

Surveillance for Antibiotic Resistant Organisms in Canadian Hospitals

- Provincial initiatives
- National surveillance



Surveillance for Antibiotic Resistant Organisms in Canada – Provincial Initiatives

- **9 provinces do surveillance and report CDI rates**
- **8 provinces do surveillance and report MRSA rates (3 provinces: MRSA BSI)**
- **4 provinces do surveillance and report VRE rates (2 provinces: nosocomial VRE BSI)**
- **1 province does surveillance for CREs (currently planned or under discussion in 3 other provinces)**

Surveillance in British Columbia

(PICNet: Provincial Infection Control Network of BC)

- CDI and MRSA (colonization/infection)
- Incidence reported for province, by health authority, by facility, facility type, facility size, healthcare/ community-associated; reported on website quarterly
- CRE surveillance is being planned

PICNet
PROVINCIAL INFECTION CONTROL
NETWORK OF BRITISH COLUMBIA
A program of the Provincial Health Services Authority



Methicillin-Resistant *Staphylococcus aureus* (MRSA) Surveillance Report

For the Fiscal Year 2012/2013

Prepared by:
Provincial Infection Control Network of British Columbia (PICNet)
September 2013



Surveillance in Québec

- Comité des Infections Nosocomiales du Québec responsible for surveillance in hospitals
- 7 compulsory surveillance programs in all Québec hospitals; 4 related to AROs (HA-CDI, nosocomial MRSA BSI, nosocomial VRE BSI, CREs); reported on website



INSPQ Institut national
de santé publique
du Québec

Centre d'expertise et de référence

[Expertises](#) > [Maladies infectieuses](#) > [Infections nosocomiales](#) > [Les infections nosocomiales](#)

Les infections nosocomiales

Les infections nosocomiales constituent une cause majeure de complication des soins de santé avec, comme impacts, une augmentation de la mortalité et de la morbidité, une prolongation de l'hospitalisation et une majoration importante des coûts de santé.

« Chaque année, le traitement et les soins dispensés à des centaines de millions de patients dans le monde sont compliqués par des infections contractées au cours de soins de santé. Certains patients se trouvent alors dans un état plus grave qu'il n'aurait été en situation normale. Certains doivent subir des hospitalisations prolongées, d'autres souffrent d'incapacités de longue durée et certains décèdent. Indépendamment du coût humain, les systèmes de soins de santé supportent une charge financière plus lourde. Les infections liées aux soins de santé – appelées aussi infections nosocomiales – présentent les nombreuses caractéristiques d'un problème majeur de sécurité pour le patient. Leurs causes sont multiples, liées à la fois aux systèmes et aux procédures de soins et aux pratiques comportementales. »

[Organisation mondiale de la santé \(OMS\)](#)

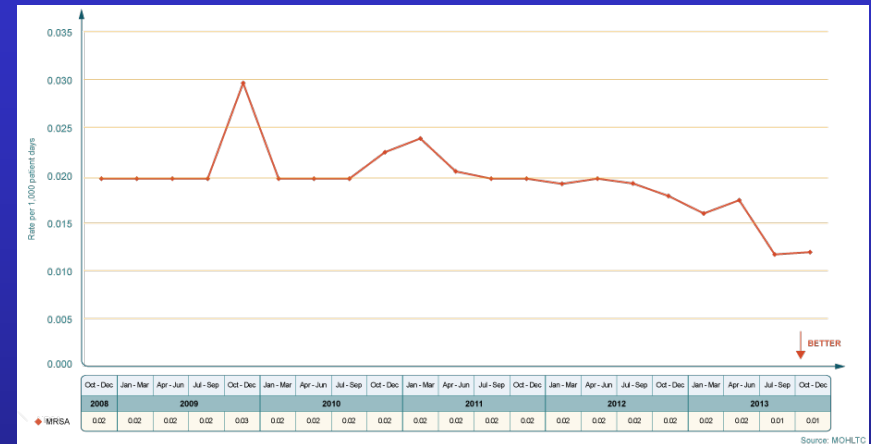
À l'Institut national de santé publique du Québec, la problématique des infections nosocomiales est étudiée par le [Comité sur les infections nosocomiales du Québec \(CINQ\)](#) duquel est né le groupe de travail de la [Surveillance provinciale des infections nosocomiales \(SPIN\)](#).



