

WHO Guidelines for the prevention and control of carbapenem-resistant Enterobacteriaceae, *Acinetobacter baumannii* and *Pseudomonas aeruginosa* in health care facilities
Prof. M. Lindsay Grayson, University of Melbourne, Australia
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**WHO Guidelines
for the prevention and control of
carbapenem-resistant Enterobacteriaceae,
Acinetobacter baumannii and
Pseudomonas aeruginosa
in health care facilities**

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Sponsored by WHO Infection
Prevention and Control Global Unit



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Guidelines on Core Components of Infection Prevention and Control Programmes at the National and Acute Health Care Facility Level

2016

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- <https://www.youtube.com/watch?v=LZapz2L6J1Q&feature=youtu.be>

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Rationale for CRE-CRAB-CRPsA Recommendations

- Concern about the burden of illness associated with CRE-CRAB-CRPsA infection/colonisation = urgent priority

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Rationale for CRE-CRAB-CRPsA Recommendations

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Reasons

- CRE-CRAB-CRPsA infection is associated with high morbidity and mortality
- CRE-CRAB-CRPsA transmission associated with high potential to cause outbreaks
- Key CR mechanism - a mobile resistance gene - readily transmitted between various intestinal bacterial species

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Rationale for CRE-CRAB-CRPsA Recommendations

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- CRE-CRAB-CRPsA transmission associated with high potential to cause outbreaks
- Key CR mechanism - a mobile resistance gene - readily transmitted between various intestinal bacterial species
- Long-term consequences of CRE-CRAB-CRPsA acquisition can be severe
 - Duration of colonisation and subsequent risk for infection can be long
 - Can have substantial psychological implications for colonised patients
- Current lack of effective treatments for infected and/or colonised patients

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Rationale for CRE-CRAB-CRPsA Recommendations

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- Current lack of effective treatments for infected and/or colonised patients
- CRE-CRAB-CRPsA are highlighted as the top critical priority pathogens
 - WHO publication *Prioritization of pathogens to guide discovery, research and development of new antibiotics for drug-resistant bacterial infections*

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Rationale for CRE-CRAB-CRPsA Recommendations

8

Reasons

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- Current lack of effective treatments for infected and/or colonised patients
- CRE-CRAB-CRPsA are highlighted as the top critical priority pathogens
 - WHO publication *Prioritization of pathogens to guide discovery, research and development of new antibiotics for drug-resistant bacterial infections*
- Cost impact of colonisation and infection with CRE-CRAB-CRPsA on healthcare systems is high
 - Potentially threatening the stability of health care systems in both the short and long term
 - IPC is critical to control these costs and resource implications

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Rationale for CRE-CRAB-CRP_sA Recommendations 9

Reasons

- CRE-CRAB-CRP_sA infection is associated with high morbidity and mortality
- CRE-CRAB-CRP_sA outbreaks are increasing in various settings
- Key reasons for the increase include:
 - Decreased antibiotic use in some settings
 - Continued use of broad-spectrum antibiotics
- Current antibiotic resistance trends are concerning
- CRE-CRAB-CRP_sA infections are a global public health threat
 - Widespread in many countries
 - Difficult to treat
- Cost of treatment is high
 - Potentially threatening the stability of health care systems in both the short and long term
 - IPC is critical to control these costs and resource implications

Note:

- Prevention and control of CRE-CRAB-CRP_sA should be seen in the context of the broader priority to implement effective IPC for the prevention of all HAI and the strengthening of health care service delivery
- Importance of good antimicrobial stewardship - not included in these GLs, but critical

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Key staff 10

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Experts who served on the GDG

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CRE-CRAB-CRPsA systematic review report- 31st March 2017

WHO Guidelines on Best Practices and Procedures to Prevent and Control the Spread of Carbapenem-resistant Enterobacteriaceae (CRE), *Acinetobacter baumannii* (CRAB) and *Pseudomonas aeruginosa* (CRPsA) in health care

