

INTRODUCTION

Unsustainable growth in health care spending is driving the need to transform the current system of specialty-driven, provider-centric, fragmented care to one that produces patient-centered, coordinated care across the healthcare delivery system. Transforming healthcare requires fundamental change at the front-line of care where healthcare providers and patients interact.¹ Front-line units, known as clinical microsystems (e.g., nursing unit, primary care clinic), are the building blocks of the larger macrosystem (e.g., hospital or integrated delivery system). Theoretically, a macrosystem is only as good as its supporting microsystems.^{2,3} The clinical microsystems development methodology, created by researchers at Dartmouth, is an evidence-based strategy designed to teach an interprofessional group of people taking care of a group of patients how to work together to improve their workplace and the care they deliver.⁴ Based on Quinn's⁵ idea that front-line activity between an organization and its clients is the "smallest replicable unit" to effectuate change, clinical microsystems development is a journey not a destination.

This annotated bibliography, built from a systematic review of the literature, provides a roadmap for understanding not only the science of clinical microsystems but how microsystem journeys enable frontline staff, managers, and organizational leaders to develop self-awareness of how their respective processes and patterns of behavior contribute or impede high-performance. The articles provide a rich source of insight and lessons learned from those who have embarked on microsystems development; as articulated by Paul Batalden, "Each system is perfectly designed to get the results it gets."⁶ Enjoy the journey. Deborah Kendall-Gallagher, RN, JD, PhD (16Jan2012)

CLINICAL MICROSYSTEMS ANNOTATED BIBLIOGRAPHY

Batalden, P.B., Nelson, E.C., Edwards, W.H., Godfrey, M.M., & Mohr, J.J. (2003). Microsystems in health care: Part 9. Developing small clinical units to attain peak performance. *Joint Commission Journal on Quality and Safety*, 29(11), 575-585. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>.

Annotation: In the ninth article of a 9-part series, the authors paint a picture of how developing peak performance at the microsystem level ultimately drives peak performance at the macrosystem level.

Published Abstract:

BACKGROUND: This last Microsystems in Health Care series article focuses on what it takes, in the short term and long term, for clinical microsystems--the small, functional, front-line units that provide the most health care to the most people--to attain peak performance. **CASE STUDY:** A case study featuring the intensive care nursery at Dartmouth-Hitchcock Medical Center illustrates the 10-year evolution of a clinical microsystem. Related evolutionary principles begin with the intention to

excel, involve all the players, use measurement and feedback, and create a learning system. **DISCUSSION:** A microsystem's typical developmental journey toward excellence entails five stages of growth--awareness as an interdependent group with the capacity to make changes, connecting routine daily work to the high purpose of benefiting patients, responding successfully to strategic challenges, measuring the microsystem's performance as a system, and juggling improvements while taking care of patients. **A MODEL CURRICULUM:** Health system leaders can sponsor an action-learning program to catalyze development of clinical microsystems. A "green-belt curriculum" can help clinical staff members acquire the fundamental knowledge and skills that they will need to master if they are to increase their capacity to attain higher levels of performance; uses action-learning theory and sound education principles to provide the opportunity to learn, test, and gain some degree of mastery; and involves people in the challenging real work of improving.

Batalden, P.B., Nelson, E.C., Mohr, J.J., Godfrey, M.M., Huber, T.P., Kosnik, L., & Ashling, K. (2003). Microsystems in health care: Part 5. How leaders are leading. *Joint Commission Journal on Quality and Safety*, 29(6), 297-308. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>.

Annotation: In the fifth article of a 9-part series, the authors use quotes from study participants to identify leadership behaviors and capture how leaders of high-performing health systems articulate and facilitate knowledge building within clinical microsystems.

Published Abstract

BACKGROUND: Leading and leadership by formal and informal leaders goes on at all levels of microsystems--the essential building blocks of all health systems--and between them. It goes on between microsystems and other levels of the systems in health care. This series on high-performing clinical microsystems is based on interviews and site visits to 20 clinical microsystems in the United States. This fifth article in the series describes how leaders contribute to the performance of those microsystems. **ANALYSIS OF INTERVIEWS:** Interviews of leaders and staff members offer a rich understanding of the three core processes of leading. Building knowledge requires many behaviors of leaders and has many manifestations as leaders seek to build knowledge about the structure, processes, and patterns of work in their clinical microsystems. Taking action covers many different behaviors—making things happen, executing plans, making good on intentions. It focuses action on the way people are hired and developed and involves the way the work gets done. Reviewing and reflecting provides insight as to how the microsystem's patterns, processes, and structure enable the desired work to get done; what success looks like; and what will be next after that "success" is created. **CONCLUSION:** The focus on the processes of leading is intended to enable more people to develop into leaders and more people to share the roles of leading.

Bates, P., Mendel, P., & Robert, G. (2008). *Organizing for quality: The improvement journeys of leading hospitals in Europe and the United States.* Oxford, U.K.: Radcliffe Publishing.

Annotation: Using a grounded theory approach, Bate et al. (2008) conducted an in-depth exploration of "why" and "how" high-performing clinical microsystems achieve their results. The authors focus on discovering the underlying human and organizational dynamics that influence the efficiency and effectiveness of quality improvement efforts.

Berry, S.A., Doll, M.C., McKinley, K.E., Casale, A.S., & Bothe, A., Jr. (2009). ProvenCare: Quality improvement model for designing highly reliable care in cardiac surgery. *Quality & Safety in Health Care*, 18(5), 360-368. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>

Annotation: Berry and colleagues (2009) provide a detailed description of how microsystems thinking can guide development of complex system redesigns that produce reliable and demonstrable improvements in patient outcomes and reduce readmissions.

Published Abstract

OBJECTIVE: To test whether an integrated delivery system could, through the application of process redesign methodology and reliability science, implement multiple evidence-based medical practices across the continuum of care for a specific surgical intervention and deliver these practices consistently. **METHODS:** The programme-ProvenCare--had three components: establishing best practices for elective coronary artery bypass graft (CABG) patients; assembling a multidisciplinary team to "hardwire" these best practices into everyday workflow; and implementing the programme with real-time data collection, feedback and focused redesign to reach high reliability. Surgeons reviewed all class I and IIa 2004 ACC/AHA guidelines for CABG surgery and translated them into 19 clinically applicable recommendations. A frontline multidisciplinary team "hardwired" these, resulting in 40 measurable process elements. Feedback of gaps in care was given and the process redesigned as needed. Clinical outcome data on consecutive elective CABG patients seen in the 12 months pre-intervention were then compared with a post-intervention group. **RESULTS:** Initially, 59% of patients received all 40 elements. At 3 months, compliance reached 100%, fell transiently to 86% and then reached 100% again, and was sustained for the remainder of the study. The overall trend in reliability was significant ($p = 0.001$). 30-day clinical outcomes showed improved trends in 8/9 measured areas (eg, patient readmissions to ICU decreased from 2.9% to 0.9% and blood products usage decreased from 23.4% to 16.2%). Operative mortality decreased to zero, but only likelihood of discharge was significant ($p = 0.033$). Frequency and length of readmissions fell, as did mean hospital charges. **CONCLUSION:** Frontline medical care providers, led by process

design specialists, can successfully redesign episodic processes to consistently deliver evidence-based medicine, which may improve patient outcomes and reduce resource use.

Berry, S.A., Laam, L.A., Wary, A.A., Mateer, H.O., Cassagnol, H.P., McKinley, K.E. & Nolan, R.A. (2011). ProvenCare Perinatal: A model for delivering evidence/guideline-based care for perinatal populations. *Joint Commission Journal on Quality and Patient Safety*, 37(5), 229-239.

Annotation: Berry et al. (2010) discusses how an integrated delivery system utilized a microsystem-informed model to redesign care to several service lines to improve workflow and patient outcomes.

