



Emergency Department Operations Management

An Information Paper

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American College of Emergency Physicians
Emergency Department Operations Management
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Purpose

The purpose of this web based module is to provide a compendium of operations management resources and information that can be utilized to improve effective hospital and emergency department (ED) function for ACEP members. Five modules have been developed:

1. The Nature of ED Services
2. The Science of Service Quality
3. The Role of Metrics in Managing Clinical Operations
4. The Dynamics of Organizational Change
5. Service Management Tools

Introduction

The clinical practice of emergency medicine and the administration of an ED ultimately constitutes the provision of a customer service, albeit a professional one. Within the world of business, there are a number of theories and models on the management of a service enterprise, most notably those of Juran, Baldrige, as well as the “Six Sigma” approach. One body of expertise that seems particularly applicable to emergency medicine services is Operations Management. Operations management utilizes a systems approach to the provision of a service, including the definition of the particular characteristics of a service (such as the service package, the service process, and the virtual value chain embedded in that service), structured planning for service quality, appropriate service metrics, selected management tools, and consideration of strategies for interdisciplinary collaboration, as well as cultural change. Ultimately, the value of an operations management approach to management of the ED is explicit consideration of all salient elements of the service process in a systematic manner. In doing so, it is important to link clearly the service function to the institutions mission/strategic plan, as well as the expectations and needs of ED patients who are served there.

Asplin (A Conceptual Model of Emergency Department Crowding. *Ann Emerg Med.* 2003; 42:173-180), describes a three-phase “input – throughput – output” model of emergency services. This model is applicable to the challenge and solutions to the problem of ED overcrowding that has occurred in many communities in the US.

The Nature of ED Services

Emergency medicine is, quintessentially, a professional service. What are the defining characteristics of a service that make them different from other human productive activities, such as producing products? What do we need to know about the nature of services to manage them well?

In order to understand emergency medicine as a professional service, the nature of services has to be defined. In this context, the relevant statement might be that we collectively provide medical care to the population at large. However, if we were to more narrowly define the scope of our service, we might say that we simply perform a task. Webster’s dictionary defines “service” as *contributing to the welfare of others*. This definition better portrays the true nature of the service we provide. Along with defining the terms, many of the questions we pose here are based on business operations management. As we lay this philosophical foundation we hope to empower you to apply business strategies to providing the best health care in a more efficient manner. Applying this theory to emergency medicine is critical to our profession’s future.

Selected Web Resources

www.mhhe.com/pom Locate current articles and readings, links to company tours and operations management organizations, a listing of resources by topic, and downloadable study/review software.

www.ceoexpress.com The website is a portal for executives interested in researching a specific issue with their business. Business research is the main heading with subheadings that address financial markets, SEC, government agencies, statistics, company research, business law, international business, and business news. Additional tools are the office tools heading that address business directory searches, technology tools, and speech and writing.

www.solutionportals.com The website looks at the virtual value chain application to company models. Members look at the business opportunities, plans, process, scenarios, strategy, marketing, product development, and value chains.

www.accenture.com The consulting website looks at promoting operational excellence, innovation and execution, alliance and collaboration, and leadership and talent management.

Pertinent Journals

These journals address the issues facing operations management.

Harvard Business Review www.hbsp.harvard.edu/

International Journal of Service Industry Management www.mcb.co.uk/cgi-bin/journal1/ijsim

Journal of Operations Management <http://www1.elsevier.com/homepage/sae/orms/jom/menu.htm>

Production and Operations Management <http://www.poms.org/>

Relevant Articles

The Nature of Services

These articles take a general approach to understanding the nature of services.

Chase RB. The Mall is My Factory: Reflections of a Service Junkie. *Prod Oper Manage.* Winter 1996; 5(4):298-308.

Cook D, Chon-Huat G, Chung CH. Service Typologies: A State of the Art Survey. *Prod Oper Manage.* Fall 1999; 8(3):318-338.

Heskitt JL. Lessons in the Service Sector. *Harv Bus Rev.* March-April 1987; 118-129.

The Role of Services in an Economy:

How the role of services changed during the evolution from a pre-industrial to today's post-industrial economy.

Heskett JL, Sasser WE, Hart CWL. *Service Breakthroughs.* Free Press, New York, 1990.

