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Lean Workcell Nursing Implementation Can Enhance the Educational Effects of QSEN and Time Spent with Patients in Comparison to Team Nursing

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ABSTRACT

This project was designed to evaluate the effects of lean workcell nursing on educating newly hired registered nurses (RNs) on Quality and Safety Education for Nurses (QSEN) concepts and to investigate the effects of lean workcell nursing on time spent with patients in ward practices. Lean workcell nursing practices and QSEN concepts were introduced and infused over a one-year residency program for the newly hired RNs. This is a descriptive prospective/retrospective study examining lean workcell nursing practices and comparing them to traditional team nursing practices in a clinical training hospital in southern Japan. Clinical Evaluation (CE) scores (prospective) based on QSEN knowledge, skills, and attitudes (KSAs) in two cohorts of newly hired RNs working in lean workcells were assessed twice each year, in June and September (cohort 1 hired in April, 2015 and cohort 2 hired in April, 2016). The mean CE scores in June 2015 were 0.50 ± 0.19 (n=85) and in June 2016 were 1.69 ± 0.49 (n=81) (p<0. 01). The mean CE scores in September 2015 were 1.72 ± 0.63 (n=84, one RN left her job) and in September 2016 were 2.62 ± 0.34 (n=81) (p<0.001). Lean workcell was defined as a care style in which nurses spent more than 80% of their time in the patient's room or just outside the patient's door in the hallway. Likert questionnaires were developed and administered (retrospective) to evaluate agreement with lean workcell nursing. The transition for newly hired RNs from team-based nursing to lean workcell nursing advanced over the year-long period, from a low of 19.2% to a high of 48.6% (p<0.023), with positive results as time progressed. RNs also ranked lean workcell nursing to be more patient-centered and more positively associated with understanding QSEN concepts than teambased nursing. Lean workcell nursing implementation can enhance OSEN education and increase the amount of time nurses spend with their patients in ward practices.

Keywords

Quality, Safety, QSEN, Lean workcell nursing, Team nursing, Newly hired RNs, Education.

Background

Lean thinking is based on a knowledge-driven approach that includes flow of value, flexible responses, and continuous improvements, to manage high-quality productions found in the Toyota Production System [1-4]. Despite the industrial origin of lean thinking, its principles have been used in various settings, including healthcare [5-8]. Lean workcell is a concept built around the idea of eliminating waste and optimizing value to customers, or in healthcare to consumers [9,10]. In hospitals, the main objectives of lean workcell are to: 1) reduce the walking distance between patient's beds and the central nursing station, and 2) increase the nurse's "caring time" in patient's rooms. Virginia Mason Medical Center (VMMC) was one of the first hospitals in the U.S. to extensively use lean workcell for inpatient care [11,12]. Plsek [12], states that previously, the assumption was that in order to present a reasonable workload, a nurse's care assignment for the day needed to be balanced in terms of patient acuity (degree of illness). This meant that a nurse might have, say, four patients, ranging from low to high acuity, but spread out over an entire nursing unit based on the random availability of beds when each patient arrived. Studies at Virginia Mason showed that nurses were spending most of their time walking around the unit, or at the central nursing station, and only about 35% of their time in direct patient contact. The concept of lean workcell is that a nurse could reasonably handle any four patients who happened to end up in adjacent rooms, if she or he had at hand the right equipment, supplies, information, and help (from a patient care technician teammate). Nurses and their patient care technician partners now do almost all of their work in patient's rooms, or in the hallway just outside the door [12]. In order to strengthen and reinforce patient-centered care, in April, 2015 Aso Iizuka Hospital (AIH) decided to change the style and philosophy of inpatient care from the pre-existent team-based nursing to lean workcell nursing.

The Quality and Safety Education for Nurses (QSEN) initiative was developed to integrate quality and safety competencies into nursing education in the U.S. The major QSEN contribution to healthcare education was the creation of six QSEN competencies, and the pre-licensure and graduate-level knowledge, skills, and attitudes (KSA) statements for each competency [13]. The statements provide a tool for faculty and staff development educators to identify gaps in curricula so changes to incorporate quality and safety education can be made [14]. AIH's partnership with the University of Pittsburgh Medical Center (UPMC) brought the QSEN concepts to southern Japan.

