



# Clinical Nurse Leader Impact on Clinical Microsystems Outcomes

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The clinical nurse leader (CNL) role is being rapidly implemented in healthcare settings. A major component of the CNL role is to provide a leader at the center of the microsystem to promote quality outcomes. To examine the impact of CNLs at the Department of Veterans Affairs Tennessee Valley Healthcare System, outcomes from 5 diverse microsystems were evaluated before and after CNL implementation using electronic scheduling system reports, patient medical records, and quality improvement reports. Statistically significant improvements were found in all 5 of the indicators evaluated. The authors discuss the implications of improvement for clinical, satisfaction, and financial performance.

The clinical nurse leader (CNL) role was introduced in 2004 by the American Association of Colleges of Nursing and by nurse leaders from education and practice. The role was developed in recognition of the need for an advanced nurse generalist educated at the master's degree level to provide high-quality, effective, and safe nursing care in complex healthcare environments.<sup>1</sup> Included in the CNL skill set are lateral integration of care services, outcome-based decision making, and implementation of evidence-based strategies to improve

performance within the microsystem or front line of care.<sup>2</sup>

Senior nursing leadership from the Tennessee Valley Healthcare System (TVHS) and senior nursing administrators from the Department of Veterans Affairs (VA) have been involved in the implementation of the CNL role since its inception in 2004. Members of the TVHS nursing executive team led the national pilot evaluation of the impact of the CNL role on 4 domains: financial, patient satisfaction, quality/internal processes, and innovation.<sup>3</sup> Evaluation measures included microsystem performance metrics such as inpatient readmission rates, nursing hours per patient day, length of stay, discharge instructions for patients with congestive heart failure, patient falls, hospital-acquired pressure ulcers, surgical infection rate, and ventilator-associated pneumonia. Improvement was found for all of the indicators except for ventilator-associated pneumonia. The information presented here extends the TVHS pilot evaluation by focusing on microsystem outcomes directly related to CNL improvement efforts.

## Methodology

In the summer of 2007, a retrospective review of quality microsystem data was used to examine the impact of CNL improvement interventions on patient and institutional outcomes. Five microsystems that implemented the CNL role between 2004 and 2006 were evaluated. For the purpose of this article, only one clinically relevant performance measure was reported for each microsystem. Four CNLs were responsible for outcome data; 1 CNL practiced on 2 units at separate times during the study period.

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All CNLs had master of science in nursing degrees, were experienced in conducting quality improvement projects, and had successfully passed the CNL certification examination.<sup>4</sup>

Outcome measures included indicators that were directly impacted by CNL-led improvement efforts and that were sensitive enough to measure short-term change. Patient satisfaction data were not analyzed because the organization was transitioning to a new survey method during the study period.

### **Microsystem Description**

#### ***Ambulatory Surgery Unit***

This microsystem provides care for all patients scheduled for outpatient surgery. Approximately 350 patients are treated in this unit each month. The quality outcome measure used to evaluate CNL impact was the rate of surgical cancellations for any reason within 24 hours of scheduled appointment time.

#### ***Surgical Inpatient Unit***

This 32-bed microsystem provides care for patients after major surgery, including orthopedics, thoracic, vascular, and abdominal surgery. The quality outcome measured to evaluate CNL impact was the number of surgical patients after a total knee arthroplasty (TKA) receiving a blood transfusion during the inpatient postoperative period.

#### ***Gastrointestinal Laboratory***

This microsystem provides care for patients undergoing gastrointestinal (GI) invasive testing. Approximately 375 patients are treated each month; most patients receive outpatient services. The quality outcome measure used to evaluate CNL impact was the rate of missed opportunities for service or cancellation rate. Missed opportunities for service as defined by the VA is the number of cases that are cancelled because (a) the patient fails to show up for the procedure (no shows) or (b) the appointment is cancelled by the patient or clinic after appointment date and time.

#### ***Surgical Intensive Care Unit***

This 12-bed microsystem cares for postsurgical patients requiring acute monitoring after cardiovascular, thoracic, or large abdominal surgery. Postsurgical patients with multiple comorbidities are also treated in this unit. The quality outcome measure used to evaluate CNL impact was the percentage of patients who were intubated with an endotracheal tube who received venous thromboembolism (VTE) prophylaxis.

