"Maintaining chest tube patency" is a crucial element of postoperative care that falls squarely on nurses caring for these patients. Thirty-five years ago, the standard intervention was stripping chest tubes. Using a specially-designed roller clamp, nurses applied pressure to compress a length of the tubing from the chest tube to the drain and then quickly released it. This reduced intraluminal pressure, creating a wave of negative pressure that was transmitted to the chest, acting as suction, ideally pulling any clots or other obstructing materials out of the tube. It seemed to do the job, but no one knew how low those negative pressures in the chest were. This ritual was performed at least every hour in the immediate postoperative period. That was until 1982 when nurse researchers Carol Duncan and Roberta Erickson published a landmark study in *Heart & Lung* that measured those negative pressures.\(^1\)

Mean pressures generated with stripping ranged from -145 cmH\(\text{2O}\) to -294 cmH\(\text{2O}\) with compression of different lengths of the tube. Stripping the entire tube reached the measuring instrument limit of -408 cmH\(\text{2O}\), underestimating the true value. To put these measurements in perspective, remember that the maximum level of suction available with dry suction drains is -40 cmH\(\text{2O}\). Virtually all patients start out at an initial level of -20 cmH\(\text{2O}\) whether a wet or dry drain is used.

With these stunning findings, there were also anecdotal reports that stripping avulsed vein grafts from the heart resulting in catastrophic bleeding, tamponade, and myocardial infarction.

In an attempt to mitigate these risks, techniques called “milking,” “fan-folding” and “tapping” the tube were introduced. However, without standardized procedures, studies could not be carried out. Patient care has been further complicated by surgeons who were likely unaware of the Duncan and Erickson study\(^1\) and had learned from their expert teachers that stripping the tube was the standard of care. In fact, a survey of surgeons and nurses asking about chest tube management revealed that 72% of nurses were not permitted to strip chest tubes while at the same time 74% of surgeons allowed tube stripping on their patients.\(^2\)

Clearly, twenty-five years later, we do not have interdisciplinary agreement on evidence-based management of postoperative chest tubes. Most nurses who have stripped tubes at one point or another have seen the technique work on occasion. However, anecdotes do not support evidence-based practice. Multiple studies and reviews do not support routine tube manipulation to maintain patentcy. (For a full list of these references, visit [AtriumU.com](http://www.AtriumU.com))

**How Much Time?**

Nursing care for patients with chest tubes includes monitoring, observing, assessing, teaching and documenting.\(^3\) Maintaining patency takes time. A poster presentation at the 2015 AACN National Teaching Institute reported on a study of how long it takes nurses in one cardiovascular ICU to manage chest tubes after cardiac surgery.\(^4\) Nurses were first asked to rate their comfort managing chest tubes in general, maintaining patency, addressing clogged tubes, managing non-secure dressings or those with oozing, and treating tube-related pain. No nurse was uncomfortable with any of these tasks. Nurses were “completely comfortable” with general care and dressings (86%). For maintaining patentcy, 72% of nurses were completely comfortable, 24% were moderately comfortable. When addressing clogged tubes, 41% were completely comfortable, 45% were moderately comfortable, and 10% were slightly comfortable.

During the first 4 hours of postoperative care, nurses spent a median of 7 minutes (range 4-11) managing chest tubes. In the first 24 hours, the total was 28.7 minutes (18.5-44.7). Nurses spent the most time maintaining drainage: 12 minutes / 24 hours (range 7-18) and on patency: 9 minutes / 24 hours (4.25-14). Nurses who were not completely comfortable managing chest tubes spent more time: 12.1 minutes v 6.9 minutes for those who were completely comfortable (p=0.035).

Not surprisingly, nurses spent the most time managing chest tubes of patients with bleeding and/or cardiac tamponade requiring reoperation. They spent 140 minutes (range 8-240) in the first 2 to 4 hours – more than half of total nursing time. Other factors increasing nursing time for chest tube management were previous CABG or valve surgery, heart failure, and anticoagulant medications.

**When Clear is Not Patent**

When a clot is visible within the lumen of the chest tube as it exits the chest, nurses pay special attention. Many manipulate the tube, bending it or tapping it to propel the clot toward the chest drain. In any case, that clot is watched until it no longer presents a danger of tube occlusion. Another assessment for tube patentcy is the volume of drainage. A study of 239 consecutive postoperative CABG patients examined the

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In the Literature

What is the Greatest Influence on Documentation?
A must-read study in the current issue of Nursing Economic$ examined documenting nursing actions to prevent complications in elderly trauma patients. The researchers found that documentation of actions required by policy, procedure, and standard is significantly affected by which actions are on flow sheets or checklists. These prompts, whether on paper or electronic, remind nurses of the standards and provide a quick and easy way for them to document care. The least documented nursing measures – coughing and deep breathing, incentive spirometer use, walking, and reassessment after pain medication – were not included and required a narrative note. Is your software determining what your nursing department considers standard of care? When was the last time documentation forms were crosschecked to policies, procedures and standards to ensure consistency?