AIH then designed a customized, culturally-appropriate New Nurse Residency for Practice (NNRP) one-year program for newly hired registered nurses (RNs). All the nurses newly hired had passed the national examination for nurses just after their completion of nursing school and thus, were registered before hiring in April. Lean workcell thinking and QSEN competencies and KSAs serve as the core component for the NNRP.

Both QSEN and the lean workcell philosophy put their priority on patient-centered care delivery. The purpose of this study is to evaluate the effects of lean workcell nursing on educating newly hired registered nurses on Quality and Safety Education for Nurses concepts and to investigate the effects of lean workcell nursing on time spent with patients in ward practices within the Japanese healthcare environment.

Methods

Ethical Considerations

The present study was approved by the Ethics Committee of Aso Iizuka Hospital.

Participants

There were two cohorts of newly hired RNs, cohort 1 hired in April, 2015, and cohort 2 hired in April, 2016. A third cohort was composed of experienced nurses who worked together with the newly hired RNs in wards.

Protocol Design

Prevalence of Lean Workcell Nursing

AIH defined lean workcell nursing as a care style in which nurses

spent more than 80% of their work time in patient's rooms, or in the hallway just outside the patient's door. The transition from the pre-existent team-based nursing to lean workcell nursing slowly progressed in hospital wards using Quality Control Circle activities [16], electronic medical records, and other resources. After preparation, the Nursing Department decided to adopt this as one of their annual objectives in April, 2015.

New Nurse Residency for Practice (NNRP) Program

In the Spring of 2015, AIH blended traditional bedside nursing practice with the NNRP, using simulation education and a rubric of Clinical Evaluation (CE) of fundamental nursing care processes based on QSEN competencies and KSAs for newly hired RNs. The nursing clinical educators established a team to promote simulation education for the newly hired RNs. They also infused the concepts of QSEN into the continuing education programs of nurse preceptors and trained them to master the judgment of competencies and KSAs in day-to-day work using a 5-Step Microskills Model for Clinical Teaching [15]. The clinical evaluation of the new hired RNs was prospectively performed by experienced nurses, including preceptors, working in the same ward in June and September of 2015 and 2016.

Measurement Instruments

The CE tool was scored from 0 to 3 in 22 categories of fundamental nursing care processes, with 0: below level 1 requirement; 1: meets level 1 requirement (41 assessment items), 2: meets level 2 requirement (93 assessment items), 3: meets level 3 requirement (63 assessment items).

The extent of the change from team-based nursing to lean workcell nursing was retrospectively evaluated in January, 2017 by an assessment that used a Likert scale for cohort 1 and cohort 2 (Questionnaire 1). It measured; on a scale from strongly agree to strongly disagree, the extent that the newly hired RNs spent more than 80% of their work time in patient's rooms, or in the hallway just outside the patient's door.

To compare lean workcell nursing to the pre-existent team-based nursing, two questionnaires were developed and sent to the newly hired RNs and experienced RNs. One questionnaire asked about the extent of patient-centered care (Questionnaire 2, December, 2016). Another did about the educational effects on QSEN concepts between lean workcell and team-based nursing (Questionnaire 3, January, 2017). A Likert scale from strongly agree to strongly disagree was used, and the results were expressed as the proportion of nurses who chose the responses of strongly agree and agree. In Questionnaire 3, experienced RNs who chose strongly agree or agree in Questionnaire 2 were further asked their educational attitudes to the newly hired RNs in lean workcell nursing versus team-based nursing (follow-up questions).

Statistical Analysis

Continuous variables are expressed as the mean \pm standard deviation (SD). The statistical significance of differences between groups was evaluated using the Wilcoxon signed-rank test and the

Chi-square test. All statistical analyses were performed using the State/SE, version 14.0 (Lightstone Corp, Tokyo, Japan). P values less than 0.05 were considered to indicate statistical significance.

Results

CE Scoring

Figure 1 shows the results of the Clinical Evaluation (CE) scores for the newly hired RNs of 2015 and 2016. The mean CE scores in June were 0.50 ± 0.19 in 2015 (n=85) and 1.69 ± 0.49 in 2016 (n=81) (p<0.001). The mean CE scores in September were 1.72 ± 0.63 in 2015 (n=84, one RN left her job) and 2.62 ± 0.34 in 2016 (n=81) (p<0.001). Thus, the CE scores were statistically significant suggesting improvement in the NNRP program, with lean workcell nursing and QSEN as core components.



