Skin Atlas

Foslevodopa/foscarbidopa

Skin Atlas Index

Introduction

- Indication, Administration, Preparation and Equipment
- Learn More: Factors Contributing to Infusion-Site Reactions
- Expert Insights: First Steps in Skin Reaction Management

Prevention of Skin Reactions

Infusion-Site Reactions

- Erythema
- Nodule
- Ecchymosis/Hematoma
- Edema (Drug pooling)
- Dermatitis
- Pain

Infusion-Site Infections

- Cellulitis
- Abscess

Additional Resources

Skin Reaction Assessment Algorithm

References

Introduction

Introduction

Indication[1]

Foslevodopa/foscarbidopa solution is indicated for the treatment of **motor fluctuations in patients with advanced levodopa-responsive Parkinson's disease (PD) who do not have satisfactory control of severe, debilitating motor fluctuations and hyper-/dyskinesia** despite optimized treatment with available combinations of PD medicinal products.

Foslevodopa/foscarbidopa should only be prescribed by neurologists who are experienced in the treatment of patients with PD.

Administration[1]

Foslevodopa/foscarbidopa is administered via **24-hour continuous SC infusion**, in the abdomen, avoiding a 5-cm radius around the navel and not be infused into areas where the site is tender, bruised, red or hard to the touch.

The infusion set (cannula) can remain in place for up to **3 days**.

Preparation and Equipment[1]

Employ **aseptic technique** for preparation and administration. Use the **VYAFUSER™ Pump** and only sterile, single-use components (syringe, infusion set, vial adapter).

Click to open the product monograph


Product Monograph
Including Patient Medication Information
PrVYALEV®

foslevodopa/foscarbidopa Solution
For subcutaneous infusion use
240 mg/mL foslevodopa and 12 mg/mL foscarbidopa
Antiparkinson Agent
ATC Code: N04BA0

AbbVie Corporation
8401 Trans-Canada Highway
St-Laurent, Qc H4S 1Z1

Date of Authorization:
2026-04-14

Control Number: 297629

VYALEV (foslevodopa/foscarbidopa solution) Page 1 of 53

Note: This tool does not include all the information from the product monograph. Please refer to the complete document for more details about foslevodopa/foscarbidopa. 1. AbbVie Corporation. PrVYALEV™ Product Monograph. April 14, 2026/p5/Indications / p11/ Administration. www.abbvie.ca/content/dam/abbvie-dotcom/ca/en/documents/products/VYALEV_PM_EN.pdf
SC, subcutaneous.

Subcutaneous Drug Delivery

Subcutaneous (SC) route of administration

- SC administration involves passing a small needle through the epidermal and dermal layers and into the fatty subcutaneous tissue.[1]
- Drug reaches bloodstream via capillaries (small-molecule) or the lymphatic system (large-molecule).[1]
- With subcutaneous administration, drug diffuses very slowly with a sustained rate of absorption.[2]



Expert insights video. Click to view
Alexis Truax, RN
Debra Johnston, RN

Continuous subcutaneous infusion (CSCI)

CSCI represents an effective method of drug administration when continuous dosing is desired and/or the oral route is compromised.[2,3]

Diagrammatic representation of SC drug injection

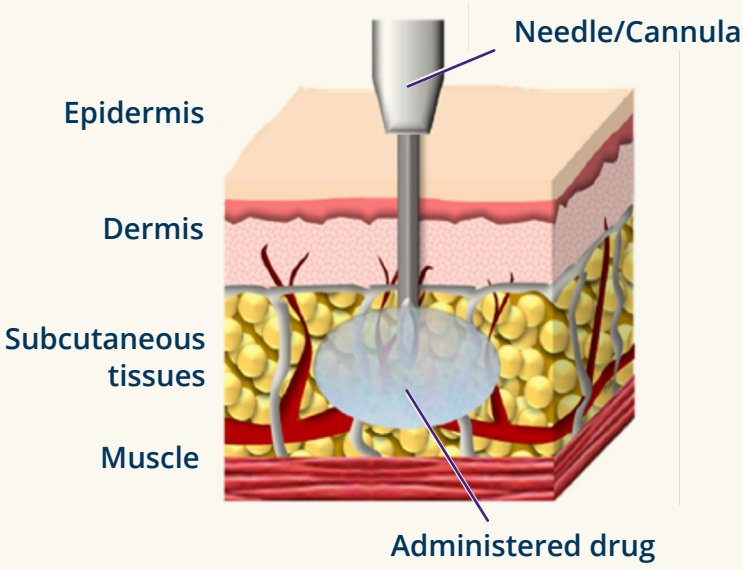
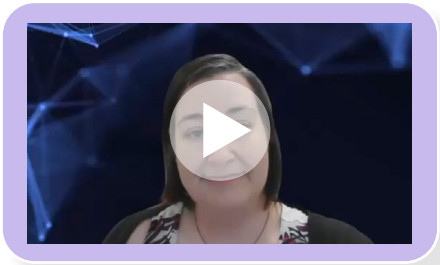


Image adapted from Kim H, et al. *Sci Rep*. 2017;7(1):9613.

1. Dychter SS, et al. *J Infus Nurs*. 2012;35(3):154–160; 2. Kim H, *et al. Sci Rep*. 2017;7(1):9613; 3. Baker J, et al. *BMC Palliative Care*. 2020;19:99.

Infusion-Site Reactions (62.2%)[1]

- Erythema
- Pain
- Edema
- Nodule
- Bruising
- Hemorrhage
- Induration
- Pruritus
- Papule
- Extravasation
- Inflammation
- Mass
- Warmth
- Hematoma
- Pallor
- Rash
- Swelling



Expert insights video. Click to view
Alexis Truax, RN

Infusion-Site Infections (28.4%)[1]

- Cellulitis
- Abscess

Monitoring for Infusion-Site Reactions and Infections[1]

Careful monitoring of infusion-site reactions and infections is recommended.

In the clinical studies, **infusion-site events were the most common reported adverse events** and most common event that led to study discontinuation.

If any unusual signs appear **(redness, pain, swelling) at the infusion site, or worsen**, the patient should be advised to consult a healthcare professional.

More frequent rotation (infusion set replacement every 3 days maximum) of the infusion site is recommended to reduce the risk.

It is recommended that new infusion sites **be at least 2.5 cm from the sites used within the previous 12 days**.

In some patients, dose reduction contributed to reduce the occurrence of infusion site event.

Click to open
the product monograph



Product Monograph
Including Patient Medication Information
PrVYALEV™

foslevodopa/foscarbidopa Solution
For subcutaneous infusion use
240 mg/mL foslevodopa and 12 mg/mL foscarbidopa
Antiparkinson Agent
ATC Code: N04BA0

AbbVie Corporation
8401 Trans-Canada Highway
St-Laurent, Qc H4S 1Z1

Date of Authorization:
2026-04-14

Control Number: 297629

VYALEV (foslevodopa/foscarbidopa solution) Page 1 of 53

1. AbbVie Corporation. PrVYALEV™ Product Monograph. April 14, 2026/p44/Instructions for Use/ p16/Infusion Site Reactions and Infections/ p17-18 Clinical Trial Adverse Reactions. www.abbvie.ca/content/dam/abbvie-dotcom/ca/en/documents/products/VYALEV_PM_EN.pdf.

Learn More: Factors Contributing to Infusion-Site Reactions

Non-Infectious Infusion-Site Reactions

Commonly seen with subcutaneous infusions of many medications

Factors that may contribute to infusion-site reactions[1]

- Concentration/tonicity of medication
- pH of solution
- Type of cannula
- Duration of cannula insertion
- Selection of site

Expert Insights: First Steps in Management of Skin Reactions



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

Assess/Observe

- Redness/rash?
- Pain?
- Bruising, bleeding?
- Swelling/nodule?
- Itching?
- Leakage of fluid at site?
- Rash?

Consider

Removing cannula and tubing & obtaining new infusion set

Placing new cannula >5 cm away from site and >2.5 cm away from any other site used within the last 12 days

1. Cleary NM, O'Gorman *A . BMJ Supportive & Palliative Care* 2023;13:e948–e950. doi:10.1136/spcare-2022-00390.
Expert Opinion, Dr. Lynne H. Robertson, October 2024.

Expert Insights: First Steps in Management of Skin Infections



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

When possible, all patients should have cultures taken

If patient is systemically well

→ Treat patient with **oral antibiotics**

If patient is systemically unwell

- Fever
- Chills
- Lymphangitic streaking
- Hypotension
- Severe pain

→ Treat patient with **IV antibiotics**

Expert Opinion, Dr. Lynne H. Robertson, October 2024.
IV, intravenous.

Prevention of Skin Reactions

Prevention of Skin Reactions

Prevention of Infusion-Site Reactions and Infection

Prevention of infusion-site reactions and infection begins before inserting the cannula and until after the site is completely healed.

Review and ensure adherence to aseptic techniques while manipulating infusion set components to minimize infection risk.

Site Selection: select and rotate infusion sites as prescribed to prevent site reactions.

- Review requirements
  - At least 5 cm away from umbilicus[1]
  - Avoid skin folds, bony prominences, scars, stretch marks, hard skin, infected, inflamed, bruised, tender or broken/cracked skin[2]
  - At least 2.5 cm from previous site (within past 12 days)[1,2]

Infusion Site: Replace infusion set and rotate site at least every 3 days.

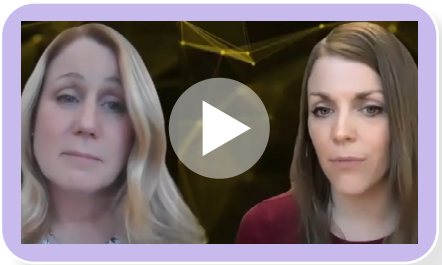
Good Skin Care Practices*: incorporate good general skin care practices for site maintenance.

1. Inspect treatment area on a regular basis
2. Wash area daily with soap and water
3. Moisturize skin with bland ointment
4. Avoid shaving
5. Regularly massage previous infusion sites

Things to Consider*

- Adequate subcutaneous tissue
- Hairy areas
- Sleeping position, physical activity, pre-existing skin disease, any contact allergies (adhesives)

Keys to Success



Expert insights video. Click to view
Debra Johnston, RN
Isabelle Beaulieu-Boire, Neurologist

Site Selection



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

Skin Hygiene



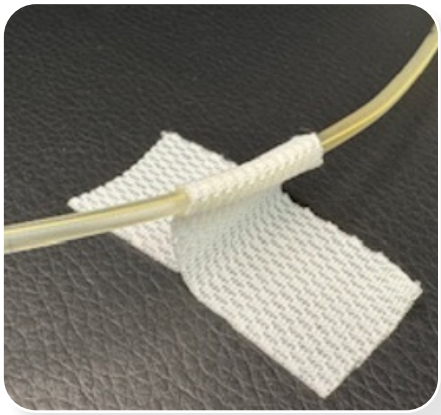
Expert insights video. Click to view
Debra Johnston, RN

*Expert Opinion, Dr. Lynne H. Robertson, October 2024.

1. AbbVie Corporation. PrVYALEV™ Product Monograph. May 3, 2023/p10/Administration;
2. AbbVie Corporation. PrVYALEV™ Product Monograph. May 3, 2023/p15/Infusion Site Reactions and Infections.

