

Hospital health care worker (HCW) vaccination coverage after implementation of an HCW vaccination policy

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Abstract

The purpose of this study was to assess knowledge, attitudes, practices, and self-reported vaccination status of HCWs at a tertiary Australian hospital, one year after implementation of a HCW vaccination policy. Two cross-sectional telephone surveys were conducted with HCWs at the hospital prior to and one year after HCW vaccination policy implementation. There was a 95% (272/287) response rate from eligible HCWs in the follow-up survey. Despite 96% (260/272) of HCWs indicating a willingness to update their vaccination status, only 24% (65/272) reported being fully vaccinated. Successful policy implementation requires adequate resource allocation and organisational commitment. Ongoing evaluation can inform the success of this process.

Background

Health Care Workers (HCWs) are at high risk of contracting infections in the workplace (Kuehnert & Cardo 2000; Sepkowitz 1996b; Sepkowitz 1996a), many of which are vaccine-preventable (Sepkowitz 1996b; Kuehnert & Cardo 2000). Occupationally acquired infections in HCWs can result in significant morbidity, and occasionally mortality (Sepkowitz 1996b). There is also the risk of disease transmission to other staff, patients and the community (Carman et al 2000; Gurevich, Barzaga & Cunha 1992; Lambert et al 2000; Rank et al 1992). Recent measles outbreaks in Melbourne in 1999 and 2001, with resultant measles infection and transmission in HCWs (Lambert et al 2000; Skull et al 2001; Kelly, Riddell & Andrews 2002), highlight the problem of vaccine preventable disease (VPD) transmission in HCWs.

HCW vaccination is known to reduce the risk of transmission of VPDs in the workplace (Kuehnert & Cardo 2000; Sepkowitz 1996b; Sepkowitz 1996a; Bolyard et al 1998; NHMRC 2000; CDC 1997), and it is a specific requirement of the Australian Council on Healthcare Standards for infection control in Healthcare facilities

(ACHS 1998). As employers, hospitals have a duty of care to maintain a safe working environment under the Victorian Occupational Health and Safety Legislation (Victorian Workcover Authority 1997).

In 1998, the Department of Human Services (DHS) in Victoria released Immunisation Guidelines for HCWs that were revised in March 2000 (DHS 2000). In response, this hospital implemented a HCW vaccination policy on 1 August 2000. The key elements of the policy were to endorse the DHS HCW Immunisation Guidelines and to advise HCWs about the HCW vaccination recommendations at commencement of employment. The policy stated that an accredited officer must undertake vaccinations, and that informed consent prior to screening or vaccination (or signed documentation for those HCWs who refuse vaccination) was required. HCWs were to be issued with a personal vaccination record, that they were responsible for updating, and they were to be aware of their occupational risk category. The policy made no mention of a staff vaccination database, a DHS recommendation.

The policy initially targeted new employees, requiring them to complete and return a HCW vaccination form within two weeks of commencing employment, and recommending they attend the Staff Health Service (SHS) to review their vaccination status. Reminder notices from the SHS were to be sent to all HCWs who did not return the vaccination forms.

In July 2000, prior to policy implementation, a baseline survey on vaccination was undertaken (Murray & Skull 2002). This survey obtained baseline data on HCWs' vaccination levels, knowledge and attitudes towards vaccination, awareness of occupational risk categories, and of the DHS HCW Immunisation Guidelines.

An initial follow-up survey undertaken in October 2000, three months after policy implementation, did not demonstrate any significant changes from baseline (S. Stewart, in progress 2001). This led to the appointment of a half-time Immunisation Coordinator in February 2001 for a period of six months. The Immunisation Coordinator was predominantly responsible for the organisation of an influenza vaccination campaign, conducted at the hospital during March, April and May 2001 as well as other HCW immunisation activities.

This paper documents the results of a second follow-up survey conducted in July/August 2001, one year after policy implementation, and six months after the appointment of the part-time Immunisation Coordinator. We assessed the impact of the staff vaccination policy on HCW vaccination attitudes and coverage, as well as some aspects of policy implementation.

Methods

Two cross-sectional telephone surveys were conducted at the hospital, in July 2000 (baseline), and July/August 2001 (follow-up). The survey instrument from the initial survey was utilised, to ensure direct comparability of responses between surveys wherever possible. To assess policy impact, additional questions for new employees were included in the survey.

HCWs were selected using proportionate random sampling according to occupational category. A sample size of 412 HCWs was chosen based on the response rate of the baseline survey. This assumed that 30% of staff would be ineligible, 10% of eligible HCWs would not participate, and would result in a final sample size of 257. Assuming a type I error rate of 5% and power of 80%, a sample of this size could detect an improvement in influenza vaccination coverage from 48% to 60% with 95% confidence.

