


REVIEWS

Building a pharmacy workforce from the ground up to support the COVID-19 vaccine rollout: lessons learned and recommendations

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Abstract

The COVID-19 pandemic has required an unprecedented surge in the pharmacy workforce to support mass vaccination hubs. This review discusses the challenges faced while training and credentialing a surge pharmacy workforce and how these challenges were overcome. The process used for training and credentialing new employees has been described and recommendations and insights have been provided based on the lessons learned at two COVID-19 mass vaccination hubs in New South Wales. Operationalising one of the largest mass vaccination hubs in Australia required efficient training and credentialing of the pharmacy workforce. This process included the use of pharmacist-extenders such as students, assistants, and those from other healthcare and non-healthcare backgrounds. Training was optimised by using a flipped classroom model, so that the vaccine preparation process was provided via asynchronous online videos. The videos covered each step of vaccine dose preparation with visual cues to guide appropriate technique. On-site training involved use of simulation and checklists for credentialing. Many factors contributed to the success of this process, including the use of triaging and the re-allocation of personnel based on skill level, collaboration with the Sydney Pharmacy School to train and support a surge workforce involving students, initial on-site information technology support in the form of pharmacy superusers, the use of checklists and guides for troubleshooting, and assigned pharmacy educators to train new employees. The public health response to the COVID-19 pandemic forced us to rapidly adapt to build a pharmacy workforce in record time to support mass vaccination hubs. The recommendations and insights provided from our experience can guide future surges. Some of these concepts may also be applied to pharmacy practice in hospitals when resources are constrained.

Keywords: COVID-19, education, pharmacy, vaccination, workforce.

INTRODUCTION

The first COVID-19 vaccine available in Australia, the Pfizer–BioNTech COVID-19 vaccine, was provisionally approved on 25 January 2021.¹ Soon after, the Royal Prince Alfred Hospital (RPAH) vaccine hub began operations as the first COVID-19 mass vaccine centre in the state of New South Wales (NSW). This was followed by the NSW Health Vaccination Centre (NHVC) at Sydney Olympic Park, which at the time, was the largest vaccine hub in Australia. At peak capacity, the NHVC was

administering more than 10,000 Pfizer–BioNTech COVID-19 vaccine doses and a very limited number of AztraZeneca COVID-19 vaccine doses per day. This resulted in a surge in the need for pharmacy staff to prepare and dispense at an unprecedented scale, a complicated mRNA product from multidose vials for the mass vaccination hubs.

The population of NSW in 2021 was approximately 8 million, with most people residing in the Greater Sydney metropolitan area.² Vaccinating the eligible population in the shortest time possible required a substantial pharmacist workforce surge in these vaccine hubs. The rapid transmission of SARS-CoV-2 worldwide and resulting morbidity and mortality, saw the introduction of strict rules for movement, travel, testing, and isolation in an effort to reduce the number of COVID-19 cases

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throughout Australia. The decision by the NSW state government that many of these COVID-19 restrictions would be lifted when 70% of those 16 years and older were fully vaccinated, served as an additional incentive to ramp up the vaccine rollout.

The priority for pharmacist staffing by NSW Health had clearly shifted to support the vaccination effort. In early October 2021, NSW reached the 70% vaccination threshold and currently Australia has one of the highest vaccination rates in the world.³ While this success was driven by several factors, the mass vaccination hubs and the pharmacy personnel who staffed these hubs played an important role in facilitating this result.

The aim of this review is to provide the perspective and insights of pharmacists and academic leaders in the Sydney Local Health District (SLHD) who led and supported the COVID-19 vaccine rollout. This paper describes, from a pharmacy workforce perspective, how the challenges to support the mass vaccination hubs were addressed, the processes used for training and credentialing, and finally, offers recommendations and insights based on these experiences.

WORKFORCE CAPACITY AND PROCESS

Function of the Workforce

Operationalising a mass vaccine hub requires significant and detailed planning.⁴ There are many factors to consider including but not limited to the environment, security, space, supplies, logistics, and the workforce.⁴ From a pharmacy perspective, the core function was to ensure the cold chain was maintained, and to ensure preparation and distribution of the vaccine with a key focus on medication safety and rigorous documentation.

