1-1-2019

How The Five Rights Are Wrong: Development Of A Nursing Medication Safety Science Curriculum

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Submitted to the Faculty
Yale University School of Nursing

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Nursing Practice

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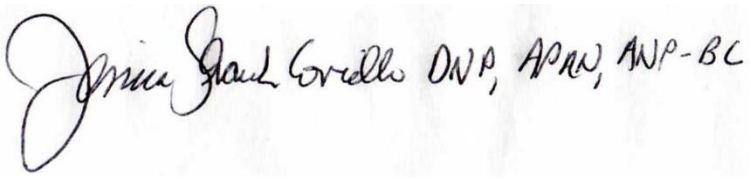
March 27, 2019

This capstone is accepted in partial fulfillment of the requirements for the degree Doctor of Nursing Practice.



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Abstract

Medication errors, now thought to be four times greater than previous estimates, pose a serious threat to nurses, patients, and health care institutions. Current nursing education lacks any coherent medication safety framework other than the classic "Five Rights" construct. This project piloted an educational intervention with senior nursing students based on systems-thinking safety principles. Students evaluated the learning experience positively and improved pre- to post-testing scores by 74%. This study demonstrates students' ready acceptance and comprehension of systems thinking medication safety theory, an alternative to the "Five Rights" construct.

In 2011, Kimberly Hiatt, a veteran registered nurse of 27 years, committed suicide after making a medication error which proved fatal for an infant under her care.[1] This tragic incident highlights consequences of nursing's current approach to medication safety. Erring nurses, at the sharp end of the medication treatment process, are second victims of their own mistakes.[2] They suffer from depression and substance abuse and are at risk to commit additional errors. Some may leave their jobs and the profession.[3,4] Medication error is a real threat to all stakeholders; and has not been adequately addressed by nursing education. This project seeks to improve the ongoing problem of nursing medication error through the creation of an evidence-based educational program taught to undergraduate nursing students enrolled in their final year at a community college located in the northeastern United States (U.S.).

SCOPE OF THE PROBLEM In 2006, it was estimated that 100,000 lives were lost to medical error annually U.S.[5] Current estimated error rates are far greater,[6] with annual mortality rates exceeding 400,000.[7] Medication errors rank in the top ten fatal sentinel events[8] and are the third leading cause of death in the country.[9] When surveyed, 55% of nurses admitted to making medication errors,[10] and it is estimated that fewer than 5% of errors are reported.[12] Directly observed rates of error average 19.6%,[13] and estimated average medication error rates number one per patient per hospital day.[14] Nurses, who spend 40% of their time administering medications, are directly affected by this issue.[2]

The World Health Organization (WHO) seeks to reduce medication error by 50% by the year 2022.[15] In 2015, however, the IOM found continued, persistent error rates, prompting a call for establishment of a new and effective safety culture.[16]

Current undergraduate nursing curricula stress pharmacology theory and mathematical

competence. Medication error risk is addressed via the "Five Rights" construct (right patient, drug, time, dose, and route), which is assumed unquestioningly to be the guarantor of error-free medication administration.[17] However, the "Five Rights" has been called a "destination without a map".[18] It places nurses at the end of an overly-simple, linear sequence which misses a wide array of complex error risk factors,[19,20] and its perfectionistic imperative is sometimes used to scapegoat nurses.[17] Wary of "naming, blaming, and shaming," nurses conceal near-misses and mistakes. Potential learning opportunities are lost, and a culture of denial is perpetuated. One of the most important consequences of blaming nurses as the sole cause of error is the absolution of flawed systems, which evade critical review of their contributions to error.

CALLS FOR CHANGE Increasing complexity, an underappreciated characteristic of the contemporary health care system, is caused by multiple factors such as varying patient populations, acute and chronic comorbidities, multiple teams and care settings, and ever-changing technologies. These and other factors are further compounded by the pace of change in the health care setting. Errors are the predictable result of failure to acknowledge and manage this increasing complexity. Effective leadership in this dynamic web of factors demands systems-based thinking for RNs, who comprise the largest faction of health care employees.[21] Competent systems thinkers see beyond their own actions to assess their interplay within the larger system. This skill enables them to better anticipate, analyze, and manage error risks.[22] The IOM[23] and the Quality and Safety Education for Nurses (QSEN) Institute recommend that nurses be educated in systems theory.[24] Systems thinking anticipates error and offers new frameworks for risk analysis and is employed by high reliability organizations (HROs) such as those in the aviation industry. The term "high reliability" speaks to their reliable safety

outcomes despite high systems complexity.[25] HRO thinking, which seeks a multitude of hidden systems-related risk factors, is a viable alternative to nursing's current reductionist approach to error prevention. The competent systems-thinking nurse accepts errors as inevitable; is always vigilant for risks; is supported when reporting near- misses and errors and can freely and safely share errors for learning and quality improvement purposes. Knowledge of HRO principles will empower nurses to improve safety outcomes. The WHO Multi-Professional Patient Safety Curriculum Guide, based on HRO principles, offers a ready resource for nursing education and development.[26]

