


Clinical Guideline

 This guideline should not replace clinical judgment.

Peripheral IV Extravasation/Infiltration (PIVIE) Treatment Inpatient and Outpatient Pediatrics

NONCYTOTOXIC INFILTRATIONS & EXTRAVASATIONS: GUIDELINE FOR PEDIATRIC PATIENTS

Purpose:

To describe the management of intravenous (IV) infiltrations and extravasations in pediatric patients.

Applicability:

Prescribers, Pharmacists, Nurses

Procedure:

1. Definitions

- a. Infiltration: the inadvertent administration or leakage of a non-vesicant (e.g., irritant) medication or solution into the surrounding tissue instead of into the intended vascular space. This occurs when the catheter becomes dislodged or the vein ruptures, causing fluid to leak into the surrounding tissue.
- b. Extravasation: the inadvertent administration or leakage of a vesicant medication or solution into the surrounding tissue instead of into the intended vascular space. A vesicant is a solution or medication that causes the formation of blisters with subsequent sloughing of tissues occurring from tissue necrosis.

Note: Phlebitis is an inflammation of the intima of the vein, and is a commonly reported complication of infusion therapy. It is completely different from, but is often confused with infiltration and extravasation. It usually occurs when the vein is irritated from solutions.


2. Signs and Symptoms of IV Infiltrations/Extravasations

- a. Swelling
- b. Redness
- c. Stinging, burning, or pain at the administration site
- d. Loss of blood return from the IV
- e. IV flow rate that slows or stops
- f. Leaking around the IV catheter or implanted port needle
- g. Skin tightness at the venipuncture site
- h. Blotching of the skin
- i. Change in temperature of the skin, cool or warm

3. Measurement Based Assessment Tool

- a. The Cincinnati Pediatric Intravenous Extravasation Assessment System standardizes the identification and assessment in the early stage of infiltration and extravasation, thus reducing the need for treatment and serious complications.
- b. Three steps in the coding system:
 - i. Volume measurement: measure max dimension of swelling of affected area (X), measure the ARM length (Y), calculate $(X/Y) \times 100 = \%$. See Figure 1.
 - ii. Medication Identification: Red (high risk), Yellow (intermediate risk), Green (low risk). See Figure 2.
 - iii. Documentation: Document immediately in Cerner.

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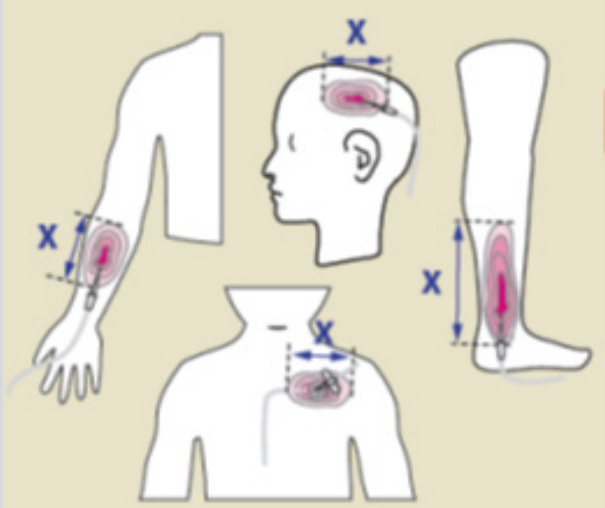
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Figure 1. Cincinnati Children's Hospital Medical Center IV Extravasation System

STEP 1: Volume

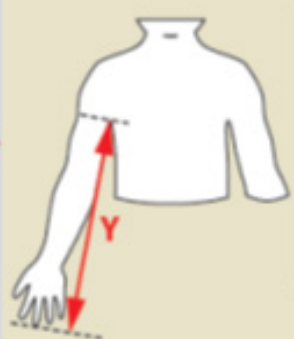
STEP 1a: Measure Swelling **X**



Notes:

- Define edges of swelling by palpation/visual observation.
- Measure longest dimension.

