

Solution: Point of Care “Quantumized”: Building a Culture of Patient Safety ‘Byte by Byte’

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IDENTIFICATION:

The Problem: How to effectively manage a Point of Care Testing (POC) program and maintain good lab practice with a large number of end-users with varying skill and knowledge levels, while having absolutely no authority over any one of them.

The Identification: The challenge is inherent in the very nature of Point of Care (POC): laboratory testing done at the patient bedside by nurses, nurse assistants, physician assistants, anesthesiologists, other doctors, etc. During the initial training and certification process, the end user variability was evident. Trainees demonstrated wide variability in manual facility, cognition, and attitude when exposed to the same basic training protocol. An additional and critical problem was fostering a culture of ownership of and acceptance for the new testing protocols among users who had been used to very little regulation of bedside testing. Several measures were used in order to establish baseline data:

- Peer reviews, or informal site visits to testing units, were carried out and documented. These visits provided opportunities to observe management of supplies and equipment, to occasionally observe user activity, and to allow an informal level of interaction between staff-members who were actually completing patient testing, and staff members who were working to implement a system of management for bedside testing.
- Results from patient bedside testing were compared to results of tests carried out in the central laboratory for the same patient occurring within a relatively narrow timeframe. A system of simple test codes allowed users and managers to identify testing factors that could result in discrepancies.
- Exploratory observations of end users during proficiency testing and in training were performed to gather information on inefficient (and effective) operations.
- A Performance Index was developed. This unique algorithm combined factors reflecting all aspects (pre-analytical, analytical and post-analytical) of testing to yield a single numerical index of performance deficiencies. An ideal level of testing performance with no deficiencies would yield a zero index, with the index number increasing with increased deficiencies in testing performance.