Prevention of Skin Reactions

Site Care



- **Maintain scrupulous skin hygiene** - Recognizing this can be challenging in the community.[2]
- **Change infusion sites daily** - Promotes adequate absorption. Allow area to fully heal before using site again. Avoid re-aggravating affected tissue.[2]
- **Choose sites with adequate adipose (fatty tissue)** - abdomen below umbilicus; flanks; outer aspect of thighs.[2]
- Rotate systematically and record.[2]
- **Ensure correct angle of cannula insertion** - Target hypodermis to avoid tissue reactions.[2]
- **Secondary securement of cannula** with a film dressing. Prevents dislodgement; allows visibility.[2]
  - Secure the tubing with Omega technique to prevent site tugging, friction or dislodgement (expert opinion).

Considerations

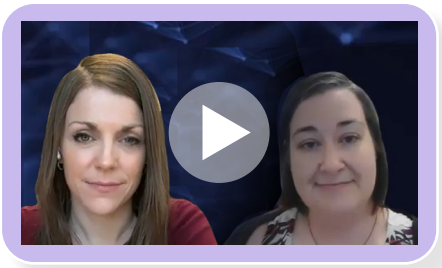
- Remove any spillage after site removal.[1,3]
  - Gently squeeze area to remove excess. Thoroughly wash area to remove medication from skin. Apply absorbent (vertical wicking) dressing, if needed.
- Apply mucopolysaccharide or heparinoid creams over established nodules.

Catheter Insertion



Expert insights video. Click to view
Alexis Truax, RN
Debra Johnston, RN

Reducing Skin Reactions



Expert insights video. Click to view
Isabelle Beaulieu-Boire, Neurologist
Alexis Truax, RN

1. Bhidayasiri R, et al. Effective delivery of apomorphine in the management of Parkinson disease: practical considerations for clinicians and Parkinson nurses. Clinical Neuropharmacology 2015, 38(3). Available at: https://dx.doi.org/10.1097/WNF.0000000000000082;
2. Todd and James. Apomorphine nodules in Parkinson's disease. Best Practice considerations. British Journal of Community Nursing Vol 13 No 10;
3. NHS: ApoMorphine Shared Care Guideline (Sept 2024).

Diagnosis of Erythema



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

Characteristics

- **Redness of the skin**. Occurs when the blood capillaries near the skin surface are congested or dilated.[1]
- Can vary from pink to dark red or violaceous.
- Typically blanchable with pressure.
- Often associated with skin inflammation but can also occur in absence of inflammation.

Causes/Etiology

- Erythema can be caused by many triggering events or underlying conditions, including infections and skin diseases.[1,2]
- In foslevodopa/foscarbidopa subcutaneous infusion pump users, erythema may be related to the catheter or the adhesive used in the device.[3]
- Erythema may also be caused by an inflammatory reaction to the infused medication.



1. Yang Y, Wu X, Liu W. Scar Symptom: Erythema and Thickness. 2020 Dec 8. In: Téot L, Mustoe TA, Middelkoop E, Gauglitz GG, editors. Textbook on Scar Management: State of the Art Management and Emerging Technologies [Internet]. Cham (CH): Springer; 2020. Chapter 11. PMID: 36351101; 2. Mosby. Mosby's Medical Dictionary. 11th ed. St. Louis, MO: Elsevier; 2021. ISBN-13: 978-0-323-63915-6; 3. Cichoń M, Trzeciak M, Sokołowska-Wojdyło M, Nowicki RJ. Contact Dermatitis to Diabetes Medical Devices. *Int J Mol Sci*. 2023;24(13):10697.

Expert Insights: Infectious vs. Non-Infectious

Clues to Non-Infectious Erythema

- Pruritus
- Swelling/redness decreasing after cannula removal
- Pain reducing after cannula removed
- No fever/systemic symptoms

Clues to Infectious Erythema

- Swelling/redness not decreasing or worsening (streaking) after cannula removal
- Worsening or persistent pain after cannula removed
- Warmth at site
- Fever/chills/systemic symptoms (fatigue, malaise)



Kansas Journal of Medicine 15(2):302–304.

Non-Infectious Clues



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

Skin Irritation vs. Infection



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist
Alexis Truax, RN

Management of Erythema

- Erythema may resolve without treatment, but if treatment is needed, it will mainly focus on the underlying cause.[1]
- **Erythema due to drug allergy**: initial management is to remove the drug that caused the reaction.[2]
- **Consider underlying infection if erythema** is associated with fever/pain, swelling, itching, or bruising.
- Ensure **use of aseptic techniques** during infusion setup and consider **rotating the infusion site more frequently** to prevent skin irritation.
- Applying **cool compresses** and using **topical anti-inflammatory creams** such as **topical corticosteroids** can alleviate symptoms if erythema persists.[3]
  - Less potent (e.g., over-the-counter) topical corticosteroids are rarely sufficient for management of local irritation (e.g., contact dermatitis) or allergic reaction.
  - Starting with at least a moderately potent agent is usually indicated.



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist
Alexis Truax, RN

1. Merck Manual. Erythema Multiforme. Updated May 2024. Accessed December 3, 2024. https://www.merckmanuals.com/professional/dermato-logic-disorders/hypersensitivity-and-reactive-skin-disorders/erythema-multiforme?query=erythema%20multiforme; 2. Ardern-Jones M. Common cutaneous drug reactions. *BMJ Best Practice*. Updated November 22, 2024. Accessed November 27, 2024. https://bestpractice.bmj.com/topics/en-gb/368; 3. Regier L, et al. Topical corticosteroids: comparison chart. Rxfiles. July 2023. https://www.rxfiles.ca/RxFiles/uploads/documents/mem-bers/CHT-SteroidClassPotencyCOLOR.pdf

Management of Redness and Swelling

Associated with fever +/- red streaks, pain, swelling, itching, bruising

Consider
- Antibiotics & schedule visit check/referral
  - Antibiotics to consider: cephalexin (Keflex), 500 mg four times daily, dicloxacillin 500 mg four times daily, or cefadroxil

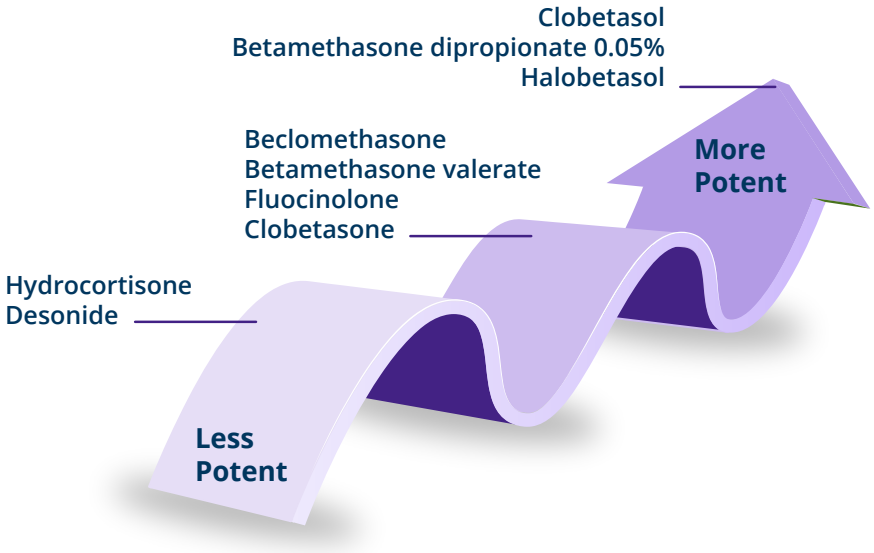
Associated with no fever +/- pain, swelling, itching, bruising

Consider
- Topical mid-potency corticosteroid

Associated with leakage of fluid?

Consider
- Monitor for increasing swelling, redness, pain, fever, streaking

Topical Corticosteroids



Redness Diagnosis



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

Specialist Referral



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist
Alexis Truax, RN

Expert Opinion, Dr. Lynne H. Robertson, October 2024.

Redness at site: Care Plan

Associated **with fever** +/- pain, swelling, itching, bruising	Consider starting antibiotics and schedule a visit check
Associated with **no fever** +/- pain, swelling, itching, bruising	Monitor for increasing swelling, redness, pain, fever and consider mid-potency topical corticosteroids
Associated with **itching only**	Refer to "Itching Care Plan"
Associated with **leakage of fluid**	Refer to "Leakage of Fluid Care Plan"

Plan of Action:

Roles and Responsibilities:

Diagnosis of Nodule



Expert insights video. Click to view
Alexis Truax, RN
Debra Johnston, RN

Characteristics

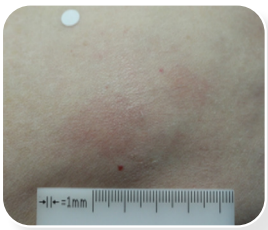
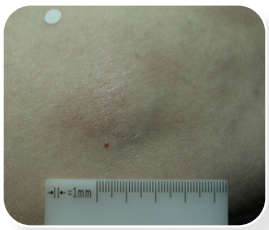
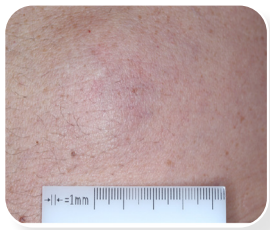
- **Nodules** are palpable, circumscribed lesions >1 cm in diameter.[1,2]
  - Different from **papules** (<1 cm) and **plaques** (>1 cm) which are usually more superficial and less voluminous.[3]
- Usually involve **dermis and/or hypodermis** and the greatest portion is typically **beneath the skin surface**.

Causes/Etiology

- Mechanisms of the development of subcutaneous nodules are not fully understood. Histological studies demonstrate the presence of an eosinophilic infiltration and suggest cell-mediated allergic type IV hypersensitivity or late-phase type I response.[4-6]
- Some evidence indicates that higher drug concentrations and rapid auto-oxidation may increase nodule formation.[7,8]

Prevention

- Subcutaneous nodules can be minimized by rotating infusion sites frequently and avoiding reuse of previously affected areas.





1. Mosby. Mosby's Medical Dictionary. 11th ed. St. Louis, MO: Elsevier; 2021. ISBN-13: 978-0-323-63915-6; 2. Nast A, Griffiths CE, Hay R, et al. The 2016 International League of Dermatological Societies' revised glossary for the description of cutaneous lesions. *Br J Dermatol*. 2016;174(6):1351–1358; 3. Potter PA, Perry AG, Stockert PA, Hall A. Essentials for Nursing Practice. 9th ed. St. Louis, MO: Elsevier; 2019. ISBN: 978-0-323-48184-7; 4. Acland KM, Churchyard A, Fletcher CL, et al. Panniculitis in association with apomorphine infusion. *Br J Dermatol*. 1998;138(3):480-482; 5. van Laar T, van Hilten B, Neef C, et al. The role of EDTA in provoking allergic reactions to subcutaneous infusion of apomorphine in patients with Parkinson's disease: a histologic study. *Mov Disord*. 1998;13(1):52–55; 6. Borgemeester RWK, van Laar T, Schuttelaar MLA. Cutaneous adverse drug reaction after apomorphine infusion, possibly caused by a systemic type IV hypersensitivity reaction to sodium metabisulfite: Report of 2 cases. *Contact Dermatitis*. 2018;79(5):316–318; 7. Borgemeester RWK, Diercks GFH, Jonkman MF, Van Laar T. Treatment of apomorphine-induced skin reactions: a pilot study. *Mov Disord*. 2015;30:S72; 8. Borgemeester RWK, Diercks GFH, Schuttelaar MLA, Van Laar T. Histology of subcutaneous nodules in PD patients treated with continuous apomorphine infusion: case series and review of the literature. Mov Disord. 2016;31:S653–S654.

