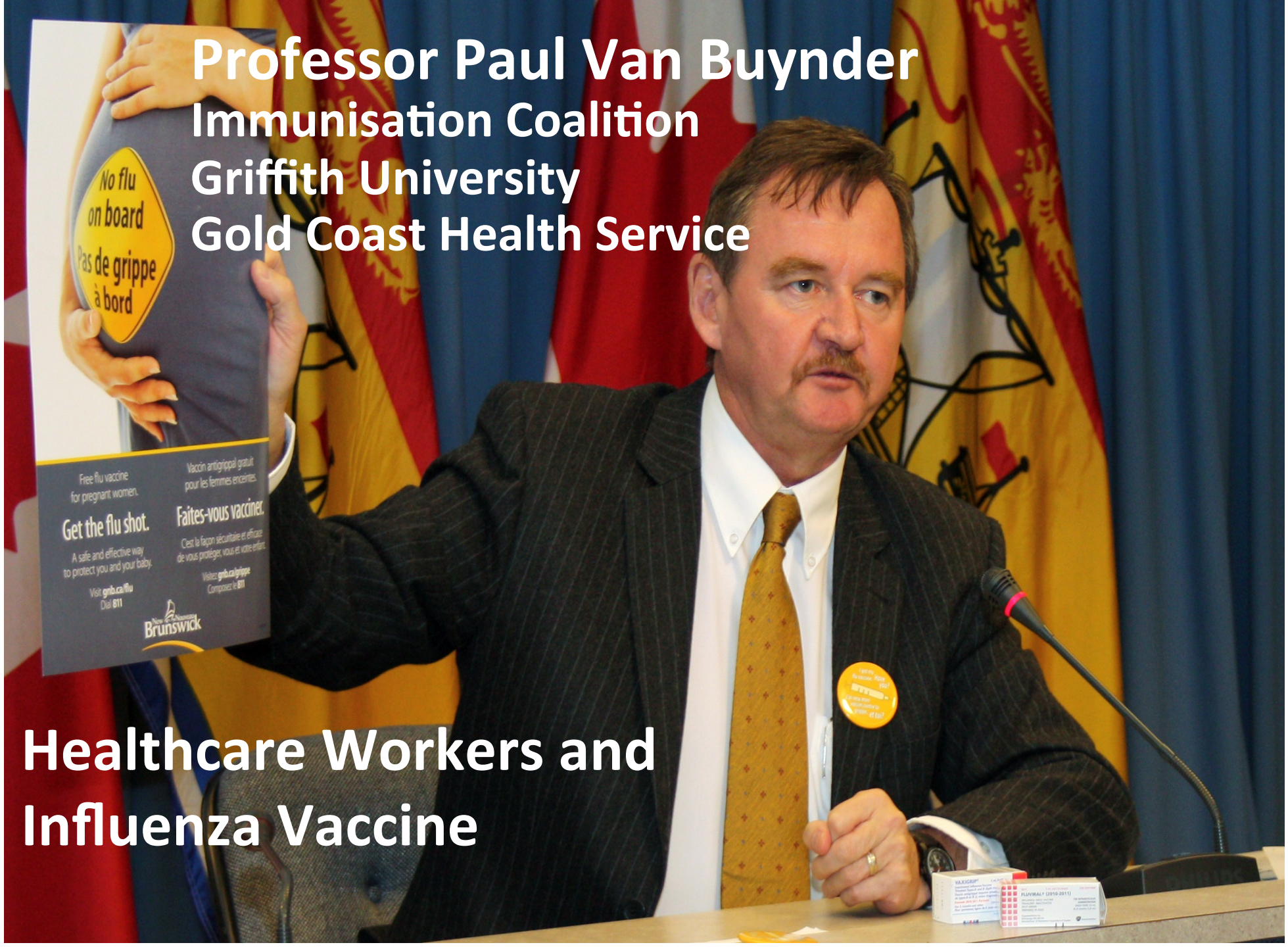


Professor Paul Van Buynder

Immunisation Coalition
Griffith University
Gold Coast Health Service

Healthcare Workers and Influenza Vaccine

The Scope of the problem

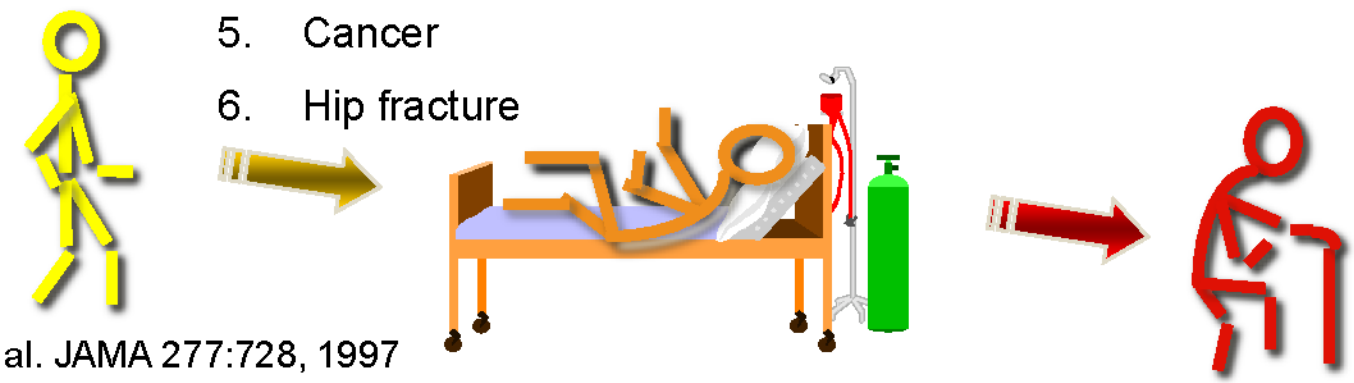
- Influenza causes by far the highest number of deaths among vaccine-preventable diseases.
- Hospitalized patients are more vulnerable to influenza than members of the general population.
- The impact of infection on the frail can lead to failure to return to self care – the 3rd commonest cause of catastrophic disability behind only stroke and CCF. Wait for long term care bed rather than going home