Figure 1: Variation in Mean Clinical Evaluation Scores of Newly Hired Nurses in 2015 and 2016.

Prevalence of Lean Workcell Nursing

The response rates to Questionnaire 1 were 88.0% in cohort 1 (73/83) and 88.9% in cohort 2 (72/81). The extent of the change from team nursing to workcell nursing was expressed as the proportion of the responses of strongly agree for the question of spending more than 80% of their work time in patient's rooms, or in the hallway just outside the door. As shown in Figure 2, the proportion of lean workcell nursing in June 2015 was 19.2% (14/73) and in June 2016 was 47.2% (34/72) (p<0.001). The proportion of lean workcell nursing in September 2015 was 30.1% (22/73) and in September 2016 was 48.6% (35/72) (p<0.023) for newly hired RNs in the NNRP program.

Comparison of Lean Workcell Nursing with Team-based Nursing Positive opinions (strongly agree or agree) of newly hired RNs and experienced RNs on patient-centered care delivery for lean workcell nursing compared to team-based nursing are shown in Table 1. The response rates to Questionnaire 2 were 96.0% in cohort 1 plus cohort 2 (145/151, newly hired RNs) and 83.2% in experienced RNs (607/730). The majority of nurses appreciate the patient-centered characteristics of lean workcell nursing, and newly hired RNs especially agreed to the advantage in the observation of patient's condition more than experienced RNs (97.2% versus 89.3%, p=0.002).



Figure 2: Prevalence of Lean Workcell Nursing in Newly Hired Nurses. (Questionnaire 1).

Question: Lean workcell nursing is better than team-based nursing in the following areas:

	Newly Hired Nurses (n=145)	Experienced Nurses (n=607)	p value
Contact with patient	129 (89.0%)	524 (86.3%)	0.494
Observation of patient condition	141 (97.2%)	542 (89.3%)	0.002
Response to patient needs	104 (71.7%)	422 (69.5%)	0.685

Table1: Comparison of Lean Workcell Nursing with Team-Based Nursing.- Patient-Centered Care (Questionnaire 2).

Opinions of newly hired RNs and experienced RNs on the educational benefits of lean workcell nursing compared to teambased nursing are shown in Figure 3. The response rates to the questionnaire 3 were 74.3% in cohort 1 plus cohort 2 (113/152, newly hired RNs) and 85.5% in experienced RNs (461/539). Again, positive opinions (strongly agree or agree) of newly hired RNs were higher than for the experienced RNs (63.7% versus 49.9%, p=0.009).

Question: Lean workcell nursing is better than team-based nursing in the QSEN Education of newly hired nurses.



Figure 3: Comparison of Lean Workcell Nursing with Team-Based Nursing.

Education (Questionnaire 3).

The follow-up questions for experienced RNs about their ability to mentor newly hired RNs are shown in Table 2. In lean workcell nursing, the majority of experienced RNs felt they were: more aware of the newly hired RNs patient's care (86.7%); more available to assist newly hired RNs with patient care (83%); and better able to teach newly hired RNs their QSEN knowledge, skills, and attitudes in ward practices (74%).

Question: In terms of QSEN Education, lean workcell nursing allows.



	Strongly Agree & Agree	Total	%
More awareness about patient care by new nurses	196	226	86.7
More chance to assist patient care by new nurses	186	224	83
More chance to teach KSAs to new nurses	165	223	74

 Table 2: Positive Opinions for QSEN Educational Effects of Lean

 Workcell Nursing.

- Follow-up Questions (Questionnaire 3).

Discussion

Lean thinking is on the rise in international healthcare systems, particularly in the United Kingdom and the U.S. because it is helpful in improving the structure, processes, and outcomes of patient care and management issues. However, it remains an emerging theme in nursing. The principal finding of the present study is that lean workcell nursing can enhance the educational effects of QSEN for newly hired RNs in ward practices. In the more active environment of lean workcell nursing in 2016 compared to 2015, newly hired RNs were faster learners of basic clinical competencies around QSEN's KSAs. To the best of our knowledge, this is the first study examining the relationship between QSEN and lean workcell nursing [17,18].