Published Abstract

Background: Geisinger Health System (GHS) has applied its ProvenCare model to demonstrate that a large integrated health care delivery system, enabled by an electronic health record (EHR), could reengineer a complicated clinical process, reduce unwarranted variation, and provide evidence-based care for patients with a specified clinical condition. In 2007 GHS began to apply the model to a more complicated, longer-term condition of wellness--perinatal care. Adapting ProvenCare to Perinatal Care: The ProvenCare Perinatal initiative was more complex than the five previous ProvenCare endeavors in terms of breadth, scope, and duration. Each of the 22 sites created a process flow map to depict the current, real-time process at each location. The local practice site providers, physicians and mid-level practitioners reached consensus on 103 unique best practice measures (BPMs), which would be tracked for every patient. These maps were then used to create a single standardized pathway that included the BPMs but also preserved some unique care offerings that reflected the needs of the local context. Results: A nine-phase methodology, expanded from the previous six-phase model, was implemented on schedule. Pre- to post-implementation improvement occurred for all seven BPMs or BPM bundles that were considered the most clinically relevant, with five statistically significant. In addition, the rate of primary cesarean sections decreased by 32%, and birth trauma remained unchanged as the number of vaginal births increased. Conclusions: Preliminary experience suggests that integrating evidence/guideline-based best practices into work flows in inpatient and outpatient settings can achieve improvements in daily patient care processes and outcomes.

Britton, L.J., Thrasher, S., & Gutierrez, H. (2008). Creating a culture of improvement: Experience of a pediatric cystic fibrosis center. *Journal of Nursing Care Quality*, 23(2), 115-120; quiz 121-112.

Annotation: Britton and colleagues (2007) describe the Center's three year clinical microsystem development journey, inclusive of lessons learned, that resulted in significant improvement in patient outcomes.

Published Abstract

Quality improvement (QI) efforts at the University of Alabama at Birmingham/Children's Hospital Cystic Fibrosis Center began in the spring of 2004, with a collaborative sponsored by the Cystic Fibrosis Foundation. As the authors gained experience with QI processes, significant system changes ensued. In this article, we describe how the center created a culture of improvement that has resulted in significant improvements in clinical outcomes in our patient population.

Foster, T.C., Johnson, T.C., Nelson, E.C., & Batalden, P.B. (2007). Using a Malcolm Baldrige framework to understand high-performing clinical microsystems. *Quality & Safety in Health Care*, 16(5), 334-341. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/17913773>

Annotation: Foster et al. (2007) provides a detailed discussion of the alignment between different sets of characteristics used to measure success of high-performing health systems

Published Abstract

BACKGROUND, OBJECTIVES AND METHOD: The Malcolm Baldrige National Quality Award (MBNQA) provides a set of criteria for organisational quality assessment and improvement that has been used by thousands of business, healthcare and educational organisations for more than a decade. The criteria can be used as a tool for self-evaluation, and are widely recognised as a robust framework for design and evaluation of healthcare systems. The clinical microsystem, as an organisational construct, is a systems approach for providing clinical care based on theories from organisational development, leadership and improvement. This study compared the MBNQA criteria for healthcare and the success factors of high-performing clinical microsystems to (1) determine whether microsystem success characteristics cover the same range of issues addressed by the Baldrige criteria and (2) examine whether this comparison might better inform our understanding of either framework. **RESULTS AND CONCLUSIONS:** Both Baldrige criteria and microsystem success characteristics cover a wide range of areas crucial to high performance. Those particularly called out by this analysis are organisational leadership, work systems and service processes from a Baldrige standpoint, and leadership, performance results, process improvement, and information and information technology from the microsystem success

characteristics view. Although in many cases the relationship between Baldrige criteria and microsystem success characteristics are obvious, in others the analysis points to ways in which the Baldrige criteria might be better understood and worked with by a microsystem through the design of work systems and a deep understanding of processes. Several tools are available for those who wish to engage in self-assessment based on MBNQA criteria and microsystem characteristics.

Godfrey, M.M., Melin, C.N., Muething, S.E., Batalden, P.B. & Nelson, E.C. (2008). Clinical microsystems, Part 3. Transformation of two hospitals using microsystem, mesosystem, and macrosystem strategies. *Joint Commission Journal on Quality & Patient Safety*, 34(10), 591-603. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>

Annotation: In the third article of a 4-part series, Godfrey and colleagues (2008) contrasted microsystem development journeys of a large academic medical center and a rural community hospital to demonstrate how hospitals can apply microsystems thinking to transform healthcare delivery.

Published Abstract

BACKGROUND: Two hospitals—a large, urban academic medical center and a rural, community hospital—have each chosen a similar microsystem-based approach to improvement, customizing the engagement of the micro-, meso-, and macrosystems and the improvement targets on the basis of an understanding of the local context. **CINCINNATI CHILDREN'S HOSPITAL MEDICAL CENTER (CCHMC):** Since 2004, strategic changes have been developed to support microsystems and their leaders through (1) ongoing improvement training for all macro-, meso-, and microsystem leaders; (2) financial support for physicians who are serving as co-leaders of clinical microsystems; (3) increased emphasis on aligning academic pursuits with improvement work at the clinical front lines; (4) microsystem leaders' continuous access to unit-level data through the organization's intranet; and (5) encouragement of unit leaders to share outcomes data with families. **COOLEY DICKINSON HOSPITAL (CDH):** CDH has moved from near closure to a survival-turnaround focus, significant engagement in quality and finally, a complete reframing of a quality focus in 2004. Since then, it has deployed the clinical microsystems approach in one pilot care unit (West 2, a medical surgery unit), broadened it to two, then six more, and is now spreading it organizationwide. In "2+2 Charters," interdisciplinary teams address two strategic goals set by senior leadership and two goals set by frontline microsystem leaders and staff **DISCUSSION:** CCHMC and CDH have had a clear focus on developing alignment, capability, and accountability to fuse together the work at all levels of the hospital, unifying the macrosystem with the mesosystem and microsystem. Their improvement experience suggests tips and actions at all levels of the organization that could be adapted with specific context knowledge by others.

Godfrey, M.M., Nelson, E.C., Wasson, J.H., Mohr, J.J., & Batalden, P.B. (2003). Microsystems in health care: Part 3. Planning patient-centered services. *Joint Commission Journal on Quality & Safety*, 29(4), 159-170. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>

Annotation: The third article in a 9-part series, Godfrey et al. (2003) demonstrates how knowing or "becoming self-aware" of your practice through targeted collection and synthesis of data concerning the four P's (patients, people, processes, and patients) can guide and enhance the planning of patient-centered services.

Published Abstract

BACKGROUND: Strategic focus on the clinical microsystems--the small, functional, frontline units that provide most health care to most people--is essential to designing the most efficient, population-based services. The starting place for designing or redesigning of clinical microsystems is to evaluate the four P's: the patient subpopulations that are served by the microsystem, the people who work together in the microsystem, the processes the microsystem uses to provide services, and the patterns that characterize the microsystem's functioning. **GETTING STARTED: DIAGNOSING AND TREATING A CLINICAL MICROSYSTEM:** Methods and tools have been developed for microsystem leaders and staff to use to evaluate the four P's--to assess their microsystem and design tests of change for improvement and innovation. **PUTTING IT ALL TOGETHER:** Based on its assessment--or diagnosis--a microsystem can help itself improve the things that need to be done better. Planning services is designed to decrease unnecessary variation, facilitate informed decision making, promote efficiency by continuously removing waste and rework, create processes and systems that support staff, and design smooth, effective, and safe patient care services that lead to measurably improved patient outcomes. **CONCLUSION:** The design of services leads to critical analysis of the resources needed for the right person to deliver the right care, in the right way, at the right time.

Gray, M. (2007). Clinical microsystems and mesosystems in mental health. *Nursing Times* 103(31): 30-31. Retrieved from <http://www.nursingtimes.net/nursing-practice-clinical-research/using-clinical-microsystems-and-mesosystems-in-mental-health/200170.article>

Annotation: Gray (2007) describes how application of clinical microsystems concepts and tools across diverse mental health teams led to increased self-awareness regarding patterns of practice within, and between, teams that influenced patient satisfaction and workflow efficiency.

Published Abstract

This article looks at the service improvement work by Mike Gray and Mike Gill of the modernisation team, Humber Mental Health Teaching NHS Trust. It argues that clinical microsystems (see Background Box) are an effective method for working

with frontline teams in mental health. Clinical microsystems have similarities with brief therapy. The same approach can be taken at the mesosystem level. Clinical microsystems are different from mesosystems, which leads to tension. The mesosystem acts as a mediator between clinical microsystems and the wider NHS, and an understanding of both can be obtained by taking a clinical microsystems approach at both levels.

Higgins, J. & Cole-Poklewski, T. (2010). Case management reform: An illustrative study of one hospital's experience. *Professional Case Management* 15(2):79-89.

Annotation: Higgins and Cole-Poklewski (2010) used clinical microsystems theory, among others, to guide long-term improvements in a case management department to improve efficiency and effectiveness of services.