STEP 1b: Measure ARM Length **Y**




Notes:

- **Y** = Axilla to tip of longest finger
- For **Y** measure arm length regardless of site of extravasation.
- NEVER measure leg or other body part.
- Arm length **Y** is just a convenient way to consistently estimate the patient's size. For **Y** never measure the leg or other body part.
- For patients with casts or limb deficiency, consult vascular access team.

STEP 1c: Calculate

$$\left(\frac{X}{Y}\right) \cdot 100 = \boxed{} \%$$

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Figure 2. Venous Infusion Extravasation Risk Chart

Venous Infusion Extravasation Risk

This is an estimate of risk for phlebitis or local tissue injury due to extravasation from any intravenous infusion device.
Risk derived from available evidence, CCHMC data and CCHMC expert opinion, subject to review and change as further evidence becomes available.
For Treatment of Extravasation, Refer to CCHMC Policy P&T II-112
This does not apply in situations of emergency medical treatment.
If a medication is not on this list, please refer to the CCHMC formulary or contact pharmacy (6-4291) for information


Red Higher Risk	Yellow Intermediate Risk	Green + Lower Risk
<p>Acyclovir Amiodarone Caffeine Citrate Calcium (all salt forms) Dextrose > 12.5% Doxycycline Esmolol Mannitol 20% & 25% Promethazine Potassium >60 mEq/L Sodium bicarbonate ≥ 3% Sodium chloride ≥ 3% TPN > 950 mOsm/L Vasopressors such as Dopamine</p> <p>Antineoplastic Medications <i>Extravasation treatment: Refer to the Hazardous Medication Procedure HM-Pro-003 & HM-Pro-006</i></p>	<p>Acetazolamide Allopurinol Amikacin Amphotericin B (conventional) Arginine Ciprofloxacin Dextrose 10% to ≤12.5% Diazepam Erythromycin Ganciclovir Lorazepam Midazolam Morphine Ondansetron Nafcillin Iodine based (CT) Radiology Contrast Phenobarbital Phenytoin Potassium ≤ 60 mEq/L TPN ≤950 mOsm/L Vancomycin</p>	<p>Aminophylline Amphotericin B Liposomal Ampicillin Ampicillin/Sulbactam Cefazolin Cefotaxime Cefazidime Ceftriaxone Cefuroxime Clindamycin D5LR Dextrose < 10% Fentanyl Fosphenytoin Furosemide Gadolinium Based (MRI) Contrast Gentamicin Heparin Imipenem IVIG Lactated Ringers Lipids Magnesium sulfate (bolus) Meropenem Methylprednisolone Normal saline Pentamidine Piperacillin</p> <div style="border: 1px solid black; background-color: #90ee90; padding: 5px; margin-top: 10px;"> <p>NOTE: No intravenous infusate is "safe". Gross extravasation, even of normal saline, may result in serious harm including compartment syndrome, causing ischemia and loss of tissue or permanent loss of limb function.</p> </div> <p style="text-align: right; font-size: small;">Piperacillin/tazobactam Ticarcillin Ticarcillin/clavulanate Tobramycin</p>



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4. Management of Noncytotoxic Infiltrations/Extravasations (See Figure 3).
 - a. Stop the infusion
 - b. Assess the affected site for pain, erythema, and size of the infiltration
 - c. Elevate the affected extremity to reduce swelling
 - d. Notify provider of suspected infiltrate
 - i. A provider must evaluate an extravasation.
 - ii. A provider must write orders for compresses and antidotes as appropriate. (Refer to Tables I and II)
 - iii. All treatments, including warm and cool compresses, require a provider order
 - iv. All orders for compresses must include the frequency and duration of application
 - e. Estimate total volume of fluid that escaped into the tissue
 - f. Obtain orders for treatment interventions as needed
 - g. Attempt to aspirate residual drug from the IV needle/catheter using a small (1-3 mL) syringe. If administering antidote, the first dose (see Table I) may be administered into the subcutaneous tissue via this cannula
 - h. If not administering an antidote, remove IV catheter
 - i. Apply cold or warm compresses as ordered (see Table II)
 - i. Do not apply pressure to the site
 - ii. Compresses should never be warmed in the microwave
 - iii. For extravasation in the neonate, defer to the provider for use of compress
 - j. Assess skin surface every hour x 24 hours for induration, discoloration, and feeling of numbness in the affected extremity
 - k. Educate patients/families on worsening symptoms and to notify a provider:
 - i. Increased swelling
 - ii. Increased pain
 - iii. Blistering, ulceration, induration or other skin changes
 - iv. Altered tissue perfusion
 - v. Changes in sensation
 - l. Consider a plastic surgery consult for any of the following:
 - i. Increased swelling
 - ii. Increased pain
 - iii. Blistering, ulceration, induration or other abnormal skin changes
 - iv. Large infiltrate (greater than 25-50 mLs)
 - m. Consider a vascular surgery consult for any of the following:
 - i. Altered tissue perfusion
 - ii. Change in sensation
 - n. Elevate the affected extremity for 48 hours to reduce swelling. After 48 hours, encourage the patient to use the extremity normally to promote full range of motion

