IMMUNISATION: Does Practice Reflect Preaching?

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ABSTRACT
The issue of childhood immunisation is never too far from the minds of paediatricians and paediatric allied health professionals. The recent implementation by the Australian Government of the establishment of a National Immunisation Register appropriately signifies its recognition of the importance of immunising children for vaccine preventable diseases, and with the requirement by schools for proof of immunisation on enrolment will serve to remind parents and health professionals of the need to vaccinate the children in their care.

"The issue of childhood immunisation is never too far from the minds of paediatricians and paediatric allied health professionals".

But do the carers maintain their own immunisation? A number of studies, including a very large serological survey in the United States, have indicated that the proportion of the population which has protective levels of antibody to vaccine preventable diseases diminishes rapidly after the age of the last scheduled childhood immunisation. Average serological immunity to tetanus in populations of developed countries is in the 50-70% range, but when age is included in the analysis, the rates vary from about 96% at age 6, to as low as 40% for those over seventy years old, with the latter being the age group at highest risk of tetanus infection. Slightly better results are found in studies of healthcare workers, which confirmed declining levels of immunity with increasing age.

We recently completed a study of a Sydney population of ages over 40 years which has confirmed that local rates of immunity are similar to those published in studies conducted overseas. In a separate study, we examined the tetanus, diphtheria, Haemophilus influenza type b (Hib) and pneumococcal antibody levels of 51 staff of the Childrens Hospital. At the time of this serosurvey, neither Hib nor pneumococcal immunisation were routinely available, but immunisation of adults for tetanus and diphtheria could easily be obtained by vaccinating with ADT.

We report here that the levels of immunity to tetanus and diphtheria in a group of Childrens Hospital staff, who are occupationally exposed to both vaccine-preventable diseases and to copious immunisation literature, were in agreement with published findings.

These findings demonstrate the vulnerability of a health-orientated professional group to certain vaccine-preventable diseases, and the failure of health care staff to demonstrate increased awareness of the value of vaccination for adults at risk, compared to the lay population. We conclude that existing proimmunisation literature, which targets children for immunisation, fails to suggest the importance of up to date immunisation for adults, and indicates the need for a specific educational campaign in support of adult immunisation, also observed overseas.

Introduction
Numerous studies published in the last decade have examined immunisation practices in developed countries, with the emphasis of these studies being on coverage of populations thought to be at greatest risk of the vaccine preventable diseases: children. A number of studies have examined rates of immunity in older children and adults, and a consistent finding in the United States, European countries and New Zealand, is for reasonably high level of immunity to be found in children and young adults, with this level declining with the increasing age of the population group studied. No large study of rates of immunity has been published for Australian populations.

In this project, which is part of a study of broader scope, we examined the rates of immunity of staff of a children's hospital to certain vaccine preventable diseases: tetanus, diphtheria, Haemophilus influenza type b (Hib), and pneumococcus. At the time of this study, vaccination for Hib and pneumococcus was not performed routinely. This childrens hospital has a good record of being proactive in the promotion of childhood immunisation, during the
period of the study conducting "on the- 
spot" immunisation to its Accident and 
Emergency Department. Staff of the 
hospital are well aware of the 
importance of childhood immunisation, 
but we reveal here that the levels of 
immunity in those staff are no higher 
than those published for the general 
population.

Our results indicate that campaigns 
for immunisation of children do not 
necessarily promote awareness of the 
need for vaccination of adults, even in 
a population highly motivated towards 
immunisation.

Materials and Methods

We recruited 51 staff members of the 
Children's Hospital Camperdown, from 
Nursing, Allied and Technical, Clerical 
and Medical staff groups, who gave 
informed consent for serology to be 
performed on a sample of blood 
collected for this research. Total staff 
numbers of the hospital were 
approximately 2000. No attempt was 
made at randomisation, nor was there 
any effort made to include or exclude 
volunteers who had actively 
participated in childhood 
immunisation programs conducted by 
the Hospital.

