

# An audit of health student immunisation at a University Department of Rural Health reveals the imperative for a coordinated approach

Caroline Crossley,<sup>1</sup> Sandra Thompson<sup>1</sup>

Vaccination is a public health success story, having contributed enormously to improvements in global health.<sup>1</sup> The public health emergency with COVID-19 has highlighted the importance of a systematic approach to the control of infectious disease, particularly for highly exposed groups such as healthcare workers (HCWs), including students in clinical environments. A successful COVID-19 vaccination is likely to be included in HCW vaccination recommendations, with health workers a targeted priority group. Hence, it is a timely reminder of the importance of immunisation, and it is essential to ensure that Australia is ready with a clear and coordinated HCW immunisation assurance system inclusive of all health professionals and students. Vaccination of student HCWs is an essential component for ensuring worker and student safety in an environment that poses high risks of pathogen contact. Moreover, student HCW vaccination is important not only for the protection of students themselves, but to protect the patients who are under their care, particularly vulnerable patients who cannot be vaccinated or are unlikely to respond well to vaccination as a consequence of their health conditions. These vulnerable individuals are more likely to have contact with health services and hence student HCWs. Students may be more susceptible to contracting and spreading diseases due to their relative inexperience, including with the use of personal protective equipment, and their potential reluctance to miss clinical learning opportunities even

## Abstract

**Objective:** Student healthcare worker immunisation ensures the protection of students, their patients and the wider community. This audit assessed allied health students' records of immunisation against national standards.

**Methods:** This audit examined clinical students' immunisation records at a University Department of Rural Health and assessed their compliance with the national Australian Immunisation Handbook recommendations. Gaps in processes were assessed through a review of forms, guidelines and stakeholder feedback.

**Results:** Around one-quarter (26%) of healthcare students provided evidence that they were immunised in line with national standards. Inconsistency of immunisation recommendations across universities, states and disciplines were identified.

**Conclusions:** This audit highlighted gaps in healthcare student immunisation assurance processes at both local and national levels, and we recommend key elements that would be required for a more consistent, streamlined and coordinated approach.

**Implications for public health:** As a pillar of communicable disease control, immunisation compliance continues to pose important public health challenges. Without further work towards coordination of healthcare students' immunisation assurances, there is a risk of preventable morbidity and mortality in vulnerable communities, as well as suboptimal student and worker safety in an environment that poses high risks.

**Key words:** student, vaccination, immunisation, healthcare, allied

if they have symptoms. This means that improving student HCW immunisation has the potential to contribute to a reduction in infection-related morbidity and mortality and the associated demands on health services. Therefore, it is of practical and ethical importance that students do all they can to ensure their own immunity and subsequent reduced transmission of vaccine-preventable infections to other HCWs and to their patients.<sup>2</sup>

The evidence regarding the benefits of immunisation for HCWs and the wider

community is extensive. Hepatitis B can be acquired from percutaneous or mucosal exposure to blood or other bodily fluids. It is recommended that all workers and students whose work activities involve direct contact with patients or body fluids should be immunised for hepatitis B.<sup>3</sup> Influenza is a severe illness among those with chronic diseases, infants, seniors and pregnant women, all of whom more frequently have contact with healthcare settings. Research has shown that vaccination of both staff and patients in healthcare settings reduces

1. Western Australian Centre for Rural Health (WACRH), University of Western Australia

**Correspondence to:** Dr Caroline Crossley, Western Australian Centre for Rural Health, University of Western Australia, Fitzgerald Street, Geraldton 6530, Perth, WA 6009; e-mail: caroline.crossley@uwa.edu.au

Submitted: June 2020; Revision requested: August 2020; Accepted: December 2020

The authors have stated they have no conflict of interest.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

*Aust NZ J Public Health.* 2021; 45:108-15; doi: 10.1111/1753-6405.13075

death in elderly patients<sup>4</sup> and randomised controlled trials have also shown decreased worker absenteeism when implementing annual influenza vaccination in healthcare settings.<sup>5</sup> The immunisation of HCWs for pertussis, rubella and varicella is predominantly for the secondary protection of pregnant women and infants, as well as other vulnerable groups such as those with chronic illness. One dose of MMR vaccine is 93% effective against measles, 78% effective against mumps and 97% effective against rubella.<sup>6</sup> Two doses of MMR vaccine are 97% effective against measles and 88% effective against mumps.<sup>6</sup> Measles has severe complications such as pneumonia and encephalitis, and as measles has one of the highest viral infectivity rates, outbreaks involve a high cost, hence the importance of ensuring HCW immunisation to prevent rapid spread through communities. Rural communities are generally not as well-resourced to deal with outbreaks of infectious diseases.

The WA Centre for Rural Health (WACRH) is one of 16 University Departments of Rural Health (UDRHs) across Australia. UDRHs undertake teaching, research and evaluation in areas relevant to rural and population health.<sup>7</sup> WACRH operates in the Midwest and Pilbara regions of Western Australia and provides multidisciplinary rural health practicum placements, education and support for allied health and nursing students from a variety of universities across Australia. While the UDRH program is intended to support Australian residents, placements include some international students enrolled in Australian courses. Most students are in their final or penultimate year of study.

Students attend for healthcare placements at the centre or partnering organisations in the local community. Student placements include contact with potentially vulnerable clients, such as patients in hospitals, primary care and aged care settings. Around 10% of the local population is Aboriginal, and students often have opportunities to work in the local Aboriginal Medical Service. Aboriginal people have higher rates of chronic disease,<sup>8</sup> and therefore may be more susceptible to and have poorer outcomes from infectious diseases.

