Emerging Superbugs: Active Surveillance Vs Passive-Surveillance in Detection of Carbapenem Resistant Organisms – A Single Centre Experience

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INTRODUCTION

- Carbapenem resistant organisms (CRO) have been emerging as significant healthcare-associated pathogens worldwide
- There are different mechanisms of resistance for CRO; the carbapenemases producing enterobacteriaceae are of greatest concern
- Detection of CRO isolates often occurs through clinical samples (passive surveillance) and active surveillance is seldom practiced
- Providing routine active surveillance for all admissions is an expensive process, and literature on its efficacy is limited
- There is lack of data on prevalence rate of CRO

OBJECTIVES

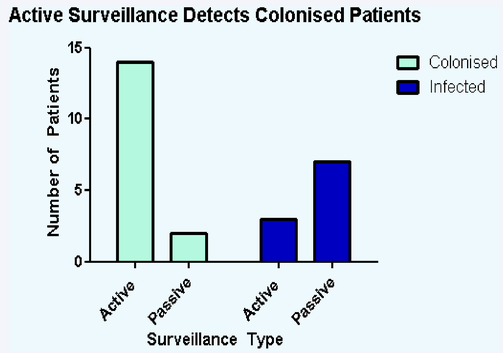
- To investigate the efficacy of active surveillance versus passive surveillance, for CRO detection and early intervention
- Determine CRO prevalence
- Identify risk factors

METHODS

- King's College Hospital (KCH) is a tertiary care 1200 bedded hospital with many super-specialities
- Active surveillance was started for CRO in May 2013
- Rectal swabs were taken on admission, weekly thereafter and on discharge for CRO, on three liver wards and a liver ICU (all comprising 120 beds)
- Chromogenic media was used to detect CRO & presumptive CRO were sent for typing to reference centre PHE, Colindale.
- Passive surveillance: CRO detected in clinical specimen for the remaining beds + point prevalence
- Presumptive CRO cases are flagged and placed into side rooms with protective wear and contact precautions.
- Upon discharge, the room receives terminal cleaning (mandatory hydrogen peroxide vapour treatment)
- Data was collected in RCA forms

RESULTS

- More then 8,000 patients were screened for CRO
- Prevalence rate was **4/1000 cases f**or CRO & **2/1000 cases** for Carbapenemase producing coliforms

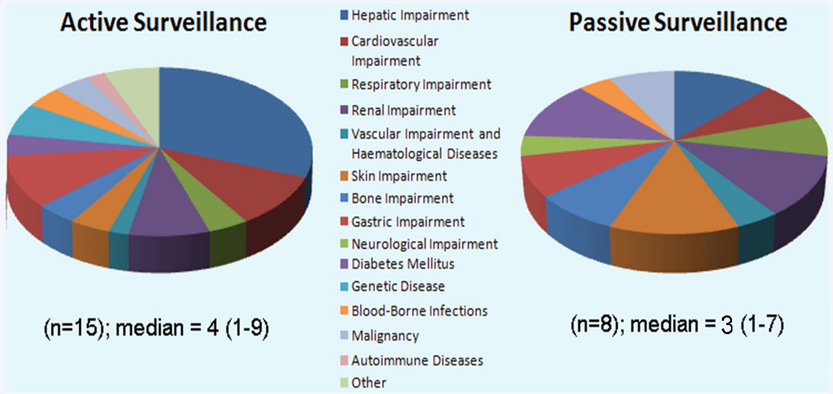


DEMOGRAPHIC DATA		Active Surveillance (n=17)	Passive Surveillance (n= 9)
Gender (F:M)		1:1.83	1:1.25
Age : median (range) years		54 (19-74)	70 (19-82)
Nationality	White British	9	5
	Black British	1	0
	Asian British	3	1
	Middle-Eastern	2	0
	Eastern European	1	0
	Irish	1	1
	Caribbean	0	1
	Other	0	1
Type of Residence	Home	13	9
	Hostel	1	0
	Overseas Visitor	3	0
Patient Status	Independent	13	8
	Dependent	4	1
Deceased*		8	1
Admission Type	Emergency	10	5
	Elective	7	4
CRE Positive on Admission		6/15	N/A
Infection Status	Colonised	14	1
	Infected	3	8
Days after admission CRO became positive median (range) days		10 (0-196)	15 (1-65)
*: most patients mortality was due to multi-organ failure, CRO contributed to mortality in one patient			

Table: CRO detected during active and passive surveillance

	Active surveillance (n=17)	Passive surveillance (n=9)
Carbapenemase producers	K pneumoniae (4 NDM, 3KPC, 1 OXA-48), 1 E coli (NDM)	1 Pseudomonas aeruginosa + 1 P. putida + 1 K oxytoca (VIM-4), 1 Acinetobacter (OXA-23), 1 K pneumoniae (KPC)
CTX-M + Porin mutation	6 K Pneumoniae	None
AMP-C + Porin mutation	2 Enterobacter aerogenes	1 K pneumoniae, 3 Enterobacter aerogenes

RISK FACTORS		Active Surveillance (n=17)	Passive Surveillance (n=9)
Total Length of hospital stay		37 (0.8- 204)	50 (0.6-124)
Travel History (within 12 months prior to admission)		5	2
Immunocompromised	Transplantation	6	0
	Chronic Illnesses	9	5
Hospital Transfer	National	7	2
	International	3	1
Number of Hospital Visits- Mean (range) days	In-patient	5 (1-128)	4 (1-24)
	Out-patient	21 (0-282)	30 (0-124)
Total Number of Departments Visited (Mean (range) days		6 (1-30)	11 (1-21)
Antibiotics (number of courses)	B-lactam	1 (0-27)	2 (0-6)
	Other	2 (0-27)	1 (0-4)
	Combined	3 (0-54)	3 (1-9)
Surgical Procedures (within 12 months prior to admission)	Upper GI	8	2
	Colorectal	3	2
	Lower Respiratory	2	2
	Other	1	2
Invasive Procedures	Endoscopic Procedures	10	5
	Line Insertions	12	8
	Drain Insertions	10	3
	Catheterisation	9	7
	Intubation	8	4



Discussion

- Active surveillance enabled **early detection** of CRO-colonised patients
- This enabled rapid implementation of infection control interventions, most likely perturbing CRO transmission.
- Most cases were:
  - Immunocompromised
  - Hospital admissions elsewhere within the past 12 months
  - Surgical intervention within the past 12 months
  - Multiple co-morbidities
  - Multiple admissions
  - Long length of hospital stay
- Point prevalence of five wards with passive surveillance did not detect any further cases.
- It is difficult to define how many cases were community or hospital acquired due to:
  - The quality of the rectal swabs
  - If few CRO in gut, exposure to risk factors, e.g. antimicrobials, may be required for detection after 48 hours
- Most of these patients were colonised in gut; only 3 patients in active surveillance group became positive in clinical specimens
- Empirical treatment were given to more than 80%

CONCLUSIONS

- Passive data collections and point prevalence detected only a fraction of the CRO positive cases
- Active surveillance was directly associated with monitoring and controlling outbreaks due to CRO in three occasions and proved cost effective
- Although prevalence rate due to CRO seems to be very low in high risk populations, it may prove cost effective to prevent silent outbreaks which otherwise increases resource utilisation
- In this cohort of patients high risk factors were recent hospitalisation overseas or those transferred from other hospitals and with multiple comorbidities
- CRO typically colonises the gut; absence of screening makes detection difficult and silent dissemination may occur in healthcare settings