Prevention of medication errors is a major concern for health care providers, and developing technology has played a part in reducing the number of deaths caused by medication errors. This article will discuss medication errors and the importance of educating nurses on new technology.

Prevention of medication errors is a top priority for all health care providers. Technological advancements – such as handheld computers – are reducing the incidence of medication errors. Electronic documentation, electronic physician ordering, and medication bar coding are becoming the norm rather than the exception. By carefully adopting new technologies into practice, nurses have the opportunity to transform nursing practice, enhance patient safety, and improve patients’ lives (Tariman, 2008). A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional or consumer (National Coordinating Council for Medication Error Reporting and Prevention, 2006). The Institute of Medicine (IOM) (1999) defines medical error as “the failure of a planned action to be completed as intended, or the use of a wrong plan to achieve an aim” (p. 210). Medical errors can occur in all health care settings. The IOM reported that medical errors can and are likely to occur in patient care settings, but implementing more stringent patient safety measures can minimize errors (IOM, 2007).

Problem

Medical errors were once the eighth leading cause of death in the United States. In 1999, the IOM reported that as many as 44,000 to 98,000 hospitalized Americans died each year from a medical error; medication errors alone accounted for an estimated 7,000 deaths annually (IOM, 1999).
Lesson Learned: Don’t be Cynical or Grumpy

How awesome was the AMSN Convention in Orlando this year? The opening speaker, Ron Culberson, MSW, CSP, CPASE, gave a great motivational talk encouraging all of us nurses to find the humor in our otherwise very stressful jobs. He told us to not be so serious and annoyed all the time. Rather we ought to seek to communicate and connect with our patients. We should set excellence as the target and the process toward excellence will then become fun. Empathy and clarity are essential elements in effective communication with our patients. Strive for those things in your personal life and in your practice settings. And for some hilarious medical humor, Ron suggested we search Google for “funny urinal targets.” I haven’t looked it up yet, but am anxious to do so.

Other speakers reminded us that each of our patients are “precious cargo” and as nurses, we need to be their advocates in what can be a very complex and sometimes dangerous health care system. Nurses need to advocate for their patients and be vigilant in helping to prevent death and serious harm caused by medical error. The convention was honored to have renowned nurse researcher Dr. Marlene Kramer present. Dr. Kramer – or Marlene, as she prefers to be called – held focus groups requesting narratives from nurses to give examples of when they advocated for patients. Her research has suggested that patient advocacy is one of the leading and most important roles a nurse can perform.

Lots of sessions were offered to improve and update our medical-surgical knowledge, including new developments in: obesity, orthopedics, diabetes, delirium, EKG interpretation, chest tube management, spinal cord injuries, venous thromboembolism, social media, transplants, heart failure, palliative care, hospice, hypertension, families, ventilators and tracheostomies, suicide prevention, sleep, pain management and addiction, lab testing, and nutrition. The poster presentations offered even more information. The variety and plethora of information and education for the med-surg nurse was outstanding. The AMSN Board of Directors and convention Program Planning Committee did an outstanding and quality job putting on this year’s conference. If you missed it, check out some of the online video presentations.

As you read this issue of MedSurg Matters!, be grateful that you are a part of such a great organization dedicated to helping you hit that target of medical-surgical nursing excellence. And during the process, don’t be cynical or grumpy but rather happy and appreciative, and find the humor in our otherwise stressful nursing roles.

Thank you to the AMSN Board of Directors and Planning Committee for a job well done at the 2014 convention. You have helped us all to network with our fellow colleagues, learn from each other, and leave the convention as better, more fulfilled medical-surgical nurses. Well done! You are to be commended. We are grateful…and are expecting more great things next year in Las Vegas!

Molly McClelland, PhD, MSN, RN, CMSRN, ACNS-BC
MedSurg Matters! Editor
Nursing is both art and science, so AMSN aimed for excellence in both areas at its 23rd Annual Convention September 11-14. Apparently the association succeeded, with the meeting drawing more than 1,000 medical-surgical nurses and health care professionals.

“I would say we achieved our three major goals,” said outgoing AMSN President Kathleen Lattavo, MSN, RN, CNS-MS, CMSRN, RN-BC, ACNS-BC. “Inspiring the nurses to develop personally and professionally, giving them the top education they need to improve patient care, and providing ample opportunities to connect with others who share their compassion and commitment.”

At the convention, held at the Hilton Orlando, Orlando, FL, the nurses attended a broad variety of medical-surgical nursing sessions, earned continuing nursing education (CNE) contact hours, and connected with colleagues at networking events.

There were many interactive special features this year; including an exhibit hall buzzing with products, recruiters, and posters; social media-driven photo shoots, graffiti boards filled with inspiring messages from attendees, gift card giveaways and scavenger hunts. The convention mascot, Florida Flo, graciously posed with attendees for selfies and helped inspire her colleagues to fly to the highest heights of professional success.

**Convention Highlights**

AMSN is currently enjoying unprecedented growth. During her opening address, Lattavo announced that AMSN now has the highest membership since it began in 1991, marking over 11,300 members. Another way the med-surg specialty has grown, Lattavo added, is through the Certified Medical-Surgical Registered Nurse (CMSRN) certification examination. There are now more than 21,000 CMSRNs, a tremendous achievement by the affiliate certifying organization of AMSN, the Medical-Surgical Nursing Certification Board (MSNCB).

At the Board of Directors Induction Ceremony on Sunday, September 14, Lattavo officially ended her 2-year term as president, handing over the top leadership spot to incoming president Jill Arzouman, MS, RN, ACNS-BC, CMSRN.

During her address, Arzouman challenged the nurses not to dwell on the ‘whys’ — why the U.S. health care system has struggled, “but to focus on the ‘whats’ — what we as medical-surgical nurses can do to better the human condition.”

