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Short report

Carbapenemase-producing Enterobacteriaceae in Australian hospitals: outcome of point-prevalence screening in high-risk wards

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SUMMARY

Carbapenemase-producing Enterobacteriaceae (CPE) infections are increasingly reported in Australian hospitals, but prevalence is unknown. In 2016, Victorian hospitals conducted CPE point-prevalence surveys in high-risk wards (intensive care, haematology, transplant). Forty-three hospitals performed 134 surveys, with 1839/2342 (79%) high-risk patients screened. Twenty-four surveys were also performed in other wards. Inability to obtain patient consent was the leading reason for non-participation. In high-risk wards, no CPE cases were detected; three cases were identified in other wards. Since there is low prevalence in high-risk wards, continuous screening is not recommended. Targeted screening may be enhanced by review of patient consent processes.

Introduction

Carbapenemase-producing Enterobacteriaceae (CPE) are being identified more frequently in healthcare settings. For example, endemic CPE has been reported in three countries contributing surveillance data to the European Centre for Disease Prevention and Control [1,2]. With burden of illness contributing to risks of local transmission, screening to identify cases is necessary to adequately inform infection prevention activities [3].

In Australia, outbreaks of CPE have been reported in hospitals in recent years, but baseline prevalence is largely

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unknown [4]. In response to epidemiologically linked cases in Victoria, the Victorian Department of Health and Human Services released the inaugural Victorian Guideline on CPE for health services in December 2015 [5]. This guideline allows identification and care of patients with CPE, surveillance and screening those at risk to prevent transmission/outbreaks, estimation of the overall burden of disease, and better understanding of the epidemiology of CPE in hospitals. Patients hospitalized overseas in the last 12 months are required to be screened for CPE on admission and placed in a single room with additional contact precautions until cleared.

Given that the prevalence in Victorian hospitals was not well established at the time of guideline formulation, recommendations included the need for high-risk wards in all Victorian public and private hospitals to undergo a point-prevalence survey (PPS) every six months, screening all patients for CPE colonization. The objective of this study was to evaluate findings from PPSs performed in 2016. Specifically, we sought to describe CPE prevalence in high-risk populations, any barriers to screening practices, and the range of tests employed.

Methods

Point-prevalence survey

All hospitals nominated a single date and time during each six-month period for the purpose of identifying a list of all inpatients constituting the cohort for screening in each ward location. High-risk wards were defined as intensive care unit/critical care unit (adult, paediatric, and neonatal), haematology wards, and transplant wards. Transplant wards included solid organ, bone marrow and stem cell transplant wards, but excluded tissue transplant wards (e.g. corneal, cardiac valve, blood vessels, bone cartilage, ligaments, and nerves). Some hospitals opted to perform screening in additional wards where clinicians considered the patient population to be at risk of CPE (e.g. presence of indwelling medical device, prolonged hospital stay, recent broad-spectrum antibiotic exposure) [6,7]. Uptake of screening was defined as the proportion of eligible patients screened in each ward.

Specimen collection

Specimens accepted for the purposes of CPE screening included: a rectal swab with evidence of faeces, a faecal sample, or a perianal swab plus an inguinal swab if neither a rectal swab nor faecal sample were able to be collected (e.g. if patient had febrile neutropenia). All phenotypically resistant Enterobacteriaceae isolates were referred to a single reference laboratory for confirmation and genomic analysis.

Analysis

Standardized data were collected from participating hospitals, including the aggregate number of eligible patients in each high-risk ward, the number screened, the specimen collected, the number unable to be screened, and the reason for not screening. Positive cases were reported and managed in accordance with the Victorian Guideline on CPE. Hospital-level PPS data were reported to the Victorian Healthcare Associated Infection Surveillance Coordinating Centre (VICNISS) via an online form.

Results

Between January 1st, 2016 and December 31st, 2016, 43 hospitals performed a total of 134 CPE PPSs in intensive care unit (ICU), transplant, and haematology wards. Overall, there were 2342 eligible patients, of which 1839 (79%) were screened for CPE and 503 (21%) were not screened (Table I).

In addition to defined high-risk wards, six hospitals performed 24 CPE PPS in other areas, including surgical (seven), renal/dialysis (six), medical (six), geriatric evaluation and management (three), and rehabilitation (two). This cohort included 632 eligible patients, of whom 556 (88%) were screened.

Rectal swabs were the most frequently collected specimen type. Practices were notably different in neonatal ICU, where faecal specimens were most frequently collected for screening purposes (Table I). Screening practices also varied between ward types. High uptake of screening was reported in ICUs, spanning 80% (paediatric ICU) to 95% (neonatal ICU). Uptake was also high for haematology wards (79%). Screening in transplant wards was performed variably, with the lowest uptake reported in heart/lung and liver transplant patients (54% and 59%, respectively), and highest uptake in renal transplant wards (80%). Other wards were screened with an uptake of 88%.