Vaccine Preventable Disability

Catastrophic disability

- Defined as a loss of independence in ≥ 3 ADL
- 72% who experience catastrophic disability have been hospitalized
- Leading causes of catastrophic disability

1. Stroke
2. CHF
3. Pneumonia and influenza
4. Ischemic heart disease
5. Cancer
6. Hip fracture



Ferrucci et al. JAMA 277:728, 1997
Barker et al. Arch Int Med 158:645, 1998
Falsey et al. *N Engl J Med*. 2005;352:1749

Clinical Frailty Scale:

1. *Very fit* – robust, active, energetic, well motivated and fit; exercise regularly, are in the most fit group for their age
2. *Well* – without active disease, less fit than people in category 1
3. *Well, with treated chronic disease* – symptoms are well controlled compared to those in category 4
4. *Apparently vulnerable* – not frankly dependent, but commonly complain of being "slowed up" or have disease symptoms
5. *Mildly frail* – limited dependence on others for instrumental activities of daily living
6. *Moderately frail* – help is needed with both instrumental and basic activities of daily living (e.g. climbing stairs and bathing)
7. *Severely frail* – mostly dependent on others for the activities of daily living
8. *Very severely frail* – completely dependent on others for the activities of daily living
9. *Terminally ill*

Rockwood et al; CMAJ; 173:489-495, 2005

Why vaccinate HCW?

BMJ Editorial

- There is clear evidence that healthcare workers play an important role in transmitting infections to their patients.
- Nosocomial flu infections have a high case fatality rate of 27%, especially in patients with comorbidities.
- Trivalent inactivated vaccine is safe and has a vaccine effectiveness of 70-90% in the presence of a good strain match *
- Flu vaccination must be mandatory in all HCW workers who have direct contact with patients.

The Scope of the problem

- Vaccination of healthcare workers reduces the risk to patients - frequently implicated as the source of influenza in healthcare settings and patient mortality and morbidity goes down when HCWs are vaccinated.

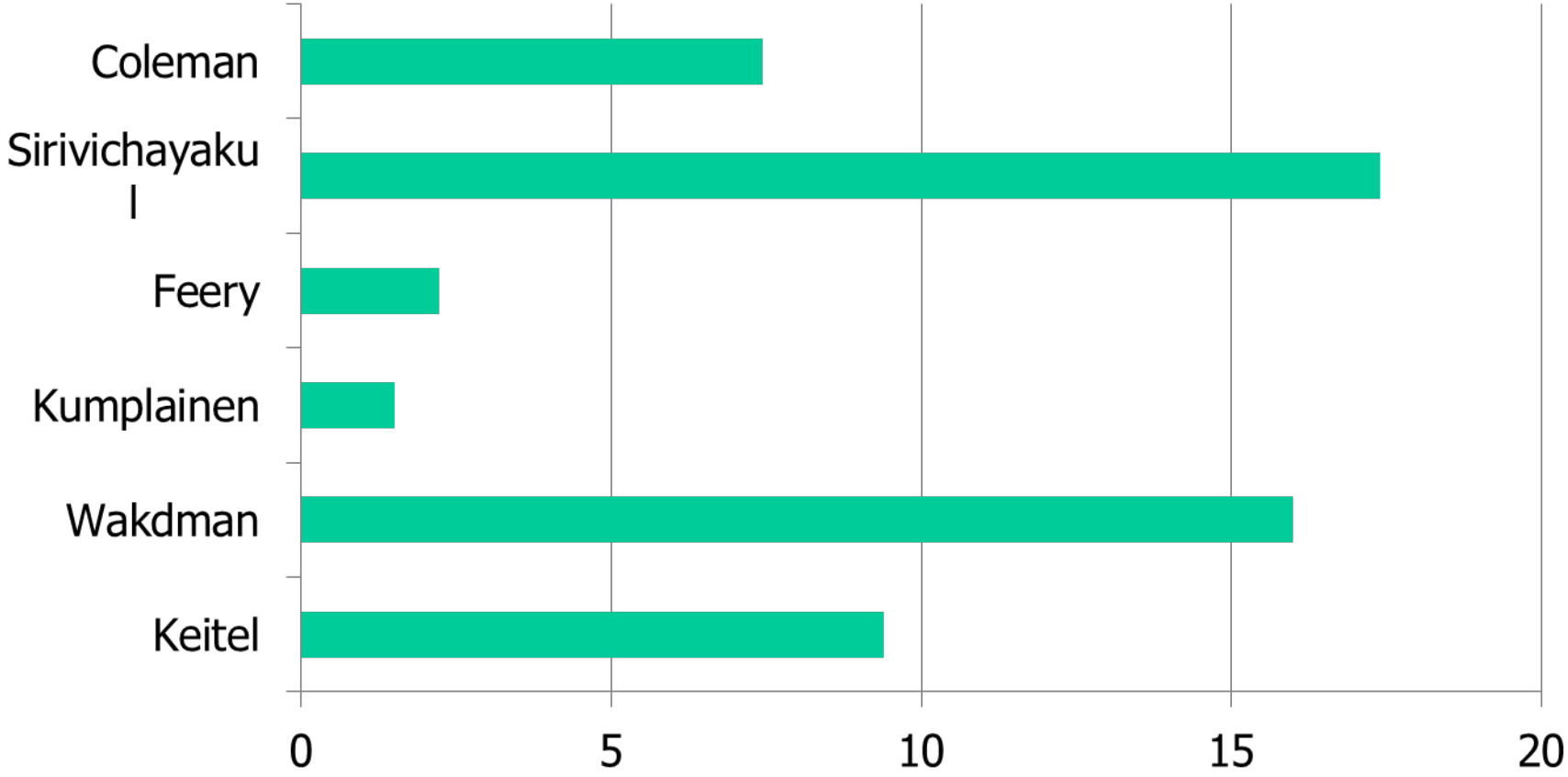
- Transmission occurs before symptoms are obvious

HCW Vaccine – Ethical Issues

- Health care workers and health care systems have an ethical and moral responsibility to protect vulnerable patients from transmissible diseases.

