**IV Connection to Tracheostomy Cuff**  
**Inflation Port Reflects Larger Problem**

Matthew Grissinger, RPh, FASCP

**Problem:** The Institute for Safe Medication Practices (ISMP) has received a report about the unfortunate death of a patient whose intravenous (IV) tubing had been connected to his tracheostomy tube cuff inflation port. The patient had both a Shiley low-pressure tracheostomy tube and a triple-lumen central IV line catheter in place. Someone accidentally attached an IV fluid line to the tracheostomy cuff pilot line (used to inflate the balloon and regulate pressure) instead of the intended port on the triple-lumen catheter.

After the IV infusion pump was turned on, the cuff continued to inflate with fluid, causing the tracheostomy tube to become obstructed. A roommate called a nurse to alert her to the patient’s respiratory distress, but the patient eventually experienced cardiac arrest. The obstruction was noticed when the code team was unable to inflate the lungs. The line was disconnected, and fluid and air were removed from the cuff; however, the patient did not survive.

It may be difficult to understand how anyone could mistake a tracheostomy cuff tube with a triple-lumen catheter, but several underlying factors allowed this error to occur:

1. The patient had just been transferred from critical care to a medical unit, where tracheostomy tubes were infrequently encountered and patients were not routinely monitored with pulse oximetry or capnography to detect problems quickly.

2. Dim lights at night also played a role. It is likely that the staff member connected the infusion without additional light to avoid waking the patient or his roommate.

3. The risk of error was heightened because the triple-lumen catheter was not secured; consequently, the tubing hung down at the same level as the tracheostomy cuff tubing.

4. Although the size of the tracheostomy pilot line is distinctly thinner than regular IV tubing, triple-lumen lines also are thin.

5. The connection ports on needle-less tubing can appear very similar to the tracheostomy pilot line—an interesting example of how an apparent “win–win” safety innovation (a needle-less system) can lead to new, unsuspected problems.

6. The IV tubing fit into the pilot line. The port on the pilot line is compatible with slip tip and Luer lock syringes (and therefore IV tubing) for easy inflation or deflation.

7. Finally, because high-volume, low-pressure cuffs are used to reduce the long-term risk of tracheal injury, they are compliant enough to accept a massive volume of air—or fluid in this case. Most infusion pumps can detect the presence of an obstruction in the IV line, for instance, as a result of the increased pressure exerted. Infusion pumps have an alarm mechanism when high pressure is detected. Unfortunately, in this instance, there was not enough pressure from filling the cuff to trigger an alarm.

**Safe Practice Recommendation:** The ISMP has received a similar report of an accidental injection of drugs into an endotracheal tube cuff during resuscitation efforts. Our organization has also heard of other unusual cases, such as attaching oxygen to a total joint drainage tube. When the errors are viewed in this light, we can do much collectively to prevent faulty connections. Health care providers should take the following steps to:

- **identify the potential for error** through a failure mode and effects analysis when introducing new tubes, catheters, and connectors into a health care system.

- **provide training** to nurses, pharmacists, physicians, and respiratory therapists before using new tubes, catheters, and connectors.

- **discuss possible sources of error** identified during the failure mode and effects analysis, and enumerate steps to avoid these errors.

- **affix labels on lines** near insertion sites when the patient has more than one potential connection to a port of entry into the body (e.g., IV, arterial, umbilical, enteral, bladder, tracheostomy, or drainage tube).

- **trace all lines** from the source (and infusion pump if used) to the connection port to verify attachments before administering drugs, solutions, or other products.

- **independently double-check all line attachments** with two practitioners if infusing high-alert medications or solutions or if administering products to high-risk patient populations.

- **monitor patients** (e.g., take vital signs; make frequent observations; and perform pulse oximetry, capnography, and electrocardiography) to assess the effects of medications, to detect errors quickly, and to minimize the consequences of an error.

Health care regulators and manufacturers should also be playing a role in solving this problem. Groups that set the trends in patient safety are...
standards must agree on concerns surrounding Luer lock connectors. Although careful testing of possible new error pathways is necessary, manufacturers must find ways to make problematic connectors incompatible with each other.

Some testing and redesign of IV infusion pumps might be in order so that a high-pressure alarm would alert the staff if a similar incident were to occur.

The Food and Drug Administration (FDA) must also take action. Perhaps tracheostomy tube manufacturers should be required to adopt a universal method of differentiating cuff inflation ports (so that they look or feel different) from IV ports, especially because compatibility with existing syringes is necessary for safe use.

The reports described in this column were received through the USP–ISMP Medication Errors Reporting Program (MERP). Errors, close calls, or hazardous conditions may be reported on the ISMP (www.ismp.org) or the USP (www.usp.org) Web site or communicated directly to ISMP by calling 1-800-FAIL SAFE or via e-mail at ismpinfo@ismp.org.