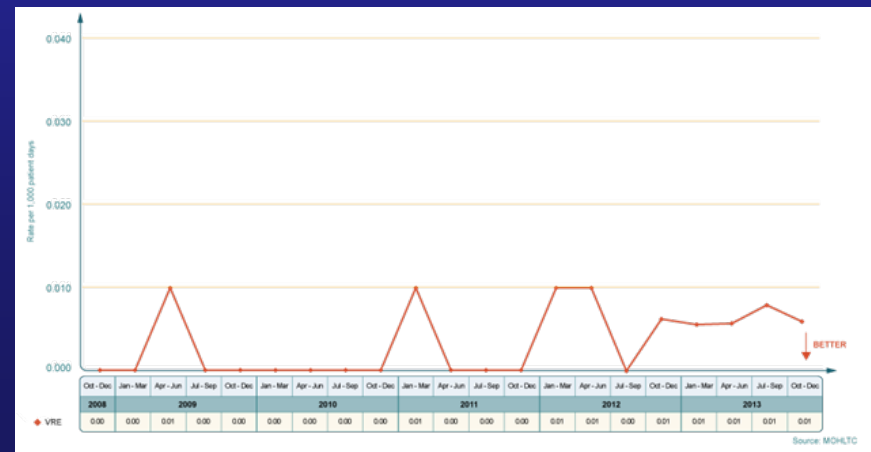
Surveillance in Ontario

- Public reporting in all hospitals of 9 patient safety indicators (3 AROs: nosocomial CDI, MRSA BSI, VRE BSI)
- Results reported on website by hospital, and as aggregate data over time

Nosocomial MRSA Bacteremia Rates

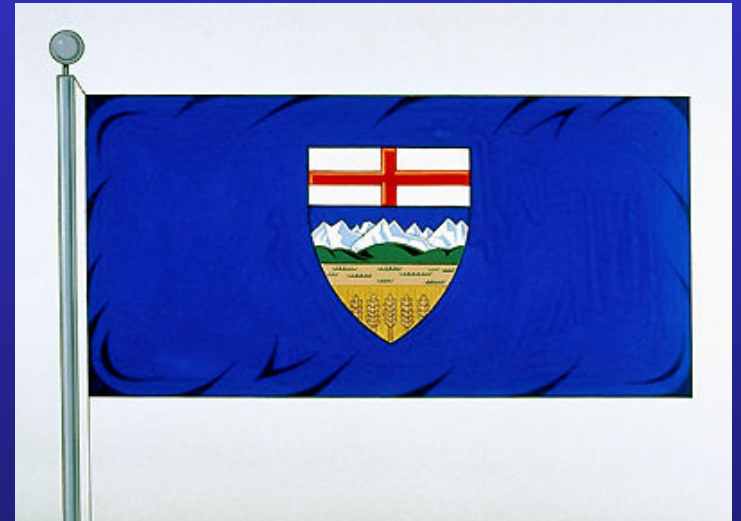


Nosocomial VRE Bacteremia Rates



Surveillance in Alberta

- Single Health Region
- CDI and CREs are reportable to Alberta Health (MOH); CDI rates available on website
- MRSA, VRE and ESBLs are reportable to Alberta Health Services (provincial Health Authority)



Surveillance for Antibiotic Resistant Organisms in Canada

Provincial surveillance is highly variable:

- Different surveillance objectives, definitions, protocols, public reporting requirements
- Data generally not audited for accuracy or reliability (VRE in Ontario)
- Results are not risk adjusted, and as surveillance methods and definitions are so variable, results cannot be compared or aggregated



©EnchantedLearning.com

National Surveillance for Antibiotic Resistant Organisms in Canada

CIPARS – Canadian Integrated Program for Antimicrobial Resistance Surveillance

- Led by PHAC
- Surveillance of agri-food sector, primarily farm animals and retail meats
- In humans: surveillance of antibiotic resistance in *Salmonella* isolates

 Government of Canada / Gouvernement du Canada

Canadian Integrated Program for Antimicrobial
Resistance Surveillance (CIPARS)

ANTIMICROBIAL RESISTANCE SHORT REPORT

2011



...working towards the preservation of effective
antimicrobials for humans and animals...