- Must put patients first
- Must do no harm
- Must protect those who cant protect themselves

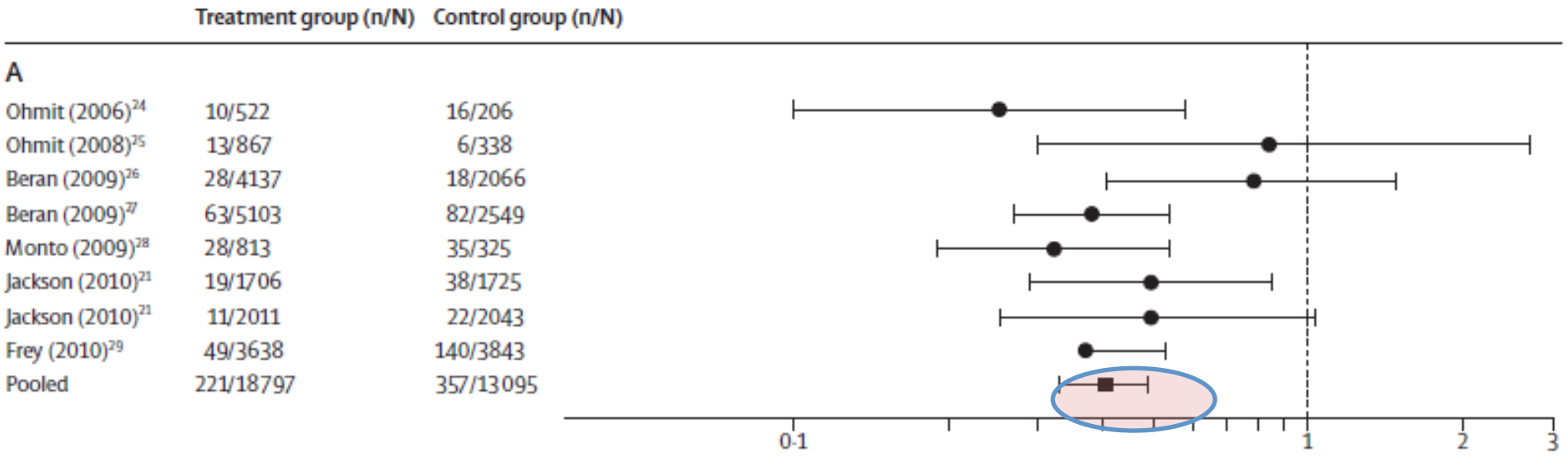
Rates of symptomatic influenza in unvaccinated HCWs



Total infection rate (ILI, ARI + asymptomatic) : 8-26%

Efficacy of influenza vaccine in healthy adults

- 59% reduction in PCR confirmed, symptomatic influenza infection



Osterholm Lancet ID 2012;12:36

Does vaccinating HCW make a difference?

Long term care studies

Cochrane … the controversy

Cluster randomized trials of the impact of HCW influenza immunization on patient mortality

Study	Journal/ Year	Setting	Crude mortality difference	Adjusted risk ratio
Potter *et al.*	JID 1997	1059 residents in 12 LTCFs in Glasgow	17% vs 12%	0.6 (0.4,0,8)
Carman *et al.*	Lancet 2000	1437 patients in 20 elderly-care hospitals in UK	22% vs 14%	0.6 (0.4,0.8)
Hayward *et al.*	BMJ 2006	2604 residents in 44 LTCFs in UK	15% vs 11%	0.6 (0.4, 1.0)

