OUTCOME EVALUATION OF A NEW MODEL OF CRITICAL CARE ORIENTATION

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Background  The shortage of critical care nurses and the service expansion of 2 intensive care units provided a unique opportunity to create a new model of critical care orientation. The goal was to design a program that assessed critical thinking, validated competence, and provided learning pathways that accommodated diverse experience.

Objectives  To determine the effect of a new model of critical care orientation on satisfaction, retention, turnover, vacancy, preparedness to manage patient care assignment, length of orientation, and cost of orientation.

Methods  A prospective, quasi-experimental design with both quantitative and qualitative methods.

Results  The new model improved satisfaction scores, retention rates, and recruitment of critical care nurses. Length of orientation was unchanged. Cost was increased, primarily because a full-time education consultant was added.

Conclusions  A new model for nurse orientation that was focused on critical thinking and competence validation improved retention and satisfaction and serves as a template for orientation of nurses throughout the medical center.
We were challenged to revise our program to address the needs of nurses with various levels of experience starting to work in the ICU. To meet this challenge, we developed a model for orienting nurses that provided distinct pathways for nurses depending on their experience: experienced critical care nurses, experienced non–critical care nurses, and graduate nurses.

To begin, a comprehensive assessment was conducted from the last quarter of 2003 through the first quarter of 2004. Managers and educators identified several inconsistencies in program implementation in each of the 5 ICUs (surgical, medical, neurosciences, cardiothoracic, and coronary care). These inconsistencies were in test administration, assessment of learning needs, and methods of evaluating competence.

A new model of orientation was developed; our goal was to create a program that provided the following:

- Relevant learning opportunities to meet individual needs
- Various learning pathways to accommodate diverse experience
- A standardized approach in all the ICUs
- A consistent method for evaluating competence
- Assessment of individual critical thinking skills
- Benner’s “novice to expert” model, which describes 5 levels of proficiency, provided a foundation on which we built the program. Also using adult learning theory as a framework, we developed a model that
  - builds on the learner’s experiences
  - incorporates a variety of methods
  - uses a problem-solving approach to learning
  - offers self-directed learning as an option
  - provides an opportunity for evaluation of the learner’s critical thinking ability

This new model changed our focus from use of a teacher-centered didactic process to a process that is learner-centered. The combined use of the novice to expert model and adult learning theory guided us in devising a process that would meet the diverse needs of all new nurses. We believed that the new model would affect several outcome measures: satisfaction, preparedness to manage patient care assignment, retention, turnover, vacancy, recruitment, cost of orientation, and length of orientation.

Methods

Study Design

This study used a prospective, quasi-experimental design with both qualitative and quantitative methods. The new program was implemented in July 2005 with all of the newly hired ICU nurses. Data were collected before, during, and after implementation on several outcome measures: satisfaction, preparedness to manage patient care assignment, retention, turnover, vacancy, recruitment, cost of orientation, and length of orientation.

This study was approved by the institutional review board of Northwestern University associated.

In May 2005, the vacancy rate of 14.3% at Northwestern Memorial Hospital, an 800-bed university-affiliated medical center, was lower than the national average of 20%. However, anticipation of doubling the capacity of 2 intensive care units (ICUs) within the next 18 months challenged us to evaluate our orientation program for critical care nurses. Historically at this hospital, new graduate nurses had not been hired to work in the ICUs. Managers believed that a solid foundation of medical-surgical experience was necessary for successful transition into the ICU. Attempting to staff adequately for increased capacity, however, caused managers to consider recruiting new graduate nurses.
Three pathways were used for orientation: 1 for experienced critical care nurses, 1 for experienced non–critical care nurses, and 1 for new graduate nurses.

Teaching methods were used to provide critical care content, including computer-assisted learning, case studies, simulations, and structured clinical time with a preceptor. Educators used a variety of teaching methods designed to meet each learner’s needs. Competence was validated through formative and summative evaluation methods.

Shifting our focus to a learner-centered model provided a method of identifying individual needs, but changes were necessary. Three distinct pathways were developed, and a variety of interactive methods replaced traditional classroom learning, requiring orientees to be more self-directed. Supplemental preceptor resources were created: online curricula, teaching guides, and case study manuals.

