

Antimicrobial stewardship and universal screening are essential components of a stepwise approach to contain the spread of carbapenemase producing *Klebsiella pneumoniae* (CPKP)

¹Meschiari M, ¹Orlando G, ¹Zona S, ²C. Venturelli C, ¹Bedini A, ¹Franceschini E, ¹Puzzolante C, ¹Lazzaretti C, ¹Codeluppi M, ²Rumpianesi F, ³Frank U, ⁴Tacconelli E, ¹Mussini C.
1.Clinic of Infectious Diseases, Modena, Italy, 2.Microbiology laboratory, Modena, Italy, 3.Department of Infectious Diseases, Heidelberg, Germany 4.Medicinische Klinik, Universitätsklinikum Tübingen

Background

Evidence to contain the spread of carbapenems resistant *Klebsiella pneumoniae* (CRKP) is poor and bundles of infection control intervention are not defined. Our aim was to identify the best strategy to control CRKP spreading in Azienda Ospedaliera Policlinico Modena, an endemic tertiary care Hospital.

Methods

Quasi-experimental, before and after, interrupted time series analysis from 2012 to 2014.

The bundles applied subsequently (Table 1) were:

- **Bundle 1:** Room isolation of positive clinical samples in all hospital (2009-2011);
- **Bundle 2:** Search and destroy strategy in patients at highest risk for CRKP acquisition according to regional indications, and audit of hand hygiene compliance (2012-2013);
- **Bundle 3:** Universal screening and antibiotic stewardship (ATBS) focused on restriction of carbapenem usage (2014).

TABLE 1: timelines of bundles application

	Before 2009	January 2009-September 2012	October 2012-March 2013	April 2013-December 2014
Bundle 1	0	X	X	X
Bundle 2	0	0	X	X
Bundle 3	0	0	0	X

Results: Microbiological Isolates

1033 CRKP positive cultures from different specimens: rectal swab (63.3%), urine (21,8%), respiratory tract (5,7%), BSI (2,9%), others (6,2%). All isolates were resistant to carbapenems, 16,9% also to colistin, 25% also to aminoglycosides.

Results: Clinical Outcomes

During the whole study period overall CRKP incidence was 0.62/1000 bed-days (95% CI 0.55–0.68), and CRKP-BSI was 0.04/1000 bed-days (0.02–0.05). After the introduction of the third bundle CRKP IR showed a decrease of 39.7% for colonisation and of 83.3% for BSI ($p < 0,001$). Figure 1 and 2. In univariable Poisson regression analyses factors associated with CRKP BSI were: interventions (bundle 2 vs. bundle 1 IRR=0.70, 0.28–1.70, $p=0.429$; bundle 3 vs. bundle 1 IRR=0.18, 0.04–0.79, $p=0.023$) and previous CRKP colonization (IRR=66.77, 28.54– 156.20, $p < 0.001$).

