



Sher - i - Kashmir Institute of Medical Sciences
Srinagar, Kashmir.

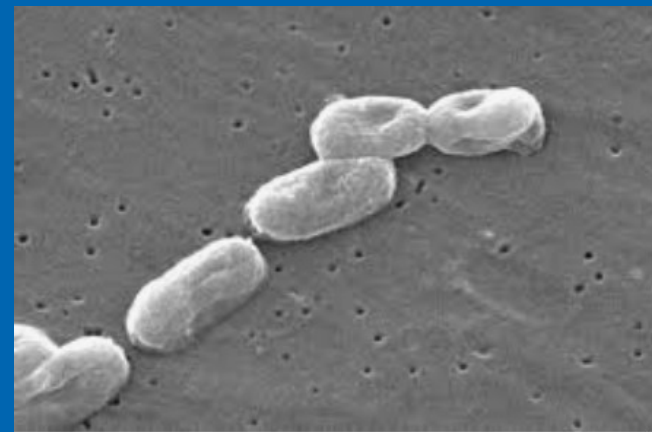


Outbreak Investigation of *Burkholderia cepacia* Bloodstream Infections, Sher-i-Kashmir Institute of Medical Sciences, Srinagar

Dr. Gulnaz Bashir
Professor of Microbiology

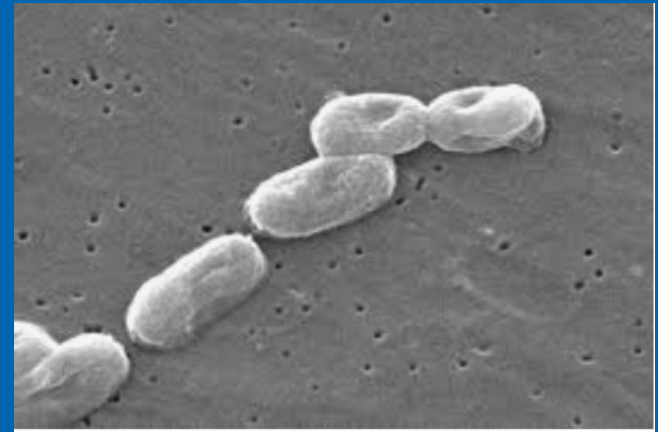
Burkholderia cepacia

- Described by William Burkholder as *Pseudomonas cepacia* in 1950 , renamed as *B. cepacia* in 1992
- Burkholderia cepacia complex (BCC) are aerobic gram-negative bacilli, commonly found in **aquatic** environments.
- A multifaceted organism, from being a plant and human pathogen to a friendly organism used for enhancement of crop yield, biocontrol and bioremediation of toxins.



Burkholderia cepacia (Contd...)

- Devastates the health of **cystic fibrosis patients**.
- An important cause of mortality and morbidity in hospitalized patients because of
 - **high intrinsic antibiotic resistance**
 - **potential to grow in hospital surroundings** (e.g., taps, sinks, irrigation solutions, intravenous fluids, antibiotic and antiseptic solutions)
- Needs to be correctly identified as it has contrasting susceptibility pattern to *P. aeruginosa*
- Present in **biofilms**, can be **difficult to isolate** from the environment