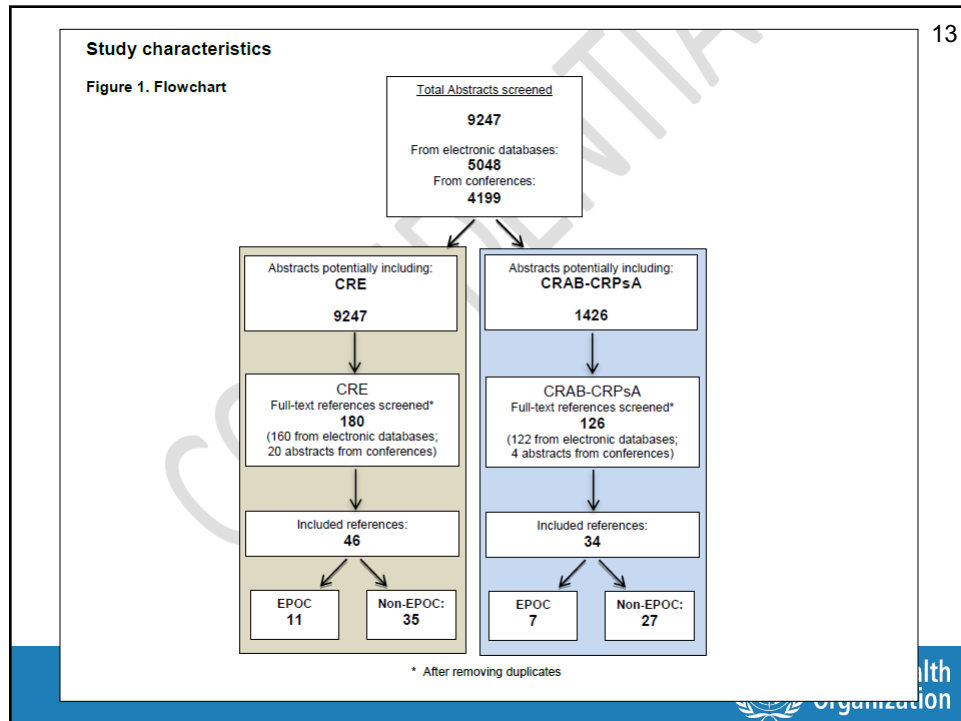
**Background evidence:
Systematic Review on Best Practices and Procedures to Prevent and Control the spread of CRE, CRAB and CRPsA in health care**

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Included studies according to WHO region

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WHO Region	CRE		CRAB		CRPsA	
	EPOC	Non-EPOC	EPOC	Non-EPOC	EPOC	Non-EPOC
Africa	-	-	-	-	-	-
America	4	14	3	5	1	3
Eastern Mediterranean	4	3	-	-	-	-
Europe	2	17	-	10	1	5
South-East Asia	-	-	-	-	-	1
Western Pacific	1	1	2	6	1	-
Total	11	35	5	21	3	9


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Included studies according to study designs


Study design	CRE		CRAB		CRPsA	
	EPOC	Non-EPOC	EPOC	Non-EPOC	EPOC	Non-EPOC
Randomized controlled trials	-	-	-	-	-	-
Non-randomized controlled trials	-	-	-	-	-	-
Controlled before-after studies	-	-	-	-	-	-
Interrupted time series	11	1	5	2	3	1
Before-after case counts	-	14	-	15	-	8
Longitudinal studies	-	2	-	-	-	-
Mathematical modelling studies	-	3	-	-	-	-
Non-controlled before-after studies	-	15	-	4	-	-
Total	11	35	5	21	3	9



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Included studies according to study scope/setting

Study scope/setting	CRE		CRAB		CRPsA	
	EPOC	Non-EPOC	EPOC	Non-EPOC	EPOC	Non-EPOC
National	1	-	-	-	-	-
Regional/State	1	1	-	1	-	1
Hospital	6	12	2	8	1	3
ICU	2	8	3	9	1	3
Neonatal ICU	-	2	-	2	-	-
Other Units: Haematology	-	8	-	-	1	1
Other Units: Burns	-	-	-	-	-	1
LCTFs	1	4	-	1	-	-
Total	11	35	5	21	3	9



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Included studies according to study outcome

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Study outcome	CRE		CRAB		CRPsA	
	EPOC	Non-EPOC	EPOC	Non-EPOC	EPOC	Non-EPOC
Incidence of infection	8	12	2	5	2	3
Prevalence of infection		5		1		
Incidence of bloodstream infection	2	4	-	1	-	-
Incidence of colonization		9	1	4	1	3
Prevalence of colonization	1	13	-	-	-	-
Incidence of "cases" (colonization or infection)	1	13	2	12	-	4
Total	11	35	5	21	3	9

*Note: A number of studies reported multiple outcomes and are therefore listed more than once



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Findings according to impact of intervention on CRE-CRAB-CRPsA outcomes in EPOC studies

The results of the EPOC studies for CRE, CRAB and CRPsA are each reported separately according to outcome and (1) change in slope (i.e. trend) using an autoregressive integrated moving average model (ARIMA) and (2) change in level (i.e. immediate change after intervention implementation) using segmented regression analysis. These are the EPOC-recommended analyses for interrupted time series studies. In order to present the EPOC recommended analysis, we contacted authors of all potential EPOC interrupted time series studies for raw data and re-analysed 12 of the 17 included EPOC studies. These results can be seen in Table 6. These and the results reported by authors can be seen in detail in Table 9.