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Figure 3. Treatment Plan

% Swelling and Infusate Component	Action
Extravasation \geq 30% AND Red list infusate	Treat with Hyaluronidase or appropriate antidote per provider order
Extravasation \geq 30% AND Red list infusate	Clinical evaluation of the extravasation site by bedside RN, provider, and RRT RN to determine if hyaluronidase or appropriate antidote is clinically indicated. Decision criteria include imminent skin loss, and/or peripheral circulation impairment (compartment syndrome)
Extravasation \geq 30% AND Yellow or Green list infusate	Clinical evaluation of the extravasation site by bedside RN, provider, and RRT RN to determine if hyaluronidase or appropriate antidote is clinically indicated, but hyaluronidase treatment usually NOT indicated.
Extravasation $<$ 30% AND Yellow or Green list infusate	No treatment indicated
Extravasation of any % of a Red list Vasoactive medication (dopamine, epinephrine, and related medications)	IMMEDIATE consult to provider and RRT RN, if necessary, to determine treatment plan and use of phentolamine or appropriate antidote.

5. Outpatient Instructions Related to IV Infiltrations/Extravasations

- a. These instructions pertain to infiltrations/extravasations that occur in the outpatient infusion center or if the patient is discharged within 72 hours of an inpatient infiltration/extravasation event
- b. Provide the following instructions to the patient and/or the patient's family:
 - i. Continue to apply cold or warm compresses as ordered (refer to Table 1). Do not apply pressure to the site.
 - ii. Continue to elevate the affected extremity for 48 hours after the event to reduce swelling. After 48 hours, use the extremity normally to promote full range of motion
 - iii. Monitor the infiltration/extravasation site closely for at least 72 hours after the event. Some sequelae may not manifest for 2-3 weeks after the event. Notify your physician and go to the emergency room to seek immediate medical attention if there is:
 1. Increased swelling
 2. Increased pain
 3. Blistering, ulceration, induration or other skin changes
 4. Altered tissue perfusion
 5. Changes in sensation
- c. The provider's office and/or nurse should contact the patient the day after an outpatient infiltration/extravasation event to follow-up on the patient's status

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6. Documentation of IV Infiltrations/Extravasations

- a. All infiltrations and extravasations must be verbally reported to the treating provider and the charge nurse on the inpatient unit.
- b. All infiltrations and extravasations must be electronically reported in the Safety Intelligence Reporting System.
- c. All infiltrations/extravasations must be documented in the medical record and include the following information:
 - i. Date and time of infiltration/extravasation
 - ii. Infiltrating/extravasating agent (including concentration and diluent)
 - iii. Estimated volume of infiltration/extravasation
 - iv. IV catheter type
 - v. Location of IV insertion site
 - vi. Description of infiltration/extravasation (including but not limited to the following):
 1. Size of the affected area
 2. Presence of swelling or redness
 3. Report of stinging, burning, or pain at the administration site
 4. Presence/absence of blood return
 5. Decreased IV flow rate
 6. Leaking around IV needle/catheter
 - vii. Name of the provider that was notified and time notified
 - viii. Any interventions (including compresses and antidotes)
 - ix. Any response to interventions
 - x. Patient education
- d. All site checks performed must be documented.