Canada 

CARA – Canadian Antimicrobial Resistance Alliance

- convenience sample of 10-15 hospitals
- clinical isolates for susceptibility testing; report % resistance, monitor changes over time
- limited clinical/epi data, and unable to determine incidence



MRSA in Canadian Hospitals

- **CANWARD:**
10 hospitals, 2008
- **MRSA accounted for 5% of all clinical isolates (5% blood, 6% respiratory, 12% wound isolates)**

ANTIMICROBIAL AGENTS AND CHEMOTHERAPY, Nov. 2010, p. 4684-4693
0066-4804/10/\$12.00 doi:10.1128/AAC.00469-10
Copyright © 2010, American Society for Microbiology. All Rights Reserved.

Vol. 54, No. 11

Prevalence of Antimicrobial-Resistant Pathogens in Canadian Hospitals: Results of the Canadian Ward Surveillance Study (CANWARD 2008)[▽]

George G. Zhanel,^{1,2,3*} Melanie DeCorby,^{1,3} Heather Adam,^{1,3} Michael R. Mulvey,^{1,6} Melissa McCracken,⁶ Philippe Lagacé-Wiens,^{1,4} Kimberly A. Nichol,³ Aleksandra Wierzbowski,^{1,3} Patricia J. Baudry,^{1,3} Franil Tailor,^{1,3} James A. Karlowsky,^{1,3} Andrew Walkty,^{1,2,3} Frank Schweizer,^{1,5} Jack Johnson,⁷ the Canadian Antimicrobial Resistance Alliance, and Daryl J. Hoban^{1,3}

Department of Medical Microbiology, Faculty of Medicine,¹ Departments of Medicine² and Clinical Microbiology,³ Health Sciences Centre, Department of Clinical Microbiology, St. Boniface General Hospital,⁴ and Department of Chemistry, Faculty of Science,⁵ University of Manitoba, and Nosocomial Infections Branch, National Microbiology Laboratory,⁶ Winnipeg, Manitoba, Canada, and International Health Management Associates, Chicago, Illinois⁷

Received 7 April 2010/Returned for modification 28 July 2010/Accepted 22 August 2010

A total of 5,282 bacterial isolates obtained between 1 January and 31 December 31 2008, inclusive, from patients in 10 hospitals across Canada as part of the Canadian Ward Surveillance Study (CANWARD 2008) underwent susceptibility testing. The 10 most common organisms, representing 78.8% of all clinical specimens, were as follows: *Escherichia coli* (21.4%), methicillin-susceptible *Staphylococcus aureus* (MSSA; 13.9%), *Streptococcus pneumoniae* (10.3%), *Pseudomonas aeruginosa* (7.1%), *Klebsiella pneumoniae* (6.0%), coagulase-negative staphylococci/*Staphylococcus epidermidis* (5.4%), methicillin-resistant *S. aureus* (MRSA; 5.1%), *Haemophilus influenzae* (4.1%), *Enterococcus* spp. (3.3%), *Enterobacter cloacae* (2.2%). MRSA comprised 27.0% (272/1,007) of all *S. aureus* isolates (genotypically, 68.8% of MRSA were health care associated [HA-MRSA] and 27.6% were community associated [CA-MRSA]). Extended-spectrum β -lactamase (ESBL)-producing *E. coli* occurred in 4.9% of *E. coli* isolates. The CTX-M type was the predominant ESBL, with CTX-M-15 the most prevalent genotype. MRSA demonstrated no resistance to ceftobiprole, daptomycin, linezolid, telavancin, tigecycline, or vancomycin (0.4% intermediate intermediate resistance). *E. coli* demonstrated no resistance to ertapenem, meropenem, or tigecycline. Resistance rates with *P. aeruginosa* were as follows: colistin (polymyxin E), 0.8%; amikacin, 3.5%; cefepime, 7.2%; gentamicin, 12.3%; fluorquinolones, 19.0 to 24.1%; meropenem, 5.6%; piperacillin-tazobactam, 8.0%. A multidrug-resistant (MDR) phenotype occurred frequently in *P. aeruginosa* (5.9%) but uncommonly in *E. coli* (1.2%) and *K. pneumoniae* (0.9%). In conclusion, *E. coli*, *S. aureus* (MSSA and MRSA), *P. aeruginosa*, *S. pneumoniae*, *K. pneumoniae*, *H. influenzae*, and *Enterococcus* spp. are the most common isolates recovered from clinical specimens in Canadian hospitals. The prevalence of MRSA was 27.0% (of which genotypically 27.6% were CA-MRSA), while ESBL-producing *E. coli* occurred in 4.9% of isolates. An MDR phenotype was common in *P. aeruginosa*.