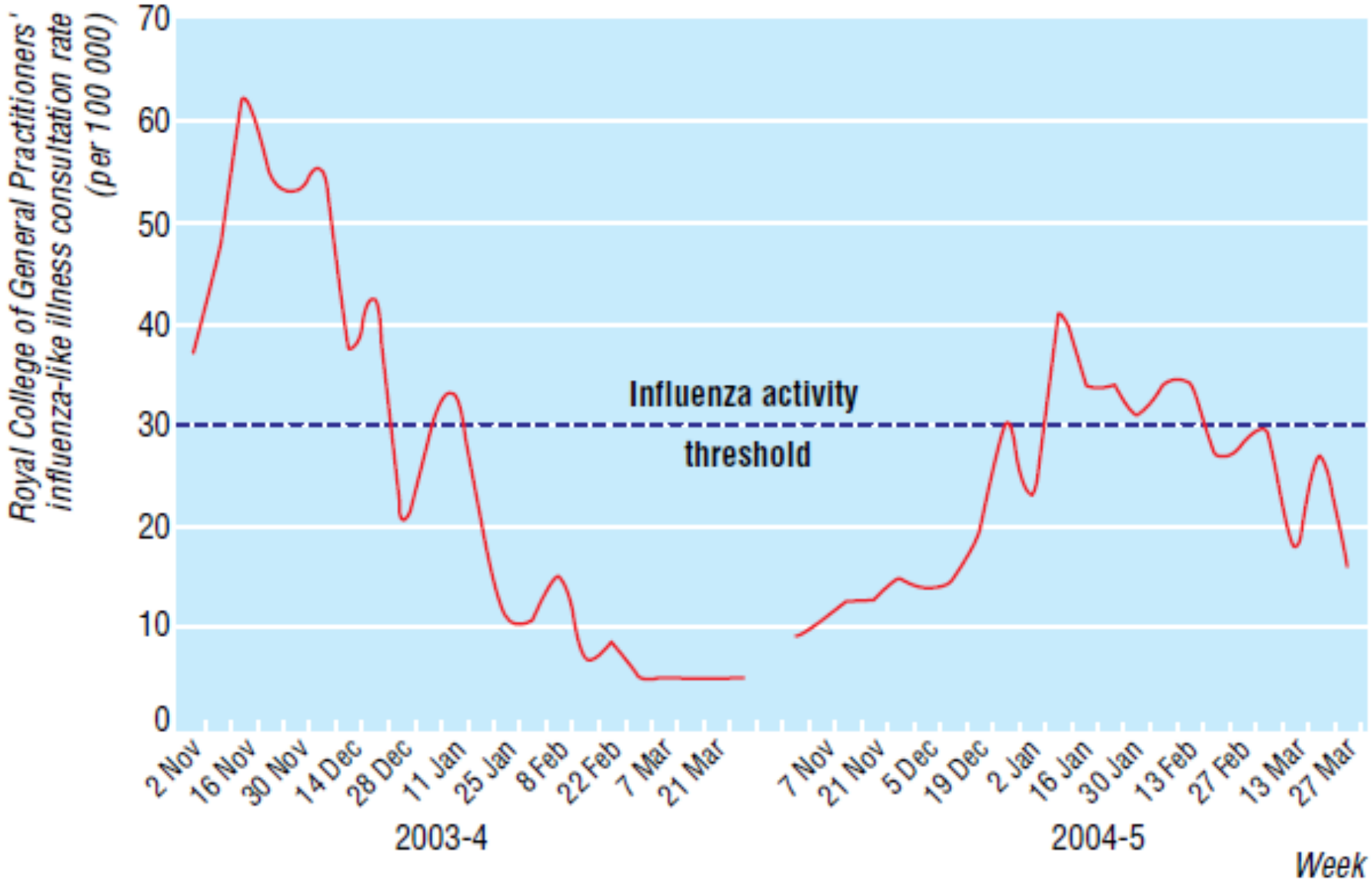
All … studies are at high risk of bias.
We conclude that there is no evidence from this research that vaccinating healthcare workers against influenza protects elderly people in their care.

Effectiveness of an influenza vaccine programme for care home staff to prevent death, morbidity, and health service use among residents: cluster randomised controlled trial

Andrew C Hayward, Richard Harling, Sally Wetten, Anne M Johnson, Susan Munro, Julia Smedley, Shahed Murad, John M Watson

- Pair matched, cluster randomized trial
  - 22 pairs of LTC facilities
  - Matched by region, size, dependence, mortality rate
  - Winters 2003/4 and 2004/5
- Intervention: policy to vaccinate staff
  - Intervention: lead nurses trained, letter to all staff, clinics on site, education
  - Vaccination rate
    - FT staff: Case homes: 48%, 43%; control homes: 5.9%, 3.5%
    - Residents: Case homes: 78.2%, 70.5%; control homes: 71.4%, 71,0%
- Primary outcome: all cause mortality during 2 influenza seasons
  - Difference should occur only during periods of influenza activity

BMJ 2006; 333:1241


Royal College of General Practitioners' influenza-like illness consultation rate (per 100 000)
70
60
50
40
30
20
10
0
Influenza activity threshold
2 Nov
16 Nov
30 Nov
14 Dec
28 Dec
11 Jan
25 Jan
8 Feb
22 Feb
7 Mar
21 Mar
2003-4
7 Nov
21 Nov
5 Dec
19 Dec
2 Jan
16 Jan
30 Jan
13 Feb
27 Feb
13 Mar
27 Mar
2004-5
Week

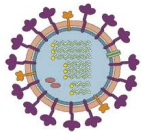
Effectiveness of an influenza vaccine programme for care home staff to prevent death, morbidity, and health service use among residents: cluster randomised controlled trial

Andrew C Hayward, Richard Harling, Sally Wetten, Anne M Johnson, Susan Munro, Julia Smedley, Shahed Murad, John M Watson

Year	Period	Weighted rate difference (events/bed-day)		
		Death	ILI	Hospital admission
1	Influenza	-.05 (-.07,-.02)*	-.09 (-.14,-.03)*	-.02
	No influenza	0	0	0
2	Influenza	-.01	0	0
	No influenza	+.01	+.03	0

BMJ 2006; 333:1241

Influenza Virus



HCP can become infected with influenza

Infected HCP

Symptomatic (ILI)

Mild Symptoms ("Cold")

Asymptomatic but infected

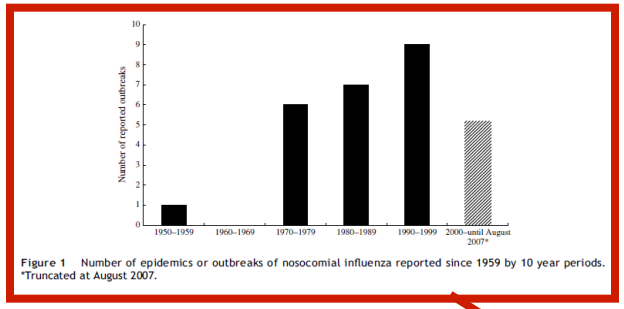


Figure 1 Number of epidemics or outbreaks of nosocomial influenza reported since 1959 by 10 year periods. *Truncated at August 2007.