Published Abstract

PRIMARY PRACTICE SETTINGS: This study describes reform of the case management department at Cooley Dickinson Hospital, a small community hospital in Western Massachusetts. **METHODOLOGY AND SAMPLE:** Based on Microsystems and Care Transition theory, the study is designed to answer 2 primary research questions: (1) What is study participants' perceived value of the recent departmental changes? and (2) What effect have the changes had on participants' work experience? A sample of case management department staff members and several other hospital staff members were interviewed near the end of the 18-month reform process, in March 2009. **RESULTS:** Results of these interviews indicate that despite a department-wide reduction in force in November 2008, case management productivity levels have increased and satisfaction levels remain strong. It is strongly believed by study observers that because the changes used proven theories, the efficiencies and satisfaction that were realized can be duplicated in other settings. **IMPLICATIONS FOR CASE MANAGEMENT PRACTICE AND RESEARCH:** Findings have practical implications for the use of a model similar to the Congestive Heart Failure program model to improve care transitions across multiple sites through a patient-centered team approach. In particular, findings underscore the importance of improved use of information technologies for a more efficient transmission of information to postacute providers and the use of follow-up telephone calls. Another practical implication is the benefit of education of hospital staff about the impact the case management department has on the hospital as a whole. Improved education of hospitalists, specifically, has resulted in earlier communication on the nursing units and more efficient discharge processes. There are also implications for research, such as the need for further research on the effects of patient-centered care for reducing readmission and on the definition and treatment of complex cases across hospital units.

Huber, T.P., Godfrey, M.M., Nelson, E.C., Mohr, J.J., Campbell, C., & Batalden, P.B. (2003). Microsystems in health care: Part 8. Developing people and improving work life: what front-line staff told us. *Joint Commission Journal on Quality & Safety*, 29(10), 512-522. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>

Annotation: In part eight of a 9-part series, Huber and colleagues (2003) describe how a large, urban primary care clinic applied clinical microsystems theory to engage frontline staff, a prerequisite to improving microsystem performance.

Published Abstract

BACKGROUND: The articles in the Microsystems in Health Care series have focused on the success characteristics of high-performing clinical microsystems. Realization is growing about the importance of attracting, selecting, developing, and engaging staff. By optimizing the work of all staff members and by promoting a culture where everyone matters, the microsystem can attain levels of performance not previously experienced. **CASE STUDY:** At Massachusetts General Hospital Downtown Associates (Boston), a primary care practice, the human resource processes are specified and predictable, from a candidate's initial contact through each staff member's orientation, performance management, and professional development. Early on, the new employee receives materials about the practice, including a practice overview, his or her typical responsibilities, the performance evaluation program, and continuous quality improvement. Ongoing training and education are supported with skill labs, special education nights, and cross-training. The performance evaluation program, used to evaluate the performance of all employees, is completed during the 90-day orientation and training, quarterly for one year, and annually. **CONCLUSION:** Some health care settings enjoy high morale, high quality, and high productivity, but all too often this is not the case. The case study offers an example of a microsystem that has motivated its staff and created a positive and dynamic workplace.

Johnson, J. K. (2010). The state of science surrounding the clinical microsystem: a hedgehog or a fox [comment]. *Quality and Safety in Health Care* 19(6), 473-474.

Annotation: Johnson (2010) discusses the development and use of clinical microsystems theory to facilitate organizational learning and system transformation.

Jukkala, A.M., Patrician, P.A., Northen, A., & Block, V. (2011). Readability and usefulness of the Clinical Microsystem Assessment Tool. *Journal of Nursing Care Quality*, 26(2),186-191.

Annotation: Jukkala and colleagues (2011) examined factors that may impact use of clinical microsystem tools in practice.

Published Abstract

Using an instrument such as the Clinical Microsystem Assessment Tool (CMAT) to examine microsystem performance can provide valuable guidance for the development of quality and safety initiatives within the microsystem. However, instruments developed for this purpose must take into account diverse literacy levels. Perceptions of health care professionals of the usefulness and readability of the CMAT were examined. Readability was determined with the Flesch Reading Ease scale, in which the CMAT was rated as "very difficult" to read, and a Simple Measure of Gobbledygook analysis revealed that 14.71 years of education would be needed to understand the content. Although the majority of the participating health care professionals identified the tool as useful, the high level of reading ability required to understand the content may create limitations for use, given the educational diversity of the health care workforce.

Kjos, B.O., Botten, G., Gjevjon, E.R., & Romoren ,T.I. (2010). Quality work in long-term care: The role of first-line leaders. *International Journal for Quality in Health Care*, 22(5), 351-357. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/20615926>

Annotation: Kjos et al. (2010) used clinical microsystem success characteristics, delineated by Nelson et al., 2002 (below) to evaluate frontline leaders' role in implementing system-level quality initiatives in long-term care. Study findings revealed that alignment of supporting mechanisms impacted quality improvement efforts across the systems.

Published Abstract

OBJECTIVE: To explore the first-line leaders' role in quality work in long-term care in Norway, in order to determine how that work is related to such success characteristics as leadership, staff, patients, performance, information and information technology. **DESIGN:** Cross-sectional telephone survey. The text was analysed using content analysis. **SETTING:** Thirty-two Norwegian municipalities stratified according to region and population size. **PARTICIPANTS:** Sixty-four first-line leaders in nursing homes and home-based care. Main outcome measure The clinical microsystem approach is used as a framework by defining and designing measurable variables. **RESULTS:** Thirty-six leaders described how they initiated and motivated employees to be active in quality work; the remaining leaders indicated that they played a passive role. The first-line leaders played a key role in implementing national quality policies and regulations. The quantity of other success

characteristics was low. **CONCLUSIONS:** The municipalities delegated the responsibility of implanting national policies to the first-line leaders. Missing were key quality success criteria such as macro- and meso-perspectives for the municipality as a whole and co-operation with other leaders in the organization and fostering of relevant learning. Quality work was fragmented rather than comprehensive and systematic.

Kollisch, D.O., Hammond, C.S., Thompson, E., & Strickler, J. (2011). Improving family medicine in Kosovo with microsystems. *Journal of the American Board of Family Medicine: JABFM*, 24(1),102-111. Retrieved from <http://www.jabfm.org/content/24/1/102.full>

ANNOTATION: Kollisch et al. (2011) describes the applicability of clinical microsystems thinking to develop health care delivery systems in low-income countries. The article reports that microsystem thinking can facilitate peak performance in environments with limited resources.

Published Abstract

Purpose: Family medicine is being adopted in many low-income countries to meet medical care needs. A systems approach may be useful for international organizations offering aid, in addition to providing resources and training. An established methodology called Microsystems was used to help implement family medicine in Kosovo, a small country seeking to rebuild after decades of turmoil and war. **Methods:** Clinical and systems changes were implemented in 2 municipalities, resulting in improved quality of care within the established primary care system. The first 2-year project focused on hypertension and the second on antenatal care. Mutual exchanges were used to introduce Microsystems, addressing medical records, data systems, evidence-based guidelines, community outreach, supplemental training, and sustainability models. **Results:** The Microsystems method successfully guided specific clinical, general management, and organizational improvements. Successes included improved teamwork; delivery of patient-centered care; empowered nursing staff; and data-driven decision making. Barriers to systems change included management systems impeding staff initiative; resistance to change by the larger health care "macrosystem"; marginal funding for prevention; and few models for clinical prevention and continuity care. **Conclusions:** Microsystems methods are adaptable for use in low-income countries or those rebuilding after conflict that are implementing family medicine models to improve medical care and population health.

Kosnik, L. K. & Espinosa, J.A. (2003). Microsystems in health care: Part 7. The microsystem as a platform for merging strategic planning and operations. *Joint Commission Journal on Quality and Safety*, 29(9), 452-459. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>

Annotation: This seventh article in a 9-part series demonstrates how application of microsystems thinking can facilitate successful behavioral paradigm shifts associated with system transformation.