Graduate nurses and experienced non–critical care nurses began with independent online programs: Essentials of Critical Care Orientation (ECCO), Mosby’s ECGs Online, and the Pulmonary Artery Catheter Education Project (PACEP). ECCO is a multisystem audiovisual program developed by the American Association of Critical-Care Nurses. Mosby’s ECGs Online is a Web-based tutorial on identification of dysrhythmias. PACEP is a comprehensive multidisciplinary program that teaches principles of hemodynamics.

Each nurse was assigned a pathway, depending on previous experience. Experienced critical care nurses were screened by using the Basic Knowledge Assessment Tool (BKAT, Version 7.0) to identify their learning needs. Experienced non–critical care nurses and graduate nurses began with the online modules, whereas graduate nurses participated in additional real-time learning opportunities.

For all nurses, online sessions were balanced with clinical time, independent learning, and other activities, including multidisciplinary rounds. Preceptors ensured that patient assignments aligned with concepts reviewed. Case studies, created for individual review or group discussion, fostered critical thinking. Clinical scenarios were presented with a high-fidelity human simulator, a computerized simulated learning environment (Medical Education Technologies, Inc, Sarasota, Florida, www.meti.com).

Pathways Based on Experience

After successful completion of the BKAT-7, experienced critical care nurses advanced to unit-specific orientation. Experienced non–critical care nurses were required to complete ECCO and PACEP with a minimum score of 85%. Demonstration of critical thinking skills was the basis for evaluating competence.

For graduate nurses, a 7-week targeted program called the Critical Care Institute (CCI) was developed.
The CCI included a program of basic care practices, called Habits for Excellence. Graduate nurses completed the online basic arrhythmia course, ECCO, and PACEP lessons followed by case study discussions, demonstrations in the simulation laboratory, and teaching rounds in all critical care units. When all didactics and group sessions were completed, graduate nurses worked exclusively on their units to complete clinical orientation.

**Instruments**

Before the new model was developed, questionnaires evaluating the program were sent to a panel of experts (1 clinical nurse specialist and 2 education consultants) to maximize content validity; the questionnaires were then distributed to educators, managers, preceptors, and orientees. These questionnaires asked about the number of preceptors on the unit, time spent in preparation, experience and motivation of new employees, perceived barriers to effective performance of preceptors, perceived satisfaction, and suggestions for improvement.

Orientees were asked to rate their level of experience, time spent in classroom and clinical education, length of orientation, if they met regularly with their preceptor or educator, if they felt comfortable caring for patients independently, preferred learning methods, and goals for orientation.

Three months into the program and at several intervals during the first year, direct feedback was obtained from all parties. New questionnaires were distributed to determine what changes were necessary. All groups were asked to evaluate the following:

- Usefulness of the CCI
- Orientees’ preparedness to function on the unit
- Perceived confidence of orientees
- Perceived anxiety among orientees
- Quality of the information provided
- Usefulness of newly created resources

After implementation, managers were asked to evaluate the CCI with respect to preceptors’ anxiety and burnout and time spent in orientation. Orientees were asked to evaluate overall satisfaction.

The human resources department provided data on length of orientation, cost, and retention rates.

**Results**

The new program began in July 2005. During the first 22 months, 147 nurses participated. At the end of 34 months, a total of 197 nurses had participated. These nurses included 43 experienced critical care nurses, 44 experienced non–critical care nurses, and 110 graduate nurses. Of those, 173 provided informed consent.

**Demographics**

Eighty-seven percent of the new hires (n = 171) were female and 13% (n = 26) were male. Whites comprised the largest ethnic group at 79% (n = 156), followed by Asians at 10% (n = 19), African Americans at 7% (n = 14), and Latinos at 4% (n = 8). The mean age at hire was 28 years.

As for years of experience when hired, 109 graduate nurses had less than 1 year, 37 nurses had 1 or 2 years, 15 had 3 to 5 years, 17 had 5 to 10 years, 17 had 10 to 20 years, and 3 had more than 20 years of experience.

**Results of Teaching Strategies**

The usefulness of primary teaching methods is illustrated in Figure 2. On a 5-point scale, orientees rated the simulation laboratory and the pocket guides highest, with scores of 4.85 each. The lowest teaching strategy score was for policy review, at 4.15. Preceptors rated usefulness of information provided in the CCI at 3.33; improvement of overall preparation for ICU, 3.20; and preparedness for working with the preceptor, 3.05.

**Satisfaction and Preparedness to Manage Patient Care Assignment**

Satisfaction with the CCI and the Habits for Excellence program was rated 93% by managers, 80% by educators, and 61% by preceptors. Managers rated their satisfaction with the on-unit portion at 77%, staff educators rated it 88%, and preceptors rated it 73% (Figure 3).

