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Clinical Nurse Leader Impact on Microsystem Care Quality

Miriam Bender, Cynthia D. Connelly, Dale Glaser, Caroline Brown

- **Background:** The current fragmented healthcare system, characterized by a lack of collaborative, patient-centered care processes, creates significant barriers to providing quality patient care. The clinical nurse leader (CNL) is theorized to provide clinical leadership at the point-of-practice to maintain cross-disciplinary collaborative processes that lead to integrated quality care.
- **Objectives:** The aim of this study was to assess the impact of CNL integration into an acute care microsystem on care quality, as measured by patient satisfaction with care.
- **Methods:** A short interrupted time series design was used to measure patient satisfaction with multiple aspects of care 10 months before and 12 months after integration of the CNL role on a progressive care unit, compared with a control unit. Data were obtained from Press Ganey surveys, and analysis was completed using a publicly available program for short time series data streams.
- **Results:** Clinical nurse leader implementation was correlated with significantly improved patient satisfaction with admission processes ($r = +.63$, $p = .02$) and nursing care ($r = +.75$, $p = .004$), including skill level ($r = .83$, $p = .003$) and keeping patients informed ($r = .70$, $p = .003$). There was no significant correlation with improved patient satisfaction with physician care ($r = .31$, $p = .14$) or discharge processes ($r = .33$, $p = .23$) post-implementation. Control data showed no significant changes in patient satisfaction measures throughout the study time frame.
- **Discussion:** The positive correlation between CNL-mediated collaborative care processes and improvements in patient satisfaction with care quality provides empirical evidence of outcomes achievable through CNL implementation. Research is needed to explore the full range of achievable outcomes and to determine the specific processes by which these outcomes are realized.
- **Key Words:** clinical nurse leader & healthcare quality & microsystem redesign

Current healthcare delivery is plagued by disciplinary silo approaches to patient care, including a lack of formal interdisciplinary collaborative processes. Until recently, overburdened healthcare providers were not educated to collaborate and build consensus regarding goals of care with the patient and members of an interdisciplinary team. This fragmented approach to patient care has been associated with preventable adverse outcomes, including increased mortality and morbidity, 30-day readmission rates, length of stay, and costs (Fewster-Thuente & Velsor-Friedrich, 2008). In response to this evidence, the Institute of Medicine (IOM) has identified creation of effective work teams as a priority for redesigning and improving healthcare (IOM, 2001). Teamwork and effective interdisciplinary collaboration have been linked to improved quality of care and patient outcomes (Zwarenstein, Goldman, & Reeves, 2009). Unfortunately, there is limited evidence describing effective processes for creating and sustaining a collaborative environment. The clinical nurse leader (CNL) is theorized to provide the necessary leadership and competency skill base at the point-of care microsystem to develop

processes that create and sustain an environment of interdisciplinary collaboration and improve patient care quality. The purpose of this study was to assess the impact of CNL role integration into an acute care delivery microsystem on quality of care, as measured by patient satisfaction with care.

Background

Professional Education in Collaboration and Communication

In the past, healthcare professionals have been trained to adopt a narrow clinical focus for their practice. The disciplines of medicine, nursing, case management, and other health service providers have their own theoretical bases for practice and are typically regulated by separate professional governing bodies (Reeves, Macmillan, & Van Soeren, 2010). The IOM's (2000) landmark report, *To Err is Human*, indicated that most medical errors could be attributed to ineffective cross-disciplinary communication. As a result, health professional organizations and policy administrators have identified collaboration as an essential factor in improving the quality and safety of patient care (Brown, Brewster, Karides, & Lukas, 2011). Clinical professions have recognized the importance of teaching practitioners about collaborative practice and are working to restructure educational curricula to include competencies in communication and collaborative practice (American College of Physicians, 2010; Interprofessional Education Collaborative, 2011).

