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URBAN MEDICINE

Editorial Board

Dear readers,

We are pleased to publish the first edition of *Urban Medicine: The Journal of Quality Improvement in Healthcare & Patient Safety*.

Health and Hospitals Corporation (HHC) and Metropolitan Hospital Center have been at the forefront in implementing a culture of safety. Metropolitan Hospital Center in particular has significantly contributed to the research underlying many of these quality improvement changes. In this issue of the journal, we are proud to highlight some of our accomplishments in improving quality and patient safety. We hope other institutions can benefit from our work and together we can create a better health care system.

On behalf of the editors, we want to thank all the writers for their articles and their continued vision for a better health care system. We highly urge you to submit your quality improvement articles to our journal so together we can achieve zero patient harm.

Sincerely,

Samrina Kahlon, MD
Editor-in-Chief
Patient Safety Officer
Assistant Professor of Clinical Emergency Medicine
Metropolitan Hospital Center
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URBAN MEDICINE

Welcome Letter from Executive Director

Dear readers,

Welcome to the first edition of *Urban Medicine: The Journal of Quality Improvement in Healthcare & Patient Safety*.

Metropolitan Hospital Center is very proud to publish this new journal highlighting some of the great work being done every day to improve the quality of care we provide. All of our patients deserve the best health care available, regardless of their age, national origin, or ability to pay. Our commitment to quality improvement and patient safety is a commitment to our patients and their families.

On behalf of the staff, volunteers, and especially the patients of Metropolitan Hospital Center, I want to thank everyone who has contributed to this journal. The hard work and effort you put into these projects reflects the care and dedication you have for your patients. I especially want to acknowledge the editors and writers of these articles for their continued vision for a better health care system.

We invite you to join us and contribute information about your own projects to improve the quality of services to all New Yorkers. Together we can be leaders for change in quality and patient safety.

Sincerely,

Anthony Rajkumar
Executive Director
Metropolitan Hospital Center

Thank You from the Chief Medical Officer

In my quarter of a century in health care at Metropolitan Hospital, I have never been more proud than when I first recognized the tremendously successful result of Dr. Kahlon and her team's vision to create a peer-reviewed published journal on patient safety and quality. This new journal will promote and disseminate the necessity of assuring the most basic of quality and safety processes are developed and practiced by sharing experiences of our clinical colleagues and encouraging additional research.

Assuring optimal quality and safety of care provided to our patients remains the domain of the clinician. In the constantly evolving and technologically advancing age of medicine, we must not let ourselves forget the basics, which may not be as exciting or glamourous. A doctor may be the best diagnostician, yet, her patients may not receive the optimal care. A nurse may be the best assessor, yet her patients may not experience the necessary nurturing and education to prevent deterioration of a chronic condition.

We need to further define exactly what constitutes quality and safety and assure that we all know our roles as part of the health care team. We need to further delineate how we can assure all teams members attend the correctly identified patient, order the correct ancillary medications in the correct amount and formulation, administer the correct medications and dosage to the correct patient, recognize and respond to unexpected events, know when to escalate, what to assess for and why, how to appropriately diposition and assure appropriate follow-up. What are the effect of distraction and fatigue? How do we improve our patients' compliance? What exactly is the contribution of limited english proficiency and communication? What role does patient and family satisfaction play in the health of a population? We need to study team science.

We need to study using the computer's power to convert our EMR from a mere typewriter to a decision-maker and reminder tool. What are the effects of reducing documentation "clutter" or "fluff" or at least highlighting critical entries. How do we improve identification and tracking of patient safety and quality issues? We need to study the effects of team member's level of competence through appropriate education and experience, including our students, PCAs, escorts, and even volunteers.

We also need to collectively improve our skills in developing the next research protocol to assure we will validly measure what we intended to measure. We need to understand sample versus population biostatics and how to interpret our data. We need to know how to recognize a journal article that has been done with scientific rigor and decide if its results are generalizable to our patients.

We now have an even better chance of improving the quality and safety of patient care thanks to this journal and it's after effects. Let us all get back to the basics.

Gregory Almond, MD, MPH, MS
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212-423-8131
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URBAN MEDICINE

Acknowledgements

We want to thank the graduate medical education committee and the medical executive committee for their continuous support for this journal.

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A special thanks to the following people for their continuous support.

Noel Alicea
Lillian Diaz
Elizabeth Guzman
Patricia Jones
Jarim Song

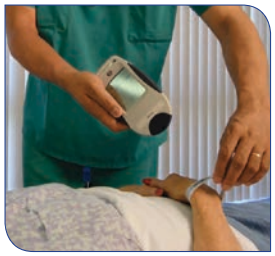
URBAN MEDICINE

Table of Contents

2015 National Patient Safety Goals: HOSPITALS

The Joint Commission

GOAL 1
Improve the accuracy of patient identification.



NPSG.01.01.01: Use at least two patient identifiers when providing care, treatment, and services.

NPSG.01.03.01: Eliminate transfusion errors related to patient misidentification.

GOAL 2
Improve the effectiveness of communication among caregivers.

NPSG.02.03.01: Report critical results of tests and diagnostic procedures on a timely basis.

GOAL 3
Improve the safety of using medications.

NPSG.03.04.01: Label all medications, medication containers, and other solutions on and off the sterile field in perioperative and other procedural settings.

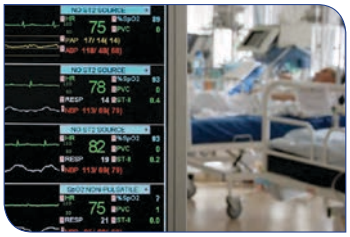
Note: *Medication containers include syringes, medicine cups, and basins.*

NPSG.03.05.01: Reduce the likelihood of patient harm associated with the use of anticoagulant therapy.

Note: *This requirement applies only to hospitals that provide anticoagulant therapy and/or long-term anticoagulation prophylaxis (for example, atrial fibrillation) where the clinical expectation is that the patient's laboratory values for coagulation will remain outside normal values. This requirement does not apply to routine situations in which short-term prophylactic anticoagulation is used for venous thrombo-embolism prevention (for example, related to procedures or hospitalization) and the clinical expectation is that the patient's laboratory values for coagulation will remain within, or close to, normal values.*

NPSG.03.06.01: Maintain and communicate accurate patient medication information.

GOAL 6
Improve the safety of clinical alarm systems.



NPSG.06.01.01: Improve the safety of clinical alarm systems.