HCP work when sick (~75 % of the time)

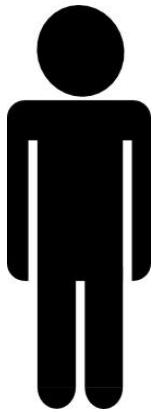
Infected HCP shed virus (even without symptoms)

HCP have frequent contact with high-risk patients

Infected HCP spread influenza to patients/ coworkers

Influenza vaccination reduces /eliminates viral shedding

Contacts (Pts, HCP)



Influenza vaccination reduces risk of infection (~60%)

Influenza vaccination is safe

Response to Influenza vaccination is better in healthy adults vs. those w/ comordbid conditions, older/younger age

Influenza vaccination reduces HCP sick days

Influenza vaccination of HCP associated with:

↓ LTCF patient

↓ LTCF patient ILI

↓ Healthcare-associated Influenza

HCP vaccination rates (40% in 2011-12) remain below targets (>90%)

Results, Cochrane review of impact of HCW vaccination on resident outcomes

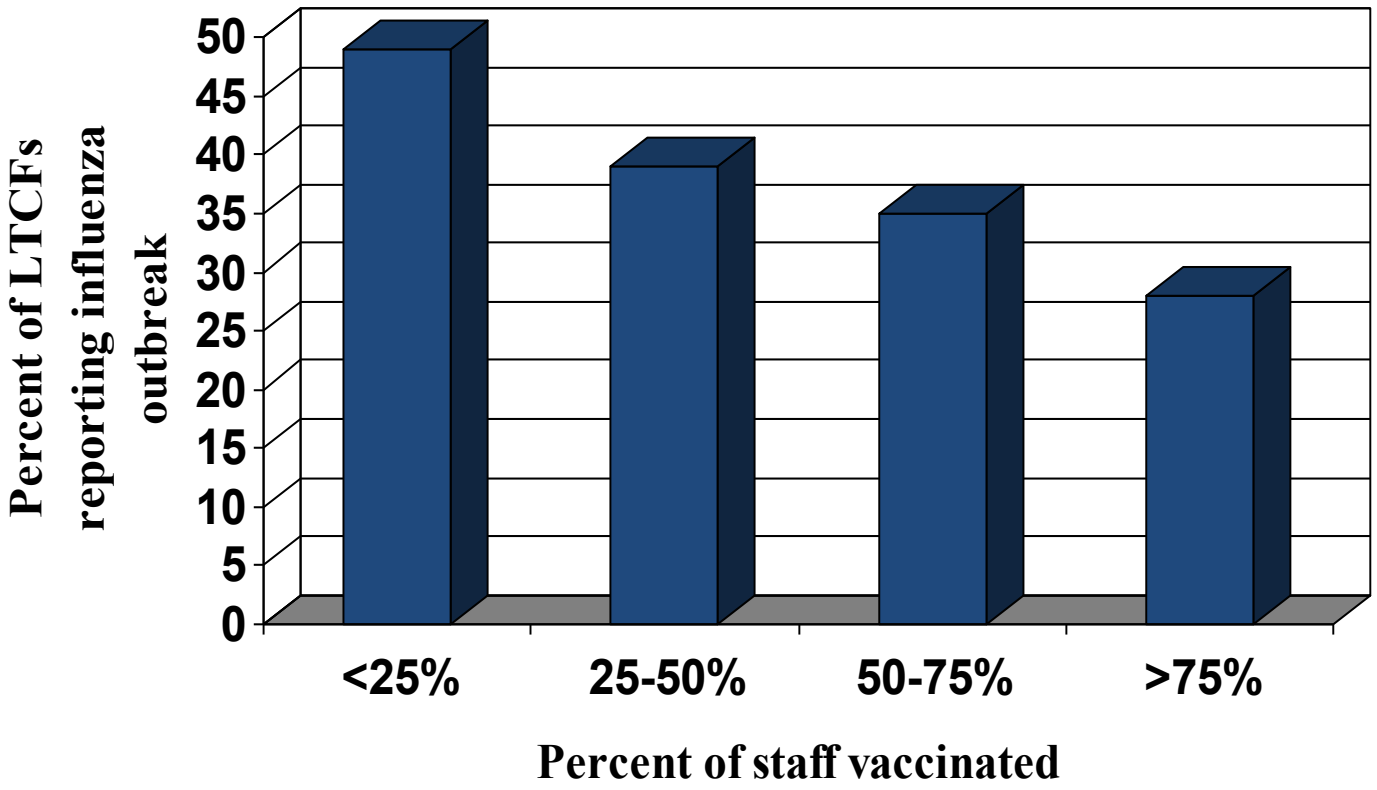
Outcome	Pooled OR (95% CI)
All cause mortality	0.68 (0.55, 0.84)*
ILI	0.71 (0.58, 0.98)*
GP consultation for ILI	0.48 (0.33, 0.69)*
Influenza	0.87 (0.38, 1.99)
*Pneumonia	0.71 (0.29, 1.71)
Hospital admission	0.90 (0.66, 1.21)
Death due to ILI	0.72 (0.31, 1.70)

Pooled data…found no effect on the outcomes of direct interest…. We conclude that there is no evidence from this research that vaccinating HCW against influenza protects elderly in their care.

Why do the results and conclusions differ?

	Potter	Carman	Hayward	Lemaitre	Cochrane
All cause mortality	Yes	Primary	Primary	Primary	Not of interest
All cause hospitalization	-		Secondary	Secondary	Not of interest
ILI	-		Secondary	Secondary	Not of interest
Mortality due to ILI	-		Secondary	-	Not of interest
GP consultation due to ILI	-		Secondary	-	Not of interest
Hospital admission w ILI	-		Secondary	-	Not of interest
Lower respiratory tract infection	Yes		-	-	Direct interest
Influenza	Yes	Secondary	-	-	Direct interest

Annual risk of influenza outbreaks by percentage of staff vaccinated



P=0.03, Chi-sq for trend

Stevenson CMAJ 2001;164:1413-9.

Response of Professional Bodies

- SHEA
  - **Therefore, for the safety of both patients and HCP, SHEA endorses a policy in which annual influenza vaccination is a condition of both initial and continued HCP employment and/or professional privileges**
- NACI
  - HCWs who have direct patient contact should consider it their responsibility to provide the highest standard of care which includes influenza vaccination.
  - In the absence of contraindications, refusal of HCWs who have direct patient contact to be immunized implies failure in their duty of care to patients.

