The first report of pigtail catheters for pleural drainage was in 1970. But, just as not all nurses are RNs, not all small catheters are “pigtail” catheters. The term refers to a curl in the distal end of the catheter inside the chest. The thinking is that the curl keeps the end-hole of the catheter off delicate tissues; pigtail catheters are also used in nephrostomies and pericardial drainage.

Literature reports on pigtail catheter pleural drainage describe use for primary spontaneous pneumothorax, secondary spontaneous pneumothorax, iatrogenic pneumothorax, traumatic pneumothorax, loculated empyema or effusion, hemothorax, and an 8 F pigtail catheter at 2.7 mm. A 32F chest tube is larger than the space available, clearly explaining why large chest tubes are painful and why smaller tubes hurt less. However, small tubes are less efficient evacuating the chest. Decreasing the internal diameter of a drainage tube from 8 mm (24F) to 4 mm (12F) decreases flow from 30L PM to 5L PM. A study testing flow rate through commercially available tubes found a range of 1.5L PM to 3.3L PM at 8 F and -10cmH2O and 17.5L PM through a 24F catheter. Smaller tubes are more likely to malfunction.

Patient Selection Key for Pigtail Catheters

The authors are reporting successes, the research raises a number of questions. All of the studies were retrospective. When traditional chest tubes were compared with pigtail catheters, tubes were selected by attending physician preference with no standard guidelines. Surgeons inserted chest tubes; intensivists, pulmonologists, and emergency medicine physicians inserted catheters. There is no way to know if positive outcomes are related to the pigtail or the small size of the catheter.

Pigtail catheters are inserted percutaneously using Seldinger technique. The pleura is initially punctured with a hollow needle trocar attached to a syringe; air or fluid is aspirated to confirm placement. The syringe is removed and a guidewire advanced through the needle lumen. The guidewire stays in place while the needle is removed and a dilator is passed over the guidewire to enlarge the opening through which the catheter will be placed. Next, the dilator is removed, the pigtail is uncoiled, and the catheter is threaded over the guidewire and into the pleural space. Finally, the guidewire is removed as the distal end of the catheter curls inside the chest. Since this technique is similar to that used for placing central venous catheters and pacemaker leads, intensivists and pulmonologists are much more likely to perform the procedure at the bedside. Researchers note careful technique is essential to place the catheter above the sixth intercostal space to avoid the diaphragm, keep the needle perpendicular to the rib and advance it only until the parietal pleura is punctured, insert only over the rib – never under (to avoid vessels and nerves), and to be particularly alert to the potential for kinking the wire or catheter.

The catheter is then connected to a drainage device. Some studies did not specify the device, others connected the catheter to a traditional drain, one to a drainage bag, and the rest used a “Heimlich valve bag.” Ideally, small tubes are connected to small devices that weigh less than traditional drains, put less traction on the catheter, and allow for patient mobility. The original small device is the Heimlich valve, but the lack of a collection chamber for drainage has led to much improvisation attaching various drainage bags to the distal end of the device. While a bag contains the fluid, air can expand a sealed bag like a balloon. Leaving an opening at the top of the bag vents the air, but drainage can spill out of any opening without very careful positioning. It's important to note that the Heimlich valve is not sold with a collection device. It’s all “off label” use.

Two newer devices not mentioned in the literature are the Pneumostat™ and the Express™ Mini 500. The Pneumostat has a built-in one-way valve, a 30mL chamber to collect fluid, and an air leak indicator that makes it a significant advantage over the Heimlich valve. The Express Mini 500 is a miniature chest drain designed for higher volume fluid drainage; it has an integrated dry suction regulator that can be attached to wall vacuum. Both devices allow clinicians to maintain standard precautions easily, unlike the Heimlich valve.

In recent years, there has been a trend toward smaller tubes for a number of drainage tasks. Smaller tubes are less disruptive to tissue and are less likely to impinge on nerves, resulting in less pain. The distance between ribs in an adult is about 9mm (5th intercostal space, midaxillary line). Compare that potential opening with a 32F chest tube at 10.7mm, a 24F tube at 8mm and an 8F pigtail catheter at 2.7mm. A 32F chest tube is larger than the space available, clearly explaining why large chest tubes are painful and why smaller tubes hurt less. However, small tubes are less efficient evacuating the chest. Decreasing the internal diameter of a drainage tube from 8mm (24F) to 4mm (12F) decreases flow from 30L PM to 5L PM. A study testing flow rate through commercially available tubes found a range of 1.5L PM to 3.3L PM at 8F and -10cmH2O and 17.5L PM through a 24F catheter. Smaller tubes are more likely to malfunction.

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In the Literature

Movin’ on Up!

The current issue of Orthopaedic Nursing has an incredibly detailed description of a progressive mobility activity protocol for critically ill patients. Not only does the author describe risks of immobility, she also synthesizes the best evidence, provides standards of practice and principles of planning a change in practice. The article also provides a care plan and documentation flow sheet that will make adopting this protocol even easier for other facilities. This is don’t miss research for anyone who wants to enhance a critical care mobility program.

Source: King L: Developing a progressive mobility activity protocol. Orthopaedic Nursing 2012;31(5):253-262. PubMed Citation

Who Speaks for the Voiceless?

Assessing symptoms in critically ill patients unable to communicate has always been challenging. A study in the current issue of Critical Care Medicine compared proxy assessments by family members, nurses, and physicians with patient reports in two domains: intensity and distress. The assessments were pain, tiredness, restlessness, anxiety, sadness, hunger, fear, thirst and confusion. Family members’ assessments were closer in agreement with patients’ ratings than those of clinicians, indicating family members may be the most effective proxies when patients are unable to communicate.


Who’s Best to Lead Evidence-Based Practice?

Researchers in Sweden present a new measure of self-assessment of capabilities in evidence-based practice and their correlation to application of EBP and research use in RNs at year 2 of practice. Nurses scored six items on a scale of 0 (cannot) to 10 (definitely can) relating how confident they were performing those six steps of the EBP process. Nurses with highest scores used research more than twice as often. While the tool needs additional validity testing, it is a simple, promising tool to identify EBP champions.


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and be externally compressed, particularly if the tube is soft.6 Kinking is also a risk with small, soft tubes.

As with most things in healthcare, using a pigtail catheter for chest drainage involves trade-offs. They are easier to insert, disrupt less tissue, are less painful, and usually placed more quickly. On the other hand, they are more likely to obstruct, can easily kink, allow significantly less flow out of the chest and may not work for thick fluid drainage. The key to successful use of these catheters is careful patient selection before catheter placement, appropriate chest drain devices, and vigilant nursing care. Targeted nursing assessments will promptly identify respiratory changes that indicate tube or system malfunction.

Sources
12. Kam AC, M O'Brien, PCA Kam: Pleural drainage systems. Anaesthesia 1993;48:154-161. PubMed Citation