

Annotated Bibliography Arrow Chronic Hemodialysis Catheters

Andrews RT, Bova DA, Venbrux AC. How much guidewire is too much? Direct measurement of the distance from subclavian and internal jugular vein access sites to the superior vena cava-atrial junction during central venous catheter placement. *Crit Care Med.* Jan. 2000;28:138-142.

A prospective, nonrandomized observational study to determine what is considered a "safe" guide wire insertion length. During central line placement excessive insertion of the guide wire can result in rare but significant complications. These complications can result from either the internal jugular (IJ) or subclavian vein (SCV) catheter insertions. The authors measured the distance in 100 adult patients (45 women, 55 men) from the point of catheter insertion IJ or SCV to the superior vena cava-atrial junction (CAJ). Distances were evaluated in relationship to the patients' height, weight, sex, and chest radiographs. Catheters were placed under direct visualization using fluoroscopy. The researchers identified the **mean** distance from all access sites to the superior vena cava-atrial junction as 18.0 cm. The individual average distances were: Right IJV-16.0 ± 2.0; Right SVC – 18.4 ± 2.8; Left IJV – 19.1 ± 1.9; Left SVC- 21.2 ± 1.6 cm. The Left IJV and Right SVC distances were not statistically different.

Neither radiographic measurements nor patient weight correlated with the measured vascular distance. There was however a trend toward longer distances in taller patients and males.

The access site selected is a more reliable indicator of a safe wire length than is patient height, weight, or measurements from previous chest radiographs.

The researchers noted that, in most cases, 18 cm should be considered the upper limit of guide wire introduced during central catheter placement in adults.

Comments: This article provides significant data points when the practitioner chooses a specific length guide wire to be used with a specific length catheter. Given the wide variation in individual patient distances from entry to cava-atrial junction, for example, RIJ: 12 to 20 cm, practitioners should use the noted averages as guidelines only and verify placement fluoroscopically.

Center for Disease Control and Prevention. Guidelines for the prevention of intravascular catheter-related infections. *MMWR.* August 9, 2002/51(RR10);1-26.

This report provides health-care practitioners with background information and specific recommendations to reduce the incidence of intravascular catheter-related bloodstream infections (CRBSI). These guidelines replace the *Guideline for Prevention of Intravascular Device-Related Infections*, which was published in 1996.

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The Guidelines for the Prevention of Intravascular Catheter-Related Infections have been developed for practitioners who insert catheters and for persons who are responsible for surveillance and control of infections in hospital, outpatient, and home health-care settings. This report was prepared by a working group composed of professionals representing the disciplines of critical care medicine, infectious diseases, health-care infection control, surgery, anesthesiology, interventional radiology, pulmonary medicine, pediatrics, and nursing. The recommendations presented in this report reflect the consensus of HICPAC (Healthcare Infection Control Practices Advisory Committee) of the Centers for Disease Control and Prevention (CDC) and other professional organizations.

Comment: The document can be retrieved in its entirety from <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5110a1.htm>

Di Iorio B, Lopez T, Procida M, Marino P, et.al. Successful use of central venous catheter as permanent hemodialysis access: 84-month follow-Up in Lucania. Blood Purif. 2001;19(1):39-43.

The authors retrospectively analyzed the long-term survival and complications associated with permanent venous catheters (PVC) placed for the purpose of hemodialysis (HD) during the period from January 1992 to December 1998 (Dialysis Units of Lucania, Italy).

Cuffed tunneled venous access catheters serve an essential role in providing access in subjects in who all other access options have been exhausted. They are commonly used for temporary as well as permanent access. The predominant complications associated with these catheters are **catheter thrombosis, catheter fibrin sheath and infection.**

A total of 98 PVC were placed in 88 patients during this period. The catheters used were of three types: 72 VasCath Soft Cell catheters (Bard Instrument Company, Toronto, Ont., Canada); 22 PermCath catheters (Quinton Instrument Company, Seattle, Wash., USA), and 4 Tesio catheters (Bellco SpA, Mirandola, Italy).

Kaplan-Meier product-limit estimator was used to calculate survival curves of the catheters. The patient survival was 60% at the 78th month. Fifty-two (52) patients (27 males, 25 females) are still alive: 15 (26.9%) of these patients have diabetes mellitus and 1 has been transplanted. The actuarial survival rate of PVC was 89% in the whole population studied and 82% in subjects alive after 84 months. Twenty-five patients (28.4%) had PVC as the first reliable vascular access. Long-term complications occurred 27 times (1 episode every 44.81 month/patient) as: breakage (3.1%); thrombosis (10.2%); displacement (2.0%); subcutaneous tunnel bleeding (3.1%); inadequate blood flow (7.1%), and infection (10.2%).

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The authors concluded that the data analyzed confirmed that permanent venous catheters might represent an effective long-term blood access route for select hemodialysis patients (i.e., older subjects with cardiovascular diseases, cancer patients and those who are terrified of repetitive venipuncture).