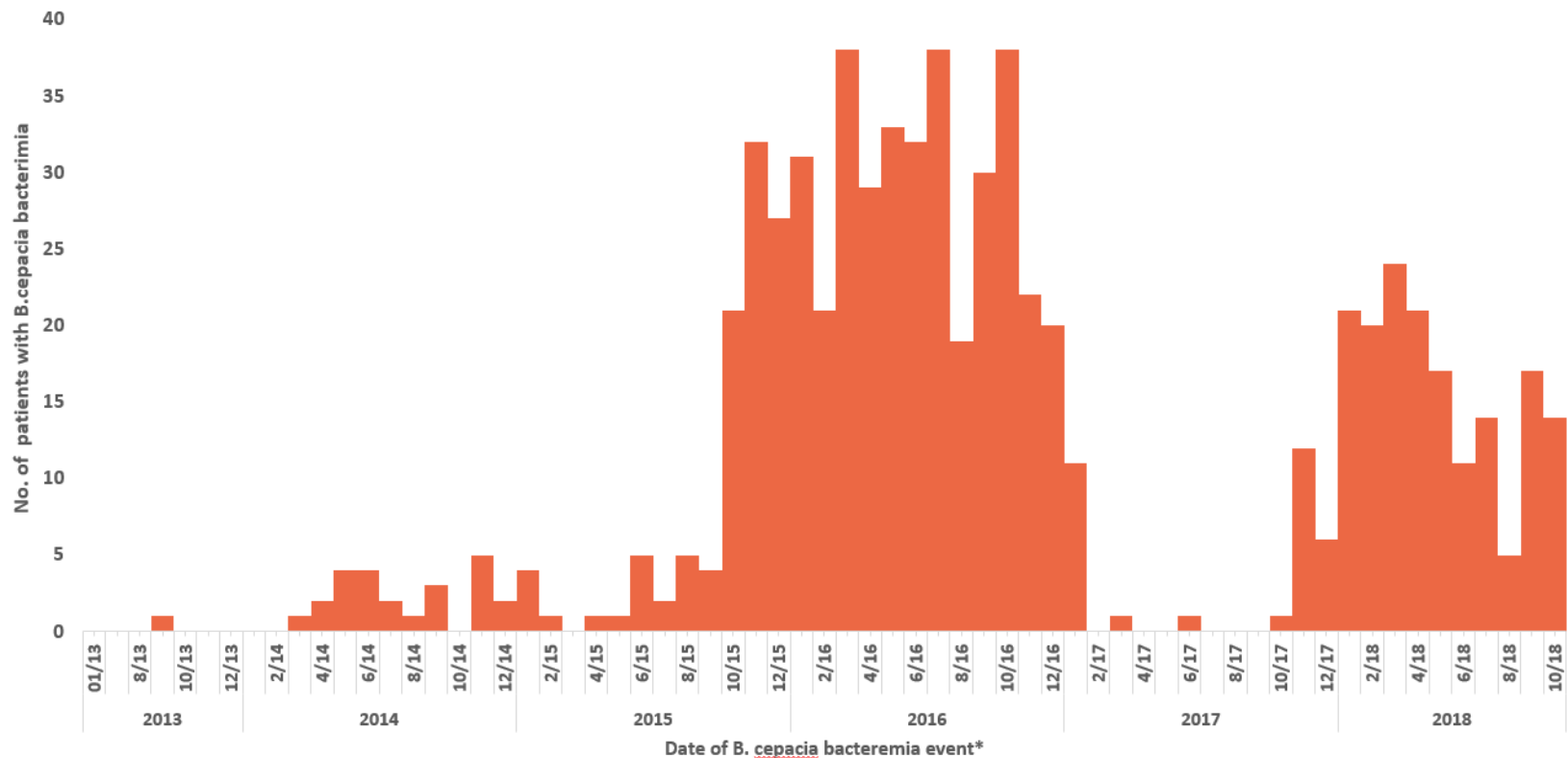
Background of our hospital

- **Sher-i-Kashmir Institute of Medical Sciences**
 - Tertiary teaching hospital - **806 beds**
- 5 Intensive care units
 - CVTS intensive care unit (CICU) – 4 beds
 - Medical intensive care unit (MICU) – 8 beds
 - Neonatal intensive care unit (NICU) – 22 beds
 - Pediatric intensive care unit (PICU)– 4 beds
 - Surgical intensive care unit (SICU) – 20 beds



Background of *B. cepacia* BSIs in SKIMS

Patients with *Burkholderia cepacia* Bacteremia at SKIMS Hospital, January 2013 to October 2018 (N=639)



*Date of event= Date positive blood culture for *Burkholderia cepacia*

Background of *B. cepacia* BSIs in SKIMS

- Among all blood isolates since 2015, *Burkholderia cepacia* is the **third most common**.
- Conducted multiple investigations
 - **Did not find source** in the past
 - Made general recommendations for IPC strengthening
 - **Recurrent outbreaks** occurring