Median Prevalence of MRSA and VRE: 132 Hospitals, 2010 and 2012

Organism	Prevalence (2010)	Prevalence (2012)	<i>P</i> value
MRSA			
Colonization/Infection	4.3 (0-22.1)	4.0 (0-26.8)	0.81
Infection	0.3 (0-5.9)	0.3 (0-4.9)	0.78
VRE			
Colonization/Infection	0.5 (0-13.1)	1.3 (0-18.0)	0.04
Infection	0 (0-1.8)	0 (0-1.5)	0.28

Simor, Infect Control Hosp Epidemiol 2013; Simor, IDSA 2013

Canadian Nosocomial Infection Surveillance Program - CNISP

- established in 1994; network of 57 sentinel hospitals across the country, in partnership with PHAC & NML
- predominantly teaching hospitals, with required expertise and commitment; 8 pediatric facilities



Geographic Location Of CNISP Hospitals

-
- Adult or mixed Adult/Pediatric Hospitals
 - Pediatric Hospitals (stand- alone)

CNISP Objectives

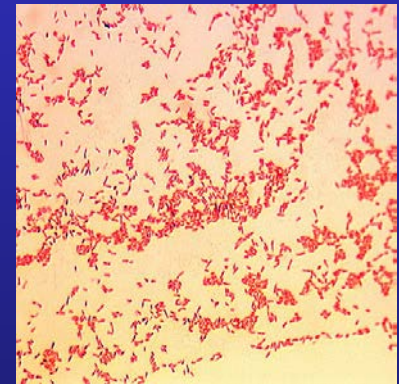
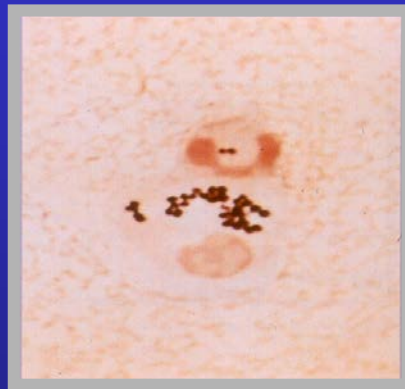


- to establish a national surveillance system to determine the epidemiology of health care associated infections in Canada
- to establish “benchmark” data
- to provide data that can be used to develop national guidelines for infection prevention

CNISP Surveillance

Significant Pathogens:

