**Introduction and Characteristics**

**Introduction:** Increased reliance on the use of the intravenous route has resulted in a need for simultaneous but separate venous access sites. This need has led to the development of a multiple lumen peripheral catheter that helps conserve peripheral sites, reduce patient discomfort and is cost effective.

Because there is great diversity from one institution to another, the information and procedures listed are intended to serve only as guidelines for successful use of the Arrow TwinCath®.

**Characteristics:** The Arrow TwinCath® is the first and only polyurethane multiple lumen over-the-needle catheter designed for peripheral placement. The catheter consists of two separate and distinct non-communicating lumens which DO NOT permit mixing of infusates within the catheter.

The catheter is available in both 18 Ga. and 16 Ga. models. The 18 Ga. catheter has a 20 Ga. distal lumen and a 22 Ga. proximal lumen while the 16 Ga. catheter has an 18 Ga. distal lumen and a 20 Ga. proximal lumen. The useable catheter length is 1-3/4 inches.

**Features**

*The distal lumen is identified* by its blue (18 Ga.) or white (16 Ga.) luer lock hub. The proximal lumen is identified by the easy to handle clear extension line also with a luer lock™ fitting and UserGard™ injection cap. All lumens are clearly marked with their individual gauge sizes.

The luer lock hub design permits use of luer lock tubing and prevents accidental disconnects. When needles are used the UserGard™ injection cap is longer in length to reduce the risk of extension line puncture and to permit visualization of the needle tip. The injection cap diaphragm can also accommodate the Arrow UserGard hub, a needle free product designed to reduce the risk of needlesticks. A flexible hub/catheter transition helps to minimize kinking and aids in patient comfort. A removable slide clamp on the extension line permits easy line changes. The small introducer needles (20 Ga. or 22 Ga.) provide for easier vein cannulation. A 0.45 micron vent plug prevents blood seepage upon vein entry.
Twin Cath® insertion sites

**Preferred placement sites for the TWIN CATH® are the major venous channels** of the arm, i.e. cephalic, basilic, median cubital and axillary, as shown to the right.

*M* Priming volume of proximal lumen excludes injection cap. UserGard™ injection cap volume is 0.17 ml.

**Flow rates** are determined with normal saline, room temperature, 40 inch head height and represent approximate flow capabilities.

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**Features**

- Pre-attached UserGard™ injection site
- Proximal lumen luer lock hub
- Clearly marked proximal lumen
- Removable Slide Clamp
- Distal lumen luer lock hub
- Flexible kink-resistant hub/catheter junction
- Polyurethane catheter material for improved indwelling characteristics
- Separate infusion ports for simultaneous infusions and/or discrete blood sampling
- Hydrophilic coating for easier insertion

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**TWIN CATH® INSERTION SITES**

**PRIMING VOLUMES AND FLOW RATES**

**Priming Volumes:**

<table>
<thead>
<tr>
<th>Catheter Gauge</th>
<th>Distal Lumen</th>
<th>Proximal Lumen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>18 Ga.</strong></td>
<td>0.07 ml</td>
<td>0.13 ml</td>
</tr>
<tr>
<td><strong>16 Ga.</strong></td>
<td>0.10 ml</td>
<td>0.21 ml</td>
</tr>
</tbody>
</table>

**Flow Rates:**

<table>
<thead>
<tr>
<th>Catheter Gauge</th>
<th>Distal Lumen</th>
<th>Proximal Lumen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>18 Ga.</strong></td>
<td>3110 ml/hr</td>
<td>960 ml/hr</td>
</tr>
<tr>
<td><strong>16 Ga.</strong></td>
<td>4235 ml/hr</td>
<td>1815 ml/hr</td>
</tr>
</tbody>
</table>