COVID-19 vaccine dose preparation had to be accurate, timely, fully traceable at each step of the process, within cold chain parameters, with near minimal wastage, and use best practice techniques to minimise both product degradation and the risk of microbial contamination. Some appropriately credentialed pharmacists were also directly involved in vaccine administration. However, in the earlier phases of the vaccination hub, this latter role was a secondary aspect of pharmacy involvement. Thus, the number of pharmacy personnel needed was driven by the volume of vaccine doses that were required for dispensing and preparation. For example, at peak capacity, it was estimated that the NHVC required more than 120 full-time equivalent (FTE) pharmacy personnel to staff the hub from 7.00am to 9.00pm, six days per week (the NHVC

was closed on Sundays), which presented a formidable challenge.

Vaccine Dispensing Process

The SLHD model had pharmacy staff prepare and label the vaccine in a syringe from the primary multidose vial. The standard pharmacy dispensing software (iPharmacy® [Dedalus Global, Milan, Lombardy, Italy]) was used, which incorporated processes such as store transfers, distribution, and dispensing. This meant that the pharmacy information communication technology (ICT) processes were familiar to many of the staff and the training burden was thus reduced. The batch number, vial expiry, and syringe expiry were presented on the label and were embedded into a barcode. This enabled subsequent scanning to transfer information into the vaccine system, which was then sent to the Australian Immunisation Register. This ensured a closed loop system for the vaccine with electronic tracking of the vaccine from the moment it arrived in the hospital through to administration to each person. Each vaccine was checked before it left the pharmacy by an Australian Health Practitioner Regulation Agency (Ahpra) registered clinician with medicine expertise (e.g. pharmacist or nurse).

Defining the Workforce

As the COVID-19 vaccination hubs started operations, pharmacists were primarily drawn from hospitals in the SLHD to provide initial leadership and develop the workforce. This had a cascading effect on hospital pharmacy services, which had to temporarily transition to a lower capacity and fewer services. For example, the antimicrobial stewardship pharmacist at RPAH became the chief pharmacist at the NHVC. As this was not sustainable, the workforce had to be built quickly from the ground up by utilising a variety of personnel that could be trained as 'pharmacist-extenders' to perform key tasks. Pharmacist-extenders have been defined as pharmacy students, assistants, or technicians who can support the provision of pharmacy services.⁵ People came from diverse backgrounds that included administrative staff, laboratory technicians, scientists, veterinary assistants, dentists, and nurses. In addition, students were recruited from across pharmacy, medicine, and nursing. The single largest group recruited were pharmacy students (>100 FTEs) from the Sydney Pharmacy School at The University of Sydney to support the RPAH and NHVC hubs. In the following section, we detail the key methods used to train this diverse workforce to support the vaccine hubs.

TRAINING AND CREDENTIALING

Vaccination Modules

The initial certification for working in a COVID-19 vaccination hub was provided upon completion of Australian Government Department of Health vaccination training modules, based on an e-learning platform.⁶ All personnel were required to complete these modules prior to on-site training at the vaccine hubs. The modules provided a broader overview of vaccine handling, storage, communication, use of multidose vials, documentation, reporting, and safety surveillance. While the Department of Health modules provided an excellent general foundation to vaccination principles and processes, they were not targeted to the specific training needs of a workforce in the COVID-19 mass vaccination hubs. As such, they were not regarded as a substitute for training in the key local process, such as drawing up vaccine, use of dispensing software, labelling, verification, and quality control that needed to be done on-site. Thus, the decision was made to develop a local training process tailored to the needs of pharmacy staff in COVID-19 mass vaccination hubs. The local process included critical elements such as vaccine transfers and dispensing, donning of personal protective equipment, aseptic technique, safe needle and syringe handling, precise preparation, best practice labelling, critical cross-checking, and accurate recording. The process was reviewed and approved by the SLHD.