#### ***Transitional Care Unit***

This 60-bed microsystem cares for patients requiring physical rehabilitation or long-term care services. Residents of this microsystem have complex medical conditions but do not require acute care services; their individualized treatment plans are aimed at maintaining and/or restoring quality of life and activities of daily living. The quality outcome measure used to evaluate CNL impact was the percentage of residents participating in the restorative dining program (RDP).

### **Procedure**

Quality outcome data were obtained 3 months before CNL role implementation through July 2007. Clinical nurse leader role implementation ranges between 2004 and 2006; subsequently, evaluation intervals vary among microsystems. Data points include pre-CNL and post-CNL implementation. Pre-CNL is defined as 3 months before and 3 months after CNL implementation. Post-CNL is defined as greater than 3 months of implementation. For this study, the post implementation range was 7 to 31 months.

Data collection points were based on John Kotter's change theory.<sup>5</sup> Kotter's theory postulates that change does not occur without adequate time placed on establishing a sense of urgency, creating the guiding coalition, developing a vision, and communicating the vision. These 4 steps in the change process are necessary to assist employees in recognizing the need for change and embracing the process. To allow time for the CNL to enact the 4 steps and for the employees to embrace the change, outcome data for the 3 months post-CNL implementation were included in the pre-CNL analysis.

Multiple data sources were used to obtain quality data. Data for surgery cancellation rates and GI laboratory missed opportunities were obtained from reports generated by the electronic scheduling systems. The TKA blood administration data were obtained through a review of patient medical records by the CNL. The data on VTE prophylaxis for intubated patients were obtained from monthly performance measure reports generated by the quality department. The number of patients participating in restorative dining was obtained from transitional care unit performance score cards.

Statistical analysis was conducted using SPSS software (SPSS Inc, Chicago, Illinois). One-tailed  $\chi^2$  test of independence at the 0.05 level of significance was used to determine differences between data points. Institutional review board approvals from the TVHS system and the University of

Tennessee Health Science Center in Memphis were obtained before initiating the study.

## Results

### Ambulatory Surgery Unit

A total of 2,238 patients were scheduled for surgery during the pre-CNL time period; 301 (13.4%) patient surgeries were cancelled within 24 hours of the scheduled appointment time. After CNL implementation, or 8 months after institution of CNL role and implementation of presurgical telephone assessment, a total of 2,689 patients were scheduled for surgery; 308 (11.5%) patient surgeries were cancelled within 24 hours of scheduled appointment time. This difference between pre-CNL and post-CNL implementation outcomes represents nearly a 2% decrease in surgery cancellation rate ( $P = .034$ ). Results for the ambulatory surgery unit, along with findings from the other 4 microsystems, are found in Table 1.

### Surgical Inpatient Unit

A total of 46 patients underwent TKA during the pre-CNL time period; 23 (50%) patients received at least one blood transfusion during the inpatient postoperative period. After CNL implementation, or 21 months after implementation of CNL role and TKA transfusion protocol, a total of 128 patients underwent TKA; 39 (30.5%) patients received a blood transfusion during the inpatient postoperative period. This difference between pre-CNL and post-CNL implementation outcomes represents a 20% decrease in number of patients receiving blood transfusions ( $P = .018$ ).

### GI Laboratory

A total of 2,366 patients were scheduled for a procedure in the GI laboratory during the pre-CNL

time period; 740 (30%) were missed opportunities. After CNL implementation, or 31 months after initiation of CNL role and implementation of scheduling grids, same-day appointments, and laboratory structural changes, a total of 11,821 patients were scheduled for a procedure in the GI laboratory; 2,359 (20%) were missed opportunities. This difference between pre-CNL and post-CNL implementation outcomes represents a 10% decrease in the rate of missed opportunities ( $P = <.001$ ).

### Surgical Intensive Care Unit

A total of 365 patients were intubated with an endotracheal tube in the surgical intensive care unit during the pre-CNL implementation; 223 (61.1%) received a VTE prophylaxis intervention. After CNL implementation, or 7 months after CNL role implementation and initiation of a VTE prophylaxis monitoring tool, a total of 331 patients were intubated with an endotracheal tube; 297 (89.7%) received VTE prophylaxis intervention. The difference between pre-CNL and post-CNL implementation outcomes represents a 28.6% increase in VTE prophylaxis implementation for critically ill, intubated patients ( $P = <.001$ ).