GOAL 7
Reduce the risk of health care–associated infections.

NPSG.07.01.01: Comply with either the current Centers for Disease Control and Prevention (CDC) hand hygiene guidelines or the current World Health Organization (WHO) hand hygiene guidelines.

NPSG.07.03.01: Implement evidence-based practices to prevent health care–associated infections due to multidrug-resistant organisms in acute care hospitals.

Note: *This requirement applies to, but is not limited to, epidemiologically important organisms such as methicillin-resistant* staphylococcus aureus (MRSA), Clostridium difficile (CDI), *vancomycin-resistant* enterococci (VRE), *and multidrug-resistant gram-negative bacteria.*

NPSG.07.04.01: Implement evidence-based practices to prevent central line–associated bloodstream infections.

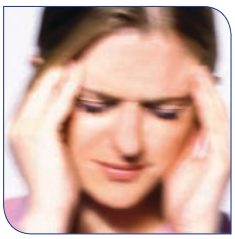
Note: *This requirement covers short- and long-term central venous catheters and peripherally inserted central catheter (PICC) lines.*

NPSG.07.05.01: Implement evidence-based practices for preventing surgical site infections.

NPSG.07.06.01: Implement evidence-based practices to prevent indwelling catheter–associated urinary tract infections (CAUTI).

Note: *This requirement is not applicable to pediatric populations. Research resulting in evidence-based practices was conducted with adults, and there is no consensus that these practices apply to children.*

GOAL 15
The hospital identifies safety risks inherent in its patient population.



NPSG.15.01.01: Identify patients at risk for suicide.

Note: *This requirement applies only to psychiatric hospitals and patients being treated for emotional or behavioral disorders in general hospitals.*

UNIVERSAL PROTOCOL
for Preventing Wrong Site, Wrong Procedure, and Wrong Person Surgery™

UP.01.01.01: Conduct a preprocedure verification process.

UP.01.02.01: Mark the procedure site.

UP.01.03.01: A time-out is performed before the procedure.

Note: Some goals and requirements may appear to be missing from the numerical sequence. This is not an error. Some goals do not apply to hospitals or have been "retired" or integrated into the standards; therefore, they have not been included on this poster. Please refer to the *Comprehensive Accreditation Manual for Hospitals* for the complete National Patient Safety Goals, including elements of performance and scoring information.

ORIGINAL RESEARCH

URBAN MEDICINE

Second Intervention by Nursing Staff as a Measure to Avoid Medication Error in Emergency Department

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ABSTRACT

PURPOSE: Approximately 50,000-100,000 patients die from medical error annually in the USA. Despite multiple safety measures, mistakes continue to happen. The purpose of this project was to examine the effect of second intervention by nursing staff to avoid medical error.

METHODS: After receiving an electronic order for a medication, the nursing staff identified and verified the patient identity using two patient identifiers. After verification and identification the nursing staff asked the patient three standardized questions before administering any medication. If the patient was not informed of the diagnosis and the medication that was to be given, the nursing staff would contact the provider to confirm the orders. In addition, allergy status was double checked. At disposition, patients were surveyed about their overall satisfaction and understanding of their condition and plan of management.

RESULTS: Fifty three percent of patients were not told about their medical conditions and 51% did not know what medication they would receive. Although we did not find a discrepancy in allergy documentation, about 1 in 3 patients had a known drug allergy. Seventy four percent of patients were satisfied with their care, of which 98% of them felt they were well informed. Of the 26% who were dissatisfied with their care, 79 % of them felt they were not well informed about their condition and treatment.

CONCLUSION: Despite the limitations associated with this quality improvement project, we are able to conclude that a second intervention by the nursing staff has the potential to reduce the number of medication errors, and improve patient satisfaction. (*Urban Medicine, Vol. 1 No. 1 (2015) 7-11)*

KEY WORDS: Medication errors, Patient safety, Nursing staff

INTRODUCTION

Approximately 50,000-100,000 patients die from medical errors annually in the USA [1-4]. Incidents are under reported and it is hard to know the exact prevalence of death and adverse events from medications/medical error. Multiple safety steps have been built into the medication ordering process such as computerized orders with safety prompts and pharmacists double checking the orders [5-7]. Despite these measures, mistakes continue to happen. Various investigational studies have been performed in regards to medical errors. Barbara Starfield's study reported 225,000 deaths from iatrogenic causes [8]. These included 106,000 deaths from non-error adverse events of medication and 80,000 deaths from nosocomial infections. In addition, there were over 12,000 deaths from unnecessary surgery and 7,000 deaths from medication errors in hospitals [8]. In 1997 Holland et al. [9] reported 180,000 deaths from medication errors and adverse reactions. A 1997 National Patient Safety Foundation survey showed that 42% of participants believed they had personally experienced a medical mistake, 33% were personally affected, 48% had a relative affected and 19% had friends affected [1]. A study from the Institute of Medicine (IOM) in 1999 estimated the death rate due to medical errors in hospitals to be between 44,000 and 98,000 [10]. The Centers for Disease Control and Prevention (CDC) reported

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2,436,652 deaths in the USA from different causes in 2009 [11].

An Australian study from 1988-1996 showed that 2.4% to 3.6% of hospital admissions were due to prescription medications errors, of which 32%-69% would have been preventable [3,12].

The data from Starfiled's report and a report from the IOM indicate that medical error is potentially the third or fifth cause of death [8]. Many research projects have been conducted and intensive preventive measures have been implemented for major causes of death like cardiovascular disease and stroke. However, little effort has been made to develop and implement preventive measures for medical or medication errors.

Due to its fast pace and extremely high patient volume, the Emergency Department (ED) is especially prone to medication errors. Many mechanisms are in place to prevent medical errors from happening in the ED. These include, among others, computerized physician orders, automatic weight-based dosage calculators, built in allergy and drug interaction prompts, and the use of dual patient identifiers. In a report in 2003, the Center for the Advancement of Patient Safety (CAPS) a not-for-profit, nongovernmental organization that promotes the public health by establishing state-of the-art standards to ensure the quality of medicines and other health care technologies found that fewer errors (23%) were intercepted before reaching patients as opposed to a general interception rate of 39% for all other areas within the hospital. Seventy seven percent of medication errors cited in ED occurred during the medication prescribing and administration phases [13]. In 2011, Pham SC et al [14] published a report delineating the types and causes of errors in the ED.