There were 18 Nursing staff (18 
female, 0 male), 6 Allied & Technical 
staff (3 female, 3 male), 6 Clerical staff 
(4 female, 2 male) and 21 Medical staff 
(8 female, 13 male). The group studied 
are not representative of Hospital staff 
generally, and management is 
particularly under represented in this 
group.

Serum prepared from a single blood 
sample collected by venepuncture from 
the volunteers was included in routine 
assays for IgG antibody specific for 
tetanus toxoid, diphtheria toxoid, Hib 
capsular antigen, and the capsular 
antigens of three serotypes of 
pneumococcus which are included in the 
Pneumovax vaccine. Serology was 
performed by well established 
"in-house" ELISA assays which are used 
for routine diagnostic purposes in a 
laboratory registered by the National 
Association of Testing Authorities.

For immunity to Hib, the levels of 
specific antibody accepted as being 
protective are 1.0 ug/ml for long term 
protection, with levels of 0.15 ug/ml 
or higher indicating immunity at the 
time of testing. There are no 
universally accepted levels of specific 
antitype which are considered 
protective for tetanus or diphtheria, 
but in a normal healthy patient we 
would report immunity as uncertain 
when antibody levels are below 0.2 
EU/ml. For pneumococcal serology, 
protective levels of antibody are not 
known, and we compare patient levels 
to a reference standard pool of post 
immunisation, normal adult human 
sera, which has an arbitrary 1000 units 
of specific IgG antibody.

Volunteers were advised of the 
results of serological tests on their blood 
samples, and were offered advice about 
their need for vaccination. A follow-up 
study will examine the number of staff 
with low or absent immunity, who 
sought immunisation after their results 
were made known.

Results

Tetanus serology

Overall 3/51 (6%) had no serological 
immunity to tetanus, and a further 
2/51 (4%) had borderline positive titres. 
Thus, we considered 90% of staff to be 
adequately protected from tetanus. 
The remaining 10% were all female, 
and were medical or nursing staff.

Diphtheria serology

Overall 28/51 (56%) had no serological 
immunity to diphtheria. 8/18 (44%) 
males were not immune, evenly 
distributed in the professional groups. 
20/33 (61%) females were not 
immune, with significantly greater 
numbers of non-immunes in the 
medical and clerical groups.

Haemophilus influenzae type b serology

Overall 28/51 (56%) had no serological 
immunity to Haemophilus influenzae 
type b (Hib). These were evenly 
distributed among gender and 
professional groups.

Pneumococcal serology

Overall 41% of staff had high levels of 
antibody to at least one of the 
pneumococcal serotypes tested. 
Nursing and medical staff were more 
likely to be immune. More male 
medical staff were immune than female 
medical staff (80% of males, 14% of 
females), and 62% of nursing staff 
were immune to at least one serotype of 
Streptococcus pneumoniae, with 
25% of the immunes tested having high 
levels of antibody to all three serotypes

tested.

Discussion

Healthcare staff are subjected to a 
significant amount of exposure to 
information about immunisation, and 
at a childrens hospital are, in particular, 
informed of the importance of 
vaccinating children. Many medical, 
nursing, and technical staff are 
selectively immunised during training, 
or preemployment, for at least tetanus 
and hepatitis B.

At a paediatric treatment centre, 
one can expect to routinely encounter 
patients infected with diphtheria, 
Haemophilus, or S. pneumoniae 
(pneumococcus). Results not shown 
here indicate that the highest levels of 
serological immunity to diphtheria were 
found in medical staff of the Infectious 
Diseases and Casualty departments of 
this children's hospital, which may 
reflect increased exposure.

The results of our tetanus antibody 
seroxervey, surprisingly, place the non-
imune individuals within the medical and 
nursing staff. Even so, the proportion 
of staff who are immune is well above 
that reported for the general popu-
lation. Therefore, staff should be aware 
of the need for immunisation.

Our study also had a higher 
proportion of individuals immune to 
diphtheria than the general population 
(where levels of serological immunity 
may be extremely low, particularly in 
adults). This cannot be accepted as 
indication of immunisation, because of 
the high likelihood of exposure of some 
of the staff to the disease organism.