..and other organisations

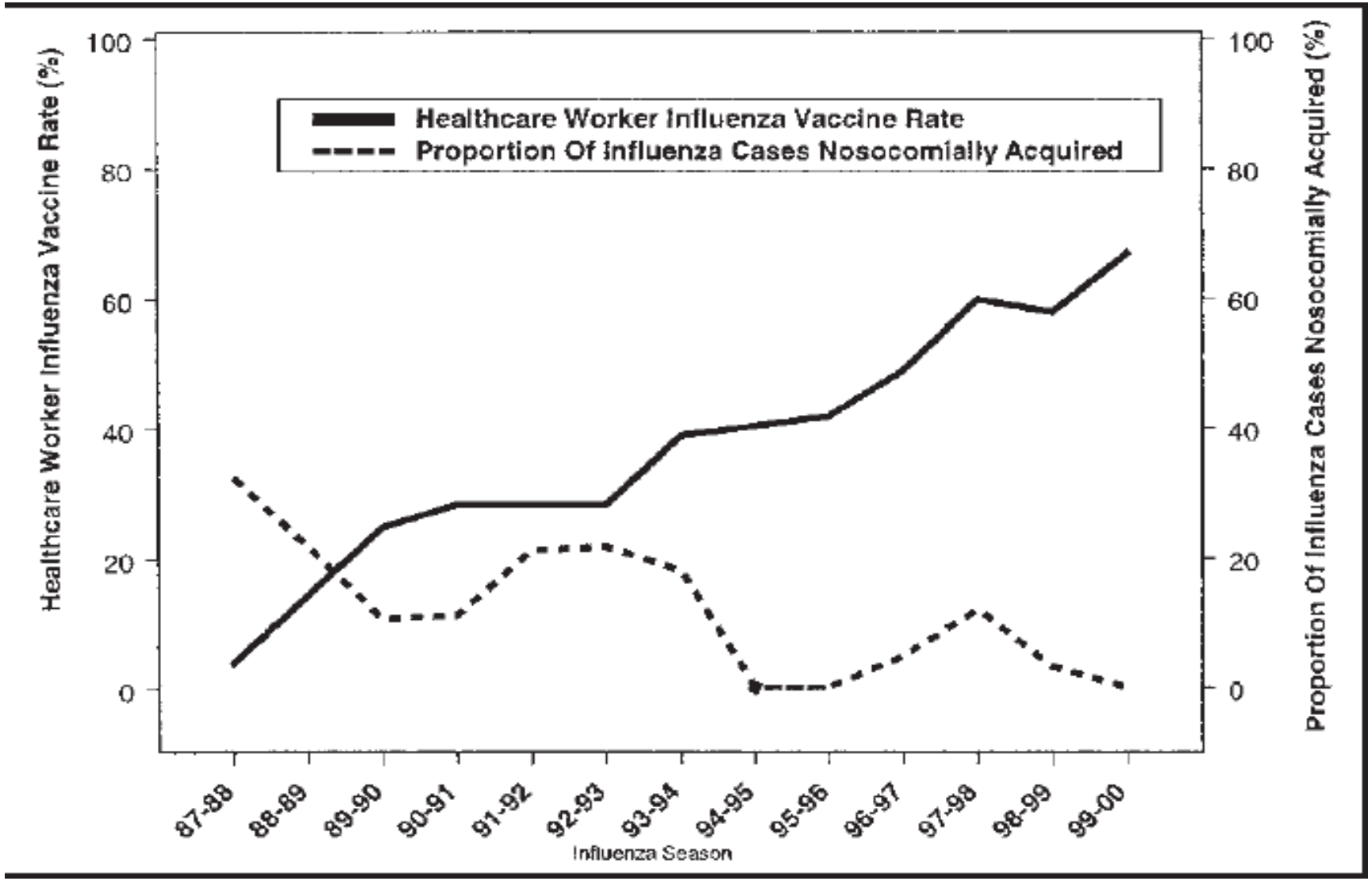
- CDC
- ATAGI
- American Hospital Association
- American College of Physicians
- American Academy of Pediatrics
- Infectious Diseases Society of America
- National Patient Safety Foundation
- Over 150 Organisations in 36 states

What about acute care facilities

Acute care hospital-acquired influenza

Incidence	3 / 1000 admissions 8 / 1000 admissions 6 / 1000 admissions	California, 1987 Virginia, 1988-94 Houston, 1988
Case fatality rate	7 % (0-60%)	
Cost/ case	$7,545 $ 4,050 $ 3,622	US, 1990 US, 1993 US, 2000