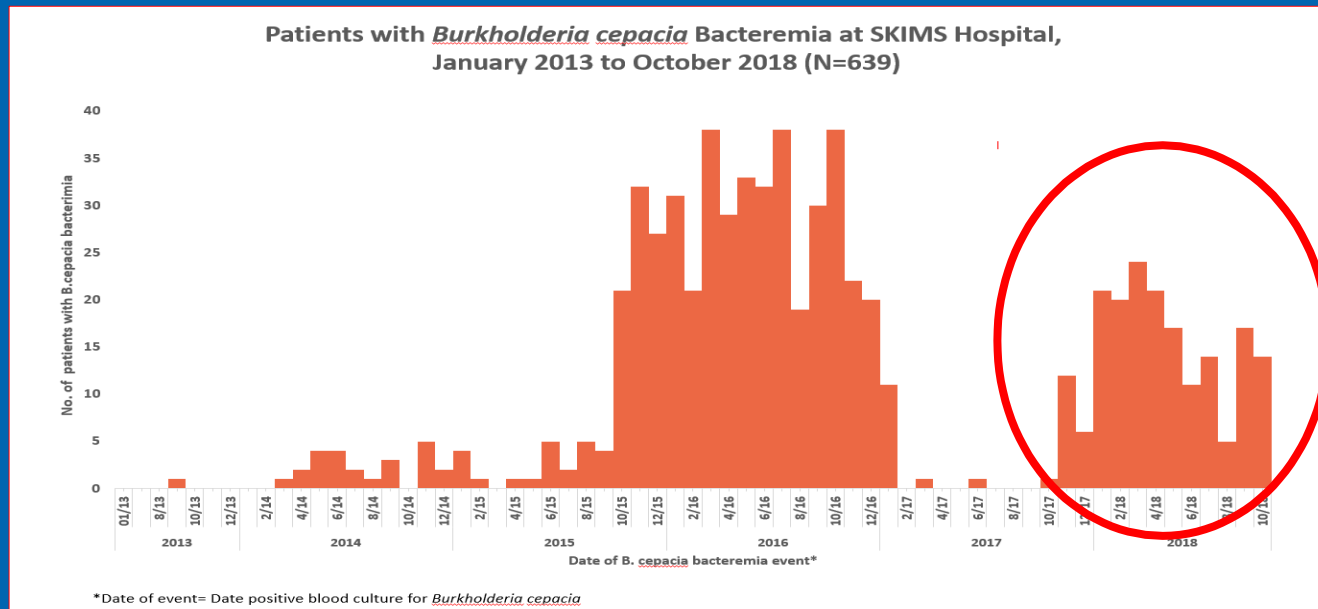


Most frequent isolates from blood Oct. 2015 to Oct. 2018

Organism	No.*	%
<i>Staphylococcus hominis</i>	480	17%
<i>Staphylococcus epidermidis</i>	471	17%
<i>Burkholderia cepacia</i>	362	13%
<i>Staphylococcus haemolyticus</i>	190	7%
<i>Escherichia coli</i>	189	7%
<i>Staphylococcus aureus</i>	157	6%
<i>Klebsiella pneumoniae</i>	144	5%
<i>Acinetobacter baumannii</i>	136	5%
<i>Enterococcus faecium</i>	94	3%
<i>Pseudomonas aeruginosa</i>	72	3%
Other species	530	19%

*Duplicate isolates per patient counted only once

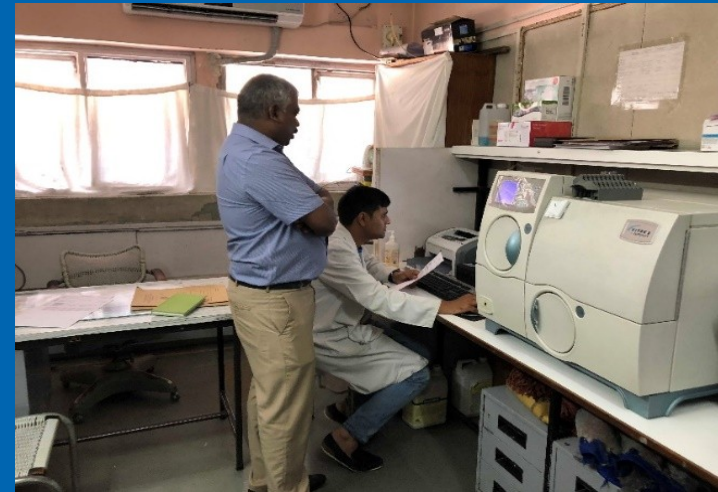
Most recent cluster began in Oct. 2017



- Appeared to be mostly clustered in **surgical ICU (SICU)**
- Infections occurred in patients who were already quite **sick** (trauma, debilitating illness, comorbidities)
- **> 75% died** from all causes (could not determine *B. cepacia*-related deaths)

Action taken

- After joining **HAI surveillance network**, SKIMS Microbiology was in communication with AIIMS-CDC team about the high rate of *B. cepacia* BSIs.
- To **confirm the outbreak**, we sent ten isolates to Jai Prakash Narayan Apex Trauma Centre (JPNATC) Microbiology lab.
 - All ten were confirmed as *B. cepacia*
- We requested assistance to conduct a **systematic investigation** to help determine potential causes and identify solutions.
- AIIMS-CDC team visited SKIMS in August 2018.