Care Environments and Collaboration

Educating practitioners about the need for collaboration is only part of the solution. Many microsystem care environments are structured so that nurses, physicians, ancillary staff, and administrative staff deliver or ensure quality care via mutually exclusive processes, with differing expected outcomes. This fragmented care delivery structure inhibits collaboration, limits effective integration of care services, and hinders cross-disciplinary alignment and measurement of care goals (Tornabeni, 2006). Leadership at the microsystem point-of-care is necessary to redesign healthcare structures and processes effectively to create care environments that foster collaboration (Cebul, Rebitzer, & Taylor, 2008; Porter-O'Grady, Clark, & Wiggins, 2010). Furthermore, leadership needs to be ongoing and involve the entire healthcare team for a collaborative care environment to be sustained (McCallin, 2001). The CNL role was created in direct response to this need for clinical leaders at the point-of-care healthcare setting, integrating care within and across care settings and disciplines (Begun, Tornabeni, & White, 2006).

The CNL Role

Clinical nurse leader integration into a care delivery system is one innovative strategy for redesigning microsystem care structures and fostering healthy work environments (IOM, 2010; Sherman, & Pross, 2010). The CNL is a masters-prepared registered nurse (RN) educated to enhance the efficiency with which care is delivered and to coordinate care through collaboration at the microsystem level with the entire healthcare team (American Association of Colleges of Nursing [AACN], 2007). The goal of the CNL is to apply advanced competencies in nursing leadership, clinical outcomes management, and care environment management to (a) lead and sustain an environment of interdisciplinary

collaboration as a basis for delivery of safe, comprehensive care; (b) integrate care services across disciplines and care settings efficiently and cost effectively; and (c) apply evidence-based criteria for measuring the quality of microsystem care delivery and lead quality improvement processes based on evidence.

Preliminary reports of improved care quality resulting from CNL (or modified CNL) integration into care delivery structures include improved nursing quality outcomes (Gabuat, Hilton, Linnaird, & Sherman, 2008; Hartranft, Garcia, & Adams, 2007; Sherman, Edwards, Giovengo, & Hilton, 2009; Smith & Dabbs, 2007; Stanley et al., 2008), efficiencies in multidisciplinary care coordination and care costs (Hix, McKeon, & Walters, 2009; Ott et al., 2009), and improved communication and collaboration across disciplines (Bowcutt & Goolsby, 2006; Poulin-Tabor et al., 2008, Smith, Manfredi, Hagos, Drummond-Huth, & Moore, 2006; Tachibana & Nelson-Peterson, 2007).

Patient Satisfaction

Patient satisfaction is an important health outcome, providing a valid measure of quality of care received. It is important because it captures the patient's experience of healthcare and acknowledges the role of the patient as a partner in care (IOM, 2001). Patient satisfaction is a mandated reportable clinical outcome for both the Centers for Medicare and Medicaid Services (2011) and the Joint Commission (2011). Donabedian's (1988) groundbreaking conceptual model of quality care incorporates patient satisfaction as a fundamental component of healthcare quality. Patient satisfaction has been defined as the degree to which care meets a patient's expectations in terms of technical quality, physical environment, continuity of care, and the actual outcomes of care (Mrayyan, 2006). Elements of patient satisfaction include involvement in care decision-making and perceptions of competent practitioners and effective care delivery processes (Doran, 2010).

Improved patient satisfaction after implementing the CNL role has been reported in several case studies (Hartranft et al., 2007; Smith & Dabbs, 2007; Smith et al., 2006; Stanley et al., 2008). Tachibana and Nelson-Peterson (2007) showed a direct but unquantified link between the CNL role and improved patient satisfaction through patient letters that specifically mention the CNL's effect on their care. The aim of this study was to empirically link and quantify CNL impact on patient satisfaction.

Methods

Clinical nurse leader integration into a care delivery system is a complex healthcare intervention, proposed to facilitate a wide range of outcomes through numerous cross-disciplinary mechanisms of action. Evaluating complex interventions is often difficult because of problems separating interdependent intervention components and their specific impact on outcomes (Blackwood, 2006). A framework depicting CNL mechanisms of action and their relationship to this study's hypothesized outcomes is presented in Figure 1. Assessing hypothesized outcomes of CNL-mediated processes continuously over time is one way to empirically link CNL processes and care outcomes: By establishing a timeline of process change (CNL implementation) and subsequent outcomes (improved care quality), a preliminary argument can be made for those processes as the mechanism by which outcomes were achieved (Kazdin & Nock, 2003). The purpose of this study was to test the hypothesis that integration of a CNL role into a

progressive care unit's care delivery system would improve care quality, defined as patient satisfaction with care.

