ORIGINAL ARTICLE

Identification of *Candida auris* in a foreign repatriated patient to Ontario, Canada and infection control strategies to prevent transmission

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ABSTRACT

Background: *Candida auris* (*C. auris*) is an emerging fungus which presents a global health threat with increased morbidity and mortality in hospitalized patients. Upon identification of our first case of *C. auris* on admission from a foreign hospital, we set out to implement infection prevention and control (IPAC) measures to prevent transmission.

Methods: We conducted a prospective surveillance of *C. auris* in a community teaching hospital from April 2019 to November 2020. We also implemented protocols to prevent *C. auris infection* such as staff education and training; establishing policy/procedures for screening and testing of patients at risk and/or colonized with *C. auris*; validation of microbiology methodology, cleaning and disinfection protocols to prevent equipment and environmental contamination, and patient and family information.

Results: Following this prospective surveillance program, a positive case of *C. auris* was identified from a high-risk patient admitted to the hospital. After identification of the case of *C. auris*, over 600 unit mates (patients on the same unit) were screened, and multiple environmental specimens were tested for *C. auris*, but no additional case was detected or evidence of hospital-acquired transmission over the 19-month hospitalization of the case.

Conclusion: Multidisciplinary approach, extra resources and senior management support are necessary to prevent and control transmission of *C. auris* within the healthcare setting.

INTRODUCTION

Candida auris (C. auris), first identified in Japan in 2009, has now spread to five continents [1]. It is known to cause severe illness in hospitalized patients and has a mortality rate ranging between 30% to 59% globally in patients with invasive infection [2]. Patients who are positive for *C. auris* can remain colonized for long periods of time and this increases the risk for cross-contamination and disease transmission [3]. *C. auris* is quite resilient and can resist routine cleaning with common hospital-grade disinfectants [1]. The use of a disinfectant effective against *Clostridioides difficile* spores is required to kill the fungus [1]. The first case of *C. auris* was reported in Canada in 2017 [4]. As of March 2020, 24 cases of *C. auris* colonization or infection in Canada have been voluntarily reported to the Public Health Agency of Canada [5].

We describe the first case of *C. auris* identified in our hospital through active surveillance following the implementation of the Provincial Infectious Diseases Advisory Committee's (PIDAC) interim guide for infection prevention and control of *C. auris*.

METHODS

At Humber River Hospital, we utilized the Ontario PIDAC guideline released in January 2019 to implement a comprehensive screening program for *C. auris* from April 2019 to November 2020. Humber River Hospital is a major acute-care community teaching hospital with 722 beds, located in Toronto, Ontario, Canada. Services provided include surgery, maternal and child, orthopaedic surgery, kidney care (nephrology), cardiology, cancer care, healthy living (geriatrics), medical imaging and mental health. Screening criteria of patients at high risk for *C. auris* includes the following: patients from *C. auris* endemic areas, patients that have travelled to the Indian subcontinent, patients with known colonization or infection with *Carbapenemase-Producing Enterobacteriaceae* (CPE), patients who have been hospitalized in a foreign country, patients with a history of intrusive antifungal use, and patients on units where transmission of *C. auris* has been documented [3]. A new order set was developed in our electronic health record to enable the ordering of *C. auris* screening swabs, which

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consists of a nasal swab, bilateral axillary swab, and bilateral groin swab with the ability to add on swabs from additional sources such as wounds, urine, sputum, line and device exit sites. Our Microbiology laboratory utilized the Centres for Disease Control (CDC) laboratory procedure for identification of *C. auris* from environmental and patient samples using appropriate media and incubation temperature [6].

Following the prospective surveillance program of *C. auris*, a positive case was identified on April 25, 2019 from a high-risk patient admitted to the hospital. The patient was a direct admission from a foreign hospital in the Indian subcontinent. The hospital Microbiology laboratory submitted the positive isolate to Public Health Ontario Laboratory (PHOL) for confirmation. It was subsequently confirmed by PHOL that this was the first case in Ontario identified through active screening by a hospital laboratory. The patient was admitted to a medical unit and was later transferred to ICU.

To prevent transmission, the patient had dedicated equipment; the room was cleaned and disinfected daily using a sporicidal agent, a cleaning checklist (to ensure that all steps of the cleaning process were followed) was created to be signed by housekeeping staff and supervisor who observed the cleaning. All equipment removed from the room were cleaned, disinfected, and subjected to high-energy ultraviolet light radiation at a wavelength of 254-265 nm for 10-minutes contact time, and then quarantined for 21 days. Patients who were present on the unit with the index case were screened on days 0, 7, and 21 following transfer and/or discharge. Environmental swabs were collected randomly to assess effectiveness of the cleaning and disinfection of the patient's room.

RESULTS

The index case was a 62-year-old male patient, directly admitted from a foreign hospital. He was hospitalized there for four months with cerebrovascular accident with right ganglio-capsular hemorrhage, treated with frontotemporal craniectomy for clot evacuation without replacement of bone flap. Invasive devices included Foley, Trach (7.5), IV, and NG tube. He also had a stage 4 sacral pressure ulcer. Admission screening for antibiotic-resistant organisms, revealed a positive result for *Vancomycin-Resistant Enterococci*, CPE, and *C. auris*. The length of stay for the *C. auris* index case was 19 months; 600 unit mates (patients on the same unit) were screened on discharge/transfer from the unit at days 0, 7 and 21. No new case was detected or evidence of hospital-acquired transmission identified. Environmental swabs were conducted for 10 high-touch points in the room, as well as quarantined equipment and a total of 10 rounds of random and post-discharge environmental and equipment testing for *C. auris* were negative.

