

Guest Feature

## Safe Systems, Safe Patients: Common Connectors Pose a Threat to Safe Practice

In 1972 an article in the Lancet described an accidental infusion of a “Milk Drip” meant to be infused intragastrically but was “inadvertently” infused intravenously (Wallace, Payne et al. 1972). The patient had immediate severe consequences of this intravenous infusion of a feeding. Over the following 30 plus years there have been numerous case reports of accidental connections of feeding lines to intravenous lines, intravenous lines and feeding lines to tracheostomy cuffs, blood pressure monitors to intravenous lines and other life threatening connections of compatible tubing to the wrong line (Lanigan 2002; FDA 2003; Eakle, Gallauresi et al. 2005). To date there has been no progress in eradicating this avoidable error.



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The common element in each of these tragic errors is the presence of a “luer lock” connector that makes connecting therapeutic products easy but also allows fatal errors when they are mistakenly connected. Blood pressure cuffs to intravenous lines can cause air embolisms, feeding tubes to intravenous lines cause sepsis and fat embolisms and intrathecal infusions of vincristine are fatal. The commonality is that each one of these errors involves a luer lock connector (FDA 2003).

Initial reactions to these case reports may be to question the vigilance of the nurse. How could a careful nurse accidentally connect the wrong lines? The answer is complex and includes many different factors that contribute to making this type of error. First and foremost, nurses are human and humans are not “perfect” at all times despite their intent. One other large problem is that as we become more familiar with a task, we may perform that task incorrectly. This is much like locking your keys in your car accidentally, although you usually perform perfectly, occasionally you do not act perfectly and lock your keys inside the car. This is called “*automaticity*” and is a function of thinking that allows us to perform common tasks without effort but also make mistakes in common tasks without knowing a mistake has been made.

The answer to this dilemma is not far from our reach – changing the design of the connectors will help prevent these errors. In the past, misconnected medical gases caused deaths every year in the operating room when anesthesiologists would inadvertently connect the patient to nitrous oxide and not oxygen. The connections to these two similar gases are now incompatible, which prevents an accidental connection. Redesigning the product so it will not connect is called a *forcing function* because it forces the user to use correct lines and prevents them from connecting incompatible lines. This change is a result of using safe design principles and recognizing the potential, however small, of human error in a critical process (Berwick 2001).

To date, there is no mandated standard in healthcare to change compatibility of these connectors to prevent these errors. Healthcare facilities are encouraged to use connectors that are not universally compatible with other infusion systems and purchase items that are not compatible to all lines – such as blood pressure cuffs without luer lock connectors or feeding tubes that will not connect to intravenous lines (Association of the Advancement of Medical Instrumentation 2001; ISMP 2003; Paparella 2005). Unfortunately nurses and facilities may not be aware of the potential for this error.

Nurses in healthcare settings where there are multiple common connectors must be aware of the possible hazard of inadvertently connecting the wrong line and take steps to protect their patients from this tragic and avoidable error. Changing the design of these connectors so they are not able to be connected is the right solution for this problem – until then here are some suggestions from experts of how to try and avoid this error:

1. All staff should be educated regarding the hazards of these connectors and strategize ways to decrease the risk (Eakle, Gallauresi et al. 2005);
2. It may be helpful to mark all lines with luer connectors at the proximal and distal end or double check lines independently (ISMP 2004);
3. Do not use IV tubing for enteral feedings or IV pumps for Enteral feedings (ISMP 2004);
4. Avoid buying equipment with common luer lock connectors when at all possible – especially for blood pressure cuffs, intrathecal or epidural lines and enteral feedings (Stone 2002; Paparella 2005).

Nurses can influence the design and safety of the work environment by being active in decisions about patient products and supporting their institutions in purchasing incompatible connectors. In addition, soliciting professional organizations to support

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standards that change connectors to be incompatible is also a strategy. Safe design of healthcare products will support the ability of nurses to practice safely and keep patients safe.

### **Where you can get more information:**

Association for the Advancement of Medical Instrumentation, [www.AAMI.org](http://www.AAMI.org)

FDA Patient Safety News, [www.FDA.gov](http://www.FDA.gov)

Institute for Safe Medication Practice, [www.ISMP.org](http://www.ISMP.org)

United States Pharmacopeia, [www.USP.org](http://www.USP.org)

### **References:**

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Paparella, S. (2005). "Inadvertent attachment of a blood pressure device to a needleless IV "Y-site": surprising, fatal connections." JEmerg Nurs **31**(2): 180-2.

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In accordance with 301.158, Texas Occupations Code, the Board disseminates information "that is of significant interest to nurses and employers of nurses in Texas." As part of its Strategic Plan for the agency, the Board has identified the need for regular input on nursing practice, licensure, and education. The guest column in the *Bulletin* is one way of meeting that need. Comments regarding this column should be addressed to the Editor at the Board's address. The opinions expressed in the guest column are those of the author and not an opinion or position statement of the Board.

### **FYI - Licensure Verification Information Available 24/7 for Nurse Administrators/Employers**

All vocational nurses, registered nurses and registered nurses with advanced practice authorization shall ensure the verification of current Texas licensure or other compact state licensure privileges and credentials of personnel for whom the nurse is administratively responsible, when acting in the role of nurse administrator [22 TAC §217.11(1)(V)]. Nurse administrators/employers hiring registered nurses, licensed vocational nurses, or advanced practice nurses can check the licensure status of nurse applicants through the Board of Nurse Examiners' web site at: <https://www.bne.state.tx.us/olv/olverif.htm>. This service is available 24 hours a day, seven days a week. BNE customer support representatives can be reached for phone verification during regular business hours, Monday through Friday, 8:00 am to 5:00 pm. The phone number is: 512 305-6809.