### Transitional Care Unit

A total of 308 TCU residents were clinically appropriate for restorative dining during the pre-CNL time period; resident participation was 21.8% ( $n = 67$ ). After CNL implementation, or 11 months after implementation of CNL role and RDP redesign, 487 TCU residents were clinically appropriate for the program; resident participation increased to 28.7% ( $n = 140$ ). This difference between pre-CNL and post-CNL implementation outcomes represents nearly an 8% increase in participation ( $P = .029$ ).

**Table 1.** Clinical Nurse Leader (CNL)-Led Project Outcomes: Comparisons of Preimprovement and Postimprovement Intervention

Microsystem	Outcome Measure	Interval, mo	Pre-CNL Implementation, % (n)	Post-CNL Implementation, % (n)	$\chi^2$ <sup>a</sup>
Ambulatory surgery	Patient cancellation rate	8	13.4 (301)	11.5 (308)	0.034
Surgical inpatient	Total knee arthroplasty patient transfusion	21	50.0 (23)	30.5 (39)	0.018
Gastrointestinal laboratory	Missed opportunities	31	30.0 (740)	20.0 (2359)	<0.001
Surgical intensive care	Venous thromboembolism prophylaxis	7	61.1 (223)	89.7 (297)	<0.001
Transitional care	Dining program participation	11	21.8 (67)	28.7 (140)	0.029

<sup>a</sup>At 0.05 level of significance.

## Discussion

Improvement in quality outcome data was found in all microsystems. Statistically significant differences were found for all 5 indicators.

### Ambulatory Surgery Unit

Data suggest that the CNL role significantly impacted quality for the ambulatory surgery unit microsystem through fewer patient surgical cancellations. One strategy implemented by the CNL to reduce surgical cancellations was a presurgical telephone assessment that included a brief medical history, listing of medications and supplements, presurgical instructions, and verification of surgery time. These findings have positive implications for clinical, satisfaction, and financial performance. Clinically, surgical delays can result in interruption of medical treatment. Moderate delays in most elective surgery are unlikely to result in patient harm; however, surgical delays for patients undergoing hip replacement, cataract surgery, cystectomy for bladder cancer, and surgery for symptomatic biliary disease have shown negative outcomes.<sup>6-9</sup> Surgery cancellations also increase patient wait time and negatively affect patient satisfaction.<sup>10</sup>

Financially, surgical cancellations result in supply waste and underutilization of available personnel due to unused operating room time.<sup>11,12</sup> The estimated cost of a surgical minute is \$10 per minute<sup>11</sup>; subsequently, a 2% reduction in cancellation rates for a single operating room could impact the facility by approximately \$23,500 per year (480 minutes [8-hour day × 60 minutes] × 0.02 × 245 days [5 days per week × 52 weeks minus holidays] × \$10). Although the CNL was successful in reducing the cancellation rate by 2%, further improvements are needed to achieve the gold standard of less than 5% cancellation rate.<sup>13</sup>

### Surgical Inpatient Unit

Data suggest that the CNL positively impacted surgical inpatient unit quality by significantly reducing patient blood transfusions after TKA surgery. This was accomplished through collaboration between the CNL and the orthopedic surgeons in implementing a post-TKA transfusion protocol. Implications of this finding relate to better clinical and financial performance. Clinically, fewer transfusions reduce the risk of adverse patient events such as infectious disease transmission risk, immunomodulation, and transfusion reactions.<sup>14</sup> This includes transfusion of allogeneic blood, which is linked to higher incidences of postoperative infections.<sup>14</sup> Financially, fewer trans-

fusions reduce the risk of adverse patient events and increased related costs. A recent study by Husted et al<sup>15</sup> found a statistically significant ( $P = .001$ ) correlation between blood transfusions and increased length of stay after hip or knee replacement. In addition, the cost of a unit of blood<sup>16</sup> (red blood cells) ranges from \$100 to \$160. Subsequently, a 20% reduction of blood transfusions not only decreases institutional cost for the blood products but also decreases nursing and laboratory personnel time in safe handling and administration of blood.