DHS category A and C HCWs (DHS 2000) were eligible to participate, as they had potential contact with blood or body substances at work (Table 1). They were subsequently excluded if they reported that they had not had 'potential exposure to blood or body fluids' within the last 5 years, were bank or temporary employees, on leave during the survey period, or no longer employed at the institution. The methodology for sampling HCWs was identical to the baseline survey, which ensured the survey populations were comparable.

Table 1: Health Care Worker Categorisation (DHS, 2000)

Category	Description	Examples
A Direct contact with blood or body substances	HCWs who have physical contact with or potential exposure to blood or body substances.	Nurses, medical practitioners, allied health practitioners, emergency personnel, dentists, maintenance engineers, mortuary technicians, central sterile supply staff, cleaners responsible for contaminated materials
B Indirect contact with blood or body substances	HCWs who rarely have contact with blood or body substances. May be exposed to infections by droplets, but risk from blood borne diseases is unlikely.	Catering staff, ward clerks
C Laboratory staff	Laboratory staff are at special risk, due the equipment used, and cultured micro-organisms. This risk is in the handling of blood and blood products.	Laboratory staff
D Minimal Patient	Contact No greater exposure to infectious diseases than the general public. They do not need to be included in vaccination programs aimed to protect category A, B and C staff.	Clerical staff, gardening staff

As the policy was initially targeted at new employees, results for this group were specifically evaluated. “New” HCWs were defined as those who had commenced employment since the introduction of the hospital vaccination policy on 1 August 2000. For the baseline survey, “new” HCWs were those who had commenced during the 12 months preceding the baseline survey. The labour categories of all survey participants were divided into three categories, medical, nursing and other.

Introductory letters were sent to all selected HCWs at their work areas. They were then telephoned at the workplace. HCWs were considered ‘not found’ if introductory letters were returned, and efforts to contact them at the workplace failed. HCWs were defined as ‘locatable but contact unsuccessful’ if contact was unsuccessful despite six calls or messages left with either the work location, paging services, or area administrative staff. HCWs who ‘declined to participate’ were those with whom contact was possible but consent was not provided to undertake the questionnaire. A single interviewer then conducted five to ten minute telephone interviews with the participants.

Two definitions for complete vaccination status were utilised, the second definition corresponding more closely to DHS recommendations. For consistency with the baseline survey, Definition 1 considered HCWs fully vaccinated if they fulfilled the following conservative criteria: completed primary childhood course of diphtheria, tetanus and pertussis component vaccines for HCWs born after 1953, primary course of oral polio vaccine (OPV), history of clinical varicella infection or vaccination against varicella, a three dose course of hepatitis B vaccine and serology for seroconversion, influenza vaccine received during the last twelve months and a single dose of measles, mumps and rubella vaccine components for HCWs born since 1970 (all those born prior to 1970 were assumed to be immune to measles through exposure). Definition 2 required that HCWs fulfill the criteria for Definition 1, and in addition, that HCWs born since 1970 had received the recommended second doses of measles, mumps and rubella vaccine components; had evidence of serological immunity to varicella for those with a negative or uncertain history, and a Mantoux test at the commencement of their employment with the hospital.

Epi-Info 6 (CDC 1997) was used for data entry. Data were cleaned for input errors, with clarification by review of survey forms and re-contacting participants as necessary. 20% of surveys were re-entered to estimate the error rate (0.7%). All detected errors were corrected. Stata 6.0 (Stata Corporation 1999) was used to calculate frequency tabulations, percentages and Chi squared statistics. Odds ratios (ORs) were calculated using logistic regression, adjusting for differences in the proportion of HCWs who were fulltime employees, from other labour categories, or were “new HCWs”.

Results

Of 412 HCWs initially sampled, 125 were excluded, leaving 287 eligible to participate. Of these, 272 completed the survey (response rate 95%). Of the 15 non-participants, eight 'declined to participate', one HCW was 'not found', the remaining six HCWs were classified as 'locatable but contact unsuccessful'.

The median age of respondents was 33 years (mean 35, range 20-65). New HCWs comprised 30% of the study population. The age and sex of the participants did not differ significantly from the baseline survey (Table 2), but there were significantly more HCWs who worked full time, more new employees, and more HCWs from "other" labour categories compared with the baseline survey.