Table 6. Results by outcome of EPOC-recommend analysis for *change in slope (i.e. trend) and level (i.e. immediate change)* from pre-intervention to post-intervention periods

Study	≥10 points*	Intervention package	Slope change ** ∞ (95% CI)	Level change *** ∞ (95% CI)
Incidence of CRE infection per 10 000 patient days				
Ben-David et al.	Yes	Contact precautions; Daily prevalence reporting to management; Infected patient database to identify readmissions; Enhanced active surveillance using rectal culture samples from ICU and step-down unit patients on admission/weekly and contact screening	-0.59 (-0.91, -0.27)	-2.03 (-3.52, -0.53)
Borer et al.	Yes	Emergency department flagging system to identify and screen high-risk patients; Strict contact precautions; Intensive active surveillance of high-risk patients on admission/weekly; Building of cohort ward for positive cases with dedicated staff/equipment; Environmental and staff hands cultures; Carbapenem prescribing restriction policy; Reporting to management	-2.41 (-4.17, -0.65)	-6.33 (-8.50, -4.16)
Campbell et al.	No	Expanded CRE surveillance: High-risk populations screened on admission/weekly	1.58 (-2.25, 5.41)	10.02 (6.06, 13.97)
Ciobotaro et al.	Yes	Cohorting and strict contact precautions; Enhanced environmental cleaning; Active surveillance of index case roommates (rectal swabs) and ICU patients; Audit and feedback; Education and training (patients and caregivers); CR-Kp cohort rotated to prevent overload; Electronic database of positive patients and flagging/instructions in electronic medical record; Immediate laboratory notification of cases	-0.91 (-0.97, -0.85) †	Not calculated
Gagliotti et al.	Yes	Active surveillance of asymptomatic carriers on admission and contacts; Contact precautions; Cohorting or single rooms; Communication of CRE on hospital transfer or discharge; Monthly reporting of prevalent cases to the	-0.17 (-0.38, 0.04)	0.17 (-0.17, 0.52)



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Findings of the EPOC studies

Table 9. Summary characteristics of EPOC-studies

CRE - EPOC

Study: Author, journal, year	WHO region/Country	Study design and setting	Main interventions	Timing	Patient outcomes	Reported Pre-intervention results	Reported Post-Intervention results	Reanalyzed results using EPOC suggested analysis	Comments
Ben-David, ICHE 2010, ⁴²	Eastern Mediterranean Israel	Interrupted time series study CR-Kp outbreak in a 1,500-bed tertiary care teaching hospital in hyper-endemic country	Before intervention: Contact precautions were implemented for patients with clinical isolates of CR-Kp. During this period, detection was based on culture of clinical samples only. During intervention: National infection control programme including: 1) Contact precautions 2) Daily prevalence reporting to the hospital management and to the national coordinator 3) Database where infected pts had their names entered so that they could be identified at hospital readmission + Hospital-specific protocol including: 1) Enhanced active surveillance* (Rectal culture samples from patients hospitalized in ICUs and in step-down units at admission to the unit and once weekly until discharge, contact screening in all other wards) * In 2006, there was a hospital outbreak of CR-Kp. Contact precautions were implemented, detection at that time was	Pre-intervention period: January 2006- May 2007 (Retrospective data) Post-intervention period: June 2007- December 2008	Incidence of CR-Kp infection	6.93 cases/ per 10,000 patient-days (last quarter before intervention)	1.8 cases/ per 10,000 patient-days (Last quarter of 2008) (p< 0.001) Change in slope: 0.12 to -0.07 from pre- to post-intervention (p<0.001)	Change in slope: -0.59 (-0.91, -0.27) Change in level: -2.03 (-3.52, -0.53);	Clear description of ITS analysis



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Table 10. Risk of bias assessment of EPOC studies

CRE (n=11)

