

Comparing Medication Error Incidents Among Foreign-Educated Nurses and U.S.-Educated Nurses

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Despite a growing number of foreign-educated nurses (FENs) joining the health care workforce, scientifically based evidence comparing FENs to U.S.-educated nurses on quality of care, including medication errors, is lacking. Hypotheses tested were related to differences in frequencies and consequences of medication error incidents between FENs and U.S.-educated nurses. The case and control groups were randomly selected from 2006 and 2010 risk management files and medication files at five Southwestern hospitals. The sample included 2,178 observations. In 2006, there were comparable percentages of FENs in the case group (34.7%) and in the control group (31.2%). In 2010, the percentages were again comparable (30.7% of FENs in the case group and 28.6% in the control group). In 2006, FENs were less likely to make medication errors not reaching patients (4.5% for FENs and 13.3% for U.S.-educated nurses), but tended to make errors reaching patients without harm (85.8% for FENs and 75.1% for U.S.-educated nurses); however, the difference disappeared in 2010. The authors' comparison demonstrates that FENs provide quality of care comparable to that of U.S.-educated nurses with regard to medication errors, which may be attributed to the rigorous registered nurse licensure exam; FENs' relatively higher educational background; the hospital's recruitment, mentoring, and training programs; and the implementation of health information systems.

Recruiting foreign-educated nurses (FENs) has gained popularity in health care settings across the United States for many reasons, including the nursing shortage (Aiken, Buchan, Sochalski, Nichols, & Powell, 2004; Polsky, Ross, Brush, & Sochalski, 2007). Since the 1980s, the U.S. government has used immigration policy to address this shortage, issuing temporary work visas in the 1980s and 1990s and permanent work visas in the 2000s (Masselink & Jones, 2014). Consequently, FEN numbers in the United States have increased from 50,000 FENs in the mid-1970s to 165,000 in 2008 (Masselink & Jones, 2014). Between 2001 and 2008, the number of full-time registered nurses (RNs) increased by 476,000, with 155,000 or one-third being foreign born and the majority working in inpatient settings (Buerhaus, Auerbach, & Staiger, 2009). Typically, these FENs come from the Philippines, Canada, the United Kingdom, and India, respectively (Masselink & Jones, 2014).

With the increase of FENs employed in health care organizations, the impact on quality of care and patient safety has become a health policy and regulation interest. Aspects of concern include communication, cultural adjustment, integration into the American health care system, and most importantly, competency in care delivery. Prior studies consistently report that FENs encounter distinct and multifaceted challenges in their transition and adaptation into a new work environment in the United States (Davis & Nichols, 2002; Xu, Guitierrez, & Kim, 2008;

Yahes & Dunn, 1996). The transition to practice can pose many challenges, including the expectations of practice and language barriers (Tregunno, Peters, Campbell, & Gordon, 2009).

In their countries of origin, FENs may not be expected to make clinical decisions, exercise professional autonomy, or question physicians' orders. Therefore, they may follow medication orders without question. Language barriers include verbal and nonverbal communication, and FENs may not understand other providers, patients, and colleagues in their daily work. Existing studies observed that FENs have certain deficiencies in linguistic (Shen et al., 2012; Xu, Shen, Staples, & Bolstad, 2013; Xu, Bolstad, et al., 2010; Shen, Xu, Bolstad, Covelli, & Torpey, 2010) and nonverbal interpersonal communications (Xu, Staples, & Shen, 2012) when interacting with patients. These challenges pose potential threats to patient safety and quality of care. Nevertheless, only anecdotal cases based on perceptions about inferior quality of care provided by FENs may exist, and there is no scientific evidence supporting or rejecting the perception.

Medication errors, an important quality of care indicator, are defined as "any preventable event that may cause or lead to inappropriate medication use or harm to a patient" (U.S. Food and Drug Administration, 2009). Similarly, an *adverse drug event* (ADE) is defined as harm experienced by a patient as a result of exposure to a medication. The Agency for Healthcare Research and Quality (2012) estimates that ADEs affect up to 5% of hos-

pitalized patients. The Institute of Medicine (IOM, 2006) puts the number of ADEs in the United States at 1.5 million a year. An estimated 2,876 patient deaths resulted from medication errors in 1983; in 1993, the number rose to 7,391 deaths (Phillips, Christenfeld, & Glynn, 1998). Preventable ADEs are a serious concern in the United States not only because of the human cost but also because of the financial cost. According to the IOM (2000), preventable ADEs in hospitals result in an estimated cost of \$2 billion annually. The IOM places the cost of hospital medication errors at \$3.5 billion. Preventable ADEs among Medicare enrollees alone cost \$887 million annually (IOM, 2006).

