



FIRST

Do No Harm

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Quality and Patient Safety Division, Board of Registration in Medicine

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The Goal of Reducing Surgical Site Infections to Zero: Our Ongoing Journey at the New England Baptist Hospital

John C. Richmond, MD and Maureen Spencer, RN, M.Ed, CIC

A post-operative infection can be a devastating complication for any patient. This is particularly true in elective orthopedic surgery, where the patient typically chooses to undergo the procedure in the anticipation of decreased pain and improved function. Deep infection following orthopedic surgery may drastically alter the outcome. The national benchmark from the CDC for orthopedic surgery is 1.25%.

At the New England Baptist Hospital (NEBH) more than 90% of our surgeries are elective orthopedic procedures and as part of our continuous improvement process, we have embraced the goal of reducing surgical site infections (SSI's) to zero. This report outlines a major step forward in that journey.

Staphylococcus aureus is considered the most important pathogen in terms of SSI. Epidemiologic studies have demonstrated that most cases of SSI are caused by strains of *S. aureus* that are brought into the hospital environment by patients themselves, i.e. most patients who develop *S. aureus* SSI are carriers of the strains causing infection. The anterior nares may be the most common niche for *S. aureus* among carriers, and multiple studies have established that nasal carrier status is a significant risk factor for the development of *S. aureus* SSI.

In July of 2006, we began screening the nares of all patients scheduled for inpatient orthopedic surgery at NEBH. Rapid screening of preoperative patients utilizing a polymerase chain reaction (PCR) based diagnostic test was used to identify methicillin-resistant *S. aureus* (MRSA) carriers. Standard microbiologic culture methods were used to identify methicillin-sensitive *S. aureus* (MSSA) strains. Patients testing positive for either MRSA or MSSA were treated with intranasal 2% mupirocin ointment applied to the interior of each nares twice daily for five days and a daily 2% chlorhexidine shower wash for five days. PCR was then repeated to confirm eradication of the MRSA carrier state.

By the end of 2007, with the *S. aureus* identification and elimination program fully functioning, our overall orthopedic

infection rate had been reduced from an already low 0.51% to 0.43%. This, however, was not the case with certain spine procedures (laminectomy and microdiscectomy), where the infection rate had actually increased to 1.34%. We put together a team from our infection control unit and our spine surgery and research divisions to investigate this anomaly. At that time, many of our spine surgeons were utilizing peridural methylprednisolone to reduce post-operative pain and adhesions. While this treatment has established benefits, corticosteroids are immunosuppressive and are known to be associated with septic arthritis if used intra-articularly during arthroscopy.

In order to identify the potential risk factors for SSI following lumbar spine procedures, a retrospective case-control study was performed, reviewing almost 6000 lumbar spine procedures, which had been done at NEBH between 2005 and 2007. A multivariate logistic regression analysis was carried out. This revealed that the use of peridural methylprednisolone was associated with a nearly 7 fold increased risk of infection (95% confidence interval 1.8-25.8). When this information was conveyed to our spine surgeons, they immediately discontinued the routine use of peridural methylprednisolone. Simultaneously the use of high dose (6+ mg) intravenous dexamethasone given intra-operatively by anesthesia to help with post-operative nausea and vomiting was also decreased to 4 mg.

Over the 2 years 2008-2009, the infection rate following lumbar laminectomy and microdiscectomy at NEBH fell to zero and our continued *S. aureus* identification and eradication program has led to a reduction in our overall infection rate to 0.31%, highlighting how a focused infection eradication program, in conjunction with a superior infection control unit, can be successful in minimizing the risk of SSI.

Dr. Richmond is Chair of the NEBH Department of Orthopedic Surgery. Ms. Spencer is NEBH Infection Control Manager and holds national Certification in Infection Control (CIC).

Actions taken in response to adverse events ... must not only be fair, they must be perceived to be fair; otherwise, future reporting of events may be discouraged. Such an approach is consistent with a culture of safety and is symbolic of a "just" culture. *The Joint Commission. Sentinel Event Alert. Issue 43. August 27, 2009.*

Children's Hospital Boston Early Warning Score: Early detection + Early intervention = Better outcomes

Monica Kleinman, MD and Jane Romano, RN, MS

In-hospital pediatric cardiac arrest is a rare event but has a poor outcome, with only 27% of children surviving to hospital discharge (Nadkarni, 2006). Most pediatric cardiac arrests are preceded by signs of respiratory insufficiency or shock, during which time the child may be using compensatory mechanisms such as increased respiratory rate and tachycardia. Research in adults has shown that there is often evidence of clinical deterioration 1-6 hours prior to an arrest (Franklin and Matthew, 1994; Buist, 1999). The pre-arrest clinical status of the patient may provide indicators that, when identified, can lead to early intervention such as rapid response team evaluation and/or transfer to a higher level of care (Hillman, 2003).