Study	Intervention independent of other changes	Shape of intervention effect pre-specified	Intervention unlikely to affect data collection	Knowledge of allocated interventions prevented	Incomplete outcome data addressed	No selective outcome reporting	No other risk of bias	Risk of bias
Ben-David, ICHE 2010	++	+	++	++	++	+	++	High
Borer, ICHE 2011	++	+	++	++	++	+	++	High
Campbell IdWeek 2016	++	+	++	++	++	++	++	High
Ciobotaro, AJIC, 2011	++	+	++	++	++	+	++	High
De Freitas, ICHE 2016	++	+	++	++	++	+	++	High
Enfield, ICHE 2014	++	+	++	++	++	++	++	High
Gagliotti, Euro Surveill, 2014	++	+	++	++	++	+	++	High
Hayden, CID 2015	++	+	++	++	++	+	++	High
Kim <i>et al.</i> ,	++	+	++	++	++	+	++	High
Schwaber, CID 2011	++	+	++	++	++	++	++	High
Viale, CMI 2015	++	+	++	++	++	+	++	High

Legend: +, low risk of bias, ++, high risk of bias.

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Table 11. GRADE evidence profile for the EPOC studies

CRE (n=11)

# of Studies (Design)	Quality assessment †					# of data points before and after	Results Findings	Quality
	Limitations	Inconsistency	Indirectness	Imprecision	Publication bias			
Outcome: Incidence of CRE Infection								
Total: 8 Ben-David Borer Campbell Ciobotaro Gagliotti Hayden* Kim Schwaber (ITS)	Serious	Not Serious	Serious	Not Serious	Uncertain	847	<ul style="list-style-type: none"> Seven out of eight studies reported a significant negative change in slope from pre- to post-intervention Four studies reported a significant negative change in level (immediate change in outcome after intervention) out of seven which calculated this measure Four studies reported a significant negative change in the outcome according to the ARIMA coefficient out of seven which calculated this measure 	○ ○ ○ ○ Low
Outcome: Incidence of CRE blood stream infection								
Total: 2 Hayden* Viale (ITS)	Serious	Not Serious	Serious	Not Serious	Uncertain	227	<ul style="list-style-type: none"> Both studies reported a significant negative change in slope from pre- to post-intervention One study reported a significant negative change in level (immediate change in outcome after intervention) One study reported a significant negative change in the outcome according to the ARIMA coefficient 	○ ○ ○ ○ Low
Outcome: Prevalence of CRE colonization								
Total: 1 De Freitas (ITS)	Serious	Not Serious	Serious	Serious	Uncertain	68	<ul style="list-style-type: none"> This study only reported a significant negative change in level (immediate change in outcome after intervention) The other two measures were non-significant (i.e. slope and ARIMA coefficient) 	○ ○ ○ ○ Very low



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Recommendation 1: Implementation of multimodal IPC strategies

The panel recommends that multimodal IPC strategies should be implemented to prevent and control CRE-CRAB-CRPsA infection or colonisation; and that these should consist of at least the following:

- Hand hygiene
- Surveillance (particularly for CRE)
- Contact precautions: gowns, gloves, and patient isolation
- Patient cohorting or single room isolation
- Environmental cleaning

(Strong recommendation, very low to low quality of evidence)




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Recommendation 1:

Implementation of multimodal IPC strategies

Key Remarks

- Majority of studies from settings with a high prevalence of CRE-CRAB-CRPsA
 - But the IPC principles outlined were equally valid in all prevalence settings.
- Control of large outbreaks was recognized to be very costly
 - All studies were all undertaken in high- to middle-income countries
 - Concerns regarding cost implications of outbreaks and affordability in other settings.



Recommendation 1:

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Implementation of multimodal IPC strategies

Key Remarks

- Majority of studies from settings with a high prevalence of CRE-CRAB-CRPsA
 - But the IPC principles outlined were equally valid in all prevalence settings.
- Control of large outbreaks was recognized to be very costly
 - All studies were all undertaken in high- to middle-income countries
 - Concerns regarding cost implications of outbreaks and affordability in other settings.
- Although the evidence = acute care facilities, similar IPC principles apply in all healthcare settings
- Implementing this REC-1 may be complex - requiring a multidisciplinary approach
- Good quality microbiological laboratory support is critical.



Recommendation 1:

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Implementation of multimodal IPC strategies

Key Remarks

- Majority of studies from settings with a high prevalence of CRE-CRAB-CRPsA
 - But the IPC principles outlined were equally valid in all prevalence settings.
- Control of large outbreaks was recognized to be very costly
 - All studies were all undertaken in high- to middle-income countries
 - Concerns regarding cost implications of outbreaks and affordability in other settings.
- Although the evidence = acute care facilities, similar IPC principles apply in all healthcare settings
- Implementing this REC-1 may be complex - requiring a multidisciplinary approach
- Good quality microbiological laboratory support is critical.
- Education/training and monitoring, audit and feedback are critical to make any multimodal strategy successful
- Daily patient bathing with chlorhexidine – insufficient evidence to be recommended



Recommendation 2:

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Importance of good hand hygiene compliance for control of CRE-CRAB-CRPsA

The panel recommends that hand hygiene best practices according to the *WHO Guidelines on hand hygiene in health care* should be implemented.

