Clinical Indications for the Replacement of Short Peripheral Catheters

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Objectives

At the end of this lecture you will be able to:

• Define “clinically indicated” and its relation to peripheral infusion therapy
• List current recommendations for the frequency of SPC site assessments
• List current recommendations for the re-siting of SPCs
History of SPCs

1400’s- Blood
• Drinking blood
• Blood letting
• Unsuccessful
History of SPCs

1600’s-IV sets developed
• Pig bladders, feather quills
• Silver pipes (catheters)
• Blood transfusions
• Medication injections
History of SPCs

1800’s

- Risks: air embolism, fluid overload
- Solutions: Ringer’s, Normal Saline
- Nutritional support: sugar, protein, fat
- Hypodermic syringes
History of SPCs

1900’s

• ABO grouping, sodium citrate
• Nurses start IVs
• 1973 INS is founded
Types of Infusion Therapy

What is Infusion Therapy?
Types of Infusion Therapy

What is Infusion Therapy?

The administration of medications or treatments through a catheter or needle with Intravenous Solutions.
Short Peripheral Catheters (SPCs)

• Goal: Preserve the vein
  – Anticipate patient’s needs & therapy duration
  – Smallest catheter for the prescribed therapy
  – Use visualization technology
  – Investigate characteristics of infusate
Fluid Resuscitation

• Correct volume deficits (hemorrhage, trauma)
• Correct serum electrolytes (shock, DKA)
• Large bore catheter (18g-14g)
• Normal Saline, Ringer’s, Blood
Chemotherapy

- Interrupts the cell cycle
- Damages cellular RNA & DNA
- Diligent verification of orders & observation
- Outpatient v. Inpatient
Biologic Therapy

- Autoimmune disorders
  - Monoclonal therapy: TNF, B-cells, T-cells
  - Recombinant fusion protein therapy
- Neurological disorders
- Antirejection transplant medications
Nutritional Support

- Parenteral Nutrition
- Hospital infusion
- Home infusion
- Dextrose & Osmolarity
- Goals of care
IV Antibiotics

• Short term v. long term
• pH & Osmolarity
• Hospital infusion (inpatient & outpatient)
• Home infusion
Blood Transfusion

• Strict guidelines for administration
• Catheter size 24g-14g
• Change sets at the completion of 1 unit or 4 hours; may give >1 unit in a 4 hour period
Successful Access

- 98% success rate
Successful Access

• 98% success rate-certified nurses
• 44% success rate-staff
• 23% success rate-physicians
Variables

- Patient & nurse positions of comfort
- Patients’ skin - tough, fragile
- Vein characteristics - crooked, sclerosed, valves
- Patients’ movements & emotional state
Variables

The longer it takes to place a SPC, the less chance one has of success
Device Length & Gauge

Pouseuille’s law - small changes in cannula diameter equal large changes in flow

- 24g 3/4” Yellow (20mL/min=1,200mL/hour)
- 22g 1” Blue (37mL/min=2,220mL/hour)
- 20g 1” Pink (63mL/min=3,780mL/hour)
- 18g 1.16” Green (95mL/min=5,700mL/hour)
Site Selection-Adults

Choose a venous site most likely to last the full length of the prescribed therapy

- Forearm
  - Increase dwell time
  - Decrease pain during dwell time
  - Prevent accidental removal & occlusions
  - Promote self-care
Site Selection-Pediatrics

Choose a venous site most likely to last the full length of the prescribed therapy

- Hand - not in breast feeders or thumb suckers
- Forearm - no right arm s/p cardiac procedures/plus a filter
- Upper arm - check for future PICC placement
- Scalp - check for arterial flow
- Foot - not for ambulatory children
Site Selection—All patients

Avoid

• Areas of flexion-antecubital
• Ventral surface of the wrists
• Compromised areas—wounds, infection, grafts
• HD fistulas
• Side of axillary node dissection—breast CA
Concentration