Addressing Skills and Knowledge Gaps

Initially, only a limited number of pharmacists in the SLHD had sufficient training and competency with sterile compounding and aseptic technique. This was particularly evident with pharmacist-extender staff who did not generally have the basic syringe/needle handling skills fundamental to drawing up the vaccine. Thus, in addition to a lack of knowledge, there was also a lack of 'muscle memory' or motor skills (the psychomotor domain of learning) which had to be developed for each trainee.⁷ Some trainees had physical limitations related to eyesight, spatial perception, or manual dexterity, which were identified as limitations during training. While this did not affect their usual role as a pharmacist in the health sector, it made these staff unsuitable for vaccine dose preparation. Furthermore, as the workforce came from a variety of experience backgrounds, some had pre-existing habits that required correction and further training to meet approved standards for vaccine dose preparation. Baseline knowledgebase varied considerably between

personnel, which resulted in some staff achieving competency sooner than others. Often delays in training were due to an inability to routinely and consistency follow protocolised steps in vaccine dose preparation (e.g. failing to clean the vial with an alcohol swab). Thus, training was initially resource intensive and required several instructors. This was challenging because there were competing demands for instructors to also meet vaccine dose preparation requirements. After multiple iterations, the local training process was optimised to maximise efficiency. This final process is described in the next section.

Local Training and Support

The process for on-site training changed over time based on an iterative process of quality assurance and training modification. The process evolved to become more efficient and less resource intensive, while maintaining the impact and effectiveness of the skills and knowledge training. The final training process is depicted in Figure 1. The three main components can be summarised as: (1) video training resources, (2) simulation, and (3) credentialing process. Explanations for each component are provided below. Using this training process, 10–15

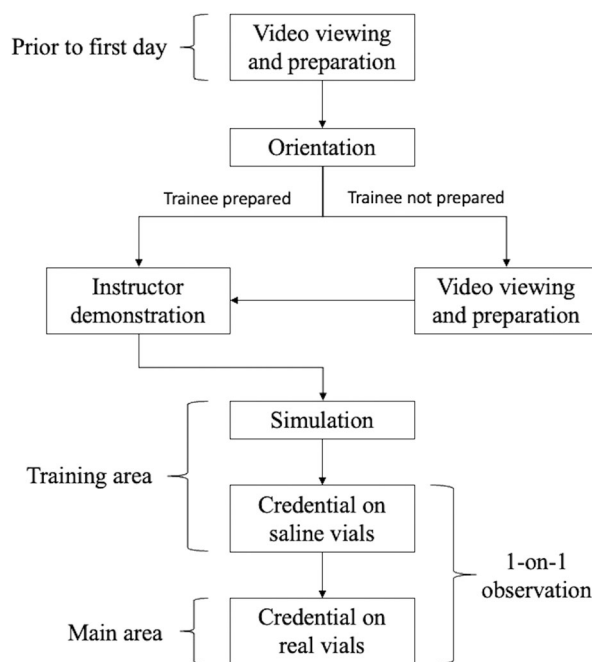


Figure 1 Flow diagram of the COVID-19 vaccine dose preparation training and credentialing process. Legend: Trainees viewed the vaccine training videos prior to arrival at the site. This was followed by orientation, training, simulation and credentialing.

staff per day were credentialed for COVID-19 vaccine dose preparation using two to three instructors.

Video Training Resources

Initially, trainee orientation was followed by a slide presentation. As this was the first-time trainees were exposed to the vaccine dose preparation process, the presentation often took longer than intended and some learners were unable to grasp the content adequately prior to practical training. This process was subsequently revised, and video training resources were developed for the specific process used in the SLHD mass vaccination hub that could be studied prior to on-site training. The training video covered each step with visual cues to guide appropriate technique. Students were asked to know and recall each of the dose preparation steps prior to on-site training, akin to the flipped classroom education model.⁸ In this model, content is provided ahead of time so the learner, at their own pace, can focus on developing and applying skills while in the classroom. Although compliance with such preparation can often be low in the academic environment,⁹ some learners, such as pharmacy students, were particularly motivated to participate in the COVID-19 mass vaccination hubs. The video training resources supported students to understand what they would be doing ahead of time and was deemed to be timesaving during the vaccine dose training and credentials process. In other words, the time taken to explain the process and for students to memorise and innately perform the various steps was offset by their prior preparation. Finally, learners could focus to a greater extent on their technique during training rather than having to learn the steps needed for vaccine dose preparation.

Simulation

The process for vaccine preparation was demonstrated by a pharmacist educator on simulated vaccine vials. This was done to reinforce what was learned in the training video and provide additional practical tips. Trainees then used simulated multidose vials to practice their technique. These were previously used vaccine vials, labelled as training vials. The empty vials were cleaned and prefilled with a small volume of saline to simulate vaccine volume. Air pressure in each vial was equalised to mimic the expected forces that are felt during dilution and dose withdrawal from COVID-19 multidose vials containing real vaccine. Trainees were asked to perform each step of the vaccine dose preparation process several times, until they had developed the required motor skills and comfort level needed to progress further. This was coined the 'saline school' at the

NHVC and was a segregated area away from the actual COVID-19 vaccine dose preparation area.