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**IV Therapies for Patients with Fluid and Electrolyte Imbalances**

**Molly McClelland**

### To Obtain CNE Contact Hours
1. For those wishing to obtain CNE contact hours, you must read the article and complete the evaluation through the AMSN Online Library. Complete your evaluation online and print your CNE certificate immediately, or later. Simply go to www.amsn.org/library.
2. Evaluations must be completed online by October 31, 2016. Upon completion of the evaluation, a certificate for 1.3 contact hour(s) may be printed.

### Fees
- **Member**: FREE
- **Regular**: $20

### Objectives
The purpose of this continuing nursing education article is to increase nurses’ and other health care professionals’ awareness of intravenous therapies for patients with fluid and electrolyte imbalances. After studying the information presented in this article, you will be able to:
1. Describe the two main types of IV solutions – crystalloids and colloids.
2. Define tonicity, and explain hypertonicity and hypotonicity.
3. Discuss osmosis and the transmission of solutes through a membrane to maintain equilibrium.

Note: The author, editor, editorial board, and education director reported no actual or potential conflict of interest in relation to this continuing nursing education article.

This educational activity has been co-provided by Anthony J. Jannetti, Inc. and AMSN.

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### Hanging accurate IV solutions specific to medical conditions can significantly impact the health and healing of patients. This article describes accurate identification of a patient’s fluid and electrolyte status, understanding tonicity, and knowing appropriate IV therapies.

### Scenario One
A 32-year-old male athlete who had been participating in a local marathon was brought to the emergency department confused and lethargic. His vital signs on arrival were: temperature 103.5°F (39.6°C), heart rate (HR) 106, respirations (RR) 24. The patient was diagnosed with heat exhaustion. The emergency department nurse removed the patient’s clothing and applied cool, moist sheets and ice packs to his groin and axilla. The emergency room physician wrote orders to initiate an intravenous (IV) infusion of chilled Lactated Ringer’s (LR) at 100 mL/hour, administer 2 L oxygen (O₂) via nasal cannula, monitor heart rate, track urine output (UO) via an indwelling catheter, and observe neurological status.

### Scenario Two
A 68-year-old female was admitted to the medical-surgical unit following a total abdominal hysterectomy for ovarian cancer. The patient arrived from the post-anesthesia recovery unit confused and with 2+ pitting edema in her bilateral extremities. Laboratory findings revealed potassium (K⁺) of 3.4 mEq/L, sodium (Na⁺) of 128 mEq/L, chloride (Cl⁻) of 93 mEq/L, carbon dioxide (CO₂⁻) of 25 mEq/L, blood urea nitrogen (BUN) of 8 mg/dL, creatinine of 0.7 mg/dL and a blood glucose of 108 mg/dL. The patient was lethargic, but denied pain. A large abdominal dressing was dry and intact. A peripheral IV of 5% dextrose in water (D₅W) was infused at 120 mL/hour. The patient was on oxygen at 2 L nasal cannula.

### Scenario Three
A neurosurgical intensive care nurse was assigned to care for a 23-year-old male who sustained severe head trauma following a motor vehicle crash the day before. He had an intracranial pressure (ICP) monitor in place with readings between 15 and 22 mmHg. He was on a ventilator and was responsive to noxious stimuli, didn’t follow commands or open his eyes during wake trials from sedation. He had an arterial line in place and a peripheral IV of 5% dextrose in 0.9% normal saline (D₅/0.9% NS) infusing at 60 mL/hr.

### Choosing the Correct IV Solution
If you were the nurse caring for any of the patients in the above scenarios, would you question any of the orders given? Would you know what to evaluate if the ordered IV solution was appropriate for the patient? Only one of the three scenarios has the appropriate IV therapy hanging given the patient situation. Fluid and electrolyte abnormalities account for numerous health-related complications, including patient mortality (Grossman et al., 2010). Understanding which type of IV fluid to give can improve health and healing and prevent complications, thus saving lives and money.

### Categories of IV Solutions
There are two major types of IV solutions: crystalloids and colloids. Crystalloids are water solutions with...
electrolytes and other substances such as minerals added. An electrolyte is an element from the periodic table with either a positive or negative charge. Examples of positively charged electrolytes are sodium (Na+) and potassium (K+). Sodium is a common electrolyte added to crystalloids. Potassium can be added to the crystalloid solution if the patient’s potassium level is low. Other substances without electrical charges such as glucose – usually infused as dextrose – can be added to water solutions (Phillips, 2010).

Crystalloids have different tonicities and are categorized as isotonic, hypotonic, and hypertonic types. It is important to understand the differences in the tonicity of the IV solution because tonicity significantly impacts the fluid and electrolyte status of the patient (Daniels & Nicoll, 2012; Phillips, 2010). These will be discussed further in subsequent paragraphs.

Crystalloids are readily available and less expensive to administer than colloids. Examples of crystalloids are LR, 0.9% normal saline (NS), 0.45% NS (.45 NS or 1/2 NS), Dextrose, Water (D2W), 3.0% normal saline (3% NS), D,0.45% NS, and D15W. Water alone cannot be infused intravascularly because it moves too quickly into the red blood cells, causing them to rupture (Daniels & Nicoll, 2012).

Colloids are volume expanders and have larger molecules compared to crystalloids, so colloid molecules remain in the vascular spaces longer. In addition, colloids increase the osmotic gradient, meaning they draw fluid from the interstitial spaces back into the vascular spaces (Phillips, 2010). Less volume is required when using colloids to achieve the same effect compared to a larger amount of crystalloids. Colloids, such as albumin, blood, plasma, and Dextran 40, are useful for patients with fluid volume overload because they expand the intravascular spaces without adding significantly more fluid. Patients with edema can benefit from colloids because the increase in oncotic pressure exerted by colloids pulls fluid from the interstitial and intracellular spaces back into the intravascular spaces, where the kidneys can excrete the excess (Shafiee, Bohn, Hoorn, & Halperin, 2003). Patients with increased intracranial pressure are often treated with colloids because they move fluid from swollen brain cells into the intravascular spaces and do not add a significant amount of extra intravascular fluid. Patients with congestive heart failure are also good candidates for colloid therapy when intravascular expansion is needed, but additional fluid volume could worsen the patient’s symptoms.