Recognizing clinical deterioration in pediatric patients can be challenging due to the wide range of "normal" values for vital signs and other parameters that vary by age. In 2006, Duncan et. al. published their findings when a 20-point score was utilized to predict which pediatric inpatients might require resuscitation. This Pediatric Warning Score, or PEWS, was shown to identify more than 75% of the children who subsequently deteriorated within the next hour. The score was later simplified and adapted by other pediatric institutions and shown to reduce the rate of cardiac arrests outside of an intensive care setting.

In 2007, Children's Hospital Boston (CHB) participated in the Child Health Corporation of America (CHCA) "Eliminating Codes and Associated Mortality on Inpatient Units" quality improvement collaborative. The goal of this collaborative was to implement a focused "change package" to prevent, detect and correct the course of patient deterioration on inpatient units. In addition to education and promotion of the rapid response team concept, a key intervention was the use of early warning scores. The CHB team examined existing pediatric early warning scoring systems and adapted them to create the "Children's Hospital Early Warning Score (CHEWS) system. The CHEWS scorecard includes objective assessment of three clinical domains: neurologic, respiratory and cardiovascular. In addition, a set of subjective criteria were included to indicate staff or family concern, or when family members are absent from the bedside (and, therefore, unable to express concerns on behalf of their child).

The CHEWS score total can range from zero to eleven, with a score of "0-2" reflecting minimal concern and a score of ≥ 5 indicating a significant risk for deterioration. CHEWS is a tool to complement clinical assessment, and is calculated every four hours on the inpatient units. By tracking the score over time, patient deterioration may be recognized at an earlier stage to allow proactive intervention and prevent progression to cardiac or respiratory arrest.

CHEWS is linked to an action algorithm that recommends specific actions related to the patient's score. When a patient transitions from a score of 0-2 ("green") to a score of 3 - 4 ("yellow"), the bedside nurse notifies the charge nurse and the primary resident team, and discusses the patient's

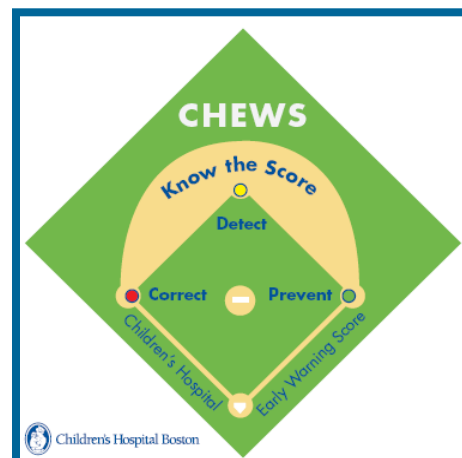
condition and plan of care. Monitoring frequency is increased, and the providers are advised to consider evaluation by the ICU team. At a score of ≥ 5 , the nurse requests that the primary resident evaluate the patient at the bedside, and notifies the attending physician of the change in patient status. If the patient's condition is quickly deteriorating, any staff member may activate the Rapid Response Team or the Code Team.

CHEWS scoring was piloted on the inpatient surgical units in the first half of 2008, during a period of increased nursing education about recognition of the deteriorating child and use of the rapid response team. Following implementation, the surgical units (comprising ~90 inpatient beds) observed an increase in the number of Rapid Response Team activations and achieved a stretch of 202 days without a respiratory or cardiac arrest.

Over the next several months the tool was implemented throughout all inpatient areas, and the electronic medical record was modified to support CHEWS documentation. A major education campaign for physicians was undertaken with the support of the Program for Patient Safety and Quality, which designated the CHEWS system as its flagship patient safety initiative for 2009 and 2010. The results continue to be encouraging and we routinely examine any arrest event in all patient care areas for opportunities to improve outcomes through early recognition and intervention.