When asked about nurses’ preparedness to manage their patient care assignment, managers rated experienced critical care nurses at 80%, experienced non–critical care nurses at 53%, and graduate nurses...
Educators rated experienced critical care nurses at 90%, experienced non–critical care nurses at 73%, and graduate nurses at 65%. Preceptors rated experienced critical care nurses at 86%, experienced non–critical care nurses at 75%, and graduate nurses at 54% (Figure 4).

One change after implementation of the new orientation program was an increase in the willingness of staff to volunteer as preceptors. Follow-up questionnaires were distributed equally to all groups; however, only graduate nurses returned them. The mean satisfaction score for the entire orientation program was 83%.

Retention

Before the new program was implemented in May 2005, the overall retention rate for nurses in the ICU was 91.2%. A midterm evaluation in June 2006 showed a slight increase to 91.6%, and by the end of the first year in August 2006, the overall ICU retention rate had increased to 93.7%.

Because the orientation program was ongoing, we evaluated retention rates of new hires in terms of cohorts. The 18-month retention rate of cohort 1, hired from July to December 2005, was 93.8%; cohort 2, hired from January to June 2006, was 93.8%; and cohort 3, hired from July to December 2006, was 100%. Figure 5 compares retention rates of the cohorts with the overall ICU retention rates.

Figure 6 shows that 94% of graduate nurses were still working on the unit 2 years after implementation of the new orientation program. One hundred percent of the experienced critical care nurses remained, and 79% of the experienced non–critical care nurses remained on the unit.

Figure 7 shows retention rates for each cohort 3 years after implementation of the new orientation program. Those nurses hired in cohort 1 (from July to December 2005), 3 years after being hired, showed an overall retention rate of 58.8%; cohort 2, 59.4%; cohort 3, 66.7%; cohort 4, 90%; and cohort 5, 83.3%. These retention rates can be compared with an overall hospital retention rate of 88.9%.

Figure 8 shows 3-year retention rates by level of experience. Experienced non–critical care nurses had a 48% retention rate, for experienced critical care nurses it was 65%, and for graduate nurses it was 80%.

Turnover

Before implementation of the new program, annual turnover rate for ICU nurses was 8.77%. One year after implementation, the rate had decreased to 6.29%. This ICU turnover rate was lower than overall hospital turnover, which decreased from 10.31% to 9.50%.
Vacancy and Recruitment

An unexpected benefit was increased recruitment. With service expansions, we successfully filled positions for 2 ICUs. In addition, the monthly hire rate increased from 11 to 18 ICU nurses monthly. The number of vacant full-time equivalent positions decreased from 31.6 to 10.9, and the ICU vacancy rate decreased from 14.3% to 4.8%. This rate is less than the national mean vacancy rate of 20%1 and less than the overall nurse vacancy rate for the hospital.

Cost

Excluding development time and other start-up costs, the new program cost $24,810 more than the old program. This cost included licensing fees for the Web-based programs and a dedicated full-time education consultant.

Length

Overall length of orientation for all groups remained unchanged.

Discussion

Several articles have been published on approaches to critical care orientation. Peterson and VanBuren13 reported on the experience of implementing ECCO and found it more consistent and cost-effective than their previous orientation program; however, they did not use additional teaching methods. Nolan and Murphy14 used the “traditional approach” of lectures and clinical time with a preceptor, with an added dimension of a “mentor.”

In her discussion of the Dreyfus model of skill acquisition and development, Benner1 highlights several examples, demonstrating that perceptual knowledge leads to proficient—and later, expert—performance. Our situational and experience-based program adds texture and understanding to the ECCO modules, allowing orientees to use concrete experiences rather than abstract knowledge in developing clinical judgment. Preceptors model critical thinking and decision making when evaluating the patient as a whole rather than as a sum of systems. By pairing each new nurse with an expert nurse, we sought to assist the new nurses in their passage to competence and broaden their knowledge base beyond the text of the ECCO modules.
$2821 for direct recruitment costs\textsuperscript{17} to $50,000 if one includes hidden costs such as lost productivity, training, bed closures, lost revenues, and agency fees.\textsuperscript{18}

Thomason\textsuperscript{19} reported results of a national survey of critical care orientation programs. Using an untested survey of 35 questions, she found that a mean of 9 new ICU nurses were trained in 2005 at each participating hospital. She found that experienced critical care nurses required a mean of 8 weeks of orientation, experienced non–critical care nurses required 12 weeks, and graduate nurses required 17 weeks, with a range of 12 to 26 weeks. Also, she found that 33% of hospitals were using ECCO, whereas most magnet-accredited hospitals were using classroom teaching as their primary method of instruction.

