

????????????????

Active CRE screening in the Vietnamese hospitals: Should or should not?



**Mattias Larsson, Associate Professor, MD, PhD, Karolinska Institutet
Training and Research Academic Collaboration (TRAC) Sweden – Vietnam
Linköping University, Karolinska Institutet and Vietnam National Childrens Hospital**

Background

Observational Study



**High prevalence
caused by gram-negative carbapenem resistant
strains in Vietnamese pediatric ICUs**

- Children : 1363 cases in 5 Hospitals, average age 11 months
→ HAI 33.1%
- Most common *K. pneumoniae* - 55% Carbapenem resistant (KPC)



PLoS One. 2016; 11(1): e0147544.

PMCID: PMC4732823

Published online 2016 Jan 29. doi: [10.1371/journal.pone.0147544](https://doi.org/10.1371/journal.pone.0147544)

Burden of Hospital Acquired Infections and Antimicrobial Use in Vietnamese Adult Intensive Care Units

- Adults : 3287 patients in 14 Hospitals
→ HAI 29.5%
- Most common *Acinetobacter baumannii* – 89% Carbapenem
resistant

Methods of CRE Screening



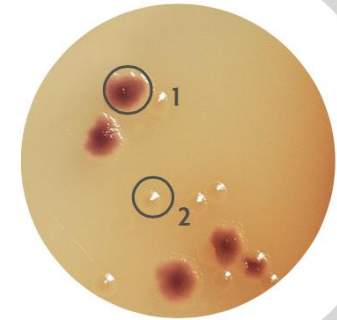
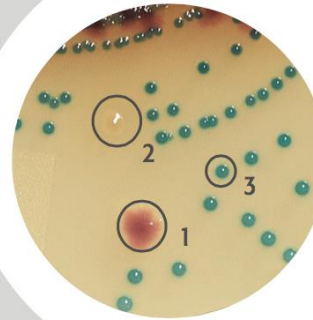
Rectum swab for fecal sample



Culture on Selective media
(Chrom ID agar)

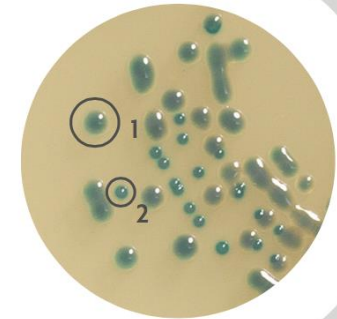
Identification of polymicrobial mixtures

- 1 - *E. coli* ATCC 25922
- 2 - *Proteus mirabilis* ATCC 12453
- 3 - *Enterococci faecalis* ATCC 29212



- 1 - *E. coli*
- 2 - *Proteus mirabilis*

- 1 - *Streptococcus agalactiae*
- 2 - *E. coli*



- 1 - *Klebsiella pneumoniae*
- 2 - *Enterococci*



Screening result and susceptibility testing

Printed Mar 26, 2017 08:26 ICT

Location: SS Patient ID: 170065473
 Lab ID: 274ps Physician:
 Organism Quantity: Isolate Number: 1
 Selected Organism : *Klebsiella pneumoniae* ssp *pneumoniae*

Source: p Collected: Mar 23, 2017

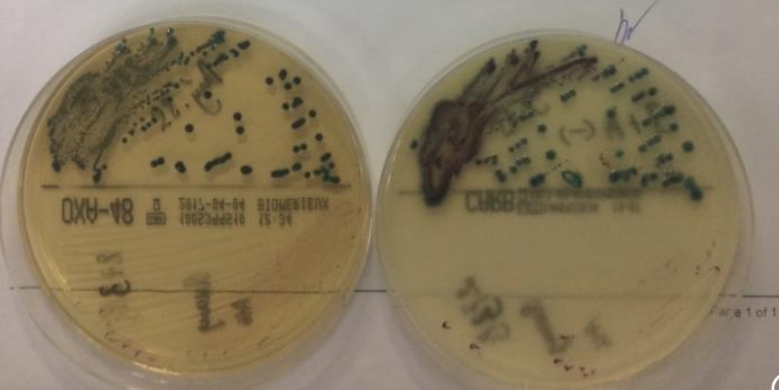
Comments:

Identification Information	Analysis Time: 4.00 hours	Status: Final
Selected Organism	99% Probability Bionumber: 6607734652164010	<i>Klebsiella pneumoniae</i> ssp <i>pneumoniae</i>
ID Analysis Messages		