### GI Laboratory

Data suggest that the CNL positively impacted GI laboratory quality by reducing patient cancellations by 17%. The reduction of patient cancellations was achieved through an interdisciplinary approach with multiple components. A few of the changes were developing scheduling grids to reduce appointment types, coordinating all of patient's healthcare appointments within the facility for the same day, revising educational materials, and expanding the laboratory to include a preparation station and recovery area. Reducing patient cancellations can be linked to improvement in clinical and financial performance. Clinically, delays in diagnostic evaluation of a patient can cause delays in diagnosis and treatment; they are also known patient dissatisfiers. Financially, procedural missed opportunities increase both fixed and variable costs. A study conducted at a university hospital and TVHS in 2002 on the cost of scheduling colonoscopy found the fixed cost to be \$42.73 per case, not including another \$10.82 per minute for personnel.<sup>17</sup> Information is not available for other types of cases, but the fixed cost should be approximately the same depending upon the length of the procedure, and cost per personnel should be similar. Reducing the percentage of cancellations from 30% in 2004 to 13% in 2007 resulted in increased efficiency and cost savings for the institution.

### Surgical Intensive Care Unit

Data suggest that the CNL positively impacted the surgical intensive care unit quality by significantly increasing VTE prophylaxis interventions for intubated patients. The CNL achieved these results by working with a multidisciplinary team to develop and implement a monitoring tool for VTE prophylaxis. Both the clinical and financial implications are substantial. Clinically, VTE prophylaxis is one of the 4 strategies in the Institutes for Healthcare Improvement campaign for protecting patients on mechanical ventilation and recommended by

American College of Chest Physicians for patients admitted to a critical care unit.<sup>18,19</sup> Venous thromboembolism is the second most common medical complication and the third most common cause of excess mortality for patients in an acute care facility.<sup>19</sup> Pulmonary embolism, a component of VTE, is considered the leading cause of preventable deaths in the acute care setting.<sup>19</sup> The risk of VTE among critically ill patients ranges from 10 to 80%.<sup>19</sup> From a financial prospective, risk reduction for VTE through prophylaxis measures results in significant savings in cost and efficiency. A retrospective review of the nationwide inpatient administrative data from 1998 to 2001 identified substantial increases in both inpatient cost (14%) and length of stay (68%) for patients with VTE.<sup>20</sup>

### Transitional Care Unit

Data suggest that the CNL positively impacted transitional care unit (TCU) quality by increasing the percentage of residents participating in the RDP. This was accomplished through the CNL's collaboration with the rehabilitation team to clearly define resident criteria and identify strategies to ensure resident attendance.

The RDP for the TCU is part of a national VA initiative to assist veterans in attaining and maintaining the highest practical ability in dining skills. The goal of the program is to improve the patient's skills and independence in eating while maintaining a therapeutic level of nutritional intake.<sup>21</sup> Malnutrition and dehydration are common problems for patients in long-term care facilities and can lead to patient complications such as pneumonia, increased infections, electrolyte imbalances, and increased risk for pressure ulcers.<sup>21</sup> Any of these conditions typically result in transfers to an acute care facility, resulting in increased cost. A recent study found that transferring a patient with nursing-home-acquired pneumonia to an acute

care institution costs \$1,000 per day or \$10,000 per acute care admission.<sup>22</sup> In addition to improving the patient's skills in eating, the RDP is designed to provide a pleasant, nurturing environment that enhances the patient's dignity and socialization.<sup>21</sup> Subsequently, it is likely that this improvement intervention would also have a positive impact on patient and family satisfaction.

A limitation to the study is the small number of indicators analyzed. As the CNL role is implemented in healthcare sites across the nation, additional studies are needed to further evaluate the role's impact on clinical microsystem outcomes.

### Conclusion

Evaluation of the selected quality indicators suggests that CNL interventions significantly improved microsystem outcomes at TVHS. All 5 of the quality measures demonstrated significant improvement after implementation of CNL-led performance improvement projects. This study extends the finding from the initial pilot by the TVHS executive nursing team that found improvement in microsystem performance after implementation of the CNL role. Together, the 2 studies strongly suggest that the CNL role and performance positively impact clinical, patient satisfaction, and financial outcomes. Data support the CNL role as a major force in organizing the efforts of the clinical microsystem to improve outcomes with sustained performance over time.