(Strong recommendation, very low quality of evidence)



Recommendation 2:

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Importance of good hand hygiene compliance for control of CRE-CRAB-CRPsA

Key Remarks

- As noted in the WHO “*Guidelines on Core Components of Infection Prevention and Control Programmes at the National and Acute Health Care Facility Level*”, hand hygiene compliance and consumption of alcohol-based hand-rub (ABHR) is very dependent on appropriate product placement and availability
 - Adequate resources are therefore necessary to ensure these features are met.
- Important to monitor hand hygiene compliance
- Beneficial impact of good hand hygiene compliance dependent on effective implementation strategies with local adaptation



Recommendation 3:

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Surveillance of CRE-CRAB-CRPsA infection and surveillance cultures for asymptomatic CRE colonization

The panel recommends that:

1. Surveillance of CRE-CRAB-CRPsA infection should be performed
2. Surveillance cultures for asymptomatic CRE colonization should be performed, guided by local epidemiology (outbreaks vs endemic settings) and risk assessment.
 - Populations to be considered for such surveillance include:
 - Patients with previous CRE colonization
 - Patient contacts of CRE colonized/infected patients and
 - Patients with history of recent hospitalization in endemic CRE settings

(Strong recommendation, very low quality of evidence)



Recommendation 3:

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Surveillance of CRE-CRAB-CRPsA infection(s)

Key Remarks

- Surveillance (i.e. clinical monitoring and laboratory assessment of clinical samples) of CRE-CRAB-CRPsA infection is essential
- In some settings (e.g. LMICs) laboratory testing for carbapenem resistance among potential CRE-CRAB-CRPsA isolates may not be available or routine
 - Unanimous view - testing for carbapenem resistance in these pathogens should now be considered as routine in all microbiology laboratories



Recommendation 3:

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Surveillance of CRE-CRAB-CRPsA infection(s)

Key Remarks

- Surveillance (i.e. clinical monitoring and laboratory assessment of clinical samples) of CRE-CRAB-CRPsA infection is essential
- In some settings (e.g. LMICs) laboratory testing for carbapenem resistance among potential CRE-CRAB-CRPsA isolates may not be available or routine
 - Unanimous view - testing for carbapenem resistance in these pathogens should now be considered as routine in all microbiology laboratories
- Surveillance of CRE-CRAB-CRPsA infection needed to define the local epidemiology of these pathogens
 - Identify patterns
 - Better allocate resources to areas of need
 - Reviewing demographics, exposures, and locations of patients can help a facility understand where, when, and which patients are getting sick to better prevent and control infections



Recommendation 3:

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Surveillance cultures for asymptomatic CRE colonization

Key Remarks

- Information regarding a patient's CRE colonization status does not (yet) constitute routine standard of care provided to patients by health systems
 - But information critical in an outbreak situation or high risk situations for CRE
 - Surveillance CRE culture results for colonization may not have immediate benefit to the screened patient, but instead contribute to the overall IPC response to CRE
 - Information regarding CRE colonization status could potentially have important beneficial effects on the antibiotic treatment plan for screened patients with subsequent CRE infection.



Recommendation 3:

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Surveillance cultures for asymptomatic CRE colonization

Key Remarks

- Information regarding a patient's CRE colonization status does not (yet) constitute routine standard of care provided to patients by health systems
 - But information critical in an outbreak situation or high risk situations for CRE
 - Surveillance CRE culture results for colonization may not have immediate benefit to the screened patient, but instead contribute to the overall IPC response to CRE
 - Information regarding CRE colonization status could potentially have important beneficial effects on the antibiotic treatment plan for screened patients with subsequent CRE infection.
- This recommendation should always apply in an outbreak situation (and also ideally in endemic settings)
 - Extensive discussion re. resource limitations (esp. LMICs) = prioritization of resources
 - No one single best surveillance approach - decision should be guided by the local epidemiology, and likely clinical



Recommendation 3:

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Surveillance cultures for asymptomatic CRE colonization

Key Remarks

- Surveillance screening based on a patient risk assessment (i.e. higher risk of CRE acquisition, the potential risk posed to others in their environment). Categories to be considered:
 - Patients with a previously known history of CRE colonization or infection
 - Epidemiologically-linked contacts of newly identified patients with CRE colonization or infection (this could include patients in the same room, unit or ward)
 - Patients with a history of recent hospitalization in regions where the regional epidemiology of CRE suggests an increased risk of CRE acquisition (e.g. hospitalization in a facility with known or suspected CRE).
 - Patients who, based on the epidemiology of their admission unit, may be at increased risk of CRE acquisition and infection (e.g. immunosuppressed patients, and those admitted to ICUs, transplantation services, or haematology units etc.)



