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Brief report

Health care–associated infection outbreaks in pediatric long-term care facilities

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Children in pediatric long-term care facilities (pLTCFs) have complex medical conditions and increased risk for health care–associated infections (HAIs). We performed a retrospective study from January 2010-December 2013 at 3 pLTCFs to describe HAI outbreaks and associated infection control interventions. There were 62 outbreaks involving 700 cases in residents and 250 cases in staff. The most common interventions were isolation precautions and education and in-services. Further research should examine interventions to limit transmission of infections in pLTCFs.

Health care–associated infections (HAIs) increase morbidity, hospitalizations, and mortality among residents of long-term care facilities.[1] Pediatric long-term care facilities (pLTCFs) provide care for children with complex, chronic medical conditions.[2] Because of the frequent use of medical devices (eg, tracheostomies), frequent peer and staff interaction (eg, group therapeutic activities), and age-related vulnerability of contracting infections, children residing in pLTCFs likely have an increased risk of developing an HAI similar to the adult long-term care populations.[3] Recent reports have described the morbidity and mortality associated with outbreaks occurring in these settings.[4,5] However, few, if any, reports have described the impact of these outbreaks on pLTCF staff. We sought to describe HAI outbreaks in pLTCFs, the impact of these outbreaks on residents and staff, and the infection prevention and control (IP&C) measures implemented in response.

MATERIAL AND METHODS

Sample and setting

We performed a retrospective cohort study at 3 pLTCFs in the metropolitan New York area from January 2010-December 2013. This substudy was part of an ongoing 4-year research study. The study sites included a 54-bed pLTCF, a 97-bed subacute pLTCF, and a 137-bed subacute pLTCF. Each site provides care for children with a wide range of complex and chronic medical conditions; approximately 29%-51% of residents have a tracheostomy, 77%-85% of residents have feeding tubes, and 60%-74% of residents are nonambulatory.

Data collection and analysis

The New York State Department of Health (NYSDOH) requires electronic reporting (Nosocomial Outbreak Reporting Application [NORA]) in pLTCFs of outbreaks, defined as ≥1 case in residents and staff of a condition that is reportable and that is known to cause outbreaks (eg, Legionella, measles) or a condition that could easily spread in the facility and lead to closure of a unit or service (eg, enterovirus, coronavirus).[6] At the study sites, confirmed and suspected infections among staff are reported to the infection preventionist from employee health. Reports submitted to NORA

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Table 1
Types of pathogens causing outbreaks in residents and staff at 3 pediatric long-term care facilities, 2010-2013

Site of infection and pathogens	Outbreaks (n = 62)	Confirmed residents (n = 389)	Suspected residents (n = 311)	Confirmed staff (n = 8)	Suspected staff (n = 242)
Blood					
Serratia marcescens	1 (2)	2 (1)	0 (0)	0 (0)	0 (0)
Streptococcus pneumoniae	2 (3)	3 (1)	0 (0)	0 (0)	0 (0)
Str pyogenes (group A streptococcal)*	3 (5)	5 (1)	3 (1)	3 (38)	7 (3)
Gastrointestinal					
Clostridium difficile and adenovirus	1 (2)	5 (1)	12 (4)	0 (0)	12 (5)
C difficile and norovirus	1 (2)	3 (1)	18 (6)	0 (0)	29 (12)
Norovirus	1 (2)	3 (1)	35 (11)	0 (0)	22 (9)
Rotavirus	2 (3)	14 (4)	3 (1)	0 (0)	0 (0)
Viral, suspect	3 (5)	0 (0)	39 (13)	0 (0)	21 (9)
Unknown	1 (2)	0 (0)	7 (2)	0 (0)	0 (0)
Respiratory					
Adenovirus	2 (3)	10 (3)	10 (3)	0 (0)	0 (0)
Coronavirus†	1 (2)	17 (4)	3 (1)	1 (13)	0 (0)
Human metapneumovirus	3 (5)	24 (6)	28 (9)	0 (0)	0 (0)
Influenza A	7 (11)	16 (4)	15 (5)	1 (13)	13 (5)
Influenza B	3 (5)	4 (1)	16 (5)	0 (0)	23 (10)
Influenza A and B	1 (2)	2 (1)	6 (2)	2 (25)	1 (0.4)
Legionella	1 (2)	1 (0.2)	0 (0)	0 (0)	0 (0)
Parainfluenza (includes types 1, 2, and 3)	10 (16)	92 (24)	38 (12)	0 (0)	28 (12)
Rhinovirus-enterovirus	6 (10)	42 (11)	8 (3)	0 (0)	7 (3)
Respiratory syncytial virus	4 (6)	20 (5)	14 (5)	0 (0)	13 (5)
Unknown	2 (3)	27 (7)	14 (5)	0 (0)	43 (18)
Polymicrobial‡	6 (10)	99 (25)	38 (12)	1 (13)	23 (10)
Skin or soft tissue					
Tinea, suspect	1 (2)	0 (0)	4 (1)	0 (0)	0 (0)

NOTE. Values are n (%).
*If the initial case is a bloodstream infection (ie, invasive group A streptococcal), the entire outbreak is classified as a bloodstream infection. Two of the confirmed group A streptococcal infections were respiratory infections, but because the initial infection was invasive they are classified as a bloodstream infection outbreak by the New York State Department of Health. All of the suspected infections in residents and staff were respiratory infections.
†Included 1 coinfection with rhinovirus-enterovirus.
‡Coinfections included adenovirus (n = 5), rhinovirus-enterovirus (n = 4), respiratory syncytial virus (n = 3), influenza B (n = 2), parainfluenza (n = 2), coronavirus (n = 1), human metapneumovirus (n = 1), and *Mycoplasma pneumoniae* (n = 1).

include pathogens, infected body sites, number of confirmed and suspect cases, and infection control interventions undertaken by the facility in response to the reportable condition. Confirmed cases are those infections with positive laboratory testing. Suspected cases are based on clinical signs and symptoms as determined by the infection preventionist for whom no laboratory testing was available. Descriptive analyses of the NORA reports from the 3 study sites obtained from 2010-2013 were conducted. This research was approved by the appropriate institutional review boards.