Although omission errors were most frequently reported among hospital systems overall, improper dosing was found to be the most common type of error in the ED [13].

Reviewing the causes of medication error as depicted above demonstrates the importance of appropriate communication between patients and health care providers and among health care providers themselves. Almost 17% of medication errors happen as a result of faulty communication, making it the third most common cause of medication error in the ED [13]. In addition to the importance of communication among health care providers, we believe that an informed patient is more likely to intercept an error prior to it happening. We suggest a "second intervention" by the nursing staff prior to medication administration that would decrease the potential for medication errors and improve the level of patient satisfaction. The purpose of this project is to examine the effect of second intervention, its potential to avoid medical error, double check for allergy status, and also to improve patient satisfaction.

METHODS

This study is a quality improvement project and involved 85 patients with medical conditions that required treatment with medications. Physicians and Midlevel Care Providers were blinded to the project-only the nursing staff was aware of the study. An Institutional Review Board (IRB) waiver was obtained from New York Medical College (NYMC) prior to the beginning of the project. After receiving an electronic order for a medication, the nursing staff identified and verified the patient identity using two patient identifiers (name and date of birth or name and medical record number). Following the patient verification and identification step the nursing staff asked the patient three standardized questions:

1. *Did your provider tell you what condition you have? And what his/her plan is? (Presumed diagnosis/ working diagnosis)*
2. *Did your provider tell you what treatment he/she is planning to give you? (Correct medication)*
3. *Are you allergic to any medication? (Allergy double check)*

If the patient was not informed of the working diagnosis and the medication that was to be given, the nursing staff would contact the provider and confirm the orders before administration. In addition, any discrepancy in allergy documentation was addressed at the same time since some patients remembered their allergies at a later time, or family members arrived and gave missing allergy information.

At disposition, patients were surveyed about their overall satisfaction and understanding of their condition and plan of management:

1. *Were you well informed about your medical condition and treatment plan?*
2. *Were you satisfied with the overall management?*

At the end of the study, the percentage of patients informed about their condition and specific treatment was measured. In addition, their allergy status was recorded and compared with the triage allergy documentation. Observations were made as to whether the second intervention prevented a medical error, and if so, the cases were recorded in a database. The association between patient satisfaction and being informed by providers about their medical condition was calculated using descriptive statistics.

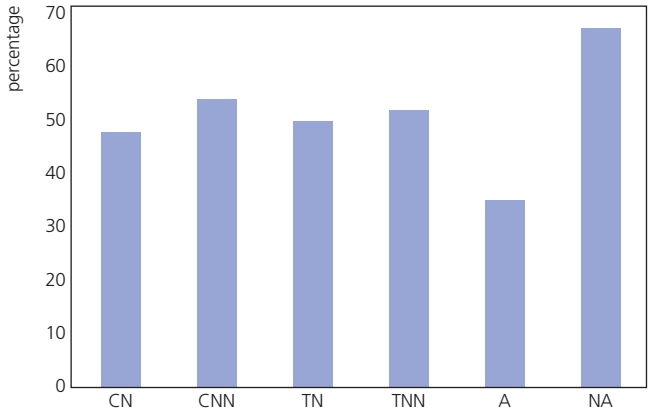
RESULTS

We obtained historic ED medication error data from the Department of Quality Assurance for Comparison. The incidence of medication error in the emergency department over the past 5 years has been from 3-10% per year. This number represents only reported cases. Overall we conducted the second intervention survey on 85 patients. Fifty three percent (95%CI: 0.42-0.63) of patients were not told about their medical conditions, and 51%

(95% CI: 0.41-0.63) did not know what medication they were supposed to get. Although we did not find a discrepancy in allergy documentation, about 1 in 3 patients (34%, 95% CI: 0.25-0.45) had a known drug allergy which makes them especially vulnerable to medical errors. Conducting the secondary survey resulted in preventing 3 potential medication errors. These 3 errors were specifically related to medications nearly being administered to the wrong patients.

In terms of satisfaction we found that 74% (95% CI: 0.62-0.82) were satisfied with their care, of which 98% of them (95% CI: 0.89-0.99) felt they were well informed. Of the 26% (95% CI: 0.18-0.38) who were dissatisfied with their care, 79 % of them (95% CI: 0.56-0.92) felt they were not well informed about their condition and treatment (Figure 2). The correlation between patient satisfaction and being well informed by providers was 93%, [95% CI: 84-0.97], (Figure 3).

Figure 1. The rate of information flow and allergy documentation in the ED during the survey



CN: condition notified; CNN: condition not notified; TN: treatment notified; TNN: Treatment not notified; A: Allergy; NA: no allergy

Figure 2. The rate of patient satisfaction and information flow (being well informed)

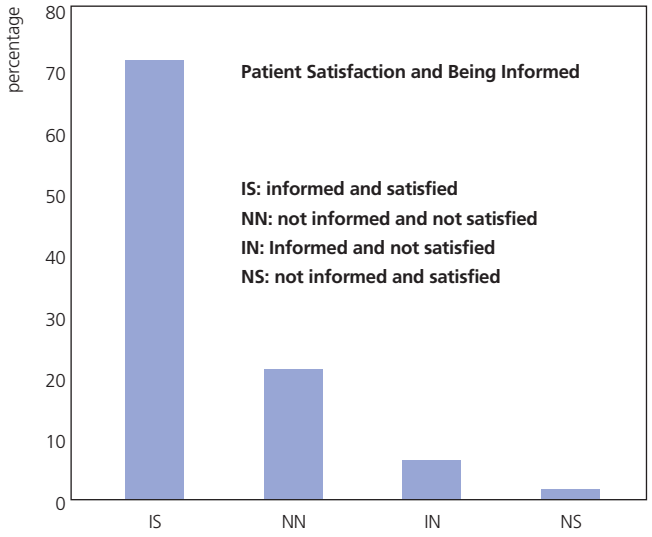
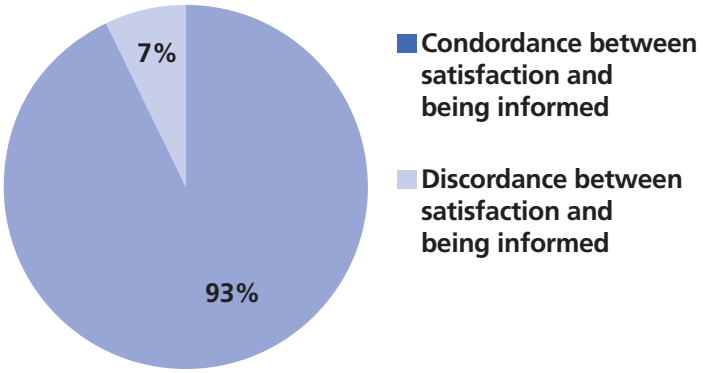


Figure 3. Concordance of satisfaction and being well informed

Ninety three percent of patients were well informed about their conditions and were satisfied with the care



LIMITATIONS

A major limitation of our project is the relatively low sample size. In order to draw a meaningful conclusion from a survey, a significantly higher sample size is necessary. Another limitation is that the result of a survey on satisfaction may be less reliable when the survey is given verbally. This could be improved by giving a paper copy of the survey to the patient, and having them fill this out in the ED while they wait.