**Tonicity of Crystalloids**

Tonicity is the relationship between the amounts of water on both sides of a membrane. A membrane is any surface dividing two areas, for example, vascular walls or the covering of cells. Sometimes the membranes are semi-permeable, meaning they will allow substances (also known as solutes) of a certain size to enter the compartment. Sometimes when solutes are too large to move across a membrane, water will move across the membrane instead; this is referred to as osmosis (Daniels & Nicoll, 2012; Port, 2008). The body strives to maintain equilibrium, a place where there is no movement of solutes or water across the membranes. When equilibrium has occurred on both sides of the membranes, the patient is considered to be in an isotonic state. The goal of parenteral therapy is to achieve or maintain an isotonic state for the patient.

**Hypertonicity**

A hypertonic state occurs when there is a higher concentration of solutes in relation to water. Patients who are hypertonic have a deficit of extracellular fluid volume (Patanwala, Amin, & Erstad, 2010). Extracellular fluid loss or too much fluid in the interstitial spaces causes this deficit. Dehydrated patients are often hypertonic and may have these symptoms: thirst, dry mucous membranes, decreased skin elasticity, pale skin color, tachycardia, decreased urine output, postural hypotension, increased hematocrit, and elevated blood urea nitrogen (BUN) and creatinine. All body systems are affected when the patient is in a hypertonic state. Lethargy, confusion, thirst, irritability, and restlessness are common neurological signs evident in patients who are hypertonic. Nausea, vomiting, decreased tearing, dry eyes, dry skin with tenting, clear but rapid and shallow respirations, and weak pulses can be evident in other body systems in patients who have a deficit of extracellular fluid volume. Patients in diabetic ketoacidosis and burned patients are other patient groups who are often in a hypertonic state. Patients who have experienced prolonged vomiting, diarrhea, GI suctioning, surgical patients, prolonged periods of no food by mouth (NPO), excessive use of diuretics, excessive diaphoresis, or have inadequate fluid intake are also at risk for developing hypertonicity.

It is important for medical-surgical nurses to know the tonicity of their patients to understand the purpose of ordered parenteral therapy (Daniels & Nicoll, 2012). The general rule is to provide IV fluids opposite of the patient’s tonicity. For example, if the patient is in a hyper-
tonic state, then an isotonic or hypotonic IV fluid should be administered. If a patient is in a hypotonic state, then a hypertonic or isotonic IV solution is a more appropriate infusion. Figure 1 depicts the concept of tonicity and appropriate IV therapies.

Choosing the Correct IV Therapy

Isotonic IV Solutions

Isotonic IV solutions include any IV therapy that does not cause osmosis or diffusion, meaning there is no change in the composition of body fluids. Two isotonic fluids commonly used to replace fluid loss in patients who do not have tonicity problems are 0.9% NS and LR. Infusing isotonic fluids does not generally alter the fluid concentrations of the patient when given as maintenance fluids (Criss, 2007). Hypotensive and hypovolemic patients are excellent candidates for isotonic fluid infusions due to the increased fluid volume associated with isotonic fluids. Patients who are hyponatremic benefit from isotonic IV solutions.

The nurse will assess signs and symptoms of isotonic losses such as hypotension, tachycardia, weak peripheral pulses, sunken eyeballs, poor skin turgor, oliguria, and hemococoncentration. Isotonic fluid volume deficits are caused by hemorrhage, gastrointestinal losses, fever, environmental heat, diaphoresis, burned patients, and overuse of diuretics (Phillips, 2010). The nursing care of patients with a fluid volume deficit diagnosis focuses on increasing fluid intake with 0.9% NS, LR, or hypotonic solutions, replacing electrolytes, restricting sodium in cases of hyponatremia, and offering oral free water (Daniels, 2010; Daniels & Nicoll, 2012).

Isotonic solutions are appropriate for patients suffering from extracellular fluid deficits such as in hemorrhaging or hypovolemic shock. The nurse can determine if the fluid volume deficit is in the intravascular space or interstitial space based on assessment data of the patient. Patients who have a fluid deficit in the intravascular space often present with orthostatic hypotension, dizziness, syncope, tachycardia, decreased urine output, and thready pulses. The nurse will assess poor skin turgor and dry mucous membranes in patients who have insufficient amounts of fluid in their interstitial spaces. Weight loss is a common assessment finding in generalized extracellular fluid volume deficits (Daniels, 2010; Shafiee et al., 2003).

0.9% NS should be used cautiously in patients with congestive heart failure (CHF) and those who are hypertensive and have left ventricular dysfunction because of the risk of fluid overload. Causes of isotonic fluid volume overload include excessive administration of fluids and excessive irrigation of body cavities (enemas, peritoneal dialysis, gastric lavage, etc.). LR should be used with caution in patients who may be at risk for acidosis such as diabetic ketoacidosis (DKA) and chronic obstructive pulmonary disease (COPD) patients. LR should be avoided in hyperthermic and febrile patients because the breakdown of lactate found in LR is lactic acid, which compounds the acidosis due to body temperature elevation. The liver is unable to metabolize lactate when the body temperature is elevated as in heat exhaustion, heat stroke, and high fevers. Diabetic patients receiving Metformin® (glucophage) should not be given LR due to Metformin’s common side effect of metabolic acidosis, which would potentiate a lactate complication from an LR infusion (Criss, 2007). LR can worsen cerebral edema, so it is not the fluid of choice in a patient with head trauma (Criss, 2007; Thompson, 2005).