Susceptibility Information						Analysis Time: 8.75 hours		Status: Final	
Antimicrobial	MIC	Interpretation	Antimicrobial	MIC	Interpretation				
Piperacillin	>= 128	R	Amikacin	>= 64	R				
Ticarcillin	>= 128	R	Gentamicin	>= 16	R				
Ceftazidime	>= 64	R	Tobramycin	>= 16	R				
Cefepime	>= 64	R	Ciprofloxacin	>= 4	R				
Piperacillin/Tazobactam	>= 128	R	Levofloxacin	>= 8	R				
Aztreonam	>= 64	R	Trimethoprim/Sulfamethoxazole	<= 20	S				
Imipenem	>= 16	R	Colistin	>= 16	R				
Meropenem	>= 16	R							

+= Deduced drug *= AES modified **= User modified

AES Findings	
Confidence:	Consistent

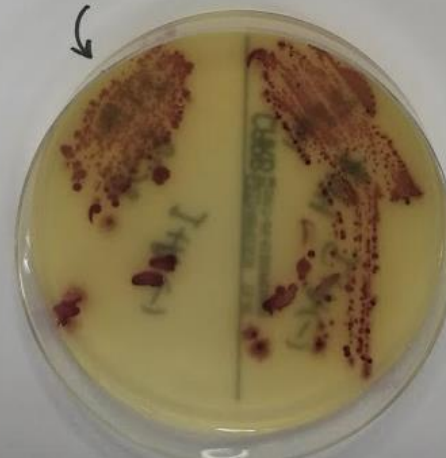


Identification Information	Analysis Time: 2.75 hours	Status: Final
Selected Organism	99% Probability Bionumber: 0405610450026611	<i>Escherichia coli</i>
ID Analysis Messages		

Susceptibility Information						Analysis Time: 7.75 hours		Status: Final	
Antimicrobial	MIC	Interpretation	Antimicrobial	MIC	Interpretation				
Piperacillin	>= 128	R	Amikacin	>= 64	R				
Ticarcillin	>= 128	R	Gentamicin	>= 16	R				
Ceftazidime	>= 64	R	Tobramycin	>= 16	R				
Cefepime	>= 64	R	Ciprofloxacin	>= 4	R				
Piperacillin/Tazobactam	>= 128	R	Levofloxacin	>= 8	R				
Aztreonam	>= 64	R	Trimethoprim/Sulfamethoxazole	>= 320	R				
Imipenem	>= 16	R	Colistin	8	R				
Meropenem	>= 16	R							

+= Deduced drug *= AES modified **= User modified

AES Findings	
Confidence:	Consistent



Clinical data collection

- Demographic data
 - Reason of admission
 - Invasive procedures (Intubation, CVC, PVC etc)
 - HAI diagnosis
 - Duration of treatment
 - Treatment outcome
-
- Electronic CRF
 - <https://docs.google.com/forms/d/1N9DsrSK8NgaE9MqtDs4Y42dqXsISNR97Ebb6ncH8160/edit>
-

Vietnam CRE Screening Summary Results



Karolinska
Institutet

- 11 Vietnamese hospitals
- 1887 patients CRE screened

916 (49%)
screening
positive!

Neonatal ICU's
654 patients → 57%+

Paediatric wards
966 patients → 40%+

Adult ICU:s
367 patients → 57%+

Provincial Hospital
167 patients → 37%+

Bacteria

- *Klebsiella pneumoniae* 670
- *Escherichia coli* 529
- *Acinetobacter Baumannii* 47.
- Average number of CRE per disc: 1,4

- Rapid acquisition of CRE
colonization → after 2 / 3 days the
colonization rate 60%.