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Tubex® Blunt Pointe™ sterile cartridge units are compatible with Arrow UserGard™ Intermittent Injection Caps. Tubex® Blunt Pointe™ is a registered trademark of Wyeth-Ayerst Laboratories.
The total blood flow through the human arm varies with the patient’s cardiac output and vasomotor tone. It is predicted that 3-5% of the total cardiac output goes to the resting arm. About one-half of this blood is then returned to the heart by the superficial venous channels at a rate of approximately 75 to 175 ml/min.\textsuperscript{1,3}


## Indications for Use

1. Patients requiring two individual peripheral sites.
2. Patients with minimal or decreased peripheral venous access.
3. Patients receiving two or more incompatible drugs with no central access.
4. Patients receiving thrombolytic therapy where venous access needs to be maximized while limiting actual puncture sites (central vein cannulation is contraindicated unless critical).
5. Patients requiring PPN (peripheral parenteral nutrition) and medication therapy.
6. Patients utilizing PCA (patient controlled analgesia).
insertion procedure

Use sterile technique and follow universal blood and body fluid precautions.

1. Prepare the puncture site in a suitable manner.

2. Prepare the catheter for insertion by flushing the proximal port through the injection cap as follows:
   Leaving the needle guard in place hold the catheter in an upright position. Flush with normal saline or heparin flush solution to activate the catheter’s hydrophilic coating.

   PRECAUTION: Do not allow the flush solution to go beyond the tip of the catheter.

3. Puncture the vessel using a continuous, controlled slow forward motion, being careful to avoid transfixing both vessel walls. Blood flashback in the clear hub of the introducer needle indicates successful entry into the vessel. Aspiration may be required.

4. After entering the vein, advance the catheter and needle as a unit, approximately 1 cm, to ensure that vessel dilation is complete.

5. Hold the clear introducer needle hub in position, and advance the catheter forward into the vessel. Remove the introducer needle.

   PRECAUTION: Do not reinsert the needle into the catheter.

6. Attach a desired stopcock, injection cap or connecting tubing to the distal hub. Do not begin the infusion until proximal lumen placement is verified.

   PRECAUTION: In order to avoid problems associated with disconnects, it is recommended that only luer lock fittings be used with this device.

7. Check the proximal lumen placement. Aspirate blood from the proximal port through the extension line, then flush.

8. Attach the proximal hub to a desired connecting line, or, if desired, the proximal port may be “locked” through the injection cap. A slide clamp is provided to occlude flow through the proximal lumen for cap and line changes.

   PRECAUTION: Open the clamp prior to infusion.

9. Secure the catheter to the patient. Begin infusion through the distal lumen, if ordered.
10. Cover the puncture site with a suitable sterile dressing.

**PRECAUTIONS:** Care should be exercised that the indwelling catheter does not come in contact with high concentrations of alcohol or 100% acetone solution, which could weaken the catheter and cause leakage.

To use proximal port for blood sampling, temporarily shut off distal port.

Complications associated with intravenous catheters include infiltration, catheter embolism, bacteremia, septicemia, thrombosis, inadvertent arterial puncture, nerve damage, hematoma, intravascular clotting and hemorrhage.

Due to the risk of exposure to HIV (Human Immunodeficiency Virus) or other blood-borne pathogens, healthcare workers should routinely use “universal blood and body-fluid precautions” in the care of all patients.

Intravenous catheter should be routinely inspected for flow rate, security of dressing and possible migration. To avoid cutting the catheter do not use scissors or other sharp instruments to remove dressing.

Use of a syringe smaller than 10ml to irrigate or declot an occluded catheter may cause intraluminal leakage or catheter rupture.

**Guidelines for Infusion of Incompatible Medications**

The ability to administer several medications simultaneously through a single peripheral catheter site is very desirable in the clinical setting. The TwinCath® has two separate, non-communicating lumens which allow the simultaneous administration of two different intravenous solutions. Incompatible infusates cannot interact within the catheter.

**Determinants of Incompatible Medication Administration**

There are four principal determinants for the safe administration of incompatible medications through different ports of the TwinCath®. They are:

1. The amount of venous blood flow going by the catheter. *
2. The concentration of the medications as they exit the catheter.
3. The rate of injection of the two medications.
4. The chemical characteristics of the incompatible drug interaction.

