# 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

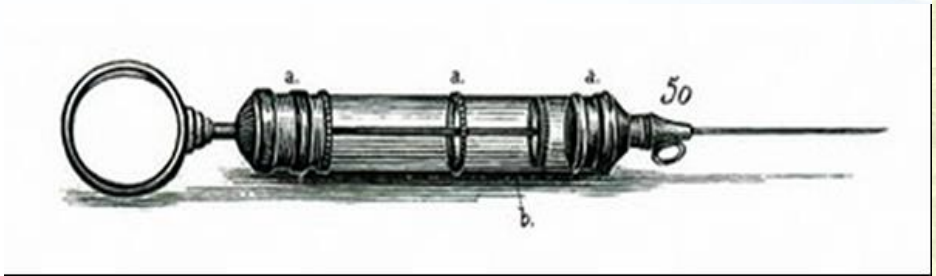
1600's-IV sets developed

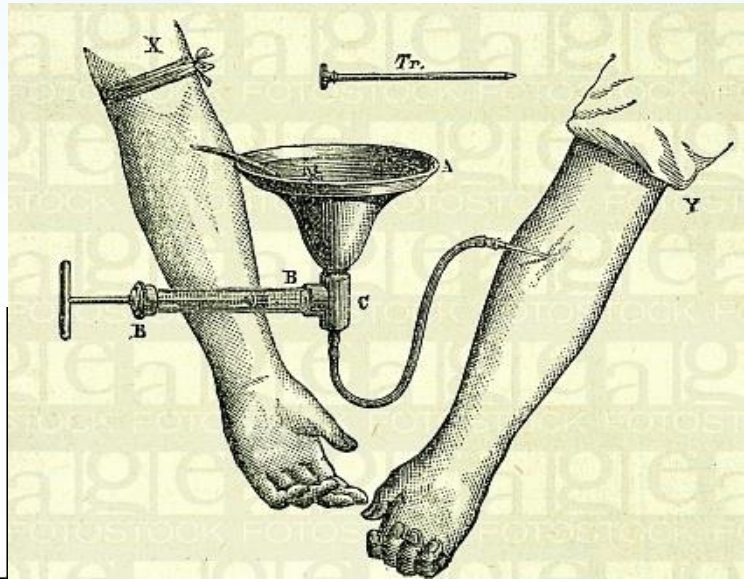
- Pig bladders, feather quills
- Silver pipes (catheters)
- Blood transfusions
- Medication injections

# 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)

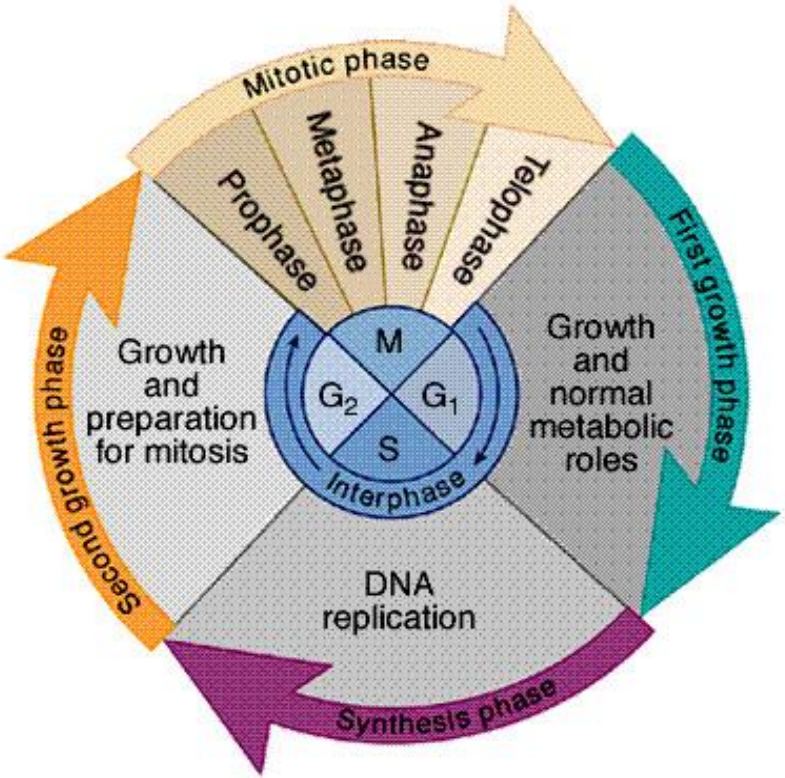
- Goal: Preserve the vein
  - Anticipate patient's needs & therapy duration
  - Smallest catheter for the prescribed therapy
  - Use visualization technology
  - Investigate characteristics of infusate

