

BACKGROUND

- Point source outbreaks of *Burkholderia cepacia* complex in patients without cystic fibrosis (CF) have been described, mostly associated with contaminated solutions (e.g., docusate, inhaled medications).^{1,2}
- Few non-point source outbreaks of *B. cenocepacia* have been identified in healthcare settings.

OBJECTIVES

To assess risk factors for *B. cenocepacia* colonization and/or infection during an outbreak without an identifiable point source in non-CF patients hospitalized in a 738-bed adult tertiary care hospital from June-December 2017.

METHODS

- Clinical isolates identified as *B. cepacia* complex using VITEK 2 were speciated as *B. cenocepacia* by sequencing the *recA* allele and genotyped by pulsed field gel electrophoresis (PFGE)
- Case patients (17 colonized or 2 infected) were those with their first positive culture for the *B. cenocepacia* outbreak strain (*recA* 365, PFGE 17-A) from June-December 2017
 - 2 infected patients were excluded because their cultures (1 blood and 1 intra-abdominal abscess) were positive on hospital admission; thus suitable controls and the exposure window could not be ascertained.
- Control subjects had negative respiratory cultures for *Burkholderia* spp. within 10 days of respective cases' culture dates and were hospitalized on the same unit at the same time as cases.
- Cases were matched (1:3) to controls
- Demographic and clinical characteristics of cases and controls were compared using Mann Whitney U and Fisher's exact tests.
- Potential risk factors included selected procedures, devices, and medication exposures
- Risk factors were assessed during two exposure windows:
 - 5 days prior to case's first positive culture (index date)
 - All days between hospital admission and index date
- Risk factors were analyzed using exact conditional logistic regression.
- Monthly incidence of *B. cenocepacia* per 1000 patient-days was calculated from June 2017 to March 2018.

RESULTS

- The incidence of *B. cenocepacia rec A 365* is shown in **Figure 1**.
 - For infection control strategies implemented during outbreak, see **Poster #: 1252**.
- Overall, 17 cases and 41 controls were included in the study:
 - No suitable controls could be found for 2 cases; these cases were included in the analysis as a sensitivity analysis without their inclusion did not change the findings.
- All included cases' first positive culture was a respiratory tract sample.
- Cases and controls had similar baseline demographic and clinical characteristics (**Table 1**).
- Only exposure to mechanical ventilation within 5 days of the index date was significantly associated with case status (**Table 2**).
- Cases had longer median length of hospitalization than controls (56 vs 33 days, p=0.02).
 - For additional clinical details, see **Poster #: 1252**.
- Two (12%) cases died within 30 days of their index date
- No point source was identified

Figure 1: Monthly Incidence of *B. cenocepacia (recA 365)* Outbreak Strain, June 2017-March 2018