Published Abstract

BACKGROUND: The microsystem, as agent for change, plays a critical and essential role in developing and deploying the macrosystem's strategic plan. **STRATEGIC PLANNING AND MICROSYSTEM THINKING:** To effectively deploy a strategic plan, the organization must align the plan's goals and objectives across all levels and to all functional units. The concepts of microsystem thinking were the foundation for the journey on which Overlook Hospital/Atlantic Health System (Summit, NJ) embarked in 1996. Six stages can be identified in the development of the relationship between macrosystems and microsystems. Five critical themes—trust making, mitigation of constraints and barriers among departments and units, creation of a common vocabulary, raising of microsystem awareness, and facilitation of reciprocal relationships—are associated with these stages. **NOTES FROM A MICROSYSTEM JOURNEY:** The emergency department (ED) experienced Stage 1—The Emergence of a Self-Aware Microsystem—as it created cultural and behavioral change, which included the actualization of staff-generated ideas and an ongoing theme of trust making. In Stage 3—Unlike Microsystems (Different Units) Learn to Collaborate—the ED's microsystems approach spread to other units in the hospital. Collaboratives addressed x-ray turnaround times, admission cycle times, and safety initiatives. **SUMMARY AND CONCLUSIONS:** The microsystem—the small, functional, front-line units—is where the strategic plans become operationalized.

Kraynack, N.C. & McBride, J.T. (2009). Improving care at cystic fibrosis centers through quality improvement. *Seminars in Respiratory and Critical Care Medicine*, 30(5), 547-558. Retrieved from <https://www.thieme-connect.com/DOI/DOI?10.1055/s-0029-1238913>

Annotation: Kraynack and McBride (2009) articulate how the clinical microsystems 5P assessment process fosters patient-centered care and facilitates development of interprofessional teams to achieve long-term gains in patient outcomes.

Published Abstract

Quality improvement (QI) using a clinical microsystems approach provides cystic fibrosis (CF) centers the opportunity to make a significant positive impact on the health of their patients. The availability of center-specific outcomes data and the support of the Cystic Fibrosis Foundation are important advantages for these quality

improvement efforts. This article illustrates how the clinical microsystems methodology can improve care delivery and outcomes by describing the gradual application of quality improvement principles over the past 5 years by the CF team at the Lewis Walker Cystic Fibrosis Center at Akron Children's Hospital in Akron, Ohio. Using the example of a project to improve the pulmonary function of the pediatric patients at our center as a framework, we describe the QI process from the initial team-building phase, through the assessment of care processes, standardization of care, and developing a culture of continuous improvement. We outline how enthusiastic commitment from physician leadership, clinical managers and central administration, the availability of coaches, and an appreciation of the importance of measurement, patient involvement, communication, and standardization are critical components for successful process improvement.

LaFave, L.R.A. (2008). *Nursing practice as knowledge work within a clinical microsystem: A dissertation.* PhD dissertation, Graduate School of Nursing, University of Massachusetts Worcester, Worcester, MA. Retrieved from http://escholarship.umassmed.edu/gsn_diss/9/

Annotation: LaFave's (2008) qualitative study of nurse -to- nurse communication within an acute care clinical microsystem explores both nurses' perceptions of needed levels of system knowledge and how exchange of system-level knowledge occurs between nurses.

Published Abstract

Nurses have a key role in keeping patients safe from medical errors because they work at the point of care where most errors occur. Nursing work at the intersection of patients and health care systems requires high levels of cognitive activity to anticipate potential problems and effectively respond to rapidly evolving and potentially harmful situations. The literature describes nursing work at the intersection of patient and health care system as well as barriers to providing safe patient care. However, little is known about the systems knowledge nurses use to negotiate the health care system on their patients' behalf, or how this systems information is exchanged between nurses. Using the clinical microsystem as the conceptual framework, this qualitative descriptive investigation identified and described: 1) the components of systems knowledge needed by nurses, 2) how systems information is exchanged between nurses, and 3) systems information exchanged between staff nurses and travel nurses. Data were collected from a stratified maximum variation sample of 18 nurse leaders, staff nurses, and travel nurses working within a high-functioning neonatal intensive care nursery within a large academic medical center in New England. Data collection methods included participant observation, document review, individual interviews, and a focus group session. Data were analyzed through constant comparison for emerging themes and patterns. Findings were compared for commonalities and differences within and across groups. Three components of systems knowledge

emerged: structural, operational, and relational. Systems information exchange occurred through direct and indirect means. Direct means included formal and informal mechanisms. The formal mechanism of orientation was identified by each participant. Informal mechanisms such as peer teaching, problem solving, and modeling behaviors were identified by participants from each of the three nurse groups. Travel nurses' descriptions of the common themes focused on individual efficacy. Staff nurses focused on fostering smooth unit functioning. Nurse leaders described common themes from a perspective of unit development. Four overarching domains of systems information were exchanged between staff nurses and travel nurses: practice patterns; staffing patterns and roles; tips, tricks, tidbits, and techniques; and environmental elements. Communication emerged as a common theme across nurse groups and domains of systems information exchanged. These findings have implications for nursing orientation and staff development, continuous improvement at the local level, and curriculum development.

MacKenzie, R., Capuano, T., Durishin, L.D, Stern, G., & Burke, J.B. (2008). Growing organizational capacity through a systems approach: One health network's experience. *Joint Commission Journal on Quality & Patient Safety*, 34(2), 63-73.

Annotation: MacKenzie et al. (2008) provides a detailed account of how an 850-bed hospital applied microsystem theory within the context of complex adaptive system thinking to design and implement an innovative, multi-pronged workflow redesign strategy that increased patient capacity without adding new buildings.

Published Abstract

BACKGROUND: Hospitals are reporting unexpected surges in demand for services. Lehigh Valley Hospital challenged its clinical and administrative staff to increase capacity by at least 4% per year using an interdepartmental, systemwide initiative, Growing Organizational Capacity (GOC). **METHODS:** Following a systemwide leadership retreat that yielded more than 1,000 ideas, the initiative's principal sponsor convened a cross-functional improvement team. During a two-year period, 17 projects were implemented. Using a complex systems approach, improvement ideas "emerged" from microsystems at the points of care. Through rigorous reporting and testing of process adaptations, need, data, and people drove innovation. **RESULTS:** Hundreds of multilevel clinical and administrative staff redesigned processes and roles to increase organizational capacity. Admissions rose by 6.1%, 5.5 %, 8.7%, 5.0%, and 3.8% in fiscal years 2003 through 2007, respectively. Process enhancements cost approximately \$1 million, while increased revenues attributable to increased capacity totaled \$2.5 million. **DISCUSSION:** Multiple, coordinated, and concurrent projects created a greater impact than that possible with a single project. GOC and its success, best explained in the context of complex adaptive systems and microsystem theories, are transferrable to throughput issues that challenge efficiency and effectiveness in other health care systems.

McKinley, K.E., Berry, S.A. Laam, L.A., Doll, M.C., Brin, K.P.

Bothe, A. Jr.,...Batalden, P.B. (2008). Clinical microsystems, Part 4. Building innovative population-specific mesosystems. *Joint Commission Journal on Quality & Patient Safety*, 34(11), 655-663. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>

Annotation: McKinley and colleagues (2008) provide a detail roadmap of how microsystems thinking can guide redesign of a service line to consistently deliver patient-centered, evidence-based care. The article describes how microsystems concepts informed leadership and role development to maximize success of the intervention.

Published Abstract

BACKGROUND: In 2005, the Geisinger Health System (Danville, Pennsylvania) developed ProvenCare, first applied to coronary artery bypass graft (CABG), as an innovative provider-driven quality improvement program to promote reliable delivery of evidence-based best practices. A new mesosystem is created for each ProvenCare model, integrating the care delivery process between contributing microsystems and defining new mesosystem leadership. The approach has been expanded to many patient populations, including percutaneous coronary intervention (PCI). **A NEW PCI MESOSYSTEM:** In 2007 clinical microsystem thinking was applied to PCI: understanding the current processes and patterns, assembling the frontline professionals to redesign the processes, and using a beta-test phase to measure the changes and adjust accordingly, until the best process was established. A new mesosystem team was created to ensure that the right care is delivered at the tight time. **REFINING IMPLEMENTATION:** In the course of developing the CABG initiative, Geisinger established role definitions to keep teams on track; a comprehensive plan from design through execution and follow-up; and guiding principles established for the teams engaged in designing, developing, and implementing ProvenCare programs. **PRELIMINARY EXPERIENCE:** For the 40 measurable process elements in the PCI mesosystem pathway, as of month seven (July 2008) of the beta-test phase, 55% of the patients received 100% of the identified process elements. **CONCLUSION:** Geisinger Health System has joined different microsystems to form an innovative mesosystem capable of producing reliable, evidence-based care for patient subpopulations. This approach to embedding evidence-based care into routine care delivery can be adapted by others.