A lean workcell is a particular, consolidated arrangement of resources and processes, (most often a combination of people, equipment, and materials), designed to improve the quality and speed of a particular output [3]. The positive effects of a lean workcell in ward practices have been shown in a study at the VMMC [12]. Nurses' time available for patient care rose to over 90%, while the average number of steps a nurse walked in a day

fell nearly tenfold. Nicholas [19], states that lean workcell nursing brought the following in terms of waste reduction: 85% in staff walking distance and 50% in time for nurses to complete morning work for patients. Furthermore, patient complaints regarding response to call lights dropped to 0 and nursing hours per patient day dropped from 9 to 8.36. Nurses had more time to attend to patients so they missed fewer breaks and lunches, which also decreased overtime [19].

Team-based nursing is a preferred model of care when the nursing skill mix consists predominantly of less experienced nurses who require constant supervision and support [20]. This approach gained popularity in the 1950s and has again, become a common choice more recently [20,21]. Although team-based nursing as a care delivery system in hospitals has many merits in the education of nurses [21], AIH decided to change to lean workcell nursing in order to increase the nurse's "caring time" at the patient's bedside to increase patient-centered care.

Cronenwett and colleagues13 report that QSEN addresses the challenge of preparing nurses with the competencies necessary to continuously improve the quality and safety of the health care system in which they work. The QSEN faculty members adapted the Institute of Medicine's (IOM) think tank (2003) competencies for nursing (patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics) proposing definitions that could describe essential features of what it means to be a competent and respected nurse. Using the competency definitions, they proposed statements of the knowledge, skills, and attitudes (KSAs) for each competency that should be developed during pre-licensure nursing education. Dolansky and Moore [22], describe that nurses need to be taught the knowledge and skills associated with systems thinking. In their day to day work, nurses' ability to engage in better problemsolving, priority setting, delegation, interactions and collaborations, decision making, and action-taking are greatly influenced by their ability to view how any one component of their work system is related to other components and to the whole. The full effect of the QSEN competencies to improve the quality and safety of care can only be realized when nurses apply them at both the individual and system levels of care. The clinical environment is an ideal place to teach systems thinking in undergraduate, graduate, and staff development education [22]. Sherwood and Horton-Deusch [23], state that QSEN, when incorporated into bedside nursing practice, it has the potential to keep nurses focused in the workplace and empowers nurses to feel that they can provide safe, quality care to their patients that is effective, efficient, timely, and patientcentered.

Lean workcell nursing provides a clinical environment in which nurses can spend most of their work hours in or around patient rooms. As shown in Figure 3, the educational effects of lean workcell nursing are highly valued by newly hired RNs who can obtain experienced nurse's assistance when needed. In addition to learning knowledge and skills, they are exposed to experienced nurse's attitudes within the clinical setting as well. All these characteristics of lean workcell nursing contribute to enhancing the education and systems thinking of newly hired RNs. It is interesting that the responses to the QSEN-infused educational program and lean workcell nursing were more positive in the newly hired RNs than in experienced RNs. We need to extend our QSEN-infused and lean workcell nursing system to be as wide as possible in order to prepare all nurses to ensure the highest level of care.

Study Limitations

Adoption of QSEN competencies and KSAs in nursing schools is in the embryonic stage in Japan. As the introductory phase, we spent two years infusing QSEN concepts into our one-year new graduate orientation program. Thanks to the collaboration with UPMC, the NNRP program for newly hired RNs was completed successfully. However, the systematic education program of the QSEN model for experienced RNs other than nurse preceptors has not been available. Therefore, there may be diverse comprehension of QSEN concepts in experienced RNs. Figure 3 might express these circumstances. We have to proceed with the continuing education of all experienced RNs to improve the educational atmosphere in AIH hospital wards.

Conclusions

Lean workcell nursing can enhance QSEN application providing new nurses with opportunities to collaborate with experienced nurses in or around the patients' room compared to team-based nursing. The environment formed by lean workcell nursing can enhance the positive application of QSEN knowledge, skills, and attitudes while providing nurses more time caring for their patients.

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