Carbapenem-resistant Enterobacteriaceae (CRE) *Klebsiella pneumonia (KP)* Cluster Analysis Associated with GI Scopes with Elevator Channel

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Abstract

Background:
CRE infections are a challenge in health-care. Carbapenem-resistant (CR) KP is the species most commonly encountered in the US and resistant to most antimicrobials. Infections have been associated with high rates of morbidity and mortality. The University of Pittsburgh Medical Center, Presbyterian (UPMC-P) is one of the largest solid organ transplantation programs in the US, performing > 300 kidney, liver, intestinal and multi-visceral transplants per year. In 2012, CRKP incidence increased from 0.24 to 0.33; many patients had an Endoscopic Retrograde Cholangiopancreatography (ERCP) prior to (+) culture.
Objective: Investigate the CRKP increase.
Methods: 2011 – 2012 CRKP incidence and health-care associated infections (HAI) were reviewed. 68 patients located on 4 GI/transplant floors were peri-rectally screened using HardyCHROM™ Carbapenemase media. Scope and washer manufacturers were notified and evaluated the cleaning/high level disinfection (C/HLD) process. GI lab/scopes were inspected, 31 scopes were cultured using previously described protocol. Usage document was obtained on implicated scope. Pulsed Field Gel Electrophoresis (PFGE) was done using Xbal.
Results: CRKP HAI rates were not increased; however, many cases were present on admission in patients who had a recent GI procedure. Screening did not identify any additional colonized patients. C/HLD processes were reviewed with no issues. 5/31 (16%) scopes grew organisms consistent with GI flora. 1 ERCP grew both carbapenem susceptible (CS) and CRKP, 1 EUS scope grew CSKP.

Setting

- The University of Pittsburgh Medical Center (UPMC) Presbyterian is a 766-bed tertiary care facility affiliated with the University of Pittsburgh Schools of the Health Sciences
- It is one of the largest solid organ transplantation programs in the US, performing > 300 kidney, liver, intestinal and multi-visceral transplants per year

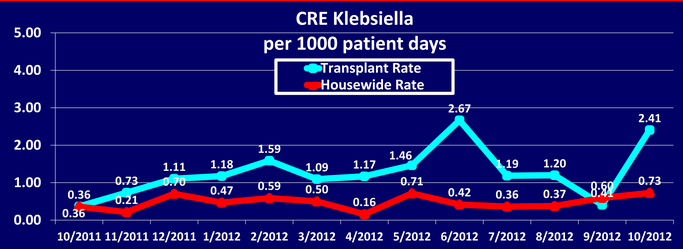
Background

- Infections caused by CRE have limited treatment options associated with high mortality rates
- KP carbapenemase (KPC) is the most common carbapenemase
- CRKP isolates are resistant to many antimicrobial classes
- Organ transplantation, antimicrobial use, length of stay and mechanical ventilation are associated with CRKP acquisition when compared with patients acquiring CSKP
- Post ERCP bloodstream infections (BSI's) and biliary tree infections are reported after 1-3% of procedures
- Outbreaks have been associated with insufficient cleaning/ disinfection of duodenoscope channels, especially the **elevator channel**.
- Ethylene oxide gas sterilization (ETO) is a more complex and expensive process than steam sterilization. Some suggest that ETO should be used on endoscopes whenever possible
- In 2012, CRKP incidence increased from 0.24 to 0.33
- Many patients had an ERCP prior to (+) culture

Objective

Investigate a CRKP cluster in the abdominal transplant population

Methods



- The cluster of CRKP isolates was identified in transplant patients
- Patients with CRKP clinically significant infections were reviewed
- Many infections were identified post-ERCP
- Blood and wound isolates were collected
- 68 GI/transplant patients were CRKP screened (peri-rectal)
- A multidisciplinary group consisting of GI, Infection Prevention/ Quality, scope manufacturer (Olympus), and ECRI Institute monitored C/HLD procedures and inspected all GI scopes. All 6 ERCP scopes were taken out of service and cultured
  - Non-ERCP scopes were also cultured
  - A total of 31 scopes were cultured
- ERCP Scope usage was reviewed
- Molecular typing methods
  - KP wound/blood isolates underwent PFGE typing using Xbal
  - BioNumerics v 6.5. Cluster analysis using UPGMA and DNA relatedness
  - Dice coefficient was calculated using a setting of 1% band tolerance and 1.5% optimization
  - A dendogram was created grouping level of 85% was used for the establishment of clonal relatedness between *KP i*solates

Results

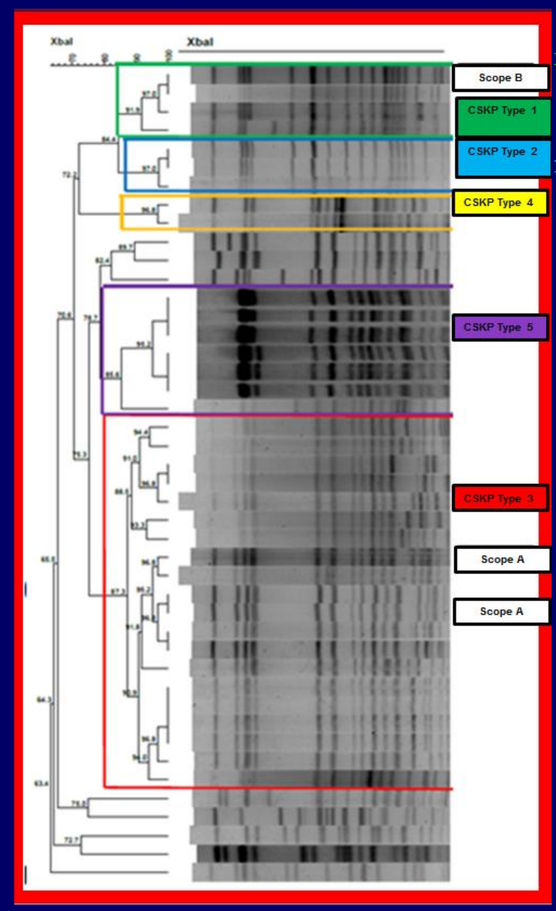
- CRKP HAI rates were not increased
- CRKP increased incidence was associated with increased cases present on admission in patients who had a recent GI procedure
- CRKP screening did not identify unrecognized colonized patients
- No issues identified with C/HLD

Scope Results

- 1/31 (3%) - No growth
- 17/31 (55%) grew environmental organisms
- 5/31 (16%) grew GI organisms
- 1 ERCP scope (A) – Both CS/ CRKP
- 1 EUS scope (B) grew CSKP

PFGE Results – 5 clusters

- CRKP – 3 clusters Types 3, 4, 5
- CSKP – 2 clusters Types 1-2



1/23 (4%) - Type 1
- Clustered with Scope A and B
- Identified post non Scope A ERCP
- No information on Scope B Usage

1/23 (4%) - Type 2
- Clustered with Scope A
- Identified post Scope A ERCP

18/23 (78%) - Type 3
- Clustered with Scope A (Type 3)
- 9/18 (50%) exposed to Scope A
- 7/9 (78%) + post ERCP Scope A

Conclusions

- Type 3 CR and Types 1/2 CSKP scope/patient isolates with same PFGE types
- Negative CRKP screens supported lack of transmission in patient care areas
- C/HDL was not sufficient to eradicate GI flora
- ↑ CRKP incidence in GI patients may have been associated with Scope A
- ETO has been implemented for scopes with an elevator channel (ERCP/EUS)
- Routine scope culturing should occur to ensure proper C/HLD