Table 2: Demographics of participating HCWs, baseline (2000) & follow-up (2001) surveys

HCW	Baseline n (%)	Follow up n (%)	Odds Ratio: 95% CI	P-value
Female	180/269 (67%)	178/272 (65%)		
Male	89/269 (33%)	94/272 (35%)	1.07: 0.74, 1.55	0.71
Nurses	149/269 (55%)	134/272 (49%)	0.78: 0.55, 1.11	0.15
Doctors	83/269 (31%)	78/272 (29%)	0.85: 0.58, 1.26	0.40
Other	37/269 (14%)	60/272 (22%)	1.77: 1.11, 2.85	0.01
Part time	114/269 (42%)	92/272 (34%)		
Full time	155/269 (58%)	180/272 (66%)	1.44: 1.02, 2.04	0.04
Old staff	219/269 (81%)	191/272 (70%)		
New staff	50/269 (19%)	80/272 (30%)	1.83: 1.23, 2.74	0.003

HCW attitudes

Nearly all HCWs surveyed had a positive attitude towards vaccination. 95% felt it was important or very important to be fully vaccinated, and 96% said they would have a blood test to check their vaccination status, and would update if necessary. These attitudes were consistent with the baseline survey (Table 3).

HCW knowledge

Awareness of the DHS HCW Immunisation Guidelines improved from 20% (53/269) in the baseline survey to 39% (107/272) in the follow-up survey. Only two (0.7%) HCWs could correctly name their occupational risk category and both were new staff (Table 3).

HCWs in the follow-up survey were significantly more likely to cite self-protection (99%), protection of family (16%) and protection of patients (33%) as reasons for vaccination. However, they also gave more reasons not to be vaccinated than at baseline (48% vs 34%). Thirty-three (12%) HCWs said that they were unwilling to have influenza vaccination despite there being no question asking HCWs about their attitude towards influenza vaccination specifically.

In the follow-up survey, 98% of HCWs had heard of the Staff Health Service (SHS), however only 25% could state correctly where it was located. 82% (218/272) knew it provided vaccinations, a statistically significant improvement. Significantly more HCWs (59%, 161/272) reported keeping a written vaccination record, compared with the baseline survey (39%, 106/269) (Table 3).

Table 3: HCW knowledge and attitudes towards vaccination: Baseline (2000) & Follow-up (2001) surveys

	Baseline (%)	Follow-up (%)	OR*	95% CI*	P-value*
Vaccination-important/very important	94%	95%	1.14	0.61, 3.00	0.43
Willing to update vaccinations	96%	96%	0.94	0.40, 2.23	0.90
Willing to have blood test to confirm vaccination status	95%	96%	1.28	0.56, 2.93	0.56
Heard of DHS HCW vaccination recommendations	20%	39%	2.86	1.92, 4.26	<0.001
- Correct HCW category nominated	0%	0.7%	NA	NA	NA
Reasons for vaccination					
- Self protection	80%	99%	18.64	6.55, 53.00	<0.001
- Protect family	4%	16%	3.90	1.20, 7.66	<0.001
- Protect patients	13%	33%	3.40	2.17, 5.35	<0.001
- No reason given	3%	0.74%	0.17	0.36, 0.84	0.03
Reasons not to be vaccinated					
- Side effects	14%	21%	1.65	1.04, 2.61	<0.001
- No reason given	66%	52%	0.54	0.38, 0.78	0.001
Written vaccination record held by HCW	39%	59%	2.17	1.47, 3.31	<0.001
- Up to date vaccination record (if held)	55%	71%	1.87	1.11, 3.16	0.02
Staff Health Service (SHS):					
- Awareness of vaccination availability	67%	82%	2.40	1.57, 3.66	<0.001

* Adjusted Odds Ratio: for occupational category, full/part time, new/old staff

Self-reported vaccination status

24% of HCWs (65/272) fulfilled the criteria for complete vaccination using Definition 1, a non-statistically significant increase from 19% in the baseline survey (Table 4). Only 10% of HCWs from labour categories other than nursing and medical were likely to be completely vaccinated. Using Definition 2, only 5% (14/272) of HCWs surveyed were fully vaccinated. Completion of hepatitis B vaccination and follow-up serology were lower than the baseline survey, although more HCWs in the follow-up survey had received a hepatitis B booster, a BCG vaccination, or a Mantoux test (Table 4). Although influenza vaccination had increased from 48% at baseline to 54% in the follow-up survey, this was not a statistically significant improvement.

Table 4: Self-reported HCW vaccination status: Baseline (2000) & Follow-up (2001) surveys