# Fluid Resuscitation

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

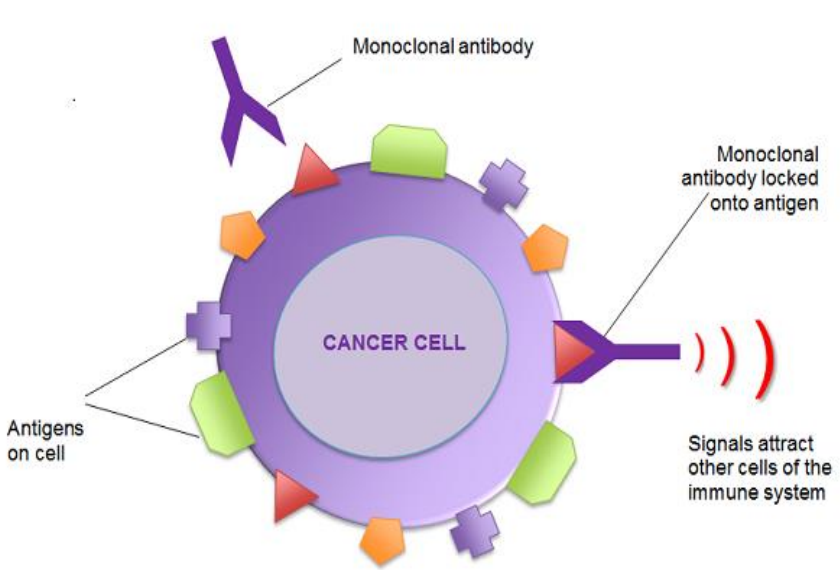
# Chemotherapy

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



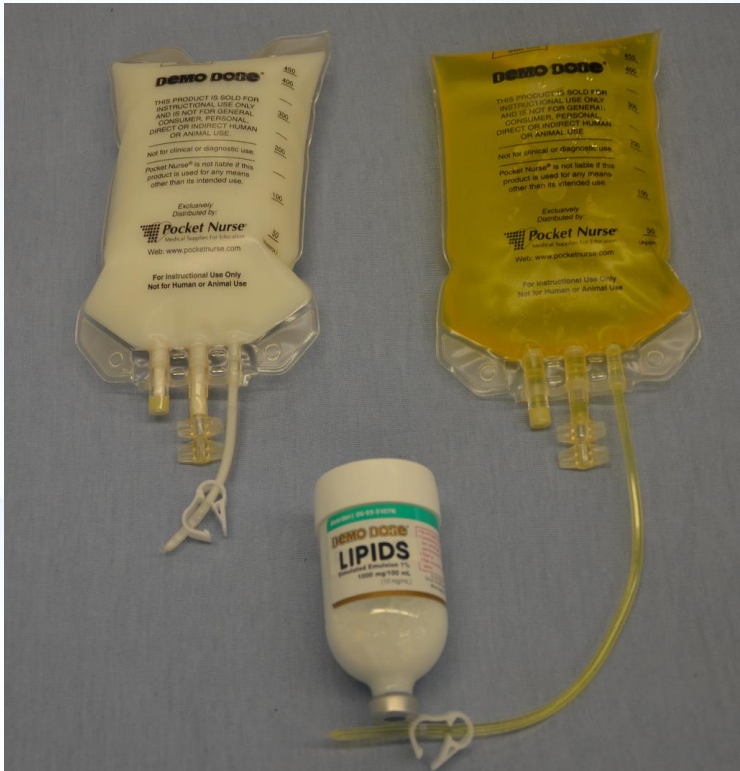
# Biologic Therapy

- 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


"I'm ordering a transfusion. We'll replace your B-negative blood with B-positive and see if that improves your mood."