* Dependent upon cardiac output and peripheral circulation.

**PRECAUTION:** Limit placement of the TwinCath® to the large venous channels of the upper arm and forearm.
Guidelines

Infusate Guidelines 1,2

In-vitro studies suggest the following recommended guidelines:

1. Two IVPB (IV piggy back) or continuous infusion medications can be administered simultaneously into a single vein through the separate catheter ports.

2. One bolus medication and one IVPB or continuous infusion can be administered simultaneously into a single vein through the separate catheter ports.

3. Simultaneous administration of two bolus medications is not recommended through the separate catheter ports. There is clear in-vitro evidence of medication interaction at normal venous flow rates.

These guidelines apply to both the inactivation of one drug by another and the formation of a precipitate.

Blood Sampling

The Arrow Twin Cath® may be used as a venous sampling catheter. As with any intravenous device, the ability to blood sample is dependent upon catheter placement within the vein and blood flow past the catheter.

Aspiration Rates

The maximum rate of aspiration through any indwelling catheter is dependent on the inherent resistance to flow through the catheter itself and on the ability of the cannulated vessel to supply a sufficient quantity of blood.

Maximum Aspiration Rates Through the 18 Ga. Twin Cath®

<table>
<thead>
<tr>
<th>Port</th>
<th>Maximum Aspiration Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximal (22 Ga.)</td>
<td>20ml/min.</td>
</tr>
<tr>
<td>Distal (20 Ga.)</td>
<td>30ml/min.</td>
</tr>
</tbody>
</table>

The above rates were established using a manual syringe sampling technique. The maximum aspiration rates listed are values just under the rates that produce cavitation.
The preceding aspiration rates were established using the 18 Ga. Twin Cath<sup>®</sup>. These guidelines should also be applied to the 16 Ga. Twin Cath<sup>®</sup>, although aspiration rates for the 16 Ga. Twin Cath<sup>®</sup> should be somewhat higher.

The appearance of vacuum-induced bubbles indicates cavitation in the syringe. Decrease force on the syringe piston.

Drawing blood samples at rates faster than the recommended rates could cause vein collapse and difficulty in obtaining a venous sample.

No measurable increase in the amount of blood hemolysis was noted when withdrawing samples at the indicated rates.

**Sampling Port**

In an in-vitro study it was observed that contamination of the distal port samples by proximal lumen infusates did occur, therefore, the **proximal** port is best suited for venous sampling.

Temporarily shut off distal port infusates before sampling through the proximal port.

**Discard Volumes**

A concern of using an indwelling catheter for venous sampling is contamination of the specimen with catheter flush solutions.

Discard volumes were established by using heparinized flush solutions in in-vitro and in-vivo studies. The results were as follows:

- A 1cc discard volume appears to be sufficient to clear the catheter when not sampling for coagulation profiles.<sup>1</sup>
- A 10cc volume of blood must be discarded before sampling for coagulation studies when using a heparin lock of 100 units heparin/ml.<sup>2</sup>
- A 5cc normal saline flush used prior to drawing the discard will reduce the discard volume to 5cc before sampling for coagulation studies when using a heparin lock of 10 units.
- To decrease the volume of blood wasted on discards, batch other blood studies with coagulation studies, drawing them first; in this way only 1cc discard is needed prior to the coagulation sample.
Suggested Sampling Technique

1. Assemble necessary equipment, i.e. gloves, sterile alcohol or betadine wipes, syringes, 2ml NSS flush, labeled blood collecting tubes, sterile injection cap.
2. Wash hands.
3. Glove.
4. Temporarily turn off distal port infusates.
5. Close slide clamp on proximal line.
7. Attach syringe, open slide clamp or withdraw recommended discard volume.
8. Close slide clamp, attach blood sampling syringe, open slide clamp and withdraw desired amount of blood for laboratory studies.
   PRECAUTION: Do not exert excessive force on the syringe piston such that vacuum induced bubbles are formed.
9. Close slide clamp, attach syringe with 2cc NSS.
10. Resume distal infusate flow.
11. Open slide clamp and irrigate proximal line clear.
13. Open slide clamp and establish a “lock”.
14. Transfer blood to appropriate collecting tubes.