Fig. 1: Trends in CRKP colonisations/infections

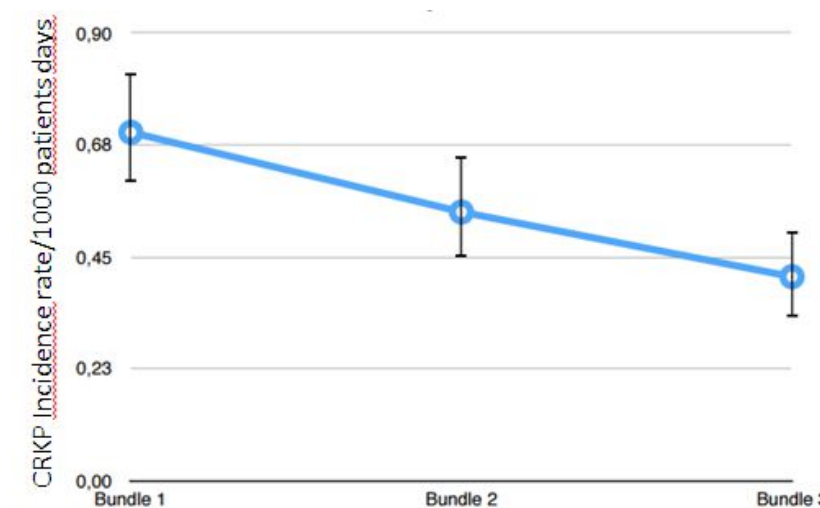


Fig. 2: Trends in CRKP BSI incidence

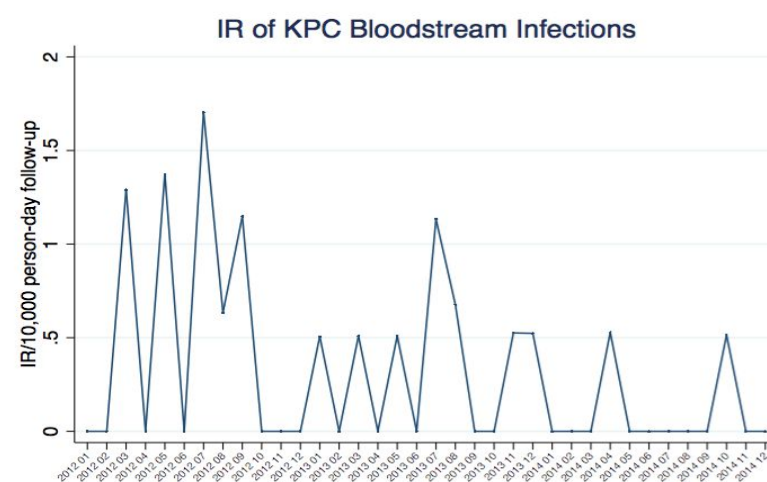


Fig. 3: MDROs BSI trends in the 3 bundles

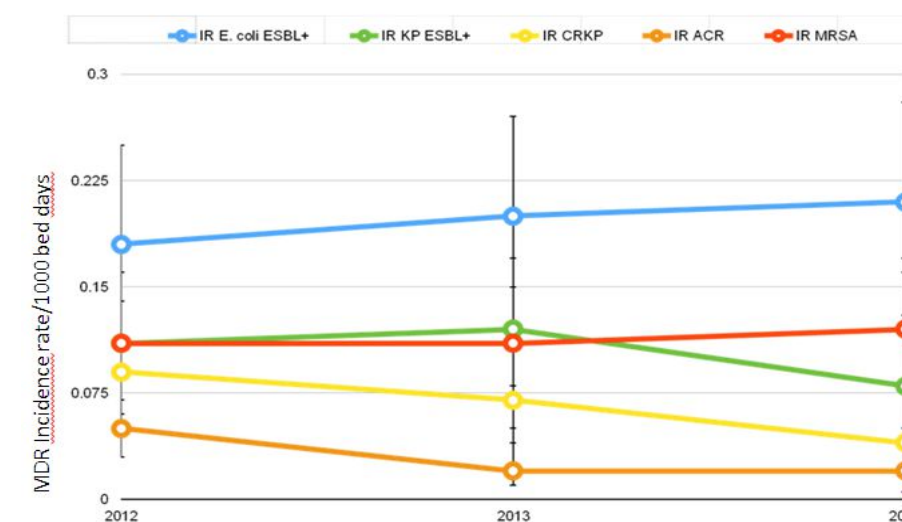


TABLE 2: multivariable analysis of factors significantly associated with mortality

	HR	95% CI	p
Male vs Women	1.31	1.21–1.42	<.0001
Age per 1 yr	1.04	1.041-1.05	<.0001
bundle 3 vs bundle 1	0.45	0.40–0.51	<.0001
bundle 2 vs bundle 1	0.67	0.61–0.74	<.0001
Previous CRKP colonisation	3.80	3.18-4.54	<.0001