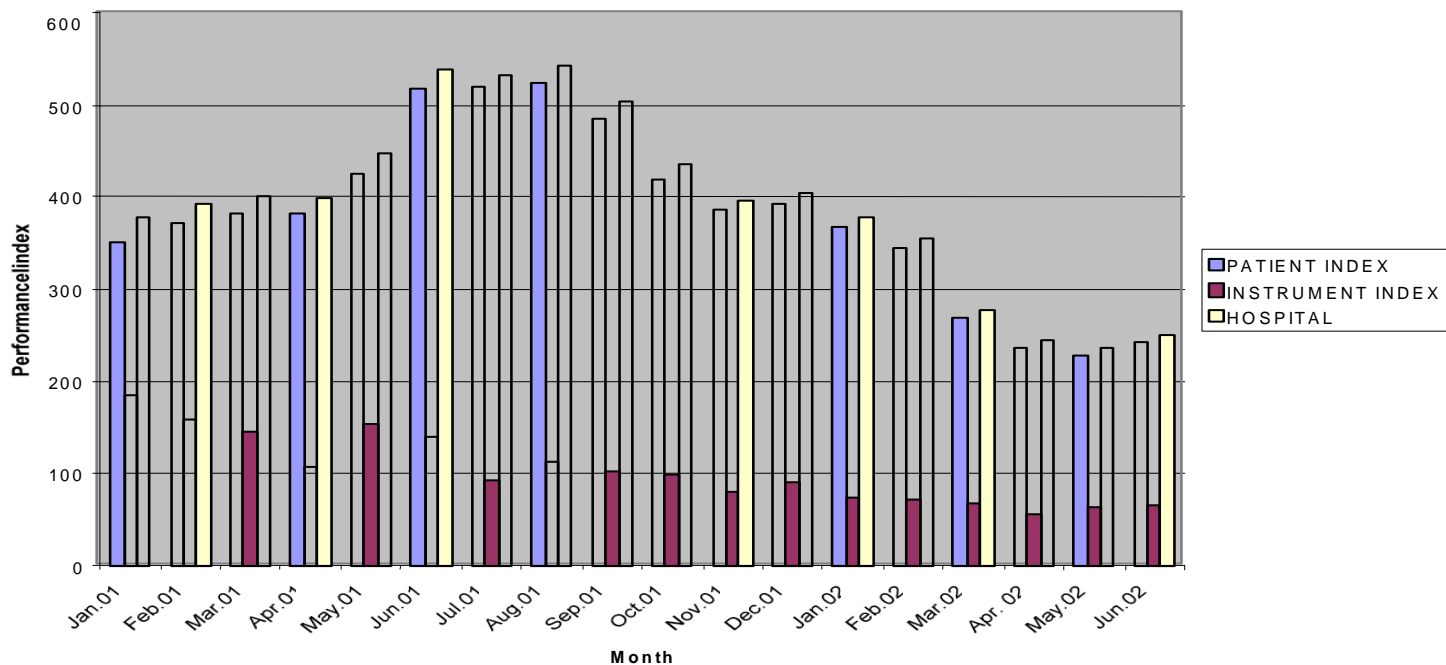


Figure 1: Where POC errors are occurring

In Figure 1, indices of pre-analytical, analytical, and post-analytical errors for the entire hospital are displayed for the period from January 2001 to June 2002. Patient indices are comprised of user-driven pre-analytical and post-analytical errors (e.g., patient ID errors, user ID errors, or errors in conducting successful review of the POC results and/or associated documentation). The instrument indices reflect instrument-driven analytical errors, (e.g., too many failed controls), that will affect all patient test results obtained from a particular instrument. The hospital index is a combination of pre-analytical, analytical and post-analytical errors. Clearly the pre-analytical and post-analytical errors comprise most of hospital errors.

Laboratory Type	Analyte	# of users	# of Instruments	# of tests per month	Departments directly involved
Main laboratory	Glucose	20+	2	8000+	2 (lab & requesting unit)
POC lab	Glucose	1500+	120+	15000+	59 (lab & each POC unit)

Table 1: Comparison of laboratory dynamics: typical main laboratory versus POC lab

Table 1 displays the differences between the POC and central laboratory environments. Although POC instrument technology is improving rapidly, the number of end users is large, accounting for the drastic difference between analytical errors and pre- and post-analytical errors. It was clear that to obtain quality of care comparable to that of the central laboratory, the pre- and post-analytical errors previously regarded as inherent to POC testing had to be addressed with corrective measures.

PROCESS:

1. Conducting initial software needs analysis and design
2. Building a culture of ownership and inclusion
Availability of data was essential in generating a culture of ownership among end users. Bedside testing at Johns Hopkins Bayview Medical Center (JHBMC) is carried out throughout the institution, in an array of settings. Effective management of activity so widespread could only be accomplished if all stakeholders were identified and enrolled in the importance of their ownership. A strong collegial relationship with Nursing and Nursing Education was essential in building our community of “One Minute Laboratorians”.
3. Refining performance monitoring system and process continuously
4. Increasing the inclusion of stakeholders in planning, design, use and analysis of program features and data
5. Conducting constant surveillance of technological advances to improve systems and performance

SOLUTION:

POC at JHBMC was “Quantumized”. JHBMC uses technology to create the desired behavior in end users, thus producing the desired culture necessary for optimum patient safety. Based on the data obtained through the previously described identification measures, a system of performance monitoring through intelligent connectivity was developed. User activities were monitored through analysis of data downloaded from individual instruments to a central computer system. The data was then used to develop training strategies and refine features of the monitoring programming.

At JHBMC patient safety is a journey rather than a destination. There is no level of performance that is considered “good enough”. The “solutions” then, are steps along the journey that yield differing discrete and measurable improvements in quality of performance for Team Bayview.

Solutions (i.e., the steps or quanta developed), are constantly implemented in the following manner:

- Data analysis reveals an area of need
- The Advisory group is made aware of the need, and feedback is obtained
- Laboratory staff develops a strategy or a software enhancement to be implemented
- The enhancement is piloted using a limited end-user group
- Results are brought back to the Advisory group for further analysis and feedback
- The enhancement or strategy is amended, if necessary, and implemented

Grouped by the departments that led the initiative or were targeted for the initiative, the following is a sample of the solutions implemented by Team Bayview.

Laboratory; Patient Care Managers

- Creation of POC mission and values statement in alignment with the hospital mission and values.