Mohr, J., Batalden, P., & Barach, P. (2004). Integrating patient safety into the clinical microsystem. *Quality & Safety in Health Care*, 139(Suppl 2), ii34-38. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1765806/>

Annotation: Mohr et al. (2004) articulates how application of clinical microsystems theory to complex adaptive systems can facilitate organizational learning within and across microsystems.

Published Abstract

Healthcare institutions continue to face challenges in providing safe patient care in increasingly complex organisational and regulatory environments while striving to maintain financial viability. The clinical microsystem provides a conceptual and practical framework for approaching organisational learning and delivery of care. Tensions exist between the conceptual theory and the daily practical applications of providing safe and effective care within healthcare systems. Healthcare organisations are often complex, disorganised, and opaque systems to their users and their patients. This disorganisation may lead to patient discomfort and harm as well as much waste. Healthcare organisations are in some sense conglomerates of smaller systems, not coherent monolithic organisations. The microsystem unit allows organisational leaders to embed quality and safety into a microsystem's developmental journey. Leaders can set the stage for making safety a priority for the organisation while allowing individual microsystems to create innovative strategies for improvement.

Mohr, J.J., Barach, P., Cravero, J.P., Blike, G.T., Godfrey, M.M., Batalden, P.B., & Nelson, E.C. (2003). Microsystems in health care: Part 6. Designing patient safety into the microsystem. *Joint Commission Journal on Quality & Safety*, 29(8), 401-408. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>

Annotation: Mohr and colleagues (2003) use a hypothetical case study to demonstrate how to analyze and redesign microsystem workflow to improve patient safety.

Published Abstract

BACKGROUND: This article explores patient safety from a microsystems perspective and from an injury epidemiological perspective and shows how to embed safety into a microsystem's operations. **MICROSYSTEMS PATIENT SAFETY SCENARIO:** Allison, a 5-year-old preschooler with a history of "wheezy colds," and her mother interacted with several microsystems as they navigated the health care system. At various points, the system failed to address Allison's needs. The Haddon matrix provides a useful framework for analyzing medical failures in patient safety, setting the stage for developing countermeasures. **CASE STUDY:** The case study shows the types of failures that can occur in complex medical care settings such as those associated with pediatric procedural sedation. Six patient

safety principles, such as "design systems to identify, prevent, absorb, and mitigate errors," can be applied in a clinical setting. In response to this particular case, its subsequent analysis, and the application of microsystems thinking, the anesthesiology department of the Children's Hospital at Dartmouth developed the PainFree Program to provide optimal safety for sedated patients. **CONCLUSION:** Safety is a property of a microsystem and it can be achieved only through thoughtful and systematic application of a broad array of process, equipment, organization, supervision, training, simulation, and team-work changes.

Mohr, J.J. & Batalden, P.B. (2002). Improving safety on the front lines: The role of clinical microsystems. *Quality and Safety in Health Care*, 11(1), 45-50. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1743568/?tool=pubmed>

Annotation: Mohr and Batalden (2002) walk the reader through the eight characteristics of high performing clinical microsystems using quotes from qualitative interviews to demonstrate how each characteristic contributes to overall microsystem performance and, ultimately, macrosystem performance.

Published Abstract

The clinical microsystem puts medical error and harm reduction into the broader context of safety and quality of care by providing a framework to assess and evaluate the structure, process, and outcomes of care. Eight characteristics of clinical microsystems emerged from a qualitative analysis of interviews with representatives from 43 microsystems across North America. These characteristics were used to develop a tool for assessing the function of microsystems. Further research is needed to assess microsystem performance, outcomes, and safety, and how to replicate "best practices" in other settings.

Nelson, E.C., Batalden, P.B., Godfrey, M.M., & Lazar, J.S. (2011). *Value by design: Developing clinical microsystems to achieve organizational excellence*. San Francisco, Jossey-Bass.

Annotation: "Value by Design" updates and expands clinical microsystems theory and practice described in Nelson and colleagues first book, "Quality by Design" (2007). Using real-world examples, the authors demonstrate how to apply clinical microsystems thinking and tools to improve outcomes, engage patients in their care, and reduce waste in four distinct settings, primary, acute, chronic and palliative care. The authors also provide a roadmap for developing a value-based health care system.

Nelson, E.C., Batalden, P.B., Homa, K., Godfrey, M.M., Campbell, C., Headrick, L.A. ... Wasson, J.H. (2003). Microsystems in health care: Part 2. Creating a rich information environment. *Joint Commission Journal on Quality & Safety*, 29(1), 5-15. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>

Annotation: In this second article in a 9-part series, the authors explain how three high-performing microsystems effectively integrated data throughout microsystem workflow to improve and transform healthcare delivery.

Published Abstract

BACKGROUND: A rich information environment supports the functioning of the small, functional, frontline units--the microsystems--that provide most health care to most people. Three settings represent case examples of how clinical microsystems use data in everyday practice to provide high-quality and cost-effective care.

CASES: At The Spine Center at Dartmouth, Lebanon, New Hampshire, a patient value compass, a one-page health status report, is used to determine if the provided care and services are meeting the patient's needs. In Summit, New Jersey, Overlook Hospital's emergency department (ED) uses real-time process monitoring on patient care cycle times, quality and productivity indicator tracking, and patient and customer satisfaction tracking. These data streams create an information pool that is actively used in this ED microsystem--minute by minute, hourly, daily, weekly, and annually--to analyze performance patterns and spot flaws that require action. The Shock Trauma Intensive Care Unit (STRICU), Intermountain Health Care, Salt Lake City, uses a data system to monitor the "wired" patient remotely and share information at any time in real time. Staff can complete shift reports in 10 minutes.

DISCUSSION: Information exchange is the interface that connects staff to patients and staff to staff within the microsystem; microsystem to microsystem; and microsystem to macro-organization.

Nelson, E.C., Batalden, P.B., Huber, T.P., Mohr, J.J., Godfrey, M.M., Headrick, L.A., & Wasson, J.H. (2002). Microsystems in health care: Part 1. Learning from high-performing front-line clinical units. *Joint Commission Journal on Quality Improvement*, 28(9), 472-493. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>

Annotation: Building on seminal research of Mohr and Batalden (2000), Nelson and colleagues (2002) identified nine success characteristics found in a sample of 20 high-performing clinical microsystems representing the continuum of care. This article is the first in a nine-part article series that explores the underlying principles, processes, and methods that contribute to building high-performing microsystems.

Published Abstract

BACKGROUND: Clinical microsystems are the small, functional, front-line units that

provide most health care to most people. They are the essential building blocks of larger organizations and of the health system. They are the place where patients and providers meet. The quality and value of care produced by a large health system can no better than the services generated by the small systems of which it is composed. **METHODS:** A wide net was cast to identify and study a sampling of the best-quality, best-value small clinical units in North America. Twenty microsystems, representing different component parts of the health system, were examined from December 2000 through June 2001, using qualitative methods supplemented by medical record and finance reviews. **RESULTS:** The study of the 20 high-performing sites generated many best practice ideas (processes and methods) that microsystems use to accomplish their goals. Nine success characteristics were related to high performance: leadership, culture, macro-organizational support of microsystems, patient focus, staff focus, interdependence of care team, information and information technology, process improvement, and performance patterns. These success factors were interrelated and together contributed to the microsystem's ability to provide superior, cost-effective care and at the same time create a positive and attractive working environment. **CONCLUSIONS:** A seamless, patient-centered high-quality, safe, and efficient health system cannot be realized without the transformation of the essential building blocks that combine to form the care continuum.

Nelson, E.C., Godfrey, M.M., Batalden, P.B., Berry, S.A., Bothe, A.E, Jr., McKinley, K.E.Nolan T.W. (2008). Clinical microsystems, Part 1. The building blocks of health systems. *Joint Commission Journal on Quality & Patient Safety*, 34(7), 367-378. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>

Annotation: In this first article of a 4-part series, Nelson and colleagues (2008) share examples and insights of how diverse organizations apply clinical microsystems thinking to foster innovation that drives improvement towards peak performance. The authors analyzed lessons from the field to better understand specific actions taken by organizations to integrate clinical microsystems concepts and tools into practice.