Nie, Winter, Kellogg. How Professors of Operations Management View Service Operations. *Prod Oper Manage.* Fall 1999; 8(3):39-355.

Pine J, Gilmore J. Welcome to the Experience Economy. *Harv Bus Rev.* July-August 1998; 97-105.

Rifkin J. *The End of Work: The Decline of the Global Labor Force and the Dawn of the Post-Market Era.* Tarcher/Putman, New York, 1995.

The "Service Package" and Process:

These articles analyze the critical factors in the "service package" and process. The service package consists of the necessary supporting facility, facilitating goods, explicit services, and implicit services. Furthermore, analysis of the service process involves entities and concepts, such as the customer, simultaneous production and consumption, time-perishable capacity, site/customer relationship, labor intensiveness, intangibility, and difficulties in measuring output. These articles aid in understanding the

intricacies of services. With such an understanding of services, we equip ourselves to make the necessary changes to provide better and more efficient care.

Articles

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- Evans P, Wurster T. Strategy and the New Economics of Information. *Harv Bus Rev*. September-October 1997; 71-82.
- Gilmore J, Pines J. The Four Faces of Mass Customization. *Harv Bus Rev*. January-February 1997; 91-101.
- Kingman-Brundage J. Technology, Design, and Service Quality. *Int J Service Ind Manage*. 1991;2(3):47-59.
- MacMillian IC, McGrath RG. Discovering New Points of Differentiation. *Harv Bus Rev*. July-August 1997; 133-145.
- Martin CR, Horne DA. Service Innovation: Successful versus Unsuccessful Firms. *Int J Serv Ind Manage*. 1999; 4(4):49-65.
- Miller JL, Craighead CW, Karwan KR. Service Recovery: A Framework and Empirical Investigation. *J Oper Manage*. 2000; 18:387-400.
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- Wood M. Statistical Methods for Monitoring Service Processes. *Int J Serv Ind Manage*. 1994; 5(4):53-68.

Publications

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- Clark G, Johnston R, Shulver M. Exploiting the Service Concept for Service Design and Development. New Service Development, Sage Publications, Thousand Oaks, CA, 71-91, 2000.
- Heskitt JL, Sasser WE, Schlesinger LA. The Service Profit Chain. Free Press, New York, 1997.
- Hill T. Manufacturing Strategy, 3rd Ed. Irwin/McGraw-Hill, Burr Ridge Ill, 2000.
- Lovelock CH. Principles of Service Marketing and Management. Prentice Hall, Upper Saddle River, NJ 1999.

The Virtual Value Chain in Medical Services:

This section touches on the need for creating value by gathering, organizing, selecting, synthesizing, and distributing information.

- Rayport JF, Sviokla JJ. Exploiting the Virtual Value Chain. *Harv Bus Rev*. Nov 1, 1995.
- Roberts ML. Internet Marketing Integrating Online and Offline Strategies. McGraw-Hill/Irwin, 2002.

Role of IT in Medical Service:

As the economy is impacted by new technologies, innovative methods for the service industry evolve.

- Boyer KK, Hallowell R, Roth AV. E-Services: Operating Strategy-A Case Study and a Method for Analyzing Operational Benefits. *J Oper Manage*. 2002; 20(2):175-188.
- Finch BJ. Internet Discussion as a Source for Customer Product Customer Involvement and Quality Information: An Exploratory Study. *J Oper Manage*. 1999; 17(5):535-556.

The Science of Service Quality

Three characteristics that make services particularly difficult to evaluate, in terms of quality are:

- **Intangibility:** Services are not manufactured according to precise standards, nor can they be stored. How consumers perceive services is very subjective, since they are a performance rather than a tangible good.
- **Variability:** Consistent service delivery is very difficult, particularly in fields such as medicine, due to the high labor contribution of the service along with the variation between clinicians.
- **Inseparability:** Service quality is extremely difficult to control since it is produced and consumed at the same time. There is no opportunity to measure or inspect the service prior to actually delivering it. Additionally, the consumer (patient) significantly impacts the quality of the service provided. For example, the description of a patient's symptoms can significantly affect the outcome of the visit. The better the description, the more likely a better outcome.