Design

A short interrupted time series (ITS) design to measure patient satisfaction with multiple aspects of care 10 months before and 12 months after integration of the CNL role on a progressive care unit, compared with a control unit, was used for this study. All study procedures were reviewed and approved by the relevant institutional review boards.

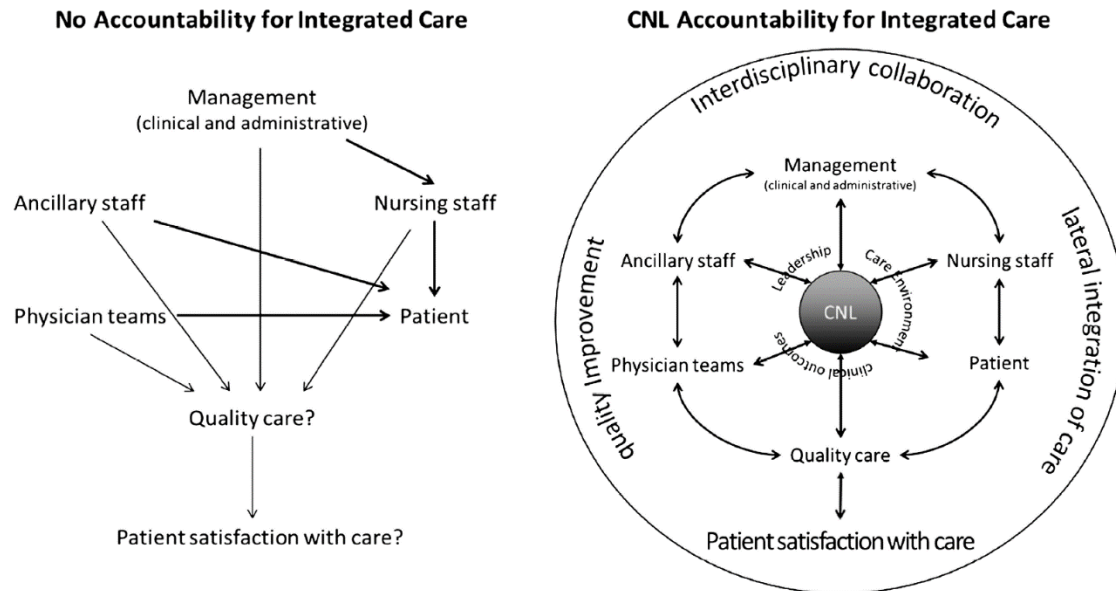


FIGURE 1. Clinical nurse leader theoretical framework.

Implementation

The CNL role was implemented on a 26-bed high-acuity progressive care unit in a 119-bed urban academic medical center with state-mandated staffing ratios in place, ranging from 3:1 to 5:1 on the study unit, depending on patient acuity. The patient population included complex surgical oncology, cardiac, pulmonary, bone marrow transplant, and neurology patients. Registered nurse staff worked 12-hour, 3-day weeks, and medical teams rotated approximately every 2 weeks. A charge RN was assigned to each shift, responsible for patient flow and administrative duties such as internal audits. One or two support staff members assigned to each shift were responsible for basic patient care needs such as hygiene and toileting, answering call lights, and assisting with patient mobility. No clinical nurse specialist was assigned to the unit. One nurse educator was responsible for RN yearly competencies and new graduate education for this and other units but was not a daily presence on the intervention or control unit. A segregated and discipline-focused decision-making hierarchy, along with constant staff and medical team turnover, resulted in care coordination that occurred through happenstance rather than by design, despite the individual dedication and expertise of all practitioners working to provide care for very complex patients.

The control unit was a high-acuity oncology and bone marrow transplant unit located on the floor above the intervention unit, with a similar (if lower acuity) patient

population, staffing ratios (typically 4:1), and nursing roles. Oncology physicians and nurse practitioners performed rounds on both units throughout the study, with the same rotation schedule.