Objectives of the investigation

- To describe the **epidemiology** of the outbreak
- To identify potential **risk factors**
- To identify **infection control** gaps and strengthen IPC practices



METHODS



Methods

- Case definition:
 - Any *Burkholderia cepacia* bloodstream infection from Sher-i-Kashmir Institute of Medical Sciences (SKIMS) between October 1, 2017 and October 31, 2018
- Case finding:
 - Reviewed microbiology records, including Vitek output (Whonet)
- Case description (*currently ongoing*):
 - Standardized case abstraction form for demographics, exposures
 - Epi Info database to record and analyze data
 - Began reviewing medical charts from SICU patients
 - To date, 121 charts reviewed -- preliminary information provided in this presentation

Methods (continued)

- Informed all key **stakeholders**
- Sensitized ICU-in-charge, clinicians, administrators.
- IPC **self-appraisal** using WHO Assessment tool (IPCAT-H)
- **Observations** of IPC practices.
- Training in use of Whonet.



Methods (continued)

HICN Delphina trains the SKIMS Hospital HICNS on IPC monitoring and Surveillance for IPC practices



JPNATC team reviews HAI forms for data Quality

Methods (continued)

- Environmental sampling
 - **Swabs** of “high-touch” surfaces around three case-patients and sinks.
- Additional samples:
 - **Intravenous** medications, saline, water samples, mouthwash.

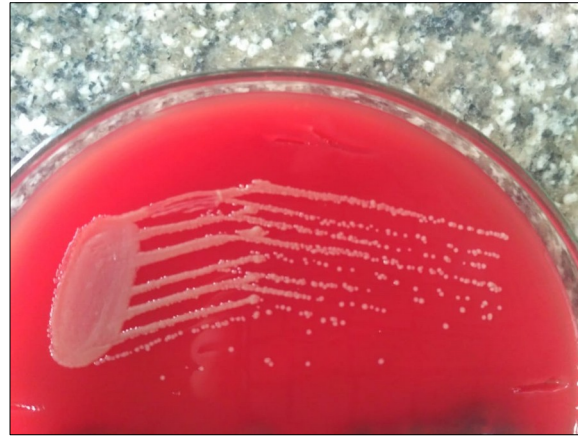


Methods (continued)