Hypotonic IV Solutions

Hypotonic IV solutions are fluids with solutes less than 0.9% NS. Examples of hypotonic solutions include 0.45% NS and D5/0.45% NS. Hypotonic solutions cause fluid to move into the cells from the interstitial spaces and are useful for increasing total fluid volume and maintaining body fluids. Dehydrated patients, hyponatremic patients, and patients using diuretics are good candidates for hypotonic solutions. Patients with renal disorders, such as diabetes and those on dialysis, benefit from hypo-

Figure 1.
Appropriate IV Solution Choices for Hypertonic, Isotonic, and Hypotonic Patients

Hypertonic Patient

![Hypertonic Patient Diagram]

Treat with hypertonic IV solutions such as D1.5W or 0.45% NS

Isotonic Patient

![Isotonic Patient Diagram]

Treat with isotonic IV solutions such as 0.9% NS or Lactated Ringer’s

Hypotonic Patient

![Hypotonic Patient Diagram]

Treat with hypotonic IV solutions such as 3% NS or D5 0.9% NS

Source: Copyright © M. McClelland, 2012. Used with permission.
Hypertonic solutions

Hypertonic IV solutions are fluids with solutes greater than 0.9%, such as D5% NS, D5/2% NS, and D2.5% LR, which pull fluid from cells into the intravascular space. Hypertonic solutions are useful for patients with elevated intracranial pressure (ICP) and some trauma patients (Patanwala et al., 2010; Phillips et al., 2009). Hypertonic IV solutions are useful in stabilizing blood pressure, increasing urine output, and correcting hyponatremia in edematous patients. Patients with inadequate electrolytes could benefit from a hypertonic solution, which helps replace the lost electrolytes. If prolonged use of hypertonic solutions is expected, administering the solution through a central line should be considered (Daniels, 2010).

The nurse should assess often for fluid volume overload in patients receiving hypertonic solutions as the fluid moves out of the cells and into the intravascular space. Assessment findings such as auscultated rales or crackles in the lung fields, shortness of breath, dyspnea, and jugular vein distention might indicate the patient is developing fluid volume overload. The nurse should notify the health care provider and anticipate a reduction or change in the type of IV solution being infused. Hypertonic solutions should not be infused rapidly.

Conclusion

Now that you have more information regarding appropriate IV fluid choices, do you know which of the three patient scenarios presented at the beginning of this article has the correct solution hanging? The answer is the patient in the third scenario. This patient has an elevated ICP following head trauma, so the hypertonic solution of D5/0.9% NS is a good choice for this patient. D5/2% NS will help to pull fluid from the cells and into the intravascular space where the excess fluid can be excreted by the kidneys. The shrinking of the brain cells will provide more intracranial space, which will help reduce the ICP. In addition, the IV is infusing at a slower rate, appropriate for hypertonic solutions and patients following head trauma.

The patient in the first scenario is suffering from heat exhaustion, and his liver will not be able to metabolize the lactate in the ordered LR. While it is appropriate to hang chilled IV solutions in an attempt to cool him down, a solution without lactate would be a better choice for this patient. Hypertonic solutions would not be a good choice because patients with dehydration, excessive diaphoresis, and inadequate amounts of fluid intake (all common following intense activities in hot conditions) are likely to be in a hypertonic state.

The patient in the second scenario is post-operative, a common risk factor for hypotonicity. She is showing signs of being in a hypotonic state as evidenced by her lethargy, edematous extremities, hyponatremia, and decreasing BUN and creatinine. The IV solution the patient is getting is a hypotonic fluid, which will make her symptoms worse. The patient would benefit from an isotonic solution at a lower rate or a hypertonic solution until she is returned to an isotonic state.

Understanding osmolality, tonicity, and IV solutions can improve nursing assessment and intervention skills, as well as lead to enhanced patient outcomes (Grossman et al., 2010; Phillips et al., 2009). Because administering and managing IV solutions is a common nursing function, knowledge of the types and reaction of intravenous fluids is essential. Table 1 depicts the types of fluids, their properties, uses, and cautions presented to be used as a quick reference guide when you are caring for your next patient who has an order to initiate IV fluids.

References


D5W is isotonic in the bag, but quickly becomes hypotonic when administered intravascularly (Phillips, 2010).

### Table 1.
Reference Guide for Care of the Patient on IV Fluids

<table>
<thead>
<tr>
<th>Category</th>
<th>Crystalloids</th>
<th>Colloids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Isotonic</td>
<td>Hypotonic</td>
</tr>
<tr>
<td>Examples</td>
<td>0.9% NS LR</td>
<td>0.45% NS D5W*</td>
</tr>
<tr>
<td>Properties</td>
<td>No movement of fluid between spaces</td>
<td>Causes fluid to move from interstitial spaces into cells</td>
</tr>
<tr>
<td>Useful for</td>
<td>Hemorrhage</td>
<td>Dehydration</td>
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<tr>
<td></td>
<td>Hypovolemia</td>
<td>Hypernatremia</td>
</tr>
<tr>
<td></td>
<td>Shock</td>
<td>Excessive diuretic use</td>
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<td></td>
<td>Hypotension</td>
<td>Renal disorders</td>
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<td>Dehydration</td>
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<td>Head trauma</td>
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<td>SIADH</td>
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<td>Hyponatremia</td>
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<td>Head trauma</td>
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<td>CHF</td>
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<td></td>
<td>HTN</td>
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<tr>
<td>Cautious In</td>
<td>Avoid LR in: DKA COPD Hyperthermia Febrile Head trauma Metformin use</td>
<td>SIADH Hyponatremia Head trauma CHF Increased CVP Pulmonary edema Edema</td>
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<tr>
<td></td>
<td>CHF</td>
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<td>Hypervolemia</td>
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<td></td>
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</tbody>
</table>

*DSW is isotonic in the bag, but quickly becomes hypotonic when administered intravascularly (Phillips, 2010).