Students attending WACRH clinical placements are asked to provide evidence to their rural clinical supervisor that they are compliant with their university immunisation recommendations before commencing. Concerns were raised by these supervisors in relation to understanding and interpreting some of the vaccination information that they received, as evidence and recommendations varied depending on the university and state of enrolment of the students. Due to this variation, it was unclear to the relevant supervising staff at the centre whether the students were optimally immunised to protect themselves and the community.

Accordingly, to better understand the nature of the problem, an audit was undertaken with the aim to:

- determine the proportion of health students on practicum placement at the UDRH centre who provided evidence of immunisation for the following vaccinations, based upon current national guidelines (Table 1): hepatitis B, diphtheria-tetanus-pertussis (hereafter referred to as dTp), measles-mumps-rubella (hereafter referred to as MMR), varicella, influenza; and

- better understand the systems of immunisation assurances for students, in particular for allied healthcare students.

## Methods

### Student selection

Records of all allied health students who attended for clinical placement in the Midwest directly through WACRH between 1 January 2019 and 31 December 2019 were included in the audit. This included students enrolled in speech pathology, occupational therapy, physiotherapy, social work, exercise physiology, dietetics, audiology, pharmacy and podiatry. Any students not enrolled in healthcare courses were excluded.

### Audit tool

A checklist was developed that collected seven demographic variables: age, sex, healthcare discipline, enrolling university, state of origin, residential status and any medical contraindication to vaccination. In addition, we ascertained whether sufficient evidence for immunisation against the five vaccine types recommended for HCWs, including students, had been obtained by the centre. These included hepatitis B, dTp, MMR, varicella and influenza. A further two fields recorded serological testing information and the format in which immunisation evidence was provided to the centre. Lastly, we considered whether the vaccine and serological immunity evidence was provided in a format that could be understood by a non-expert. This was deemed important, as forms are generally assessed by discipline supervisors or administrative staff with no formal training in immunisation and serological interpretation.

### Ethics approval

Ethics exemption for the project was approved by the University of Western Australia.

### Data collection

Stored student records were reviewed by one auditor (CC) with experience in medicine and public health using the audit data collection tool described. All data was collected from a confidential folder containing student records, or from emails obtained from the relevant disciplinary supervisors. Prior to beginning data collection, an email was sent to all supervisors requesting that

**Table 1: Summary of the NHMRC Australian Immunisation Handbook (3) recommendations for the immunisation of healthcare workers, including all workers and students directly caring for patients.**

Immunisation	Recommendation for healthcare workers, including students:
Hepatitis B	Hepatitis B vaccine is recommended for people who work in an occupation that involves any of: direct patient care, handling human tissue, blood or body fluids, or handling used needles or syringes. Evidence of an age-appropriate vaccination course plus serological evidence of immunity is required.
Diphtheria-Tetanus-Pertussis	Healthcare workers are recommended to receive a pertussis-containing vaccine every 10 years and should be up to date with the standard immunisation schedule for diphtheria and tetanus. There are additional requirements for specialised laboratory workers who work with diphtheria samples.
Measles-Mumps-Rubella	Healthcare workers are strongly recommended to have received 2 doses of measles-mumps-rubella containing vaccine at least 4 weeks apart given at ≥12 months of age unless they have evidence of serological immunity to all three diseases.
Varicella	Healthcare workers are strongly recommended to receive 2 doses of varicella vaccine given at least 4 weeks apart unless they have a history of varicella infection or serological evidence of immunity to varicella.
Influenza	Healthcare workers are strongly recommended to receive an annual influenza vaccine.

immunisation data be uploaded to the relevant folder if this had not already been completed, to reduce the issue of incomplete documentation. Immunisation evidence was available in a variety of formats, including pathology results, university immunisation forms and immunisation schedules. Demographic information was obtained from student registration forms and any relevant allergy or other medical contraindication to vaccination was obtained from a pre-orientation health screening form. In addition, interviews were undertaken with allied health supervisors to gain their perspective on the challenges they had experienced with obtaining, interpreting and managing student immunisation prerequisites. We communicated with 12 supervisors and other professionals from a variety of disciplinary backgrounds and states who are actively engaged in student healthcare worker immunisation.

### Data analysis

Audit findings were analysed using descriptive statistics in Microsoft Excel. Adherence to the guidelines was calculated using proportion analysis to ascertain the percentage of students who were compliant with immunisation recommendations for the five vaccination types: hepatitis B, dT<sub>p</sub>, MMR, varicella and influenza, as per the recommendations in the *Australian Immunisation Handbook*. This data was further examined by residential status and age. Where demographic data was missing, for example, residential status, these students were excluded from the analysis for that category only. It should be noted that although information on student discipline of study, state and university were obtained, numbers for these categories were too small for meaningful analysis. However, they were useful at a local level for delivering service improvement measures, whereby discipline results were presented at face-to-face meetings with individual supervisors, and qualitative feedback around challenges with obtaining and clarifying immunisation status of students was obtained.

### Results and discussion

Of the 150 students, 118 (79%) were female, and 94 (63%) were under the age of 25 years (range 20 to 51 years). Just over one-quarter (26%) of the students were attending their rural practicum placement from interstate.

There were 15 international students, with an additional eight students not having their residential status recorded; hence, international students made up between 10% and 15% of this student group. There were no students with documented medical contraindications to vaccination.

