San Mateo Medical Center's Medication Administration Check System

Issue

Is the San Mateo Medical Center's Medication Administration Check system safe and efficient when dispensing medication to patients?

Background

On a national level, the administration of prescription drugs is error-prone while being up to 88% preventable. "Medication administration-related errors that result in patient harm are the leading cause of in-patient deaths, an estimated 7,000 annually. Hospital patients, on average, are subject to one administration error a day, according to the Institute of Medicine."[1] The Journal of the American Medical Association reports medication administration-related errors occur at all stages of the medication-use process: ordering (56%), administering (34%), transcribing (6%), and dispensing (4%). Administering is defined as the facilitated consumption of the medication. Dispensing is defined as furnishing or providing a medication to the end user for self-administration. Nationally, medication administration-related errors cost hospitals an estimated $3.5 billion dollars annually.[2] Local or institution-specific level data is not available.

Legislation enacted by California State Legislature (SB 1875) mandated that all California general hospitals "implement a formal plan, on or before January 1, 2005, to eliminate or substantially reduce medication administration-related errors" in hospital facilities. Medication administration errors are so prevalent and so rarely intercepted in hospital settings that bar-coded medication administration (BCMA) systems are recommended for all hospitals. BCMA systems, though costly, can significantly reduce medication errors and enhance patient safety.[3]

In 2003, the San Mateo County Board of Supervisors approved a contract agreement with Siemens Healthcare Solutions USA, Inc., that allowed the San Mateo Medical Center (Medical Center) to purchase computer applications. In 2007, the Medical Center purchased and implemented a Siemens Medication Administration Check system (MAK) at a cost of $808,000, with an annual cost of $126,000 for licensing and support. Hospital administrators stated that

[1] Buxton, Herbert T. and Kolpin, Dana W. Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, USGA Fact Sheet FS-027-02, June, 2002
[2] Bates et al. Journal of American Medical Association 1997; 277:307-11
[3] Sakowski et al. American Journal of Health System Pharmacy 2005; 62 (24): 2619-2625

MAK was purchased to reduce medication administration errors. The MAK system is an administration recording system designed to catch and prevent a certain type of error: those associated with wrong patient, wrong medication. MAK is designed to ensure adherence to the five patient "rights" of medication administration: the *right* drug administered via the *right* route, to the *right* patient, in the *right* amount, at the *right* time.

In December 2007, after three years of design and development work by an internal planning team, the Medical Center implemented the MAK system which utilizes the BCMA technology. Implementation began in the Acute Medical/Surgical Unit and the Intensive Care Unit, followed by implementation in the Acute Inpatient Psychiatry Unit. MAK is designed only for use in acute inpatient units and does not lend itself to non-acute environments. MAK is not used in the Medical Center's emergency department, outpatient, short stay, clinics, and long term care services. MAK is utilized by pharmacists and the following clinicians: registered nurses, licensed vocational nurses, licensed psychiatric technicians, and respiratory therapists. The Medical Center does not currently own the Computerized Provider Order Entry (CPOE) software module that allows physicians to enter prescriptions to coordinate with the MAK software module. The Medical Center staff believes the CPOE software module would take the Medical Center to the next level of medication error prevention. The estimated cost of the module is over $2 million. Access to MAK is only provided to fully trained Medical Center clinicians authorized to administer medications.

The MAK system is designed to document the physical administration of medications to patients. One hundred percent of acute inpatient medications are charted through MAK when administered, whereas drugs administered in non-acute settings, are not. About 24% of the total drugs dispensed in all Medical Center settings are non-acute. The MAK work flowchart shows that a pharmacist enters a physician's faxed or hand-delivered prescription order into the pharmacy system and into MAK. The pharmacist dispenses the bar code labeled patient's medication to the Pyxis® automated drug dispensing station located on each patient floor.

Verifying the prescription order starts with the following steps:

1) Clinicians log into the system using their unique sign-on name and password,
2) They scan the bar code on their identification badge to identify them as MAK users and then to identify and match the prescriptions prescribed by the physician,
3) Using a hand-held scanning device tethered to a Computer on Wheels (COW) system, the medication is scanned using MAK at the patient's bedside,
4) The patient is first identified then confirmed by scanning the patient's bar coded wristband. All scans must reconcile in the system before medication is administered,
5) The event is finally recorded into the patient's record and uploaded to the Siemens data server.

If all scans do not reconcile, the MAK system alerts the clinician with a system-generated visual warning, similar to the universal STOP sign. The clinician can then evaluate what has gone wrong and take corrective measures. These measures may include a dosage change, a change of drug, or an override of the visual warning.