To Glove or Not to Glove: Is That the Question?
Two studies in the current issue of the American Journal of Infection Control examine this question. In one, researchers compared compliance with hand hygiene before and after policy changed to voluntary glove use during contact precautions. The policy change came about because of an initial analysis showed hand hygiene was significantly worse for clinicians caring for patients on contact precautions compared with the rest of the hospital. Gloves remain part of standard precautions. After the change, hand hygiene significantly improved before invasive procedures and before patient contact. In fact, the only one of the six indications that did not show significant improvement was after patient contact, where compliance remained at 94%. The other study looked at transmission of A baumannii via fomites. In one arm, the bacteria were applied to a subject’s fingertip, then the finger was pressed onto a non-porous surface to assess transfer. Researchers tested six different surfaces. In the other arm, the bacteria were placed on the surface and then the finger was pressed on the contaminated surface. Transmission from surface to finger was 24% and from finger to surface, 5.6%. When subjects used latex gloves, surface to covered finger transmission dropped to 10.6% and covered finger to surface dropped to 3.0%.

While the studies were different, the message from the researchers is the same: everyone, from clinicians to housekeepers, needs regular reminders to change gloves frequently during the time spent in a patient’s room, and to pay attention to hand hygiene before and after glove use.

Greene C., et al.: Fomite-fingerpad transfer efficiency (pick-up and deposit) of Acinetobacter baumannii – with and without a latex glove. AJIC 2015;43(9):928-934.

Drug Shortages
The FDA has a page dedicated to tracking drug shortages. You can visit through the link below, and download an app for your mobile device. You can also sign up for alerts on new shortages.


Hand Hygiene Worldwide
The World Health Organization has been at the forefront of education efforts on hand hygiene all over the world. All of their resources are free to download, and are available in multiple languages. Their latest initiative is adding alcohol-based hand rub to their core list of Essential Medicines for a basic healthcare system.

http://www.who.int/gpsc/news_events/en/

Influenza Dashboard
The CDC now offers influenza data in a user-friendly dashboard you can customize to see national or regional data and which data to display. You can also change formats with pie charts, columns, line charts, and maps.

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distribution of chest drainage volume over time. Researchers discovered a plateau in volume at post op hour 6 with minimal variations in drainage volume (63-66mL), then another plateau at hour 24. Mean drainage for the first 2 hours postop was 160mL, hours 2-4 118mL, and hours 4-6 68mL. These data are important because nurses begin investigating when the volume of drainage drops unexpectedly, regardless of the tube’s appearance.

Does a chest tube without visible clots or debris mean the tube is patent? What about the lumen of the chest tube inside the chest? Like an iceberg, what we see may be only a small part of the whole picture. In the past five years, there has been greater attention to this hidden threat to chest tube patency. The two latest reports were presented at recent international conferences.

The Latest on Retained Blood
Researchers are coining a new term: retained blood syndrome (RBS). This refers to a collection of blood postoperatively that does not drain from the chest. It can be in the mediastinal, pericardial or pleural spaces. A previous study that examined tubes in situ and on removal found 36% had some degree of obstruction. Of the 51 with thrombus noted at removal, 44 (86%) were located in the distal portion of the tube, hidden from view inside the chest.

One group of researchers performed a retrospective, observational cohort study of 6909 patients to identify the incidence of complications associated with blood retention (defined as effusion, tamponade or hemothorax requiring intervention) after cardiac surgery. RBS occurred in 16.3% of patients. In comparing those without RBS and with RBS, there was a statistically significant difference (p<0.001) in mortality, 5.11% v 17.5%; ICU LOS, 5d v 15d; hospital LOS, 12d v. 27d; ventilation time, 20h v. 84h; hemodialysis 11.5% v 44%; and postop pRBC transfusion, 12.4% v. 54.7%.

A different group of researchers collected data from 2105 cardiac surgical procedures. RBS was re-exploration for hemorrhage; pericardial window / pericardiocectensis; or pleural intervention for hemothorax, pneumothorax or effusion despite a chest tube. Researchers compared 1849 baseline patients with 256 intervention patients. The intervention was using “active clearance technology (ACT).” A special guidewire is placed inside the chest tube lumen, and the clinician moves it back and forth periodically to clear the lumen. For study purposes, ACT was done on a single mediastinal tube for the first 24 hours post op. Other chest tubes could be present, with routine care. Since this was a German study, nurses were free to strip and milk the conventional tubes at their discretion even though the researchers note these actions are ineffective and potentially harmful.

Twenty percent of the baseline group required intervention for RBS. Statistically significant differences between the baseline group and the intervention group included: RBS, -42% (p=0.0021); post op atrial fibrillation -31% (p=0.0033); and ICU days -27% (p=0.00075). There was no significant difference in re-exploration.

A Look Toward the Future
While these studies still need to undergo peer review and formal publication, these promising results should spur more research. The next step will be to determine cost savings attributable to reducing retained blood after cardiac surgery. This new perspective has the potential to significantly change nursing care of patients with chest tubes after cardiac surgery.

Sources