The conceptual framework used to develop CNL role workflow and details concerning the administrative context of implementation has been discussed elsewhere (Bender, Connelly, & Brown, 2012; Bender, Mann, & Olsen, 2011). Briefly, the unit was staffed with two CNLs, each responsible for 13 patients, working Monday to Friday from 7:00 am to 3:30 pm.

The CNL system responsibilities entailed developing unit-based structures for care coordination and quality benchmarking, including daily physician team rounds (with the staff RN); skin and fall rounds; assessment of all indwelling catheters for patency, infection, and valid criteria for use; standardized interdisciplinary care plans; quality improvement project facilitation; quality data tracking; and facilitation of a unit-based shared governance counsel.

The CNL staff responsibilities entailed developing supportive inter- and cross-disciplinary pathways for lateral integration of care, including informal nursing and ancillary staff rounds, assisting staff RNs with hands-on complex care needs, facilitating accurate and complete documentation in interdisciplinary care plans, and ensuring all disciplines and the patient had a voice in the decision-making process regarding complex care goals (which often meant translating needs from one discipline to another).

The CNL patient responsibilities entailed multiple daily patient rounds and daily review of objective patient measurements such as medication reconciliation, laboratory values, and test results for inclusion into the care plan, as well as review with interdisciplinary staff during daily rounds.

Measurement

Press Ganey survey scores were used to measure patient satisfaction in this study. The Press Ganey survey instrument, managed by the organization's executive level administration, is a standardized measure of patient satisfaction, with acceptable reliability and validity (Kaldenberg & Regrut, 1999). The instrument includes items related to overall satisfaction with admission and discharge processes, as well as nursing and physician care. It is also used to address specific components related to comfort, patient explanations, caring relationships, and courtesy. The tool was developed from the focus-group data obtained from both patients and providers. The instrument has been tested for validity through content evaluation, and reliability is reported as Cronbach's alphas ranging from .86 to .92 for the subscales (Kaldenberg & Regrut, 1999).

Scores collected for this study include overall measures of satisfaction with multiple components of care. These components were itemized in the survey as admission, discharge, nursing, and physician. The scores represent the percentage of survey responses with an answer of 5 (percent of fives) on a 5-point Likert-type scale, with 1 = very poor to 5 = very good. Nursing-specific scores were also obtained to evaluate nursing processes that may have improved after CNL implementation. These were labeled skill of the RN, RN kept you informed, attention to special needs, and attention to requests. For the nursing-specific scores, response to call light was used as a control item, with the rationale that the process for answering call lights on the study unit did not involve RNs directly; the call was first directed to a unit clerk who alerted an

unlicensed technician to check on the patient. Most calls were related to toileting or general assistance needs, and the process was not changed during the study. Scores were collected 10 months prior to CNL integration and 12 months afterwards. Data were collected for the same time period on the control unit. Changes in reporting mechanisms for patient satisfaction did not allow capturing of data for a longer period before CNL integration. Nevertheless, data were captured for a sufficient length of time to allow for historical biases, such as quarterly effects, to become visible (22 months total).

ITS Analysis

Clinical practice is a dynamic process that is often time dependent. This dependency creates a problem in terms of statistical analysis, as many methods have an assumption of independent observations, often violated with clinical processes that cannot be separated easily into independent quanta of care and outcome. This dependence of measures over time is called autocorrelation. Interrupted time series research design accounts for autocorrelation in analysis and is well suited for time-dependent evaluations of clinical process interventions (Biglan, Ary, & Wagenaar, 2000).

In ITS, the outcome variable is manipulated (via introduction of the intervention) after a series of baseline data measurements. Data measurement then continues through similar time increments after introduction of the intervention. The ITS design cannot be used to detect a cause-effect relationship between variables, but it can be determined that an intervention is empirically correlated with changes in the outcome. The design improves the internal validity of nonrandomized study methodology by accounting for potential study biases, such as preintervention trends, seasonality, and random fluctuation. Introducing a nonequivalent control group that is not subject to the intervention but is otherwise similar to the intervention group further strengthens the internal validity of ITS study design (England, 2005).