In summary, the CHEWS system was developed and implemented as one component of a campaign to prevent cardiac arrests on the inpatient units. The primary mechanism of its effect may be the increased communication between members of the care team in the early stages of a patient's deterioration. As such, it strengthens the safety net for children and their families during hospitalization.

Dr. Kleinman is Clinical Director of the Children's Hospital Boston Medical - Surgical ICU & Chair of the CPR Committee. Ms. Romano is Manager of the Resuscitation Quality Project

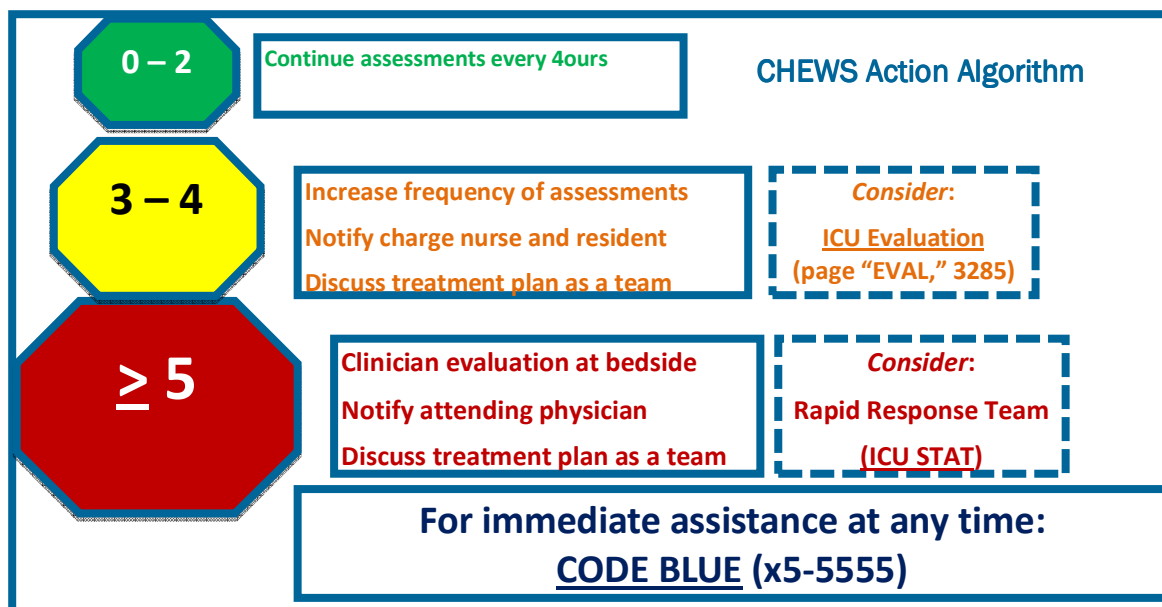




Children's Hospital Early Warning Score, continued

Children's Hospital Early Warning Score (CHEWS)					
	0	1	2	3	Score
Behavior/Neuro	Playing appropriately, alert, at baseline	Sleepy, somnolent when not disturbed	Irritable, difficult to console	Lethargic, confused, floppy OR Reduced response to pain OR Prolonged, frequent seizures OR Pupils asymmetric or sluggish	
Family Concern		Concerned or family absent			
Cardiovascular	Pink or capillary refill 1-2 seconds	Pale or capillary refill 3 secs	Grey or capillary refill 4 seconds OR Tachycardia of 20 above normal rate OR Bradycardia of 20 below baseline	Grey and mottled OR capillary refill 6 seconds OR Tachycardia of 30 above baseline OR Bradycardia of 30 below baseline	
Respiratory	Within normal parameters, no retractions	RR > 10 above normal parameters: using accessory muscles OR 30+% oxygen OR 3+ liters/min	RR >20 above normal parameters retracting OR 40+ % oxygen OR 6+ liters/min OR Nebs q 1hr	If below normal parameters with retractions and/ or grunting OR 60+ % oxygen OR 8+ liters/min OR Nebs q 30 min	
Staff Concern		Concerned			

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Baystate Franklin Medical Center: A Team Approach to Anticoagulation Therapy

Gina Campbell RN, MSN, Director, Quality and Risk Management

Baystate Franklin Medical Center (BFMC) began its focused performance improvement work with anticoagulant medications in 2005. The ongoing medication management performance improvement efforts at the hospital identified community use of warfarin as problematic based on trends in events observed on admission to the hospital. The need to better understand the issues and the opportunities for improvement resulted in the formation of a multidisciplinary team led by Ed Tessier, PharmD, MPH, a clinical pharmacist at BFMC. The multidisciplinary team was charged with developing a coordinated approach to monitoring patients' warfarin use at the hospital and at home.

