

Cardiac Complications of Community Acquired Pneumonia amongst Hospitalized Canadian Adults

George Worthen

G Worthen¹, A Ambrose¹, M Andrew^{1,2}, G Boivin³, W Bowie⁴, M Elsherif¹, K Green⁵, T Hatchette¹, J Johnstone⁶, J Leblanc¹, M Loeb⁶, D Mackinnon-Cameron¹, T Marrie, MD², A McCarthy⁷, A McGeer⁶, M Semret⁸, G Stiver⁴, S Trottier³, L Valiquette⁹, D Webster¹⁰, L Ye¹, S McNeil^{1,2}

on behalf of the Public Health Agency of Canada/Canadian Institutes of Health Research Influenza Research Network (PCIRN) Serious Outcomes Surveillance Network Investigators

Disclosures

- No personal financial relationships to disclose
- This PCIRN SOS Network Study is funded by the Public Health Agency of Canada/Canadian Institutes of Health Research Influenza Research Network and through an Investigator-Initiated Research Grant from Pfizer, Canada

Background

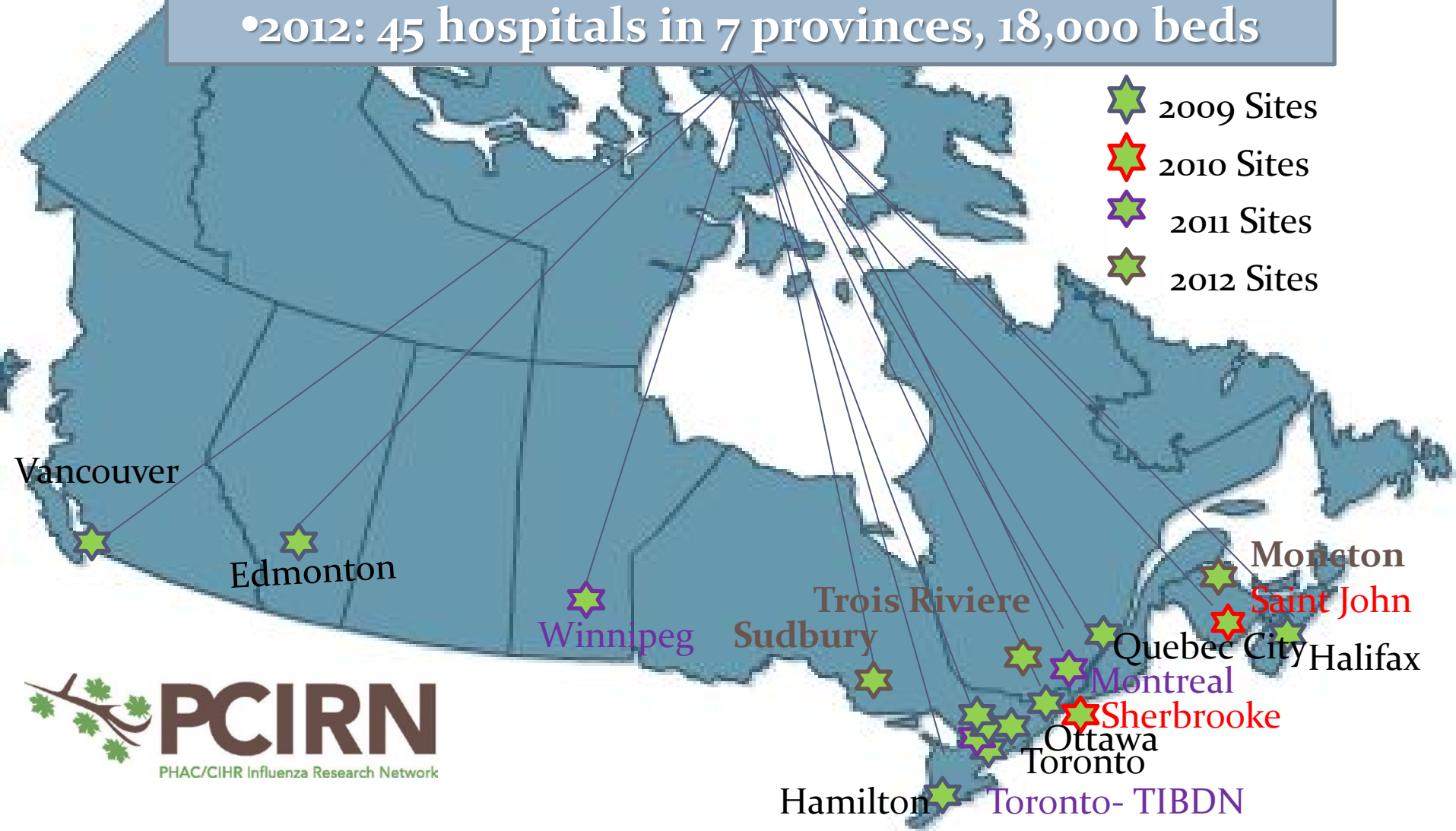
- Community acquired pneumonia is an important contributor to morbidity and mortality among Canadian adults
- Cardiac complications in CAP are a main contributor to morbidity and mortality, with as many as 10-30% of CAP patients experiencing a cardiac complication