Published Abstract

BACKGROUND: Wherever, however, and whenever health care is delivered-no matter the setting or population of patients-the body of knowledge on clinical microsystems can guide and support innovation and peak performance. Many health care leaders and staff at all levels of their organizations in many countries have adapted microsystem knowledge to their local settings. **CLINICAL MICROSYSTEMS: A PANORAMIC VIEW: HOW DO CLINICAL MICROSYSTEMS FIT TOGETHER?** As the patient's journey of care seeking and care delivery takes place over time, he or she will move into and out of an assortment of clinical microsystems, such as a family practitioner's office, an emergency department, and an intensive care unit. This assortment of clinical microsystems-combined with the

patient's own actions to improve or maintain health—can be viewed as the patient's unique health system. This patient-centric view of a health system is the foundation of second-generation development for clinical microsystems. LESSONS FROM THE FIELD: These lessons, which are not comprehensive, can be organized under the familiar commands that are used to start a race: On Your Mark, Get Set, Go! ... with a fourth category added-Reflect: Reviewing the Race. These insights are intended as guidance to organizations ready to strategically transform themselves. CONCLUSION: Beginning to master and make use of microsystem principles and methods to attain macrosystem peak performance can help us knit together care in a fragmented health system, eschew archipelago building in favor of nation-building strategies, achieve safe and efficient care with reliable handoffs, and provide the best possible care and attain the best possible health outcomes.

Nelson, E.C., Splaine, M.E., Godfrey, M.M., Kahn, V., Hess, A., Batalden, P., & Plume, S.K.(2000). Using data to improve medical practice by measuring processes and outcomes of care. *Joint Commission Journal on Quality Improvement*, 26(12), 667-685.

Annotation: Nelson, Splaine et al. (2000) utilize an amalgam of actual clinic characteristics to demonstrate how point-of-care data can be easily collected and analyzed to drive practice changes that improve patient outcomes, reduce waste, and increase operating margins.

Published Abstract

BACKGROUND: The purpose of this article is to help clinicians expand their use of data to improve medical practice performance and to do improvement research. Clinical practices can be viewed as small, complex organizations (microsystems) that produce services for specific patient populations. These services can be greatly improved by embedding measurement into the flow of daily work in the practice. **WHY DO IT?:** Four good reasons to build measures into daily medical practice are to (1) diagnose strengths and weaknesses in practice performance; (2) improve and innovate in providing care and services using improvement research; (3) manage patients and the practice; and (4) evaluate changes in results over time. It is helpful to have a "physiological" model of a medical practice to analyze the practice, to manage it, and to improve it. One model views clinical practices as microsystems that are designed to generate desired health outcomes for specific subsets of patients and to use resources efficiently. This article provides case study examples to show what an office-based practice might look like if it were using front-line measurement to improve care and services most of the time and to conduct clinical improvement research some of the time. **WHAT ARE THE PRINCIPLES FOR USING DATA TO IMPROVE PROCESSES AND OUTCOMES OF CARE?:** Principles reflected in the case study examples--such as "Keep Measurement Simple. Think Big and Start Small" and "More Data Is Not Necessarily Better Data. Seek Usefulness, Not Perfection, in Your Measures"--may help guide the

development of data to study and improve practice. HOW CAN A PRACTICE START TO USE DATA TO IMPROVE CARE AND CONDUCT IMPROVEMENT RESEARCH?: Practical challenges are involved in starting to use data for enhancing care and improvement research. To increase the odds for success, it would be wise to use a change management strategy to launch the startup plan. Other recommendations include "Establish a Sense of Urgency. (Survival Is Not Mandatory)" and "Create the Guiding Coalition. (A Small, Devoted Group of People Can Change the World)." SUMMARY: Over the long term, we must transform thousands of local practice cultures so that useful data are used every day in countless ways to assist clinicians, support staff, patients, families, and communities.

Nelson, G.C., Batalden, P.B., & Godfrey, M.M. (2007). *Quality by design: a clinical microsystems approach*. San Francisco: Josey Bass.

Annotation: "Quality by Design" is a "how-to" book for applying clinical microsystems thinking to practice. Part I discusses the growing evidence-base for clinical microsystem thinking and practice. Part II provides detailed explanations of how to implement each step of the Dartmouth Improvement Ramp, inclusive of data collection tools.

Nolan, R., Wary, A., King, M., Laam, L.A., & Hallick, S. (2011). Geisinger's ProvenCare methodology: driving performance improvement within a shared governance structure. *Journal of Nursing Administration*, 41(5), 226-230.

Annotation: Nolan and colleagues (2011) discuss how to leverage shared governance structures to foster peak performance across clinical microsystems.

Published Abstract

Many performance improvement projects fail because they occur in parallel to the organization's shared governance structure. Leveraging the full potential of its nursing shared governance structure, Geisinger Health System's ProvenCare methodology harnessed the full potential of its staff nurses to create truly reliable workflows that benefit patients and that the team finds professionally satisfying. Using ProvenCare Perinatal and its smoking cessation education intervention and outcomes as an example, the authors describe the ProvenCare methodology.

Olsan, T.H., Shore, B., & Coleman, P.D. (2009). A clinical microsystem model to evaluate the quality of primary care for homebound older adults. *Journal of the American Medical Directors Association*, 10(5), 304-313.

Annotation: Olsan et al. (2009) applied clinical microsystems concepts to develop an evidence-based framework to evaluate the quality and effectiveness of home-based primary care.

Published Abstract

The declining use of nursing homes and a growing aging population is increasing the demand for home-based primary care (HBPC) among chronically ill disabled homebound older adults and their informal caregivers. The problem this poses is that access to HBPC is limited. Typically, HBPC programs are small and available in only a few communities. Expansion of HBPC nationally has been hampered by limited awareness of this mode of care and by a dearth of research examining the quality and effectiveness of primary care delivered in the home. In this article, we address the need for stronger evidence demonstrating how well HBPC programs deliver and improve care by laying the foundation for more rigorous evaluation of HBPC services. First, an HBPC clinical microsystem model for evaluating program quality and effectiveness is described to clarify relationships among 5 elements essential for delivering high-quality primary care to homebound elders: purpose, patients, people (staff), processes, and patterns. Data for the model were identified through MEDLINE, CINAHL, and PubMed searches that produced 540 potentially relevant studies, from which 21 studies of HBPC programs and services were selected to construct the clinical microsystem. Second, in order to inform health policymaking about the design and financing of HBPC, from program evaluations reported in the selected studies are summarized. Finally, recommendations for future research are outlined, including epidemiological studies to estimate the proportion and characteristics of the homebound population for planning appropriate services and creating large databases for evaluating HBPC quality, costs, and outcomes. Ultimately, the scalability of HBPC to meet the demand current and future older adults depends on incentives that value the home as a bona fide setting for delivering primary care.

Pardini-Kiely, K., Greenlee, E., Hopkins, J., Szaflarski, N.L., & Tabb, K. (2010).

Improving and sustaining core measure performance through effective accountability of clinical microsystems in an academic medical center. *Joint Commission Journal on Quality & Patient Safety*, 36(9), 387-398.

Annotation: Pardini-Kiely and colleagues (2010) describe how application of clinical microsystems thinking and tools, inclusive of run charts, informed the design and implementation of a multi-prong strategy that focused on increasing accountability for improvement of core measures at the microsystem level. The authors outline

specific actions taken to increase engagement of frontline leaders and staff in facilitate project success.

Published Abstract

BACKGROUND: Evidence-based performance measures, known as core measures, have been established by The Joint Commission to improve the quality of care for patient populations, such as those with acute myocardial infarction (AMI), heart failure, and community-acquired pneumonia (CAP), as well as to improve the quality of surgical care--the Surgical Care Improvement Project (SCIP) measures. Hospital administrators have traditionally held academic and community physicians and hospital clinicians accountable for integrating the core measures into daily practice. Such efforts have often led to suboptimal results because of the belief that the "organization" (macrosystem) is the appropriate level at which to work to improve quality. Stanford Hospital and Clinics (Stanford, California) has instead held leaders of clinical microsystems--the clinical units where care is provided--accountable to improve performance on the core measures. The strategic approaches taken for this initiative include engagement of the hospital's board of directors; clear assignment of accountability among interdisciplinary care teams to drive the change; implementation of a unit-based medical director program; transparency of core measure performance at the microsystem, mesosystem, and macrosystem levels; and concurrent monitoring with rapid feedback of results. **RESULTS:** In 2007, the first year of this initiative, the 24-metric composite compliance score for all four core measures increased from 64% to 82%. The composite score was sustained at a minimum of 90% during 2009 and Quarter 1 of 2010. **CONCLUSIONS:** Holding clinical microsystems accountable for improving unit performance proved beneficial to macrosystem performance of the Joint Commission core measures.

Reis, M.D., Scott, S.D., & Rempel, G.R. (2009). Including parents in the evaluation of clinical microsystems in the neonatal intensive care unit. *Advances in Neonatal Care*, 9(4),174-179.