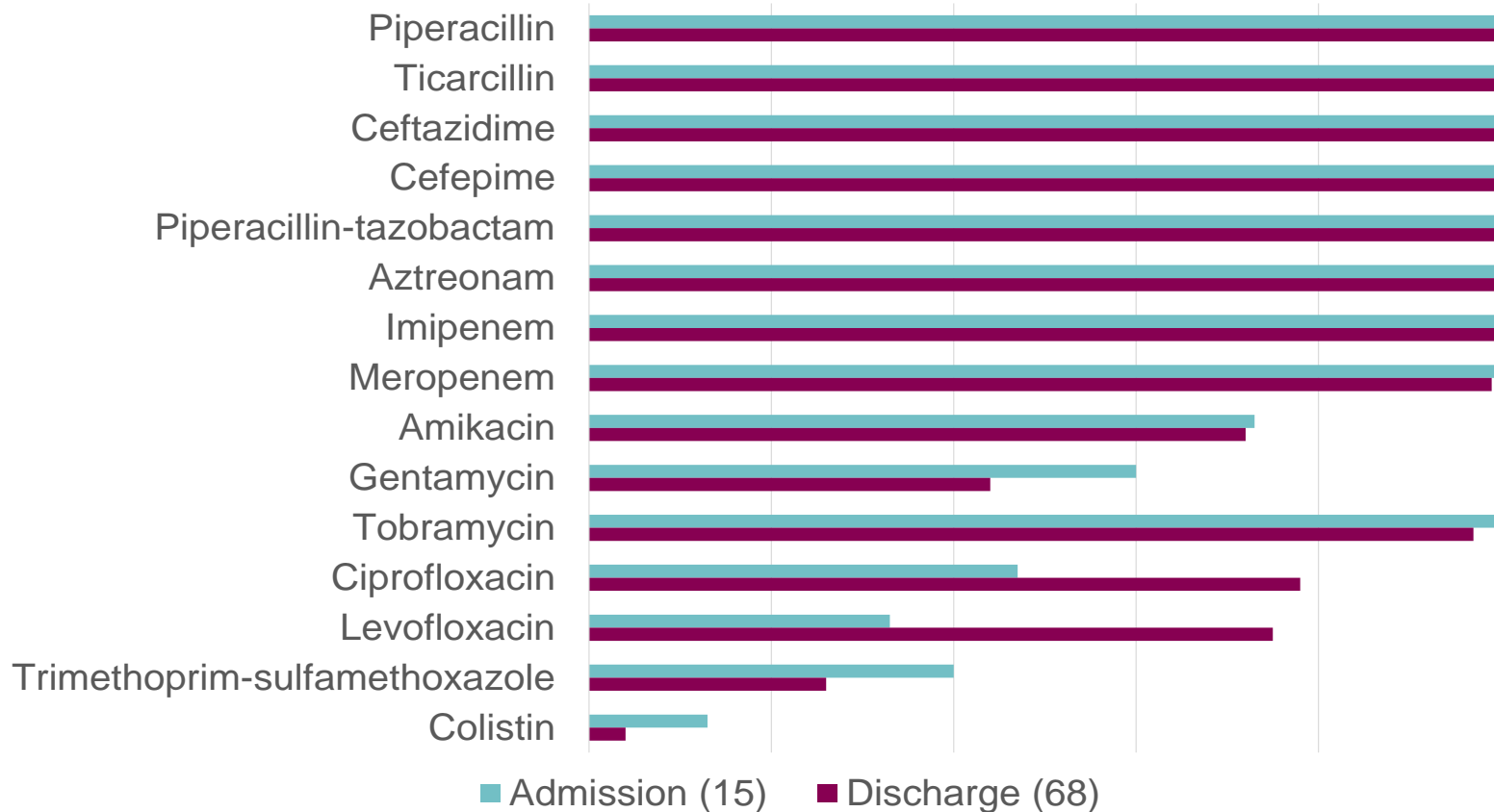
The Majority of KPC Strains Resistant To Most Antibiotics With Increasing Colistin Resistance