The detail on documented completed vaccination for hepatitis B, varicella, MMR and dT<sub>p</sub> immunisation is reported in Table 2. Only 31% of students had evidence of influenza vaccination within the winter season (May to October). When influenza vaccine was excluded, 54 out of 150 (36%) of students provided evidence that they met the recommendations for the other four vaccine types. However, for all five standard immunisations recommended in the *Australian Immunisation Handbook*,<sup>3</sup> only 39 out of 150 students (26%) had provided evidence confirming that they were fully immunised.

The highest rates of immunisation compliance were with the dT<sub>p</sub> vaccine (63% fully compliant), followed by MMR (57%), varicella (55%) and hepatitis B (48%). Excluding influenza, rates of compliance decreased as the number of vaccine doses required increased. If HCWs are requiring hepatitis B vaccination as an adult, they require at least three doses and a serology result; this vaccination had the highest rate of 'partial' compliance. We speculate that the need for multiple vaccinations and blood tests, and the fact that most vaccinations incur costs that are not funded by universities, may lead students to delay vaccinations until they commence employment unless they are enforced as part of the course requirements. However, it could also be argued that a potential complementary strategy might be to teach the ethical principles behind vaccination as part of student healthcare

curriculums. As Maltezos (2011) postulated:

*HCWs refusing immunisation could argue that the implementation of a mandatory vaccination scheme conflicts with the ethical principle of personal autonomy because the right to freely choose not to get vaccinated is suspended. Nevertheless, we should take into account two other ethical principles that are equally important: non-maleficence (the moral obligation to not to harm others) and beneficence (the moral obligation to act for the benefit of others). In light of this aspect, one would argue that HCWs have the obligation to take all appropriate measures to protect their vulnerable patients and thus should get vaccinated.<sup>18</sup>*

In addition, it has been shown that medical students who are concerned about patient safety are significantly more likely to have been vaccinated against influenza.<sup>19</sup> Therefore, the importance of emphasising the duty of care for patients in promotional materials<sup>20</sup> or via declination statements should not be underestimated in their potential effectiveness.

Influenza vaccination is recommended yearly for HCW students in the *Australian Immunisation Handbook*, and this vaccination had the lowest rate of completion at only 31%. This may be due to most university immunisation forms being completed only once at course commencement, the way that the influenza vaccination element on many university forms is worded, or unclear university recommendations on influenza vaccination for healthcare students. Each of these aspects is discussed further below. The low rates of influenza vaccination are particularly concerning given the evidence that immunisation of HCWs can aid in reducing mortality rates in the elderly. For example, it has been shown that vaccinating care home staff against influenza can prevent deaths, health service use and influenza-like

**Table 2: Documented immunisation status by vaccine, residential status and age group.**

All Students (n=150)	Hepatitis B N (%)	Diphtheria, Tetanus, Pertussis N (%)	Measles, Mumps, Rubella N (%)	Varicella N (%)	All Four Vaccines N (%)
<b>Immunised</b>	72 (48)	95 (63)	85 (57)	82 (55)	54 (36)
<b>Partially Immunised</b>	29 (19)	0 (0)	17 (11)	7 (5)	54 (36)
<b>No evidence of Immunisation provided</b>	49 (33)	55 (37)	48 (32)	61 (41)	42 (28)
<b>Immunisation by Residential Status<sup>a</sup></b>					
Domestic (n=127)	64 (50)	86 (68)	78 (61)	74 (58)	37 (29)
International (n=15)	7 (47)	8 (53)	6 (40)	7 (47)	2 (13)
<b>Immunisation by Age</b>					
<25 (n=94)	43 (46)	58 (62)	54 (57)	48 (51)	24 (26)
25+ (n=56)	29 (52)	37 (66)	31 (55)	34 (61)	15 (27)

Note:

a: The 8 students without a documented residential status have been excluded from this analysis only.

illness in residents.<sup>21,22</sup> However, this result is not surprising given that there have been longstanding problems with achieving high rates of influenza vaccination in health care settings, indicating the ongoing challenges in this area.<sup>23,24</sup> Healthcare students have also been shown to be the least likely health professionals to be vaccinated against influenza.<sup>25</sup> Another study concluded that it is likely that policies or mandates will be needed to significantly increase uptake of the seasonal influenza vaccine in HCWs.<sup>26</sup> When guidelines are conflicting, it makes education, awareness-raising and consistency of messaging very difficult. This may be particularly applicable to students who have limited knowledge of vaccination benefits within the healthcare environment. Embedding vaccination as a requirement for student HCWs may offer an important component for improving future uptake and would warrant further longitudinal studies.

### Residential status

Although there were low numbers of international students available for comparison, there were indicative differences observed in the vaccination status of domestic and international students. International students enrolled in Australian health degrees are expected to have immunisation documentation equivalent to Australian domestic students. Of concern, rates of vaccination compliance for MMR appeared to be lower for international students, at 40% compared to 61% for domestic students (Table 2). Given higher rates of measles overseas and the episodic occurrence of imported cases in Australia,<sup>27</sup> improving MMR vaccination rates and documentation is important to lessen the risk of further outbreaks. Additionally, dT<sub>ap</sub> vaccine documentation compliance was apparently lower in international students (Table 2). Further assessment of these differences in a larger group is recommended.