Recommendation 3:

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Surveillance cultures for asymptomatic CRE colonization

Key Remarks

- Surveillance cultures - feces best > rectal swab > perianal swab
 - Minimum one culture necessary; >1 better
- Take surveillance as soon as possible after hospital admission or risk exposure
 - Prompt processing
- Optimal frequency of testing uncertain – commonly, on-admission, then weekly



Recommendation 3:

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Surveillance cultures for asymptomatic CRE colonization

Additional Remarks

- Surveillance activities could involve potential harms or unintended consequences for the patient with ethical implications, including:
 - A sense of cultural offensiveness or stigma associated with obtaining a rectal swab or providing a fecal specimen
 - Potential discrimination of colonized or infected patients
 - HOWEVER – key mitigation measures are available and should be implemented



Recommendation 3:

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Surveillance cultures for asymptomatic CRE colonization

Additional Remarks

- Surveillance activities could involve potential harms or unintended consequences for the patient with ethical implications, including:
 - A sense of cultural offensiveness or stigma associated with obtaining a rectal swab or providing a fecal specimen
 - Potential discrimination of colonized or infected patients
 - HOWEVER – key mitigation measures are available and should be implemented
 - Ethical obligation to reduce the burden of CRE - larger public good
 - Ethical burdens associated with this:
 - personally identifiable information - risk of disclosure
 - discrimination
 - potential risks with rectal swabs
 - perhaps no direct benefit to patient
 - Safeguards to be provided to protect the patients:
 - ongoing monitoring for ethical burden (discrimination, clinical harms),
 - making all patients aware of surveillance protocol to generate awareness
 - identification of vulnerable patients

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Recommendation 3:

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Surveillance cultures for asymptomatic CRE colonization

Additional Remarks

- Surveillance activities could involve potential harms or unintended consequences for the patient with ethical implications, including:
 - A sense of cultural offensiveness or stigma associated with obtaining a rectal swab or providing a fecal specimen
 - Potential discrimination of colonized or infected patients
 - HOWEVER – key mitigation measures are available and should be implemented
- Insufficient evidence on surveillance cultures for CRAB and CRPsA colonization to extend the recommendation to these two microorganisms
 - Sometimes beneficial - depends on the clinical setting, epidemiological stage (for example, outbreak) and body sites
 - Optimal microbiological methods for CRAB-CRPsA surveillance cultures for colonization require further research

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Recommendation 4: Contact precautions

The panel recommends that:

Contact precautions should be implemented when providing care for patients colonised or infected with CRE-CRAB-CRPsA

(Strong recommendation, very low to low quality of evidence)




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Recommendation 4:

Contact precautions

Key Remarks

- “Contact precautions” = WHO definition of contact precautions – namely, the use of gowns, gloves, PPE, dedicated equipment, appropriate patient placement, limiting transport/movement of patients; use of disposable or dedicated patient-care equipment; and prioritizing cleaning and disinfection of patient rooms
- Contact precautions should be considered a standard of care for patients colonized or infected with CRE-CRAB-CRPsA in the vast majority of health systems
- HCW education regarding the principles of IPC and monitoring of contact precautions is crucial



<i>Recommendation 4:</i>	<h2 style="color: red;">Contact precautions</h2> <h3>Key Remarks</h3> <ul style="list-style-type: none"> • “Contact precautions” = WHO definition of contact precautions – namely, the use of gowns, gloves, PPE, dedicated equipment, appropriate patient placement, limiting transport/movement of patients; use of disposable or dedicated patient-care equipment; and prioritizing cleaning and disinfection of patient rooms • Contact precautions should be considered a standard of care for patients colonized or infected with CRE-CRAB-CRPsA in the vast majority of health systems • HCW education regarding the principles of IPC and monitoring of contact precautions is crucial • Pre-emptive isolation/cohorting and use of contact precautions may be necessary in some situations, until the results of surveillance cultures for CRE-CRAB-CRPsA are available <ul style="list-style-type: none"> – Patients with a history of recent hospitalization in regions where the local epidemiology of CRE suggests an increased risk of CRE acquisition • Clear communication regarding a patient’s colonization/infection status - important 	41
		