Although we trained 197 nurses in a 34-month period, the lengths of orientation for experienced critical care nurses (6 weeks), experienced non–critical care nurses (8 weeks), and graduate nurses (12 weeks) in our study were somewhat less than the durations reported in the study by Thomason.

Thomason\textsuperscript{19} also reported that the mean retention rate of new ICU nurses in her sample was 85%; in our study, that rate was 94% after the first 18 months, and 91.2% after the first 2 years. In addition, our vacancy rate of 4.8% is well below the national average of 20%, and our turnover rate of 6.29% is also well below the national average of 13.9%.

Two years after implementation of the new orientation program, the overall retention rate was 91.2%, the same rate as before implementation. One explanation for this unchanged retention rate could be the relative transient nature of graduate nurses at university-affiliated hospitals. Although we can find no published data to support a national trend, we have noted anecdotally that our university-affiliated urban hospital tends to attract young nurses to the ICU because of the opportunity that an inner-city level I trauma center provides. Many of our nurses have clear career goals. They stay for relatively short periods of time, then pursue other goals. Figure 7 seems to support this idea, as retention rates of nurses in cohorts 1, 2, and 3 decreased in the 3 years following implementation of the new orientation program. Despite these factors, the retention rate for graduate nurses remains high at 80%.

It is unclear why such large discrepancies are apparent between groups in reports of satisfaction with the CCI and the Habits for Excellence program. Initial reports from managers, orientees, and educators indicated very high satisfaction—and results reported here were taken 1 year after implementation. Preceptors, however, reported lower results initially as well as 1 year after implementation of the new orientation program.

Graham\textsuperscript{15} discussed cost savings of a multihospital consortium approach that uses traditional lectures. One model implemented a program that used online learning combined with experience in the simulation laboratory with "excellent feedback."\textsuperscript{16}

Although our new orientation program cost more than the old one, it added value because of nurse retention. Savings realized with increased retention rates (from 2.1% to 6%) adequately offset program costs, considering that human resource data indicate that the cost of filling a vacancy varies from

\textsuperscript{16}
program. Lower scores could be a result of the precursors being overwhelmed by the large influx of new nurses into certain units—specifically into the cardiac transplant ICU (formerly the cardiothoracic ICU) and the neurosciences ICU. Both of these units dramatically enlarged services and bed capacity, hiring 50 and 39 nurses, respectively.

One year after implementation, questionnaires were distributed to all groups of orientees; however, only graduate nurses returned them. The higher response rate for graduate nurses can be attributed to more program structure and frequent reinforcement of the need to complete the questionnaires. As we continue, we recognize the need to solicit feedback from all groups of participants and are actively pursuing it.

We regularly monitor feedback of all involved to improve the program. For example, shortly after initiating the model, precursors reported that they did not have all of the skills necessary to evaluate orientees’ performance from a critical thinking perspective, and they were not familiar with expectations of being a precursor in the new model. By creating sessions to review these expectations, we provided methods to facilitate critical thinking and training in effective use of case studies.

No immediate solution is available for the problem of the limited supply of ICU nurses, so orientation programs that work are still needed. Further research is needed on the best practices to train and retain staff. One answer to this challenge is to hire experienced medical-surgical nurses. They have a strong clinical base and solid assessment skills, and they draw from their past nursing experience as they learn critical care concepts. Another alternative is to hire graduate nurses. They are learning new and difficult concepts, but also learning important foundational skills such as time management and prioritization. Their willingness to learn makes work with them rewarding. Although the first year of employment for graduate nurses is challenging, with a high turnover rate,20,21 our experience in meeting this challenge has proven successful on many levels.

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FINANCIAL DISCLOSURES
None reported.

REFERENCES

SEE ALSO
For more about critical care orientation, visit the Critical Care Nurse Web site, www.ccnonline.org, and read the article by Morris and colleagues, “Designing a Comprehensive Model for Critical Care Orientation” (December 2007).
Outcome Evaluation of a New Model of Critical Care Orientation
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