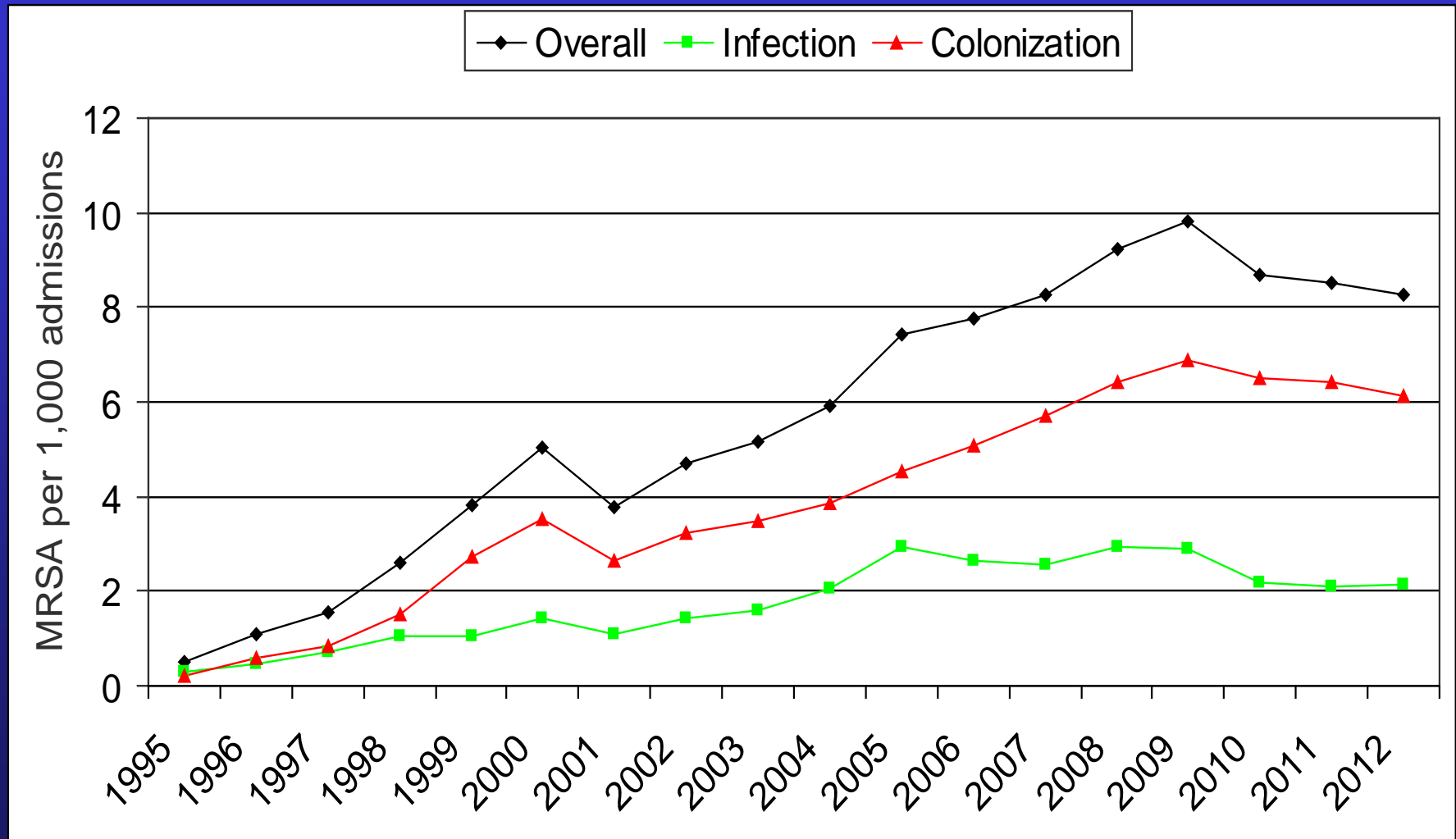
- MRSA
- VRE
- ESBLs
- CREs
- Multiresistant *Acinetobacter*
- *Clostridium difficile* infection



CNISP Surveillance for Antimicrobial Resistance

- **laboratory – based, prospective, incidence, hospitalized patients**
- **updated hospital profiles**
- **demographic and clinical data**
- **laboratory characterization, molecular typing**