Management of Nodules



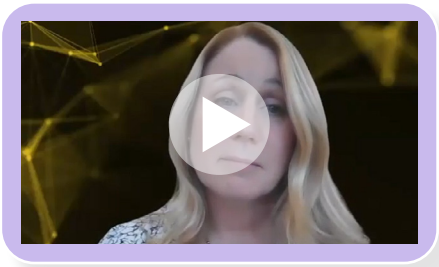
- Subcutaneous nodules can be minimized by **rotating infusion sites frequently and avoiding reuse of previously affected areas**.
- If nodules form, **gentle massage** (by hand or using a spiky rubber massage ball) may assist in resolution.
  - Local massage should proceed slowly and be stopped if discomfort becomes too intense.*
  - If tolerated, massage can be continued for at least a few days after the needle is withdrawn.*
- Persistent or painful nodules may require medical evaluation.

Preventing Nodules



Expert insights video. Click to view
Alexis Truax, RN
Debra Johnston, RN

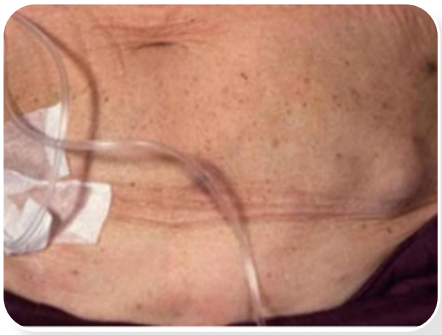
Nodule Management



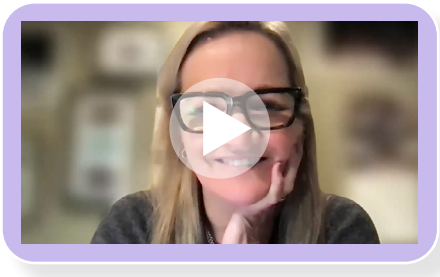
Expert insights video. Click to view
Debra Johnston, RN

Expert Insights: Signs of a Nodule**

- Firm, mobile nodules/hard areas of subcutaneous tissue
- No fever/constitutional symptoms
- No persistent erythema



Skorvanek M, et al. *Mov Disord Clin Pract.* 2016;4(1):21–31.



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

*Expert Opinion, Dr. Marc-André Doré, August 2023.
**Expert Opinion, Dr. Lynne H. Robertson, October 2024.

Expert Insights: Nodule vs. Abscess and Management

Assess/Observe
No pain, redness, fever, drainage → probable subcutaneous **nodule**

Consider
- **Ultrasound**
  - Diagnostic purposes/differential diagnoses
- **Massaging in circular motion 10 min/day**
- **Not using this site again until nodule resolved completely**
- **Monitoring for development of redness, increasing size, pain, fever**

Assess/Observe
Associated with fever, increasing redness/pain → possible **infection/abscess**

Consider
- **Ultrasound**
  - Diagnostic purposes/differential diagnoses
- **Culture drainage**
- **Antibiotic, incision and drainage**
  - Initiate similar oral/IV antibiotic regimen for cellulitis, such as cephalosporin (cephalexin) or penicillin (amoxicillin or cloxacillin), depending on criteria
  - Antibiotic for MRSA coverage (trimethoprim-sulfamethoxazole, doxycycline, minocycline, clindamycin)
- **Arranging to see patient/referral**

Abscess Management



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

Nodules vs. Abscesses



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist
Debra Johnston, RN

Expert Opinion, Dr. Lynne H. Robertson, October 2024.
IV, intravenous; MRSA, methicillin-resistant *Staphylococcus aureus*.

Deep Lump in Skin: Care Plan

Is there any redness, fever, increasing pain → possible infection/abscess?



Consider
1. Starting antibiotic
2. Arranging to see patient

No pain, redness, fever, drainage → probable subcutaneous nodule



Consider
1. Massaging
2. Not using this site again until nodule has resolved completely

Plan of Action:

Roles and Responsibilities:

Diagnosis of Ecchymosis/Hematoma

Characteristics

- **Ecchymosis**: localized, flat discolouration of the skin caused by a collection of clotted blood that accumulated into tissues from ruptured capillaries, appearing as bruising.[1-3]
- **Hematoma**: localized collection of blood outside the vessels, forming a swollen, often firm lump.[1,4]
- Symptoms include discolouration (ranging from red to purple, then yellow-green as they heal), tenderness, and swelling (for hematomas).[1-4]

Causes/Etiology

- Ecchymosis and/or hematoma can result from trauma, injections, or anticoagulant use, and may occur in patients with fragile blood vessels or coagulopathies.[1-4]



1. Davis CP. Hematoma vs. ecchymosis: differences and similarities. eMedicineHealth. Updated by Cunha JP. Accessed November 27, 2024. https://www.emedicinehealth.com/hematoma_v_ecchymosis/article_em.htm; 2. Asirdizer M, Besik EZ, Kartal E. Non-traumatic ecchymoses: A literature review from a medico-legal perspective. *J Forensic Leg Med*. 2023;95:102490; 3. Mallidi RQ. Ecchymosis. MedIndia. Published August 23, 2017. Accessed November 27, 2024. https://www.medindia.net/patientinfo/ecchymosis.htm; 4. Wedro B. Hematoma. In: Balentine JR, ed. MedicineNet. Published July 5, 2024. Accessed November 27, 2024. https://www.medicinenet.com/hematoma/article.htm.

Prevention and Management of Ecchymosis and Hematoma

Prevention

- Prevention involves proper injection techniques (including avoiding areas with visible blood vessels), site rotation, and careful handling of patients on anticoagulants.[1–4]

Management

- Ecchymosis/bruising typically resolves on its own, does not require any specific intervention.[1–4]
- Large hematomas may require medical attention or drainage.[1–4]
- Management of ecchymosis includes applying **cold compresses** initially to reduce swelling, then **warm compresses** to promote healing.[1–4]
  - For existing cases, cold compresses applied immediately post injection can decrease swelling, while warm compresses later can promote healing.

Expert Insights: Diagnosis of Ecchymosis vs. Hematoma



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

Non blanchable violaceous macules

- **Possible mechanisms***
  - Cannula too long (pain at insertion)
  - Cannula dislodged
  - Patient on blood thinners?
  - Trauma

Associated with an underlying **palpable** swelling → **probable hematoma**

1. Davis CP. Hematoma vs. ecchymosis: differences and similarities. eMedicineHealth. Updated by Cunha JP. Accessed November 27, 2024. https://www.emedicinehealth.com/hematoma_v_ecchymosis/article_em.htm; 2. Asirdizer M, Besik EZ, Kartal E. Non-traumatic ecchymoses: A literature review from a medico-legal perspective. *J Forensic Leg Med*. 2023;95:102490; 3. Mallidi RQ. Ecchymosis. MedIndia. Published August 23, 2017. Accessed November 27, 2024. https://www.medindia.net/patientinfo/ecchymosis.htm; 4. Wedro B. Hematoma. In: Balentine JR, ed. MedicineNet. Published July 5, 2024. Accessed November 27, 2024. https://www.medicinenet.com/hematoma/article.htm.

*Expert Opinion, Dr. Lynne H. Robertson, October 2024.

Bruising: Care Plan

Localized, flat discolouration of the skin from ruptured capillaries (ecchymosis)

Localized collection of blood outside the vessels, forming a swollen and/or firm lump (hematoma)

Consider

1. Applying cold compresses **immediately** post injection to reduce swelling
2. Applying warm compresses to promote healing

Future prevention of ecchymosis or hematoma

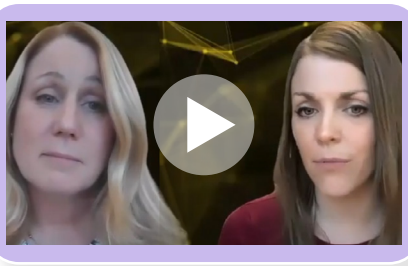
Consider

1. Avoiding areas with visible blood vessels
2. Site rotation
3. Careful handling of patients on anticoagulants

Plan of Action:

Roles and Responsibilities:

Diagnosis of Edema vs. Drug Pooling



Expert insights video. Click to view
Debra Johnston, RN
Isabelle Beaulieu-Boire, Neurologist

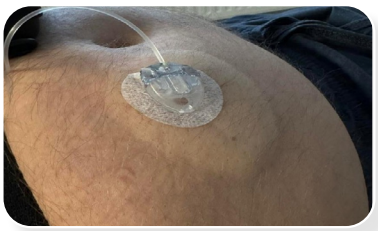
Characteristics

- **Edema**: accumulation/retention of fluid within layers of the skin or beneath the skin, leading to noticeable swelling.[1]
- Edema may be generalized or local, and it can appear abruptly or insidiously (more common). If edema develops slowly over time, it may become massive before patients seek medical care.[2]
- Feels soft to the touch and if pressure is applied, may leave an indentation, referred to as "pitting" after pressure is released.[1]
- **Drug pooling** is an accumulation of drug under the skin around the area of infusion. It is typically manifested as an elevated area of the skin, with or without induration and might be a sign of reduced absorption.











1. Ellenson S. Subcutaneous edema: symptoms, causes, and treatment. Tactile Medical. Published May 22, 2023. Accessed November 27, 2024. https://tactilemedical.com/resource-hub/cellulitis-and-edema/subcutaneous-edema-symptoms-causes-and-treatment/;
2. Thompson AD, Shea MJ. Edema. MSD Manual Professional Edition. Reviewed/Revised August 2024. Accessed November 27, 2024. https://www.msdmanuals.com/professional/cardiovascular-disorders/symptoms-of-cardiovascular-disorders/edema.

Prevention and Management of Edema

Prevention

- To prevent edema, ensure correct catheter placement and avoid areas prone to swelling.

Management

- When possible, treatment involves resolving the underlying cause.[1,2]
- Mild edema typically resolves spontaneously.
- **Gentle massage** of the area can accelerate the absorption of the edema.
- Persistent or worsening symptoms require further evaluation to rule out infection.
  - If swelling, redness, pain, fever increases after infusion site change, further evaluation from an HCP is required.

Initial recommendations:

- Change infusion site.
- Rotate infusion site more frequently.
- Change cannula size.
- Review patient technique.
  - Ensure 90° angle when inserting cannula.
  - Stretching the skin.
  - Insert cannula in standing/lying position.
- Experience from clinical trials with LDp/CDp suggests that although drug pooling does occur, **it does not typically influence efficacy and tends to resolve after a day to a few days** of switching to a new infusion site.

