-2017. Emerg Infect Dis. 2018;24(10):1816-1824.
2. Borman AM, Szekely A, Johnson EM. Comparative pathogenicity of United Kingdom isolates of the emerging pathogen *Candida auris* and other key pathogenic *Candida* species. mSphere. 2016;1:e00189–16.
3. Calvo B, Melo ASA, Perozo-Mena A, et al. First report of *Candida auris* in America: clinical and microbiological aspects of 18 episodes of candidemia. J Infect. 2016;73:369–74.
4. Chakrabarti A, Sood P, Rudramurthy SM, et al. Incidence, characteristics and outcome of ICU-acquired candidemia in India. Intensive Care Med. 2015;41:285–95.
5. Chowdhary A, Kumar VA, Sharma C, et al. Multidrug-resistant endemic clonal strain of *Candida auris* in India. Eur J Clin Microbiol Infect Dis. 2014;33:919–26.
6. Chowdhary A, Sharma C, Duggal S, et al. New clonal strain of *Candida auris*, Delhi, India. Emerg Infect Dis. 2013;19:1670–3.
7. Chowdhary A, Voss A, Meis JF. Multidrug-resistant *Candida auris*: 'new kid on the block' in hospital-associated infections? J Hosp Infect. 2016;94:209–12.
8. Emara M, Ahmad S, Khan Z, et al. *Candida auris* candidemia in Kuwait, 2014. Emerg Infect Dis. 2015;21:1091–2.
9. Lee WG, Shin JH, Uh Y, et al. First three reported cases of nosocomial fungemia caused by *Candida auris*. J Clin Microbiol. 2011;49:3139–42.
10. Lockhart SR, Etienne KA, Vallabhaneni S, et al. Simultaneous emergence of multidrug resistant *Candida auris* on three continents confirmed by whole genome sequencing and epidemiological analyses. Clin Infect Dis. Advance access, published October 20, 2016, accessed December 15, 2016.
11. Magobo RE, Corcoran C, Seetharam S, et al. *Candida auris*-associated candidemia, South Africa. Emerg Infect Dis. 2014;20:1250–1.
12. Oh BJ, Shin JH, Kim M-N, et al. Biofilm formation and genotyping of *Candida haemulonii*, *Candida pseudohaemulonii*, and a proposed new species (*Candida auris*) isolates from Korea. Med Mycol. 2011;49:98–102.
13. Okinda N, Kagotho E, Castanheira M, et al. Candidemia at a referral hospital in sub-Saharan Africa: emergence of *Candida auris* as a major pathogen. European Congress of Clinical Microbiology and Infectious Diseases. Barcelona, 2014. Poster presentation.
14. Sarma S, Kumar N, Sharma S, et al. Candidemia caused by amphotericin B and fluconazole resistant *Candida auris*. Indian J Microbiol. 2013;31:90–1.
15. Satoh K, Makimura K, Hasumi Y, et al. *Candida auris* sp. nov., a novel ascomycetous yeast isolated from the external ear canal of an inpatient in a Japanese hospital. Microbiol Immunol. 2009;53:41–4.
16. Schelenz S, Hagan F, Rhodes JL, et al. First hospital outbreak of the globally emerging *Candida auris* in a European hospital. Antimicrob Resist Infect Control. 2016;5:eCollection.
17. Southwick K, Adams E, Greenko J, et al. New York State 2016-2018: Progression from *Candida auris* Colonization to Bloodstream Infection. Poster session presented at: IDWeek, 2018 Oct 3-6; San Francisco, CA.
18. Toussaint, K. Health experts detail 'concerning' outbreak of *Candida auris* fungus in NYC. *Metro New York City*. September 21-23.
19. Tsay S, Welch R, Adams E, et al. Notes from the Field: Ongoing Transmission of *Candida auris* in Health Care Facilities – United States, June 2016-2017. MMWR. 2017;66(19):514-515.
20. Welsh R, Bentz M, Shams A, et al. Survival, Persistence, and Isolation of the Emerging Multidrug-Resistant Pathogenic Yeast *Candida auris* on a Plastic Healthcare Surface. J Clin Micro. 2017;55(10):2996-3005.