### Age

Vaccination recommendations have changed over time based on vaccine availability, evidence and costs. For example, the individual measles vaccine was first registered in Australia in 1968, the mumps vaccine in 1969 and the rubella vaccine in 1980. The combined MMR vaccine was not introduced until 1989.<sup>28</sup> The varicella vaccine was scheduled for 18 months of age in 2005 with a catch-up for secondary school students.<sup>29</sup> In

addition, access to immunisation records has improved over time. The Australian Childhood Immunisation Register (ACIR) was introduced in 1996 to record all immunisations administered to children from birth to seven years of age with the earliest year of birth for which data was recorded being 1989. This was superseded by an expanded Australian Immunisation Register (AIR) in 2016 that records immunisations given to people of all ages in Australia.<sup>30</sup> Hence, older students could have more challenges accessing historical vaccination records. The audit did not demonstrate any differences in vaccination rates for students younger than 25 years compared to mature students (Table 2), although the number of mature students in this audit was small.

### Documentation of immunisation evidence

Overall, 109 of 150 (73%) students provided some evidence of immunisation. Forms were stored in various files, which varied by health discipline. Students provided information in different formats, most commonly specific university immunisation forms (60%), followed by personal vaccine schedules (36%) and laboratory reports (27%).

Each university had its own immunisation sign-off form. While they included the same core immunisations, form presentation and terminology differed greatly. In reviewing and interpreting the evidence of immunisation compliance provided by the students, three key issues were identified.

The first was the clarity of evidence of vaccination and immunity provided. Few students provided their evidence in the format of an Australian Immunisation Register (AIR) list. It should be possible for the majority of Australian-born students to obtain their childhood and more recent vaccination record from AIR. However, this would not include the additional serology results required by their university, which could be one reason that evidence was not often provided in this format. Another reason could be the difficulties reported with the AIR system initially, in failing to capture all vaccinations because of the wide range of locations in which adult vaccines are administered and not all providers having the capability for electronically uploading information.<sup>31</sup> University forms varied widely in their simplicity and consequent ease of understanding for the recipient. The most common difficulties encountered were with

the interpretation of serology results for hepatitis B, MMR and varicella immunisations. Serology results proved difficult to interpret in nearly one in every five forms (19%) provided. Reasons for this included that results were provided as numbers (without a reference range) that could not be interpreted by 'non-experts', or that results were written as 'positive' or 'negative' without explanation of what this means. One university's immunisation prerequisite form was particularly unclear as it was not formatted to allow a space for the serology results to be written for hepatitis B, MMR and varicella. The easiest forms to understand were those that had 'immune' and 'non-immune' tick boxes completed by a general practitioner, leaving no room for misinterpretation. For influenza, an additional problem was noted with the wording of some university immunisation sign-off forms, many stating only that the general practitioner had 'recommended' the vaccine. This meant that there was no evidence that it had been administered unless the student elected to provide this evidence, or the university provided an additional separate form. Similar issues have been noted in the US, with a study concluding that education was required for health professional schools on the acceptable forms of evidence required to meet national immunisation standards.<sup>32</sup>

Secondly, there were differences in immunisation evidence requirements across states, territories, universities and disciplines. The majority of professional bodies representing the allied health disciplines of the students base their immunisation recommendations on Department of Health guidelines or the requirements stipulated by placement sites. States and territories have developed their own policies and guidelines based on the *Australian Immunisation Handbook* and this was evident when reading the university forms and guidelines from interstate students. Although the national guidelines stipulate the immunisations recommended for HCWs, they are not prescriptive in how the recommended standards are met. For the 26% of students who attended for placement from interstate, the issue of compliance was more complex as they may have been compliant in their home state, but this did not translate directly to the standards recommended in WA. Differences in the immunisation evidence requirements across states and territories are highlighted in Table 3. As an example, determining

varicella immunity is particularly important for those students working in environments with immunosuppressed patients, pregnant women or newborns. Given this significance, the evidence for proving immunity needs to be clarified to ensure national consistency, based on the best available evidence. Whether or not influenza vaccination was deemed mandatory for students also varied greatly, even within the same state, with the consequences of remaining unimmunised against influenza unclear. This makes it very difficult for WACRH and other placement institutions to know whether influenza immunity is included when a university informs them that the student is ‘fully compliant with immunisation requirements’. In our follow up with immunisation advisors, we learnt that there are plans to address this at a state level. However, national consistency on health student influenza vaccination recommendations would be helpful, particularly for those students travelling interstate for practicum placements in rural areas.

Following this audit, we have developed a draft immunisation policy and we are consulting the WA universities regarding implementation. This approach aims to improve compliance and documentation at a local level through standardised forms, supervisor education and declination statements for unimmunised students. Feedback from staff at other UDRH sites throughout Australia has identified that systems and pathways vary widely with respect to processes for checking student immunisation evidence. For example, the responsibility for ensuring immunisation compliance before a student attends for placement may lie with the parent university, the UDRH or the placement site. Therefore, these are issues that cannot be solved at a local level alone and would benefit from greater clarity and consistency at a national level. A nationally consistent approach, once fully implemented, could be more efficient and easier to oversee at a local level, and would likely result in higher rates of student immunisation and appropriate documentation.

The third aspect that proved challenging related to the timing of vaccinations; this was a particular issue for pertussis and influenza vaccines. The audit revealed that university immunisation prerequisite forms are generally one-off forms completed at the beginning of the student’s course. However,

dates of vaccinations that are recommended at regular intervals need to be checked to ensure that they remain current. One university did not require dates of vaccination to be specified on their form, so it was not possible to know whether the student met these recommendations.