Despite calls for HRO safety education and ready curricula, HRO concepts are not readily found in nursing education and practice.[27,28] Nursing faculty offer general, implicit safety instruction, but are not well-versed in HRO safety science,[29-31] and have sought to outsource instruction to visiting safety experts.[33] While isolated HRO concepts may be taught, instruction is done ad hoc and without rigor.[34]

REVIEW OF THE LITERATURE The literature review sought to answer the following questions: are RNs and students exposed to HRO-related medication safety concepts/curricula, and if so, does doing so significantly improve their HRO safety knowledge? What is the quality of curricular design and delivery?

A thorough literature search related to medication safety science education was conducted. Scopus, CINAHL, ERIC, and Ovid Medline were searched with key words medication, patient, safety, error, nursing, teaching, instruction, learning; teamwork, communication, systems theory, human factors, culture, high risk medications, safety science, Quality and Safety Education for Nurses (QSEN), WHO Safety Curriculum, and risk attitudes. Search years were limited to 2007-

2017. Reference lists and ancestry searches from relevant articles were searched manually, and gray literature was included. Exclusion criteria included materials written in languages other than English and those which were simply editorial in nature. Over 1000 articles were reviewed to yield 25 relevant studies. Sources were analyzed for setting, content taught, and instructional quality.

SETTINGS AND SAFETY CONTENT Instructional settings included undergraduate nursing [20, 17-31, 33, 35-41] and medical programs[33,39, 42-44] and nursing professional development.[45-60] Studies taught one to three HRO concepts such as communication,[37,39,43-46] teamwork,[37,43-46] safety culture,[20, 39,46-50]; nature of error [20,36,38-42,44,47,49-56,58,59]; human factors engineering [42,47,49, 56]; systems thinking[543,47]; and WHO Multiprofessional Safety Curriculum modules.[38,42] Traditional safety approaches included Five Rights Theory[58]; reinforcement of institutional policies[40,55, 58,59]; high alert medications,[53] equipment training,[51,56,58] and pharmacology.[54]

Instructional quality was evaluated for assessment, learning needs prioritization, teaching interventions, and evaluation[60]. Assessment of learning was found in six studies only.[42,44,51,53,58,59] Prioritization of learning needs was implicit; and construction of "learning objectives" which were actually teaching interventions, was seen in one study only.[43] Instruction was done by qualified educators in undergraduate settings; and by nurses, pharmacists,[50] physicians, and "guest speakers"[61] in practice areas. Educational theory underpinned only four studies.[37,42,44,62] Instructional methods of lecture, independent study, and online applications were found. All three QSEN-required learning domains (knowledge, skills, and attitudes/KSA), were addressed in four studies only.[20,38,47,49]

For evaluative purposes, instructors assessed decreased observed medication error rates[50,59 and

higher post-test scores without desired behavior change.[51,58] Some studies measured learner satisfaction only.[39,40] In general, instruction, learning outcomes, and evaluation were absent and lacked alignment.[50,55,57,62]

GAPS IN THE LITERATURE All instructional settings lacked universal, comprehensive, HRO-oriented medication safety education; and curricula were inadequately planned, grounded in theory, and sometimes delivered by educators of questionable qualifications.

The most effective curriculum for nursing medication safety competence will be professionally planned, will employ HRO constructs and incorporate QSEN Safety KSA objectives; and will engage learners through constructivist instructional techniques.[63]

AIMS The aims of this study were to offer an HRO medication safety curriculum to senior associate degree nursing students and evaluate their KSA learning and feedback on the learning experience.

CURRICULUM CONSTRUCTION An HRO medication safety curriculum was constructed and sent to a panel of five medication safety science experts for expert feedback. A content validity index was computed at 1.0, with an evaluation status of "excellent".[64]

DESIGN, SETTINGS, SAMPLING, AND RECRUITMENT This study utilized a nonexperimental, pre- and post-test design. The study was conducted at a community college located in the northeastern U.S. using a convenience sample of senior associate degree students

INTERVENTION A three-hour interactive lecture/discussion session, consisting of six HRO modules (medication safety, human factors, systems thinking, teamwork, engaging patients as team members, and anticipation/learning from errors), was delivered by the author to three groups of students (eight to 24 students in each, for a total of 53). QSEN KSA student learning

objectives were shared with students for each module.

At the outset of the session, students viewed a film which illustrated an actual error scenario. This measure served to arouse their interest and provide case study material for analysis. Similarly, each module was also illustrated at the outset with a medication error anecdote. This tactic enabled reflection and ready, practical application of HRO concepts with instructor guidance.