In addition to the MAK reporting system, every time a medication administration-related incident is observed by the clinician, the clinician is required to complete a Medication Error Reporting Form before the end of his/her shift. The form is submitted to the head nurse who

then forwards it to Medical Center's Quality and Performance Improvement Department. Data from the Medication Error Reporting Forms is compiled into monthly reports using a parallel reporting system, not MAK. The head nurse receives these monthly reports and presents the data at quarterly meetings of senior Medical Center staff.

Medical Center does not plan to phase out its parallel reporting system. Medical Center staff report that the "MAK system, operating at its best, can only catch and report the class of errors entailed in its specific part of the order/distribution/administration pathway. Medication errors can happen anywhere in the distribution/administration pathway, e.g. physician prescribing errors, pharmacist transcribing errors, packaging errors, failure to note a preexisting allergy, etc."

Investigation

The 2008-2009 San Mateo County Civil Grand Jury (Grand Jury) toured the San Mateo Medical Center (Medical Center) and viewed an operational demonstration of the Siemens Medication Administration Check (MAK) system.

The Grand Jury interviewed Medical Center senior and mid-level personnel, as well as, a member of the San Mateo County Board of Supervisors. Additionally, the Grand Jury researched websites, medical journals, manuals, and articles. The Grand Jury also reviewed the Medical Center strategic plan, documents, forms, reports, and the in-house MAK manual.

The Grand Jury did not examine healthcare or information systems outside the scope of the MAK system.

Findings

The 2008-2009 San Mateo County Civil Grand Jury found the following:

General Findings:

1. San Mateo Medical Center (Medical Center) staff is correctly using the Medication Administration Check (MAK) system, and there appears to be no identified abuse or inappropriate use of the system.
2. The Medical Center's goal is to improve the accuracy of patient identification, ensure the effectiveness of communication among caregivers, ensure the safety of administering medications, and encourage the patients' active involvement in their own health care.
3. Clinicians contributed to the success of the MAK implementation by being involved in the pre-implementation planning, developing, and training, and by demonstrating their competency prior to using the MAK system.

Operational Findings:

1. The MAK system documents the physical administration of medications to patients. It is not applicable to outpatient settings.

2. If a patient receives medication in the emergency department and is subsequently admitted to the hospital, the patient medication record is not entered into the MAK system.
3. Physicians do not utilize the MAK because the Medical Center determined that the physician's order entry module would be considered later. The physician continues to forward handwritten medication orders to the pharmacist, who enters all medication orders into MAK.
4. The clinician can stop the medication administration process if there is an error in the prescription, dosage, or bar code reconciliation. They then verify, reconcile, and/or override the system, and report the incident manually.
5. Patients are informed by staff about the checks and balances performed before their medication is administered.

Assessment and Evaluation Findings:

1. The Unusual Occurrence Reports submitted by the Acute Medical/Surgical, Acute Inpatient Psychiatry, and Intensive Care units during the first three quarters of MAK operation (fourth quarter 2007 through second quarter 2008), show a decrease in total medication errors. In the year before MAK implementation, 115 medication administration errors were reported to the Medical Center's Unusual Occurrence Report system from nursing units targeted for deployment of the MAK system. Since MAK implementation, 46 medication administration errors were reported in the identical time period from those same units after MAK implementation.
2. The Medical Center Quality and Performance Improvement Department monitors and analyzes its parallel reports and the reports automatically generated in the MAK system.
3. The Quality and Performance Improvement Department monitors overall medication safety parameters.

Conclusions

The 2008-2009 San Mateo County Civil Grand Jury concludes that:

1. The San Mateo Medical Center (Medical Center) has promoted safety and more efficient methods for detecting and reducing medication administration-related errors at the hospital by implementing the Medication Administration Check (MAK) system. This system supports monitoring and alerting clinicians to potential medication administration-related errors, provides capability for reporting errors in medication administration, and involves patients in their own health care. The MAK implementation was well planned and executed.
2. The Medical Center has no benchmarks or established baseline for comparison to quantitatively evaluate the effectiveness or the contribution to safety by the MAK system.
3. The Medical Center has implemented a process that addresses safety and efficiency by ensuring clinicians are adequately trained and competent before using the MAK system.

Recommendations

The 2008-2009 San Mateo County Civil Grand Jury recommends that the San Mateo County Board of Supervisors direct the Chief of the Health System to work with the Chief Executive Officer of the San Mateo Medical Center (Medical Center) to:

1. Improve data used to measure the Medication Administration Check (MAK) system performance by creating bench marks and a baseline to assess the safety and efficiencies when dispensing medication to patients at the Medical Center.
2. Utilize MAK data to make decisions and suggestions for improvement of the current MAK module, and development of future software modules.
3. Submit regular reports that evaluate the overall effectiveness and efficiency of the MAK system and recommend areas for system improvement to the Medical Center Board of Directors.
4. Contact other hospitals who use MAK and share ideas contributing to successful data gathering and reporting processes.
5. Evaluate the purchase of a Computerized Provider Order Entry (CPOE) module which allows physicians to coordinate with the MAK software module.

