



# Clinical Update

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## New Developments In Chest Tube Technology

Our topic this month may not seem to make much sense. To most of us, a tube is a tube, and a chest tube hardly seems like a technological wonder. But recent advances in how chest tubes are made can have a big impact on the care of patients who require chest drainage.

Tubes have been used to drain the chest since the time of Hippocrates. More recently, chest tubes were red rubber catheters, very similar to catheters used to drain the bladder or suction the lungs. Over the past 30 years, most advances in chest drainage have focused on the chest drainage device itself: making it safer, more user-friendly and smaller at the bedside. Today, however, manufacturers are spending more time researching and developing new chest tubes.

The ideal chest tube should have these four characteristics:

- non-thrombogenic
- low coefficient of friction
- high biocompatibility
- resist attachment of bacteria

### Non-thrombogenic Tubes

The ideal chest tube should be designed to minimize the adherence of clots to the catheter. If clots can't stick, the risk of occlusion is significantly reduced. A few years ago, heparin-coated chest tubes were introduced. These tubes were dipped into a heparin solution, then allowed to dry; the heparin clung to the tube through an ionic bond. While this concept was sound, in practice, the ionic bond turned out to be weak and unstable, and the heparin washed off quickly, within a few hours of use.

Additional research led to a chemical process that attaches the heparin to the tube using covalent bonds, which are much stronger. These bonds allow the anticoagulant to maintain therapeutic efficacy for 24 to 48 hours, depending on the volume of blood flow through the catheter. This is the optimal time frame during which most bloody chest drainage will occur.

This covalent bonding also allows for passive drug release. Trace amounts of heparin are released and immobilized on the catheter surface using a polymer matrix. The heparin is released, or delivered, through molecular diffusion. This diffusion is site specific, allowing a reduction in the risk of catheter thrombosis without systemic anticoagulant effects. These specially coated tubes are called HydraGlide™ thoracic catheters.

Ideally, a chest tube will be non-thrombogenic. Covalently-bonded, heparin coated catheters have been tested in vivo, and have resulted in significantly less thrombus adherence.

### Low Coefficient Of Friction

The *coefficient of friction* describes how slippery a tube is. The lower the coefficient of friction, the more slippery the tube. When a tube is more slippery, blood will flow through it more smoothly. HydraGlide™ thoracic catheters have the lowest coefficient of friction of any catheters available.

A tube with a low coefficient of friction will also slide out of the chest more easily during tube removal. Studies done on the sensations patients feel during tube removal report that burning, pulling and yanking cause the greatest discomfort. If the tube is more slippery, the patient should feel less discomfort during tube removal.

### High Biocompatibility

Since a chest tube is an implanted device, it will cause some degree of tissue reaction. Ideally, the tube should be as biocompatible as possible. A high level of biocompatibility will result in less inflammation, less irritation to local tissues, and less trauma during chest tube removal.

### Resist Attachment Of Bacteria

Chest tubes can be a source of bacterial colonization in the chest. A tube that resists or inhibits bacterial colonization can be of great benefit to patients who need their chest tubes for more than a matter of hours postoperatively. The HydraGlide™ coating, which lowers the coefficient of friction and enhances biocompatibility, also allows the tube to resist bacterial adherence.

In addition, reducing trauma – due to the low coefficient of friction and enhanced biocompatibility – will reduce the risk of infection by reducing tissue injury sites where bacteria are more likely to colonize.

There truly is new technology in chest tubes today. As nurses, we have traditionally focused on the tube as it leaves the chest and connects to the chest drain. Today, we should consider what is happening with the tube inside the chest because we now know that the properties of the tube itself can have a significant impact on the patient's overall postoperative nursing care.

### Test Your Knowledge...

**Q.** At the beginning of your shift, you're caring for a patient with a spontaneous pneumothorax. You can hear the bubbling in the suction control chamber from the doorway to the patient's room. What should you do next?

*Answer on other side*

## Families And Critical Care

This month's issue of *Critical Care Nurse* features an interview with Daphne Stannard RN, PhD, CCRN, about integrating families into critical care nursing practice. Dr. Stannard has researched family involvement in care; this was the focus of her doctoral studies.

Stannard notes that family-centered care has not been the traditional model in critical care nursing practice. Many nurses feel they must master the patient care skills before turning to the "psychosocial." Nurses have reported that they don't want families to feel overwhelmed with the critically ill family member, and they believe restricting access protects the family. Still other nurses have concerns about being watched while they provide patient care.

Through this interview, Stannard explains how important family involvement is and how nurses can work effectively with families. She describes how nurses can guide family members in decision-making; gain the trust of family members; encourage family members to participate in care, and deal with dysfunctional families and those in conflict.

This article is a must-read for anyone interested in enhancing the role of patients' families in nursing care.

## Being A Nurse Educator In The Clinical Setting

With the increasing complexity of health care, it has become more and more difficult for hospitals to support the role of clinical educators. This article describes the demands of the educators' role and identifies strategies for success.

The success of the clinical nurse educator depends on a number of factors: agreement among staff, management and the educator about role expectations; mastering characteristics of successful educators; the ability to be flexible and deal with challenges; and maintaining and updating skills.

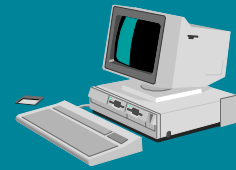
Many clinical educators will tell you they are a jack-of-all-trades. That's why a range of skills is so important. These skills include leadership, management, and communication, as well as clinical expertise and political savvy.

The article provides a useful guide for clinical educators or those expert clinicians who are interested in this role.

If you have any technical questions about chest drainage, or if you need product information or educational support materials, please call or fax Atrium's hotline anytime.

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## On the World Wide Web...



Our patients have more health information available to them than ever before. Here are web sites for major news organizations that focus on health news for the general public.

[www.msnbc.com/news/HEALTH\\_Front.asp](http://www.msnbc.com/news/HEALTH_Front.asp)  
This health site is part of the partnership between NBC News and Microsoft.

[www.cnn.com/HEALTH/](http://www.cnn.com/HEALTH/)  
This health site is provided by the Cable News Network.

[www.usatoday.com/life/health/ldh1.htm](http://www.usatoday.com/life/health/ldh1.htm)  
This site collects health news from *USA Today*.

[www.reutershealth.com](http://www.reutershealth.com)  
This site, from the Reuters news service, contains both professional and consumer news sections. For a low annual subscription fee, you can search the site and the archives. What makes this site different is the volume of reporting on medical journal articles.

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Thompson SC, Wells S, Maxwell M: Chest tube removal after cardiac surgery. *Critical Care Nurse* 1997;17(1):34-38.

#### Families And Critical Care

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#### Being A Nurse Educator In The Clinical Setting

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## Test Your Knowledge...

**A** Assess the patient. Turn the vacuum source down until bubbling stops in the suction control chamber. Then gradually increase the vacuum source pressure until gentle bubbling just begins. Bubbling that is too vigorous will create unnecessary noise, and hasten evaporation from the suction control chamber.

*Clinical Update* is an educational newsletter provided by Atrium Medical Corporation and is edited by Patricia Carroll, RN,C, CEN, RRT, MS.