DISCUSSION

Effective communication between health care providers and patients is of paramount importance in preventing medical errors and improving patient satisfaction [14-16]. Also, it could increase the likelihood that patient will follow up with their Primary Care Physician, and comply with medication regimens prescribed in the ED.

A systematic review of literature on ED patient satisfaction found that the three most frequently identified factors affecting patient satisfaction were ED staff's interpersonal skills and attitudes, provision of information/explanations, and perceived waiting time [17].

Even though no adverse effects occurred during our observation, we believe that the lack of communication with patients contributed to adverse events and decreased patient satisfaction. The prevention of three "near misses" with the second intervention method reinforces this view. Patient participation in healthcare decision making is widely recognized as a necessity, and is increasingly being advocated as a factor in reducing medical errors [18].

Most medical errors are preventable, and are thought to be due to multiple factors such as faulty processes, poor technique, inappropriate environment and failing equipment [10]. Patients are more likely to participate in medical decision making when they are thoroughly informed about their medical condition [18]. A "second intervention" could be used as a measure to identify mistakes such as administration of wrong medications and failure to obtain allergy status. This is not only designed as a safety mechanism for the health care provider to double check before the administration of medications, but it also gives the patient an opportunity to ask questions. In essence, the "second intervention" has the potential to facilitate dialogue between patient and provider to fill gaps in knowledge about a patient's health condition.

A recent study by Safe Surgery Saves Lives Study Group showed a nearly 50% reduction in mortality and decrease in complication rate by one third by using a nineteen item surgical safety checklist [19]. Similar safety measures are also used in ED, Intensive Care Unit (ICU) and operating rooms to avoid medical errors before procedures. This safety measure is known as time-out. Bodies of research and intensive preventive measure are implemented for other major cause of death like cardiovascular disease and stroke. Yet, little effort has been made to develop preventive measures for medical errors. Future prospective studies with higher sample size are necessary to evaluate the potential impact of second intervention.

We plan a second phase of the project by implementing the second intervention as a policy in the ED and subsequently studying its effect on medication errors as well as patient satisfaction by comparing the satisfaction level before and after the implementation based on the results of routinely performed patient satisfaction surveys.

Despite the limitations associated with this quality improvement project, we are able to conclude that a second intervention by the nursing staff has the potential to reduce the number of medication errors, and improve patient satisfaction. This needs to be validated prospectively by implementing the policy of second intervention in the ED.

CONFLICT OF INTEREST

The authors have declared that no competing interests exist associated with any type of financial or personal relationship.

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We thank Dr. Benjamin Mason for reviewing the manuscript.

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ORIGINAL RESEARCH

URBAN MEDICINE

Influencing Factors on Prescribing Medication by Resident Physicians: A Single Center Study

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ABSTRACT

PURPOSE: As front-line providers, it is essential to understand the prescribing behaviors of resident physicians in order to determine areas of improvement for the appropriate prescription of medication for patients' individual clinical needs. The purpose of this study was to investigate prescription patterns and the factors influencing on prescribing medications by them.

METHODS: This study was carried out at Metropolitan Hospital Center, New York Medical College, part of the New York City Health and Hospitals Corporation (HHC). The residents working in inpatient services and outpatient clinics in Internal Medicine, Emergency Medicine, Physical Medicine and Rehabilitation and Pediatrics were included in this study. A questionnaire was jointly developed by the Committee of Interns and Residents (CIR) in partnership HHC, with a goal of assessing resident physicians' experience with and knowledge of patient safety. The survey was conducted by CIR staff over numerous in-person meetings with paper questionnaires after verbally consenting the residents.

RESULTS: Survey response rate was 64.7 %, with 75 out of 116 total residents completing the survey. The questionnaire examined different aspects of residents' experience of safety culture, including various topics relating to medication safety: questions that aimed to investigate the determinants of prescribing behavior; questions elucidating negative factors affecting their prescribing behavior; questions focusing on attitudes towards patient safety; questions about the general culture of safety; and questions about the communication issues. The survey illuminated a number of gaps, including a strong desire on behalf of residents for more faculty mentors in safe prescribing, training to improve team communication, and resources to address barriers to communication and issues of culture of safety.

CONCLUSION: The gaps identified through this project indicated the best targets for improving prescription quality included promoting resident physicians' medical knowledge, reinforcing the policy of rational drug use, and increasing awareness of patient safety issues. *(Urban Medicine Vol. 1 No. 1 (2015) 12-18)*

KEY WORDS: Prescriptions, Residency training, Physician

INTRODUCTION

It is essential for the physicians to prescribe medication appropriately for patients' specifically individualized clinical needs [1,2]. Rational prescribers should attempt to maximize clinical effectiveness, minimize harms to the patients, avoid wasting healthcare resources, and respect patient choices. The process of rational prescribing medication consists of several parts: diagnostic skill which clearly defines the patients' medical problem; medical knowledge to specify the therapeutic goal; knowledge of medication and understanding of the principles of clinical pharmacology to select the appropriate drug and evaluate therapy regularly (e.g. monitor treatment results and adverse effects, consider

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discontinuation and change of the drug); and communication skills to provide information, instructions and warnings to patients [1,2].

Irrational use of medication leads to serious consequences which include low chance of benefit, risk of harm, adverse drug reactions, reduced adherence, wasting of resources and breaching of patients' confidence, negatively affecting patients' health outcomes as well as incurring unnecessary costs [3,4]. The majority of irrational prescribing occurs as a result of the prescribers' poor training [5-7]. In order to prescribe medication properly and inform the patient sufficiently, the physicians should have extensive, accurate and up-to date information on the prescribed medication.