**Feedback from stakeholders, including local supervisors and immunisation experts**

Feedback was obtained from WACRH clinical supervisors, and three key issues emerged related to obtaining immunisation evidence from students. The first issue related to the inconsistencies of national, state, university and clinical placement site immunisation recommendations. This made it difficult to understand what was required of student documentation to be able to sign them off as compliant. The second issue to emerge was that much of the effort to obtain immunisation evidence seemed inefficient and duplicative, with a commonly expressed view that a change was needed to make the process as straightforward as possible for staff and students. Thirdly, in the absence of a standardised record for reporting, and given that staff were not trained on the vaccinations recommended or how to interpret the immunisation evidence given to them by students, a process for review of student immunisation records by someone with suitable training in vaccination and serological testing was needed. Feedback and advice were also obtained from two immunisation policy experts, where an additional issue was raised around

confidentiality concerns for student records, particularly when provided to multiple institutions. For example, serological blood results for hepatitis B could inadvertently reveal carrier status to third parties.

**Barriers and enablers**

The circumstances of the rural university placement site with the diversity of students attending for placement reveals an important public health issue that cannot be solved at a local level alone. The challenge of receiving various disciplines of students, from different states and enrolling universities, has highlighted the need for clearer recommendations and a standardised approach to recording and reporting vaccination and immunity status. It is not realistic to expect field placement supervisors to interpret information that is provided in a plethora of formats. Moreover, where responsibility sits for ensuring students comply fully with immunisation recommendations is not clear. An additional issue with most systems at present is that they are not ‘living’ forms, but rather are a one-off point of data entry. A mechanism is needed to ensure that immunisations requiring regular updates have automatic flagging systems in place to inform a university and student when their immunisations need updating, such as the yearly recommendation for influenza vaccination. An online platform would be best suited to this, and a trial of such a program has been successfully used to monitor influenza vaccination coverage of healthcare workers in a Sydney local health district.<sup>33</sup>

**Table 3: Examples of immunisation requirements in the Australian Immunisation Handbook (3) and how these are interpreted and implemented as outlined in current State and Territory Government healthcare worker policies and guidelines.**

Immunisation	Australian Immunisation Handbook Recommendations <sup>a</sup>	State and Territory Variations
Varicella	The Australian Immunisation Handbook recommends two doses of varicella vaccine for unimmunised HCWs unless a person has a history of varicella or serological evidence of immunity.	‘History’ of varicella is not defined in the Handbook: Queensland Health accepts physician-diagnosed varicella infection as evidence <sup>9</sup> and Australian Capital Territory Government Health accepts laboratory diagnosed varicella, <sup>10</sup> others states do not specify.
Diphtheria and Tetanus	The Australian Immunisation Handbook recommends a dT <sub>ap</sub> booster every 10 years and that healthcare workers are up to date with the standard immunisation schedule for diphtheria and tetanus.	WA and SA require a declaration that a primary course of dT <sub>ap</sub> has been completed but do not require evidence of this. <sup>11,12</sup> For all other states, evidence of a diphtheria and tetanus primary immunisation course does not appear to be required. <sup>9-16</sup>
Influenza	The Australian Immunisation Handbook strongly recommends that healthcare workers are vaccinated against influenza each year.	In NSW it is mandatory for all category A high-risk position <sup>b</sup> workers. <sup>17</sup> In most other states, it is recommended but not mandated. WA policy is currently under review.

Notes:  
 a: This additionally states HCWs should ‘be up to date with routinely recommended vaccines for adults’.  
 b: Category A high risk positions includes workers in antenatal, postnatal and neonatal care, intensive care units, transplant or oncology units.<sup>17</sup>

As raised during stakeholder feedback, students who are carriers of blood-borne viruses (BBVs), particularly hepatitis B, could have their confidentiality eroded through the serological testing processes involved with immunisation programs. This draws attention to the need for any immunisation system to be sensitive to the security of personal information, and to avoid the potential for discrimination and stigma. The current mixed methods for proving immunity make this difficult for students with a BBV-positive status. National guidelines state that HCWs, including students, are not obliged to tell their employer of a positive BBV result but must be managed and advised regarding monitoring and work practices by a medical practitioner.<sup>34</sup> Therefore, it is of importance that any new system is accessible by medical practitioners as well as university and placement site staff. It should allow for pertinent information to be uploaded for each immunisation (for example: immune, not immune, vaccinations in progress, or under medical review), without the need to show specific laboratory results.

As an example of progress being made, the state of Victoria has been working on standardising healthcare student immunisation recommendations across universities, and there is now an arrangement that they will aim for adherence to the agreed immunisation guidelines for all healthcare students across the state.<sup>14</sup> This agreement will be used by all placement sites attended by students from all universities. It provides a detailed list of the immunisations recommended, and the evidence needed to show immunity, so that all sites are fully aware of the immunity status of their students. There are procedures in place to ensure that student confidentiality is maintained through the recommendation that original immunisation information is only provided by the student to their original education provider, who is then responsible for informing the clinical placement sites that the student is immune or non-immune to each of the diseases outlined in the protocol (hepatitis B, influenza, measles, mumps, rubella, pertussis and varicella). If the student is not fully immune, the recommendation is that the placement sites make the necessary adjustments to accommodate the student safely where possible, but both the education provider and clinical site may refuse a student placement if an unacceptable risk is posed. The changes were well received by the state health sector,

with 95% agreeing that there are benefits to standardisation.<sup>14</sup> The aim is to achieve a centralised database where all immunisation compliance data can be recorded. Another example of a state-based system is that used by the Rural Clinical School of Western Australia, which accepts medical students from a variety of universities for a one-year rural placement. They use a standardised electronic database for inputting student immunisation information at the beginning of their rural year, which is a way of reducing the variations in requirements between universities and ensuring that all students are immunised to the same standard. However, this labour-intensive step could be reduced if there was a central and standardised system for all universities to input immunisation information at the beginning of each course. There are many other examples of electronic systems being used to store immunisation information, but these tend to be siloed, in that only certain universities or sites have access to them. This limits their use in reducing duplication of effort and improving efficacy. The siloed nature of the systems also means that it is not clear which system ultimately holds overall responsibility, with different agents potentially believing that another agent in the system has the required information and responsibility. Therefore having one system would reduce the risk of under immunised students 'slipping through the cracks'.