Borckardt et al. (2008) developed a time series analysis program, Simulation Modeling Analysis: Time Series Analysis Program for Short Time Series Data Streams (available at <http://clinicalresearcher.org>), to analyze outcomes data for changes over time. A change in outcomes is referred to as a level change and is analogous to the difference in mean scores before and after intervention with independent data values. The level change or the association of the intervention with a change in outcomes (accounting for autocorrelation) is reported as Pearson's r . The probability of obtaining the calculated level change by chance alone is also reported. The trend over time is called the phase effect. While the level change identifies the size of an intervention's effect, the phase effect identifies the pattern of the intervention trend. It is necessary to report both level change and phase effect to interpret the results of an ITS study accurately. For example, an intervention might not result in a significant overall change in outcome scores, but the trend over time may change significantly. Possible level changes and phase effects for an ITS study are illustrated in Figure 2.

Results

Between-Unit Results

The results of the ITS analysis are shown in Table 1. There were no significant level changes between baseline and intervention phase for any control unit outcome. This can

be interpreted to mean that there were no concurrent systemic or organizational changes or trends occurring within the hospital during the study time frame that could account for significant changes seen in study unit outcome scores. For the CNL unit, level changes between baseline and intervention phase were significant for both admission ($r = +.63$, $p = .02$) and nursing ($r = +.75$, $p = .003$), which results in rejecting the null hypothesis of no difference between pre- and postintervention scores. The raw admission data scores are depicted in Figure 3. Figures for the remaining outcome variables are not shown in the interest of space but can be deduced from the level change and phase effect information presented in Table 1. Phase effects were significant for both admission ($r = +.60$, $p = .02$) and nursing ($r = +.63$, $p = .03$) scores, showing continuous improvement over time in patient satisfaction. There were no significant level changes or phase effects in patient satisfaction with physician care or discharge processes for either the CNL or control units.

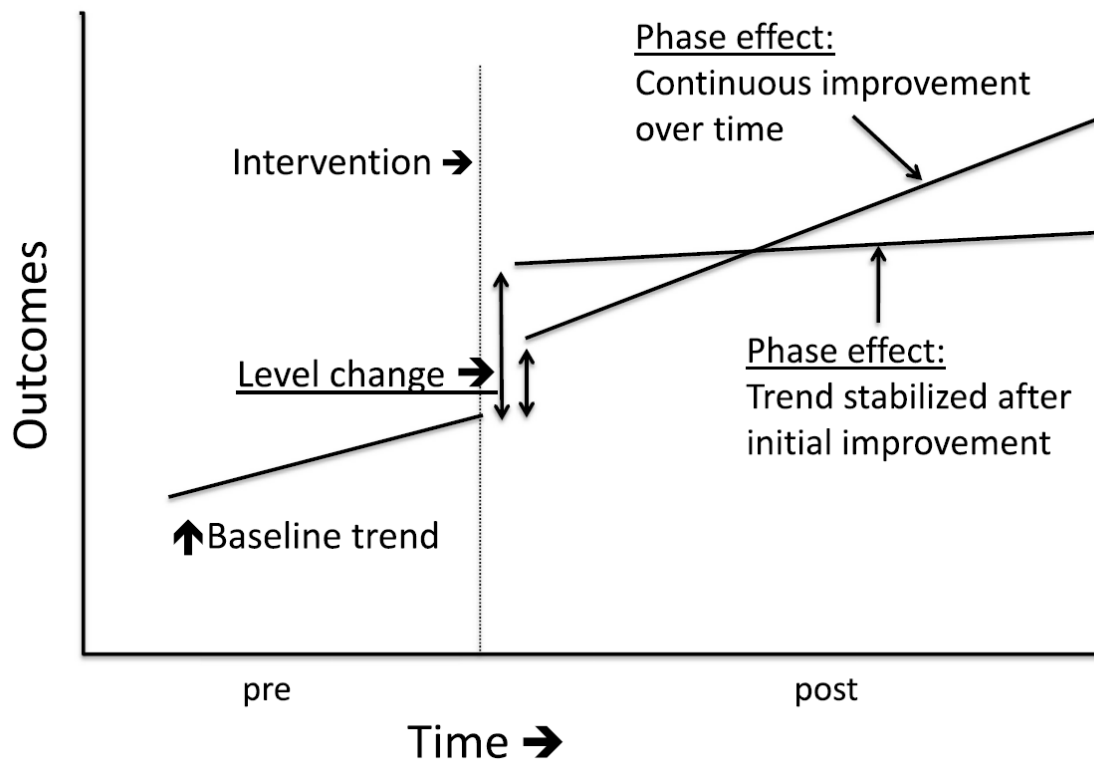


FIGURE 2. Illustration of interrupted time series level changes and phase effects.