Molly McClelland, PhD, MSN, RN, CMSRN, ACNS-BC, is an Associate Professor of Nursing, University of Detroit Mercy, Detroit, MI. She is the MedSurg Matters! Editor.

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Collaborative Learning: Student Nurses Caring for Community Residents

Collaborative learning is an essential part of nursing education today. Nurse educators strive to facilitate student service learning through helping the local community. One school of nursing took a proactive approach to benefit its students and the local community.

Collaborative projects between community agencies and schools of nursing in the form of service learning projects provide invaluable learning opportunities for learners and provide a much needed service for the agency (Billings & Halstead, 2009). Service learning is an educational experience in which students participate in an activity that meets the community needs within the framework of a specified curriculum (Billings & Halstead, 2009). Penn State University’s Worthington Scranton Campus and The Lackawanna County Housing Authority have collaborated to provide preventive health care to low income senior adults. The nursing faculty and nursing students at Penn State Worthington Scranton provide free preventive care, such as stroke risk assessments that are held one Saturday a month from 9 a.m. to 2 p.m. from September to May. Stroke risk assessment forms are provided free of charge on the American Heart Association’s website (www.heart.org).

Rationale for the Project

Stroke is the third leading cause of death and the leading cause of disability in the United States. Someone in the United States has a stroke every 40 seconds; every 4 minutes, someone dies of a stroke. Nearly two-thirds of all stroke deaths are among individuals age 65 or older (Centers for Disease Control and Prevention, 2014). The percentage of individuals age 60 continues to grow in Northeastern Pennsylvania. In fact, the number of individuals who are over 85 years old has grown by over 45% (Pennsylvania Department of Aging, 2014). For these reasons, it is critical that preventive health screening be provided to at-risk populations, including elder adults and those with limited access to care.

Secondly, by providing stroke risk assessments at their place of residence, it eliminates the need for the elderly to travel to health care services. Travel can be a hardship for elderly individuals because they often are forced to rely on friends and relatives, as well as public and private transportation, to get the health services they need and/or desire. By providing these services at locations convenient to them, we can assure that this population of individuals receives care in a preventive and proactive manner, thus enabling them to address health concerns before they become health problems.

Finally, this collaborative project provides Penn State student nurses with the opportunity to become engaged in a meaningful educational experience related to both the clinical and community aspects of their instruction. Based on the demographics of Northeastern Pennsylvania, student nurses must become sensitive to the social and health care needs of this growing segment of our community. The enhanced exposure of the students to the needs and care of the elderly increases their expertise and skills in managing problems exclusive to this group.

Outcomes

Outcomes of the collaborative project positively benefit students, faculty, and the school of nursing, as well as the university and the community. Students benefit in many ways. They are able to master basic skills, such as pulse and blood pressure assessments, and gain needed experience in communicating with colleagues and clients. Other outcomes for students include increased socialization into the nursing profession, greater transfer of theory material into the clinical setting, and understanding the importance of health promotion and volunteerism (Billings & Halstead, 2009). Many students have commented on how the health screenings helped them better understand the barriers faced by the elderly population, increased their abilities to perform clinical skills, and made them feel good about themselves.

Outcomes for faculty include an increased sense of well-being, increased faculty-student interaction, and possible research data for faculty interested in studying health promotion or other related concepts of the collaborative project. Outcomes for the school of nursing and the university include increasing the visibility of the campus in the community and increasing the appeal to potential donors. It is hoped that the collaborative project would increase recruitment and retention efforts within the school of nursing and the entire university (Billings & Halstead, 2009).

Finally, the community – in particular, elder individuals residing in high-rises within Lackawanna County in PA – greatly benefits from the collaborative project. Outcomes for the high-rise residents include increased knowledge related to stroke and various related diseases and healthy living, as well as an increased understanding of personal risk factors assessed during the stroke risk assessment. This allows the residents to make informed choices concerning their health and be proactive about their health in future appointments (Billings & Halstead, 2009). In fact, on one occasion, the faculty and students had to intervene and call emergency services to have a resident transported to the hospital with a blood glucose reading of over 700.

In conclusion, collaborative service learning projects like the one described are essential components in nursing education today. Collaborative learning is an essential part of nursing education today. Nurse educators strive to facilitate student service learning through helping the local community.
Reducing Medication Errors  
continued from page 1

In an effort to better understand the problem, a project was designed and is described here.

Project Questions
This project was guided by three questions:
• Has new technology used in hospital settings shown a reduction in medication errors?
• What are the barriers to implementing bar code technology?
• Why is it important to educate medical-surgical nurses regarding the use of new technology?

Literature Review
Bar Coded Medication Administration (BCMA) is designed to prevent medication errors in healthcare settings and improve the quality and safety of medication administration. In 1995, the Department of Veterans Affairs (VA) in Kansas became one of the first healthcare facilities to adopt bar coding technology when BCMA was implemented at the Colmery-O’Neil Veteran Medical Center in Topeka (Coyle & Heinen, 2005). Between 1995 and 1999, the VA found bar coding technology led to a 74% reduction in the administration of wrong medications, a 57% reduction in errors caused by the administration of incorrect doses, a 91% reduction in wrong patient errors, and a 92% reduction in wrong time errors (Carlson, 2004).

In 2004, bar coding technology usage increased in healthcare systems after the Federal Drug Agency’s (FDA) ruling requiring medications to have machine-readable bar codes. Bar code point-of-care systems help track and reduce medication errors, thus decreasing the risk for wrong patient, wrong drug, wrong dose, wrong route, and wrong time errors (Dohnalek, Cusaac, Westcott, Langeberg, & Sandler, 2004).