As resident physicians who have been prescribing medication primarily in training hospitals, we aimed to investigate the influencing factors on prescribing medication by the resident physicians in a single center. To increase prescription quality and improve the rationality of prescribing medication, we needed to investigate the present situation of resident physicians' attitudes regarding the prescription of medication. Outcomes of this study will help to lead to an appropriate education plan in terms of clinical training for resident physicians regarding rational prescribing medication. The results of this study can also help to identify other opportunities to improve the patient safety and quality of care provided to patients.

METHODS

Study Design

This study was carried out at Metropolitan Hospital Center, New York Medical College. The residents working in outpatient and inpatient clinics in Internal Medicine, Emergency Medicine, Physical Medicine and Rehabilitation and Pediatrics were included in this study. A questionnaire was developed by the Committee of Interns and Residents (CIR) partnered with New York City Health and Hospitals Corporation (HHC) as a project aimed at assessing resident physicians' experience and knowledge on patient safety. Verbal consent was given by each resident, and survey was administered using a paper interview instrument. This survey study is non-intentional and it does not involve patients, hence no ethical approval was needed.

Study Tools

The questionnaire is divided into five different sections: the first is designed to investigate the determinants of prescribing behavior; the second reflects negative factors affecting their prescribing behavior; the third section focuses on attitudes towards patient safety; the fourth section is about culture of safety; and the last section includes questions about communication issues. The questionnaire included Likert-type and semi-closed questions. Data collectors were not physicians and were pre-trained by a principle investigator.

RESULTS

Survey response rate was 64.7 %, with 75 out of 116 total residents completing the survey. The questionnaire focused on different aspects of residents' experience of various topics relating to medication safety and culture of safety.

Prescribing Behaviors of Resident Physicians

Participants responded to a five-point scale of always, most of the time, sometimes, rarely, never, and non-applicable. A majority of the resident physicians (86%) verified the patient's identity by using two unique patient identifiers prior to prescribing medication. In inpatient and outpatient units, 75% of respondents "always" or "most of the time" reviewed and documented current and previous medications. Three percent of the resident physicians answered that they ordered a medication that they were not familiar with most of the times, whereas most of the resident physicians (79%) "rarely" or "never" ordered an unfamiliar medication. When they handled a medication that they were not familiar with, a larger proportion of respondents (83%), "rarely" or "never" ordered the dose of a medication that they were unsure of before confirmation. When they were unfamiliar with a medication, dose, route, side effect, or drug interaction, only 13 % of the respondents consult with pharmacy "always", 15% "most of the time" and 26% "sometimes", 28% of respondents "rarely" or "never" consulted with a pharmacist. A majority of resident physicians feel that they received support from the faculty (78%), peers (74%), senior resident (70%), and the nurses (50%) when they prescribed medication. Fifty one percent of respondents "sometimes" feel that handovers from residents are variable or inadequate. When a mistake is made that harms a patient, 75% "always" report the incident, whereas in cases that did not cause harm to the patient and did not reached the patient, 49% and 35% respectively "always" reported the incident (Table I).

Negative Factors Affecting Prescribing Medications

Nineteen percent of residents complained of experiencing fatigue "most of the times", 37% "sometimes", and 21% "rarely". Fifty nine percent of the resident physicians experienced a situation where the medication that they wanted to order was not available at that moment "most of the times" or "sometimes". Forty one percent also stated that they were "sometimes" interrupted and distracted during a patient encounter and prescribing medication (Table II).

Perception of Patient Safety

The following responses are scaled from strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, or strongly agree.

Forty seven percent of the resident physicians "strongly

agree" that patient safety is never sacrificed to get more work done. However, only 36% of the respondents "strongly agree" that the current procedures and systems are good at preventing errors from happening. Thirty nine percent of the respondents "strongly disagree" that patient safety is a problem in the unit, 18% "somewhat agree" and 11% "strongly agree" that they had patient safety issues in their unit (Table III).

Culture of Safety

Seventy percent of respondents feel that their mistakes are not held against them, whereas 30% feel that might be harmful to their career. Sixty six percent feel comfortable talking about their medical errors. However, 41% of respondents answered that talking about their errors would negatively impact their career. The attending physician was identified as the individual a resident felt most comfortable talking to about their medical error (81%); next was the chief resident (61%); residents feel least comfortable talking with the nurses about their medical errors (22%), (Figure 1). Thirty two percent feel that their colleagues will think less of them if they admit a medical error. Of the respondents, 65% know how to report a mistake to the hospital's event reporting system, with 31% having reported a mistake or near miss into the hospital's adverse event reporting system. Sixty nine percent of the respondents know what types of events should be reported how to make the report. Of the respondents who have reported their mistake, only 51% received feedback on a reported adverse event. Most of the respondents think that are treated with dignity and respected by everyone they work with (76%), and are recognized and appreciated for their contribution (73%) (Table IV).

Communication Issues

Fifty three percent of residents identified having

Table I. Resident physicians' declaration on the prescribing behavior

Questions	Always, n (%)	Most of the times, n (%)	Sometimes, n (%)	Rarely, n (%)	Never, n (%)	N/A, n (%)
Verify the patient's identity by using tow unique patient identifiers prior to patient care and prescribing medication	46 (62%)	18 (24%)	6 (8%)	2 (3%)	2 (3%)	0 (0%)
Review and document current/previous medications in the inpatient unit	35 (47%)	21 (28%)	6 (8%)	3 (4%)	2 (3%)	7 (9%)
Review and document current/previous medications in the outpatient unit	33 (45%)	22 (30%)	8 (11%)	4 (5%)	3 (4%)	4 (5%)
Order a medication that you are not familiar with	0 (0%)	2 (3%)	14 (19%)	41 (55%)	18 (24%)	0 (0%)
Order the dose of a medication that you are unsure of before confirmation	0 (0%)	0 (0%)	13 (17%)	32 (43%)	30 (40%)	0 (0%)
Consult with pharmacy when unfamiliar with a medication, dose, route, side effect and drug interaction	13 (17%)	15 (20%)	26 (35%)	9 (12%)	12 (16%)	0 (0%)
Get mutual support from faculty	23 (31%)	35 (47%)	13 (17%)	4 (5%)	0 (0%)	0 (0%)
Get mutual support from senior resident	22 (29%)	31 (41%)	17 (23%)	2 (3%)	0 (0%)	3 (4%)
Get mutual support from peers	19 (25%)	37 (49%)	16 (21%)	3 (4%)	0 (0%)	0 (0%)
Get mutual support from nurses	10 (13%)	28 (37%)	24 (32%)	10 (13%)	3 (4%)	0 (0%)
Feel that handovers from other residents are variable or inadequate	1 (1%)	5 (7%)	38 (51%)	24 (32%)	6 (8%)	1 (1%)
When I make a mistake that harms the patient, I report it	54 (75%)	9 (13%)	4 (6%)	5 (7%)	0 (0%)	0 (0%)
When I make a mistake that reached the patient but causes no harm, I report it	35 (49%)	20 (28%)	11 (15%)	6 (8%)	0 (0%)	0 (0%)
When I make a mistake that does not reach the patient, I report it	25 (35%)	21 (29%)	8 (11%)	15 (21%)	3 (4%)	0 (0%)