Service quality can be defined as the degree to which the service delivered matches the consumer's expectations(s). Deviation from this expectation creates either a higher or a lower quality perception. There are five dimensions of service quality: reliability, responsiveness, assurance, empathy and tangibles. Each of these dimensions can contribute to a service quality "gap," if the consumer's expectation is not met.

Measuring service quality is as difficult as defining it. The characteristic intangibility of a service, specifically with reference to the dimension of the assurance and empathy, makes service quality measurements vulnerable to many complex influences, including psychological ones. There is a good chance that a medical encounter with a clinician who has good bedside manner and questionable clinical skills will be better received than an encounter with a very astute clinician who exhibits a poor bedside manner. Also, somewhat unique to healthcare is the fact that service quality can extend far beyond the actual encounter. The positive or negative effects of an encounter can last for a lifetime.

If the patient's service expectation is not met, there are ways to remedy this shortcoming. Service recovery is an effective tool to prevent patient defection, but it is necessary to have a well crafted plan in place before the actual event occurs. Patient retention can have a significant financial impact.

Patients are becoming more sophisticated and the healthcare industry must take notice of this. Other sectors of the economy are providing an ever higher quality of service and are raising consumers' expectations along with it. If budget motels, low cost airlines and quick auto lube outlets can produce consistently high quality service encounters, patients will only come to expect that much and more from high-tech and high-cost medical encounters.

Resource List

Relevant Articles

1. Conway T, Willcocks S. The role of expectations in the perception of health care quality: developing a conceptual model. *Int J Health Care Quality Assurance*. 1997; 10:131.
2. Dansky KH, Miles J. Patient satisfaction with ambulatory healthcare services: Waiting time and filling time. *J Healthcare Manage*. 1997; 42:165-177.
3. Fottler MD, Ford RC, Roberts V, et al. Creating a healing environment: The importance of the service setting in the new consumer-oriented healthcare system. *J Healthcare Manage*. 2000; 45:91-106.
4. Frost FA, Kumar M. INTSERVQUAL - an internal adaptation of the GAP model in a large service organization. *J Services Marketing*. 2000; 14:358.
5. Furse, David H, Burcham, Michael R, Rose, Robin L, Oliver, Richard W. *Leveraging the value of customer satisfaction information*. *Marketing Health Services*. 1994; 14:16-20.
6. Hess Jr RL, Ganesan S, Klein NM. Service failure and recovery: The impact of relationship factors on customer satisfaction. *Academy Marketing Science J*. 2003; 31:127-145.

7. Houston MB, Bettencourt LA, Wenger S. The relationship between waiting in a service queue and evaluations of service quality: A field theory perspective. *Psychology & Marketing*. 1998; 15:735-751.
8. Mayer TA, Cates RJ, Mastorovich MJ, et al. Emergency department patient satisfaction: Customer service training improves patient satisfaction and ratings of physician and nurse skill: Practitioner response. *J Healthcare Manage*. 1998; 43:427-440.
9. Noon CE, Hankins CT, Cote MJ, et al. Understanding the impact of variation in the delivery of healthcare services / Practitioner application. *J Healthcare Manage*. 2003; 48:82-98.
10. Parasuraman A. A Conceptual Model of Service Quality and Its Implications for Future Research. *J Marketing*. 1985; 49:41-50.
11. Parasuraman A, Berry LL, Zeithaml VA. Perceived Service Quality as a Customer-Based Performance Measure: An Empirical Examination of Organizational Barriers Using an Extended Service Quality Model. *Human Resource Manage*. 1991; 30:335-64.
12. Parasuraman A. Service Quality and Productivity: A Synergistic Perspective. *Managing Service Qual*. 2002; 12:6-9.
13. Reichheld FF, Sasser Jr WE. Zero Defections: Quality Comes to Services. *Harvard Bus Rev*. 1990; 68:105-111.
14. Schweikhart SB, Strasser S, Kennedy MR. Service recovery in health services organizations. *J Healthcare Manage*. 1993; 38:3-21.
15. Svensson G. A generic conceptual framework of interactive service quality. *Managing Service Quality*. 2003; 13:267.
16. Their SO, Gelijns AC. Improving health: The reason performance measurement matters. *Health Affairs*. 1998; 17:26-28.
17. Webb D. Understanding customer role and its importance in the formation of service quality expectations. *The Service Industries J*. 2000; 20:1-20.