Expert Insights: Diagnosis of Drug Pooling

May be associated with swelling & erythema

Possible causes

- Cannula too short - Available in 6 mm and 9 mm
- Cannula dislodged/occluded
- Not enough fatty tissue
- Infusion volume too high
- Poor site selection



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

1. Ellenson S. Subcutaneous edema: symptoms, causes, and treatment. Tactile Medical. Published May 22, 2023. Accessed November 27, 2024. https://tactilemedical.com/resource-hub/cellulitis-and-edema/subcutaneous-edema-symptoms-causes-and-treatment/; 2. Thompson AD, Shea MJ. Edema. MSD Manual Professional Edition. Reviewed/Revised August 2024. Accessed November 27, 2024. https://www.msdmanuals.com/professional/cardiovascular-disorders/symptoms-of-cardiovascular-disorders/edema.
Expert Opinion, Dr. Lynne H. Robertson, October 2024.
CDp, carbidopa prodrug; HCP, healthcare professional; LDp, levodopa prodrug.

Expert Insights: Management of Drug Pooling

May be related to

- Cannula too short → drug pooling in dermis
- Cannula was dislodged
- Drug volume high

Consider

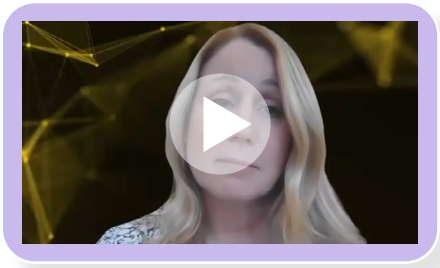
- Increasing cannula length
- Changing site more frequently (volume related)
- Massaging the area after cannula removal
- Antibiotic & referral to Derm/Infectious Disease if increased swelling, redness, pain, +/- fever at site

Infusion Site Leakage



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

Managing Drug Pooling



Expert insights video. Click to view
Debra Johnston, RN

Expert Opinion, Dr. Lynne H. Robertson, October 2024.

Leakage of Fluid: Care Plan

May be associated with swelling at site

Consider

1. Increasing the cannula length (9 mm vs. 6 mm)
2. Changing site more frequently (volume related)
3. Massaging the area after cannula removed
4. If increasing swelling, redness, pain, fever at site after removal of cannula → HCP involvement

Plan of Action:

Roles and Responsibilities:

HCP, healthcare professional.

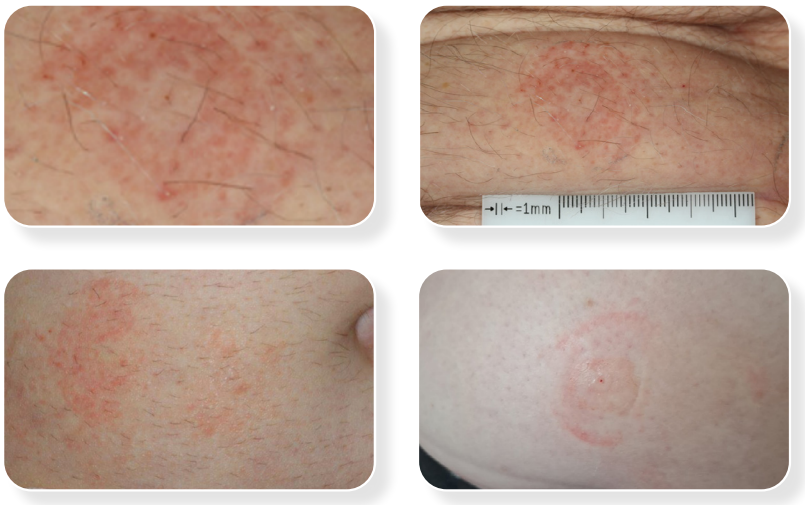
Diagnosis of Dermatitis

Characteristics

- **Dermatitis**: localized skin inflammation caused by irritation, allergens, or immune responses to infusion or delivery system.[1]
- Often presents as redness, **swelling, itching, or a rash** around the injection site and may be accompanied by dryness or flaking. In severe cases, blisters or erosions can develop.[1]
- Symptoms can vary in severity from mild irritation that resolves on its own to persistent inflammation requiring medical treatment.[1]
- **Allergic contact dermatitis** occurs in sensitized individuals who develop an immune response after repeated contact with specific allergens. It typically appears at the site of allergen contact, but the rash can spread beyond the area of contact.
- Patch testing remains the definitive gold standard for diagnosing allergic contact dermatitis.
- **Irritant contact dermatitis**: more common, and may include erythema, scaling, edema, vesiculation, and erosions in acute cases. Erythema, lichenification, hyperkeratosis, and fissures in chronic cases.
- Allergic and irritant reactions may be indistinguishable based solely on visual assessment, as both can present with characteristics similar to eczema.

Causes

- Common triggers of dermatitis include the medication itself, the adhesive used for securing infusion devices, or improper aseptic techniques.[1]



1. Forkel S, Buhl T. Allergic Contact Dermatitis After Injection of Local Anesthetic. *J Allergy Clin Immunol Pract*. 2020;8(6):2060-2061.

Other Considerations Localized vs. Non-localized Dermatitis

- **Localized and geometric** shape corresponding to what was contacting the skin → **probable contact dermatitis**





- **Not localized** to injection site → **broad differential diagnosis**



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

Prevention and Management of Dermatitis



Expert insights video. Click to view
Alexis Truax, RN
Debra Johnston, RN

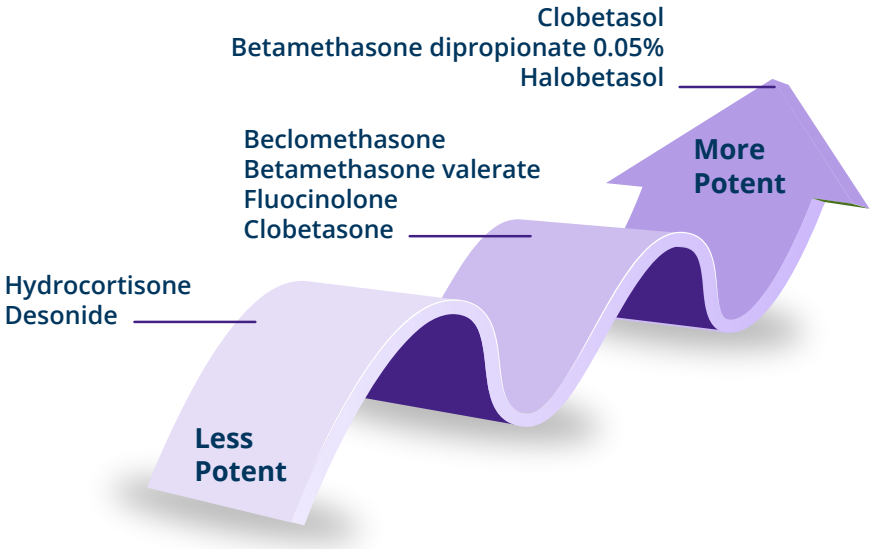
Prevention

- Infusion-site dermatitis can often be prevented by using hypoallergenic adhesives, barrier films, rotating injection sites and maintaining strict aseptic techniques during infusion setup.[1]

Management

- Management of dermatitis involves **identifying and removing the irritant** (e.g., switching adhesives or adjusting medication delivery), applying **topical treatments like corticosteroids or emollients, and maintaining proper hygiene** at the site.[1]
- For mild cases, emollients and topical steroids may suffice.
  - After removal, hydrocortisone cream or ointment can be applied to the affected area for a few days to reduce inflammation and itching.
- Severe or recurrent reactions warrant consideration of alternative infusion methods or materials and referral to patch testing.
- Consider use of skin barrier products to create a protective layer between the skin and the adhesive/cannula (e.g., 3M Cavilon No Sting Barrier Film, Skin-Prep, AllKare wipes).
- If dermatitis does not improve with treatment after 2 days or is associated with other symptoms, consider consultation with dermatologist.

Topical Corticosteroids



1. Forkel S, Buhl T. Allergic Contact Dermatitis After Injection of Local Anesthetic. *J Allergy Clin Immunol Pract*. 2020;8(6):2060–2061.

Expert Insights: Management of Itching

+/- Redness, scaling, swelling and **localized** to injection site or adhesive site → likely non-infectious injection-site reaction/contact dermatitis

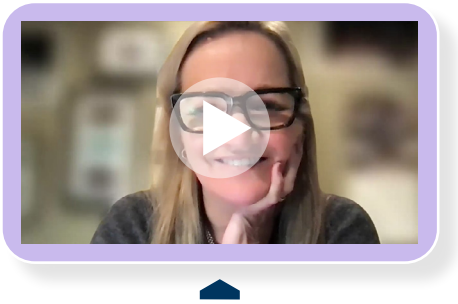
Consider

- Mid-high potency topical corticosteroid
  - Clobetasol propionate 0.05% or betaderm (which contains betamethasone) 0.1% cream 1–2 times daily
- Investigating cause +/- referral to dermatology

Not localized or associated with fever +/- skin changes/pain → possible infection

Consider

- Antibiotic
  - Initiate similar oral/IV antibiotic regimen for cellulitis, such as cephalosporin (cephalexin) or penicillin (amoxicillin or cloxacillin), depending on criteria
- Arranging to see patient/referral to dermatology/ infectious diseases



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

Expert Opinion, Dr. Lynne H. Robertson, October 2024.
IV, intravenous.

Itching at Site: Care Plan

+/- Redness, scaling, slight swelling

Consider
1. Topical steroid

Possible irritant reaction or allergic reaction to adhesive/dressing/other agent contacting skin

Consider
1. Changing cannula site
2. Patient to see MD if not getting better within 2 days or earlier if fever, increasing redness, blisters, pain
3. Stopping any suspected causative agents – wipes, creams, adhesives, solutions

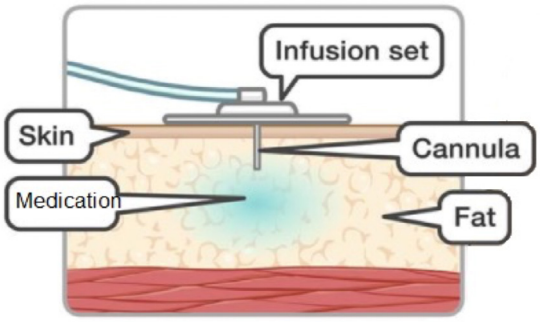
Plan of Action:

Roles and Responsibilities:

Diagnosis/Management of Pain at Infusion Site

Possible Causes*

- The cannula is too long
- Thin subcutaneous tissue
- Poor insertion technique
- Dislodged cannula



Considerations and Management

Pain at insertion of cannula +/- bruising but no other skin changes

Consider

- Changing site
- Using smaller (shorter) cannula/changing to area with deeper fatty tissue

Ongoing pain – +/- bruising but no other skin changes

Consider

- Better securement of cannula or tubing
- Changing site and monitoring old site for redness, swelling, increasing pain (may have dislodged cannula/early infection)

Associated with other skin changes – redness, swelling, but no fever

Consider

- Monitoring after site change

Associated with fever +/- ANY skin changes

Consider

- Starting antibiotics and schedule a visit check



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

*Expert Opinion, Dr. Lynne H. Robertson, October 2024.

Pain: Care Plan

At insertion of cannula +/- bruising but no other skin changes

Consider
1. Changing site
2. Using smaller (shorter) cannula/changing to area with deeper fatty tissue

Ongoing pain +/- bruising but no other skin changes

Consider
1. Better securement of cannula or tubing
2. Changing site and monitoring old site for redness, swelling, increasing pain (may have dislodged cannula/early infection)

Associated with other skin changes – redness, swelling, but no fever

Consider
1. Monitoring after site change

Associated with fever +/- ANY skin changes

Consider
1. Starting antibiotics and visit check

Plan of Action:

Roles and Responsibilities:

Diagnosis of Cellulitis

IMPORTANT INFORMATION

- **Early detection of cellulitis is crucial.**
- Educate patients to monitor for redness, warmth, and tenderness around the infusionsite.

