



# Getting it in the right spot: Shoulder injury related to vaccine administration (SIRVA) and other injection site events

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## Introduction

Shoulder injury related to vaccine administration, or “SIRVA,” is an uncommon but emerging phenomenon caused by an improper technique or landmarking for intramuscular deltoid injections.<sup>1-9</sup> Patients with SIRVA present with shoulder pain and a limited range of motion. Symptoms occur when the patient had no prior shoulder injury or pain, and symptoms do not typically resolve on their own.<sup>1-6,9</sup> SIRVA is more painful and debilitating than the typical soreness that many patients feel after an intramuscular deltoid injection.<sup>1-6,9</sup> A review of the literature suggests a lack of data about SIRVA, and many cases are likely underreported, leading to an unknown incidence.<sup>1</sup> While this injury is rare in Canada, the National Vaccine Injury Compensation Program in the United States added SIRVA to its list of recognized vaccine injuries earlier in 2017.<sup>10</sup> Now that most pharmacists in Canada can be authorized to administer vaccines,<sup>11</sup> it is important they know how to landmark appropriately to prevent SIRVA, to recognize it in a patient and to know when to refer patients if they suspect this injury.

Pharmacists are highly accessible health professionals when it comes to immunization in Canada. For example, 30% of Canadian adults who received an influenza vaccine last year did so in a pharmacy.<sup>12</sup> We developed an infographic to guide all health professionals in the proper administration of intramuscular deltoid

injections and to help in the prevention and identification of SIRVA (Figure 1). To develop the infographic, we performed a literature search using terms related to SIRVA (“Shoulder injury related to vaccine administration,” “shoulder dysfunction after injection,” “incorrect vaccine administration,” “bursitis,” “frozen shoulder” and “rotator cuff tear”), causes of SIRVA (“improper landmarking,” “improper injection technique” and “incorrect deltoid injection”), diagnosis of SIRVA (“ultrasound,” “imaging” and “differential diagnosis”) and other injection site events (“radial nerve injury,” “axillary nerve injury,” “neuropathy in shoulder,” “lipoatrophy,” “nodules” and “cellulitis”) in the PubMed, Embase and Google Scholar databases. We also searched for relevant grey literature such as government reports using the Google search engine. What follows is an explanation of what pharmacists need to know to prevent and identify SIRVA.

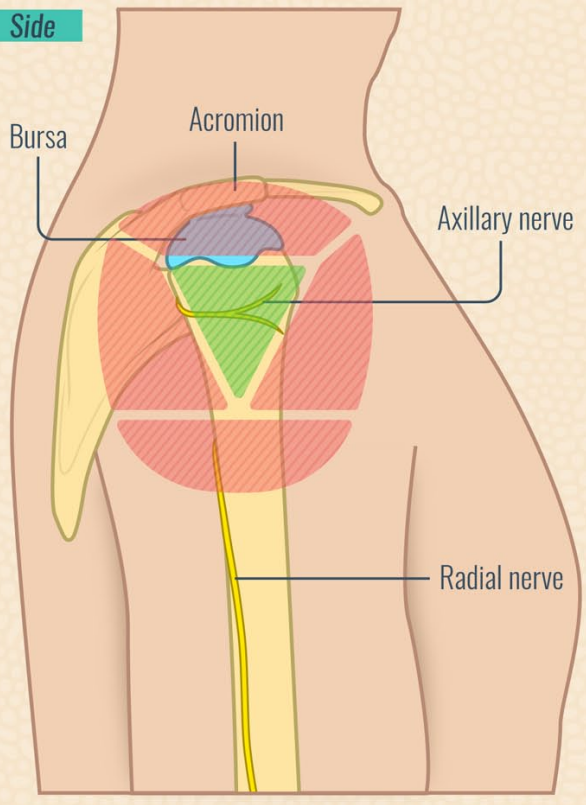
## What is SIRVA?