Selected Texts

18. Isenberg SF, Gliklich RE. *Profiting From Quality: Outcomes Strategies for Medical Practice*. San Francisco: Jossey-Bass, 1999.
19. Berwick DM, Godfrey AB. *Curing Healthcare: New Strategies for Quality Improvement*. San Francisco: Jossey-Bass, 1990.
20. Johnson MD, Gustafsson A. *Improving Customer Satisfaction, Loyalty, and Profit: An Integrated Measurement and Management System*. San Francisco: Jossey-Bass, 2000.
21. Fitzsimmons JA, Fitzsimmons, MJ. "Service Quality" in *Service Management: Operations, Strategy and Information Technology*. New York: McGraw-Hill, 2004, 4th edition.

Web Resources

www.prhi.org

The Pittsburgh Regional Healthcare Initiative (PRHI) is an innovative model for health system change based on region wide shared learning. By linking patient outcomes data with processes of care and sharing that information widely, PRHI supports measurable improvements in region wide clinical practice and patient safety. In addition, through the redesign of problem solving at the front lines of care, PRHI helps health care organizations to evolve toward becoming sustainable systems of perfect patient care.

www.femf.org

The Emergency Medicine Learning & Resource Center (EMLRC) is dedicated to promoting high quality health care by identifying areas of educational need through the provision of cutting edge education to emergency care providers.

www.quality.nist.gov

Baldrige National Quality Program: To enhance the competitiveness, quality, and productivity of U.S. organizations for the benefit of all residents.

www.mhhe.com/pom

Operations management resource site offering links to OM publications (articles and text), organizations, software and news feeds.

The Role of Metrics in Managing Clinical Operations

A metric is a verifiable measurement and may be expressed in either quantitative or qualitative terms. The use of metrics for the purpose of improving efficiency is standard practice in competitive manufacturing and service industries. The most successful companies break down and analyze the processes used for such varied tasks as producing automobiles and delivering packages. The very survival of these companies depends on extracting the most with the least possible effort. Measurement, “metrics,” and operations management techniques make all of this possible. After all, “You can’t manage what you don’t measure.”

Metrics applicable to the ED can be grouped into three main categories, volume, cycle time, and patient satisfaction. Volume metrics including arrivals per hour, percentage of ED beds occupied and age of patients are understood at a basic level at all hospitals as an indication for staffing requirements. Cycle time metrics are the mainstays of the evaluation and tracking of process efficiency and are less widespread since an active effort is needed to collect and analyze this data. Patient satisfaction metrics, already commonly collected by physician groups and hospitals, are useful in demonstrating the impact of changes in patient perception of care over time. Since patient satisfaction metrics are derivative and subjective, they are less useful in primary process improvement.

Many private physician groups keep track of basic performance metrics for each emergency physician, such as patients per hour, relative value units (RVUs) per hour, RVUs per patient, etc. While such numbers may reflect clinical care productivity, they are of limited utility to assessing the efficiency of patient care delivery and are of no value to inferring its quality. They provide only a fraction of the data needed to measure and improve the operations of the ED as a whole. Clearly more in-depth process analysis is needed.

While there is no single set of “ED metrics,” it is undeniable that basic volume and cycle time measurements are vital to understanding and managing ED work flow. The “input” of Asplin’s model relates to patient volume while the capacity of the system, the “throughput” in Asplin’s model, is directly related to how much total time patients spend in the ED. The milestones of a visit—arrival to triage, arrival to bed, arrival to physician evaluation, etc. provide insight into specific areas of delay in patient care. Real-time measurement of temporal metrics provides data that can pinpoint developing problems in patient flow through the department, allowing more active management.

Nationwide, EDs face challenges to the efficient delivery of patient care—overcrowding produces long wait times, decreased patient satisfaction, ambulance diversion, and decreased quality of care. The ED “on demand” practice model is relatively unique in medicine. Such a “unique” environment however, does not preclude measurement and improvement with standard industry techniques. After all, despite very high variability in individual patient needs, the basic processes during an ED encounter are similar and most importantly, quantifiable. Recent work, published by Asplin has gone a long way towards developing a process model of the ED. Significant studies have been published in the emergency medicine literature demonstrating the tangible benefit of process improvement and the implementation of best practices. Such work provides support and guidance for applying operations management principles

in the ED. It is important to make the link between collecting process data in the ED and making real and sustainable change in the efficiency of care delivery.