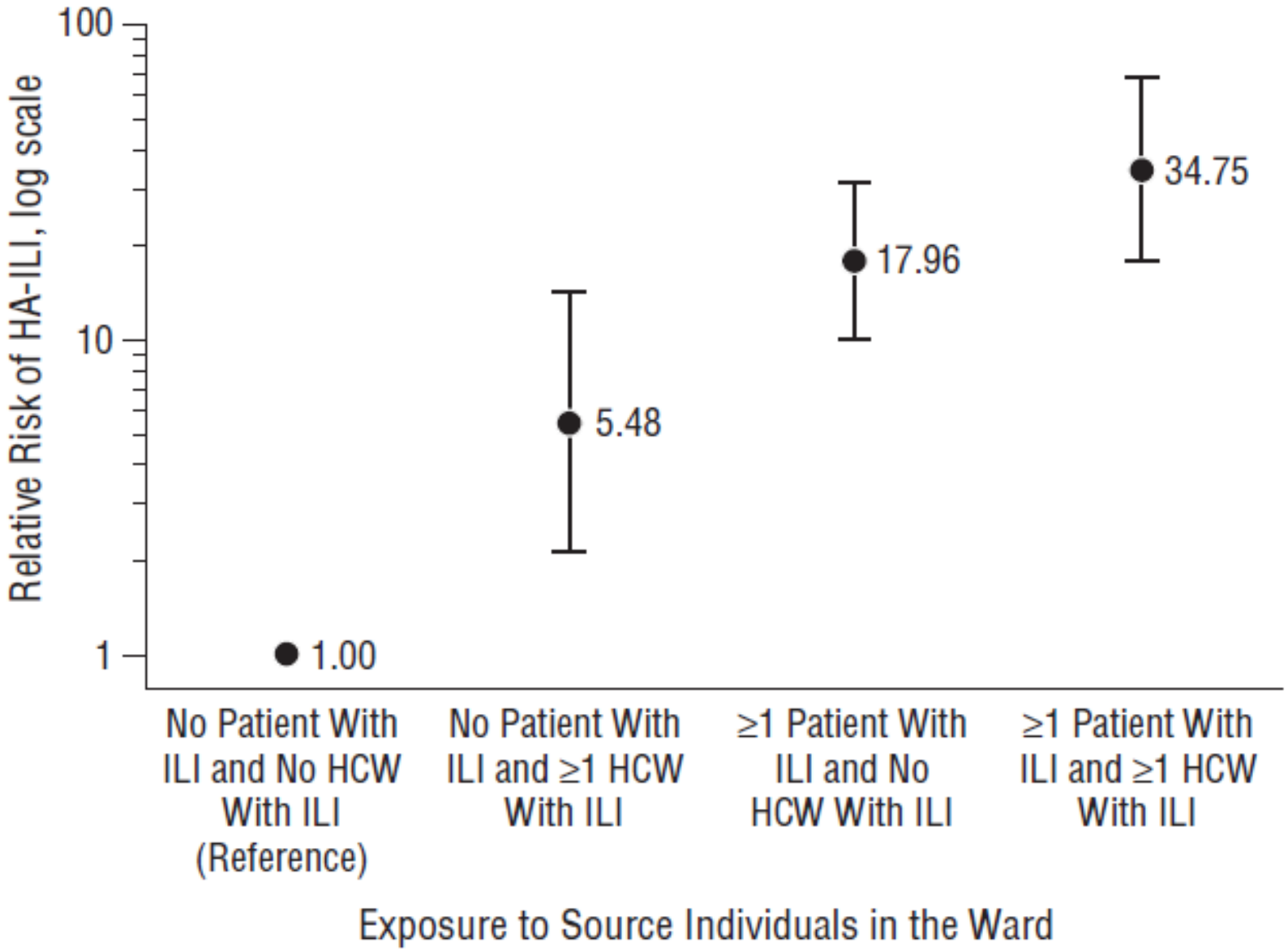
Weingarten AIM1988;148:113; Glezen CJIC 1991;6:65; Adal ICHE 1996;17:641; Serwint PIDJ 1993;12:200; Evans AJIC 1997;25:357; Salgado LancetID 2002;2:145



Salgado ICHE 2005;11:923

Risk of ILI in ACH during seasonal influenza epidemics, Edouard Herriot Hospital, 2004/5-06/7

- Tertiary medical center
  - 1102 beds, 105 units
  - 36 units participated (12 with 224 beds in 2004/5, 30 with 537 beds in 2006/7)
- Oct 15-Apr 15 – daily screen for HCWs or patients with fever and cough or sore throat
  - Once index case identified, 2x/d visits for secondary cases x 10 days
  - Potential exposure to prior cases recorded
  - Nasal swabs sent for IFA and culture


100
10
1
Relative Risk of HA-ILI, log scale
1.00
5.48
17.96
34.75
No Patient With ILI and No HCW With ILI (Reference)
No Patient With ILI and ≥1 HCW With ILI
≥1 Patient With ILI and No HCW With ILI
≥1 Patient With ILI and ≥1 HCW With ILI
Exposure to Source Individuals in the Ward

Influenza vaccination of HCW in acute-care hospitals: a case-control study of effect on hospital-acquired influenza among patients

- Nested case-control study
  - Cases: patients with laboratory confirmed influenza with onset ≥72 hours after admission
  - Controls: patients with HA-ILI, negative for influenza
  - 4 controls: case, matched by season

Benet BMCID 2012;12:30

Univariate analysis

Characteristic	Cases (N=11)	Controls (N=44)	OR (95% CI)
Gender, female	8 (75%)	33 (75%)	0.9 (0.2-3.7)
Age, median	66yrs	79 yrs	NS
Immunosuppressed	2 (18%)	1 (2%)	8.0 (0.7-88)
Influenza source on unit	7 (64%)	13 (30%)	4.1 (1.1-15)
Individual vaccinated against influenza	2 (20%)	21 (48%)	0.3 (0.1-1.7)
Proportion of HCW vaccinated ≥35%	3 (27%)	25 (57%)	0.2 (0.01-1.3)