EVALUATION OF LEARNING A twenty-item multiple choice quiz was administered prior to and immediately following the learning session. A 25-item Likert scale student evaluation survey concluded the session. Data collection was carried out between November and December of 2018.

ETHICAL CONSIDERATIONS Prior to participation in this learning module, **s**tudents were informed of the nature of the project and potential benefits of improved personal medication safety knowledge. They were assured that their participation was voluntary and unrelated to their academic coursework. Consent was implied by completion of pre- and post-quizzes, which were individually and anonymously coded. All discussion was conducted without solicitation or use of subjects' names.

RESULTS All 53 quizzes were returned for both pre- and post-assessment sessions, for a total of 106 responses (100%). Paired individual raw test scores saw an average increase of 74%, as shown in Table 1. Because data were skewed, a Wilcoxon Signed-Ranks test was run. The output indicated that post-test scores were statistically significantly higher than pre-test scores, Z

= -6.3342, $p < 0.05$. Test and item analyses were conducted via Parscore tools (item difficulty and discrimination; test internal reliability testing via Cronbach's alpha, and KR20 scores).

Students evaluated the learning experience and expressed attitudes toward content via a 25 item Likert scale instrument. Statements were positively-worded with response options ranging from "strongly disagree" (score value of one) to "strongly agree" (score value of five).[65] All 53 surveys were returned with a mean response rate of 98.4% per question. Item score responses ranged from 4.8/5 ("I would attend further in-service education on these topics ") to 5.0/5 ("Instruction challenged me to think"; "I am ready to apply some ideas I learned," and "Effective teamwork is crucial to patient safety") with a mean score of 4.9/5.

45% (24) of the 53 respondents volunteered free text comments. Learners expressed appreciation for information, relief that mistakes might be systems-based; resolve to apply learned concepts, and advocacy for inclusion of content in undergraduate curricula ("This was extremely informative and beneficial, especially as a nursing student. I strongly believe this material should be taught in nursing Schools and a shift in the nursing culture itself should occur to align with this school of thought"). One subject doubted that the greater nursing community would support alternatives to the "Five Rights": "It's against the 'Five Rights'. I doubt nursing schools will say it's ok to make a med error. I agree with the content, however. Very informative! Thanks!"

DISCUSSION This study aimed to evaluate subjects' KSA learning and qualitative feedback of HRO medication safety instruction. It revealed initial gaps in systems thinking knowledge, improvement in KSA following targeted instruction, and receptivity toward the lesson's

meaningfulness, value, and importance to nursing.

Through this work we found that systems-thinking test scores improved significantly. Voluntary student evaluations of the lesson were appreciative and supportive of teaching content to other nursing personnel.

In this study, subjects engaged readily when presented with HRO concepts. Statistical analysis suggests effective comprehension of HRO concepts. This study differentiates itself from others in three respects: first, it revealed a deficit in baseline knowledge of HRO safety concepts. Next, it employed a more comprehensive curriculum dealing with HRO safety concepts. Lastly, this study reflected well-planned execution by a qualified nurse educator, employing the following strategies: measurable KSA learning objectives were constructed and aligned with interventions and evaluation; and learners were engaged through multimedia case studies and discussion.

STUDY LIMITATIONS Study findings were limited by sample size (n=53), non-experimental design, and testing which was limited to the immediate post-intervention period. Item analysis reflects internal consistency more than validity; validity will be enhanced by repeated use and refinement of quiz items.[66,67] Some items rated high in difficulty, and 25% of them had fair discrimination quality only. Further investigation should include larger sample sizes, delayed assessment of learning, and expansion of study population to practicing RNs, nursing faculty, and nursing administration. The goal is to improve safety by adopting a new standard of nursing competence though adoption of systems thinking.

CONCLUSION Medical error rates have been found to be four times greater than previously thought. At the same time, current nursing curricula lack medication safety theory beyond the

"Five Rights" construct. While nursing students are not universally exposed to systems-thinking theory, they are receptive to these concepts and comprehend them readily, as evidenced by students' positive feedback and improved test scores. As the largest faction of the health care workforce, nurses who are competent in systems thinking will be well-positioned to effect meaningful improvement in safety outcomes for all stakeholders. Both undergraduate and professional nurses should be educated in these concepts.

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Table 1. Pre- and Post-Intervention Test Scores, Groups A, B, and C

Group	Pre-Test Raw Score/20	Pre-Test %	Post-Test Raw Score/20	Post Test %	% Change
A n = 24	9.50	47.5%	15.58	78%	+64%
B n = 8	8.38	42%	15.88	79%	+89.5%
C n = 21	8.62	43%	14.67	73.4%	+70.19
Total	8.83	44.2%	15.38	76.8%	+74.18