Comment: A-V fistulas are still the most important form of access for hemodialysis patients. Practitioners should choose the right access for the right patient for the right reason.

Johnson LA, Alikan MA, Mehta P, et al. Caval perforation with bronchial communication: a rare complication of long-term venous access. JIR 2005;16:1149-1152.

Superior vena cava (SVC) perforation with bronchial communication is a very rare complication of long-term venous access. A patient recently presented with erosion of a venous port catheter into a bronchus, with infusion of medications into the bronchus and associated SVC syndrome. An unusually short catheter, together with a catheter tip position against the SVC wall and a beveled catheter tip were the likely causes of the perforation. Surgery was avoided and the complication successfully managed using a unique combination of percutaneous techniques.

Comment: Correct tip placement in the right atrium would have avoided this complication. Practitioners should always consider fluoroscopic verification of tip placement, particularly when surgically placing ports.

Lancaster LE. Core Curriculum for NEPHROLOGY NURSING. Fourth Edition. ANNA 2001;pp.325.

The Core Curriculum for Nephrology Nursing is a comprehensive text for both beginning and advanced practice nephrology nurses.

National Kidney Foundation. KDOQI Clinical Practice Guidelines for Vascular Access, 2000. Am J Kidney Dis. 37:S137-S181, 2001 (suppl1)

Evidence-based clinical practice guidelines for all stages of chronic kidney disease (CKD) and related complications are provided by The National Kidney Foundation (NKF) Kidney Disease Outcome Quality Initiative (NKF KDOQI)™. The NKF is recognized throughout the world for improving the diagnosis and treatment of kidney disease. This particular set of guidelines focuses on vascular access.

As stated in the KDOQI Clinical Practice Guidelines for Vascular Access, adequate care of an end-stage renal disease (ESRD) hemodialysis dependent patient requires constant attention to vascular access. An ideal access delivers a flow rate adequate for the dialysis prescription, has a long use-life, and has a

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low rate of complications. No current access type fulfills all of these criteria, although the native arteriovenous (AV) fistula comes closest to doing so.

The vascular access guidelines include a list acronyms and abbreviations, presents information dealing with patient evaluation prior to access placement, as well as monitoring, surveillance, and diagnostic testing. They also discuss complications, prevention, management of the complications and when to intervene. Optimal approaches for treating complications are included. Quality of Care Standards and references complete the document.

Comment: To date, KDOQI has developed and disseminated thirteen guidelines for the care of kidney disease patients. The following link takes you to the foundation where all thirteen documents can be reviewed and accessed.

http://www.kidney.org/professionals/kdoqi/guidelines_commentaries.cfm

Timsit JF, Bruneel F, Cheval C, Mamzer MF, et al. Use of tunneled femoral catheters to prevent catheter-related infection. A randomized, controlled trial. Ann Intern Med. 1999 May 4;130(9):729-35.

In a randomized, controlled trial, Timsit JF. and colleagues evaluated the effect of catheter tunneling on femoral catheter-related infection in critically ill patients. Previously, this technique showed that the use of tunneled catheters is associated with a threefold decrease in jugular catheter-related sepsis Fan ST. (1988).

The femoral vein is frequently used in critically ill patients because of it's ease of access and low rate of associated mechanical complications. Infection rates associated with the use of this site seem unacceptably high. Reason for this increased infection rate is thought to be due to fecal contamination. Femoral access is often used in patients with severe respiratory impairment or disorders of hemostasis, in whom subclavian or jugular puncture could cause life-threatening complications.

To decrease the potential for CRBSI (catheter-related bloodstream infection) it has been suggested that burying the catheter in a subcutaneous tunnel could reduce the transfer of pathogens by increasing the distance between the skin-catheter junction and vein.

345 adult patients requiring a femoral venous catheter for more than 48 hours were enrolled into the study, either to receive a tunneled or nontunneled femoral catheter and monitored for suspicion of catheter related sepsis.

336 patients were evaluable. Probable systemic catheter-related sepsis occurred in 15 of 168 patients who received a nontunneled femoral catheter (controls) and in 5 of 168 patients who received a tunneled femoral catheter (estimated

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absolute risk reduction, 6% [95% CI, 0.9% to 11%]). Time to occurrence of catheter-related bloodstream infection was not significantly modified (relative risk, 0.28 [CI, 0.03 to 1.92]; $P = 0.18$); 3 events occurred in the control group and 1 event occurred in the tunneled-catheter group. After stratification by treatment center and adjustment for variables that were prognostic (use of broad-spectrum antimicrobial agents at catheter insertion) or imbalanced between both groups (mechanical ventilation at insertion), tunneled catheterization reduced the proportion of patients who developed systemic catheter-related sepsis (relative risk, 0.25 [CI, 0.09 to 0.72]; $P = 0.005$) and positive quantitative culture of the catheter tip (relative risk, 0.48 [CI, 0.23 to 0.99]; $P = 0.045$).