- Osmolarity
  - # of milliosmoles (mOsm) in one liter (L) of solution
  - Solute concentration in fluid
  - Hypertonic-Osmolarity $\geq 375$ mOsm/L
  - Hypotonic-Osmolarity $\leq 250$ mOsm/L
  - Isotonic-Osmolarity of 250-350 mOsm/L
SPC Infusate Details

Concentration

• Osmolality
  – # of milliosmoles (mOsm) in one kilogram (kg) of water
  – Solute concentration by weight
  – mOsm/kg
  – Human plasma is 280-295 mOsm/kg
SPC Details

- **pH of infusate**
  - Human pH is 7.35-7.45
  - pH < 7.35 is more acidic
  - pH > 7.45 is more alkalotic
  - 5 < pH > 9 clinical indication for a central line
Irritants v. Vesicants

Chemical Nature

Vesicants

• Cause a reaction when outside the vessel
  – Blistering
  – Tissue sloughing
  – Tissue necrosis

Irritants

• Cause a reaction along the vessel
  – Itching
  – Phlebitis
Continuous Infusions

Advantages

• Drug is diluted
• Plasma concentrations are constantly maintained
• Large fluid volumes can be replaced
Continuous Infusions

Disadvantages

• Risk for fluid volume overload
• Incompatibilities of solutions & drugs
• Patient comfort
Intermittent Infusions

Advantages

• Periodic peak blood concentration
• Decreased risk of fluid overload
• Great convenience to the patient
Intermittent Infusions

Disadvantages

• May result in venous irritation
• Drug may be less effective
• Requires additional equipment
Clinical Indicators

What are Clinical Indicators?
Clinical Indicators

What are Clinical Indicators?

Measures of a process, structure, or outcome used to Interpret a clinical situation

(Objective data)
SPCs-Clinical Indications

- Infiltration
- Extravasation
- Infection
- Nerve damage
- Phlebitis
Infiltration

The inadvertent administration of a non-vesicant solution or medication into surrounding tissues

• Chemical
  – Osmolarity
  – pH

• Mechanical
  – Flexion

• Obstructive
  – Thrombosis, sclerosis
Infiltration

Prevention
• Education
• Policy & procedure for administration
• Check for valves & thrombosis
• Stabilize catheter
• Rescues
Extravasation

The inadvertent administration of a vesicant solution or medication into surrounding tissue. Tissue damage is directly related to type, concentration, & volume infiltrated

- Blisters
- Compartment Syndrome
- Nerve & tissue damage
- Tissue sloughing/necrosis
Extravasation

Prevention

• Education
• Policy & Procedure for administration
• Catheter stabilization
• Blood return check
• Rescues
Infection

• Signs & symptoms
  – inflammation at the site
  – drainage
• Usual cause
  – Poor hand/site hygiene
Nerve Damage

Anatomical variations of vasculature
  – Risky sites (ex.) dorsal hand, wrist

• Nerve compression
• Compartment Syndrome
• May require a fasciotomy
• Patients’ reports of paresthesia
  – Electric shock
  – Tingling
  – Numbness
Phlebitis

Inflammation of the intima of the vein

Endothelial cells become irritated

• Patient factors- current infection, diabetes, immunodeficiency, age ≥ 60 y/o
• Chemical- nature of the infusate
• Mechanical- movement r/t placement
• Bacterial- dirty insertion
• Post infusion- occurs 48-96 hours after
Phlebitis

Prevention

• Education
• Policy & procedure
• Skilled insertion
• Stabilize catheter
• Dilute infusate
• Smallest gauge catheter for the therapy
Phlebitis Scales

- Check your facilities’ phlebitis scale
- Must be valid, reliable, & clinically feasible
- INS scale 0-4
  0 = Healthy site
  4= Streak formation, palpable cording
- Document site check frequency
Previous Clinical Indicators for Re-Siting SPCs

- Previous guidelines
  - Re-site SPCs every 72 to 96 hours
  - Risk of potential for infection
  - Risk of potential for phlebitis
SPCs-Clinical Indicators