Annotation: Reis et al. (2009) explores how clinical microsystems thinking could inform strategy for integrating family centered care into NICU workflow.

Published Abstract

Neonatal intensive care is an area of healthcare that has experienced significant growth in recent years. As a result, "megaunits" of more than 60 beds are not uncommon. Delivering care in units of this size that incorporates the principles of family-centered care and that is satisfying to both staff and parents is challenging. One proposed method to enhance delivery of care in the megaunit NICU has been to implement a clinical microsystem approach. Up to now, research to evaluate the efficacy of a clinical microsystem has focused primarily on staff satisfaction and perception. However, implementing the clinical microsystem within the NICU requires that careful attention be paid to the parents and their experience and

perception of their infant's care in the NICU. This article reviews the basic principles of family-centered care, identifies components of care that affect parents' satisfaction with NICU care, reviews the theoretical underpinnings of the clinical microsystem, and discusses areas for future research.

Rikli, J., Huizinga, B., Schafer, D., Atwater, A., Coker, K., & Sikora, C. (2009). Implementation of an electronic documentation system using microsystem and quality improvement concepts. *Advances in Neonatal Care*, 9(2), 53-60.

Annotation: Rikli et al. (2009) reports evidence of how clinical microsystems thinking can prevent or mitigate barriers to implementing an electronic medical record designed to improve care and workflow.

Published Abstract

Electronic documentation systems have become integral to improving the quality of healthcare, reducing medical errors, and advancing the delivery of evidence-based medical care. A smooth transition from paper charting to an electronic documentation system is challenging. Using quality improvement tools and building on the clinical microsystems concept can assist with a smooth transition. Specific strategies include involving all stakeholders in the development and implementation of the plan, assessing the culture of the department, and identifying processes and patterns that require attention. Specific steps include developing a statement of aim, formulating a specific path to reach the aim, evaluating the progress of implementation, and creating a template for future process improvement. This article describes the process used in one midwestern NICU to implement an integrated electronic documentation system using a clinical microsystems approach and quality improvement methods. Challenges encountered and lessons learned are discussed.

Santana, C., Nunez-Smith, M., Camp, A., Ruppe, E., Berg, D., & Curry, L. (2010). Quality improvement in community health centres: The role of microsystem characteristics in the implementation of a Diabetes Prevention Initiative. *Quality and Safety in Health Care*, 19(4), 290-294.

Annotation: Santana et al. (2010) created an interview guide, informed by clinical microsystems success characteristics delineated by Nelson et al. (2002), to assess study participants perceptions of the characteristics that facilitated an evidence-based practice change. The microsystem-informed interview guide allowed researchers to identify gaps in the underlying organizational infrastructure that could impact success of the change.

Published Abstract

Objectives: To examine the role of microsystem characteristics in the translation of

an evidence-based intervention (the Diabetes Prevention Initiative (DPI)) into practice in a community-health centre (CHC). Design: Case study. Analysis: Constant comparative method of qualitative analysis. Setting: Community-health centre in a mid-sized city in the USA. Participants: 27 administrators, clinicians and staff of a community-health centre implementing a DPI. Main outcome measures: Perceptions of microsystem characteristics that influence the implementation of this initiative. Results: Five characteristics of high-performing microsystems were reflected, but not maximized, in the implementation of the DPI. First, there was no universally shared definition of the desired purpose of the DPI. Second, investment in quality improvement (QI) was strong, yet sustainability remained a concern, since efforts were dependent upon external grant support. Third, lack of cohesiveness between the initiative planning team and the rest of the organisation served to both facilitate and constrain implementation. Fourth, administrators showed both support for new initiatives and a lack of strategic vision for QI. Fifth, this initiative substantially strained already-stretched role definitions. Conclusions: Translation of the DPI in this CHC was constrained by the lack of a cohesive QI infrastructure and incomplete alignment with characteristics of high performing microsystems. The findings suggest an important role for microsystem characteristics in the process of implementing evidence-based interventions. Enhancing the level of microsystem performance of CHCs is essential to informing efforts to improve quality of care in this critical safety-net system.

Shapiro, S. E. & Donaldson, N. A. (2008). Evidence-based practice for advanced practice emergency nurses, Part III: Planning, implementing, and evaluating an evidence-based small test of change. *Advanced Emergency Nursing Journal*, 30(3), 222-232.

Annotation: Shapiro and Donaldson (2008) outline how to effectively apply microsystems principles to design, facilitate, and sustain evidence-based practice changes.

Published Abstract

In this article, we describe the steps involved in implementing an evidence-based practice change in an emergency department. Using the hypothetical case of changing from a 3-tier to a 5-tier triage system, we present an overview of change theory, microsystem analysis, and rapid cycle change. We then provide practical as well as theoretical suggestions for planning, implementing, and evaluating an evidence-based practice change. We also provide practical tools for conducting a gap analysis and creating a project plan that advanced practice emergency nurses will find useful as they take on this leadership role in their department.

Thies, K.M. & Ayers, L. (2007). Academic microsystems: Adapting clinical microsystems as an evaluation framework for community-based nursing education. *Journal of Nursing Education*, 46(7), 325-329.

Annotation: Thies et al. (2007) demonstrate applicability of microsystem thinking and tools to diverse settings. Using the microsystems 5P assessment framework, the authors evaluated key factors that influenced the success of a nursing school/community partnership.

Published Abstract

When an academic nursing program and clinical agency form a partnership to both educate students and effect changes in the health care of the community, evaluation presents a challenge for measuring structure, processes, and outcomes at three levels: student educational processes and outcomes; student-sensitive outcomes for the community; and the effectiveness of the partnership itself. This article describes how we adapted the Clinical Microsystems model as an Academic Microsystems model to evaluate the complementary processes and outcomes for the community and for the nursing program in a senior Community Capstone course. The Capstone is a community-based initiative in which students assess community needs, intervene appropriately, evaluate their intervention, and pass the initiative on to the next year's class. Although outcomes for students and the community were positive, the model revealed that developing the frontline microsystem of student /faculty /community nurse mentor was the key to success.

Varkey, P., Karlapudi, S.P., & Hensrud, D.D. (2008). The impact of a quality improvement program on employee satisfaction in an academic microsystem. *American Journal of Medical Quality*, 23(3), 215-221.

Annotation: Varkey and colleagues (2008) demonstrate how microsystem thinking and tools can be used to identify and address key system issues that impact employee satisfaction that impedes full engagement of frontline staff.

Published Abstract

Quality improvement is a potential method to enhance employee satisfaction. This Study describes the impact of a program instituted to enhance employee satisfaction using the principles of high-performing microsystems. A shared leadership committee, participatory meetings, suggestion boxes, and quality improvement projects were implemented as part of the program. A follow-up survey 1 year after implementation of the program demonstrated an increase in employee perception of the division's desire to improve service (16%), opportunities to expand skills (17%), involvement in work decisions (25%), and the institution's interest in employee wellbeing (17%). Key drivers of discretionary effort (4 of 5), job satisfaction (2 of 6), and overall satisfaction (1 of 8) with the institution showed statistically significant improvement in the study division as

compared with the other divisions in which no such program was implemented. Further research is needed to study systems changes that enhance employee satisfaction and their impact on patient and financial outcomes.

Wasson, J.H., Anders, S.G., Moore, L.G., Ho, L., Nelson, E.C., Godfrey, M.M. & Batalden, P.B. (2008). Clinical microsystems: Part 2. Learning from micro practices about providing patients the care they want and need. *Joint Commission Journal on Quality & Patient Safety*, 34(8), 445-452. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>

Annotation: In the second article of a 4-part series, Wasson and colleagues (2008) articulate specific facilitators and challenges that can impact application of clinical microsystems thinking in small practices.

