Shoulder Injury Related to Vaccine Administration: Causes, Response, and Prevention

The College Complaints Committee has received an increasing number of complaints involving possible cases of Shoulder Injury Related to Vaccine Administration (SIRVA).

Manitoba pharmacists who are authorized by the College of Pharmacists of Manitoba to administer injections play a key role in public vaccination efforts, such as annual influenza campaigns and during the COVID-19 pandemic, resulting in a greater number of vaccinations provided to all Manitobans. However, the administration of vaccines by injection is not without risk and requires professional knowledge, skill and due diligence with every injection administered.

Symptoms and Causes of SIRVA

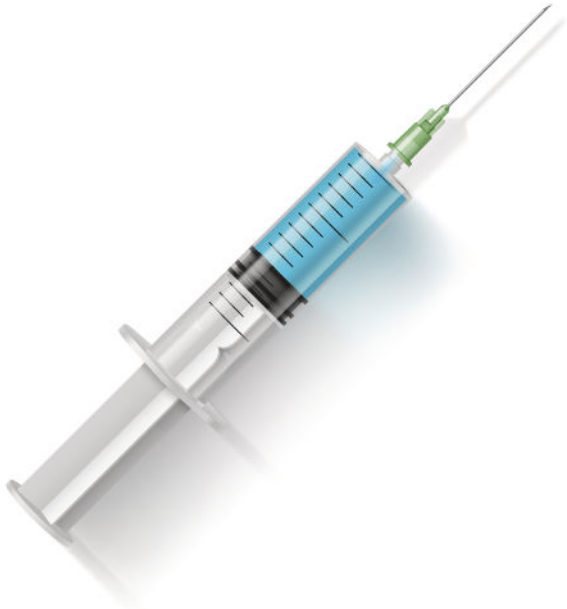
While it is normal for patients to experience transient shoulder pain after an intramuscular injection into the deltoid, SIRVA is characterized by persistent and prolonged shoulder pain with restriction of function. Because the shoulder seems frozen, some refer to it as 'frozen shoulder' syndrome. SIRVA should be suspected in any individual who has no prior history of shoulder pain or dysfunction and are experiencing sudden onset of shoulder pain with reduced range of motion following administration of a vaccine into the deltoid area.

While some patients experiencing SIRVA will develop symptoms within hours after injection, approximately 84 per cent of them will experience severe pain and limited range of motion within 48 hours of injection. Shoulder symptoms from SIRVA have been reported to last anywhere from 6 months to years and can greatly impact a person's ability to function in daily life.

The most common reported cause of SIRVA is thought to be improper landmarking whereby the injection is administered 'too high' in the deltoid and delivered into the deltoid bursa or within the joint space. Some have defined 'too high' as less than 3 cm from the lateral edge of the acromion process. Not only would missing the injection zone compromise vaccine efficacy, but it may lead to inflammation, pain, shoulder weakness, significantly reduced range of motion and nerve damage.

What to Do If You Suspect SIRVA

If you suspect you have administered a vaccine too high on the shoulder, or into the shoulder capsule, you should inform the patient and counsel them on the typical signs and symptoms of SIRVA and notify their physician. If a patient reports symptoms consistent with possible SIRVA to you, the patient should be referred to a physician for a timely assessment which may include imaging to assess the level and type of damage. Reports suggest, that provided there is no nerve damage, patients who begin a physician directed treatment pathway within three weeks of the onset of pain trended towards good to excellent outcomes. As a reminder, diagnosis is not within a pharmacist's scope of practice, so referral of suspected SIRVA to a physician is imperative.



Prevalence and Diagnosis of SIRVA

Diagnosis of SIRVA is difficult because the link between recent vaccination and the onset of symptoms are often missed, and SIRVA presents like other common shoulder injuries. Often, clinical diagnosis is made when a healthcare practitioner recognizes the link between a recent vaccination and the symptoms, suspects incorrect vaccination technique, and confirms the diagnosis with imaging studies such as an ultrasound or MRI. Diagnoses is not within the scope of practice for pharmacists, and clinical diagnosis of SIRVA must be referred to a physician.