communication difficulties between departments "sometimes", and 23% "rarely" had these issues. Communication with other residents is "sometimes" (35%) or "rarely" (48%) an issue. Communication with the senior resident or attending was "sometimes" identified as an issue among 11% and 23% of respondents, and 55% and 49% "rarely" experienced the issue, respectively. Communication with other members of the patient team remains high, with 37% "sometimes" and 37% "rarely" having an issue. The majority of respondents feel they "sometimes" know what strategies to use when encountering communication difficulties with either members of the patient care team (43%), the attending (29%), or the senior resident (25%). More than half of the residents (57%) feel they know how to approach patients with language and/or educational barriers (Table V).

LIMITATION

In this study, the resident physicians' gender, sex, age, and final academic degree were not considered for evaluation. These factors might influence on prescription pattern and quality by the resident physicians. We also did not investigate the difference among the different specialties.

DISCUSSION

Medication errors are a common cause of iatrogenic adverse events [8]. They can lead to severe consequences, including prolonged hospitalization, unnecessary diagnostic tests and treatments, and even death [8,9]. Medication use is a complex subject involving the prescriber, the patient, and pharmaceutical institutions. It is influenced by factors such as drug availability, prescribers' experience, cultural factors, communication system and the complex interaction between these factors [10]. Our survey suggests that there are complex and interrelated factors underlying resident physicians' decision on prescription. A majority of the resident physicians (86%) verified the patient's identity and reviewed the current and previous medications (75%) but about one fourth of the respondents answered negatively. The failure to review the current or previous medications could be related to high probability of occurring medication error. When they handled a medication that they were not familiar with, a large proportion of respondents (83%) confirmed the medication before administration. When they were unfamiliar with a medication, dose, route, side effect, or drug interaction, only 13 % of the respondents consult with pharmacy "always",

Table II. **Resident physicians' declaration about the negative factors affecting prescribing medications**

Questions	Always, n (%)	Most of the times, n (%)	Sometimes, n (%)	Rarely, n (%)	Never, n (%)	N/A, n (%)
Fatigue	7 (9%)	14 (19%)	28 (37%)	16 (21%)	9 (12%)	1 (1%)
The medication that I want to order was not available	0 (0%)	9 (12%)	35 (47%)	25 (33%)	6 (8%)	0 (0%)
Get interrupted and distracted during prescribing medication	12 (16%)	9 (12%)	31 (41%)	17 (23%)	6 (8%)	0 (0%)

Table III. **Resident physicians' declaration about perception of patient safety**

Questions	Strongly disagree, n (%)	Somewhat disagree, n (%)	Neither disagree nor agree, n (%)	Somewhat agree, n (%)	Strongly agree, n (%)
Patient safety is never sacrificed to get more work done	4 (5%)	15 (20%)	8 (11%)	12 (16%)	35 (47%)
Our procedures and systems are good at preventing errors from happening	5 (7%)	8 (11%)	5 (7%)	29 (39%)	27 (36%)
We have patient safety problems in this unit	29 (39%)	13 (18%)	11 (15%)	13 (18%)	8 (11%)

15% "most of the time" and 26% "sometimes"; however, 28% of respondents "rarely" or "never" consulted with a pharmacist. The role of the pharmacist in preventing medication errors has been studied, and the role of pharmacist in reviewing and revising the medication as a second intervention has been assessed to have an important role in preventing medication errors [11]. According to a study reported by Smith et al. [12] pharmacists clearly have an important place in the medical home, as they can perform comprehensive reviews of patient therapies, identify or resolve medication-related complaints, optimize treatment, and prevent or identify drug-drug interactions. In our hospital, residents will need to be encouraged to engage in communication with pharmacist about the medication use when the physician is not sure about the medication. Foster ME et al. [13] studied the effects of a resident physician educational program in a pediatric emergent department (ED) on pharmacy interventions and medication errors, particularly dose adjustments, order clarifications, and adverse drug events. They concluded that the implementation of a resident physician educational program in pediatric ED significantly decreased the number of medication errors, increased resident physician awareness of the potential for errors, and increased ED pharmacist utilization.

When they made a mistake that could harm a patient, 75% "always" reports the incident, whereas in cases where they don't think that the error may cause harm to a patient only 49% of the respondents "always" report the incident. Forty one percent of respondents feel that reporting their mistake might negatively affect their career. Resident physicians are trainees. If they get comfortable reporting their mistake early, more serious problems might be prevented and harm to the patient avoided. However, if they don't report mistakes, medication error could develop into a more serious problem later on. Residents should be encouraged to report errors for shared learning and for issues to be resolved systematically. Forty seven percent of the resident physicians "strongly agree" that patient safety is never sacrificed to get more work done. However, only 36% of the respondents "strongly agree" that current procedures and systems are good at preventing errors from happening. In this study, we did not ask what they think the problem in their units was specifically. Residents felt that current procedures and systems are not enough to prevent the errors. A good quality improvement project could be to examine the issues on a unit level to identify unit-specific issues.

Resident physicians had difficulty in communication with other departments, other residents, or sometimes with attending physicians. Communication failures have been implicated as the root causes of greater than 60% of sentinel events reported to the Joint Commission on Accreditation of Healthcare Organizations [14]. Breakdowns in communication lead to most of the adverse events in studies [15]. Most errors linked to communication failures, however, have been shown to be preventable. Moreover, it is necessary to recognize the crucial role of communication within and between clinical teams for safe clinical practices and effective organizational performance [16]. We need to pay attention to increase communications between the teams and members.