EDs are increasingly turning to information systems to help manage and monitor the work flow in the department. These systems come in many shapes and sizes from the most basic, task-oriented system (ie, an electronic greaseboard) to a comprehensive system that encompasses all aspects of the visit from registration to discharge. One function of an ED information system is to gather data for the purposes of analyzing the work flow of an ED encounter. The most sophisticated of these systems include automatic passive data collection. One such system uses infrared-emitting badges to track patients and staff. Hard wired sensors, in each treatment room and in x-ray for example, automatically record milestones for the encounter. Many ED information systems are also designed to interface with other hospital information systems such as lab and radiology for the automatic transfer of data.

The concept of using metrics to improve efficiency must be put into perspective, however. A good metric is a tool to analyze a perceived problem area, provide data, and track improvements in that area. The best ED information system available merely will document just how poorly the department is doing - unless the commitment exists at all levels to produce real and meaningful improvement in the ED. Well-defined metrics can help ED and hospital administrators make better decisions but they won't do it for you.

Resource List

Relevant Articles

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- Chan SY, Ohlmann J, Dunbar S, et al. Operations research methods applied to workflow in a medical records department. *Health Care Manag Sci.* 2002; 5(3):191-199.
- Cors WK. Organization theory. Analyzing health care organizations. *Physician Exec.* 1997; 23(2):21-3.
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- Hoffenberg S, Hill MB, Houry D. Does sharing process differences reduce patient length of stay in the emergency department? *Ann Emerg Med.* 2001; 38:533-540.
- Hu SC. Computerized monitoring of emergency department patient flow. *Am J Emerg Med.* 1993; 11:8-11.
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Frost B. Measuring Performance: Using the new metrics to deploy strategy and improve performance. Measurement International, 2000.
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Kaplan RS, Norton DP. The Balanced Scorecard: Translating Strategy into Action. Harvard Business School Press, 1996.
Melnyk S. Measurements, Metrics and the Value-Driven Operations Management System. Atlanta: Lionheart Publishing, 2001. Also available as an e-book from <http://www.lionheartpub.com>
Shim JK, Siegel JG. Operations management (Business review series). Barrons Education Series, 1999. This is a short, review-type book good for a general overview of the field.

Web Resources

<http://www.bscoll.com>

The balanced scorecard collaborative site—an extension of the original concept pioneered by Kaplan and Norton of Harvard Business School. Their original book on the subject is referenced above.

<http://management.bu.edu/research/hcmrc/mvp/index.asp>

Boston University program for management of variability in health care delivery.

<http://www.acep.org/1,32140,0.html>

Link to ACEP website content on overcrowding and potential solutions.

ED Information Systems Resource List

Commercial vendors of ED information systems

Systems provided by these vendors include varying levels of patient tracking and integrated metrics. Many sites provide case studies and extensive background information specific to the use of metrics in ED management.

A4 – HealthmaticsED and EmStat ED
www.a4healthsystems.com

Healthcare IT – EDTracker and ED Log
www.healthcareit.com

Cerner - FirstNet
<http://www.cerner.com>

ibex Healthdata Systems – PulseCheck
www.ibexhealthdata.com

Codonix - Codonix
www.codonix.com

Logicare – OnTrack
www.logicare.com

Emergisoft – Emergisoft ED
www.emergisoft.com

MedHost, Inc. – EDMS
www.medhost.com

Tenet – EDNet32
www.tenetinfo.com

Patient Care Technology Systems – Amelior ED
www.pcts.com

VitalWorks – EMStation, EMTrack
www.vitalworks.com

T-Systems – T-SystemEV
www.tsystem.com

Wellsoft Corporation – HomeEast, ICMS
www.wellsoft.com

The Dynamics of Organizational Change

Organizational culture can loosely be defined as the shared values, beliefs, and “normal behaviors” (norms) of a group. These are manifest in the behaviors, rituals, and symbols shown in the workplace, and form the context for much of organizational behavior. These are powerful influences on the way people live and act as they define what is “normal” and how to sanction those who are not “normal.” To a large degree, what we do is determined by our culture.