Despite the increasing number of FENs working in the American health care organizations and the staggering amount of attention paid to medication errors nationwide, little research focuses on the relationship between FENs and medication errors. Studies comparing the care quality of FENs with that of U.S.-educated nurses are almost nonexistent, although a few studies focus on the care of foreign-educated physicians and that of U.S.-educated physicians. Norcini and colleagues (2010) found that internationally educated non-U.S. citizen physicians had lower patient mortality rates when treating patients with heart failure or myocardial infarction in hospitals than domestically educated U.S.-citizen physicians (Norcini et al., 2010). Given the continuing growth of FENs in the U.S. nurse workforce and increasing national attention on patient safety and quality of care, the purpose of this study was to explore potential differences and related factors regarding medication errors, an important aspect of quality of care, between FENs and U.S.-educated nurses.

Study Design

This was a retrospective, quasi-case control design. In this design, a *case* was defined as an incident in which an RN made an error during medication administration, and a *control* was defined as an incident in which an RN administered a medication without error. RNs in the case group were randomly selected from the medication error case list. If the number of cases was not sufficient to conduct the random sampling at a hospital in a specific year, all cases in that year were selected. RNs in the control group were randomly selected from the medication administration data file in the pharmacy department. If an RN selected from the pharmacy department's list was already in the case group, he or she was excluded from the control group. One hospital was unable to provide the pharmacy list for the control group selection, and the human resource database was used to select the control group. The years of 2006 and 2010 were selected to investigate potential changes in RN-related medication errors. The study was approved by the Institutional Review Board of the University of Nevada, Las Vegas, and by the Western Institutional Review Board.

Data and Sample

Data were collected at five hospitals in the Southwest region of the United States. The ratio of sample size between the case group and the control group was 1:1. The minimum sample size was estimated as 816 per year (Fleiss, Levin, & Paik, 2003) and 1,632 for both years (2006 and 2010). The authors oversampled the 2010 case group for the purpose of investigating more severe but rare medication errors. As a result, the final sample after data clearing for data analysis consisted of 2,336 observations (1,276 medication error incidents and 1,060 control incidents). Medication error information was obtained from the risk management department, and information about RNs' demographics and educational background was obtained from the human resource department. Because the RN identification might be missed in some medication error cases, the related patient medical records were examined to identify the RNs who were involved in medication errors. The data collection was conducted from November 2011 to July 2014. Each hospital hired its own data collectors for data entry. To protect privacy, RN identifiers, such as name, Social Security number, and employee identification number, were removed at the data collection sites by the hospitals before data were given to the research team.

Measures and Analyses

The independent variable was whether an RN was an FEN (with a value of 1) or a U.S.-educated nurse (with a value of 0). The original definition of an FEN was a nurse who was born outside the United States and received his or her basic nursing education outside the United States. However, after the data collection, the authors found that human resource records for about 40% of the RNs did not indicate the country of birth. Therefore, the country where these RNs attended high school was used as a proxy for the country of birth, and the definition of an FEN was changed to a nurse who attended high school outside the United States and received his or her basic nursing education outside the United States. As a result, three RNs who attended high school in the United States and received basic nursing education in another country, 154 RNs who attended high school in another country but received basic nursing education in the United States, and one RN whose nursing education information was missing were excluded from the data analysis. The final number of observations for data analysis was 2,178, representing 1,190 in the case group and 989 in the control group. Because the first language of RNs from Canada is English, the authors included and excluded them from the sample for data analysis and did not find any differences in the results.

The authors compared percentages of FENs in the case and control groups in both 2006 and 2010, respectively. The authors also analyzed educational background, length of working experience, and most common drug classes involved in medication errors. Chi-square was used to compare FENs and U.S.-educated

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