The fact that such a large proportion 
of the staff have no serological 
immunisation to diphtheria more likely indicates that 
very few have been recently immunised for 
diphtheria.

In the case of Haemophilus 
influenza type b (Hib) immunity, a 
history of immunisation of these adults 
is unlikely, and positive titres probably 
reflect recent infection with this 
organism. Nearly half of the staff 
therefore have results suggestive of 
fairly recent infection with Hib.

Similarly, vaccination of healthy staff 
with Pneumovax is unlikely, and the 
fact that only 25% of "immunes" had 
high levels of antibody to each of the 
three serotypes tested, suggests that 
these antibodies are the result of 
natural exposure.

In this context, therefore, the 
presence of antibodies is likely to be the 
result of natural infection, and this is 
seen in about half of the staff, for each 
organism tested.

Approximately 2.5% of the Hospital 
staff were tested, with an emphasis on 
staff at the frontline of exposure to 
infectious diseases; the nursing and 
medical staff. For all agents tested, 
other than tetanus which is not a 
common infection in children less than 
half of the staff are immune to these 
vaccine preventable diseases.

Our results are consistent with 
the recently published findings of studies 
conducted overseas on general 
populations, revealing a significant 
proportion of the adult population to 

“Vaccines for tetanus and diphtheria are well established, and have been used for many years to protect children and military personnel.”

be lacking protective levels of antibodies to certain vaccine-preventable diseases.

Vaccines for tetanus and diphtheria are well established, and have been used for many years to protect children and military personnel. Vaccines are successful, suitable, inexpensive, and easily accessible. Hib vaccines are now also easily accessible and shown to be effective, though, like the pneumococcal vaccine (Pneumovax 23) are not routinely prescribed for adults.

The Childrens Hospital Camperdown [now at Westmead] is proactive in the field of childhood immunisation, participating in educational campaigns, and performing “on-the-spot” immunisation of children visiting the Accident & Emergency Department who had an incomplete vaccination history. Generally, the staff in this Hospital are quite aware of the importance of vaccination.

In such a climate of vaccine-awareness, one might assume that our volunteers would have considered their own immune status, particularly with the increased possibility of occupational exposure to some of these vaccine-preventable diseases. Our results show that the proportion of this group with protective levels of antibody was little higher than that of the general population, based on results of other published studies. Protection for diphtheria, for which there is a routine available vaccine, was no higher than protection for Hib and pneumococcus.

Conclusions

Our results indicate that, for any organism tested (other than tetanus), about half of the staff have had a natural exposure. This study was not capable of evaluating morbidity data, and the consequent cost of sick leave, and was not designed with the intention of performing a cost-benefit analysis of immunising hospital staff for these vaccine-preventable diseases. Nonetheless, if we attribute two days’ sick leave for each infection with each organism (excluding tetanus), the total amounts to about 2.5 thousand sick-days, with a resulting cost far in excess of the cost of the vaccinations.

We conclude that the campaigns which promote childhood immunisation, although they are targeted at those who care for children, are not successful in promoting awareness of the need for immunisation by adults, even in a group of paediatric healthcare staff. These results indicate the need for an adult immunisation awareness program.

References


Sharps Container Alert

A recent incident in NSW highlights the need to ensure the safe placement of sharps containers.

A child visiting a general practitioner's surgery received a needlestick injury following the insertion of a hand into a sharps container placed on the floor. The Royal Australian College of General Practitioners document Sterilisation/Disinfection Guidelines for General Practice, 1994, when referring to sharps containers states that “Care should be taken in the placement of such containers so that children cannot reach them under any circumstances. Specifically sharps containers must not be located on the floor, as children have been observed to place their hands inside containers.”

The NSW Health Department's Infection Control Policy also requires placement of containers such that they are not easily accessible to children.

All practitioners are requested to assist in the wide dissemination of this information and undertake preventative measures. NSW Health Department June 1996