Organizational culture is similar to a regional culture. The same person in different organizations (or different parts of the same organization) would act in different ways. Culture is that powerful. Many companies have turned themselves around, converting imminent bankruptcy into prosperity. Some did it through financial gimmickry, but the ones who have become paragons of success did it by changing their own culture.

The underlying causes of many organizations’ problems are not in the structure, leadership, or staff; rather, one looks to the culture. Because people working in different cultures act and perform differently, changing the culture can cause everyone to perform more effectively and constructively. The concept of culture is particularly important when attempting to manage organization-wide change. Practitioners are coming to realize that, despite the best-laid plans, organizational change efforts must include not only changing structures and processes, but also changing the organizational culture as well.

Culture change is a form of organizational transformation--it is a “frame-breaking” fundamental form of change. Culture change alters the basic values, norms, and beliefs among members of the organization. There has been a great deal of literature over the past decade about the concept of organizational culture, particularly, regarding how to change organizational culture. Organizational change efforts often fail. Usually, this failure is credited to lack of understanding about the strong role of culture and the role it plays in organizations. That's one of the reasons that many strategic planners now place as much emphasis on identifying strategic values as they do mission and vision.

This is the hardest part. Interdisciplinary collaboration is vital to ensuring that a major change in current operations can be effected. Changing the organization’s culture is a fundamental step in this process. How should one approach a culture change? First, conduct an audit of previous changes in a given institution and evaluate how they succeeded or failed. Second, begin by encouraging senior administrators, the medical staff, middle management, and members of the ED (all non-physician staff, physician extenders, as well as physicians) to participate. Introduce new ideas for patient care process improvement. By assessing previous changes, one can avoid pitfalls that have occurred in the past. By empowering employees to have some autonomy in the decision making process, one begins to develop the needed psychological climate to facilitate real cultural change. An assessment of the current culture –specifically, the gap between current values, beliefs, and the desired new set of values and beliefs -- must be addressed. It is imperative for those responsible for those driving the change to be mindful that there are many different types of individuals as well as personalities participating in (or resisting) the change.

There are those who are visionary, early adapters, the cautious wait and see, late adapters, and last but not least; the laggards. It will take the utmost skill and tact to ensure that the latter do not “poison the well.” One needs to lead the change effort, initially, with the visionaries and early adapters. Get them “on board” first, and then work through them to persuade the more cautious and the more reticent of the merits of the proposed change. Think of the change effort like the ripples from a pebble thrown into a pond – the pebble propagates its impact on the water from the central “core” outward toward the “periphery.”

The following five steps are key elements of any organizational change effort:

1.) Surface dissatisfaction with the present state and create a sense of urgency.

An example might be to send reports to every nursing unit to be addressed/discussed with the nurses at each change of shift describing the number of patients in holding beds in the ED. This practice informs all of the charge nurses in the hospital about the issue. Establish appropriate metrics and accountability as to what is happening that inhibits ED patient flow to their floor.

Communicate those metrics throughout the organization to reveal how a particular problem involves the entire hospital and medical staff not just the ED. A prime example would be to use ED wait times for patients when the ED is holding admitted patients, and to correlate this with patients waiting to be discharged by primary care physicians. Communicate to those from whom we need collaboration regarding how they can be part of the solution.

2.) Communicate a clear vision of the proposed change.

Hold mandatory in-services. Show videos that illustrate successful change efforts. Go over metrics. Show pictures illustrating the problem. Hold group discussions. Publish newsletters. Speak to the emotional as well as the cognitive. In other words, exploit multiple channels of communication, use multiple media to communicate and remember the value of emotion, as well as repetition, for reaching your audience.

3.) Promoting participation in the proposed change.

The value of promoting participation in any proposed change effort cannot be over-emphasized. Use “the carrot” (incentives, contests, etc) as well as “the stock” (mandatory inservices, etc.) Once an individual becomes part of the opportunity, has input into the change, and makes suggestions along the way, a major victory has occurred. It is akin to spreading good news, everyone wants to hear it and be part of it.