Background cont'd

- Understanding the risk factors and outcomes of cardiac complications amongst adults admitted with CAP can be useful for directing clinical management
- Establishing the impact of vaccination on cardiac complications in CAP in Canada is critical to inform immunization policy for pneumococcal vaccine use in adults

The PCIRN SOS Network:

- 2009: 8 hospitals in 5 provinces, 5000 beds
- 2010: 10 hospitals in 6 provinces, 6000 beds
- 2011: 40 hospitals in 7 provinces, 15,000 beds
- 2012: 45 hospitals in 7 provinces, 18,000 beds



Objectives

- To determine the incidence and outcomes of cardiac complications amongst adults admitted with CAP
- To identify risk factors for developing cardiac complications with CAP
- To evaluate the effectiveness of pneumococcal vaccine for cardiac complications in CAP

Methods

- Active surveillance for CAP in 9 SOS Network sites from 12/1/2010 to 12/31/2013
 - **CAP:** New or evolving infiltrate + \geq fever, cough, SOB, pleuritic CP, sputum, crackles
- Data collection: medical, functional and immunization history, presenting illness, hospital course and outcomes
- Sputum and blood cultures for culture, urine for *S. pneumoniae* antigen (Binax and Pfizer UAD), nasopharyngeal swab for *S. pneumo* PCR

Results: Demographics

	No cardiac complications (n=6042) N (%)	Cardiac complications (n=688) N (%)	P value
Age (mean, range)	68.2 (17-105)	75.7 (26-98)	<0.0001
16-49y	902 (15)	20 (3)	
50-64y	1342 (22)	116 (17)	
65-74y	1361 (23)	159 (23)	
≥ 75y	2437 (40)	393 (57)	
Gender (male)	3139 (52)	368 (54)	0.47
Lab-confirmed influenza	1245 (21)	215 (31)	<0.0001
>1 comorbidities	5535 (92)	651 (95)	0.0005
Current or past smoker	3562 (59)	420 (61)	0.13
Obesity	1279 (21)	148 (22)	0.65
Pneumococcal vaccine	2121 (52)	247 (52)	0.96
Unknown	1976 (33)	216 (31)	
Influenza vaccine	2206 (51)	293 (58)	0.008
Unknown	1728 (29)	178 (26)	

Cardiac complications

Cardiac Complications (n = 688)	n (%)
Myocardial infarction	21 (3)
Unstable angina	176 (26)
New arrhythmia	366 (53)
Congestive heart failure	217 (32)

Patients with cardiac complications were older...

	No cardiac complications (n=6042) N (%)	Cardiac complications (n=688) N (%)	P value
Age (mean, range)	68.2 (17-105)	75.7 (26-98)	<0.0001
16-49y	902 (15)	20 (3)	
50-64y	1342 (22)	116 (17)	
65-74y	1361 (23)	159 (23)	
≥ 75y	2437 (40)	393 (57)	
Gender (male)	3139 (52)	368 (54)	0.47
Lab-confirmed influenza	1245 (21)	215 (31)	<0.0001
>1 comorbidities	5535 (92)	651 (95)	0.0005
Current or past smoker	3562 (59)	420 (61)	0.13
Obesity	1279 (21)	148 (22)	0.65
Pneumococcal vaccine	2121 (52)	247 (52)	0.96
Unknown	1976 (33)	216 (31)	
Influenza vaccine	2206 (51)	293 (58)	0.008
Unknown	1728 (29)	178 (26)	

... were more likely to have lab-confirmed influenza...

	No cardiac complications (n=6042) N (%)	Cardiac complications (n=688) N (%)	P value
Age (mean, range)	68.2 (17-105)	75.7 (26-98)	<0.0001
16-49y	902 (15)	20 (3)	
50-64y	1342 (22)	116 (17)	
65-74y	1361 (23)	159 (23)	
≥ 75y	2437 (40)	393 (57)	
Gender (male)	3139 (52)	368 (54)	0.47
Lab-confirmed influenza	1245 (21)	215 (31)	<0.0001
>1 comorbidities	5535 (92)	651 (95)	0.0005
Current or past smoker	3562 (59)	420 (61)	0.13
Obesity	1279 (21)	148 (22)	0.65
Pneumococcal vaccine	2121 (52)	247 (52)	0.96
Unknown	1976 (33)	216 (31)	
Influenza vaccine	2206 (51)	293 (58)	0.008
Unknown	1728 (29)	178 (26)	

... were more likely to have underlying comorbidities...

