HEALTH CARE PAYMENT reforms, higher inpatient acuity, and increasingly complex technology are driving payer and regulator demands for reduced hospital-based medication errors and improved patient safety. Yet the complexity of the medication administration procedure – the intersection of human behavior and technology – has increased the risk of making errors. As baby-boomer nurses exit the workforce in increasingly larger numbers, it is imperative newer, younger nurses attain and sustain the utmost level of competency in medication safety. The Institute of Medicine (2003) identified simulation education as a key technological component, if alternative teaching methods are to be used to facilitate the acquisition and maintenance of nursing competencies. In this commentary, four factors that have converged to make the need for high-fidelity simulation education a cost-appropriate approach to the reduction of inpatient medication errors are reviewed:

- Most hospitals should be able to recover high-fidelity simulation (HFS) investment costs within 12 months.
- Four factors, including baccalaureate preparation, that have converged to make the need for HFS education a cost-appropriate approach to the reduction of inpatient medication errors are reviewed.
- Inadequate and insufficient knowledge are major causes of medication errors (Bobb al., 2004; Santelli, 2006), and between 49% and 53% of new nurses are making these medication errors (Saintsing, Gibson, & Pennington, 2011). Further, frontline leaders reported only 41% of new RNs were proficient in medication administration and only 28% had knowledge of pharmacologic implications (Advisory Board Company, 2008). Evidence suggests one reason for the higher incidence of errors among new RNs is a notable preparation-practice gap, the three-fold outcomes of which are unsatisfactory or limited clinical experiences, a faculty shortage caused by lack of qualified instructors, and limited numbers of students on a practice site at a given time. The need to close the preparation-practice gap is now a driving force in the transformation of nurse curricula, reinforced by the well-known Carnegie study (Benner, Sutphen, Leonard, & Day, 2010). Here, the authors concluded nursing education, if it is to teach the essence of “being” a nurse, must transfer learning to clinical practice skills through relevant learning experiences and a sense of salience.

This study endorsed simulation education as a strategy to provide these opportunities.
Historically, simulation was used for developing psychomotor skills, such as cardiopulmonary resuscitation. Nonetheless, high-fidelity simulation (HFS) education is a perfect platform for developing evidence-based replication of real-life patient scenarios (using person-sized programmed mannequins) that demonstrate realistic physiologic responses to a nurse’s actions. HFS appears to be an excellent way to bridge the preparation-practice gap (Kardong-Edgren et al., 2011). With HFS, nurses can develop clinical experiences integrating the cognitive, psychomotor, and affective domains of nursing practice (Jeffries & Norton, 2005). HFS teaching-learning methodology is believed to have lasting impact on the nurse’s knowledge, skills, and confidence.

The overriding question, however, is whether HFS will have a positive impact on medication errors and performance among new RNs. Although simulation studies lack methodological quality, there is strong evidence of improvement in outcomes (Cook et al., 2011). Scholarly review studies have found significant outcomes in the learners’ knowledge, skills, satisfaction, and self-confidence after simulation education (Cook et al., 2011; Lapkin, Levett-Jones, Bellchambers, & Fernandez, 2010). Furthermore, a review by Elliott and associates (2011) found blended educational programs (those that combine simulation and didactic instructions) were effective in improving the performance of health care practitioners. More importantly, simulation can be substituted for up to 50% nursing students’ clinical instruction (Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014). As exciting as this is, several meta-analyses of simulation education have identified a lack of rigor and quality, which limits the quality of outcomes data.

In spite of a less-than-desired robustness of outcomes research, HFS education may be the best approach to lowering the frequency, volume, and avoidable costs of inpatient medication errors. Since medication errors occur post-graduation and during employment, the onus for improvement is on the hospital (payer quality targets play a role, as well). The investment would be well made. HFS manikins are very costly; prices for a simulator, accessories, and software hover around $91,800 (Hallenbeck, 2012; Laerdal Corporation, 2009). The Institute of Management Accountants Consulting (2008) reported the cost of 1 additional day for nursing orientation ranges between 8.5 and 9 hours per patient day (9 is recommended, and in our analysis we used $50 per nursing care hour). On a national level, among non-federal hospitals, and building on a model proposed by Durham (2014), the return on investment (ROI) will average $461,200 in savings per hospital within 7.6 months (range: 1.26 months). Hospitals with low patient care costs and low numbers of errors could recoup manikin, orientation, and payer costs almost immediately. Even hospitals in states such as Oregon, where costs of care are very high ($2,900 per patient day compared to the U.S. rate of $1,990), should recoup their investment in less than 3 months (House, 2015). High-cost critical access hospitals, particularly
those in Illinois, Michigan, Ohio, and Texas, also will have longer ROIs (average 15 months). Lastly, not all hospitals will want to spend $98,000 on an HFS manikin (plus annual maintenance fees). Here is where integrated simulation education will be most effective. Shared costs with colleges of nursing, particularly among hospitals and schools in more rural areas, could provide an even better ROI. Although data are unavailable, simulation education via an HFS manikin may compare favorably with other technology solutions (e.g., electronic prescribing, bar code systems, computerized physician order entry) that can cost millions and have longer return rates (NPP, 2010).

**Conclusion**

In light of recent payment reforms, greater demands will be placed on new hospital-based RNs to function at higher skill levels, many of which drive health care organizations to seek new opportunities to improve quality and reduce costs. All key stakeholders have acknowledged the huge costs of medication errors and have identified a need for robust systems and procedures that could better avert avoidable human errors. Thus, restructuring nurse education and on-site clinical orientation that combines didactic learning with simulation-based case scenarios will provide new RNs enhanced knowledge, skills, and self-confidence, which is a cost-appropriate approach to the reduction of medication errors in the hospital setting.

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