



# Carbapenem-Resistant *Klebsiella pneumoniae* Cluster Associated with Gastroscope Exposure Among Surgical Intensive Care Unit Patients at University of Pittsburgh Medical Center

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## Background

- In January 2016, an increase in carbapenem-resistant *Klebsiella pneumoniae* (CR-Kp) isolates was observed in the open 8 bed surgical intensive care unit (SICU) at University of Pittsburgh Medical Center (UPMC) Presbyterian Hospital.
- Three new cases were identified on SICU in one month compared to the 2015 unit average of 0.5 new cases/month.
- Three additional cases were identified who had exposure to SICU in January but whose CR-Kp isolates were recovered on another unit.
- Preliminary review of the six cases found that, in addition to SICU exposure, all cases were exposed to the same OR gastroscope (G5).
- An investigation was launched to determine the exposure source as well as the relatedness of CR-Kp strains.

## Setting

UPMC-Presbyterian Hospital is a complex 757 bed tertiary care hospital affiliated with the University of Pittsburgh Schools of the Health Sciences. It is an adult medical-surgical facility that specializes in organ transplantation and is a recognized leader in cardiology.



## Methods

### Identify Additional Cases:

- Rectal swabs were collected on all current inpatients exposed to the SICU in January 2016 to assess for CRE carriage.
- Aside from the 6 cases, no patients exposed to G5 were still inpatient at the time of investigation.

### Assess Scope G5:

- Removed scope from service and reprocessing records were reviewed.
- Conducted microbiologic assessment utilizing two scope culturing techniques.<sup>1,2</sup>
- A boroscopy was performed to examine the scope lumen for defects.

### Environmental Controls:

- Moved patients out of SICU to thoroughly clean space and conduct ultraviolet (UV) light disinfection.

### Molecular Typing:

- Sent all CR-Kp isolates to Microbial Genomics Epidemiology Laboratory (MiGEL) for pulsed-field gel electrophoresis (PFGE) typing and whole genome sequencing (WGS) to assess for relatedness.

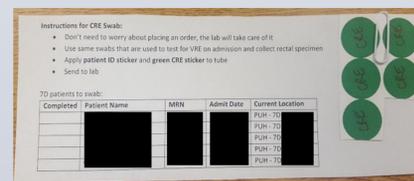
## Results

### Identify Additional Cases

- 43 patients (aside from cases) were exposed to SICU in January
  - 19 still in house and available for rectal screen
  - 17 rectal swabs obtained (2 patients discharged prior to obtaining swab)
    - 1 positive for CR-Kp with same sensitivities as cases
    - Patient never had exposure to G5
- Given positive pt, SICU asked to continue weekly screens until no new positives
  - Next weekly screen consisted of 6 patients
  - All negative for CRE, therefore weekly screenings stopped

### Assess Scope G5

- No deficiencies identified with scope reprocessing
- No organisms identified using either of the scope culturing methods
- Boroscopy of scope lumen revealed several deep scratches and luminal debris, despite undergoing high-level disinfection
- After boroscopy, scope lumen was removed and replaced with new lumen before being placed back in service
- Discovered a known CR-Kp patient with same sensitivities as case patients had used same scope at end of December 2015



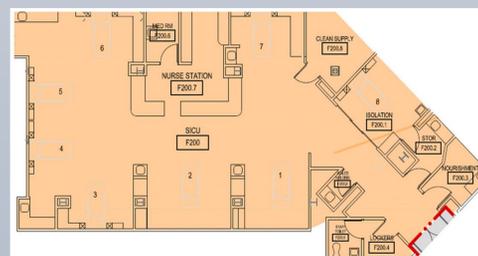
Instructions given to units for obtaining rectal swabs



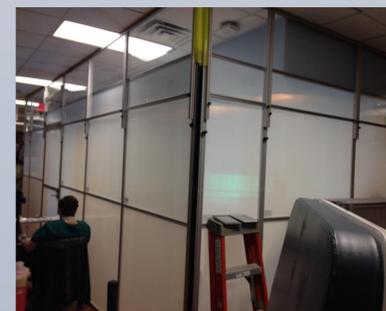
Gastroscope model under suspicion (image obtained from <http://www.global-endo.com/wp-content/uploads/2013/04/GIF-H180-2-new.jpg>)

### Environmental Controls

- All SICU patients moved from the unit and placed in a flex unit
- Environmental Support Services thoroughly cleaned the entire unit
- Used UV machine to further disinfect the space
  - Entire unit is open with only partial walls and curtains separating bed spaces, complicating the UV disinfection process
  - Maintenance got creative and was able to install temporary walls to partition off small spaces so the UV machine could effectively disinfect



SICU open floor plan

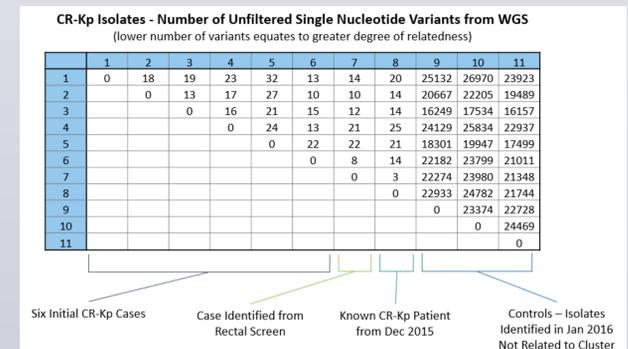
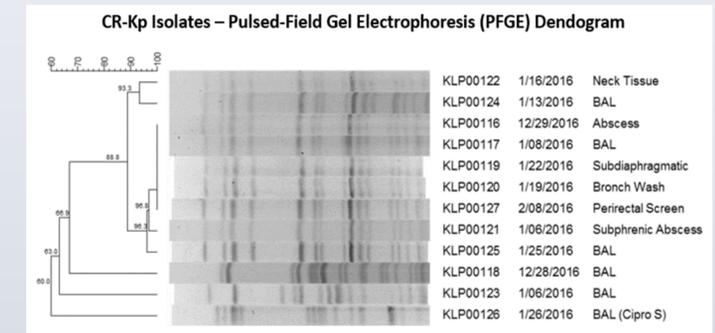


Floor to ceiling temporary walls being installed by maintenance

## Results

### Molecular Typing

- Six case isolates and new isolate identified via screen sent for typing
- December 2015 CR-Kp result sent as well as some other isolates identified in January that did not appear to be related to the cluster (controls)
- All seven new case isolates as well as the December 2015 isolate were determined to be related by PFGE and WGS



## Conclusions

- Given boroscopy results of debris and scratches, CR-Kp transmission likely occurred through a contaminated gastroscope with subsequent limited horizontal transmission in the SICU.
- G5 possibly was contaminated in December 2015 after being used on a known CR-Kp patient.
- Non-recovery of organisms from a suspected scope should not preclude a scope from suspicion of transmission.
- Less complex scopes (as compared to ERCP scopes) may fail high level disinfection and lead to infections and clusters.

## References

- Marsh, J. W., et al. (2015). Genomic Epidemiology of an Endoscope-Associated Outbreak of *Klebsiella pneumoniae* Carbapenemase (KPC)-Producing *K. pneumoniae*. PLoS ONE, 10(12), e0144310. <http://doi.org/10.1371/journal.pone.0144310>
- Centers for Disease Control and Prevention. (2015). Interim Sampling Method for the Duodenoscope – Distal End and Instrument Channel. Available at: <https://www.cdc.gov/hai/settings/lab/lab-duodenoscope-culture-method.html>