SIRVA is a rare sequela of the body’s immune response to direct injection of a vaccine into the shoulder capsule instead of the deltoid muscle.<sup>1-6</sup> It causes inflammation in the musculoskeletal structures of the shoulder such as the bursae, tendons and ligaments, resulting in shoulder pain and a limited range of motion that can persist for months without treatment.<sup>1-6,9</sup> Patients will often present to a physician months after the injection because of their inability to manage

**FIGURE 1** An infographic to help health professionals prevent shoulder injury related to vaccine administration

# 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**      **Too Low**
- Can inject into **axillary nerve**
  - Can inject into **radial nerve**
- ↓
- Can cause paralysis and/or neuropathy
  - Watch for burning, shooting pain during injection
  - Symptoms start immediately

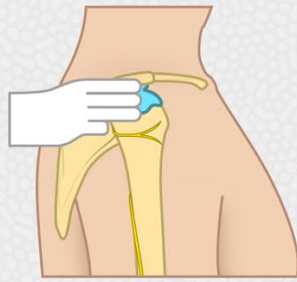
### What happens when:

- 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

increasing amounts of pain and being unable to perform daily tasks.<sup>1-3</sup> These patients are often diagnosed with various complications such as bursitis, rotator cuff tears or frozen shoulder syndrome.<sup>1-6,9,13</sup> SIRVA is an emerging topic, as the first case report was published in 2006 by Bodor and Montalvo.<sup>4</sup> Recent publications have reported more cases of SIRVA, in which vaccines were injected too high into the shoulder or at an incorrect angle, emphasizing the growing need for awareness.<sup>1-6,9,13,14</sup> Of note, SIRVA is not caused by the ingredients in the vaccine itself but by the incorrect placement of the vaccine into the shoulder joint.<sup>1-6</sup> Therefore, a review of proper landmarking and injection technique is essential to preventing SIRVA.<sup>1-9</sup>

### How to recognize SIRVA

It is common to experience a dull muscle ache after a vaccine injection that disappears within a few days.<sup>1,2,4,6</sup> Treatment can include an ice pack or over-the-counter analgesics such as acetaminophen or ibuprofen.<sup>2-4</sup> The key to recognizing SIRVA is that the pain will often begin within 48 hours of vaccine administration and will not improve with over-the-counter analgesics.<sup>1,2,4</sup> In fact, months may pass by, and patients will still complain of increasing pain, weakness and impaired mobility/function.<sup>1,2,4</sup> Community pharmacists can play a key role in recognizing these patients, as they may request pharmacist assistance in selecting an over-the-counter analgesic. Furthermore, when patients present to the pharmacist complaining of shoulder pain or that they cannot lift their arm to brush their teeth, pharmacists should ask if they had a vaccine in that arm recently and refer them to a physician for diagnosis if SIRVA is suspected.<sup>2</sup> Physician assessment and management will typically include diagnostic imaging such as an ultrasound, corticosteroid injections and physiotherapy.<sup>2,6,9</sup>

### Other injection site events

SIRVA results from an injection that is administered too high. There are other structures near the deltoid muscle that are at risk when a vaccine is improperly injected. In particular, injections that are below the deltoid can hit the radial nerve, and injections that are too far to the side of the deltoid can hit the axillary nerve.<sup>5,7,15,16</sup> When a nerve is hit, the patient will feel a strong shooting and burning pain immediately and

may eventually develop paralysis or neuropathy that does not always resolve.<sup>5,7,15,16</sup> Therefore, in addition to preventing SIRVA, proper landmarking of the deltoid can also prevent nerve injuries from occurring.<sup>5,7,15,16</sup> In addition, health care professionals should choose a needle length based on the weight of the patient.<sup>15,17-19</sup> A needle that is too long may pass through the deltoid muscle and hit the bone instead.<sup>15,17-19</sup> While the patient will not feel if you hit the bone, the vaccine may not be fully absorbed into the muscle, leading to reduced immunity.<sup>15,17-19</sup> In addition, if the needle is too short, the vaccine can be administered subcutaneously instead of intramuscularly, which can sometimes result in decreased immunity as well as nodules, cellulitis or localized lipoatrophy.<sup>7,17,19,20</sup> A 2005 survey of Irish general practitioners and nurses discovered that the deltoid region was a popular site for injections, but most health care professionals were unaware of the structures that were at risk from injections in that area such as the axillary nerve or subdeltoid bursa.<sup>21</sup> Therefore, all health care professionals who provide injections, including pharmacists, should make landmarking and careful needle length selection a routine part of the injection workflow.