# Successful Access

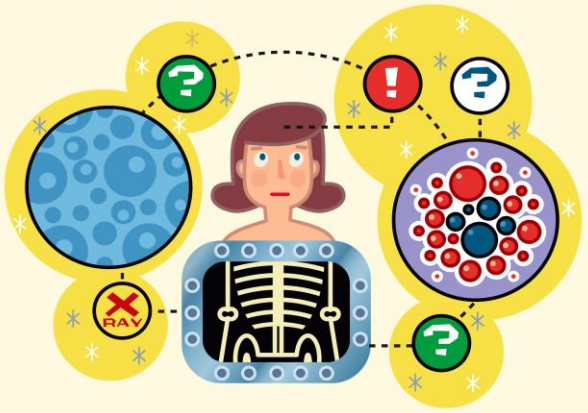

- 98% success rate

# 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

24g¾" Yellow (20mL/min=1,200mL/hour)
22g1" Blue (37mL/min=2,220mL/hour)
20g1" Pink (63mL/min=3,780mL/hour)
18g1.16" 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

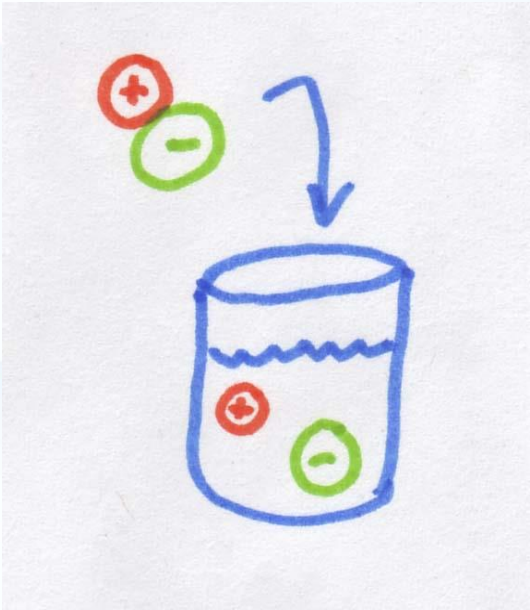
Avoid

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

# SPC Infusate Details

## Concentration

- Osmolarity
  - # of milliosmoles (mOsm) in one liter (L) of solution
  - Solute concentration in fluid
  - Hypertonic-Osmolarity ≥ 375 mOsm/L
  - Hypotonic-Osmolarity ≤ 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

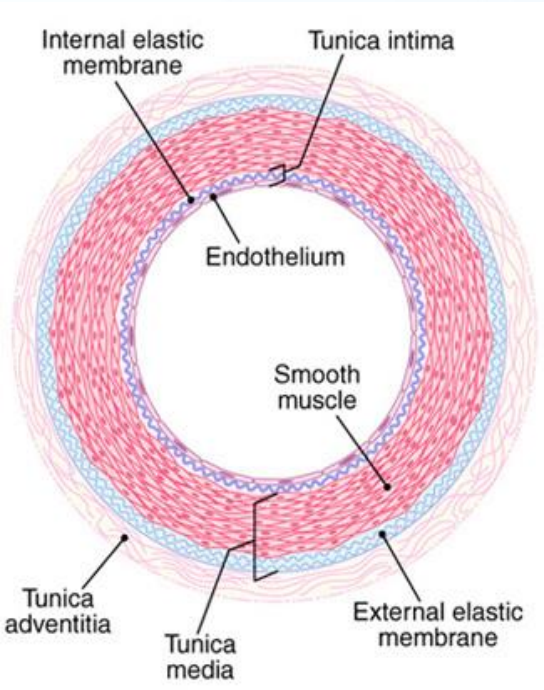
- Nerve compression
- Compartment Syndrome
- May require a fasciotomy
- Patients' reports of paresthesia
  - Electric shock
  - Tingling
  - Numbness

# 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!

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