MRSA in Canada, 1995-2012



Simor, Infect Control Hosp Epidemiol 2010; CNISP, 2013

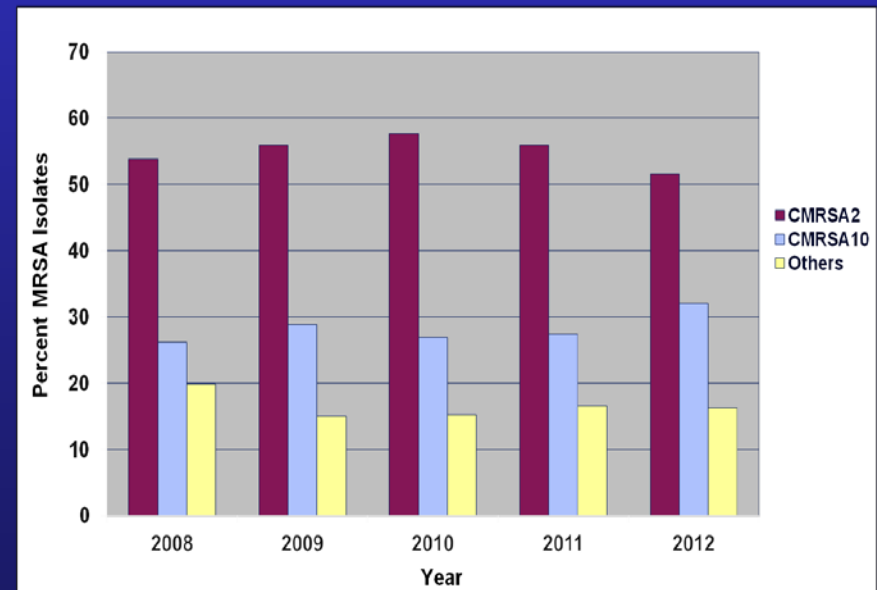
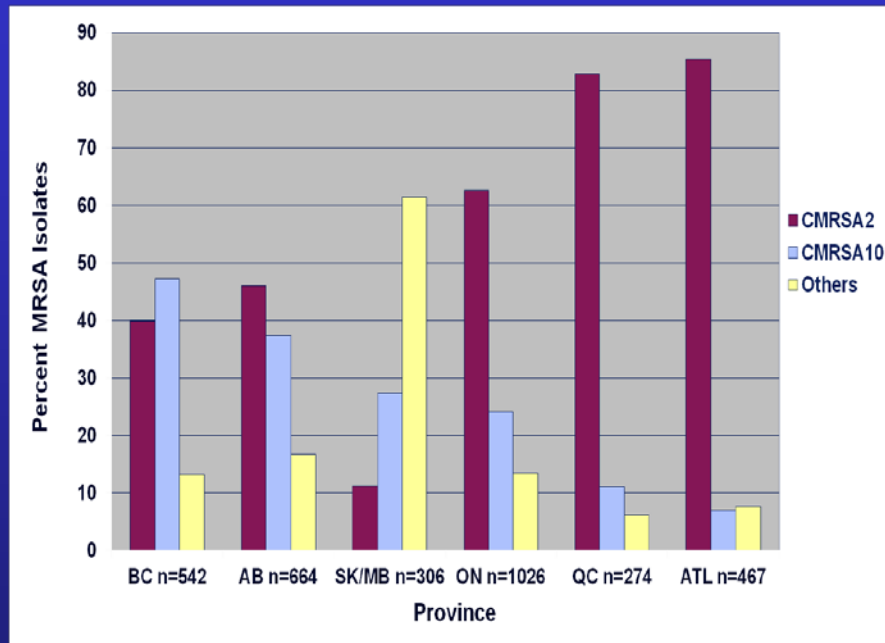
MRSA – Regional Rates

(per 1,000 admissions)

Year	West	Central	East
2010	6.23	11.61	7.54
2011	7.45	11.41	7.33
2012	6.96	10.96	6.82