TABLE 1. Simulation Modeling Analysis of Time Series Data Streams Before and After Clinical Nurse Leader Intervention

| | | | | | | Phase effect ^b | | | |
|-------------------------|----------------------------|---------------------------------|----------------------------------|---------------------------|-------|---------------------------|--------------------------|-------|------|
| | | Pre-CNL scores, n = 10 (months) | Post-CNL scores, n = 12 (months) | Level change ^a | | Continuous improvement | Immediate then sustained | | |
| Press Ganey scores | | Mean ± SD | Mean ± SD | r | p | r | p | r | p |
| Admission: between unit | Control | 54 ± 11.8 | 48.4 ± 12.9 | -0.22 | 0.19 | 0.01 | 0.95 | -0.09 | 0.59 |
| | Intervention | 58.1 ± 8.4 | 69.6 ± 7.4 | 0.63 | 0.02 | 0.6 | 0.02 | 0.45 | 0.12 |
| Physician: between unit | Control | 64.8 ± 9.7 | 64.8 ± 14.7 | 0.00 | 1.0 | 0.25 | 0.35 | 0.17 | 0.53 |
| | Intervention | 67.9 ± 6.7 | 72.5 ± 7.3 | 0.31 | 0.14 | 0.15 | 0.49 | 0.22 | 0.31 |
| Discharge: between unit | Control | 46.5 ± 12.6 | 53.3 ± 11.6 | 0.27 | 0.35 | 0.41 | 0.13 | 0.23 | 0.40 |
| | Intervention | 53.1 ± 7.9 | 59.0 ± 8.9 | 0.33 | 0.23 | 0.07 | 0.81 | 0.27 | 0.33 |
| Nursing: between unit | Control | 63.7 ± 9.8 | 63.8 ± 11.1 | 0.00 | 1.0 | 0.262 | 0.37 | 0.04 | 0.90 |
| | Intervention | 61.8 ± 3.0 | 73.6 ± 6.4 | 0.75 | 0.004 | 0.63 | 0.03 | 0.69 | 0.01 |
| Nursing: within unit | Control | 55.4 ± 8.1 | 55.5 ± 19.4 | 0.27 | 0.36 | 0.18 | 0.56 | 0.36 | 0.22 |
| | Skill of the RN | 62.5 ± 5.2 | 81.3 ± 7.3 | 0.83 | 0.003 | 0.79 | 0.01 | 0.78 | 0.01 |
| | RN kept you informed | 55.1 ± 4.5 | 69.5 ± 9.1 | 0.70 | 0.003 | 0.52 | 0.05 | 0.55 | 0.03 |
| | Attention to requests | 63.2 ± 7.0 | 69.3 ± 21.7 | 0.68 | 0.01 | 0.55 | 0.04 | 0.55 | 0.04 |
| | Attention to special needs | 58.7 ± 6.5 | 63.1 ± 22.0 | 0.47 | 0.05 | 0.39 | 0.11 | 0.45 | 0.05 |

Note. CNL = clinical nurse leader; RN = registered nurse.

^aThe correlation between the intervention and a change in outcomes postintervention (accounting for autocorrelation), reported as Pearson's R (r), including probability (p) of obtaining the effect size by chance alone.

^bThe trend of the data over time postintervention: Continuous Improvement is the correlation between outcome data and a trend model of continuous improvement postintervention and Immediate and Sustained Improvement is the correlation between outcome data and a trend model of stabilization at immediate improvement postintervention.