The multidisciplinary team began by completing the Institute for Safe Medication Practices (ISMP) Antithrombotic Self Assessment with input from the departments of nursing, laboratory, pharmacy, the medical staff and information systems. Upon completion of the self assessment, a number of specific opportunities for improvement were identified.

In February 2006, the pharmacy department established an inpatient anticoagulation monitoring program, which has maintained anticoagulation safety for inpatients and has provided feedback to hospital and community providers regarding variations in anticoagulation practice in the community. The pharmacy provides a monitor of INR trends daily for each patient maintained on warfarin, and contacts the prescriber when the trend in INR warrants dose adjustment (before a problem arises), or when there is a clinical question of risk for adverse event (e.g. drop in H/H, blood pressure, increase in heart rate, or other data to suggest adverse consequence). The pharmacy also identifies cases where bridge therapy with another anticoagulant is required until an INR is therapeutic. Since February 2006, nearly 7000 warfarin patient days have been monitored by the department.

In 2007 the team worked to identify appropriate educational booklets and videos for community-wide distribution, including inpatients at the hospital, the emergency room, in physician offices and at other locations throughout Franklin County. Each patient education booklet contains a log sheet on which people may record their INR results. The materials encourage people to take an active role in their health care - to ask questions, become informed, pay attention to their warfarin dosage, and report any changes or concerns to their health care providers immediately. The materials are in use at all three Baystate Health hospitals, office practices, anticoagulation clinics and the Baystate Health Visiting Nurse Association.

In 2008 the team supported the development of an anticoagulation tool kit for ambulatory practices. The tool kit for prescribers/offices include Baystate practice guide-

lines for oral anticoagulation, a summary card for oral anticoagulation, resource manual for available software, national and regional links and contacts for existing anticoagulation clinics. The tool kit for patients included the patient education handbook "My Guide to Warfarin Therapy," Baystate Franklin "My Medication List" cards, Baystate 7 day pill minders, and Baystate Warfarin Dosing Schedule/Log Sheets with coordinated 7 day pill minders.

The multidisciplinary team has regularly reviewed medication management performance improvement data, trended over time, to identify changes in both hospital and community practice regarding the administration of warfarin. Additional improvements in medication management processes specifically related to warfarin use include the following:

- ✦ Focused reviews of warfarin use, and of management of TIA/Stroke patients.
- ✦ Revisions to the Baystate Health CPOE computer systems to enhance anticoagulation monitoring and safety (e.g. Care Sets, order sentences, anticoagulation flow sheet).
- ✦ Education program provided by Dr. Jack Ansell regarding current state of practice and identifying additional opportunities for improvement in the management of a patient on warfarin. The program was open to all Baystate Health hospitals.
- ✦ Data presentation of INR trends by community provider with blinded de-identified benchmark comparison to assist community providers with practice assessment.
- ✦ Community education for anticoagulation management and safety was provided via grand round presentations to physicians, surgeons, mid-level providers, nurses, visiting nurse agency staff and pharmacists.
- ✦ Consultation with office practices and long term care settings to share best practices and anticoagulation tracking systems to improve community-based care.
- ✦ Investigation of the feasibility of a traditional anticoagulation clinic for the county (not adopted).
- ✦ Investigation of the feasibility of a visiting nurse based anticoagulation clinic for the county (not adopted due to lack of sustainable revenue source).

Education to other hospitals in Massachusetts regarding best practice and ways to exceed the Joint Commission patient safety goals was presented at the Massachusetts Rural Hospital Pharmacy Network supported by the Massachusetts Department of Public Health in February 2008 and at the annual meeting of the Medical Staff of Baystate Mary Lane Hospital in May 2008.

(Continued on page 5)



Anticoagulation Therapy at BFMC

(Continued from page 4)

The work of the team has been regularly shared with the Pharmacy and Therapeutics Committee, the Hospital Quality Council, the Medical-Executive Committee and the hospitals service line teams. In addition the performance improvement efforts have been shared across Baystate Health, to support the ongoing improvement efforts at all three Baystate Health hospitals and outpatient care settings.