A nationally consistent system that integrates and uses information stored on the AIR would make sense and is an approach that was not possible a decade ago. The AIR is the national database for entering and storing information about vaccines administered to individuals of all ages. However, as noted in this study, it is rarely used at present by healthcare students to provide evidence, which could be due to its inability to store evidence of serological immunity or due to the initial difficulties experienced with uploading vaccination information, particularly those administered in non-clinical settings such as in workplaces and pharmacies.<sup>31</sup> There is potential to adapt and update the AIR platform to allow for immunity status to be uploaded for HCWs and health students in a way that maintains confidentiality, as described above. A nationally consistent database, even if implemented and coordinated at a state government or local level, would empower individual placement sites to make informed decisions to enable the protection of their

patients and staff based on this one source of immunisation knowledge rather than a reliance on the current mixed information channels. This would also reduce duplication of efforts and staffing workload both at university and placement sites.

### Limitations

Audits provide insight into organisational performance and highlight opportunities for improvement. Like any audit, findings rely upon documentation. Documentation will not necessarily accurately reflect the immune status of the students, and it is likely that more students were fully immunised than are indicated. For example, supervisors may have documentation that has not been uploaded into electronic files or they may have verbally received confirmation that students were immunised. However, if this is the case, it does highlight the need for a more robust process whereby student immunisation can be assured even at times when a primary supervisor is not available. Given that students participate in multiple placements at different sites during their training, there is a case for a simpler, centralised repository of information to which supervisors could be granted access. It is also possible that students are immune to the various diseases but have not been able to obtain the required evidence due to access or cost barriers. For example, international students may have difficulty obtaining vaccination records from overseas. Obtaining the views of students around immunisation processes would be an important next step in determining the key elements that enhance the ease of obtaining immunisation evidence.

This study did not include an audit of hepatitis A immunisation. The guidelines state that people who regularly provide care for Aboriginal children or who live or work in rural or remote Aboriginal communities in Western Australia (among other areas) should be immunised against Hepatitis A,<sup>3</sup> due to the higher prevalence. During the course of this study, we recognised that a number of staff and students might meet this prerequisite, so this warrants further consideration.

### Recommendations

This audit has highlighted the gaps in health student immunisation assurance systems and has shed light on that which would be required, through streamlined national or state-specific databases, to allow for consistent and standardised processes.

Based on the evidence from this audit and subsequent review of available systems, the key elements required would include:

- standardisation of immunisation and evidence recommendations across educational institutions, states and territories, with requirements actioned through digitalised forms in an online repository;
- built-in confidentiality assurances;
- automated systems that inform a university and student when immunisations need updating; and
- training capabilities for all relevant staff members at each university site and/or department to ensure consistent data entry capabilities across sites.

## Conclusions

Audits are an important part of improving organisational effectiveness.<sup>35</sup> As they rely upon documentation, our findings may underrepresent student vaccination and immunity against vaccine-preventable diseases. However, this audit made evident why staff overseeing clinical allied health student placements reported concerns in interpreting the immunisation evidence they were provided by students and has helped our understanding of the nature and extent of the problem. Generally, there is now a proactive approach to vaccination of health staff and students who interact with patients, rather than a 'high risk' approach with individual assessment of likely exposures. However, given that immunisation recommendations and policies vary between organisations and states, and change over time, this is an area that often requires more specialised expertise than most allied health supervisors currently receive.

The COVID-19 pandemic has shown the importance of strong and coordinated systems for enhancing communicable disease control. However, this audit has highlighted ongoing gaps in the systemic processes of assuring compliance of health care students with immunisation recommendations at the 'coal face'. Given the hope of COVID-19 vaccines soon being available and the high likelihood that these will be recommended for healthcare workers including health students, a more robust system of immunisation documentation for health students should be a priority. Ideally, this should be nationally consistent, recognising

that health professionals can be mobile, both during their student training and during their working life. It is also evident that a more uniform approach is required across Australia to ensure that immunisation guidelines for student HCWs are adhered to. There is already an established 'truth' – the *Australian Immunisation Handbook* – and aligning with this in a coordinated manner may be the most straightforward way to achieve this. The current study has shown that a database for healthcare worker immunisation is long overdue, particularly one that captures nationally standardised healthcare worker immunisation recommendations and is accessible in all Australian states and territories. One national database already serving this function is the AIR and this register could work for the majority of domestic students if it was updated to allow for storage of serological information. It is also possible to upload vaccination information to the AIR for non-Medicare entitled persons, making it a flexible option that could also include international students.

Collaborative input from both the university and healthcare sectors, as well as students, will be important for designing a streamlined system. This will ensure the achievement of a system that is accessible, acceptable and feasible on the ground, and will expedite meeting the aim of assuring documented high immunisation rates for healthcare students in line with nationally standardised policy. In the long run, a coordinated immunisation system would reduce the patchwork of arrangements and would enable a safer healthcare environment for all. From a public health perspective, this approach will help to ensure the protection of healthcare students, the patients under their care and the wider community from vaccine-preventable communicable diseases, an issue that remains of high importance.