Red flags that warrant immediate medical attention:

- Fever
- Chills
- General malaise
- Fatigue
- Other systemic symptoms

Immediate initiation of antibiotic therapy, as guided by clinical severity, can prevent complications.

Characteristics

- **Cellulitis**: bacterial infection involving the inner layers of the skin, specifically affecting dermis and subcutaneous fat.[1]
- Presents as a **red, swollen, warm, and often painful** area of skin. Area of redness increases in size over a few days with borders that are generally round, but the edges of the redness are not always well defined.[1]
- Individual may have a fever and feel tired.[2]
- Lymphatic vessels may occasionally be involved.[1-4]
- Potential complications include abscess formation.[1]
- Infusion-site swabbing discouraged.[5]
  - Swabbing skin will not identify bacterial pathogen and may produce inconclusive results.









Causes

- **Cellulitis** is typically caused by *Streptococcus* or *Staphylococcus aureus* bacteria.[1]

1. Vary JC, O'Connor KM. Common dermatologic conditions. *Med Clin North Am*. 2014;98(3):445–485; 2. Mistry RD. Skin and soft tissue infections. *Pediatr Clin North Am*. 2013;60(5):1063–1082; 3. Edwards G, Freeman K, Llewelyn MJ, Hayward G. What diagnostic strategies can help differentiate cellulitis from other causes of red legs in primary care? *BMJ*. 2020;368:m54; 4. Tintinalli JE, Ma O, Yealy DM, Meckler GD, Stapczynski J, Cline DM, Thomas SH, eds. Tintinalli's Emergency Medicine: A Comprehensive Study Guide. 9th ed. McGraw-Hill Education; 2020. Accessed November 27, 2024. https://accessmedicine.mhmedical.com/content.aspx?bookid=2353&sectionid=183421313;
5. Fung VSC, and al. Clinical Parkinsonism & Related Disorders. 2024, Vol.10.

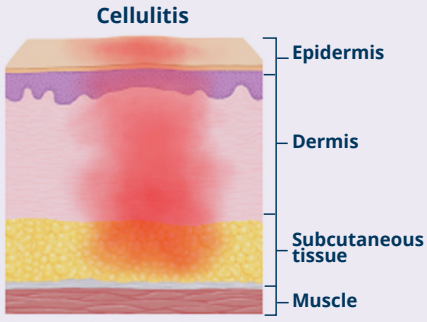
Other Considerations

Expert insights video.
Click to view
Lynne H. Robertson,
Dermatologist

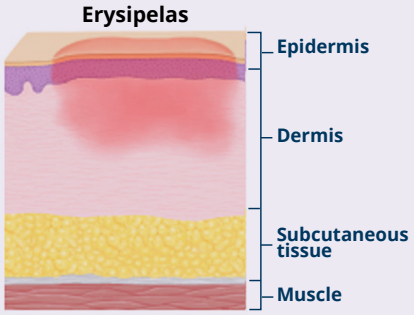


Cellulitis vs. Erysipelas[1]

Cellulitis
- Infection of deep dermis and subcutaneous tissue
- Group A strep and *Staph aureus*
- **Signs**:
  - Slower onset, spreading redness and increasing pain/warmth
  - Lighter red colour, border ill defined
  - +/-purulence, red streaking, enlarged lymph nodes



Erysipelas
- Infection in superficial dermis & lymphatics
- Group A strep
- **Signs**:
  - Acute onset, fever/chills, malaise, headache
  - Bright red with sharp cutoff borders
  - No purulence



Management of Cellulitis – Bacterial Infection

- Treating physicians usually prescribe **oral/IV antibiotics**, such as cephalosporin (cephalexin) or penicillin (amoxicillin or cloxacillin)[2,3] depending on their criteria.
- For patients with recurring infections:
  - Test for MRSA.
  - Consider consultation with infectious disease specialist.
    - Do not limit specialist consultation for MRSA only, as it could be various infections.

1. UpToDate - https://www.uptodate.com/contents/cellulitis-and-skin-abscess-epidemiology-microbiology-clinical-manifestations-and-diagnosis.
2. Vary JC, O'Connor KM. Common dermatologic conditions. *Med Clin North Am*. 2014;98(3):445–485; 3. Phoenix G, Das S, Joshi M. Diagnosis and management of cellulitis. *BMJ*. 2012;345:e4955.
IV, intravenous; MRSA, methicillin-resistant *Staphylococcus aureus*.

Infectious Reaction: Care Plan

At insertion of cannula, a localized, red, swollen, warm, and often painful area of skin that increases in size with borders that may or may not be well defined



Consider

1. Prescribing oral/IV antibiotics, such as cephalosporin (cephalexin) or penicillin (amoxicillin or cloxacillin), depending on criteria
2. Testing for MRSA for patients with recurring infections
3. Consultation with an infectious disease specialist

Skin reaction is accompanied by fever, chills, general malaise, fatigue, persistent pain or other systemic symptoms

Ensure

1. **Immediate medical attention**

Plan of Action:

Roles and Responsibilities:

IV, intravenous; MRSA, methicillin-resistant *Staphylococcus aureus*.

Diagnosis of Abscess



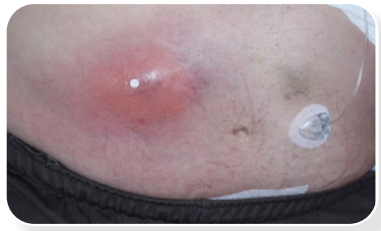
Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

Characteristics

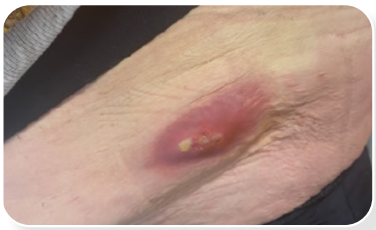
- **Abscess**: collection of pus that has built up within the tissue of the body.[1]
- **Abscesses** present as a **localized, swollen, red, and painful area**, often **warm to the touch** and **sometimes with a visible pus-filled centre**.[1]
- Abscess may feel as though it is **filled with fluid or "boggy"** if it is pressed (fluctuates).[1]
- Area of redness is often bigger than the area of swelling.[2]
- Pain, fever and chills may also be present.[1]

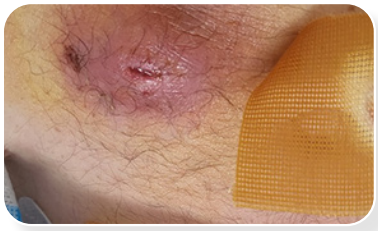
Causes

- **Abscesses** are usually caused by bacterial infections, with many different types of bacteria as possible etiologic agents.[2-4]

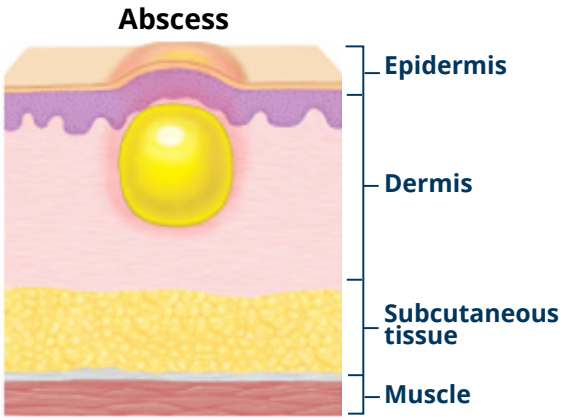












1. Singer AJ, Talan DA. Management of skin abscesses in the era of methicillin-resistant *Staphylococcus aureus*. *N Engl J Med*. 2014;370(11):1039-1047; 2. Tidy C, Willacy H. Abscess. Patient.info. Last updated September 26, 2023. Accessed November 27, 2024. https://patient.info/infec-tions/abscess-leaflet; 3. Bush LM. Abscesses. MSD Manual Professional Edition. Reviewed/Revised July 2024. Accessed November 27, 2024. https://www.msdmanuals.com/professional/infectious-diseases/biology-of-infectious-disease/abscesses?query=abscess; 4. The Manual's Editorial Staff. Folliculitis and skin abscesses. MSD Manual Consumer Version. Reviewed/Revised November 2023. Accessed November 27, 2024. https://www.msdmanuals.com/home/quick-facts-skin-disorders/bacterial-skin-infections/folliculitis-and-skin-abscesses.

Expert Insights: Nodule vs. Abscess and Management

Assess/Observe
No pain, redness, fever, drainage → probable subcutaneous **nodule**

Consider
- **Ultrasound**
  - Diagnostic purposes/differential diagnoses
- **Massaging in circular motion 10 min/day**
- **Not using this site again until nodule resolved completely**
- **Monitoring for development of redness, increasing size, pain, fever**

Assess/Observe
Associated with fever, increasing redness/pain → possible **infection/abscess**

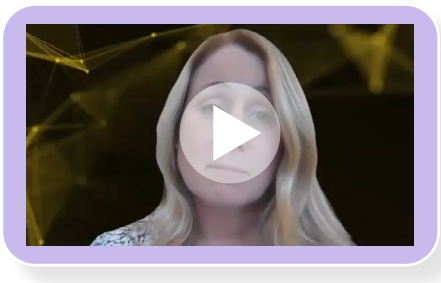
Consider
- **Ultrasound**
  - Diagnostic purposes/differential diagnoses
- **Culture drainage**
- **Antibiotic, incision and drainage**
  - Initiate similar oral/IV antibiotic regimen for cellulitis, such as cephalosporin (cephalexin) or penicillin (amoxicillin or cloxacillin), depending on criteria
  - Antibiotic for MRSA coverage (trimethoprim-sulfamethoxazole, doxycycline, minocycline, clindamycin)
- **Arranging to see patient/referral**

Abscess Management



Expert insights video. Click to view
Lynne H. Robertson, Dermatologist

Nodules vs. Abscesses

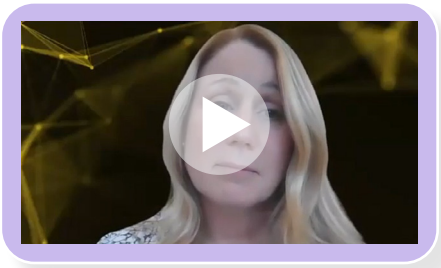


Expert insights video. Click to view
Debra Johnston, RN
Lynne H. Robertson, Dermatologist

Expert Opinion, Dr. Lynne H. Robertson, October 2024.
IV, intravenous; MRSA, methicillin-resistant *Staphylococcus aureus*.

Management of Abscess

- Prompt identification and **cut/drainage of abscesses** are essential to prevent systemic spread.[1]
- **Send sample of drained pus for bacterial cultures**. It is critical for guiding targeted antibiotic therapy, if needed.[1]
- Red flags, such as **fever, chills, worsening redness, or persistent pain**, should prompt immediate medical attention to rule out systemic involvement or complications.



Expert insights video. Click to view
Debra Johnston, RN

1. Stevens DL, Bisno AL, Chambers HF, et al; Infectious Diseases Society of America. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. Clin Infect Dis. 2014;59(2):e10-e52.