Fig. 5: rectal swabs submitted during the 3 bundles

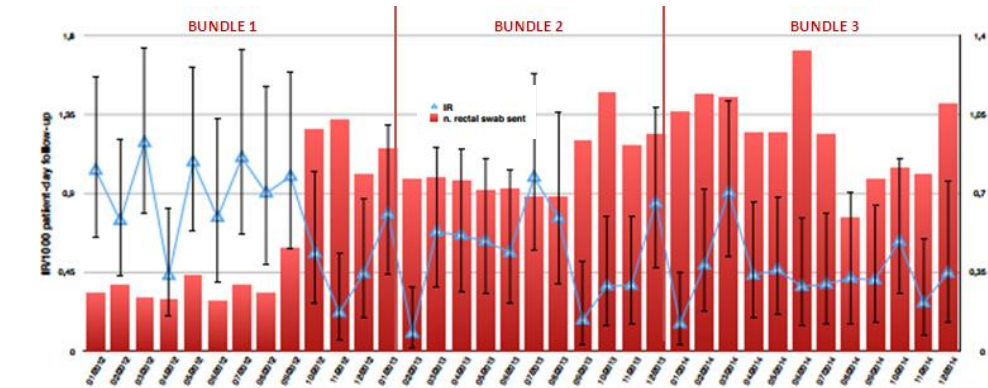


Fig. 4: AHR consumption and CRKP IR

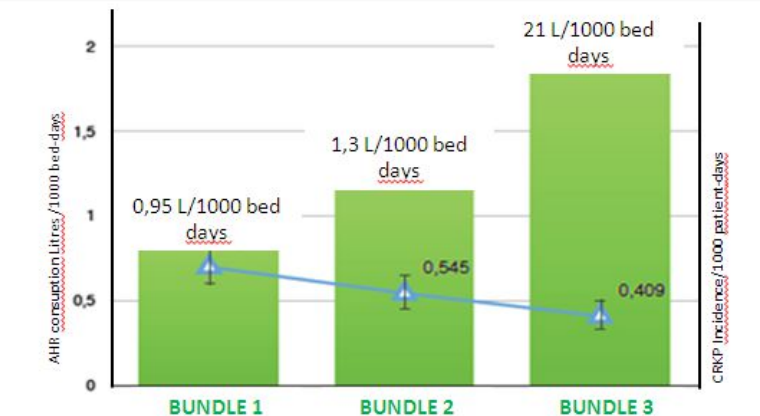
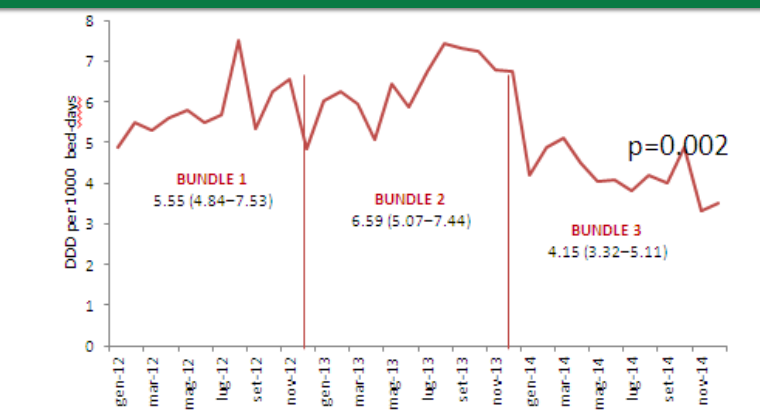


Fig. 6: Carbapenem DDD/100 bed-days and CRKP IR



Conclusions

- This study demonstrated that a **multi-faced approach** could lead to a statistically significant reduction in CRKP colonisations and BSI in high endemic setting.
- The combination of a **persuasive ABS approach to meropenem use restriction** (meropenem prescription confirmation by ID consultant within 48 hours) played a pivotal role, together with universal screening for carbapenem resistant bacteria
- Our study is the first one trying to describe the impact of different infection control interventions including targeted ASP on the incidence of CRKP