In conclusion, prescription quality mainly depends on resident

Table IV. Resident physicians' declaration on the culture of safety

Questions	Yes, n (%)	No, n (%)
I feel that my mistakes are held against me	22 (30%)	51 (70%)
I feel comfortable talking about my medical errors	48 (66%)	25 (34%)
I worry that if I talk about my errors, it will be put on my permanent record or may impact my career negatively	30 (41%)	43 (59%)
I feel that my colleagues will think less of me/not respect me if I talk about my medical errors	24 (32%)	50 (68%)
I know how to report a mistake or near miss into the hospital's event reporting system	48 (65%)	26 (35%)
I have reported a mistake or near miss into the hospital's adverse event reporting system	23 (31%)	51 (69%)
I know what types of events I should be reporting through the hospital's adverse event reporting system	51 (69%)	23 (31%)
At my hospital, I get feedback on adverse events I reported	31 (51%)	30 (49%)
I am treated with dignity and respect by everyone I work with	56 (76%)	18 (24%)
I am recognized and thanked for my contribution	53 (73%)	20 (27%)

physicians' choices, but its improvement is not only the business of doctors themselves. Promoting resident physicians' medical knowledge, education related to patient safety concern, reinforcing the publicity of rational drug use, encouraging communication with pharmacist or other department, and second intervention to check their prescription before administration are effective ways to improve prescription quality in training hospitals.

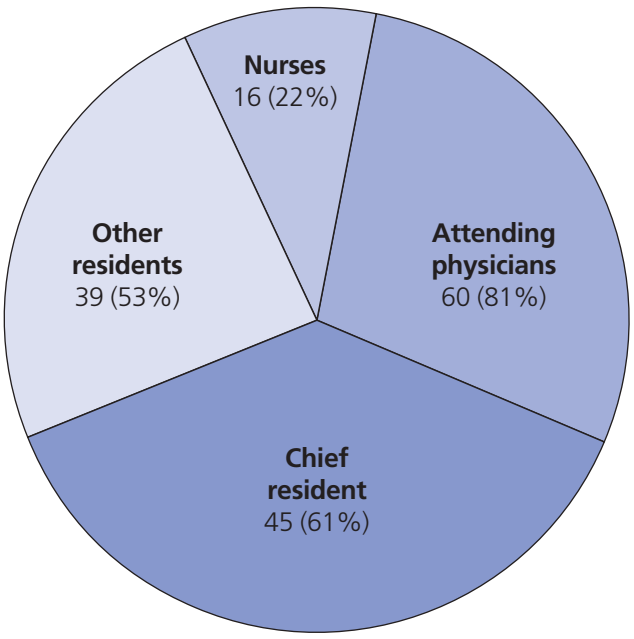
CONFLICT OF INTEREST

We hereby disclose that this study does not have any type of financial or personal relationship with other people or organizations that could inappropriately influence our study.

Table V. **Resident physicians' concerns about the communication issues**

Questions	Always, n (%)	Most of the times, n (%)	Sometimes, n (%)	Rarely, n (%)	Never, n (%)	N/A, n (%)
Communication difficulties across departments	1 (1%)	15 (20%)	40 (53%)	17 (23%)	1 (1%)	1 (1%)
Communication difficulties with other residents	1 (1%)	3 (4%)	26 (35%)	36 (48%)	9 (12%)	0 (0%)
Communication difficulties with my senior resident	1 (1%)	1 (1%)	8 (11%)	41 (55%)	21 (28%)	3 (4%)
Communication difficulties with my attending	1 (1%)	0 (0%)	17 (23%)	37 (49%)	20 (27%)	0 (0%)
Communication difficulties with other members of the patient care team	1 (1%)	4 (5%)	28 (37%)	28 (37%)	14 (19%)	0 (0%)
I know what strategies to use when I encounter communication difficulties	11 (15%)	16 (21%)	32 (43%)	13 (17%)	2 (3%)	1 (1%)
I know how to approach patients with language and/or educational barriers	18 (24%)	25 (33%)	15 (20%)	15 (20%)	2 (3%)	0 (0%)

Figure 1. **All the staff members if resident physicians made a medical error that could harm a patient they would feel comfortable talking with**



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ORIGINAL RESEARCH

URBAN MEDICINE

Effect of Provider Education and Vaccine Card Reminders on Improving Prenatal Vaccination Rates

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ABSTRACT

PURPOSE: To estimate the effect of provider education and vaccination card reminders as an intervention on the vaccination rates of pregnant women receiving the influenza and Tdap vaccines.

METHODS: Beginning September 2013, at the Metropolitan Hospital Center, we gave a series of lectures to Obstetrics and Gynecology (Ob/Gyn) providers on the benefits of prenatal vaccinations and placed plastic vaccination reminder cards next to each computer screen in the examination rooms where patients were evaluated. We compared pharmacy records of vaccination rates to the same influenza season period (September to March) of the previous year.

RESULTS: Our vaccination rates for 2013-2014 year significantly increased compared to same period of 2012-2013 year. The number of Tdap vaccines given in the high risk obstetrical clinic increased from 9 to 90 ($P<0.01$); for the low risk obstetrical clinic the number of Tdap vaccines increased from 86 to 303 ($P<0.01$). The number of influenza vaccines given in high risk clinic increased from 48 to 135 ($P<0.01$), and the number of influenza vaccines given in low risk clinic increased slightly from 527 to 533 ($P<0.3$)

CONCLUSION: Our prenatal vaccination rates were positively affected by provider education and card reminders. Best practices should be augmented by implementation strategies to improve compliance. *(Urban Medicine Vol. 1 No. 1 (2015) 19-23)*

KEY WORDS: Obstetrics, Gynecology department, Hospital, Vaccination, Prenatal education

INTRODUCTION

Vaccination is one of the most successful medical interventions that have led to the eradication of many diseases that previously killed millions of people [1]. In the US, most efforts to increase vaccination rates were devoted to immunization in children. As a result, adults currently account for 99% of all victims of vaccine preventable diseases (VPD). Children are the remaining 1% of VPD victims, making the adult VPD mortality rate 200 times higher than the rate in children [2].

In recent years, the levels of vaccination started to plateau and even decreased in some regions of the country. The low prevalence of vaccination preventable diseases and anti-vaccine activism induced complacency, and even denial, among many communities and some healthcare providers. Some diseases that were not seen in years are making a powerful comeback. For example, the rates of pertussis increased from 40 per 100,000 in 1990 to 80 per 100,000 in 2012 with a majority of the disease occurring in infants younger than one year of age. Provisional pertussis case counts for 2012 have surpassed the last peak year in 2010 with 41,880 pertussis cases and 14 deaths in infants aged less than one year [3].