	No cardiac complications (n=6042) N (%)	Cardiac complications (n=688) N (%)	P value
Age (mean, range)	68.2 (17-105)	75.7 (26-98)	<0.0001
16-49y	902 (15)	20 (3)	
50-64y	1342 (22)	116 (17)	
65-74y	1361 (23)	159 (23)	
≥ 75y	2437 (40)	393 (57)	
Gender (male)	3139 (52)	368 (54)	0.47
Lab-confirmed influenza	1245 (21)	215 (31)	<0.0001
>1 comorbidities	5535 (92)	651 (95)	0.0005
Current or past smoker	3562 (59)	420 (61)	0.13
Obesity	1279 (21)	148 (22)	0.65
Pneumococcal vaccine	2121 (52)	247 (52)	0.96
Unknown	1976 (33)	216 (31)	
Influenza vaccine	2206 (51)	293 (58)	0.008
Unknown	1728 (29)	178 (26)	

... and were less likely to have received an influenza vaccine...

	No cardiac complications (n=6042) N (%)	Cardiac complications (n=688) N (%)	P value
Age (mean, range)	68.2 (17-105)	75.7 (26-98)	<0.0001
16-49y	902 (15)	20 (3)	
50-64y	1342 (22)	116 (17)	
65-74y	1361 (23)	159 (23)	
≥ 75y	2437 (40)	393 (57)	
Gender (male)	3139 (52)	368 (54)	0.47
Lab-confirmed influenza	1245 (21)	215 (31)	<0.0001
>1 comorbidities	5535 (92)	651 (95)	0.0005
Current or past smoker	3562 (59)	420 (61)	0.13
Obesity	1279 (21)	148 (22)	0.65
Pneumococcal vaccine	2121 (52)	247 (52)	0.96
Unknown	1976 (33)	216 (31)	
Influenza vaccine	2206 (51)	293 (58)	0.008
Unknown	1728 (29)	178 (26)	

Risk factors for cardiac complications (multivariate analysis)

	Cases < 65y OR (90% CI)	Cases ≥ 65y OR (90% CI)	Overall OR (90% CI)
Age			
16-49y	Ref		Ref
50-64y	2.59 (1.58, 4.26)		2.20 (1.20, 4.05)
65-75y		Ref	3.88 (2.13, 7.05)
> 75y		1.13 (0.86, 1.49)	4.60 (2.54, 8.32)
Underlying diabetes	1.87 (1.25, 2.79)		
Underlying cardiac comorbidity	1.79 (1.18, 2.70)	1.45 (1.11, 1.91)	1.40 (1.11, 1.78)
Underlying vascular comorbidity			1.49 (1.11, 1.99)
Obesity (BMI >30)			1.29 (1.00, 1.67)
Lab-confirmed influenza		1.86 (1.45, 2.40)	1.62 (1.29, 2.02)

Outcomes associated with cardiac complications

	No cardiac complications (n=6042) N (%)	Cardiac complications (n=688) N (%)	P value
Overall			
LOS (d) median (SD)	7 (16)	11 (17)	<0.0001
Admitted to ICU	983 (16)	255 (37)	<0.0001
Mechanically ventilated	616 (10)	165 (24)	<0.0001
30d mortality	628 (10)	178 (26)	<0.0001
Age ≥ 65y			
LOS (d) median (SD)	8 (15)	10 (17)	<0.0001
Admitted to ICU	456 (12)	175 (32)	<0.0001
Mechanically ventilated	276 (7)	104 (19)	<0.0001
30d mortality	490 (13)	154 (28)	<0.0001
Age < 65			
LOS (d) median (SD)	6 (17)	11 (18)	<0.0001
Admitted to ICU	527 (24)	80 (59)	<0.0001
Mechanically ventilated	340 (15)	61 (45)	<0.0001
30d mortality	138 (6)	24 (18)	<0.0001

Pneumococcal vaccine effectiveness in the prevention of cardiac complications

Age group	VE % (90% CI)
Overall	22 (2, 38)*
≥65	10 (-16, 31)**
<65	47 (19, 66)†

* adjusted for age, influenza infection, underlying cardiac/vascular comorbidity, obesity, and receipt of antibiotics within 8 hours of admission

** adjusted for age, baseline frailty index, influenza infection, underlying cardiac comorbidity, and receipt of antibiotics within 8 hours

† adjusted for diabetes, and underlying cardiac comorbidity

Conclusions

- In-hospital cardiac complications are common in patients admitted with CAP – 10% overall; 13% in patients ≥ 65 y and 5.7% of younger adults
- Risk factors vary by age group but overall increasing age, underlying cardiac and vascular comorbidity, obesity and concomitant lab-confirmed influenza were risk factors
- Cardiac complications were associated with increased lengths of stay and frequently resulted in ICU admission and mechanical ventilation
- CAP patients who develop cardiac complications have high mortality rates (18-28%)

Conclusions

- Overall vaccine effectiveness in the prevention of cardiac complications among adults admitted with CAP was 22% (2,38)
- In those under 65 vaccine effectiveness was 47%, while in those over 65 it dropped to 10%
- While there is no evidence that polysaccharide pneumococcal vaccines prevent CAP, we demonstrate clinically important impact of vaccination on cardiac complications associated with CAP hospitalization

Acknowledgements



CIHR **IRSC**

Canadian Institutes of
Health Research

Instituts de recherche
en santé du Canada



PCIRN

PHAC/CIHR Influenza Research Network