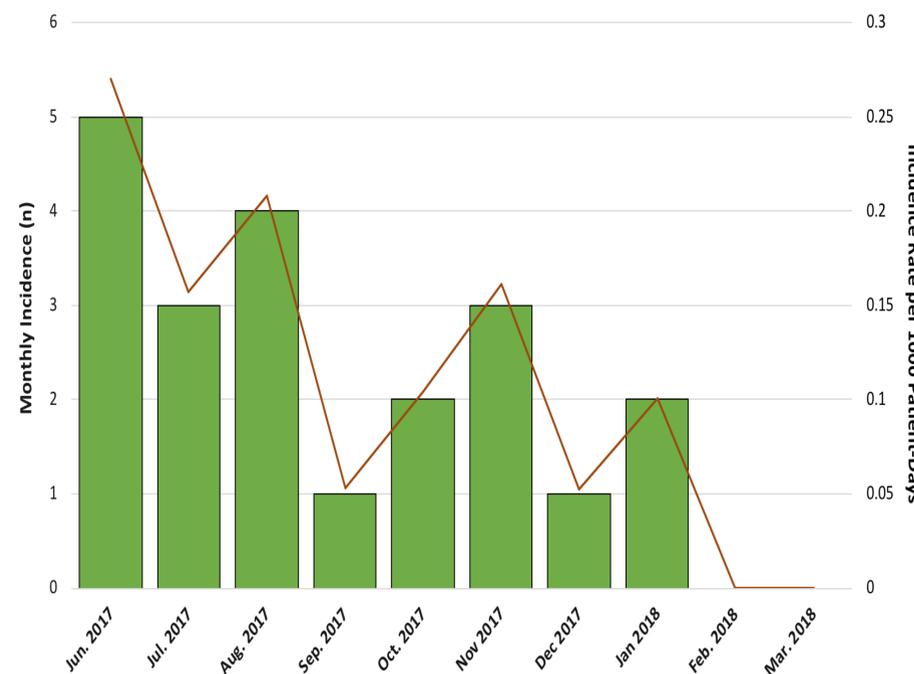


Table 1: Baseline Demographic and Clinical Characteristics of Cases and Controls

Characteristic	Cases (n=17)	Controls (n=41)	p-value
Mean age, years (SD)	59.9 (±13.2)	59.5 (±13.3)	0.90
Male sex (N,%)	13 (76.5%)	30 (73.2%)	1.00
Inpatient stay prior to index date, days (median, IQR)	24.5 [7.7, 80.0]	10.9 [8.3, 22.0]	0.18
Weighted Charlson Comorbidity Index Score (N,%) ¹			0.80
"0"	2 (15%)	3 (8%)	
"1-2"	3 (23%)	12 (32%)	
"3-4"	4 (31%)	13 (35%)	
"≥5"	4 (31%)	9 (24%)	
History of Transplant	9 (53%)	14 (34%)	0.24
Lung Transplant	5 (29%)	11 (28%)	1.00
Heart Transplant	2 (12%)	2 (5%)	0.57
Other Transplant	2 (12%)	1 (2%)	0.21

Table 2: Risk Factors for Hospital-Associated *B. cenocepacia*

Exposure	Cases (N, %)	Controls (N, %)	OR (CI ₉₅)
PROCEDURES			
Surgery prior to index date	13 (76%)	30 (73%)	1.8 (0.2, 21.3)
Surgery ≤ 5 days of index date	6 (45%)	9 (22%)	2.6 (0.5, 17.9)
Echocardiogram prior to index date	15 (88%)	32 (78%)	3.2 (0.4, 151.1)
Echocardiogram ≤ 5 days of index date	9 (53%)	19 (46%)	1.7 (0.4, 8.3)
Ultrasound prior to index date	12 (71%)	26 (63%)	1.3 (0.3, 6.5)
Ultrasound ≤ 5 days of index date	3 (18%)	13 (32%)	0.5 (0.1, 2.4)
Bronchoscopy prior to index date	7 (41%)	12 (29%)	1.7 (0.4, 8.9)
Bronchoscopy ≤ 5 days of index date	2 (12%)	6 (15%)	0.8 (0.1, 6.4)
Respiratory therapy prior to index date	12 (71%)	21 (51%)	3.2 (0.7, 20.9)
Respiratory therapy ≤ 5 days of index date	7 (41%)	13 (32%)	2.1 (0.5, 9.2)
DEVICES – Type of ventilation			
Non-invasive prior to index date	8 (47%)	15 (37%)	1.8 (0.5, 6.8)
Non-invasive ≤ 5 days of index date	3 (7%)	12 (29%)	0.6 (0.1, 3.0)
Invasive prior to index date	15 (88%)	35 (88%)	2.5 (0.1, 176.6)
Invasive ≤ 5 days of index date	15 (88%)	26 (63%)	10.5 (1.91, ∞)
MEDICATIONS - Aerosolized			
Prior to index date	14 (82%)	27 (66%)	2.0 (0.5, 12.2)
≤ 5 days of index date	13 (76%)	23 (56%)	2.3 (0.5, 14.0)

SUMMARY AND CONCLUSIONS

- This was one of the first hospital-associated *B. cenocepacia* outbreaks in non-CF patients not attributable to a point source and the first known identification of *recA 365 B. cenocepacia*.
- The results of this case-control study led to reinforcement of best practices regarding ventilator care and disinfection, which appeared to lead to attenuation of the outbreak clone.
- Limitations:** Small sample size precluded adjustment for multiple covariates. Because incubation period for *B. cenocepacia* is unknown, the 5 days prior to detection may not best define the risk window.
- Conclusions:** Matched case control studies can help identify risk factors during complex outbreaks without a discernible point source.
- Future studies should examine the latency period of *B. cenocepacia*, including the potential for intracellular locations, to better elucidate incubation periods and exposure windows.
- Whole genome sequencing should be utilized to better characterize transmission patterns.

REFERENCES

¹Dolan SA, Dowell E, LiPuma JJ, Valdez S, Chan K, James JF. An outbreak of *Burkholderia cepacia* complex associated with intrinsically contaminated nasal spray. *Infect Control Hosp Epidemiol.* 2011;32(8):804-10.
²Akinboyo IC, Sick-Samuels AC, Singeltary E, et al. Multistate outbreak of an emerging *Burkholderia cepacia* complex strain associated with contaminated oral liquid docusate sodium. *Infect Control Hosp Epidemiol.* 2018;39(2):237-9.

ACKNOWLEDGEMENTS

Special thanks to Dr. John LiPuma for his insight into *Burkholderia* and its complex transmission patterns. Special thanks also to the clinical microbiology laboratory at Columbia University Irving Medical Center