A study by Paoletti and colleagues (2007) implemented a multidisciplinary approach to systematically decrease medication errors with observation methodology and the deployment of electronic medication administration records (EMARs) and BCMA. The measurement of medication errors using the observation process occurred in two phases: pre-implementation and post-implementation. Three inpatient nursing units participated. The control group was a 20-bed cardiac telemetry unit. Two intervention groups implemented observational methodology. Intervention group one was another 20-bed cardiac telemetry unit and intervention group two was a 36-bed medical-surgical unit. The medication error rates, which were given voluntarily, were collected between July 2003 and March 2005. The results of the study indicated an overall reduction of medication administration errors of 54% following implementation of a multidisciplinary, collaborative approach to medication safety (Paoletti et al., 2007). Successful implementation of EMARs and BCMA was evident through a consistent bar code scanning compliance rate exceeding 90% and has resulted in improved satisfaction survey results from nursing staff, patients, and patients’ families. The commitment to providing a safer environment for patients and nursing staff has served as a recruitment tool for new nurses (Paoletti et al., 2007).

Helmons, Wargel, and Daniels (2009) investigated the effect of BCMA technology on six indicators of medication-administration accuracy and nine types of medication-administration errors in distinct patient care areas. The study was conducted in two medical-surgical units, one medical intensive care unit (ICU), and one surgical ICU in a 386-bed academic teaching hospital. The nursing staff was observed administering medications one month before and three months after the implementation of BCMA technology. Improved adherence to patient identification policies was observed after BCMA implementation in the medical-surgical units, but more distractions of the nursing staff occurred, and the medications administered were less frequently explained to the patients. Although an increase in time errors was observed in the medical-surgical units, the total number of medication errors did not change (Helmons et al., 2009). The conclusion of the study by Helmons and colleagues (2009) showed that after implementing BCMA technology, there was a decrease in medication-administration errors in the medical-surgical units, but not in ICUs when time errors were excluded. BCMA technology affected dif-
different types of medication-administration errors in different patient care areas (Helmons et al., 2009).

Theoretical Framework

New technology brings changes to health care, and there is a constant need for nurses to learn how to use new devices. The change theory by Kurt Lewin is widely known in nursing and involves three stages. The unfreezing stage occurs when the need for change is recognized, and the process of creating awareness has begun. The second stage, moving, occurs when the need for change is accepted and implemented. The third stage of refreezing occurs when the change is made permanent (Burke, 2011). Implementing technology to help reduce medication errors is an important and necessary change. However, without the proper education regarding how to use the new technology, health care institutions can be setting themselves up for failure.

Evaluation

Education is the key to safe implementation of any new technology. It is important to have all disciplines involved in planning the implementation. Stakeholders in the fields of pharmacology, nursing, information services, medicine, and health care administration are needed to invest time and expertise into a successful delivery of the new technology. To achieve success, it is important for all disciplines to work together and brainstorm ideas. Nurses are the frontline that will be utilizing the bar code technology; therefore, educating nurses on how to use the BCMA technology is a top priority. Nurses’ understanding of how BCMA works and their level of comfort with the technology are crucial in incorporating the BCMA into nursing practice.

Bar code technology works by checking the six rights of the patient: right patient, right drug, right dose, right route, right time, and right documentation. When educating the nurse on bar coding medication administration, it is important to note that the nurse still needs to check the six rights and the two patient identifiers of name and date of birth. Scanning the patient’s wristband is verifying the right patient. Nurses need to be educated that the bar code technology can help them detect a wrong dose or time, but it is still the nurse’s responsibility to manually check and double-check the medications (Pennsylvania Patient Safety Authority, 2008).

Bar coding safeguards reflect well-established principles of safe drug administration, including proper identification practices, documentation, double-checking administration of high-alert drugs, and avoiding preparation of medications for multiple patients at one time (Grissinger & Globus, 2004). To prevent medication errors, avoid these shortcuts:

- Do not remove patients’ wristbands for scanning.
- Do not scan surrogate bar codes, such as those found on a sheet of paper with multiple bar codes of commonly prescribed drugs.
- Do not bypass system checks designed to ensure that the correct medication is administered. A mismatch between the patient and the drug packaging applied during manufacturing or repackaging triggers a warning, thus prompting the nurse to investigate the discrepancy before administering the medication.

Conclusion

Nursing is forever changing and evolving. Bar code technology has shown a reduction in medication errors when utilized appropriately. Implementing new technology into nursing practice is inevitable, and nurses have to constantly learn new technology. Education and implementation need to be well planned across key stakeholders and pertinent to the work of the nurse for there to be successful implementation of BCMA to reduce medication errors.

References


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Emerging Roles for Nurses After Health Care Reform

The Patient Protection and Affordable Care Act (PPACA) started changing the health care system almost from its inception in March 2010 with many of the biggest changes taking effect January 1, 2014. The overall goal of the PPACA is to make health care more affordable and available to all Americans through employer-based insurance, private insurance companies, state-based health insurance market places (also called exchanges), or Medicaid (Guest, 2013).

As 2014 unfolds, we can expect to see an array of central provisions from the health care law come to life. Many of these will add millions more insured to our health care system. It’s already estimated that approximately 1.1 million people have obtained health insurance through the exchanges, and many more are expected to have gained coverage before open enrollment ended in March 2014 (Kennedy, 2014). These numbers will continue to rise as some states expand their Medicaid programs. Moreover, as their care needs increase, an aging and growing population will further inflate these numbers (Christensen, 2013).