Infectious Reaction: Care Plan

At insertion of cannula, a localized, swollen, red, and painful area, often warm to the touch and sometimes with a visible pus-filled centre

Consider

1. Prompt identification and ultrasound for diagnostic purposes/differential diagnoses
2. Cut/drainage of abscess
3. Culture drainage for bacterial cultures to guide antibiotic therapy
4. Initiating similar oral/IV antibiotic regimen for cellulitis, cephalosporin (cephalexin) or penicillin (amoxicillin or cloxacillin), depending on criteria and/or MRSA coverage (trimethoprim-sulfamethoxazole, doxycycline, minocycline, clindamycin)

Skin reaction is accompanied by fever, chills, general malaise, fatigue, persistent pain or other systemic symptoms

Ensure

1. **Immediate medical attention**

Plan of Action:

Roles and Responsibilities:

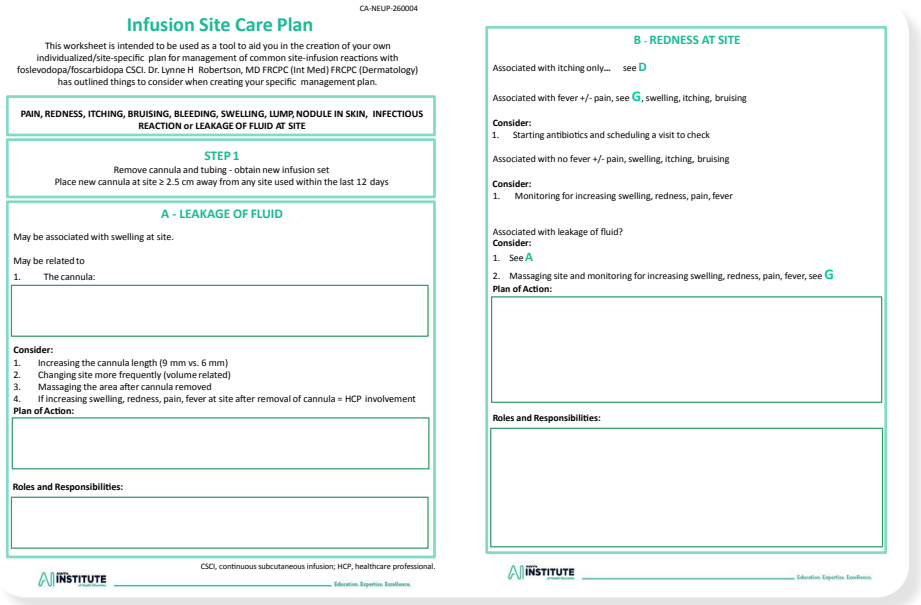
IV, intravenous; MRSA, methicillin-resistant *Staphylococcus aureus*.

Additional Resources

Additional Resources

Click to view and/or print

Care Plan: Clinical Plan, Roles and Responsibilities



CA-NEUP-260004

Infusion Site Care Plan

This worksheet is intended to be used as a tool to aid you in the creation of your own individualized/site-specific plan for management of common site-infusion reactions with foslevodopa/foscarbidopa CSCI. Dr. Lynne H Robertson, MD FRCPC (Int Med) FRCPC (Dermatology) has outlined things to consider when creating your specific management plan.

PAIN, REDNESS, ITCHING, BRUISING, BLEEDING, SWELLING, LUMP, NODULE IN SKIN, INFECTIOUS REACTION or LEAKAGE OF FLUID AT SITE

STEP 1

Remove cannula and tubing - obtain new infusion set
Place new cannula at site ≥ 2.5 cm away from any site used within the last 12 days

A - LEAKAGE OF FLUID

May be associated with swelling at site.

May be related to

1. The cannula:

Consider:
1. Increasing the cannula length (9 mm vs. 6 mm)
2. Changing site more frequently (volume related)
3. Massaging the area after cannula removed
4. If increasing swelling, redness, pain, fever at site after removal of cannula = HCP involvement

Plan of Action:

Roles and Responsibilities:

CSCI, continuous subcutaneous infusion; HCP, healthcare professional.

B - REDNESS AT SITE

Associated with itching only... see D

Associated with fever +/- pain, see G, swelling, itching, bruising

Consider:
1. Starting antibiotics and scheduling a visit to check

Associated with no fever +/- pain, swelling, itching, bruising

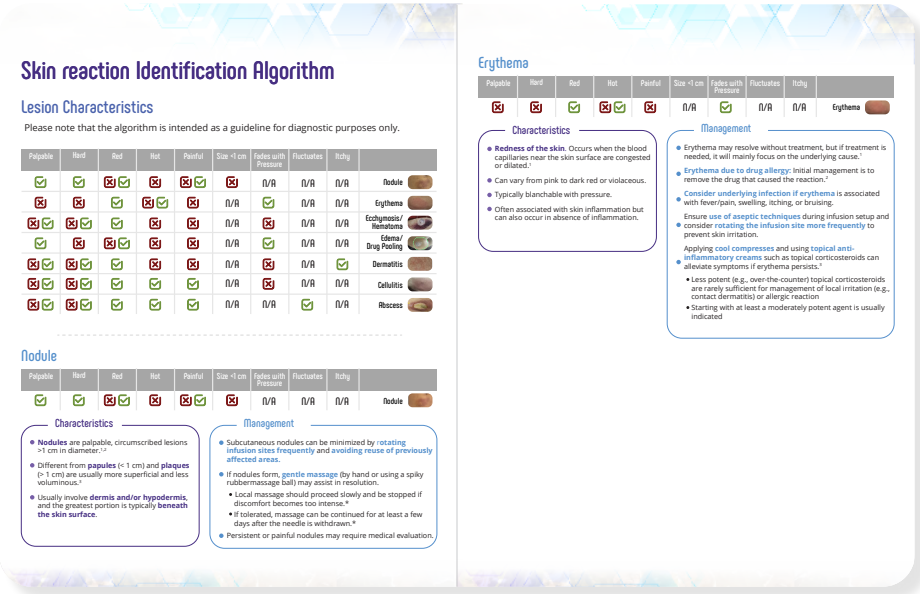
Consider:
1. Monitoring for increasing swelling, redness, pain, fever

Associated with leakage of fluid?
Consider:
1. See A
2. Massaging site and monitoring for increasing swelling, redness, pain, fever, see G

Plan of Action:

Roles and Responsibilities:

Skin Reaction Identification Algorithm



Skin reaction Identification Algorithm

Lesion Characteristics

Please note that the algorithm is intended as a guideline for diagnostic purposes only.

Palpable	Hard	Red	Hot	Painful	Size <1 cm	Fades with Pressure	Fluctuates	Itchy	
☑	☑	☒☑	☒	☒☑	☒	N/A	N/A	N/A	Nodule
☒	☒	☑	☒☑	☒	N/A	☑	N/A	N/A	Erythema
☒☑	☒☑	☑	☒	☒	N/A	☒	N/A	N/A	Ecchymosis/ Hematoma
☑	☒	☒☑	☒	☒	N/A	☑	N/A	N/A	Edema/ Drug Pooling
☒☑	☒☑	☑	☒	☒	N/A	☒	N/A	☑	Dermatitis
☒☑	☒☑	☑	☑	☑	N/A	☒	N/A	N/A	Cellulitis
☒☑	☒☑	☑	☑	☑	N/A	N/A	☑	N/A	Abscess

Nodule

Palpable	Hard	Red	Hot	Painful	Size <1 cm	Fades with Pressure	Fluctuates	Itchy	
☑	☑	☒☑	☒	☒☑	☒	N/A	N/A	N/A	Nodule

Characteristics

- **Nodules** are palpable, circumscribed lesions >1 cm in diameter.[1,2]
- Different from **papules** (< 1 cm) and **plaques** (> 1 cm) are usually more superficial and less voluminous.[1]
- Usually involve **dermis and/or hypodermis**, and the greatest portion is typically **beneath the skin surface.**

Management

- Subcutaneous nodules can be minimized by **rotating infusion sites frequently** and **avoiding reuse of previously affected areas.**
- If nodules form, **gentle massage** (by hand or using a spiky rubbermassage ball) may assist in resolution.
  - Local massage should proceed slowly and be stopped if discomfort becomes too intense.*
  - If tolerated, massage can be continued for at least a few days after the needle is withdrawn.*
- Persistent or painful nodules may require medical evaluation.

Erythema

Palpable	Hard	Red	Hot	Painful	Size <1 cm	Fades with Pressure	Fluctuates	Itchy	
☒	☒	☑	☒☑	☒	N/A	☑	N/A	N/A	Erythema

Characteristics

- **Redness of the skin.** Occurs when the blood capillaries near the skin surface are congested or dilated.[1]
- Can vary from pink to dark red or violaceous.
- Typically blanchable with pressure.
- Often associated with skin inflammation but can also occur in absence of inflammation.

Management

- Erythema may resolve without treatment, but if treatment is needed, it will mainly focus on the underlying cause.[1]
- **Erythema due to drug allergy:** Initial management is to remove the drug that caused the reaction.[2]
- **Consider underlying infection if erythema** is associated with fever/pain, swelling, itching, or bruising.
- Ensure **use of aseptic techniques** during infusion setup and consider **rotating the infusion site more frequently** to prevent skin irritation.
- Applying **cool compresses** and using **topical anti-inflammatory creams** such as topical corticosteroids can alleviate symptoms if erythema persists.[3]
  - Less potent (e.g., over-the-counter) topical corticosteroids are rarely sufficient for management of local irritation (e.g., contact dermatitis) or allergic reaction
  - Starting with at least a moderately potent agent is usually indicated

Skin reaction Identification Algorithm

Lesion Characteristics

Please note that the algorithm is intended as a guideline for diagnostic purposes only.

Palpable	Hard	Red	Hot	Painful	Size <1 cm	Fades with Pressure	Fluctuates	Itchy	
☑	☑	☒ ☑	☒	☒ ☑	☒	N/A	N/A	N/A	Nodule 
☒	☒	☑	☒ ☑	☒	N/A	☑	N/A	N/A	Erythema 
☒ ☑	☒ ☑	☑	☒	☒	N/A	☒	N/A	N/A	Ecchymosis/ Hematoma 
☑	☒	☒ ☑	☒	☒	N/A	☑	N/A	N/A	Edema (Drug Pooling) 
☒ ☑	☒ ☑	☑	☒	☒	N/A	☒	N/A	☑	Dermatitis 
☒ ☑	☒ ☑	☑	☑	☑	N/A	☒	N/A	N/A	Cellulitis 
☒ ☑	☒ ☑	☑	☑	☑	N/A	N/A	☑	N/A	Abscess 

Nodule

Palpable	Hard	Red	Hot	Painful	Size <1 cm	Fades with Pressure	Fluctuates	Itchy	
☑	☑	☒ ☑	☒	☒ ☑	☒	N/A	N/A	N/A	Nodule 

Characteristics

- **Nodules** are palpable, circumscribed lesions >1 cm in diameter.[1,2]
  - Different from **papules** (<1 cm) and **plaques** (>1 cm) which are usually more superficial and less voluminous.[3]
- Usually involve **dermis and/or hypodermis**, and the greatest portion is typically **beneath the skin surface**.