<i>Recommendation 4:</i>	<h2 style="color: red;">Contact precautions</h2> <h3>Key Remarks</h3> <ul style="list-style-type: none"> • “Contact precautions” = WHO definition of contact precautions – namely, the use of gowns, gloves, PPE, dedicated equipment, appropriate patient placement, limiting transport/movement of patients; use of disposable or dedicated patient-care equipment; and prioritizing cleaning and disinfection of patient rooms • Contact precautions should be considered a standard of care for patients colonized or infected with CRE-CRAB-CRPsA in the vast majority of health systems • HCW education regarding the principles of IPC and monitoring of contact precautions is crucial • Inform patients of need for PPE practices to facilitate acceptance • Ethical burdens associated with this: <ul style="list-style-type: none"> – Reduced contact with health care providers – Discrimination – Resource constraints in material resource leading to poor management of patients • Safeguards to be provided to protect the patients: <ul style="list-style-type: none"> – Active engagement of patients in the contact precaution decision – ? Patients under contact precautions receive priority services to mitigate potential harms 	42
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Recommendation 5: Patient Isolation

The panel recommends that:

Patients colonised or infected with CRE-CRAB-CRPsA should be physically separated from non-colonised/infected patients using:

- 1) single room isolation, or
- 2) cohorting with patients with the same resistant pathogen.


(Strong recommendation, very low to low quality of evidence)



Recommendation 5: 44

Patient Isolation Key Remarks 1

- Inconsistent use of the terms “isolation” and “cohorting.” Standard definition used:
 - *Isolation*: Patients should be placed in single-patient rooms (preferably with own toilet facilities) when available. When single-patient rooms are in short supply - cohort
 - *Cohorting*: Grouping together patients who are colonized or infected with the same organism to confine their care to one area and prevent contact with other patients
- Purpose of isolation – to separate colonized/infected patients from non-colonized/non-infected patients
- Strongest evidence for CRE colonization/infection
 - But also likely to be effective for CRAB and/or CRPsA
- Patient isolation = some potentially negative unintended consequences
 - But that these can be minimized so as to outweigh these concerns
- Patient isolation - should always apply in an outbreak situation



Recommendation 5:

45

Patient Isolation

Key Remarks 1

- Inconsistent use of the terms “isolation” and “cohorting.” Standard definition used:
 - *Isolation*: Patients should be placed in single-patient rooms (preferably with own toilet facilities) when available. When single-patient rooms are in short supply - cohort
 - *Cohorting*: Grouping together patients who are colonized or infected with the same organism to confine them to a specific area and prevent contact with other patients
- Purpose of isolation: To prevent transmission of colonized/infected patients from non-colonized/non-infected patients
- Strongest evidence: Cohorting/Isolation/Infection
 - Inform patients of need for isolation to facilitate acceptance
 - Ethical burdens associated with this:
 - Reduced contact with health care providers
 - Discrimination
 - Resource constraints in material resource leading to poor management of patients
 - Depression/ anxiety in the patient
 - Safeguards to be provided to protect the patients:
 - Active engagement of patients in the isolation decision; psychological support
 - ? Patients under contact precautions receive priority services to mitigate potential harms

Recommendation 5:

46

Patient Isolation

Key Remarks 2

- Single rooms may not be possible in endemic situations
 - Particularly in low-income settings where resources and facilities are limited
- Some evidence to support the use of dedicated health care workers to exclusively manage isolated/cohorted patients
 - Although there may be some feasibility issues


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Recommendation 6: Environmental Cleaning

The panel recommends that:

Compliance with environmental cleaning protocols of the immediate surrounding area (i.e. “patient zone”) of patients colonised or infected with CRE-CRAB-CRPsA should be ensured

(Strong recommendation, very low quality of evidence)




Recommendation 6:

48

Environmental Cleaning Key Remarks

- The “patient zone” = the patient and his/her immediate surroundings
 - Includes all inanimate surfaces that are touched by or in direct physical contact with the patient such as the bed rails, bedside table, bed linen, infusion tubing bedpans, urinals and other medical equipment.
 - Contamination is likely in toilets and items found nearby
- The optimal cleaning agent for environmental cleaning protocols for CRE-CRAB-CRPsA has not yet been defined
 - A number (n=3) studies used hypochlorite (gen. a concentration of 1000 ppm)