• Evidence Based Practice
  – Current studies (within the past 5 years)
  – New & improved catheter designs
  – Dwell time based on phlebitis & infection rates
  – Other clinical indicators
    • Blockage, swelling, pain, leaking
Dwell Time Changes-Evidence

- Cochrane Vascular Group (2015)
  - 4,895 patients
  - Review of 7 randomized controlled trials
  - No difference in CR-BSI/phlebitis rates whether SPCs changed routinely or according to clinical indications

No evidence to support routine 72-96 hour site rotation of SPCs
Dwell Time Changes - Evidence

- Australia
  - 3,283 patients/5,907 SPCs
  - Randomized equivalence trial
  - Phlebitis & infection rates were not statistically significant across routine & clinically indicated restarts

SPCs can be re-sited as clinically indicated
Exceptions

• CDC (2011)
  – No need to replace SPC more frequently than 72-96 hours to decrease infection or phlebitis rates
  – Unresolved issues for replacing SPC when clinically indicated

• Standard 44.I.C.
  – Restart emergently placed SPC within 24-48 hours
What does this mean?

Extending SPC dwell times

• By 1 day
  – 20% reduction in unnecessary restarts
  – Saves patients’ veins
  – Save the facility's money
  – Save staff time
Site Assessment Frequency
INS Position Paper (2012)

• At least every 4 hours
  – Alert, oriented, & able to tell nurse of symptoms
  – Receiving nonirritant & nonvesicant infusions

• At least every 1-2 hours
  – SPCs in high risk areas (flexion, external jugular)
  – Sedated, sensory or cognitive deficits, unable to notify nurse of symptoms
Site Assessment Frequency
INS Position Paper (2012)

• At least every 1 hour
  – Neonates
  – Pediatrics

• Every 5-10 minutes
  – Vesicants in intermittent infusions
  – Vasoconstrictor agents
Site Assessment Frequency INS Position Paper (2012)

• Temperature check per policy & procedure
• Locked SPCs for intermittent infusions
  – Site assessment with each access
  – At least 2X per day
• At every home or outpatient visit
  – Home infusions
  – Family education
    • Signs & symptoms of complications
    • Site checks ever 4 hours by patient or family
    • How to start, stop, & flush
Case Study I

A 70 yo man arrives at the ED c/o “dark red” diarrhea and dizziness. PMH concerning for ETOH use & cardiomyopathy with an ejection fraction of 20%. You are called to start a SPC.

Vital signs are:

- BP =75/35
- map=45
- HR =110
- T =37.3 C
- RR =24

What do we know about this patient so far?
Case Study I

- Bleeding
- Heart is weak
- Not perfusing
- Work of breathing
- Needs a SPC & fluids

What size & length SPC shall we use?
Where shall we site the SPC?
What fluids & how much?
Case Study II

A 6 mo baby girl (pre-op for hypertrophic pyloric stenosis repair) & her mom arrive on the pediatric unit. The patient has a 24g3/4” SPC in situ right hand/dorsal vein. You are called to assess the SPC. As they settle down in the room, you see mom is breast feeding the patient. The patient stops feeding & vomits in a projectile fashion.

What do we know about the patient so far?
Case Study II

- Dehydrated & hungry
- SPC in hand of breast feeding baby
- Patient will need IV antibiotics on-call to the OR in the morning

Is the SPC sited in an appropriate place?
Are you going to change the SPC site?
At what frequency will you check the SPC site?
Case Study III

A 34 yo male patient with a history of IVDU arrives on the Medicine unit. He is here to be treated with IV antibiotics for an abscess to his left upper arm. You are called because 4 previous attempts by staff are unsuccessful. The physician has offered to try.

What do we know about the patient so far?
Case Study III

- Difficult access
- May be septic (needs labs)
- May need a PICC
- Bring Ultra Sound to visualize vasculature

What size & length SPC shall we use?
Where shall we site the SPC?
How long will he need a SPC?
Is he a candidate for Home Infusion?
Thank You!

Thank you for coming!
References I


Infusion Therapy Standards of Practice (2016). Supplement to Journal of Infusion Nursing, 39(1S), S1-159.


References II