### The pharmacist's role

Pharmacists can play a significant role in preventing SIRVA and other injection site events by reviewing proper landmarking technique. This includes using 2 to 3 finger widths (depending on the size of your fingers) from the acromion process to ensure you inject below the shoulder capsule and identifying the level of the armpit to ensure you inject into the deltoid.<sup>7,8,15,18-20</sup> After determining the upper and lower limits, you can use your thumb and forefinger to make a "V" to outline the deltoid and keep the "sweet spot" visible before picking up the needle.<sup>20</sup> The injection should always be given at a 90° angle using a darting motion.<sup>7,8,15,18-20</sup> In addition, choose a 5/8-inch needle for smaller patients weighing less than 60 kg (130 lb) and a 1-inch needle for patients who weigh 60 to 70 kg (130-152 lb).<sup>18</sup> Women weighing 70 to 90 kg (152-200 lb) or men weighing 70 to 118 kg (152-260 lb) should receive either a 1-inch or 1.5-inch needle.<sup>18</sup> A 1.5-inch needle should be used for women weighing more than 90 kg (200 lb) and men weighing more than 118 kg (260 lb).<sup>18</sup>



If you accidentally insert the needle outside the properly landmarked area, you should pull the needle out, apply a new needle tip and try landmarking again. Do not inject. However, if you suspect that you administered the injection into the shoulder capsule, you should inform the patient about SIRVA and its symptoms, so the patient can access care in a timely manner.<sup>2</sup>

If you suspect that a patient might be suffering from SIRVA, refer them to their physician for diagnosis, as an ultrasound is needed to determine the level and type of damage.<sup>1,2,5,9,13</sup> In addition, over-the-counter analgesics will not be effective for patients with SIRVA, as the preferred treatments include corticosteroid injections into the shoulder and physiotherapy.<sup>2,6,9</sup>

### Practice tips

Prevention of SIRVA and other injection site events is key. Here are some points to remember:

- Landmark every patient, never “eyeball it.”<sup>1-9</sup>
- Always sit or kneel to inject a seated patient. Standing above a patient may increase the likelihood that you will inject too high.<sup>2,8,20</sup>
- To help decrease the amount of pain the patient experiences, have them sit with their hand placed on their hip with their elbow out and away from the body, as this will relax their deltoid muscle.<sup>2,8,20</sup>
- Expose the shoulder completely. When a shirt cannot be removed, roll the sleeve up

rather than pull the shirt’s neck over the shoulder.<sup>2</sup>

- If you hit bone, don’t worry. The patient will not feel it, but you should pull the needle back slightly into their muscle before injecting.
- If you suspect you hit a nerve, pull the needle out completely, landmark properly and try again.
- If you suspect you inserted the needle too high, pull the needle out before injecting, landmark properly and try again.
- If you are unsure about a patient’s weight, ask them so that you can use the proper needle length.<sup>16,18-20</sup>
- If you think you injected too high, or you suspect a patient has SIRVA, educate the patient about what SIRVA is and tell them to see a doctor if pain in their shoulder increases or if they lose range of motion after 2 days that does not improve.<sup>2</sup>
- Report SIRVA and other injection site events like any other injection reaction. Follow the protocol for your province.<sup>18</sup>

In conclusion, education and awareness are key to preventing SIRVA and other vaccine injuries related to improper landmarking of the deltoid muscle. The next time you inject a patient, pay attention to your technique. Even the most experienced health care professionals need to polish their skills once in a while. ■

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