RESULTS

From January 2010-December 2013, there were 62 outbreaks involving 389 confirmed and 311 suspected HAIs in residents. During this study period, there were 8 confirmed and 242 suspected infections among staff members. Most outbreaks were respiratory infections (n = 46) followed by gastrointestinal (n = 9), blood (n = 6), and skin or soft tissue (n = 1) infections. The etiology of the NORA-reported outbreaks is described in Table 1.

During the study period, 121 (36%) residents were transferred to acute care as a result of their infections, and no staff were transferred to acute care. Of the residents transferred to acute care, 101 (83%) were related to a respiratory infection outbreak, 14 (12%) were related to a gastrointestinal infection outbreak, and 6 (5%) were related to a bloodstream infection outbreak. Three residents expired: 1 had human metapneumovirus and 2 had respiratory syncytial virus. Infection control interventions and practices implemented in response to the outbreaks were available for 51 (82%) reported outbreaks and are described in Table 2.

Table 2
Infection control interventions implemented to limit the transmission of infections during outbreaks at 3 pediatric long-term care facilities, 2010-2013 (N = 51)

Infection control interventions	n (%)
Isolation precautions	45 (88)
Education/in-service	42 (82)
Reinforce hand hygiene	42 (82)
Limit or modify patient activities	40 (78)
Cohort staff	36 (71)
Closed staffing (floor specific)	35 (69)
Notify visitors of outbreak	28 (55)
Cohort patients	15 (29)
Antibiotic treatment	13 (25)
Antiviral prophylaxis	9 (18)

DISCUSSION

In this report, we confirmed that HAI outbreaks in pLTCFs, particularly caused by respiratory viral pathogens, are a significant burden on both residents and staff. Parainfluenza was the most common cause of an outbreak followed by influenza A and rhinovirus-enterovirus. Influenza A occurred in residents despite virtually 100% of the pediatric long-term care population being vaccinated. Staff were not required to be vaccinated but were encouraged to do so by the facilities. Our findings were consistent with previous studies of HAIs in pLTCFs because most outbreaks were caused by respiratory infections.[2] In addition, the NORA-based outbreak reporting system allows pLTCFs to report outbreaks not only based on testing but also signs and symptoms

because testing may not be available or may be cost prohibitive. This allows for better surveillance for outbreaks but decreased specificity about pathogens.

Although most infections were among residents, 26% occurred in staff. Most cases in staff were suspected based on signs and symptoms, rather than confirmed by diagnostic testing. Additionally, it is possible that illness in staff is underreported, is subclinical illness, or is asymptomatic viral shedding or bacterial carriage. Previous reports on respiratory illness outbreaks in long-term care have shown transmission between staff and residents.[7,8] Although the routes of transmission were not collected in the current study or at the sites, it is feasible that staff transmitted some infections. In a study of the impact of the H1N1 influenza A pandemic on health care workers at an acute care hospital in New York City, 65% of those diagnosed with H1N1 influenza A reported working with influenza-like symptoms prior to presenting to workforce health and safety for evaluation.[9] Similarly, Mitchell et al[10] reported that among health care workers who had influenza-like symptoms during the influenza A (H1N1) pandemic, 28% continued working.

As in acute care, outbreaks in pLTCFs require interdisciplinary IP&C strategies. These interventions often result in additional responsibilities for staff, particularly nurses. Staff may experience increased anxiety as they try to avoid becoming infected and transmitting infections to residents, families, and other staff members. Therefore, it is important for infection control policies to include input from employee health because staff may be at risk of infection or a source of transmission. In addition, the teachers at the on-site schools and the occupational, physical, and rehabilitation staff were often required to adjust their schedules to provide services on residential units because shared facilities, such as classrooms and therapy areas, are closed in response to an outbreak. Outbreaks in pLTCFs also likely have a considerable economic impact caused by increased environmental cleaning, the increased use of personal protective equipment, laboratory testing, medications, blocked beds, unit closures, admissions to acute care hospitals, and staff absenteeism.

Our study has some limitations. We conducted the study in only 3 sites. Although there are differences among the sites, our results may not be generalizable to other pLTCFs. Also, data were collected from the NYSDOH NORA system; therefore, outbreaks that were not reported by the sites or that did not meet reporting requirements were not included. At each site, diagnostic testing algorithms differed; therefore, fewer laboratory-confirmed cases may have been reported. Finally, variability in reporting suspected cases may have occurred because there are no formal case definitions for suspected cases.

CONCLUSIONS

Although significant attention has been given to IP&C policies regarding device-related infections, bacterial infections, and multidrug-resistant organisms in acute care settings,[2] our study shows that it is critically important for policies to address respiratory viral HAIs in pLTCFs. Infection prevention and antimicrobial stewardship in pLTCFs can also have positive implications for acute care facilities because children in pLTCFs are frequently hospitalized and can introduce viral respiratory pathogens and multidrug-resistant gram-negative organisms into hospital settings.[11] Further research in infection prevention interventions should focus on this pLTCF population because this population is growing and a significant part of the health care continuum.

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