Within-Unit Results

The within-unit control score (response to call light) showed no level change between baseline and intervention phase, and there was no significant phase effect. This can be interpreted to mean that there were no concurrent organizational changes or trends occurring on the unit during the study time frame that could account for changes seen in outcome scores. All other outcome scores showed significant level changes with strong effect sizes. Skill of the RN scores showed the largest level change between phases ($r = .83$, $p = .003$), followed by RN kept you informed ($r = .70$, $p = .003$). Patient satisfaction with attention to requests ($r = .68$, $p = .01$) and attention to special needs ($r = .47$, $p = .05$) also showed significant level changes. Phase effects were significant for all noncontrol, within-unit outcomes, showing a sustained immediate increase in scores, followed by incremental improvement over time (except for attention to special needs). Detailed results are shown in Table 1.

Discussion

Admission and Nursing Patient Satisfaction Outcomes

Admission score showed significant continuous improvements after CNL implementation. This improvement corresponds with the creation of CNL care coordination accountability to ensure that, on admission, comprehensive patient information was gathered and documented appropriately, holistic care plans were created, and all admission orders were addressed to ensure basic elements like diet and appropriate medications were accounted for. This required ongoing collaboration with staff RNs, admitting physicians, and ancillary staff such as respiratory therapy, and pharmacy.

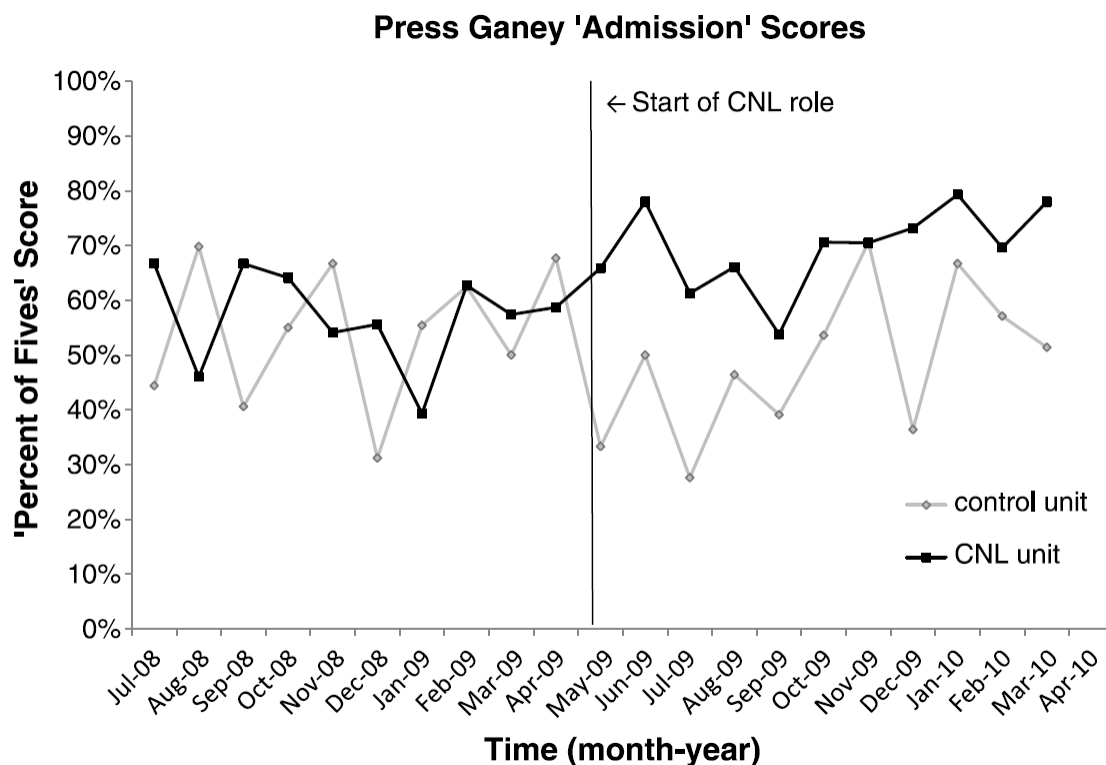


FIGURE 3. Press Ganey patient satisfaction admission score raw data.