The team received a Baystate Health risk management grant in 2006 for anticoagulation safety in Franklin County that supported many of the team's efforts to improve anticoagulation safety. The team's efforts have been recognized by Premier Healthcare Alliance with an \$8500 safety award. In June of 2009 Ed Tessier, PharmD, MPH, presented an overview of the team's work at a Premier conference in Anaheim, California.

The team's work over the past 5 years to develop a strong interdisciplinary approach to the safe use of anticoagulants has supported tremendous improvements in the care of the patient at Baystate Franklin Medical Center and the patients of Franklin County.

Baystate Franklin Medical Center is a 91 bed acute care community hospital in Greenfield Massachusetts, serving the 22 towns of Franklin County, a rural relatively poor county in northwestern Massachusetts.

The leader for the anticoagulation team, Ed Tessier, PharmD, MPH, BCPS, is a clinical pharmacist at Baystate Franklin Medical Center, in Greenfield Massachusetts. In addition Dr. Tessier is a lecturer at the School of Nursing at the University of Massachusetts at Amherst. He has 25 years of experience as a clinical pharmacist in acute, sub-acute, chronic, and ambulatory care settings.

Safety and Quality Review Corner

The Quality and Patient Safety Division encourages facilities to ask the following question when they review a case: "Regardless of whether or not something went wrong, are there any actions we can take to improve care for future patients?"

A hospital reported the following findings and improvement measures after its review of an event involving a patient seen in the emergency room for severe tongue swelling and loss of airway.

- ◆ Reviewers believed that this patient's angioedema was a complication associated with Lisinopril (an ACE inhibitor), which the patient was taking for hypertension.
- ◆ A literature search revealed that epinephrine, Benadryl and steroids are the main pharmacologic treatments for angioedema, but are not always effective. Fresh Frozen Plasma may be tried, but usually takes 30 minutes to thaw and obtain from the Blood Bank. Consideration should be given to the patient's weight when determining the route of administration of epinephrine. IV epinephrine administration may be the route of choice for an obese patient.
- ◆ When a difficult airway case is expected, both the Anesthesia and ENT services will be called to the Emergency Department.
- ◆ The reviewers discussed the timeline for decision making from medical management to intubation to tracheostomy, if intubation fails. A "compromised airway" protocol was developed to guide decision making during these emergencies. The protocol also included procedures for getting the patient to the OR for controlled intubation. "Mock" compromised airway drills were implemented.
- ◆ Education on drug-induced angioedema was provided to primary care physicians and to hospital staff. Recommendations were made to increase public awareness of the risks of angioedema associated with ACE inhibitors.



Quality and Patient Safety Division Workshops Held in June - More Scheduled for the Fall



Tracy Gay, Maureen Keenan and Dr. Marc Rubin

The Quality and Patient Safety Division (QPSD) held two half-day workshops at the Board of Registration in Medicine (BORM) offices in Wakefield on June 3rd and 4th. The workshops focused on Patient Care Assessment (PCA) Programs in health care facilities: providing an overview of the regulations; outlining reporting requirements; and a facilitated discussion on how to conduct a safety and quality review.

Eighty people from forty-one acute care and twelve rehabilitation and specialty hospitals attended. Twenty-one PCA Coordinators, twenty Quality and Patient Safety Managers, eighteen Risk Managers, and fifteen Chief Medical Officers were among the attendees.

In response to requests, we have scheduled two more half-day workshops for the fall. We will hold one on October 28th in Wakefield and one on October 29th at Baystate Franklin Medical Center in Greenfield. Please look for registration information in early September.



QPS Committee Members enjoying the Workshop:
Nicola Truppin, Dr. Dinesh Patel, and Dr. John Herman

Dr. Dinesh Patel, QPS Committee Member, Is Honored

On June 14, 2010, Dr. Patel was honored at the unveiling ceremony of the Dinesh G. Patel M.D. Arthroscopic Learning Laboratory at the Massachusetts General Hospital (MGH) Sports Medicine Center.

The Learning Center will provide residents, fellows and surgical trainees with an opportunity to learn the discipline of arthroscopic surgery using specially designed dry models of all joints and computer simulation before they operate on human patients.

Arthroscopic surgery is a minimally invasive procedure using an endoscope and special surgical instruments to examine and treat damage to a joint.