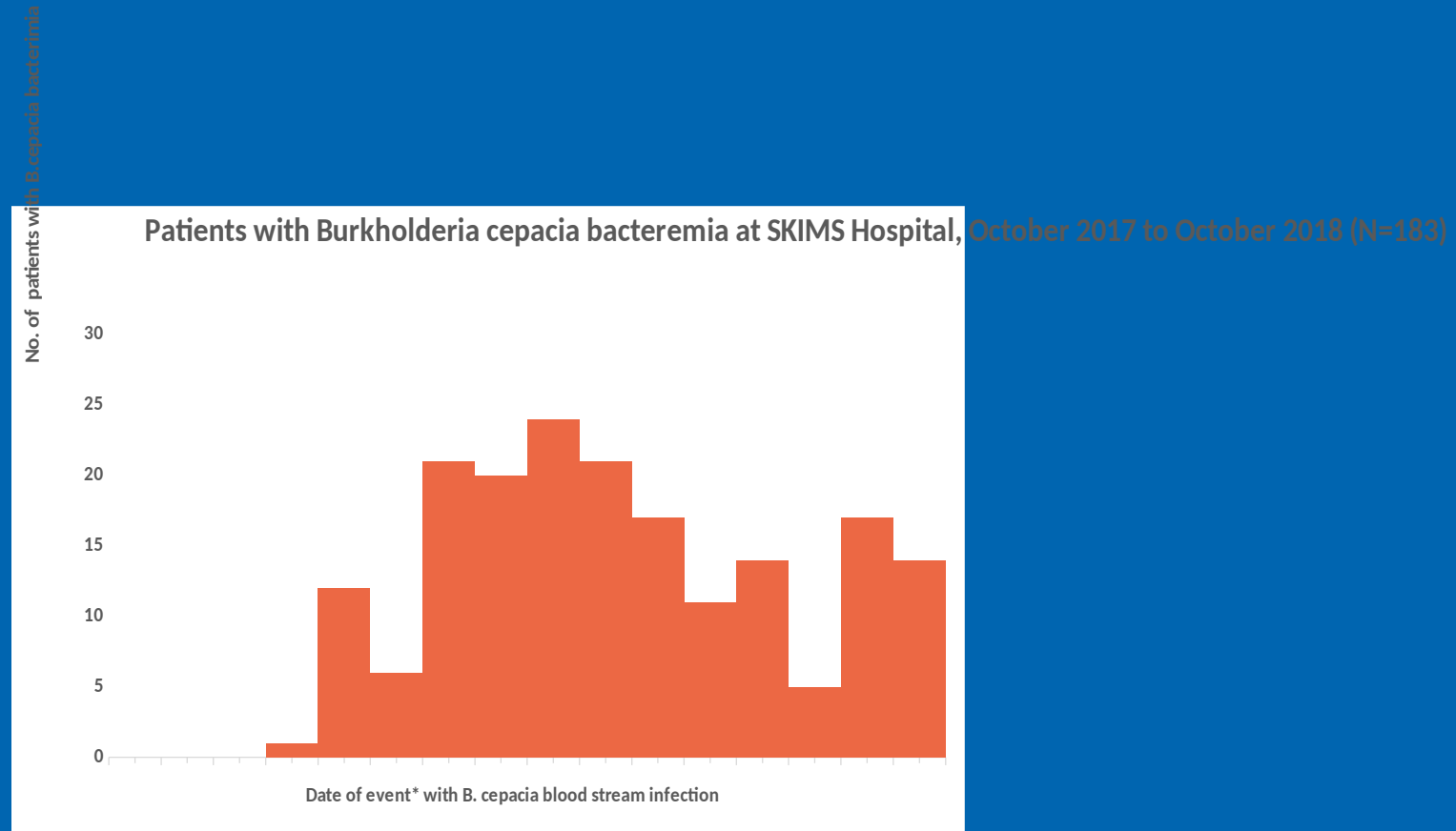
Samples collected by the team were processed in the Department of Microbiology, SKIMS.