## Funding

We would like to acknowledge that the Western Australian Centre for Rural Health receives core funding as part of the rural health workforce development program of the Australian Government Department of Health. Dr Caroline Crossley receives training support as part of the Specialist Training Program, which is administered by the Royal Australasian College of Physicians.

## References

1. Greenwood B. The contribution of vaccination to global health: Past, present and future. *Philos Trans R Soc Lond B Biol Sci.* 2014;369:2013.0433. doi.org/10.1098/rstb.2013.0433.
2. Hooste W, Bekaert M. To be or not to be vaccinated? The ethical aspects of influenza vaccination among healthcare workers. *Int J Environ Res Public Health.* 2019;16(20):3981.
3. Australian Department of Health. *Australian Immunisation Handbook: Vaccination for People at Occupational Risk* [Internet]. Canberra (AUST): Government of Australia; 2018 [cited 2020 Jun 8]. Available from: <https://immunisationhandbook.health.gov.au/vaccination-for-special-risk-groups/vaccination-for-people-at-occupational-risk>
4. Thomas RE, Jefferson T, Lasserson TJ. Influenza vaccination for healthcare workers who work with the elderly. *Cochrane Database Syst Rev.* 2010;2:CD005187.
5. Saxen H, Virtanen M. Randomized, placebo-controlled double blind study on the efficacy of influenza immunization on absenteeism of health care workers. *Pediatr Infect Dis J.* 1999;18:779.
6. Centers for Disease Control and Prevention. *Measles, Mumps, and Rubella (MMR) Vaccination* [Internet]. Atlanta (GA): CDC; 2019 [cited 2020 Jul 16]. Available from: <https://www.cdc.gov/vaccines/vpd/mmr/public/index.html>
7. Lyle D, Greenhill J. Two decades of building capacity in rural health education, training and research in Australia: University departments of rural health and rural clinical schools. *Aust J Rural Health.* 2018;26(5):314-22.
8. Australian Bureau of Statistics. *4714.0 - National Aboriginal and Torres Strait Islander Social Survey, 2014-15* [Internet]. Canberra (AUST): ABS; 2016 [cited 2020 Jul 16]. Available from: <https://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/4714.0>
9. Queensland Health. *Guideline: Vaccination of Healthcare Workers* [Internet]. Brisbane (AUST): State Government of Queensland; 2016 [cited 2020 Nov 9]. Available from: [https://www.health.qld.gov.au/\\_data/assets/pdf\\_file/0029/444872/vaccination-of-healthcare-workers.pdf](https://www.health.qld.gov.au/_data/assets/pdf_file/0029/444872/vaccination-of-healthcare-workers.pdf)
10. Canberra Health Services. *Participation in Occupational Assessment, Screening and Vaccination* [Internet]. Canberra (AUST): Government of the Australian Capital Territory; 2020 [cited 2020 Jun 8]. Available from: <https://health.act.gov.au/sites/default/files/2020-06/Form%201%20update%200620.pdf>
11. Western Australia Department of Health. *Health Care Worker Immunisation Policy* [Internet]. Perth (AUST): State Government of Western Australia; 2012 [cited 2020 Jun 8]. Available from: <https://www2.health.wa.gov.au/-/media/Files/Corporate/Policy-Frameworks/Public-Health/Policy/Health-Care-Worker-Immunisation-Policy/OD388-Health-Care-Worker-Immunisation-Policy.pdf>
12. South Australian Health. *Prospective SA Health Employees Screening Form* [Internet]. Adelaide (AUST): State Government of South Australia; 2019 [cited 2020 Jul 29]. Available from: [https://www.sahealth.sa.gov.au/wps/wcm/connect/e9d0a7c5-8cfe-4f99-b6f7-f689c2cdd8fb/W+immunisation+screening+form+-+Prospective+employee\\_v1.5-20191008.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-e9d0a7c5-8cfe-4f99-b6f7-f689c2cdd8fb-mUkosNO](https://www.sahealth.sa.gov.au/wps/wcm/connect/e9d0a7c5-8cfe-4f99-b6f7-f689c2cdd8fb/W+immunisation+screening+form+-+Prospective+employee_v1.5-20191008.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-e9d0a7c5-8cfe-4f99-b6f7-f689c2cdd8fb-mUkosNO)
13. Health Protection NSW. *Occupational Assessment, Screening and Vaccination Against Specified Infectious Diseases* [Internet]. Sydney (AUST): State Government of New South Wales; 2020 [cited 2020 Nov 9]. Available from: [https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2020\\_017.pdf](https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2020_017.pdf)
14. Victorian Department of Health and Human Services. *Standardised Student Induction Protocol* [Internet]. Melbourne (AUST): State Government of Victoria; 2019 [cited 2020 June 8]. Available from: <https://www2.health.vic.gov.au/health-workforce/education-and-training/student-placement-partnerships/standardised-student-induction-protocol>

