

# Insertion and Removal of Tunneled Hemodialysis Catheters



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# Insertion and Removal of Tunneled Hemodialysis Catheters

## 1.0 Scope

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An arteriovenous (AV) fistula is the recommended access for chronic hemodialysis *adult* patients. Despite this recommendation, tunneled cuffed hemodialysis catheters are required to be used in select groups of patients (see recommendation #1). This guideline outlines the indications for the use of tunneled cuffed hemodialysis catheters, method of insertion, and methods of removal.

For *paediatrics*, current K/DOQI recommendations - although not evidence based - support catheters being the FIRST access in children if a transplant is expected within 1 year. Catheters are also most likely to be the access of choice in children weighing <20 kg or in situations where the child's developmental level precludes safe cannulation.

### Related Guidelines:

- BC Provincial Renal Agency. *Provincial Recommendations for VA for Patients with HD as Primary Modality*, 2005.
- Canadian Society of Nephrology Guidelines. Chapter 4: Vascular Access, *Journal of American Society of Nephrology*, 17: S16–S23, 2006.
- National Kidney Foundation. KDOQI Clinical Practice Guidelines and Clinical Practice Recommendations for 2006 Updates: Hemodialysis Adequacy, Peritoneal Dialysis Adequacy and Vascular Access. Guideline 2: Selection and Placement of HD Access, *American Journal of Kidney Disease*, 48:S192-S200, 2006 (suppl 1).

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## 2.0 Recommendations

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### Recommendation 1:

A tunneled, cuffed hemodialysis catheter is the access of choice for temporary hemodialysis of greater than two to three weeks duration (evidence).

Other indications for the use of tunneled, cuffed hemodialysis catheters include:

- permanent hemodialysis (HD) access when no other access options exist
- when a fistula or graft is maturing
- when a peritoneal dialysis (PD) tube is planned or healing
- when a live donor transplant is scheduled
- children weighing <20 kg or in situations where the child's developmental level precludes safe cannulation.

### Recommendation 2:

The preferred site for tunneled cuffed hemodialysis catheters is the right internal jugular vein (evidence).

Other options than the right internal jugular vein include:

- left internal jugular vein,
- subclavian veins – only when jugular options are not available
- femoral veins
- translumbar access to the inferior vena cava

Notes re: site selection:

- Tunneled cuffed catheters should not be placed on the same side as a maturing or planned AV access, if possible.
- If a femoral vein is chosen, the length of the catheter must be at least 20 cm to avoid recirculation.

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## **Recommendation 3:**

Tunneled, cuffed hemodialysis catheters are inserted by, or under the supervision of, trained personnel under fluoroscopy (evidence).

Notes re: insertion:

- Surgical placement in the operating room is also acceptable.
- Complication rates should be <0.1% for pneumothorax, <1% for carotid puncture and <10% for early catheter malfunction.
- If a catheter is not placed under fluoroscopy, then ultrasound guidance is recommended for insertion (evidence).
- If a catheter is not placed under fluoroscopy, a chest x-ray is strongly advised (and supported by evidence) prior to line use to ensure proper position and exclude complications (excludes femoral catheters).

## **Recommendation 4:**

Using fluoroscopy, the catheter tip is adjusted so the tip is in the mid right atrium when the patient is prone (proximal right atrium when the patient is sitting) (evidence).

## **Recommendation 5:**

Prophylactic antibiotic coverage is not recommended prior to line insertion (no evidence to support the use of prophylactic antibiotics).

## **Recommendation 6:**

Removal of tunneled cuffed hemodialysis catheters may be performed using venous cutdown or traction, depending upon how the catheter was inserted (evidence).

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## 3.0 Rationale

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Once inserted, a tunneled cuffed catheter requires no maturation and can be used immediately for hemodialysis.<sup>1</sup> This convenience, however, comes with many disadvantages including high patient morbidity due to infection, thrombosis and the risk of central vein stenosis. They also achieve lower blood flow rates than other access types.

The right internal jugular vein offers the most direct route to the caval atrial junction, leading to greater blood flow rates and less stenosis and thrombosis when compared to left sided vessels. However, if an arteriovenous (AV) fistula or graft is planned, the cuffed catheter should be placed in the contralateral internal jugular vein.

The optimal tip position is poorly studied. The K/DOQI guidelines recommend positioning the tip within the right atrium. The tip is placed distally in the right atrium while the patient is lying in a supine position during insertion, as it will retract proximally by several centimeters when the patient returns to an upright position. However, the mid right atrium is ideally suited for the catheter tip due to its large caliber space, reducing inadvertent mural wall trauma (Mokrzycki and Lok, 2010).

Subclavian vein catheters are discouraged as they have been found to have higher complication rates and a higher incidence of central vein stenosis and thrombosis when compared with internal jugular vein catheters<sup>2-6</sup>.

Ultrasound guided insertion has been shown to limit insertion related complications in several studies<sup>7-10</sup>, including a 68% reduction in failure rate, 78% reduction in complication rate and 40% reduction in number of attempts in one meta-analysis.<sup>7</sup>

Fluoroscopy allows ideal catheter tip placement to maximize blood flow. In several studies<sup>11-14</sup>, interventional radiologic placement of tunneled hemodialysis catheters showed equal or better long-term results than those reported for surgical placement.

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Employing imaging-guided placement with both ultrasound guidance for venous puncture and fluoroscopy for catheter placement and positioning has been shown to reduce the rate of initial malfunction from as high as 14%<sup>1</sup> to near zero<sup>12,13</sup>. The rate of major complications has also shown to decrease from a high of 5.9% to near zero<sup>14</sup>

Evidence is lacking to support the prophylactic use of antibiotics at the time of catheter placement. Several randomized controlled trials of patients with cancer have shown no benefit to this strategy.<sup>15,16</sup> A recent Cochrane systematic review also failed to show a reduction in catheter related infections with prophylactic antibiotics.<sup>17</sup>

Catheter removal can be performed with traction or cutdown. Cuff retention occurs in approximately 10% of catheters removed with traction and these retained cuffs are generally of no consequence, rarely requiring removal with cutdown for cuff migration to the exit site, infection or poor healing.<sup>18</sup>

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## 4.0 References

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# Insertion and Removal of Tunneled Hemodialysis Catheters

## 5.0 Sponsors

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This provincial guideline was developed to support improvements in the quality of vascular access care delivered to patients with chronic kidney disease in BC. Based on the best information available at the time it was published, the guideline relies on evidence and avoids opinion-based statements where possible. When used in conjunction with pertinent clinical data, it is a tool health authorities and health professionals can use to develop local guidelines.

Developed by a Vascular Access Working Group of multidisciplinary care providers from across BC, the guideline was approved by the Provincial Vascular Access Services Team and the BC Provincial Renal Agency Medical Advisory Committee. It has been adopted by BCPRA as a provincial guideline.

## 6.0 Effective Date

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- Effective date: Updated: Sept 9, 2011.
- This guideline is based on scientific evidence available at the time of the effective date; refer to [www.bcrenalagency.ca](http://www.bcrenalagency.ca) for most recent version.