4.) Clear communication

Communication should be fostered about the upcoming change with medical and nursing staff. It should be on the agenda for medical staff and department meetings, in a newsletter, be on a poster on each unit, etc. A day should be picked to begin the new process. A method for ongoing communication regarding the change process should be established. Bulletin boards, timely newsletters, and “bathroom” postings are ways to effectively communicate on-going progress. Feedback and suggestions can be obtained by “suggestion box” and/or comment postings which take on the appearance of an internet user group thread. Verbal communication is ideally suited for focused groups, departmental, administrative or medical executive meetings. The foundation for change is that everyone has a voice and opinions that should be listened to and heard. Finally, publicize success. Let administration, the medical staff, and the entire organization, even the public, know of improvement.

5.) Maintaining the commitment

Organizational leaders should use feedback mechanisms to assess progress during the transition. Use qualitative and quantitative metrics that reflect the change that has been absorbed by the organization. And lastly, a written policy is recommended to underscore important decisions.

Relevant Articles:

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Improving clinical practice: total quality management and the physician / David Blumenthal, Ann C. Scheck, editors. First edition. San Francisco: Jossey-Bass Publishers, c1995.

Web-Based Resources

Culture Change Resources:

http://www.findarticles.com/cf_0/PI/search.jhtml?magR=all+magazines&key=organizational+culture

Culture Links:

<http://www.css.edu/users/dswenson/web/6300-OBOD/culturechange.html>

Organization Infrastructure: Where does Culture Fit In?

<http://www.russellconsultinginc.com/docs/white/culture.html>

Organization Culture Assessment and Understanding:

<http://www.hcnet.com/html/articles/understanding-Culture.html>

Business Culture Models:

<http://www.entarga.com/stratplan/culture.htm>

Organization Life-Cycle and Culture:

<http://www.brandonu.ca/artsadm/orglife/>

Service Management Tools

There are numerous “tools” that have been developed by industrial engineers and operations researchers to manage service operations. The list of “tools” mentioned below is neither mutually exclusive nor exhaustive. Some have been used in specific industries and have functions that overlap with other “tools.” Some of the techniques have enthusiastic champions who identify with a software package or a flow-charting method having a particular world-view and lots of jargon.

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1. General operations management
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 - c. Quality Function Deployment (QFD):
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- d. Failure Mode and Effects Analysis:
- i. web powerpoint: <http://www.ihi.org/conferences/natforum/handouts2003/1>
 - ii. <http://www.qualityhealthcare.org/qhc/workspace/tools/fmea/>
 - iii. Pareto analysis: Fitzsimmons JA, Fitzsimmons MJ. *Service Management*. 4th ed. McGraw Hill/Irwin; 2003.
3. Analyzing
- a. Static
- i. Process capability analysis
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 - ii. Demand/capacity matching

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 - iii. Constrained optimization – linear programming
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- Simulation models
1. Software packages:
 - a. <http://www.hps-inc.com/>
 - b. <http://www.vensim.com/>
 2. References
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- c. Troubleshooting
- i. Fishbone diagram
Breiterman-White R. CQI in anemia management: using the fishbone approach to improve outcomes. Case study of the anemic patient. *Anna J.* 1999;26(2):254-7.
 - ii. Causal Loop diagrams
<http://www.pegasus.com/cld.html>
 - iii. Data mining
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4. Managing
- a. Supply – Fitzsimmons JA, Fitzsimmons MJ. *Service Management.* 4th ed. McGraw Hill/Irwin; 2003.
 - i. Work-shift scheduling
 - ii. Patient participation
 - iii. Creating adjustable capacity
 - iv. Cross training
 - b. Demand
 - i. Understanding - Queuing theory
 1. Arun CP. Queueing and inventory theory in clinical practice: application to clinical toxicology. *Ann NY Acad Sci.* 2000; 919:284-287.
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 - ii. Selected Texts:
 1. Standard Industrial Engineering text “Handbook of IE” contains a chapter on SPC by John English

2. Tutorial (\$600 “Six sigma” package) at <http://www.qualityamerica.com/SPCTopics/SPCCC/spcccq.htm>
 3. “SPC Primer” a programmed learning text by Pyzdek. I have a copy now (excellent introduction for the innumerate).
- iii. Software packages
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 - i. Anonymous. Benchmarking data may underestimate ED staffing needs, study reveals. *ED Manag.* 1997; 9(10):117-120.
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