Management

- Subcutaneous nodules can be minimized by **rotating infusion sites frequently** and **avoiding reuse of previously affected areas.**
- If nodules form, **gentle massage** (by hand or using a spiky rubber massage ball) may assist in resolution.
  - Local massage should proceed slowly and be stopped if discomfort becomes too intense.*
  - If tolerated, massage can be continued for at least a few days after the needle is withdrawn.*
- Persistent or painful nodules may require medical evaluation.

1. Mosby. Mosby's Medical Dictionary. 11th ed. St. Louis, MO: Elsevier; 2021. ISBN-13: 978-0-323-63915-6; 2. Nast A, Griffiths CE, Hay R, et al. The 2016 International League of Dermatological Societies' revised glossary for the description of cutaneous lesions. *Br J Dermatol*. 2016;174(6):1351–1358; 3. Potter PA, Perry AG, Stockert PA, Hall A. Essentials for Nursing Practice. 9th ed. St. Louis, MO: Elsevier; 2019. ISBN: 978-0-323-48184-7.

*Expert Opinion, Dr. Marc-André Doré, August 2023.

Erythema

Palpable	Hard	Red	Hot	Painful	Size <1 cm	Fades with Pressure	Fluctuates	Itchy	
☒	☒	☑	☒ ☑	☒	N/A	☑	N/A	N/A	Erythema 

Characteristics

- **Redness of the skin**. Occurs when the blood capillaries near the skin surface are congested or dilated.[1]
- Can vary from pink to dark red or violaceous.
- Typically blanchable with pressure.
- Often associated with skin inflammation but can also occur in absence of inflammation.

Management

- Erythema may resolve without treatment, but if treatment is needed, it will mainly focus on the underlying cause.[1]
- **Erythema due to drug allergy:** initial management is to remove the drug that caused the reaction.[2]
- **Consider underlying infection if erythema** is associated with fever/pain, swelling, itching, or bruising.
- Ensure **use of aseptic techniques** during infusion setup and consider **rotating the infusion site more frequently** to prevent skin irritation.
- Applying **cool compresses** and using **topical anti-inflammatory creams** such as **topical corticosteroids** can alleviate symptoms if erythema persists.[3]
  - Less potent (e.g., over-the-counter) topical corticosteroids are rarely sufficient for management of local irritation (e.g., contact dermatitis) or allergic reaction.
  - Starting with at least a moderately potent agent is usually indicated.

1. Yang Y, Wu X, Liu W. Scar Symptom: Erythema and Thickness. 2020 Dec 8. In: Téot L, Mustoe TA, Middelkoop E, Gauglitz GG, editors. Textbook on Scar Management: State of the Art Management and Emerging Technologies [Internet]. Cham (CH): Springer; 2020. Chapter 11. PMID: 36351101.

1. Merck Manual. Erythema Multiforme. Updated May 2024. Accessed December 3, 2024. https://www.merckmanuals.com/professional/dermatologic-disorders/hypersensitivity-and-reactive-skin-disorders/erythema-multiforme?query=erythema%20multiforme; 2. Ardern-Jones M. Common cutaneous drug reactions. *BMJ Best Practice.* Updated November 22, 2024. Accessed November 27, 2024. https://bestpractice.bmj.com/topics/en-gb/368; 3. Regier L, et al. Topical corticosteroids: comparison chart. Rxfiles. July 2023. https://www.rxfiles.ca/RxFiles/uploads/documents/members/CHT-SteroidClassPotencyCOLOR.pdf

Ecchymosis/Hematoma

Palpable	Hard	Red	Hot	Painful	Size <1 cm	Fades with Pressure	Fluctuates	Itchy	
☒ ☑	☒ ☑	☑	☒	☒	N/A	☒	N/A	N/A	Ecchymosis/ Hematoma 

Characteristics

- **Ecchymosis:** localized, flat discolouration of the skin caused by a collection of clotted blood that accumulated into tissues from ruptured capillaries, appearing as bruising.[1–3]
- **Hematoma:** localized collection of blood outside the vessels, forming a swollen, often firm lump.[1,4]
- Symptoms include discolouration (ranging from red to purple, then yellow-green as they heal), tenderness, and swelling (for hematomas).[1–4]

Management

- Ecchymosis/bruising typically resolves on its own, does not require any specific intervention.[1–4]
- Large hematomas may require medical attention or drainage.[1–4]
- Management of ecchymosis includes applying **cold compresses** initially to reduce swelling, then **warm compresses** to promote healing.[1–4]
  - For existing cases, cold compresses applied immediately post injection can decrease swelling, while warm compresses later can promote healing.

1. Davis CP. Hematoma vs. ecchymosis: differences and similarities. eMedicineHealth. Updated by Cunha JP. Accessed November 27, 2024. https://www.emedicinehealth.com/hematoma_v_ecchymosis/article_em.htm; 2. Asirdizer M, Besik EZ, Kartal E. Non-traumatic ecchymoses: A literature review from a medico-legal perspective. *J Forensic Leg Med.* 2023;95:102490; 3. Mallidi RQ. Ecchymosis. MedIndia. Published August 23, 2017. Accessed November 27, 2024. https://www.medindia.net/patientinfo/ecchymosis.htm; 4. Wedro B. Hematoma. In: Balentine JR, ed. MedicineNet. Published July 5, 2024. Accessed November 27, 2024. https://www.medicinenet.com/hematoma/article.htm.

1. Davis CP. Hematoma vs. ecchymosis: differences and similarities. eMedicineHealth. Updated by Cunha JP. Accessed November 27, 2024. https://www.emedicinehealth.com/hematoma_v_ecchymosis/article_em.htm; 2. Asirdizer M, Besik EZ, Kartal E. Non-traumatic ecchymoses: A literature review from a medico-legal perspective. *J Forensic Leg Med*. 2023;95:102490; 3. Mallidi RQ. Ecchymosis. MedIndia. Published August 23, 2017. Accessed November 27, 2024. https://www.medindia.net/patientinfo/ecchymosis.htm; 4. Wedro B. Hematoma. In: Balentine JR, ed. MedicineNet. Published July 5, 2024. Accessed November 27, 2024. https://www.medicinenet.com/hematoma/article.htm.

Edema (Drug Pooling)

Palpable	Hard	Red	Hot	Painful	Size <1 cm	Fades with Pressure	Fluctuates	Itchy	
☑	☒	☒ ☑	☒	☒	N/A	☑	N/A	N/A	Edema (Drug Pooling) 

Characteristics

- **Edema:** accumulation/retention of fluid within layers of the skin or beneath the skin, leading to noticeable swelling.[1]
- Edema may be generalized or local, and it can appear abruptly or insidiously (more common). If edema develops slowly over time, it may become massive before patients seek medical care.[2]
- Feels soft to the touch and if pressure is applied, may leave an indentation, referred to as "pitting" after pressure is released.[1]
- **Drug pooling** is an accumulation of drug under the skin around the area of infusion. It is typically manifested as an elevated area of the skin, with or without induration and might be a sign of reduced absorption.

Management

- When possible, treatment involves resolving the underlying cause.[1,2]
- Mild edema typically resolves spontaneously.
- **Gentle massage** of the area can accelerate the absorption of the edema.
- Persistent or worsening symptoms require further evaluation to rule out infection.
  - If swelling, redness, pain, fever increases after infusion site change, further evaluation from an HCP is required.

Initial recommendations:

- Change infusion site.
- Rotate infusion site more frequently.
- Change cannula size.
- Review patient technique.
  - Ensure 90° angle when inserting cannula.
  - Stretching the skin.
  - Insert cannula in standing/lying position.
- Experience from clinical trials with LDp/CDp suggests that although drug pooling does occur, **it does not typically influence efficacy and tends to resolve after a day to a few days** of switching to a new infusion site.

1. Ellenson S. Subcutaneous edema: symptoms, causes, and treatment. Tactile Medical. Published May 22, 2023. Accessed November 27, 2024. https://tactilemedical.com/resource-hub/cellulitis-and-edema/subcutaneous-edema-symptoms-causes-and-treatment/; 2. Thompson AD, Shea MJ. Edema. MSD Manual Professional Edition. Reviewed/Revised August 2024. Accessed November 27, 2024. https://www.msdmanuals.com/professional/cardiovascular-disorders/symptoms-of-cardiovascular-disorders/edema.

1. Ellenson S. Subcutaneous edema: symptoms, causes, and treatment. Tactile Medical. Published May 22, 2023. Accessed November 27, 2024. https://tactilemedical.com/resource-hub/cellulitis-and-edema/subcutaneous-edema-symptoms-causes-and-treatment/; 2. Thompson AD, Shea MJ. Edema. MSD Manual Professional Edition. Reviewed/Revised August 2024. Accessed November 27, 2024. https://www.msdmanuals.com/professional/cardiovascular-disorders/symptoms-of-cardiovascular-disorders/edema.

CDp, carbidopa prodrug; HCP, healthcare professional; LDp, levodopa prodrug.

Dermatitis

Palpable	Hard	Red	Hot	Painful	Size <1 cm	Fades with Pressure	Fluctuates	Itchy	
☒ ☑	☒ ☑	☑	☒	☒	N/A	☒	N/A	☑	Dermatitis 

Characteristics

- **Dermatitis:** localized skin inflammation caused by irritation, allergens, or immune responses to infusion or delivery system.[1]
- Often presents as **redness, swelling, itching, or a rash** around the injection site and may be accompanied by dryness or flaking. In severe cases, blisters or erosions can develop.[1]
- Symptoms can vary in severity from mild irritation that resolves on its own to persistent inflammation requiring medical treatment.[1]
- **Allergic contact dermatitis** occurs in sensitized individuals who develop an immune response after repeated contact with specific allergens. It typically appears at the site of allergen contact, but the rash can spread beyond the area of contact.
- Patch testing remains the definitive gold standard for diagnosing allergic contact dermatitis.
- **Irritant contact dermatitis:** more common, and may include erythema, scaling, edema, vesiculation, and erosions in acute cases. Erythema, lichenification, hyperkeratosis, and fissures in chronic cases.
- Allergic and irritant reactions may be indistinguishable based solely on visual assessment, as both can present with characteristics similar to eczema.

Management

- Management of dermatitis involves **identifying and removing the irritant** (e.g., switching adhesives or adjusting medication delivery), applying **topical treatments like corticosteroids or emollients, and maintaining proper hygiene** at the site.[1]
- For mild cases, emollients and topical steroids may suffice.
  - After removal, hydrocortisone cream or ointment can be applied to the affected area for a few days to reduce inflammation and itching.
- Severe or recurrent reactions warrant consideration of alternative infusion methods or materials and referral to patch testing.
- Consider use of skin barrier products to create a protective layer between the skin and the adhesive/cannula (e.g., 3M Cavilon No Sting Barrier Film, Skin-Prep, AllKare wipes).
- If dermatitis does not improve with treatment after 2 days or is associated with other symptoms, consider consultation with dermatologist.

1. Forkel S, Buhl T. Allergic Contact Dermatitis After Injection of Local Anesthetic. *J Allergy Clin Immunol Pract*. 2020;8(6):2060-2061.

1. Forkel S, Buhl T. Allergic Contact Dermatitis After Injection of Local Anesthetic. *J Allergy Clin Immunol Pract.* 2020;8(6):2060–2061.