Table I. Treatment of Extravasation

Overview of Treatment Modalities for Non-cytotoxic Medications		
Non-Pharmacologic		
Elevation	elevate	
Thermal	Warm /cold compress (See Table I) apply x 15 mins QID or continuously on initial injury Warm compress disperses agent via increase circulation like hyaluronidase Cold compress – limit the spread i.e. localizes the drug	
Topicals	bacitracin/ collagenase	
Pharmacologic		
	NICU	Pediatrics
Hyaluronidase Injection	Dilution: Withdraw 0.1 ml hyaluronidase 150 unit/ml & place in 0.9 ml NS for concentration 15 units/ml . Administer: 15 units by Injection of 0.2 ml at 5 points around periphery of extravasation site. May repeat in 30-60 mins if no resolution. DO NOT use near active infection or purulence.	Dilute 0.1 mL hyaluronidase 150 unit/mL with 0.9 mL NS for a final concentration of 15 units/mL. Administer as five 0.2 mL injections around the periphery of the extravasation site May repeat in 30-60 minutes if no resolution Do NOT use near active infection or purulence

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<p>Phentolamine Injection*</p>	<p>WEIGHTS < 1 kg: use 0.1 mg/ml concentration</p> <p>Inject Total dose 0.05 mg by using 0.1 ml SQ at five points on edge of swelling/blanching can repeat in 60 mins but watch for low BP</p> <p>WEIGHTS > 1-2.5 kg: USE 0.1 mg/ml concentration</p> <p>Inject total dose 0.1 mg, by Using 0.2 ml SQ at five points on edge of swelling/blanching can repeat in 60 mins but watch for low BP</p> <p>Weights 2.5-5 kg: USE 0.5 mg/ml concentration</p> <p>Inject Total dose 0.25mg, by using 0.1 ml SQ at five points on edge of swelling/blanching can repeat in 60 mins but watch for low BP-</p>	<p>Weight < 5 kg: see NICU recommendations</p> <p>Weight > 5 kg: USE 0.5mg/ml concentration</p> <p>Inject Total Dose 0.5mg, by Using 0.2 mL SubQ at five points at the leading edge of swelling/ blanching. Can repeat in 60 minutes. Monitor for low BP</p>
<p>Topical Nitroglycerin ointment</p> <p>Apply ONCE if no resolution can follow Every 8 hr x 3 dose</p>	<p>Some say use on Postnatal age \geq 21 days</p> <p>Do not use on broken skin</p> <p>DOSE: 4 mm/kg of ointment MAX of 25 mm (1 inch)</p> <p>Use Gramfield tape:</p> <p>Order sentences:</p> <p>Nitroglycerin 2% ointment, 4 mm, (weight 1 kg), Apply ONCE</p> <p>MONITOR BP every 5 min x 15 mins</p> <p>Nitroglycerin 2% ointment , 8 mm, (weight 2 kg), Apply ONCE</p> <p>Monitor BP every 5 mins x 15 mins</p> <p>Nitroglycerin 2% ointment 12 mm, (weight 3kg), Apply once Monitor BP every 5 mins x 15 mins</p> <p>Nitroglycerin 2% ointment 16mm, (weight 4kg), Apply once Monitor BP every 5 mins x 15 mins</p> <p>Nitroglycerin 2% ointment 20 mm, (weight 5kg), Apply once Monitor BP every 5 mins x 15 mins</p>	<p>Weight < 5 kg: 4 mm/kg (max 25 mm) of ointment apply to affected area. Use Gramfield tape to measure.</p> <p>Weight > 5 kg: 1 inch apply to affected area</p> <p>Monitor BP every 5 minutes x 15 minutes</p>
<p>Terbutaline (pediatrics)</p>	<p>Half-life too long in neonates</p>	<p>Do not use in patients < 2 years of age</p> <p>Patient's \geq 2 years: Dilute 1 mg of terbutaline in 9 mL of NS to make a final concentration of 0.1 mg/mL. Inject 0.1-0.2 mL SubQ doses at the leading edge of the extravasated site</p>

*Phenolamine: extracted form NeoFax and Lexicomp & dose adjusted from pediatric cardiovascular surgery & dental literature.