Vaccination/Immunity	Baseline (%)	Follow up (%)	OR*	95% CI*	P-value*
Fully vaccinated ^a	19%	24%	1.37	0.90, 2.09	0.146
Fully vaccinated ^b	-	5%	NA	-	-
ADT/DTP ^c	85%	82%	0.92	0.57, 1.48	0.735
OPV childhood course	82%	86%	1.72	1.04, 2.85	0.033
Hepatitis B	96%	88%	0.42	0.20, 0.85	0.015
Hepatitis B booster	25%	33%	1.56	1.07, 2.29	0.022
Hepatitis B serology	77%	73%	0.87	0.58, 1.31	0.515
Influenza (in last 1 year)	48%	54%	1.27	0.90, 1.81	0.171
Measles Mumps Rubella (MMR) ^d	3%	90%	0.81	0.43, 1.52	0.504
MMR second dose ^e	-	28%	NA	-	-
MMR serology	33%	35%	1.20	0.83, 1.73	0.337
BCG	62%	76%	2.33	1.57, 3.46	<0.001
Mantoux test -ever	88%	94%	3.31	1.67, 6.55	0.001
Mantoux test -at start of employment	-	25%	NA	-	-
Varicella Zoster Virus (VZV)	80%	77%	0.91	0.60, 1.40	0.676
VZV (positive serology)	-	2%	NA	-	-
VZV (vaccine)	0.4%	1%	10.45	0.98, 111.06	0.052

* Adjusted Odds Ratio: for occupational category, full/part time, new/old staff

a Complete vaccination, Definition 1

b Complete vaccination, Definition 2

c Includes all HCWs born prior to 1953 and those HCWs born after 1953 who reported DTP/ADT vaccination

d Includes all HCWs born prior to 1970 and those HCWs born after 1970 who reported Measles Mumps Rubella (MMR) vaccination

e MMR 2nd dose, as a proportion of HCWs born after 1970

New HCWs

78% (58/80) of new HCWs in the follow-up survey had received the information about vaccination requirements at the commencement of employment, as per the vaccination policy, and 53% (43/80) returned the form. However, only 34% (27/80) visited the SHS or their GP at commencement of employment. No new HCWs had received a reminder for non-returned forms.

New HCWs in the follow-up survey were not significantly different demographically (sex, full/part time, occupational category) from new HCWs surveyed at baseline. They were, however, significantly more likely to state protection of self, family and patients as reasons for vaccination compared with new HCWs in the baseline survey. They were also significantly more aware of the DHS Immunisation Guidelines, more likely to know that vaccinations were available at the SHS, and to have a written vaccination record.

Of new HCWs surveyed at follow-up, 25% (20/80) were completely vaccinated (Definition 1), compared with 30% (15/50) at baseline. Twelve new HCWs (15%) had not had hepatitis B vaccination versus all new HCWs at baseline reporting they had completed the course of three hepatitis B vaccines.

Discussion

HCW vaccination coverage remained unacceptably low one year after introduction of a new vaccination policy for HCWs and six months after the appointment of an Immunisation Coordinator. Despite the vast majority of HCWs stating the importance of vaccination and the improvement in HCW awareness and knowledge at follow-up, most HCWs remained insufficiently protected against VPDs and therefore at increased risk of contracting or acting as a vehicle for the transmission of disease.

Some of the results for specific vaccinations were of particular concern - for example, those HCWs born after 1970 who had not received a second MMR dose. Considering that HCWs are at increased risk of nosocomial exposure to measles (Atkinson 1994; Bolyard et al 1998; CDNANZ 2000) measles vaccination is especially important (CDNANZ 2000; Skull et al 2001; Kelly, Riddell & Andrews 2002). Inadequate knowledge of varicella-zoster virus (VZV) status was also concerning as nosocomial transmission of VZV is a known risk among susceptible HCWs (Stover & Bratcher 1998). Incomplete hepatitis B vaccination status is consistent with a recent study (Thompson & Norris 1999) that also found many hospital HCWs are insufficiently protected against hepatitis B.

The increased number of HCWs with written vaccination records was an encouraging finding since this is known to be associated with increased vaccination rates (CDC 1997; Bolyard et al 1998; Thompson & Norris 1999). However more than half of the survey respondents still did not keep such a record.

Using self report of vaccination status is likely to have resulted in recall bias, though it is difficult to know whether this resulted in an over- or under-estimation of HCW vaccination status (Murray & Skull 2002). There was one source of potential data contamination identified during the survey, the influenza vaccination campaign that was run at the hospital during 2001. Campaign awareness might have had a positive impact on HCW attitudes, knowledge, and vaccination rates for influenza, which, of note, were low.

The minimal improvement noted in HCW vaccination coverage is likely to have been in part due to inadequate policy implementation. For example, there was no system in place to follow-up returned vaccination forms of new HCWs. Previous studies have also demonstrated that the simple existence of a policy is not necessarily associated with improvements in staff vaccination coverage (Russell 2001).

Policy implementation requires organisational commitment. This must include designation of responsibility for policy implementation and adequate resources (staff time and money) for these activities. Evaluation of policy implementation can contribute to this process through monitoring of the health outcomes, knowledge, attitudes and practices of concern.

Inconsistency between hospital policy and practice is a potential occupational health and safety concern (Thompson & Norris 1999). Successful implementation of vaccination policies is required to ensure health care workers and their patients are protected from vaccine preventable diseases.

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