Credentialing Process

A dual credentialing process was followed once trainees were deemed ready. Trainees were assessed on the full process, starting from initial handwashing. A checklist approved by the SLHD was used to observe trainees' completion of the process on simulated COVID-19 vaccine vials. This was followed by the same assessment process on actual COVID-19 vaccine vials. In some cases, trainees were sent back to 'saline school' if errors were observed during the actual COVID-19 vaccine preparation assessment. After the two credentialing steps (i.e. simulated vials and actual vials), students were assigned a workstation and could start preparing vaccines independently for a final check by a registered pharmacist or nurse.

RECOMMENDATIONS AND INSIGHTS

The lessons learned from the COVID-19 vaccination rollout can be applied to future circumstances when a surge workforce is needed and to other aspects of routine hospital pharmacy practice in resource-limited environments. The public health response to the COVID-19 pandemic revealed a circumstance where there were relatively few pharmacist educators (all with competing demands), numerous trainees, and a resource intensive process, which was further compounded by a low baseline skill level of trainees. Below are a few recommendations based on our experience to address such circumstances. These are not listed in any specific order.

Recommendation 1: Hospital pharmacy departments should catalogue and video record simple and repetitive tasks that may encompass pharmacy operations.

Actual workflows and repetitive tasks can be conveyed to trainees ahead of time and asynchronously via brief training videos. Such technology is neither novel nor difficult but is rarely incorporated into routine training education. Video training resources enable a trainee to re-watch key tasks or processes that would otherwise need to be learned via trial and error. Familiarity with local hospital processes and protocols via advanced preparation will help trainees to more rapidly contribute to processes during a pandemic. This is particularly valuable in situations where external support is needed if pharmacy operations are impacted due to staff illness or isolation requirements; for example, where American military personnel have been deployed to support hospitals.¹⁰ Similarly, it will help pharmacist-extendors, such as students to contribute to a greater extent to the

workforce, rather than being relegated to an observational role during clinical placements. This is particularly useful when the staffing of pharmacy personnel is strained, or a surge workforce is needed. Pharmacy departments can start by developing a catalogue of tasks that can be conducive to video training. For example, such a process has already been initiated at RPAH, where students are exposed to a virtual representation of the pharmacy department.¹¹

Recommendation 2: When training personnel in the context of a pandemic, trainees should be triaged and re-allocated quickly based on skill level.

It was common at the NHVC that 10 or more people had to be trained simultaneously each day, often with only two instructors. However, the time it took for each of the 10 people to be ready to be credentialed varied. Thus, the training process was divided into a sequence of small steps (e.g. drawing up saline). Those who progressed faster went on to the next step, whereas the others continued to practice. As some trainees were ready for their assessment sooner, it enabled us to stagger the observations required for credentialing. The credentialing process was often a bottleneck because of a lack of available instructors. In some cases, we were able to identify people early who were likely to require extensive support and instructor time. Some people had physical or technical limitations. This was revealed as they continued to make errors or not complete essential steps within the vaccine dose preparation protocol. These trainees were identified and assigned to different

roles without further training for vaccine preparation. In the context of the public health response to a pandemic, it is important to be clear and direct regarding expectations and the reasons for such timely decisions.

Recommendation 3: Local health districts should maintain strong collaborative partnerships with universities (including Schools of Pharmacy).

At one stage during the pandemic, there were more than 100 students from the Sydney Pharmacy School at the NHVC and RPAH hubs combined (Figure 2). This represents 8,000 hours (100 students × 10 days × 8 hours per day) of vaccine dose preparation during a usual two-week (10 working days) placement. This occurred during the time when a batch of 1 million doses of the vaccine was purchased from the Republic of Poland, and approximately half of this was distributed to the Greater Sydney region.¹² This resulted in a sudden escalation of capacity needed at the COVID-19 mass vaccination hubs. Based on the request of the SLHD, the Sydney Pharmacy School adapted their semester schedule so that students could staff the SLHD vaccination hubs. This was possible because of a strong relationship between the School and the SLHD and was coordinated by an academic (AP) who was jointly funded by the two entities. It was enabled because of support from senior executives in the University and SLHD. In addition, as discussed in this review, the local training program was developed in collaboration with this same academic. It is important that there is ongoing communication between leaders in pharmacy departments in hospitals and Schools of Pharmacy. This