The exact prevalence of SIRVA is uncertain. Although there has been an association of SIRVA following influenza and tetanus immunization, many believe there are numerous other confounding factors such as injection technique, frequency of vaccine administration, and under-reporting due to health professionals failing to recognize SIRVA. Further complicating matters, SIRVA may not always be the result of improper injection technique but may manifest from an immunological reaction within the muscle to the vaccine itself; however, there is no definitive clinical study demonstrating a quantitative link between vaccine antigen and/or adjuvant and an immune mediated shoulder inflammation that causes prolonged symptomology, as with SIRVA.

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Proper Technique is Key to Preventing SIRVA

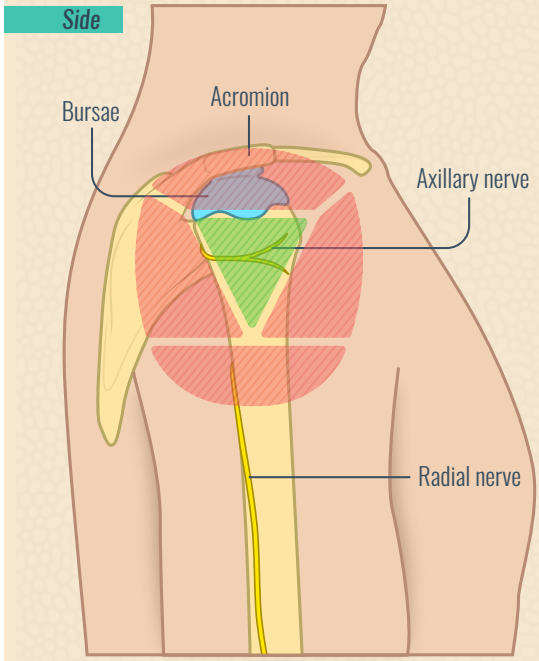
The best way to prevent SIRVA is correct injection technique. Although pharmacists must individually complete training to obtain their certificate of injection authorization from the College, pharmacy managers are encouraged to have their staff review proper injection technique and landmarking regularly, and prior to the busy influenza vaccination season.

The attached infographic on page 10. succinctly illustrates key fundamental points when administering a vaccine, and may be referred to during the review. Other great educational resources are the SIRVA module developed by the University of Waterloo School of Pharmacy in www.pharmacy5in5.ca or Institute for Safe Medication Practices Canada's Safety Bulletin on COIVD-19 vaccination errors.

A conversation with staff regarding SIRVA, how to prevent SIRVA and providing direction on how to manage a patient with possible SIRVA is also recommended.

SIRVA

Shoulder Injury Related to Vaccine Administration



What to watch for when landmarking:

Too High*

*Most reported cause of injury

- Risk of injecting into shoulder joint or bursa
- Can cause inflammation leading to bursitis, frozen shoulder syndrome, and other complications
- Watch for prolonged shoulder pain, weakness, and decreased range of motion
- Symptoms begin within hours to days
- Without treatment, symptoms last months and may never resolve

Too Far to Side

- Can inject into **axillary** nerve

Too Low

- Can inject into **radial** nerve

- Can cause paralysis and/or neuropathy
- Watch for burning, shooting pain during injection
- Symptoms start immediately

What happens when:

Needle Too Short

Can inject into subcutaneous tissue

- More painful for patient
- Risk of skin reaction
- Vaccine may be less effective

Needle Too Long

Can hit bone or nerve

- If you hit bone, pull needle **back slightly** and inject
- If you hit nerve, pull needle out and try again

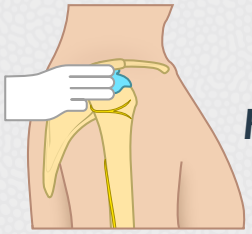
Tips to Avoid SIRVA

Landmark, don't "eyeball"

Always sit to inject a seated patient

Expose the shoulder completely

When a shirt can't be removed, roll the sleeve up, don't pull the shirt's neck over the shoulder



Remember!