Laboratory; Quality management; Risk management; Nursing administration

- Development of an annual mock in-house POC Audit procedure carried out twice yearly, using a method similar to the tracer methodology subsequently used by Joint Commission.

Laboratory; PDS consultant; Information Services; Clinical Engineering:

- Removal of subjectivity from monitoring process: Developed an automated continuous monitoring of glucose and all other on-line POC testing performance, through computerized review of data downloaded from individual test instruments; downloads manually executed by testing unit personnel.

Laboratory; Nursing education; Security and ID; Advisory groups:

- Early introduction of bar-coded Operator Identification, directed at reducing operator Identification errors.
- Requirement of finger stick demonstration during initial and annual training/recertification.
- Development of a “train the trainer” system, utilizing the web-based instruction module and quiz, and concentrated train-the trainer sessions facilitated through Nursing Education, beginning with zero-base intensive training.

Laboratory; nursing education; PDS consultant:

- Development of a web-based component of the computer system, through which the database could be accessed by laboratory and Nursing Education Staff.
- Formation of a cadre of Point Persons--unit based staff members willing to take an active role in training staff, monitoring performance, and facilitating resolution of problems and issues on a daily, continuing basis.

Laboratory; Finance; Advisory group:

- Development and implementation of billing for and transfer of all on-line POC test results to the Electronic Medical Record.

Laboratory; PDS consultant; Clinical Engineering; Information services; Nursing education; Advisory group:

- Development of Emergency Barcode to be used for patients needing POC test before medical record number is generated.
- Implementation of a series of new testing devices, with a variety of new technological features.
- Implementation of patient bar-coded armbands.
- Addition of a user performance monitoring system in addition to the unit performance monitoring system.
- Implementation of a focused one on one remedial training system based on frequency of occurrence for each POC testing method.

- Enhancement of an automatic weekly “GOOD WORK” email message to all units that performed POC with no concerns in any of the POC procedures in which they participate.
- Expansion of the web module to self-monitoring of user history and certification status to all end users.
- Introduction of the “occurrence” report delineating the number of occurrence users have up to 5 when they are locked out from further testing until they meet one on one with designated lab representative for targeted remediation.
- Introduction of the “Good End User” report delineating the number of days each user has performed POC without any concerns.

The results of these continuing processes are:

- All POC results delineated in the Electronic Medical Record along side other lab results within 12 min.
- Continued downtrend in overall deficiency index.
- Successful targeting and remediation of recurrent problems.
- Increased end user satisfaction and empowerment.
- Continued success in inspections.
- Patient satisfaction.
- AND best of all:
INCREASED PATIENT SAFETY!

Insurance for the future:

Team Bayview is confident that the culture of safety and performance excellence can be sustained, chiefly because our staff has learned to recognize the personal and patient-related benefits of reliable, carefully completed testing, supported by carefully designed and reliably functioning technology. The widespread stakeholder involvement also assures continuation. The Point of Care system of technology has many features which are hands-free, and do not rely on any particular individual’s intervention for successful operation. One thing that technology cannot replace is the staff’s commitment to the best of practice and safety in patient care.

Point of Care is a barometer for patient safety in the hospital. It is a critical component of every aspect of hospital services: Acute hospital, out patient services, research, long term care, geriatric care, and mobile community care. The monthly Hospital deficiency index is down from its peak of 800 at its inception in 1999, to its current value of 20. Each department in the hospital has evolved to recognize that each staff person is a valuable stakeholder in patient safety. The extent of the energy required from each department, each person and each initiative is yet unknown. But that intangible, yet defined energy is a requirement to assure good lab practice throughout JHBMC and to maintain safe patient care. JBHMC is accomplishing this goal--“Byte by Byte.”

In physics, a **quantum** (plural: **quanta**) is an indivisible entity of a quantity that has the same units as the Planck constant and is related to both energy and momentum of elementary particles of matter (called fermions) and of photons and other bosons. The word comes from the Latin “quantus,” for “how much.” Behind this, one finds the fundamental notion that a physical property may be “quantized”, referred to as “quantization”. This means that the magnitude can take on only certain discrete numerical values, rather than any value, at least within a range.