Ensuring adequate access to care is a major concern that coverage expansion has introduced to the burgeoning health care delivery system (Yee, Boukus, Cross, & Samuel, 2013). Currently, there is a shortage of primary care physicians; with many more people obtaining health insurance, the system could be stretched to its limit and access can become compromised. This challenge presents an opportunity for Advanced Practice Registered Nurses, such as Nurse Practitioners (NP), Clinical Nurse Specialists (CNS), Doctors of Nursing Practice (DNP), and Certified Nurse Midwives (CNMW).

The year 2013 brought many changes to our current health care system, and more changes are expected within the next few years. Nurses need to be prepared to be flexible and take a prominent role in implementing health care reform. As our system evolves over the next decade, new opportunities will emerge for nurses. Our responsibility is to be prepared to take the lead and continue to perpetuate the trustworthiness that nursing has maintained in years past.

Nurses have already made immense contributions to the current health care system. Through innovation, nurses have increased access to care in underserved areas, improved chronic disease management through coordination of care, and decreased length of stay in acute care patients (Kunic & Jackson, 2013). The fact that nurses have been able to make these accomplishments shows our ability to adjust to new systems and be positive change-agents. Our future achievements depend on our ability to be adaptable and inventive as the United States enters a new era in health care delivery.

Opportunities for nurses to take on leadership roles in the coming years abound. Nurses are integral in identifying wasteful practices in their environment and play a role in decreasing health care costs (Strech & Wyatt, 2013). Nurses can also participate in and lead process improvement teams to decrease “never events” or other complications of care that can occur (Strech & Wyatt, 2013). In the past, nurses have only looked at their own practice areas to make enhancements, but the time has come for us to consider the larger picture of our health care system (Strech & Wyatt, 2013). Taking an active role in health care policy will move nurses from the role of bystanders in our system to the leadership role that is so necessary to advocate for our patients.

The demand for well-educated and professional nurses is expected to continue to rise as our health care system changes. Successful nurses will be lifelong learners with the initiative to take the lead. Patient safety, evidence-based practice, quality improvement, team management, health information technology, research, education, health policy, and resource management have been identified as areas of growth for nurses both at the bedside and in other roles (Kunic & Jackson, 2013). This growth will occur both within and outside of acute care as focus shifts from management of disease to preventive care. Nurses in the ambulatory setting will be in a prime position to prevent re-hospitalization and improve care coordination (Swan & Haas, 2011).

To gain the necessary edge for leadership positions in the future, nurses can begin by joining a professional organization (Chard, 2013). The Academy of Medical-Surgical Nurses offers many benefits to members, including continuing education and opportunities for networking with a variety of professionals. Certification in medical-surgical nursing is a great way to meet both personal and professional goals. Nurses can also gain leadership experience through their employing organization by joining a unit-based council, becoming a member of an interprofessional committee, and/or acting as a formal or informal mentor to new staff members (Chard, 2013). Being a preceptor for new nurses is an excellent way for medical-surgical nurses to contribute to the next generation of nurses and gain skill in nursing education.

Advancing one’s education can be fulfilling and also increase access of care for individuals that will be seeking primary care. A shortage of primary care providers is expected as the number of aging individuals and individuals with chronic illnesses increases (Brassard, 2013). While APRNs have been proven to be quality health care providers, many APRNs face restrictions in their practice due to regulations and policies (Kunic & Jackson, 2013). However, the Institute of Medicine Report in 2011 called for APRNs to be able to practice to the full extent of their education, and recent changes in some state legislation indicate that positive transformations in policy may be at hand (Brassard, 2013). As our health care delivery system continues to evolve, the role of nursing and impact that nurses will have on the system will most definitely expand and areas for playing a larger role as primary care providers will be tremendous.
References

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curricula as educators look for innovative ways to teach student nurses necessary skills and behaviors and promote involvement in the community.

References

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NSAIDs Found to Significantly Increase Bleeding Risk with Traditional and Newer Oral Anticoagulant Drugs

A study published in the April 14, 2014, issue of the Journal of the American Medical Association (JAMA) Internal Medicine indicates that the concomitant use of non-steroidal anti-inflammatory drugs (NSAIDs) or aspirin doubles the risk for significant bleeding events among patients taking anticoagulant medications; either a combination of enoxaparin (Lovenox®) and vitamin K-antagonists such as warfarin (Coumadin®) or rivaroxaban (Xarelto®), a recently introduced factor Xa direct inhibitor (Davidson et al., 2014). Researchers found that the risk doubled with the addition of either aspirin or any NSAID (most frequently ibuprofen) to the standard venous thromboembolic (VTE) prophylaxis regimen for either deep vein thrombosis (DVT) or pulmonary embolus (PE). For years, physicians knew that aspirin and NSAIDs increased bleeding risks with anticoagulant medications, although this is the first objective study to document the rate of increase based on data provided from the EINSTEIN-DVT Study (The EINSTEIN Investigators, 2010) and The EINSTEIN-PE Study (The EINSTEIN-PE Investigators, 2012), both sponsored by Bayer HealthCare (2014).

The main clinical take-away from these findings is that medication teaching for all patients on VTE prophylaxis medications is essential (see Table 1) and should include: (1) A detailed discussion of all side-effects and medication interactions related to anticoagulants that the patient is currently prescribed, and (2) A detailed listing of specific NSAIDs available over-the-counter that the patient should avoid (see Table 2). Nurses or other staff providing medication teaching should be familiar with all prescribing information and inserts provided by the pharmaceutical manufacturer when discussing any Factor Xa inhibitor with patients.