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Table II. Medications Specific Treatment Modalities

* For THERMAL Treatment in the neonate, defer to the provider for use of compress

Drug	Mechanism of injury	Antidote	Primary Thermal Compress*	Other
Acyclovir	pH	Hyaluronidase	warm	
Ampicillin	Osmolarity	Hyaluronidase	warm	
Amiodarone	pH	Hyaluronidase	warm	
Amphotericin B	unknown	Hyaluronidase	warm	
Aminophylline	osmolality/osmolarity	Hyaluronidase	warm	
Arginine	pH /osmolarity	Hyaluronidase	warm	
Calcium salts	osmolarity	Hyaluronidase	warm	
Dantrolene	pH	Hyaluronidase	warm	
Dextrose 10% W,12.5%	osmolarity	Hyaluronidase	warm	
Diazepam	osmolarity	Hyaluronidase	warm	
Digoxin	osmolarity	Hyaluronidase	warm	
DoBUTamine	vasoconstriction	Phentolamine	warm	nitroglycerin ont/terbutaline-ped
DOPamine	vasoconstriction	Phentolamine	warm	nitroglycerin ont/terbutaline-ped
Doxycycline	pH	Hyaluronidase	warm	
EPInephrine	vasoconstriction	Phentolamine	warm	nitroglycerin ont/terbutaline-ped
Esmolol	pH	Hyaluronidase	warm	
Etomidate	osmolarity	Hyaluronidase	warm	
Fat Emulsion w/out TPN		Flush Out with Normal Saline	warm	FLUSH OUT procedure by Martin PH British J of Anaesthesia 1994;72:702.

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		procedure		
Gentamicin	pH	Hyaluronidase	warm	
Immune globulin	osmolarity	Hyaluronidase	warm	
IV Contrast		No antidote	cool	Symptomatic treatment, defer to radiology IV Contrast policy
Lorazepam	osmolarity	Hyaluronidase	warm	
Mannitol >=20%	osmolarity	Hyaluronidase	warm	
Metronidazole	unknown	Hyaluronidase	warm	
Nafcillin	osmolarity	Hyaluronidase	warm	
NOREpinephrine	vasoconstriction	Phentolamine		nitroglycerin/terbutaline-ped
Parenteral Nutrition	osmolarity	Hyaluronidase	warm	
Pentamidine	pH	Hyaluronidase	warm	
Phenobarbital	pH/osmolarity	Hyaluronidase	warm	
Phenobarbital	pH/osmolarity	Hyaluronidase	warm	
Phenytoin	pH/osmolarity	Hyaluronidase	warm	
PHENYLephrine	vasoconstriction	Phentolamine		nitroglycerin/terbutaline-ped
Potassium Chloride	osmolarity	Hyaluronidase	warm	
Potassium Phosphate	osmolarity	Hyaluronidase	warm	
Penicillin G Aqueous	unknown	Hyaluronidase	warm	
Propofol		Hyaluronidase	warm	Flush out
Promethazine	pH	Hyaluronidase	warm	
Sodium Bicarbonate	osmolarity	Hyaluronidase	warm	Flush out/lidocaine
Sodium Chloride >=3%	osmolarity	Hyaluronidase	warm	
Sodium Phosphate		Hyaluronidase	warm	
Valproic acid	unknown		cold	
Vancomycin	pH	Hyaluronidase	warm	
Vasopressin	vasoconstriction	Nitroglycerin ont	warm	Phentolamine/terbutaline-ped

****For extravasation in the neonate, defer to the provider for use of compress**

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Reynolds PM Pharmacotherapy 2014;34(6):67-632