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### References

1. American Association of Colleges of Nursing. White papers on education and role of the clinical nurse leader. 2007. Available at [http://www.aacn.nche.edu/Publications/White\\_Papers/CNL-07.pdf](http://www.aacn.nche.edu/Publications/White_Papers/CNL-07.pdf). Accessed October 29, 2008.
2. American Association of Colleges of Nursing. Guiding principles for the partnership model. 2004. Available at <http://www.aacn.nche.edu/CNL/ImplementationConf/guidingprinciples6-04.doc>. Accessed October 29, 2008.
3. Harris JL, Walters S, Quinn C, Stanley J, McGuinn K. The clinical nurse leader role: a pilot evaluation by an early adopter. Available at <http://www.aacn.nche.edu?CNL/pdf/tk/VAEvalSynopsis.pdf>. Accessed October 29, 2008.
4. American Association of Colleges of Nursing. CNL certification. 2007. Available at <http://www.aacn.nche.edu/CNL/pdf/Directory.pdf>. Accessed October 29, 2008.
5. Kotter JP. *Leading Change*. Boston, MA: Harvard Business School Press; 1996.
6. Garbuz DS, Xu M, Duncan CP, Masri BA, Sobolev B. Delays worsen quality of life outcomes of primary total hip arthroplasty. *Clin Orthop*. 2006;447:79-84.
7. Conner-Spady B, Sanmartin C, Sanmugasunderam S, et al. A systematic literature review of the evidence on benchmarks for cataract surgery waiting time. *Can J Ophthalmol*. 2007; 42(4):543-551.
8. Sanchez-Ortiz RF, Huang WC, Mick R, Van Arsdalen KN, Wein AJ, Malkowicz SB. An interval longer than 12 weeks

- between the diagnosis of muscle invasion and cystectomy is associated with worse outcome in bladder carcinoma. *J Urol*. 2003;169(1):110-115.
9. Ruthledge D, Jones D, Rege R. Consequences of delay in surgical treatment of biliary disease. *Am J Surg*. 2000;180(6):466-469.
  10. Kengay J, Berwick DM, Shore MF. Service quality in health care. *JAMA*. 1999;281(7):661-665.
  11. Ferischi MB, Avery T, Sweitzer BJ, Huo D, Glick DB. Preoperative clinic visits reduce operating room cancellations and delays. *Anesthesiology*. 2005;103(4):855-859.
  12. St. Jacques P, Higgins MS. Beyond cancellations: decreased day of surgery delays from a dedicated preoperative clinic may provide cost savings. *J Clin Anesth*. 2004;16(6):478-479.
  13. Macario A. Are your hospital operating rooms "efficient"? A scoring system with eight performance indicators. *Anesthesiology*. 2006;105(2):370-380.
  14. Lai B. Transfusion medicine: the base and the future. *Sci Creat Q*. 2007;3:728-734.
  15. Husted H, Holm G, Jacobsen S. Predictors of length of stay and patient satisfaction after hip and knee replacement surgery: fast-track experience in 712 patients. *Acta Orthop*. 2008;79(2):168-173.
  16. Colman N, Friedman M. Blood basics: the blood supply. Red gold. 2002. Available at <http://www.pbs.org/wnet/redgold/basics/bloodcollection.html>. Accessed October 29, 2008.
  17. Henry SG, Ness RM, Stiles RA, Shintani AK, Dittus RS. A cost analysis of colonoscopy using microcosting and time-and-motion techniques. *J Gen Intern Med*. 2007;22(10):1415-1421.
  18. Institute of Healthcare Improvement. Protecting 5 million lives from harm. Available at <http://www.ihl.org/IHI/Programs/Campaign>. Accessed October 29, 2008.
  19. Geerts WH, Bergqvist D, Pineo GF, et al. Prevention of venous thromboembolism: American College of Chest Physicians Evidence-based Clinical Practice Guidelines 8th Edition. *Chest*. 2008;133:381S-453S.
  20. Henke P, Froelich J, Upchurch G, Wakefield T. The significant negative impact of in-hospital venous thromboembolism after cardiovascular procedures. *Ann Vasc Surg*. 2007;21(5):545-550.
  21. Department of Veterans Affairs. *Center for Restorative and Transitional Care: Excellence in Care Restorative Dining Program*. 2002.
  22. Dosa D. Should I hospitalize my resident with nursing home-acquired pneumonia? *JAMDA*. 2006;7(3 suppl):S74-S80.

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