APPROVED BY
BOARD OF SUPERVISORS

AUG 0 4 2009

CLERK OF BOARD
BY Marie H. Peterson DEPUTY

COUNTY OF SAN MATEO
Inter-Departmental Correspondence

County Manager's Office

DATE: July 20, 2009
BOARD MEETING DATE: August 4, 2009
SPECIAL NOTICE/HEARING: None
VOTE REQUIRED: None

TO: Honorable Board of Supervisors

FROM: David S. Boesch, County Manager

SUBJECT: 2008-09 Grand Jury Response

RECOMMENDATION:
Accept this report containing the County's responses to the following 2008-09 Grand Jury reports:

1. Camp Glenwood Should Remain an Honor Camp,
2. San Mateo Medical Center's Medical Administration Check System, and
3. San Mateo County's Pharmaceutical Disposal Program

BACKGROUND / DISCUSSION:
The County is mandated to respond to the Grand Jury within 90 days from the date that reports are filed with the County Clerk and Elected Officials are mandated to respond within 60 days. To that end, attached are the County's responses to the Grand Jury reports on Camp Glenwood and the Medical Center's Medication Administration Check System issued on May 20, 2009 and the Pharmaceutical Disposal Program, issued on May 26, 2009.

Acceptance of this report contributes to the Shared Vision 2025 outcome of a Collaborative Community by ensuring that all Grand Jury findings and recommendations are thoroughly reviewed by the appropriate County departments and that, when appropriate, process improvements are made to improve the quality and efficiency of services provided to the public and other agencies.

COLLABORATIVE COMMUNITY

San Mateo Medical Center's Medication Administration Check System

Findings:
Staff is in general agreement with the Grand Jury's findings.

Recommendations:

The Grand Jury recommends that the San Mateo County Board of Supervisor's direct the Chief of the Health System to work with the Chief Executive Officer of the San Mateo Medical Center (Medical Center) to:

1. **Improve data used to measure the Medication Administration Check (MAK) system performance by creating benchmarks and a baseline to assess the safety and efficiencies when dispensing medication to patients at the Medical Center.**

   Response: Agree. This recommendation has been partially implemented. The San Mateo Medical Center Pharmacy has continued to report on medication errors and discrepancies using methodologies that predate the MAK system implementation. These methodologies used data on medication errors, discrepancies and near misses that was generated by reporting mechanisms that existed outside of the MAK system (i.e unusual occurrence reports completed by staff). These reports have demonstrated that the MAK system has had a significant positive impact on the safe administration of medications at San Mateo Medical Center. These reports were shared with the Grand Jury as part of their investigation. By November 1, 2009, quality reports from the Department of Pharmacy shall begin to incorporate data that comes directly out of the MAK system so as to further support this assertion. These reports will include information on averted medication administration errors, overrides and other data relevant to the safety of inpatient medication administration.

2. **Utilize MAK data to make decisions and suggestions for improvement of the current MAK module, and development of future software modules.**

   Response: Agree. This recommendation has not been implemented but will be implemented in the future. By November 1, 2009, San Mateo Medical Center will use compiled data to begin work with its MAK vendor to further develop the MAK system to better serve the needs of San Mateo Medical Center and its patients.

3. **Submit regular reports that evaluate the overall effectiveness and efficiency of the MAK system and recommend areas for system improvement to the Medical Center Board of Directors.**

   Response: Agree. This recommendation has not been implemented but is slated for implementation once the reports and data listed in items 1 and 2 are fully developed. By November 1, 2009, these reports will be incorporated into Pharmacy services' quarterly report to the Hospital Quality Improvement Committee. These reports and their recommendations are then submitted to the Hospital Board.

4. **Contact other hospitals who use MAK and share ideas contributing to successful data gathering and reporting processes.**

   Response: Agree. This recommendation has not been implemented but is consistent with the Medical Center's approach to implementing new technologies. Now that the Medical Center has gained sufficient experience with the MAK system, it can begin to seek out other MAK users to share best practices. This process will begin by October 1, 2009.

5. **Evaluate the purchase of a Computerized Provider Order Entry (CPOE) module, which allows physicians to coordinate with the MAK software module.**

   Response: Agree. This recommendation has not been implemented but will be implemented in the future. The Medical Center agrees that the implementation of a CPOE system would better leverage the potential of the MAK system and further improve medication safety. The purchase of a CPOE module would, however, involve a significant outlay of capital that the Medical Center does not currently possess. Federal stimulus funding aimed at the expansion of Health Information Technology may provide the means by which the Medical Center can purchase this module. The Medical Center will continue to track federal stimulus funds and evaluate whether these funds can be secured to purchase a CPOE module. It is anticipated that this analysis can be completed by November 1, 2009.