When patients were not screened the reasons varied between ward types. Inability to obtain patient consent prevented screening in 73% of those not screened in adult ICU but it did not impact screening of neonatal ICU and liver transplant patients. Transplant wards, which had the lowest overall uptake, had high numbers of patients who were discharged/transferred or were not screened for other reasons.

Of the patients screened in high-risk wards, no cases of CPE were detected. Of the wards screened outside of the recommended high-risk wards, three CPE cases were identified, which corresponded to a prevalence of 1.2% (2/167) and 0.7% (1/148) in renal and surgical wards, respectively. Two of the three cases (one from renal ward and one from surgical ward) were previously known cases and all cases were located at different hospitals.

Discussion

The findings of a CPE screening programme in an Australian jurisdiction are reported here, in parallel with implementation of screening and management guidelines. Notably, no cases of CPE colonization occurred in defined high-risk populations. Three cases were identified in other wards, suggesting that the scope of screening practices and target patient populations may be better defined by local epidemiology, rather than a uniform strategy for all hospitals.

Whereas the collection of screening specimens was recommended in our jurisdiction, this was not mandated. We were therefore able to evaluate the range of specimen collection methods employed. We observed rectal swabs to be most frequently used for screening of patients, excluding those in neonatal ICUs. In neonatal ICUs, faecal specimen collection was more frequently performed for screening purposes.

Table I
CPE point-prevalence screening uptake, by ward type (2016)

	Intensive care unit				Transplant				Haematology	Total (high risk)	Additional wards		
	Adult	Paediatric	Neonatal	All	Renal	Heart/lung	Liver	All			Renal	Surgical	Other[a]
Contributing hospitals	40	1	4	43	5	2	2	6	17	43	4	1	4
Patients eligible	649	44	244	937	212	230	123	565	840	2342	199	162	271
Patients screened	542 (84%)	35 (80%)	232 (95%)	809 (86%)	169 (80%)	124 (54%)	73 (59%)	366 (65%)	664 (79%)	1839 (79%)	167 (84%)	148 (91%)	241 (89%)
Faecal specimen	32	19	156	207	2	33	30	65	130	402	70	0	0
Rectal swab	456	16	47	519	166	90	43	299	426	1244	97	148	241
Perianal + inguinal swab	54	0	29	83	1	1	0	2	108	193	0	0	0
Patients not screened	107 (16%)	9 (20%)	12 (5%)	128 (14%)	43 (20%)	106 (46%)	50 (41%)	199 (35%)	176 (21%)	503 (21%)	32 (16%)	14 (9%)	30 (11%)
Did not consent	78	1	0	79	25	47	0	72	93	244	30	6	13
Discharge/transfer	6	5	3	14	9	36	16	61	27	102	1	7	11
Other	23	3	9	35	9	23	34	66	56	157	1	1	6
Patients positive for CPE	0	0	0	0	0	0	0	0	0	0	2 (1.2%)	1 (0.7%)	0

CPE, carbapenemase-producing Enterobacteriaceae.
[a] Medical (three hospitals), geriatric evaluation and management (two hospitals), and rehabilitation (two hospitals).

Whereas the reasons for this are not clear, it is possible that this approach is used due to the convenient non-invasive sample collection available from the diaper. Comparative study of CPE detection using rectal swabs and faecal specimens has not been performed to define the relative yield of screening programmes using various sampling techniques.

Although not mandated, we observed uptake of screening practices to be high (79%), indicating acceptance and prioritization of the strategy within hospitals in our region. Where screening was not performed, this was most frequently a result of inability to obtain patient consent. Given the frequency of non-consent (21%), uptake in future screening surveys may be improved by refinement or amendment to the existing consent processes. Indeed, others have recommended the need for patient education, but not consent, when screening patients for multidrug-resistant organisms in healthcare [8]. To date, this has not been evaluated or proposed in our region.

We acknowledge the potential for ascertainment bias in our surveillance findings. Some eligible patients were not screened and the high use of rectal swabs (in preference to faecal specimens) may have resulted in missed detection of some colonized patients.

Having performed screening on two occasions in relevant wards in Victoria, findings support the revision of screening recommendations. As such, the Victorian guideline was amended in April 2017 to no longer stipulate routine PPS [9]. Instead, hospitals with local transmission of CPE are required to perform weekly surveys in the identified clinical ward until no additional confirmed cases have been identified for a continuous four-week period.

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Conflict of interest statement
None declared.

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