Cellulitis

Palpable	Hard	Red	Hot	Painful	Size <1 cm	Fades with Pressure	Fluctuates	Itchy	
☒ ☑	☒ ☑	☑	☑	☑	N/A	☒	N/A	N/A	Cellulitis 

Characteristics

- **Cellulitis:** bacterial infection involving the inner layers of the skin, specifically affecting dermis and subcutaneous fat.[1]
- Presents as a **red, swollen, warm, and often painful** area of skin. Area of redness increases in size over a few days with borders that are generally round, but the edges of the redness are not always well defined.[1]
- Individual may have a fever and feel tired.[2]
- Lymphatic vessels may occasionally be involved.[1–4]
- Potential complications include abscess formation.[1]
- Infusion-site swabbing discouraged.[5]
  - Swabbing skin will not identify bacterial pathogen and may produce inconclusive results.

Management

- Treating physicians usually prescribe **oral/IV antibiotics**, such as cephalosporin (cephalexin) or penicillin (amoxicillin or cloxacillin)[1,2] depending on their criteria.
- For patients with recurring infections:
  - Test for MRSA.
  - Consider consultation with infectious disease specialist.
    - Do not limit specialist consultation for MRSA only, as it could be various infections.

1. Vary JC, O'Connor KM. Common dermatologic conditions. Med Clin North Am. 2014;98(3):445–485; 2. Mistry RD. Skin and soft tissue infections. *Pediatr Clin North Am.* 2013;60(5):1063–1082; 3. Edwards G, Freeman K, Llewelyn MJ, Hayward G. What diagnostic strategies can help differentiate cellulitis from other causes of red legs in primary care? *BMJ*. 2020;368:m54; 4. Tintinalli JE, Ma O, Yealy DM, Meckler GD, Stapczynski J, Cline DM, Thomas SH, eds. Tintinalli's Emergency Medicine: A Comprehensive Study Guide. 9th ed. McGraw-Hill Education; 2020. Accessed November 27, 2024. https://accessmedicine.mhmedical.com/content.aspx?bookid=2353§ionid=183421313; 5. Fung VSC, and al. Clinical Parkinsonism & Related Disorders. 2024, Vol.10.

1. Vary JC, O'Connor KM. Common dermatologic conditions. *Med Clin North Am.* 2014;98(3):445–485; 2. Phoenix G, Das S, Joshi M. Diagnosis and management of cellulitis. *BMJ*. 2012;345:e4955.
IV, intravenous; MRSA, methicillin□resistant *Staphylococcus aureus*.

Abscess

Palpable	Hard	Red	Hot	Painful	Size <1 cm	Fades with Pressure	Fluctuates	Itchy	
☒ ☑	☒ ☑	☑	☑	☑	N/A	N/A	☑	N/A	Abscess 

Characteristics

- **Abscess:** collection of pus that has built up within the tissue of the body.[1]
- **Abscesses** present as a **localized, swollen, red, and painful area**, often **warm to the touch** and **sometimes with a visible pus-filled centre**.[1]
- Abscess may feel as though it is **filled with fluid or "boggy"** if it is pressed (fluctuates).[1]
- Area of redness is often bigger than the area of swelling.[2]
- Pain, fever and chills may also be present.[1]

Management

- Prompt identification and **cut/drainage of abscesses** are essential to prevent systemic spread.[1]
- **Send sample of drained pus for bacterial cultures**. It is critical for guiding targeted antibiotic therapy, if needed.[1]
- Red flags, such as **fever, chills, worsening redness, or persistent pain**, should prompt immediate medical attention to rule out systemic involvement or complications.

1. Singer AJ, Talan DA. Management of skin abscesses in the era of methicillin-resistant Staphylococcus aureus. *N Engl J Med*. 2014;370(11):1039-1047; 2. Tidy C, Willacy H. Abscess. Patient.info. Last updated September 26, 2023. Accessed November 27, 2024. https://patient.info/infections/abscess-leaflet.

1. Stevens DL, Bisno AL, Chambers HF, et al; Infectious Diseases Society of America. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. *Clin Infect Dis*. 2014;59(2):e10-e52.

References

References:

AbbVie Corporation. PrVYALEV™ Product Monograph. April 14, 2026. www.abbvie.ca/content/dam/abbvie-dotcom/ca/en/documents/products/VYALEV_PM_EN.pdf

Kim H, et al. *Sci Rep*. 2017;7(1):9613.

Dychter SS, et al. *J Infus Nurs*. 2012;35(3):154–160.

Baker J, et al. *BMC Palliative Care*. 2020;19:99.

Cleary NM, O ' Gorman A. *BMJ Supportive & Palliative Care* 2023;13:e948–e950. doi:10.1136/spcare-2022-00390.

Bhidayasiri R, *et al*. Effective delivery of apomorphine in the management of Parkinson disease: practical considerations for clinicians and Parkinson nurses. Clinical Neuropharmacology 2015, 38(3). Available at: https://dx.doi.org/10.1097/WNF.0000000000000082.

Todd and James. Apomorphine nodules in Parkinson's disease. Best Practice considerations. British Journal of Community Nursing Vol 13 No 10.

NHS: ApoMorphine Shared Care Guideline (Sept 2024).

Yang Y, Wu X, Liu W. Scar Symptom: Erythema and Thickness. 2020 Dec 8. In: Téot L, Mustoe TA, Middelkoop E, Gauglitz GG, editors. Textbook on Scar Management: State of the Art Management and Emerging Technologies [Internet]. Cham (CH): Springer; 2020. Chapter 11.

Mosby. Mosby's Medical Dictionary. 11th ed. St. Louis, MO: Elsevier; 2021. ISBN-13: 978-0-323-63915-6.

Cichoń M, Trzeciak M, Sokołowska-Wojdyło M, Nowicki RJ. Contact Dermatitis to Diabetes Medical Devices. *Int J Mol Sci*. 2023;24(13):10697.

Merck Manual. Erythema Multiforme. Updated May 2024. Accessed December 3, 2024. https://www.merckmanuals.com/professional/dermatologic-disorders/hypersensitivity-and-reactive-skin-disorders/erythema-multiforme?query=erythema%20multiforme.

Ardern-Jones M. Common cutaneous drug reactions. BMJ Best Practice. Updated November 22, 2024. Accessed November 27, 2024. https://bestpractice.bmj.com/topics/en-gb/368.

Regier L, et al. Topical corticosteroids: comparison chart. Rxfiles. July 2023. https://www.rxfiles.ca/RxFiles/uploads/documents/members/CHT-SteroidClassPotencyCOLOR.pdf.

Nast A, Griffiths CE, Hay R, et al. The 2016 International League of Dermatological Societies' revised glossary for the description of cutaneous lesions. *Br J Dermatol*. 2016;174(6):1351–1358.

Potter PA, Perry AG, Stockert PA, Hall A. Essentials for Nursing Practice. 9th ed. St. Louis, MO: Elsevier; 2019. ISBN: 978-0-323-48184-7.

Acland KM, Churchyard A, Fletcher CL, et al. Panniculitis in association with apomorphine infusion. *Br J Dermatol*. 1998;138(3): 480–482.

van Laar T, van Hilten B, Neef C, et al. The role of EDTA in provoking allergic reactions to subcutaneous infusion of apomorphine in patients with Parkinson's disease: a histologic study. *Mov Disord*. 1998;13(1):52–55.

Borgemeester RWK, van Laar T, Schuttelaar MLA. Cutaneous adverse drug reaction after apomorphine infusion, possibly caused by a systemic type IV hypersensitivity reaction to sodium metabisulfite: Report of 2 cases. Contact Dermatitis. 2018;79(5):316–318.

Borgemeester RWK, Diercks GFH, Jonkman MF, Van Laar T. Treatment of apomorphine-induced skin reactions: a pilot study. *Mov Disord*. 2015;30:S72.

Borgemeester RWK, Diercks GFH, Schuttelaar MLA, Van Laar T. Histology of subcutaneous nodules in PD patients treated with continuous apomorphine infusion: case series and review of the literature. *Mov Disord*. 2016;31:S653–S654.

Davis CP. Hematoma vs. ecchymosis: differences and similarities. eMedicineHealth. Updated by Cunha JP. Accessed November 27, 2024. https://www.emedicinehealth.com/hematoma_v_ecchymosis/article_em.htm.

Asirdizer M, Besik EZ, Kartal E. Non-traumatic ecchymoses: A literature review from a medico-legal perspective. *J Forensic Leg Med*. 2023;95:102490.

Mallidi RQ. Ecchymosis. MedIndia. Published August 23, 2017. Accessed November 27, 2024. https://www.medindia.net/patientinfo/ecchymosis.htm.

Wedro B. Hematoma. In: Balentine JR, ed. MedicineNet. Published July 5, 2024. Accessed November 27, 2024. https://www.medicinenet.com/hematoma/article.htm.

Ellenson S. Subcutaneous edema: symptoms, causes, and treatment. Tactile Medical. Published May 22, 2023. Accessed November 27, 2024. https://tactilemedical.com/resource-hub/cellulitis-and-edema/subcutaneous-edema-symptoms-causes-and-treatment/.

Thompson AD, Shea MJ. Edema. MSD Manual Professional Edition. Reviewed/Revised August 2024. Accessed November 27, 2024. https://www.msdmanuals.com/professional/cardiovascular-disorders/symptoms-of-cardiovascular-disorders/edema.

Forkel S, Buhl T. Allergic Contact Dermatitis After Injection of Local *Anesthetic. J Allergy Clin Immunol Pract.* 2020;8(6):2060–2061.

Vary JC, O'Connor KM. Common dermatologic conditions. *Med Clin North Am.* 2014;98(3):445–485.

Mistry RD. Skin and soft tissue infections. *Pediatr Clin North Am*. 2013;60(5):1063–1082.

Edwards G, Freeman K, Llewelyn MJ, Hayward G. What diagnostic strategies can help differentiate cellulitis from other causes of red legs in primary care? *BMJ*. 2020;368:m54.

Tintinalli JE, Ma O, Yealy DM, Meckler GD, Stapczynski J, Cline DM, Thomas SH, eds. Tintinalli's Emergency Medicine: A Comprehensive Study Guide. 9th ed. McGraw-Hill Education; 2020. Accessed November 27, 2024. https://accessmedicine.mhmedical.com/content.aspx?bookid=2353&sectionid=183421313.

Fung VSC, and al. Clinical Parkinsonism & Related Disorders. 2024, Vol.10.

Phoenix G, Das S, Joshi M. Diagnosis and management of cellulitis. *BMJ*. 2012;345:e4955.

Singer AJ, Talan DA. Management of skin abscesses in the era of methicillin-resistant *Staphylococcus aureus*. *N Engl J Med*. 2014;370(11):1039–1047.

Tidy C, Willacy H. Abscess. Patient.info. Last updated September 26, 2023. Accessed November 27, 2024. https://patient.info/infections/abscess-leaflet.

Bush LM. Abscesses. MSD Manual Professional Edition. Reviewed/Revised July 2024. Accessed November 27, 2024. https://www.msdmanuals.com/professional/infectious-diseases/biology-of-infectious-disease/abscesses?query=abscess.

Folliculitis and skin abscesses. MSD Manual Consumer Version. Reviewed/Revised November 2023. Accessed November 27, 2024. https://www.msdmanuals.com/home/quick-facts-skin-disorders/bacterial-skin-infections/folliculitis-and-skin-abscesses.

Stevens DL, Bisno AL, Chambers HF, et al; Infectious Diseases Society of America. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. Clin Infect Dis. 2014;59(2):e10-e52.