Figure 2 Students at the NSW Health Vaccination Centre at Sydney Olympic Park. Legend: Students in the picture have white Sydney Pharmacy School shirts. The picture depicts their contribution to the workforce.

communication should be both strategic and on an 'on-the-ground' level. This may serve as a seamless buffer when a surge workforce is needed. The experience from the COVID-19 vaccination hubs supports the notion that pharmacy students can form a vital surge workforce with the right training and support.

Recommendation 4: On-site and immediate information technology support in the form of pharmacy 'superusers' should be routinely available.

The entire cold chain and dispensing process was built upon a fully traceable and barcoded process using pharmacy software that was already in use in SLHD hospitals. Thus, information technology support was crucial. On the first day of NHVC operations, some of the pharmacists could not log in to the pharmacy system. This problem was resolved by pharmacy superusers embedded with the team. Pharmacy superusers had additional access privileges and training to support other staff. This group of superusers included an SLHD information technology pharmacist and others credentialed by this pharmacist. In another example, the printers at the RPAH hub were printing vaccine labels very slowly, which appeared to be related to how data was being transferred between the computers and the printers. Even minor issues related to information technology could have a substantial impact on the workflow. This could ultimately impact upon people waiting for services during a pandemic.

Recommendation 5: Checklists and quick reference guides should be developed and readily available for each process for quick reference.

Checklists and guides served as abbreviated references for standard operating procedures. The preparation of the vaccine required careful adherence to several protocolised steps. For example, inverting (not shaking) the vial 10 times before dilution is required for Pfizer-BioNTech vaccine.¹ This step was commonly missed by trainees during practice and sometimes flagged as being missed during credentialing. Each preparation station at NHVC was subsequently provided with a checklist for the preparation process. The use of checklists is well known to be an effective safety strategy in health care.¹³ Similarly, laminated quick reference guides with pictures for the pharmacy software system were provided at each computer terminal to guide the dispensing process or to troubleshoot any problems that may occur.

Recommendation 6: There should be assigned positions for pharmacist educators to lead training of the workforce.

When the RPAH hub first opened, the training process was somewhat organic with a few experienced pharmacists functioning in an educator capacity and taking on the responsibility of training new employees. This was

also supported by an academic (AP) from the Sydney Pharmacy School who was based at RPAH and coincidentally had experience in aseptic technique. Subsequently, when the NHVC began operations, there were many more pharmacists and pharmacist-extendors who had gained experience at the RPAH hub. These staff were able to transition to the NHVC and lead training in that location. One challenge was that while most pharmacists were comfortable teaching cognitive skills, they were less adept in teaching motor skills. The large volume of vaccination at the NHVC also meant that there were two operations occurring simultaneously for pharmacy each day. First, there was the actual vaccine preparation for the hub. Second, there was the training of new employees. The latter was in a segregated area and coined the 'saline school' as mentioned previously. Senior pharmacists were then formally moved into educator roles so that training and preparing vaccines could occur simultaneously. This helped minimise the demands of staff so they would not be responsible for both training and actual vaccine production. It also improved the speed with which staff training could occur and the number of people who could be trained each day. The Society of Hospital Pharmacists of Australia has an Education and Educational Visiting specialty practice stream, which can serve as a resource for development for those in educator roles. [Correction added on 18 July 2022 after first online publication: "pharmacist education" was changed to "Education and Educational Visiting"]

CONCLUSION

The public health response to the COVID-19 pandemic forced the healthcare system to rapidly adapt to build a pharmacy workforce in record time to support COVID-19 mass vaccination hubs. The pressures of the process also resulted in improving efficiencies for staff training and credentialing. The recommendations and insights provided from our experience can guide future surges that may be required in the workforce. Some of these concepts may also be applied to pharmacy practice in hospitals when resources are constrained. Pharmacy students and interns are under-utilised and have the potential to provide a vital surge workforce with the right training and support at times of critical need.

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None.

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ETHICS STATEMENT

None required.

DATA AVAILABILITY STATEMENT

There is no data available for this review article

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