Published Abstract

BACKGROUND: Usual medical care in the United States is frequently not a satisfying experience for either patients or primary care physicians. Whether primary care can be saved and its quality improved is a subject of national concern. An increasing number of physicians are using microsystem principles to radically redesign their practices. Small, independent practices-micro practices-are often able to incorporate into a few people the frontline attributes of successful microsystems such as clear leadership, patient focus, process improvement, performance patterns, and information technology. **PATIENT FOCUS, PROCESS IMPROVEMENT, AND PERFORMANCE PATTERNS:** An exemplary microsystem will (1) have as its primary purpose a focus on the patient-a commitment to meet all patient needs; (2) make fundamental to its work the study, measurement, and improvement of care-a commitment to process improvement; and (3) routinely measure its patterns of performance, "feed back" the data, and make changes based on the data. **LESSONS FROM MICRO PRACTICES:** The literature and experience with micro practices suggest that they (1) constitute an important group in which to demonstrate the value of microsystem thinking; (2) can become very effective clinical microsystems; (3) can reduce their overhead costs to half that of larger freestanding practices, enabling them to spend more time working with their patients; (4) can develop new tools and approaches without going through layers of clearance; and (5) need not reinvent the wheel. **CONCLUSIONS:** Patient-reported data demonstrate how micro practices are using patient focus, process improvement, performance patterns, and information technology to improve performance. Patients should be able to report that they receive "exactly the care they want and need exactly when and how they want and need it."

Wasson, J.H., Godfrey, M.M., Nelson, E.C., Mohr, J.J., & Batalden, P.B. (2003).

Microsystems in health care: Part 4. Planning patient-centered care. *Joint Commission Journal on Quality & Safety*, 29(5), 227-237. Retrieved from <http://clinicalmicrosystem.org/materials/publications/>

Annotation: In the fourth article in a 9-part series, Wasson et al. (2003) uses examples of high-performing microsystems to demonstrate how to operationalize two components essential for delivering patient-centered care, (1) knowing what is important to a patient and family and (2) ensuring staff and clinicians within the microsystem have protected time to reflect and plan care. The authors identify common myths and attitudes that impede application of microsystems thinking to practice.

Published Abstract

BACKGROUND: Clinical microsystems are the essential building blocks of all health systems. At the heart of an effective microsystem is a productive interaction between an informed, activated patient and a prepared, proactive practice staff. Support, which increases the patient's ability for self-management, is an essential result of a productive interaction. This series on high-performing clinical microsystems is based on interviews and site visits to 20 clinical microsystems in the United States. This fourth article in the series describes how high-performing microsystems design and plan patient-centered care.

PLANNING PATIENT-CENTERED CARE: Well-planned, patient-centered care results in improved practice efficiency and better patient outcomes. However, planning this care is not an easy task. Excellent planned care requires that the microsystem have services that match what really matters to a patient and family and protected time to reflect and plan. Patient self-management support, clinical decision support, delivery system design, and clinical information systems must be planned to be effective, timely, and efficient for each individual patient and for all patients. **CONCLUSION:** Excellent planned services and planned care are attainable today in microsystems that understand what really matters to a patient and family and have the capacity to provide services to meet the patient's needs.

Weinstein, J.N., Brown, P.W., Hanscom, B., Walsh, T., & Nelson, E.C. (2000).

Designing an ambulatory clinical practice for outcomes improvement: From vision to reality--the Spine Center at Dartmouth-Hitchcock, year one. *Quality Management in Health Care*, 8(2), 1-20.

Annotation: Weinstein et al. (2000) provides one of the first, experience-based descriptions of how microsystems theories, concepts, and tools can be applied to redesign and improve healthcare delivery for complex patient populations. The authors discuss how to anticipate and mitigate challenges encountered when implementing a new model of care.

Published Abstract

Development of a new program for diagnosis and treatment of spine-related problems provided a unique opportunity to design and implement a new model for delivery of health care incorporating outcomes measurement and improvement. Key features include: application of microsystem thinking and interdisciplinary practice; integration of a uniform outcomes measurement tool, the Dartmouth Clinical Value Compass; and touch pad technology for data collection. This, for the first time, provided clinically meaningful point-of-service data and aggregated information for improvement. A further advantage was the ability to integrate a clinical research program within this microsystem. A multisite clinical research trial, the Spine Patient Outcomes Research Trial (SPORT), modeled on the Spine Center microsystem and funded by The National Institute of Arthritis, Musculoskeletal and Skin Diseases and the Office of Research on Woman's Health, the National Institutes of Health, and the National Institute of Occupational Safety and Health, the Centers for Disease Control and Prevention, is currently underway. The significant problems we face today cannot be solved by the same level of thinking that created them.

Williams, I., Dickinson, H. & Robinson, S. (2007). Clinical microsystems: An evaluation. University of Birmingham, UK: Health Services Management Centre (HSMC), School of Public Policy. Retrieved from http://birmingham.academia.edu/helendickinson/Papers/737094/Clinical_Microsystems_An_Evaluation

Annotation: Williams et al. (2007) provides an evidence-based evaluation of a National Health Service initiative to apply clinical microsystems thinking at the local level to impact health service delivery at the system level. The authors found that the primary question was not asking if clinical microsystems worked as an improvement methodology but under what conditions the methodology works best.

Williams, I., Dickinson, H., Robinson, S., & Allen, C. (2009). Clinical microsystems and the NHS: A sustainable method for improvement? *Journal of Health Organization & Management*, 23(1), 119-132.

Annotation: This article summarizes findings from Williams and colleagues' 2007 evaluation report on the effectiveness of clinical microsystem methodology to drive improvement at the local level. Findings from this small study highlight the important role of each component of the microsystem 5P assessment process in achieving improvement goals.

Published Abstract

PURPOSE: The purpose of this paper is to evaluate the claims made for the clinical

microsystems approach of healthcare improvement within an English NHS context. DESIGN/METHODOLOGY/APPROACH: The research adopted a Realistic Evaluation approach to examine a series of pilot clinical microsystems sites to determine what worked for whom, when and within what circumstances. Interviews and group discussions were used to collect qualitative data, whilst quantitative outcome data was also collected within each of the sites. Data was triangulated to produce case studies for each of the sites. FINDINGS: The research concurred with many of the claims for clinical microsystems, particularly that democratic, consensual approaches to change and improvement can be better received than externally derived initiatives with imposed targets. The clinical microsystem approach emphasises identifying and nurturing strengths--of both teams and individuals--and this reinforced these positive aspects. The case study sites demonstrated higher staff morale, empowerment, commitment and clarity of purpose. To a lesser extent the research also indicated an enhanced predisposition towards improvement and innovation and a seemingly embedded of improvement as an ongoing (if essentially episodic) process. RESEARCH LIMITATIONS /IMPLICATIONS: The evaluation was limited in terms of the numbers of case study sites that it was able to incorporate. This sample represented sites of different sizes, coverage of primary, secondary and tertiary care and those reporting more and less positive experiences of the clinical microsystems approach--but any findings may be limited in their generaliseability and further studies may be needed to test out the relevance of these findings in wider settings. PRACTICAL IMPLICATIONS: Future microsystem programmes will need to address components of patient involvement and process/outcome monitoring if the broader legitimacy of the approach is to be cemented and enhanced. In particular, the importance of strong data collection in achieving "high performing" status is emphasised. ORIGINALITY /VALUE: There is currently no other empirical studies within the academic literature which investigate the value of the clinical microsystems approach to an English NHS context.

Wrobel, J.S., Robbins, J.M., Charns, M.P., Bonacker, K.M., Reiber, G.E., & Pogach, L. (2006). Diabetes-related foot care at 10 veterans affairs medical centers: Must do's associated with successful microsystems. *Joint Commission Journal on Quality and Patient Safety*, 32(4), 206-213.

Annotation: Wrobel et al. (2006) demonstrates how mapping a microsystem's performance to evidence-based characteristics of high-performing microsystems delineated by Nelson et al. (2002) can identify specific system characteristics that impact patient outcomes within the microsystem

Published Abstract

Background: Well-coordinated interdisciplinary preventive foot care has been reported to significantly reduce diabetes-related foot ulcers, amputations, and hospitalization. However, the contribution of the specific components leading to

these "successes" is not fully characterized. The microsystem conceptual framework was adapted to foot care to determine which of the microsystem success characteristics were associated with decreased major lower-limb amputation rates at 10 Veterans Affairs (VA) medical centers. Methods: Two-day site visits were conducted using standardized interviews at the 10 VA medical centers. Results: Six "must do's" for foot care in microsystems were correlated at $\geq (-.30)$ with amputation rates: (1) addressing all foot care needs, (2) appropriate referrals, (3) ease in recruiting staff, (4) confidence in staff, (5) available stand alone specialized diabetic foot care services, and (6) providers attending diabetic foot care education in the past three years. Using multiple linear regression, the sum of these items described 59% of the variance ($p = 0.006$). Discussion: Clinicians and managers may want to include the must-do's in system modifications to improve foot care for people with diabetes. Many of the sites displayed exemplary features in foot care, such as providing a formal orientation to the foot care clinics.

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