The authors concluded that the incidence of femoral catheter-related infections in critically ill patients can be reduced by using subcutaneous tunneling

Comment: Grant support was in part by the Fondation-Hôpital Saint Joseph, Bellon, Eli Lilly & Co., Marion Merrell Dow, Inc., Pfizer, Inc., SmithKline Beecham Pharmaceuticals, Roche Laboratories, Roussel & Diamant, and Wyeth-Lederle. Plastimed provided 50 tunneled catheters. None of the funding agencies had input into research design or conduct of the study or the decision to submit for publication.

Trerotola SO, Kuhn-Fulton J, Johnson MS, et al. Tunneled Infusion Catheters: Increased Incidence of Symptomatic Venous Thrombosis after Subclavian Versus Internal Jugular Venous Access. Radiology. 2000; 217:89-93.

In a retrospective analysis, the authors compared the incidence of symptomatic venous thrombosis after tunneled infusion catheter placement via the internal jugular vein (IJV) versus the subclavian vein (SCV). The analysis was performed on 774 placed catheters. Only catheter placements having complete follow-up were included in the study (279 catheters placed in 238 patients). One hundred-sixty-six (166) catheters were placed in the SCV, 113 in the IJV; for a total of 26,242 catheter days. All catheters were placed using guidance, ultrasonographic in the IJV or venographic in the SCV, and all catheters were placed by interventional radiologists.

Venous thrombosis developed in 13% of patients (0.12 per 100 catheter days) with an SVC catheter placed as compared to 3% (0.04 per 100 catheter days) with an IJV catheter ($P = .018$). This difference persisted after adjustment for catheter size and side of placement ($P = .025$). The mean time to thrombosis was 36 days for SCV catheters and 142 days for IJV catheters.

Initial complications were limited to one pneumothorax in the SCV group and one episode of over sedation in the IJV group; there was no difference in infection rates between the two sites. The mean dwell time was slightly longer for SCV catheters (103 days) than for IJV catheters (79 days) ($P = .04$).

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The authors concluded that the IJV is the preferred site for tunneled infusion catheter placement because of the lower incidence of symptomatic venous thrombosis.

Comment: All catheters placed were made from silicone rubber. This study was supported by a grant from Bard Access Systems.

Zaleski OX, Funaki B, Lorenz J, et al. Experience with tunneled femoral hemodialysis catheters. A.I.R February 1999; 172:493-496.

The preferred central venous access site for hemodialysis catheters is the right internal jugular vein. But when this site is no longer viable other sites need to be considered; making sure that their placement will not interfere with the creation of future access sites. By means of a retrospective review, the researchers evaluated the use and complication rate of tunneled femoral hemodialysis catheters placed in patients when no remaining thoracic venous access sites were available.

The review was conducted over a 3-year period where 41 tunneled femoral vein catheters (35 right; 6 left) were placed in 21 patients. The catheter tips were positioned immediately above the iliac bifurcation, at the mid inferior vena cava (IVC), or at the junction of the IVC and right atrium.

Placement of all the catheters was without incidence. Total length of follow-up was 2506 catheter days. Average time of function was 61 days between interventions. Infections requiring catheter removal occurred at a rate of 2.4 per 1000 catheter days. One partial IVC thrombosis occurred following a catheter infection which developed after 78 days indwelling. No episodes of symptomatic pulmonary embolism occurred.

It appears that the common femoral vein can be used successfully, when needed, for permanent tunneled hemodialysis access. They do require more frequent interventions than thoracic catheters and are more susceptible to infection.

Comments: Catheters used were 13.5 French hemodialysis catheters by Bard.

Occupational Exposure to Bloodborne Pathogens; Needlestick and Other Sharps Injuries. 66 Federal Register 5317 (2001) Codified at 29 CFR~1910.1030).

This is the final ruling to the revision of the 1991 Blood Borne Pathogens standards which includes the Needlestick Safety and Prevention Act.

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Comment: The document can be retrieved in its entirety from <http://www.gpoaccess.gov/fr/retrieve.html>; choose Federal Register # 66 and type in page 5318 which will take you to the first page of the document.

Guideline for Hand Hygiene in Health-Care Settings 2002

The hand hygiene guidelines were developed by the CDC's Healthcare Infection Control Practices Advisory Committee (HICPAC), in collaboration with the Society for Healthcare Epidemiology of America (SHEA), the Association of Professionals in Infection Control and Epidemiology (APIC), and the Infectious Disease Society of America (IDSA). The hand hygiene guidelines are part of an overall CDC strategy to reduce infections in health care settings to promote patient safety.

Comment: <http://www.cdc.gov/handhygiene/> Website contains free download of the Hand Hygiene Guidelines and a link to the Hand Hygiene Resource Center which contains educational resources.

Also published as: Guideline for Hand Hygiene in Health-Care Settings: recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. *Infect Control Hosp Epidemiol.* 2002 Dec;23(12 Suppl):S3-40.