Karolinska
Institutet

Antibiotic non-susceptibility among CRKP

0% 20% 40% 60% 80% 100%



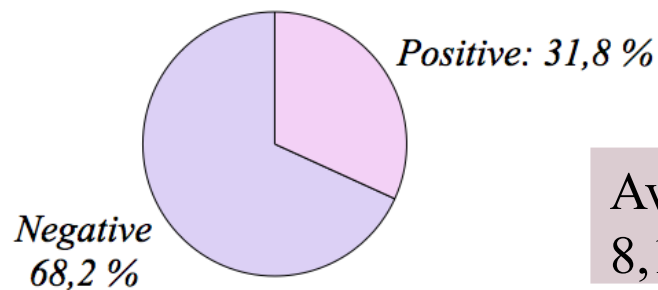
VNCH - NICU

Admission - Discharge CRE Screening

n=305

Admission : 31,8% CRE+

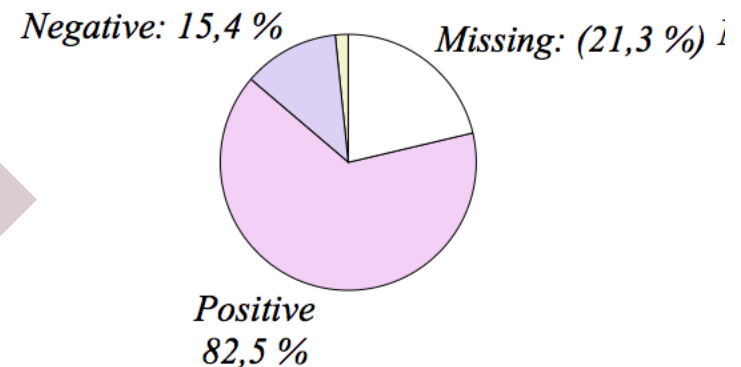
Distribution of CRE+ Admission



Observed Sample

Discharge : 82,5% CRE+

Distribution of CRE+ discharge



Observed Sample

Average
8,1 days

Increase (Acquisition) → 51,7%

Crude mortality – CRE+

CRE + at discharge → Significantly ($p < 0,01$) increased risk for HAI (n=305)

Negative



Positive



VNCH NICU Admission - Discharge CRE Screening, n=305

Crude mortality – CRE+

CRE + at discharge → Significantly ($p < 0,01$) increased crude mortality (n=305)

Negative



Positive



VNCH NICU Admission - Discharge CRE Screening, n=305

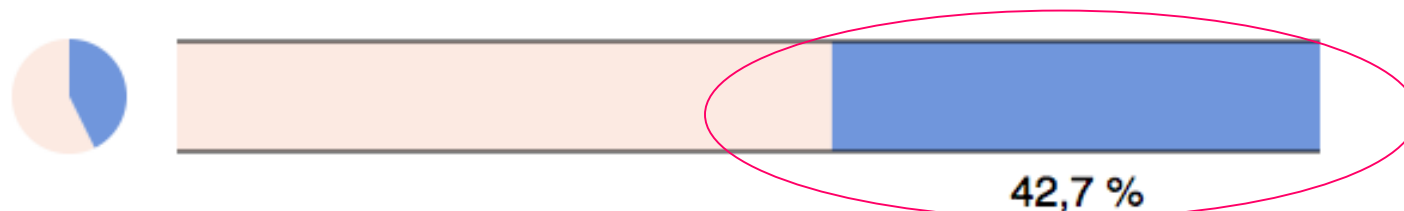
Duration of Treatment – CRE+

CRE + at discharge → Significantly ($p < 0,01$) increased treatment > 7 days

Negative



Positive



Average duration of treatment: **CRE+ 8,4 days** > CRE- 5,4 days

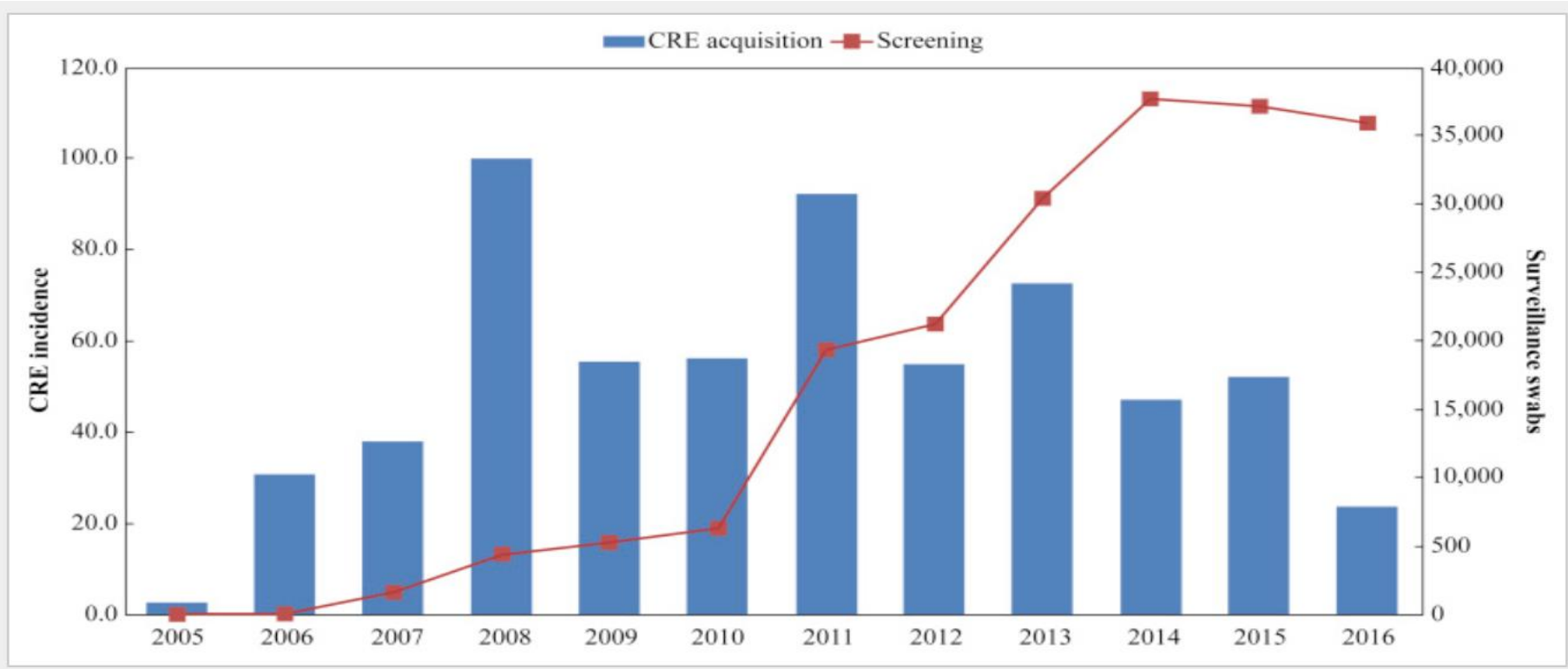
VNCH NICU Admission - Discharge CRE Screening, n=305