15. Northern Territory Department of Health. *Staff Immunisation Assessment, Screening and Vaccination Form* [Internet]. Darwin (AUST): Government of Northern Territory; 2020 [cited 2020 June 8]. Available from: <https://digitallibrary.health.nt.gov.au/prodjspu1/bitstream/10137/1010/1/Staff%20immunisation%20assessment%2c%20screening%20and%20vaccination%20form.pdf>
16. Tasmanian College of Health and Medicine. *Tasmanian Student Immunisation Record* [Internet]. Hobart (AUST): University of Tasmania; 2019 [cited 2020 June 8]. Available from: [https://www.utas.edu.au/\\_\\_data/assets/pdf\\_file/0004/462631/Tasmanian-Student-Immunisation-Record-Form.pdf](https://www.utas.edu.au/__data/assets/pdf_file/0004/462631/Tasmanian-Student-Immunisation-Record-Form.pdf)
17. New South Wales Department of Health. *Influenza Vaccine Information for NSW Health Workers* [Internet]. Sydney (AUST): State Government of New South Wales; 2019 [cited 2020 June 8]. Available from: <https://www.health.nsw.gov.au/Infectious/Influenza/Pages/health-professionals.aspx#1>
18. Maltezou HC, Tsakris A. Vaccination of health-care workers against influenza: Our obligation to protect patients. *Influenza Other Respir Viruses*. 2011;5:382-88.
19. Walker L, Newall A, Heywood A. Knowledge, attitudes and practices of Australian medical students towards influenza vaccination. *Vaccine*. 2016;34:6193-99.
20. Munyaradzi NG, Kelly DA, Macey DJ, Mak DB. Student-centered interventions the key to student health care worker influenza vaccination. *Infection, Disease & Health*. 2016;21(3):108-115.
21. Carman WF, Elder AG, Wallace LA, McAulay K, Walker A, Murray GD et al. Effects of influenza vaccination of health-care workers on mortality of elderly people in long-term care: A randomised controlled trial. *Lancet*. 2000;355(9198):93-7.
22. Hayward AC, Harling R, Wetton S, Johnson AS, Munro S, Smedley J, et al. Effectiveness of an influenza vaccine programme for care home staff to prevent death, morbidity, and health service use among residents: Cluster randomised controlled trial. *Br Med J*. 2006;333:1241.
23. Lam PP, Chambers LW, MacDougall DM, McCarthy AE. Seasonal influenza vaccination campaigns for health care personnel: Systematic review. *CMAJ*. 2010;182(12):e542-8.
24. Stuart MJ. *Review of Strategies to Enhance the Uptake of Seasonal Influenza Vaccination by Australian Healthcare Workers*. Canberra (AUST): Australian Department of Health; 2012.
25. Hogan V, Lenehan M, Hogan M, Natin DP. Influenza vaccine uptake and attitudes of healthcare workers in Ireland. *Occup Med*. 2019;69:494-9.
26. Seale H. Seasonal influenza vaccination in Australian hospital healthcare workers: A review. *Med J Aust*. 2011;195(6):336-8.
27. MacIntyre I, Karik S, Sheikh M, Zwar N, Heywood A. The role of travel in measles outbreaks in Australia – An enhanced surveillance study. *Vaccine*. 2016;34(37):4386-91.
28. National Centre for Immunisation Research and Surveillance. *Significant Events in Measles, Mumps and Rubella Vaccination Practice in Australia* [Internet]. Sydney (AUST): NCRIS; 2019 [cited 2020 Nov 9]. Available from: <https://ncirs.org.au/sites/default/files/2019-12/Measles-mumps-rubella-history-Dec%202019.pdf>
29. Victorian Department of Health and Human Services. *Vaccine History Timeline* [Internet]. Melbourne (AUST): State Government of Victoria; 2019 [cited 2020 June 8]. Available from: <https://www2.health.vic.gov.au/public-health/immunisation/immunisation-schedule-vaccine-eligibility-criteria/vaccine-history-timeline>
30. Western Australia Department of Health. *Australian Immunisation Register* [Internet]. Perth (AUST): State Government of Western Australia; 2019; [cited 2020 June 8]. Available from: [https://www.healthywa.wa.gov.au/Articles/A\\_E/Australian-Immunisation-Register](https://www.healthywa.wa.gov.au/Articles/A_E/Australian-Immunisation-Register)
31. Hull B, Hendry A, Dey A, Macartney K, McIntyre P, Beard F. *Exploratory Analysis of the First 2 Years of Adult Vaccination Data Recorded on AIR*. Sydney (AUST): National Centre for Immunisation Research and Surveillance; 2019.
32. Dolan S, Libby T, Lindley MC, Ahmed F, Stevenson J, Strikas RA. Vaccination policies among health professional schools: Evidence of immunity and allowance of vaccination exemptions. *Infect Control Hosp Epidemiol*. 2015;36(2):186–91.
33. Gadsden T, Bateman-Steel C, Chaverot S, Ressler KA, Chee K, Redwood L et al. Using a computerized database (REDCap) to monitor influenza vaccination coverage of healthcare workers and staff in South Eastern Sydney Local Health District. *Aust Health Rev*. 2020 Aug 28. doi: 10.1071/AH20006
34. Communicable Diseases Network Australia. *Australian National Guidelines for the Management of Healthcare Workers Living with Blood Borne Viruses and Healthcare Workers who Perform Exposure Prone Procedures at Risk of Exposure to Blood Borne Viruses* [Internet]. Canberra (AUST): Australian Department of Health; 2018 [cited 2020 Jun 8]. Available from: [https://www1.health.gov.au/internet/main/publishing.nsf/Content/36D4D796D31081EBCA257BF0001DE6B7/\\$File/nat-guidelines-work-bbv-Oct2019.pdf](https://www1.health.gov.au/internet/main/publishing.nsf/Content/36D4D796D31081EBCA257BF0001DE6B7/$File/nat-guidelines-work-bbv-Oct2019.pdf)
35. Woodhouse D. Quality improvement through quality audit. *Qual High Educ*. 2003;9(2):133-9.