Multivariate analysis

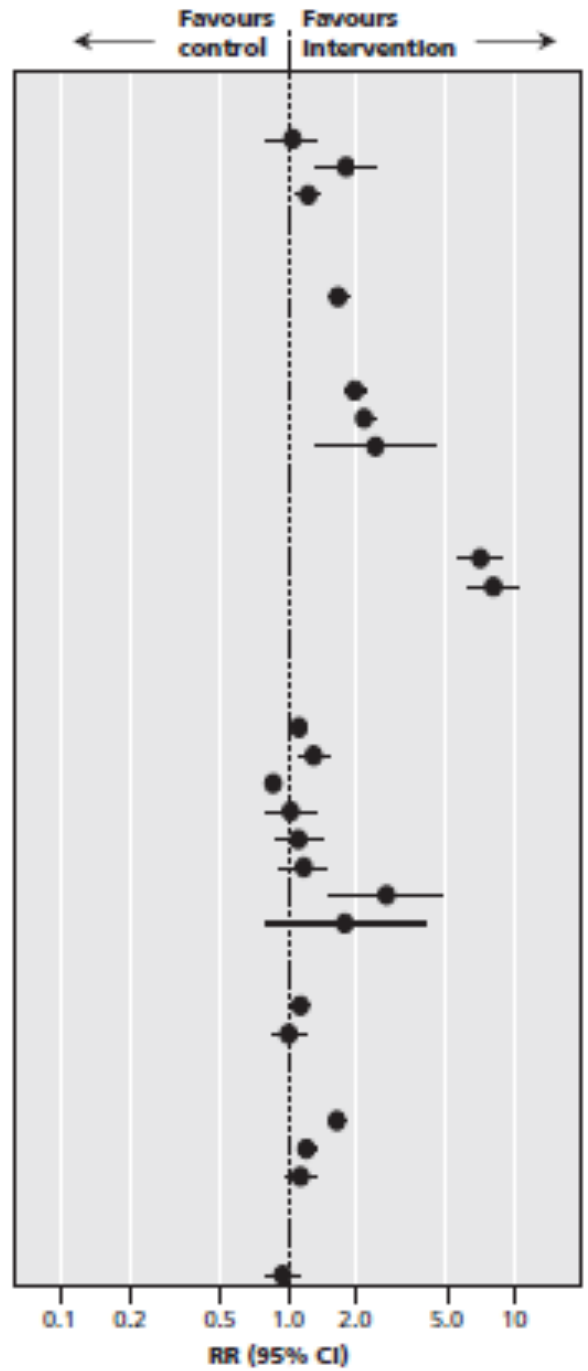
Characteristic	Adjusted OR (95% CI)
Age, per year older	1.03 (0.99-1.07)
Potential influenza source on unit	5.22 (1.08-25.2)
Proportion of HCW vaccinated ≥35%	0.07 (0.005-0.98)

What does this mean?

Improving HCW vaccination rates

Hospital	Program	PCT vaccinated	
		Pre	Post
Cadena, 2011 Single hospital	QI methodology: PDSA cycle, with weekly meetings, force-field analysis, cause and effect diagrams, process flow charts, Gantt charts	59%	77%
Ribner, 2008 Single hospital	task force, senior management visible support, weekly feedback to managers, T-shirt given out to vaccinees, declination form required	43%	67%
Rakita, 2011 Single hospital	Task force, education, on-line modules, champions, incentives	38%	54%
Ajenjo, 2010 Multiple	Education, communication, incentives, feedback, leadership involvement, prizes, competitions, declination forms	45%	72%
Zimmerman, 2009 multiple	Education, communication, incentives, accessibility	32%	39%
Lopes, 2008 Single hospital	Education, communication, incentives, accessibility, leadership involvement	6%	49%

Study	RR (95% CI)	Intervention (*n*/*N*)	Control (*n*/*N*)
Nonhospital setting			
Education or promotion			
Dey et al.[14] — primary care, cluster RCT	1.04 (0.81–1.35)	100/457	83/395
Dey et al.[14] — nursing home, cluster RCT	1.80 (1.33–2.43)	78/768	77/1364
Kimura et al.[16] — cluster RCT	1.22 (1.09–1.38)	298/821	450/1517
Improved access to vaccine			
Kimura et al.[16] — cluster RCT	1.66 (1.50–1.84)	410/832	450/1517
Education + improved access			
Kimura et al.[16] — cluster RCT	1.96 (1.78–2.17)	439/754	450/1517
Lemaitre et al.[17] — cluster RCT	2.16 (1.96–2.39)	678/989	322/1015
Tannenbaum et al.[18] — before–after*	2.43 (1.33–4.41)	32/135	13/133
Education + access + legislation + role models			
Hayward et al.[11] — cluster RCT, year 1	7.06 (5.67–8.78)	570/1610	84/1674
Hayward et al.[11] — cluster RCT, year 2	8.05 (6.30–10.30)	527/1726	67/1766
Hospital setting			
Education or promotion			
Zimmerman et al.[21] — direct,† before–after*	1.11 (1.02–1.21)	1499/3904	430/1247
Zimmerman et al.[21] — indirect,† before–after*	1.29 (1.12–1.50)	640/1478	138/412
Zimmerman et al.[21] — business/admin, before–after*	0.86 (0.80–0.92)	2778/7015	447/969
Doratotaj et al.[19] — letter, RCT	1.03 (0.80–1.32)	78/200	76/200
Doratotaj et al.[19] — raffle, RCT	1.11 (0.87–1.41)	84/200	76/200
Doratotaj et al.[19] — letter + raffle, RCT	1.17 (0.93–1.48)	89/200	76/200
Ohrt et al.[20] — letter, RCT	2.71 (1.53–4.81)	39/180	14/175
Ohrt et al.[20] — call, RCT	1.78 (0.80–3.96)	14/70	8/71
Improved access to vaccine			
Zimmerman et al.[21] — direct,† before–after*	1.13 (1.03–1.24)	960/2461	430/1247
Zimmerman et al.[21] — indirect,† before–after*	1.01 (0.85–1.19)	299/888	138/412
Education or promotion + improved access			
Harbarth et al.[21] — before–after*	1.64 (1.49–1.80)	408/1092	1008/4422
Zimmerman et al.[21] — direct,† before–after*	1.20 (1.11–1.30)	2691/6500	430/1247
Zimmerman et al.[21] — indirect,† before–after*	1.13 (0.98–1.31)	894/2359	138/412
Improved access + measurement, feedback			
Polgreen et al.[22] — before–after*	0.94 (0.80–1.12)	113/195	108/176



But maybe not needed in Malaysia??