RESULTS



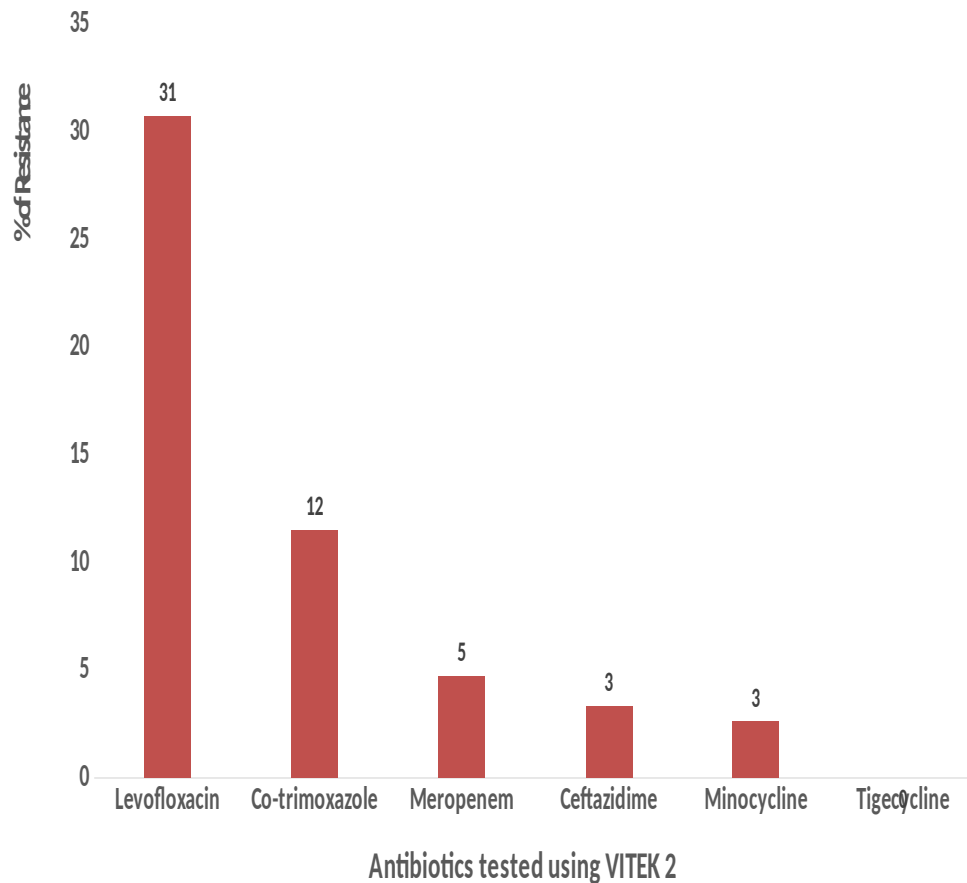
Epidemic Curve



- **183 patients** met the case definition between Oct 2017 – Oct2018
- At least **144 (79%)** were in **SICU** at time of infection

AMR patterns among cases (N=183)

Proportion of *B. cepacia* blood isolates resistant to selected antibiotics – SKIMS, Oct 2017-Oct 2018 (N=183)



CASE-PATIENT REVIEW

(*Preliminary data from 121 case-patients from SICU)



Case-patient characteristics (n=121)

Characteristics	No. patients	%
Male sex	91	75.2
Age (median; range)	35	(0-80)
Length of stay before infection (median; range)	4	(2-8)
Refer from other hospital	46	38.0
Outcome - death	57	47.1
Signs and symptoms	No. patients	%
Hypoxia	58	47.9
Tachycardia	35	28.9
Nausea/ vomiting	32	26.4
Altered mental status	31	25.6
Fever	29	24.0
Hypotension	11	9.1
Tachypnea	10	8.3
Abdominal pain	10	8.3

Admitting department for cases (n=121)

Admitting Department	Number of patients	(%)
Neurosurgery	46	38.0
General Surgery	24	19.8
Neurology	12	9.9
General Medicine	9	7.4
Nephrology	8	6.6
Gastroenterology	4	3.3
Cardiology	3	2.5
Emergency dept. (ED)	3	2.5
Medical oncology	3	2.5
Pediatrics	2	1.7
CVTS	1	0.8
Hematology	1	0.8
Unknown	5	4.1
Total	121	100.0

- 38% of SICU case-patients were in the neurosurgery department
- To evaluate whether this was more than expected, we looked at average patient census data
- In average year at our hospital:
 - 57% of SICU patients belong to neurosurgery
 - 16% of all neurosurgery patients are in the SICU
- Thus, this outbreak did not appear to “cluster” in neurosurgery dept.

IV medications among cases (n=121)

IV medication	Number exposed	%
Inj. Paracetamol	68	56.2
Inj. Pantoprazole	52	43.0
Inj. Anti-emetics	25	20.7
Inj. Ranitidine	24	19.8
Inj. Phenytoin	24	19.8
Inj. Hydrocortisone	9	7.4
Inj. Mannitol	8	6.6
Inj. Lasix	6	5.0

* Total is more than 121 because one case-patient can receive more than one IV medication

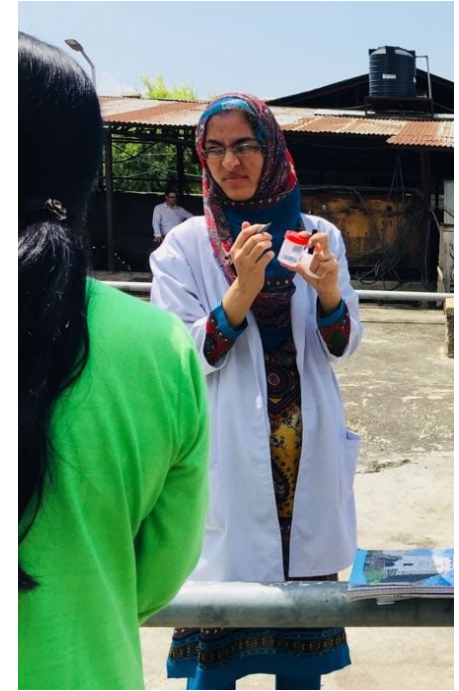
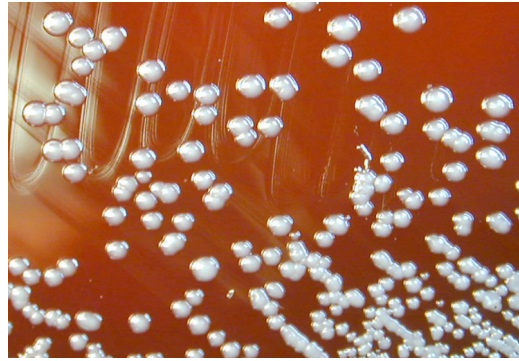
Potential exposures among cases (n=121)