Nursing score showed an immediate, sustained improvement with further incremental improvement over time. This increase most likely reflects the summation of significant improvements in individual nursing scores. Skill of the RN showed the greatest improvement. Although the CNLs did not engage in formal staff-RN education, they modeled professional practice on a daily basis and were a convenient source of information about policy standards and evidence-based clinical practice for all members of the healthcare team, not just the nursing staff. The CNLs were also a nonthreatening, consistent source of practical and clinical information for newly hired and new graduate RNs, which may have helped new staff members integrate more quickly into the practice setting, resulting in increased patient perception of RN skill. Improvement in RN kept you informed, attention to special requests, and attention to special needs may reflect the CNL role's accountability to promote patient-centered care through multiple daily patient rounds focused on answering patient questions; continuously interpreting information received by the physicians, case managers, or other disciplines that may have been confusing to the patient; reviewing completed tests and procedures or those still to be done; and generally being a friendly and accurate daily source of information and support.

Physician and Discharge Patient Satisfaction Outcomes

The CNL role did not influence patient satisfaction significantly with overall physician care. Although the CNLs formalized an interdisciplinary rounding structure on the unit to improve collaboration between physicians and staff regarding patient care needs, the

organizational structure of biweekly physician team rotation unfortunately was not amenable to reform. Notably, patients often saw a complete change in their medical care team during their stay. This organizational structure likely was a significant factor in patients' perceptions of their physicians' ability and willingness to focus on their care needs, which did not appear to be altered by the improved interdisciplinary collaboration that occurred during physician rounds to ensure the entire healthcare team and patient had a voice in decision-making process regarding complex care goals.

Clinical nurse leader implementation did not affect patient satisfaction with discharge either. The CNLs were accountable for holistic patient care plans, with a new focus on broad, interdisciplinary discharge goals. The CNL-facilitated formalized interdisciplinary rounding structure also prioritized sharing of information, so the entire team would be knowledgeable about ultimate discharge goals and thus be able to act on them more efficiently. This strategy unfortunately did not translate into improved patient satisfaction with discharge. Patients might respond to day-of-discharge delays more than to improved progression toward discharge goals during their stay. There were many systemic structures and organizational processes hindering prompt discharge, which CNL implementation could not address during the study time frame. These included resident physician discharge order writing and medication reconciliation. The results suggest that there is still much work to be done creating effective day-of-discharge processes.

Limitations and Considerations for Future Research

Several limitations are noted. The sample size was limited to one acute care microsystem, and only one quality outcome was measured. Press Ganey scores have been used in previous studies as a valid measure of patient satisfaction, but, as Doran (2010) notes, there are issues with any measure of patient satisfaction, such as low response rates (in this study, the mean number of patients responding to the survey monthly was 27 ± 6), and the positive skewness and lack of variability of many satisfaction rating scales. The strong effect sizes of the improvements in multiple aspects of patient satisfaction found in this study mitigate these concerns somewhat, but the fact remains that no causal inferences can be made regarding the CNL role and improved outcomes related to this study.

The CNLs were also accountable for nursing quality indicators such as falls, pressure ulcers, and core measure compliance, but the unit was already performing at acceptable benchmarks prior to the study, so these measures were not considered a focus here. Fragmentation and lack of interdisciplinary collaboration were the most pressing issues on the intervention unit, as evidenced by lower-than-average patient satisfaction scores with multiple aspects of care. The mandate of the CNL role was to improve collaborative care on the unit; thus, measurement was focused on a reliable and cost-effective outcome measure of collaborative care quality: patient satisfaction (Doran, 2010). More research is needed to identify the full range of outcomes achievable through CNL implementation and the mechanisms by which CNL-mediated processes affect outcomes.

Conclusions

In their 2010 report, *The Future of Nursing*, the IOM concluded that the nursing profession needs to reconceptualize nursing practice to focus more on care coordination, health coaching, and system innovation to meet higher standards for quality care. The IOM highlights the CNL role as an innovative strategy for restructuring care delivery structures and services to improve care quality. Clinical nurse leaders are educated to be agents of change, practicing where most decisions about patient care are made and helping to assist the entire healthcare team in transforming their practice from fragmented, discipline-focused care to collaborative, patient-centered care. The CNL is a new nursing role, and although it has been piloted successfully in numerous healthcare organizations, with numerous reports of improved quality care outcomes, it remains untested in many ways. This study has added to the CNL evidence base by providing empirical evidence of a positive, sustained correlation between CNL-mediated processes and quality patient outcomes.

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