The association between infection control interventions and carbapenem-resistant Enterobacteriaceae incidence in an endemic hospital

K. Hussein^{a,b,*}, G. Rabino^a, O. Eluk^a, S. Warman^a, S. Reisner^{b,c}, Y. Geffen^{b,d}, L. Halif^e, M. Paul^{a,b}

Israel: 186.6 new acquisitions per 100,000 hospital-days.

Key intervention: CRE screening at admission, then applying mix intervention strategies including cohort care → 27% reduction CRE colonization.



Cohort care / isolation



Karolinska
Institutet

- For patients with culture confirmed CRE HAI
- For patients CRE colonized at admission?



Example : Active CRE screening based on 1000 ICU patients

Active CRE screening and cohort care with assumption decrease of 30% CRE colonization

HAI → 180

Crude mortality → 50

Hospital days → 6700

No active CRE screening

HAI → 240

Crude mortality → 75

Hospital days → 4700

Cost based on 500 USD
per ICU day

Example: Burden of resistance per 10.000 ICU patients

- Excess HAI → 2400 (40,5% CRE+ vs 16,2% CRE- =)
 - Excess Mortality → 750 Crude mortality (23,7% CRE+ vs 16,2% CRE-)
 - Hospital days → $30000 * 0,8 = 24000$ days (duration of treatment 8,4 CRE+ vs 5,4 days CRE-)
 - Estimated cost 500 USD/day → 12 million USD (270 billion VND)
 - Cost for screening 3 USD per patient → 30.000 USD
 - Cohort care reduction of colonization with 30% → saving 4 million USD → **Cost saving 3.970.000 USD (Estimate).**
-

Conclusion and Recommendations

- There is a high rate of CRE colonization in Vietnamese hospitals
 - About 30% CRE colonization in Provincial level and 60% in central level hospitals
 - There is a significant correlation between CRE colonization, HAI, duration of treatment and crude mortality
 - Active admission screening and cohort care of CRE colonized patients can reduce transmission, HAI, treatment time and mortality.
 - In central level hospital active screening is cost effective if cohort care can be implemented
 - In provincial level hospitals the cost effectiveness of active CRE screening depends on CRE colonization rates and capacity of the hospital
 - Active CRE screening is recommended as a tool for Infection Control monitoring and as basis for interventions
-

CAM ON QUY VI DA LANG NGHE

THANK YOU FOR YOUR ATTENTION

TRAC SWEDEN - VIETNAM



GÖTEBORG
UNIVERSITY



LINKÖPING
UNIVERSITY



**Karolinska
Institutet**



UMEÅ
UNIVERSITY



UPPSALA
UNIVERSITY



UNIVERSITY OF MEDICINE
AND PHARMACY - HCMC



HANOI MEDICAL
UNIVERSITY



RESEARCH CENTER FOR
CHILD HEALTH

TRAINING AND RESEARCH ACADEMIC CENTER
