Pattern of Acquisition of Hospital-Associated Pathogens in the ICU of a Tertiary Hospital

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Background

- A 48 hour window from hospital admission is commonly used to guide empiric antimicrobial selection.
- In the intensive care unit (ICU), patients are at a high risk of infection related morbidity and mortality and may be exposed to broad-spectrum antimicrobials early on in their ICU stay.
- Overuse of broad-spectrum antimicrobials can lead to antimicrobial resistance and *Clostridioides difficile* infections.
- Identifying the earliest and median time to acquire a multi-drug resistant pathogen will help guide empiric antimicrobial therapy.

Objectives

Primary Objective:

- Determine the earliest and median time since hospital admission to acquire hospital associated pathogens in ICU patients.

Secondary Objectives:

- Describe the source of isolated pathogens (ie. blood, sputum)
- Determine how many patients were known to be colonized or infected with these pathogens on ICU admission
- Determine the median time to acquisition from any source for each of these pathogens

Methods

- **Design**: Single-centre retrospective cohort study
- **Study dates**: January 1, 2018 to December 31, 2018
- **Inclusion**: Age >18 years, admitted to VGH ICU from emergency department, another ward in this hospital, Richmond Hospital, or UBC Hospital
- **Exclusion**: Patients transferred from any other hospital, admitted to hospital ≥ 14 days prior to ICU admission, solid organ or bone marrow transplant recipients, immunocompromised
- **Hospital-associated pathogens**: methicillin resistant *staphylococcus aureus* (MRSA), vancomycin resistant *enterococci* (VRE), extended spectrum beta lactamase(ESBL) producing *enterobacterales*, ceftriaxone resistant *enterobacterales*, *Pseudomonas* and *Stenotrophomonas*
- **Analysis**: Descriptive statistics

Results

Figure 1: Patient Population

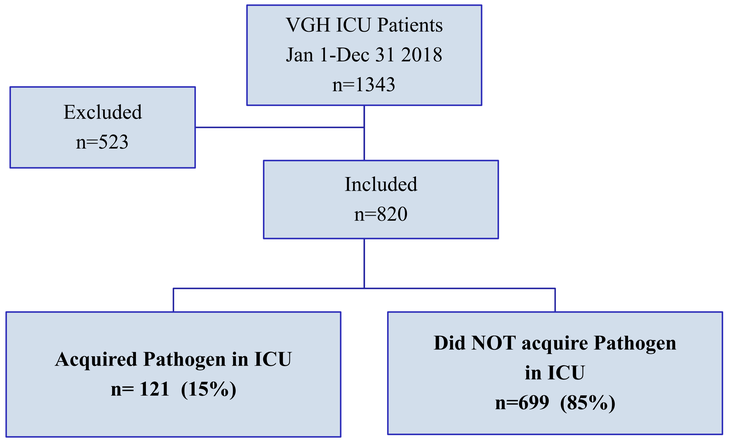


Table 1: Patient Characteristics

Age- mean (SD)	56.7 (15.3) years
Time in Hospital prior to ICU admission– median (IQR)	0 (0,3) days
ICU Length of Stay- median (IQR)	4.9 (2.1, 10.2) days
Colonized with Pathogen on ICU Admission- n (%)	40 (4.9%) patients
Infected with Pathogen on ICU Admission- n (%)	46 (5.6%) patients

Figure 2: Sources of Each Hospital Associated Pathogen

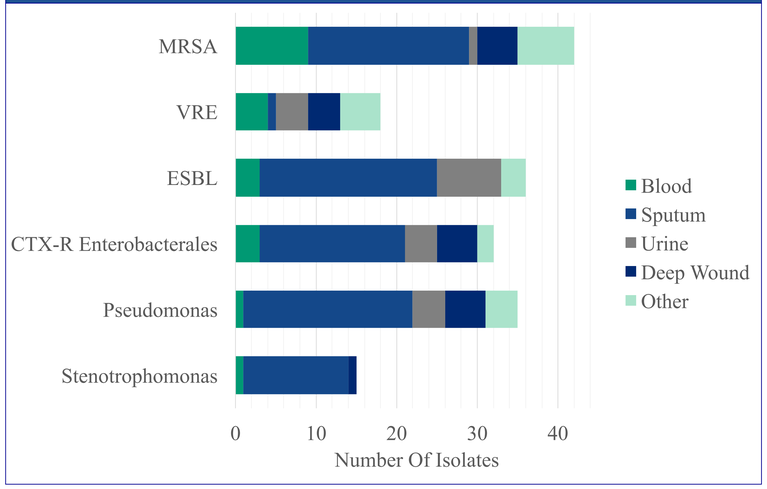
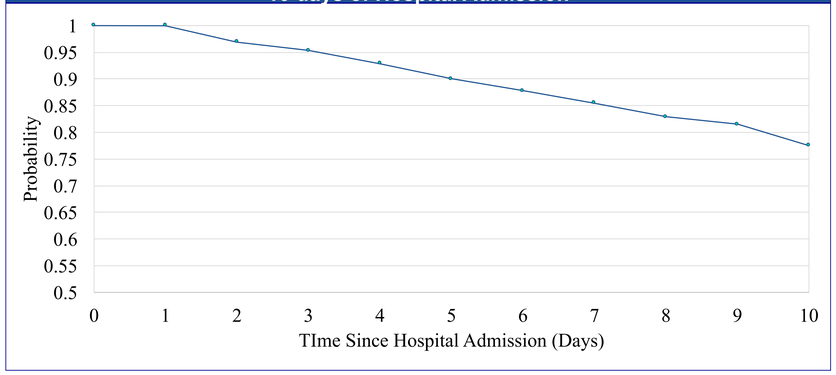


Table 2 : Time to Acquisition of Hospital Associated Pathogens

Pathogen	Earliest Time of Acquisition – hours	Median Time of Acquisition – days (IQR)
Any Hospital Associated Pathogen	29	9 (3.8, 15.6)
MRSA	29.3	5 (3.0, 13.4)
VRE	186.3	15.8 (9.8, 22.4)
ESBL	38.8	8.8 (5.0, 15.4)
CTX resistant *enterobacterales*	29	9.2 (4.4, 13.8)
Pseudomonas	29.8	6 (3.7, 12.6)
Stenotrophomonas	56	9 (5.8, 12.3)

Figure 3: Probability of Remaining Pathogen-Free Within 10 days of Hospital Admission



Limitations

- Did not assess recent hospitalizations or antimicrobial use
- Collected primarily microbiological data
- Excluded patients at higher risk for infection (eg. immunocompromised)

Conclusions

- In our study, at a tertiary ICU, the probability of acquiring a hospital associated pathogen by 48 hours of hospitalization is 3%.
- The earliest time to acquire a hospital associated pathogen is 29 hours, the median time is 9 days.
- Use of broad spectrum antibiotics empirically at a threshold of 48 hours of hospitalization may not be necessary.
- Clinical presentation, past microbiological cultures and previous antibiotic use may also be considered in addition to time since hospitalization when recommending empiric antimicrobial agents.

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