Canadian Nosocomial Infection Surveillance Program; www.ammi.ca/

MRSA Strains, Canada 2008-2012



Canadian Nosocomial Infection Surveillance Program

MRSA Bloodstream Infection

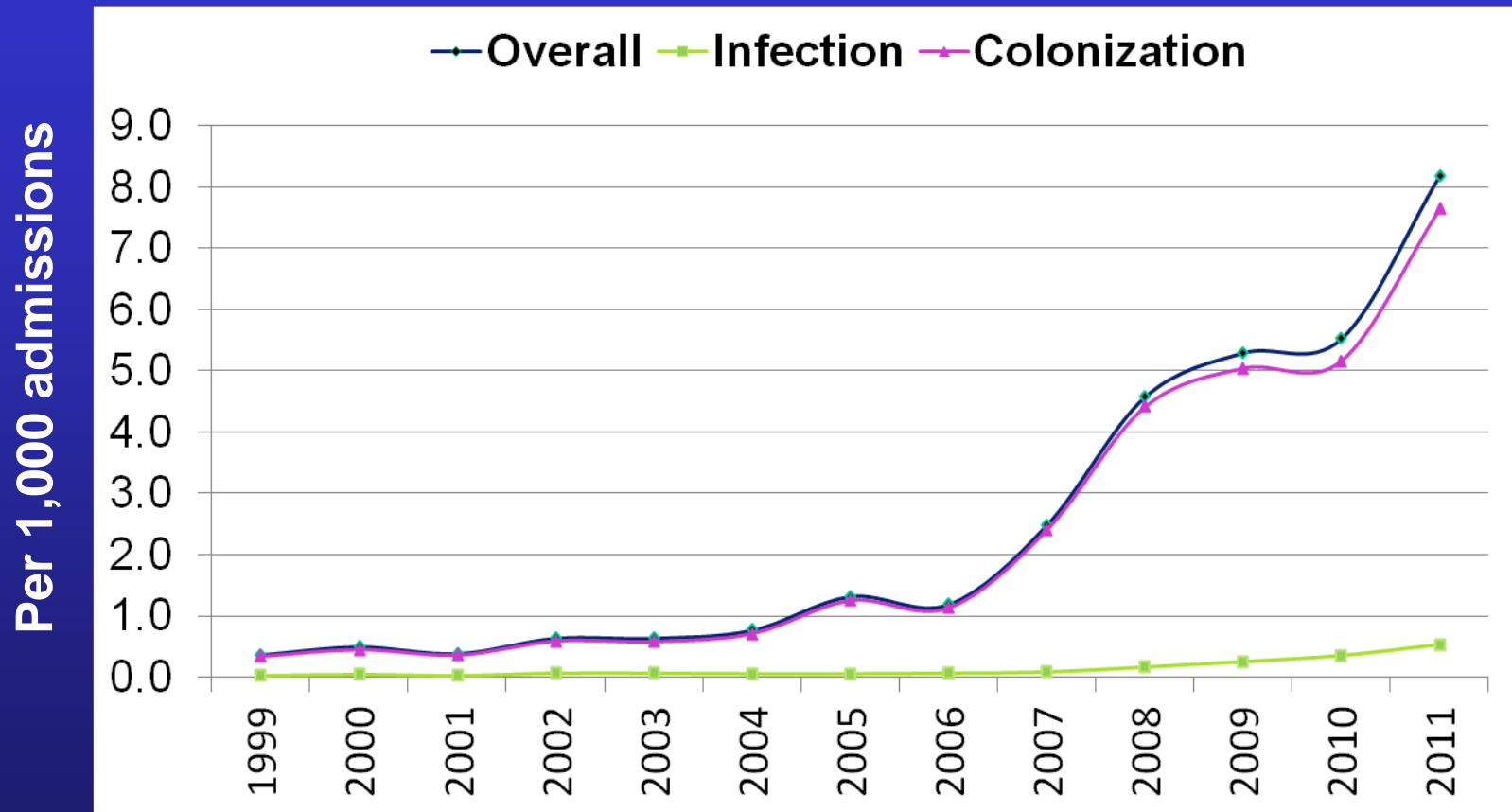
Year	Incidence (per 1,000 admissions)	Incidence (per 10,000 pt-days)
2008	0.49	0.61
2009	0.55	0.72
2010	0.40	0.57
2011	0.44	0.56
2012	0.40	0.51

Canadian Nosocomial Infection Surveillance Program

MRSA Bacteremia in Canadian Hospitals, 2008-10

- **30-day all-cause mortality: 23.4%**
- **variables associated with mortality:**
 - age > 65 yrs (OR 3.3, 95% CI 1.4-7.9)**
 - pneumonia (OR 3.5, 95% CI 2.5-5.1)**
 - skin/soft tissue (OR 0.6, 95% CI 0.4-0.8)**
 - HA-BSI (OR 1.4, 95% CI 1.1-1.6)**
- **mortality not associated with PFGE type, or reduced susceptibility to vancomycin**