Risk factor	Number exposed	%
Surgery/ invasive procedures		
Craniotomies	31	25.6
Other surgeries	12	9.9
Other invasive procedures	20	16.5
Blood glucose monitoring	89	73.6
Any blood or blood product	11	9.1
Referred from other hospital	46	38.0
Central venous catheter (CVC)	86	71.1
<i>Location of insertion</i>		
SICU	59	48.8
OT	22	18.2
Other	5	4.1
Days from CVC insertion to infection (median; range)	2	(1-4)

What we know about the outbreak so far...

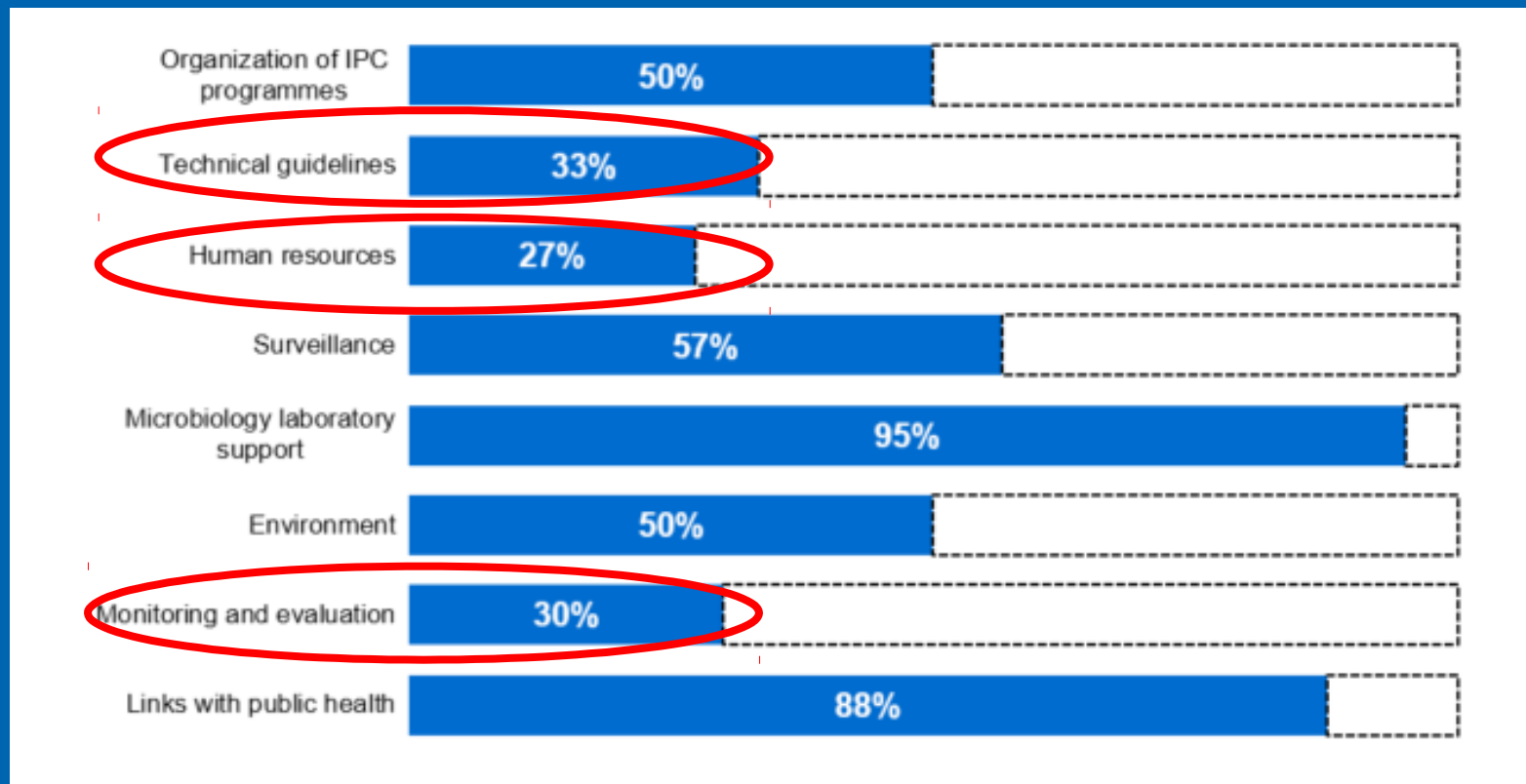
- Most cases occurred in **SICU** -- might point to certain risk factors there
- Most patients were **male, had central venous catheters, and received multiple antibiotics** and IV medications– this may be expected for SICU population
- Initially concerned about neurosurgery patients, but data do not suggest neurosurgery cases are higher than expected
- No **IV product** was found in common among all case-patients; however, some products (such as IV saline) are not possible to track on our forms
- Case-patients had **central line** placed median of **2 days** prior to infection. This could suggest possible exposure during or soon after insertion
- Evaluation of **general IPC practices** as well as potential **blood exposures** (e.g., central line management, intravenous products) are critical