DISCUSSION

Best Practice Guidelines and multiple studies recommend strict isolation of *C. auris* confirmed cases in a private room under contact precautions [3, 7, 8]. Following the identification *of C. auris*, as well as colonization/infection with other multiple drug-resistant organisms in respiratory tract, urine, wounds, and nasal/rectal sites, we placed the patient on droplet/contact precautions in a private room with an adjoining anteroom. Traffic into and from the room was diverted through the anteroom which served as a yellow zone for donning and doffing personal protective equipment (PPE). A written log was kept for all healthcare providers who entered the room.

Although risk factors for *C. auris* colonization or infection have been identified [7] and captured in best-practice guidelines [3], there is still gap in scientific literature around screening protocols for high-risk patients. Our admission screening protocol for *C. auris* includes patients from foreign hospitals, intrusive anti-fungal use, known CPE infection/colonization, and patients coming from areas where *C. auris* transmission has been documented. Most documented outbreaks of *C. auris* in intensive care units have been linked to open wards housing multiple patients [9, 10, 11]. Recommendations for case investigation include testing on days 0, 7, and 14 of roommates, and other patients who were in the ward before the case was identified, regardless of the duration of exposure and placing them on precautions. This also includes patients who were placed in the room occupied by the *C. auris* case before the room received enhanced cleaning and disinfection [3]. Despite having private rooms in our ICU, we screened all ward-mates on discharge from the unit and placed them in private rooms in their new locations on contact precautions. A repeat testing schedule was adjusted to days 7 and 21,
and included testing for both *C. auris* and CPE. During the pre-emptive isolation period, we also limited the use of shared equipment between patients, encouraged single-use items where possible, and continued our standard environmental cleaning with sporicidal agent.

It has been shown that *C. auris* can persist on surfaces and equipment for prolonged periods of time and adequate disinfection may be difficult to achieve. A hospital in Brooklyn, USA was only able to eradicate the fungus after ripping out some of the ceiling and floor tiles [12]. In a less extreme case, a *C. auris* outbreak documented in the United Kingdom in 2018 was traced back to reusable axillary temperature probes, and was only successfully controlled after the probes were removed [9]. In response, we dedicated reusable equipment to the patient, and introduced single-use items where feasible. When equipment could not be dedicated to the patient, or it needed to be removed from the room for maintenance, such as portable diagnostic imaging units, we implemented a cleaning and disinfection protocol that comprised of three cycles of thorough cleaning with sporicidal agent and 20 minutes of UVC radiation followed by a 21-day quarantine period. The equipment was finally tested for *C. auris* before being released for general use or maintenance services.

We incorporated the same environmental and equipment disinfection and testing protocols as part of the surveillance routine during the patient's stay and 21 days after discharge

or after equipment/instruments used in the care of the case. A 10-touch point protocol for environmental testing of the room was developed, focusing mostly on horizontal surfaces and frequently used equipment. Trained environmental associates, under direct supervision, cleaned the patient's room twice per day. A cleaning checklist was used and both worker and supervisor signed the completed checklist. After the case was transferred and upon discharge, stretchers, bed, and ventilator were disinfected and quarantined. All subsequent environmental and equipment testing for *C. auris* were negative.

In a qualitative study conducted by Meyer *et al.* [13] about lessons learned from *C. auris* outbreaks in the United States, participants' opinions converged around key themes for the prevention of nosocomial spread. Education and communication themes revolved around regular staff "huddles" to discuss patient isolation status, dissemination of evidence-based messaging, emphasizing the importance of this emerging infection without inducing fear or panic among staff, and providing just-in-time training on relevant precautions. During the hospitalization of the *C. auris* case, education was ongoing with all staff and visitors. An interdisciplinary team led by IPAC and including the unit manager, clinical practice leader, program director, respiratory therapist, environmental services, patient transport, laboratory, allied health professionals, dietary services, pharmacy, and occupational health met daily to ensure that all components of the protocol were being followed, that issues and concerns were addressed, and that frequent updates were provided to the organization.

Limitations of this study include the lack of information to perform a cost-benefit analysis of the measures implemented to prevent transmission. The management of this case was resource-intensive. Best-practice guidelines in Ontario recommend single-room accommodation, contact precautions, daily cleaning with sodium hypochlorite or hydrogen peroxide agents, dedicated equipment, and further highlight the potential/unconfirmed role of UVC light in reducing environmental contamination [3]. We implemented additional measures over and above best-practice guidelines, which included initial cleaning and disinfection of medical equipment used by the case, followed by quarantining for 21 days, and a repeat cleaning before releasing the equipment for general use. Our case management and screening strategy also went beyond the recommended practices. The rooms where the case received care in the ICU and medical inpatient units throughout the hospital were never used to place other patients during the 19 months of hospitalization, and were only released for general use after multiple cycles of enhanced cleaning, UV light disinfections, and negative environmental cultures were confirmed. The lack of a comparison group make it impossible to determine if these enhanced measures were necessary or beneficial in preventing transmission.

CONCLUSION

The prevention of transmission of *C. auris* requires additional resources around environmental cleaning and disinfection, patient screening and microbial environmental testing and additional dedicated equipment. A comprehensive surveillance program is necessary to identify and control this emerging pathogen which can have a serious impact on the morbidity and mortality of vulnerable populations. Through an active surveillance program, efficient environmental cleaning/disinfection, and a robust laboratory testing system, the transmission of *C. auris* from the index case to other patients was prevented.

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