OR

1. Assemble necessary equipment i.e. gloves, sterile alcohol or betadine wipes, syringes, 2ml NSS flush, labeled blood collecting tubes, sterile injection cap.
2. Wash hands.
3. Glove.
4. Temporarily turn off distal port infusates.
5. Prep proximal lumen injection cap with a sterile alcohol wipe.
6. Withdraw recommended discard volume.
7. Use sampling syringe and withdraw desired amount of blood for laboratory studies.
   CAUTION: Do not exert excessive force on the syringe piston such that vacuum induced bubbles are formed.
8. Close slide clamp, attach blood sampling syringe, open slide clamp and withdraw desired amount of blood for laboratory studies.
9. Flush the proximal lumen making sure that all blood is flushed from the injection cap. Utilize the “locking” technique described under the Lumen Patency Section. If unable to flush the blood from the cap, a cap change should be done. Make sure to prep the injection cap connection before removing the cap.
10. Establish a “lock”.
11. Transfer blood to appropriate blood collecting tubes.
Catheter Site Care

The following guidelines are recommended to assist the nurse in maintaining the multiple lumen peripheral catheter insertion site.

1. Multiple lumen peripheral catheters should be changed every 72 hours. If longer placement is necessary due to limited access sites, or other reasons for site change deferral, the catheter’s polyurethane material has excellent indwelling characteristics. Reasons for deferring a catheter change and pertinent observations should be documented.

2. Assess the insertion site through an intact dressing as well as the patient’s comfort at least every 8 hours.

3. Multiple lumen peripheral catheter dressings should be changed according to hospital protocol, or before if the dressing becomes soiled, wet or loose.

4. At the time of dressing change, inspect the site for erythema, drainage, induration or palpable thrombosis. Assess the patient for pain or tenderness at the site.

5. Upon dressing change, the site should be cleansed with 70% isopropyl alcohol or povidone-iodine solution and allowed to dry. If used, reapply a topical ointment at the insertion site.

6. A sterile dressing is applied.

7. Aseptic technique and avoidance of touch contamination should be utilized in all phases of catheter maintenance.

8. Label catheter, dressing, IV administration sets and solution appropriately.


Maintaining Lumen Patency

There are a variety of “locking” solutions that are utilized to maintain the patency of the multiple lumen peripheral catheter. These solutions include normal sterile saline (NSS) and heparinized normal saline with varying heparin concentrations, e.g. 10 units of heparin/ml, 100 units heparin/ml.

Ten units of sodium heparin in 1ml. of normal saline has been documented as effectively maintaining catheter patency while not interfering clinically with manifestations of altered clotting factors. It is suggested that a single dose of heparin-lock solution be used. Heparin-lock solutions are available in prefilled syringes and in single and multi-dose vials.
**Catheter Site Care**

**Locking Technique**

When establishing a “lock”, utilize the following technique:

Inject all but 0.5cc of the locking solution; then while keeping a forward motion on the syringe plunger, remove the needle from the cap. NEVER COMPLETELY EMPTY THE SYRINGE.

Utilizing this technique should prevent blood backflow into the catheter lumen.

**Suggested Procedure to Establish a Lock**

1. Wash hands.
2. Prep injection cap with alcohol.
3. Inject 1cc to 2cc of flushing solution. Make sure to utilize the previously described technique.

**PRECAUTION**: Because some infusates/medications are incompatible with heparin, it may be necessary to flush the heparin lock with a compatible fluid such as normal sterile saline before and after heparin is used.

**References**

REFERENCES