As a side note, the current findings could potentially lead to explanations for

### Table 1. Traditional and Newer Oral Anticoagulant Drugs

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Trade Name</th>
<th>FDA Indication Approval</th>
<th>Site of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apixaban</td>
<td>Eliquis®</td>
<td>Prevention of emboli in non-valvular atrial fibrillation; DVT and PE prophylaxis following knee and hip replacements.</td>
<td>Direct factor Xa inhibitor</td>
</tr>
<tr>
<td>Dabigatran</td>
<td>Pradaxa®</td>
<td>Prevention of emboli in non-valvular atrial fibrillation; DVT and PE prophylaxis following knee and hip replacements.</td>
<td>Direct factor Xa inhibitor</td>
</tr>
<tr>
<td>Edoxaban*</td>
<td>Savaysa®</td>
<td>*Not yet approved in U.S. (ongoing clinical trials in Japan; pending FDA application).</td>
<td>Synthetic factor Xa inhibitor</td>
</tr>
<tr>
<td>Rivaroxaban</td>
<td>Xarelto®</td>
<td>Prevention of emboli in non-valvular atrial fibrillation; DVT and PE prophylaxis following knee and hip replacements; treatment of symptomatic DVT or PE.</td>
<td>Direct factor Xa inhibitor</td>
</tr>
<tr>
<td>Warfarin</td>
<td>Coumadin®</td>
<td>Prophylaxis and treatment of DVT and PE; prophylaxis and treatment of thromboembolic complications associated with atrial fibrillation or cardiac valve replacement; reduction in the risk of death after myocardial infarction, and events such as stroke or embolization after myocardial infarction.</td>
<td>Prevents formation of Vitamin K-dependent clotting factors and thrombin</td>
</tr>
</tbody>
</table>

**Abbreviations:** DVT = deep vein thrombosis; PE = pulmonary embolus.

**Sources:** Information compiled from available data presented on medication websites; Eliquis® (http://www.eliquis.com); Pradaxa® (https://www.pradaxa.com); Xarelto® (https://www.xarelto-us.com); Coumadin® (http://www.coumadin.com/html/index.htm).

### Table 2. Common Nonsteroidal Anti-inflammatory Medications (NSAIDS)

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Trade Name</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ibuprofen</td>
<td>Advil®</td>
<td>Pfizer</td>
</tr>
<tr>
<td></td>
<td>Motrin®</td>
<td>McNeil</td>
</tr>
<tr>
<td>Naproxen</td>
<td>Aleve®</td>
<td>Bayer</td>
</tr>
<tr>
<td></td>
<td>Naprosyn®</td>
<td>Roche</td>
</tr>
<tr>
<td>COX-2 inhibitors:</td>
<td>Celebrex®</td>
<td>Pfizer</td>
</tr>
<tr>
<td></td>
<td>Celecoxib</td>
<td></td>
</tr>
</tbody>
</table>

**Sources:** Information adapted from medication websites; Advil® (http://www.advil.com); Aleve® (http://aleve.com); Celebrex® (http://www.celbrex.com); Motrin® (http://www.motrin.com); Naprosyn® (http://www.roche.com/products).
unexpected bleeding events that have been reported (U.S. Food and Drug Administration [FDA], 2011) with use of one new Factor Xa inhibitor, even though all data from the FDA-approved clinical trials show a decreased risk for bleeding, especially intracerebral bleeds, when compared to warfarin and enoxaparin used in standard VTE prophylaxis protocols (Connolly et al., 2009; The EINSTEIN Investigators, 2010; The EINSTEIN-PE Investigators, 2012).

Part II of the update on VTE prophylaxis will highlight new attempts at finding stable and safe antidotes for use with the new Factor Xa inhibitors.

References

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surgical nurses and AMSN members can do to improve health care for everyone.”

Scholarships, Grants, & Awards
Throughout the year, AMSN distributed over $33,500 in scholarships, grants, and awards as part of an ongoing effort to support members in research and practice. MedSurg Matters! will be featuring an article on the winners in the November/December issue, and full details are posted on the AMSN website (go to ‘About AMSN’ and click on Awards, Grants, and Scholarship Recipients).

Program Highlights
The convention began Thursday, September 11, with Opening Ceremonies and the first address, “Do It Well. Make It Fun. The Key to Success in Medical-Surgical Nursing,” by author and humorist Ron Culberson, MSW, CSP. The next day, Michael R. Bleich, PhD, RN, FAAN, FNAP, an expert in the future of nursing practice and policy, delivered the Keynote Address, “The Lion and the Lamb: A Nursing Approach to the Affordable Care Act (ACA).” He explored nurses’ role in advancing health care and how they can navigate the ACA.

As always, one of the most dynamic and well-attended offerings was the interactive Town Hall, held on Sunday, September 14. The session, “Integrating Nutritional Care to Optimize Patient Outcomes: Med-Surg Nurses at the Forefront,” was led by Beth Quatrara, DNP, RN, ACNS-BC, CMSN, and Andrea Melendez, MSN, RN, CHTP, HTCP. AMSN is a founding member of the Alliance to Advance Patient Nutrition, a national campaign advocating for education and change.

One of the most notable closing General Sessions on Sunday, September 14, was presented by Marlene Kramer, PhD, RN, the visionary nursing leader whose research helped create the Magnet Recognition Program®. Kramer, the author of the widely-cited Reality Shock: Why Nurses Leave Nursing, discussed “The Unique Professional Practice Role of the Clinical Nurse in Hospitals,” and described how Complex Adaptive Systems (CAS) theory applies to the practice of the clinical nurse. Kramer was a constant presence throughout the convention, holding focus groups with attendees as a component of helping AMSN more comprehensively define medical-surgical nursing practice.

AMSN offered nurses and other allied health care professionals two ways to attend: onsite or by joining in on a live video broadcast of selected sessions and major presentations. Video broadcast participants could also listen and participate as sessions unfolded via live chats.

For additional learning after the convention, AMSN has an Online Library that is constantly updated. Any health care professional can use this resource, and convention attendees get free access to the library for the broadcasted courses.

For complete convention details and a photo gallery, visit amsn.org.

2015 Convention
Mark your calendar! The AMSN 24th Annual Convention will be held September 24-27, 2015, at the Paris Hotel, Las Vegas, NV.