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Executive Summary

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References

- Ray-Barruel G et al Infusion phlebitis assessment measures: a systematic review. *J of Evaluation in Clinical Practice* 2014; 20: 191-202
- Ibrahim A et al A new Approach to Management of Intravenous Infiltration in Pediatric Patients. *J Infusion Nursing* 2011; 34(4):242- 249.
- Ong J and Gerpen RV. Recommendations for Management of Non- cytotoxic Vesicant Extravasation *J of Infusion Nursing* 2020; 43 (6): 319-343.
- Reynolds PM et al Management of Extravasation Injuries: A focused Evaluation of Non-cytotoxic Medications. *Pharmacotherapy* 2014;34(6) 617-632.
- Montgomery LA et al Guideline for IV infiltrations in pediatric patients. *Pediatric Nursing* 1999; 25(2): 167-180.
- Valentin D et al Extravasation of non- cytotoxic medications. *Ann Pharmacotherapy* 2020; 54(8): 804-814.
- Amjad I et al A new Approach to Management of Intravenous Infiltration in Pediatric Patients. *J of Infusion Nursing* 2011; 54(4) 242-249.
- Sawatzky-Dickson D Neonatal Intravenous Extravasation Injuries: Evaluation of a Wound Care Protocol. *Neonatal Network* 2006; 25(1) 13-19.
- Beaulieu M Hyaluronidase for Extravasation Management. *Neonatal Network* 2012; 31(6):413-418.
- Corbett M et al Treatment of extravasation infiltration injuries in infants and children: a scoping review and survey. *Health Technology Assessment*. 2018; 22(46) 1-112.
- Schie J and Goodman K Treatment of Neonatal Extravasation Injuries Using Non-Contact Low-Frequency Ultrasound: Development of a New Treatment Protocol. *Newborn& Infant Nursing Reviews*.2013; 13: 42-47.
- Kostogloudis N et al Severe Extravasation Injuries in Neonate: a report of 34 cases. *Pediatric Dermatology* 2015; 2(6): 839-835.
- Ramasetu J Prevention and Management of Extravasation Injuries in Neonates. *Neo Reviews* 2004; 11(5) e491-e497.
- Casanova D et al Emergency treatment of accidental infusion leakage in the newborn: report of 14 cases. *B J of Plastic Surgery* 2001; 54: 396-399.
- Driscoll C et al Improving Detection of IV infiltrates in Neonates: *BMJ Quality Improvement Reports* 2015; 4(1): 1-5.
- Warren D and Cert G. Implementation of a protocol for the prevention and management of extravasation injuries in the neonatal intensive care patient. *Int J Evid Based Healthcare* 2011; 9 (2): 165-171

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Executive Summary

Nitroglycerin

Plum M, Moukhachen O. Alternative pharmacological management of vasopressor extravasation in the absence of phentolamine. P T. 2017;42(9):581-592

Samiee-Zafarghandy S et al Topical Nitroglycerin in neonates with tissue Injury: A case report and review of the literature. Paediatr Child Health 2014; 19(1): 9-12.

Vasquez P et al Resolution of Peripheral Artery Catheter – induced ischemic Injury Following Prolonged Treatment with Topical Nitroglycerin Ointment in Newborn: a case report. J Perinatology 2003; 23: 348-350.

Phentolamine

Subhani M et al Phentolamine Use in a Neonate for the Prevention of Dermal Necrosis Caused by Dopamine: A case Report J of Perinatology 2001;21:324-326.

Koner O et al Effects of Phentolamine on Tissue Perfusion in Pediatric Cardiac Surgery. J Cardiothoracic and Vascular Anesthesia 1999;13(2) 191-197.

Hersh EV et al Phentolamine mesylate for Accelerating recovery form Lip and tongue Anesthesia Dent Clin N Am 2010; 54: 631-642.

Furck AK et al. The impact of afterload reduction on the early postoperative course after the Norwood operation- a 12 year single –centre experience. European J Cardio-Thoracic Surgery 2010;37: 289-295.

Compartment Syndrome

Severyn N Kua KL. Neonatal extremity compartment syndrome: A rare Diagnosis requiring prompt resolution. Am J Perinatol Report 2020; 10: e386-e389.

Ragland R et al. Forearm Compartment Syndrome in the Newborn: Report of 24 cases. J Hand Surg. 2005;30(5): 997-1003

Flush out Procedure

Martin PH, Carver N, Petros AJ. Use of liposuction and saline washout for the treatment of extensive subcutaneous extravasation of corrosive drugs. British J of Anaesthesia 1994; 72: 702-704.

Citation

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