Dr. Patel is a pioneer in developing the techniques of arthroscopy as a treatment, as well as the development of its instrumentation. He has been an associate clinical professor at Harvard Medical School, as part of its combined orthopedic residency program at MGH, since 1978 and has also expanded education globally.

This approach to medical treatment is an example of how developments in technology can improve patient outcomes, reduce postoperative periods of disability and reduce health care costs and get patients back to productive function faster.

Dr Patel states, " The use of this innovative technology enhances the work and efforts made by the Quality and Patient Safety Division's direction for self improvement for enhancing patient safety and public welfare --reduction of medical errors, training trainees and re-education for those who need training.



Courtesy of MGH Photo Labs

Drs. Thomas J. Gill, Jr., Dinesh G. Patel, Arthur Boland & Harry E. Rubash



Quality and Patient Safety Division Notes

- ◆ The QPS Division recently received three Safety and Quality Review (SQR) reports involving patients who developed rhabdomyolysis and renal failure believed to be caused by the concomitant use of statins and Ketoconazole. Please remind your clinical staff of the potential risk for this complication and make sure that appropriate alerts are entered in your facility's computerized physician order entry system.
- ◆ In response to its findings following review of a complicated delivery, one hospital implemented the following improvements: development of a policy for fetal heart monitoring during epidurals, with an audit to monitor compliance; continuous education in fetal heart rate interpretation for all RNs, MDs and CNMs, (consistent with the Betsy Lehman Center OB Expert Panel Report recommendations for electronic fetal monitoring); and workshops to promote optimal communications between obstetrical team members.
- ◆ The QPS Division has received four SQR reports describing patients who developed pericardial tamponade during pacemaker implantation. Review of the cases resulted in opportunities for the involved hospitals to assess protocols for (1) obtaining a STAT echocardiogram; (2) performing pericardiocentesis; and (3) transferring patients for urgent cardiac surgery. Hospitals also re-educated staff on the need to "assume" cardiac tamponade if the patient has a precipitous or persistent decline in blood pressure. [Please note that development of cardiac tamponade following an interventional procedure is considered a serious unexpected patient outcome and an SQR report should be submitted to the QPS Division.]
- ◆ QPS Division staff are reviewing hospital PCA Plans to better understand hospital governance structures and the mechanisms for identification, review and analysis of unexpected patient outcomes. Hospitals may be asked to submit copies of their most recent PCA Plan with their next Semi-Annual report.
- ◆ A July 2010 article in the Archives of Surgery reviewed data on general surgery patients and found that the identification and screening of high-risk patients for signs and symptoms of sepsis and septic shock may be warranted. Highest risk patients are those >60 years old, who undergo emergency rather than elective surgery and have a major co-morbidity. Monitoring of this group every 12 hours for heart rate, WBC, temperature and respiratory rate was found to decrease sepsis-related mortality. Moore, LJ, et al. *Sepsis in General Surgery*. Archives of Surgery. 2010; 145:695-700.
- ◆ The results of a national survey of physicians, recently published in the Journal of the American Medical Association, indicated that when faced with decisions about whether to report an impaired or incompetent colleague to the relevant authority, many physicians do not report. The authors comment on the need to have systems for reporting health care providers that facilitate, rather than impede, the reporting process. DesRoches CM, et al. *Physicians' Perceptions, Preparedness for Reporting, and Experiences Related to Impaired and Incompetent Colleagues*. JAMA. July 14, 2010;304(2):187-193. Many hospitals have transitioned to a culture that promotes medical error and "near miss" reporting by clinical staff and employees. These recent survey findings may provide an opportunity for hospitals to reinforce those same principles for their peer reporting procedures. Please let us know if you have undertaken any successful initiatives in this area.

Contact QPS Division

To be added to the QPS Division Newsletter and advisory mailing list, update hospital contact information, submit an article, request an SQR form, or obtain additional information, contact QPS: Jennifer.Sadowski@state.ma.us or (781) 876-8296. Send mail to Massachusetts Board of Registration in Medicine, QPS Division, 200 Harvard Mill Square, Suite 330, Wakefield, MA 01880.

The Quality and Patient Safety Division newsletter, FIRST Do No Harm, is a vehicle for sharing quality and patient safety initiatives of Massachusetts healthcare facilities and the work of the Quality and Patient Safety Division and Committee. Publication of this Newsletter does not constitute an endorsement by the Board of any studies or practices described in the Newsletter and none should be inferred.