2-3 fingers down from the acromion

Atanasoff S, Ryan T, Lightfoot R, Johann-Liang R. Vaccine 2010;28(51):8049-52.doi: 10.1016/j.vaccine.2010.10.005.Epub 2010 Oct 16.
Barnes MG, Ledford C, Hogan K. J Am Board Fam Med 2012; 25(6):919-22.doi: 10.3122/jabfm.2012.06.110334.
Cook IF. Hum Vaccin 2011; 7(8):845-8.doi: 10.4161/hv.7.8.16271.Epub 2011 Aug 1.
Cook IF. Hum Vaccin Immunother 2015; 11(5):1184-91.doi: 10.1080/21645515.2015.1017694.
Cross GB, Moghaddas J, Buttery J, Ayoub S, Korman TM. Aust Fam Physician 2016; 45(5):303-6.
Davidson LT, Carter GT, Kilmer DD, Han JJ. Am J Phys Med Rehabil 2007; 86(6):507-11.

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There are several techniques pharmacists can use to prevent SIRVA:

1. **Correct landmarking of the deltoid muscle for injection.** Vaccine injections outside of the proper site may not only compromise efficacy, but, injections too high risk injecting into the shoulder joint, injections too low may result in injection into the radial nerve, and injections too far to either side may lead to injection into the axillary nerve. Proper landmarking involves identifying the upper boarder by measuring 2-3 finger widths (approximately 2 inches) down from the acromion process to ensure injection below the shoulder capsule. The lower boarder of the deltoid is marked by the armpit area. Injection should typically occur in the middle of the identified zone. It is imperative that one does not 'eyeball' landmarking; this may lead to injection outside of the deltoid.

2. **Both the vaccinator and the person should be seated with the shoulder relaxed and completely exposed.**

3. **Sleves should be rolled up to expose the shoulder. Avoid pulling the shirt down over the shoulder resulting in a raised shoulder position as for this may lead to incorrect landmarking.**

4. **Select the correct needle length.** Selection of a needle length that is too short results in a subcutaneous injection and may compromise vaccine efficacy, whereas if the needle is too long, the injection can hit a nerve or bone. Consider the patient's build when selecting a needle. People who have a slim build may have a smaller deltoid fat pad resulting in deeper needle penetration that can lead to injury.

Report Adverse Events Such as SIRVA

In accordance with The Public Health Act, pharmacists are required to report adverse events, following immunization (AEFI) within seven days of becoming aware of the incident. For serious events, the report should be completed within one day, with the written report being completed within 72 hours. Reporting is not required in cases where the reaction is only mild and local and not overly concerning to the vaccine recipient. AEFI reports are submitted to Manitoba Health, Seniors and Active Living – Surveillance Unit.

Full details of what constitutes an AEFI, the reporting requirements, process, and reporting forms can be found here.

Works Cited

Bancsi, A, S Houle, and K Grindrod. January 2019 . "Shoulder injury related to vaccine administration and other injection site events." Canadian Family Physician 65(1): 40–42.

Cagle, P. 'Shoulder Injury after Vaccination: A Systematic Review.' June 2021. Revista Brasileira de Ortopedia 56(3):299-306

Cross, G, Moghaddas, J, Buttery, J, Ayoub, S, Korman, T. 'Don't aim too high: Avoiding shoulder injury related to vaccine administration. May 2016. Australian Family Physician 45(5):303-6.

Manitoba Health, Seniors and Active Living. 2021. Vaccine Safety . Accessed October 7, 2021. https://www.gov.mb.ca/health/publichealth/cdc/div/aefi.html.

Shahbaz, M, Blanc, P, Domeracki, S, Guntur, S. October 2019. 'Shoulder Injury Related to Vaccine Administration (SIRVA) An Occupational Case Report.' Workplace Health & Safety 67(10): 501-505.