VRE Incidence, 1999-2011



Canadian Nosocomial Infection Surveillance Program; www.ammi.ca/

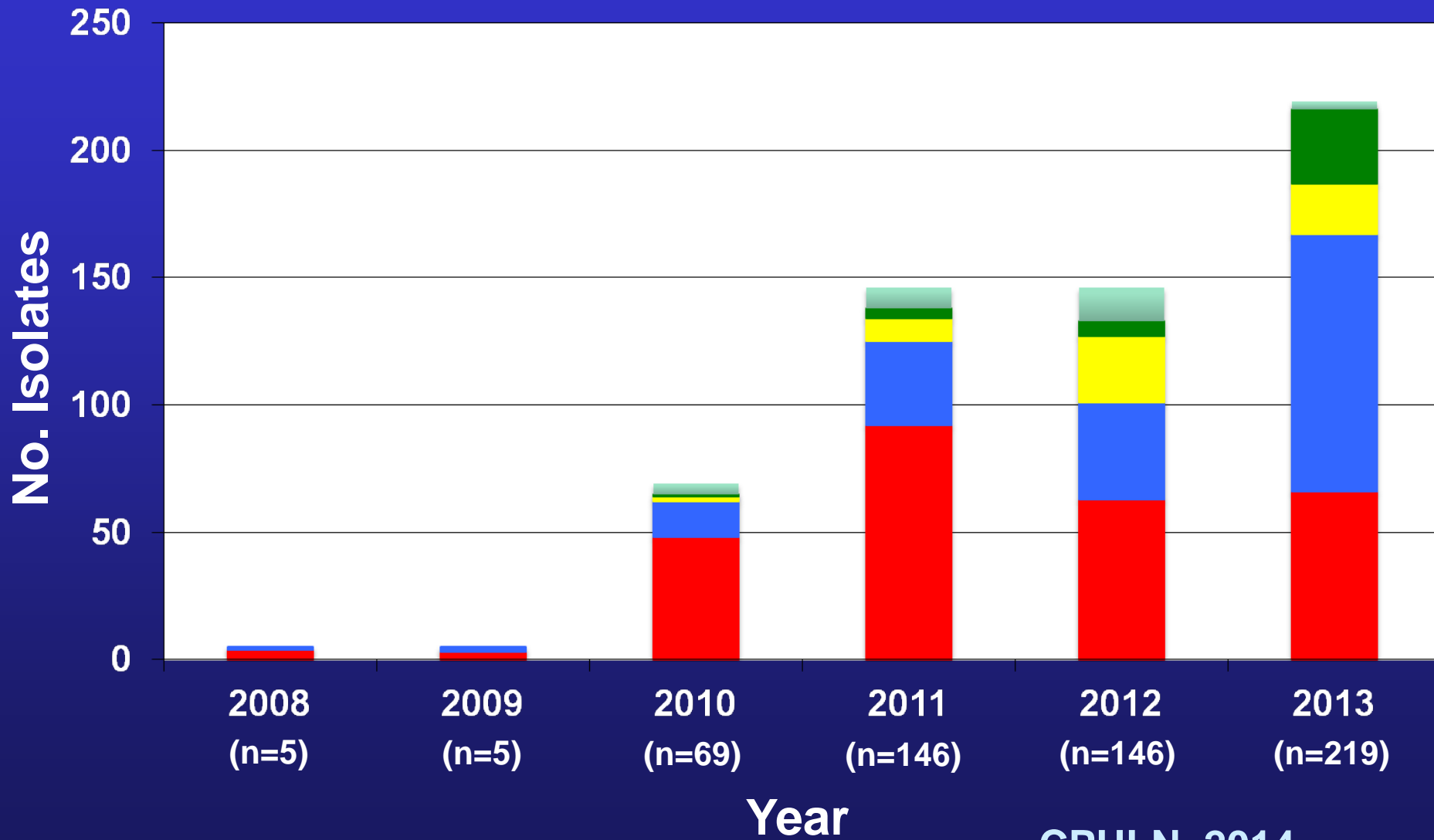
Carbapenem-Resistant *Enterobacteriaceae*

Year	Incidence (per 1,000 admissions)	Incidence (per 10,000 pt-days)
2010	0.11	0.15
2011	0.18	0.23
2012	0.14	0.17

Canadian Nosocomial Infection Surveillance Program; www.ammi.ca/

CPE in Canada

KPC NDM OXA-48 SME Other



CPHLN, 2014

CNISP - Strengths

- collaborative network of hospitals and PHAC; good geographic representation; lab, epidemiologic, and statistical expertise
- accurate, comprehensive data
- national, regional and site-specific rates
- ability to link epidemiologic and lab data
- able to distinguish infection vs colonization

CNISP - Limitations

- **mostly tertiary-care teaching hospitals; few community hospitals**
- **significant workload at hospital sites (not reimbursed); limited data collection**
- **results not available in a timely manner (although recently improving)**

CNISP Surveillance

- 57 peer-reviewed publications (1997-2013)
- CNISP data have been used to 'benchmark' hospital rates, to alert healthcare facilities and government agencies, and to effect changes in practice