**EVALUATION OF IPC
PRACTICES
&
RESULTS OF
ENVIRONMENTAL
SAMPLING**



Results of IPC Self-Assessment

Results of WHO IPCAT- H self appraisal tool



Specific IPC practices

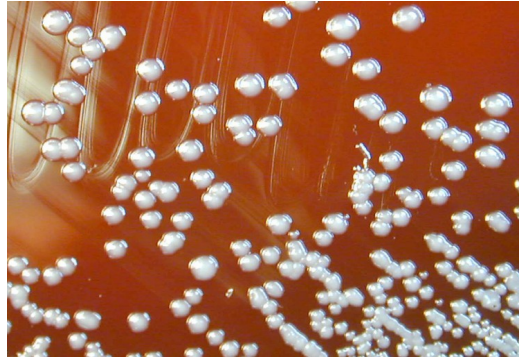
- Observation of IPC practices in the SICU, surgical OR, and surgical emergency room revealed.....
- High turnover of patients, requiring frequent insertion of IVs
- Low nurse: SICU patient ratio (~ 1:5)
- Opportunities for improvement in IPC practices
 - Large bottles of saline used as “flush” for multiple patients
 - Poor placement of SICU hand wash facilities in the adjacent toilet.
 - Lack of adequate human resources to support hand hygiene, PPE use, or environmental cleaning programs.

Environmental culture results

- Multiple samples were taken periodically from environmental surfaces, water samples, intravenous products, and other medications till date.
- *Burkholderia cepacia* growth was identified recently in
 - A large, **open, saline** bottle used as “IV flush” for multiple patients
 - A loaded, **used syringe** with fentanyl sitting next to the case-patient
 - **Used and Unopened bottle** of chlorhexidine mouth wash
- Suspected *B. cepacia* identified in:
 - The rim of a **water faucet** (mixed growth; Identified by Vitek as *Acinetobacter spp.* but AST pattern suspicious of *B. cepacia*)



SUMMARY



Summary

- **Recurrent** outbreaks of *B. cepacia* bloodstream infections have occurred in our hospital, most recently since October 2017
- Infections have primarily occurred in **SICU** patients and have been associated with **high morbidity**
- Although difficult to isolate from the **environment**, this is the first time we have been successful in isolating *B. cepacia* from multiple sources
- Review of lab and epidemiological data suggest there may *not be one* point-source of *B. cepacia*
- However, these findings suggest potential **IPC breaches** allowed this organism to get from environment → bloodstream

Summary (cont.)

- These findings highlight the importance of aggressive IPC interventions, particularly around risk of bloodborne infections
 - Safe **IV product** preparation and administration
 - Ensuring **single-use** products not used for multiple patients
 - Strengthening **central line** insertion and maintenance practices
- Vigilant continued **surveillance** for *B. cepacia* BSIs needed
- **IPC monitoring** and **evaluation** needed to facilitate best practices.

Limitations

- Retrospective chart review --may have missed some information
- Medical charts still being reviewed - epidemiological information may change
- *B. cepacia* cases identified by Vitek -- potential for case misclassification

Way forward

- Assess for **clonality** of available blood and environmental isolates.
- Strengthen **IPC practices** in SICU
 - Hand hygiene audits
 - Strengthen practices for administration of IV fluids/ medications, including “single-use” products
 - Prevention bundles for central line insertion and maintenance.
- Continue surveillance for *B. cepacia* infections

Thank you...