Recommendation 6:

Environmental Cleaning

49

Key Remarks

- The “patient zone” = the patient and his/her immediate surroundings
 - Includes all inanimate surfaces that are touched by or in direct physical contact with the patient such as the bed rails, bedside table, bed linen, infusion tubing bedpans, urinals and other medical equipment.
 - Contamination is likely in toilets and items found nearby
- The optimal cleaning agent for environmental cleaning protocols for CRE-CRAB-CRPsA has not yet been defined
 - A number (n=3) studies used hypochlorite (gen. a concentration of 1000 ppm)
- Educational programs for hospital cleaning staff – crucial
 - Multimodal strategies to implement environmental cleaning essential – including institutional policies, structured education, monitoring compliance with protocols
- Assessment of cleaning efficacy by performing environmental screening cultures - worthwhile in some settings
- In some outbreak situations, temporary ward closures necessary to allow for enhanced cleaning



Recommendation 7:

50

Surveillance cultures of the environment for CRE-CRAB-CRPsA colonization/contamination

The panel recommends that:

Surveillance cultures of the environment for CRE, CRAB, and CRPsA may be considered when epidemiologically indicated

(Conditional recommendation, very low quality of evidence)



Recommendation 7:

51

Surveillance cultures of the environment for CRE-CRAB-CRPsA colonization/contamination

Key Remarks

- Correlation of environmental surveillance culture results to the rates of patient colonization/infection with CRE-CRAB-CRPsA should be undertaken with caution and depend on an understanding of the local epidemiology and resources
- Based on expert opinion (and only limited available data), surveillance cultures of the general environment were considered most relevant to CRAB outbreaks
- Outbreaks of CRPsA colonization/infection - more commonly associated with environmental CRPsA contamination involving water and waste-water systems such as sinks and faucets



52

Recommendation 8: Monitoring, Audit and Feedback

The panel recommends:

Monitoring of the implementation of multimodal strategies and feedback of results to health care workers and decision-makers

(Strong recommendation, very low to low quality of evidence)



Monitoring, Audit and Feedback

Key Remarks

- Monitoring, audit and feedback of IPC interventions - fundamental component of any effective intervention - esp. for CRE-CRAB-CRPsA
- Appropriate training of HCWs who undertake monitoring – crucial
 - Is a key component of all IPC educational programs
- All components of the multimodal strategy intervention should be regularly monitored, including hand hygiene compliance
- Monitoring, audit and feedback of multimodal strategies are a key component of all IPC educational programmes
- IPC monitoring should encourage improvement and promote learning in a non-punitive institutional manner

Planned dissemination and implementation of the Guidelines

Conclusions

- New CRE-CRAB-CRPsA Guidelines now available
- IPC interventions – the key to controlling CRE-CRAB-CRPsA in healthcare settings
- Implementation will be a challenge, but is necessary



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WHO Guidelines for the prevention and control of carbapenem-resistant Enterobacteriaceae, *Acinetobacter baumannii* and *Pseudomonas aeruginosa* in health care facilities
Prof. M. Lindsay Grayson, University of Melbourne, Australia
Sponsored by the World Health Organization

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THANK YOU!

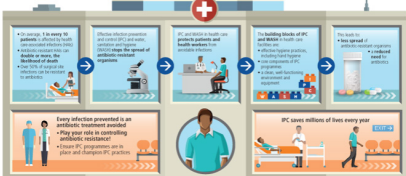
World Health Organization

Infection prevention and control

The role of infection prevention and control in preventing antibiotic resistance in health care

Health care-associated infections (HAI) are one of the most common adverse events in care delivery. A large proportion are caused by antibiotic-resistant organisms. There is a worldwide consensus that urgent action is needed to prevent and control the spread of antibiotic-resistant organisms and, in health care, effective infection prevention and control (IPC) is an obvious solution. Every infection prevented is an antibiotic treatment avoided and IPC action can save millions of lives every year. During World Antibiotic Awareness Week, and in fact every week, IPC should be a priority.

THE ROLE OF INFECTION PREVENTION AND CONTROL IN PREVENTING ANTIBIOTIC RESISTANCE IN HEALTH CARE



[Infographic in English](#)
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World Antibiotic Awareness Week

Help WHO highlight the role of IPC to combat AMR and participate in the World Antibiotic Awareness Week!

WAAW website: <http://www.who.int/campaigns/world-antibiotic-awareness-week/en/>

Learn more about WHO's IPC work at:
<http://www.who.int/infection-prevention/en/>

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