One of the most vulnerable adult groups is pregnant patients. Obstetrician-gynecologists providing prenatal care have to consider a balance between the effects of any medical intervention on the health of a woman and her unborn child. Many pregnant patients try to avoid any medications in pregnancy altogether. However, pregnant women and their children are susceptible to two of the most common VPDs, influenza and pertussis.

Influenza in pregnancy is associated with an increased risk

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of spontaneous abortion, preterm delivery, small for gestational age infants, and fetal death. Pregnant women are at an especially increased risk of serious illness, the aforementioned complications, and death during the 3rd trimester and in the first four weeks postpartum. The United States Centers for Disease Control and Prevention (CDC) and the American College of Obstetricians and Gynecologists (ACOG) both recommend that all pregnant women who will be pregnant during the influenza season (October, 2013 through May, 2014) receive the influenza vaccine at any time during their pregnancy [4].

Another VPD, pertussis, has the greatest effect on neonates. Infants under three months of age are at the highest risk of morbidity and mortality due to pertussis, since they cannot mount their own immune responses, and rely on the passive immunity received from the mother [5]. According to the Advisory Committee on Immunization Practices (ACIP) recommendations, every woman should receive a dose of the Tdaps vaccine between 27 and 36 weeks during each pregnancy to allow for the greatest protection in the neonate. However, the vaccine is safe at any time during pregnancy. Due to the rising incidence of pertussis, the ACIP has changed their Tdap recommendations several times in the last decade, causing some confusion among patients and healthcare providers.

As leaders in healthcare have increasingly focused on hospital safety [6], it has become apparent that most evidence based guidelines fall short of target of increased vaccination rates without clear and effective implementation strategies. The uptake of new vaccines remains slow, and typically, only 60 percent of healthcare providers themselves get vaccinated against influenza each season. CDC, ACOG and other leading medical and government agencies have published strategies for improving adherence to recommendations [7,8]. The majority of implementation strategies focus on several principles for improving compliance, such as education, reminders, incentives, monitoring and feedback. Some of the interventions are simple and inexpensive; some require significant investments and changes in system engineering. As healthcare resources have become strained, attention is focused on the most cost effective strategies that can increase vaccination rates with the least expenditure.

In our project, we evaluated whether simple interventions, such as provider education and reminder systems, can improve patient vaccination rates in an urban, hospital based obstetrics and gynecology clinic.

METHODS

As this study involved a review of de-identified pharmacy records, it was IRB exempt. Prior to the initiation of the study, we obtained pharmacy records on the number of influenza vaccine and Tdap vaccine doses distributed to the Metropolitan Hospital obstetrics and gynecology clinics. The study was primarily focused on prenatal care obstetrics clinics, since the pregnant patients in this setting are treated almost exclusively by our providers and do not receive vaccinations from other sources.

Prenatal care at the Metropolitan Hospital Center, department of Obstetrics and Gynocology (OB/Gyn) is separated into high risk clinic, where prenatal care is provided by Ob/Gyn residents, nurse practitioners, physician assistants under the supervision of Maternal Fetal Medicine (MFM) specialists and generalist obstretics attendings, and low risk clinic, where care is provided by midwives and generalist obstetrics attendings. Patients receiving care at the high risk clinic have serious maternal or fetal medical complications, which may impact their pregnancies. The clinics are equipped with an electronic medical record system where all encounters and vaccine administration are documented. In addition, the MFM specialists maintain an Excel spreadsheet listing all patients and their medical problems.

Prior to the commencement of 2013-2014 influenza seasons, all health care providers received a lecture on the importance of the vaccination of prenatal patients with particular attention to influenza and Tdap vaccinations. Providers were encouraged to administer the influenza vaccine to all pregnant women without contraindications at the next prenatal appointment, regardless of gestational age, and to administer Tdap to all pregnant patients between 27 and 36 weeks gestational age, regardless of prior vaccinations. In addition, plastic reminder cards (Figure 1) were attached next to the computer workstations to remind providers to offer vaccinations to pregnant and postpartum patients who have not been vaccinated. During the influenza season, an additional lecture was given on vaccination and printed materials were distributed to patients to inform them on the benefits of vaccinations.

In the high risk clinic, a patient spreadsheet was maintained to assist with the management of the patients. A vaccination status graph was added to spreadsheet, and patients eligible for vaccination were highlighted. We administered inactivated, preservative-free vaccines during both 2013 and 2014 influenza seasons. Charges, billing and insurance coverage of vaccinations did not change significantly between the 2012-2013 and 2013-2014 influenza seasons. After the completion of the 2013-2014 influenza seasons, we compared vaccination rates between September 2012 and March 2013 and between September 2013 and March 2014. Patients who declined to receive vaccination underwent the same standard of care as those who received vaccination per the guidelines of the department of Ob/Gyn, Metropolitan Hospital Center.

Power calculations were based on a two-sided Chi square test.

Table I. Common Ob/Gyn vaccines

OB	Tdap (Adacel) 0.5ml IM ×1	Vaccine given after 27 weeks GA in EACH pregnancy	Contraindications: • Allergy to vaccine • Unstable neurologic disorder including Guillain Barre syndrome • Caution, if acute illness or immunocompromised
Ob/Gyn	Influenza (Fluzone) 0.5 ml IM ×1	• Vaccine given to all patients between September and March. • Vaccine can be given in any trimester of pregnancy	Contraindications: • Allergy to vaccine • Egg allergy • Unstable neurologic disorder including Guillain Barre syndrome • Caution, if acute illness or immunocompromised
Gyn	HPV (Gardasil) 0.5 ml IM ×3 (at 0, 2, 6 months)	Females 9-26 years of age (regardless of Pap smear status)	Contraindications • Allergy to vaccine • Caution if acute illness • Caution if pregnant, delay vaccination until postpartum

Abbreviation; Ob/Gyn, Obstetrics and Gynecology

RESULTS

The number of clinic visits between 2012-2103 and 2013-2014 influenza seasons was similar; 4742 and 4521 visits in 2012-2013 for the low risk clinic, and 1734 versus1653 in 2013-2014 for the high risk clinic, respectively. The number of deliveries decreased during 2013-2014 period compared to previous year, 756 versus 655 (during 2012-2013 period) (Figure 2). The number of clinic providers remained constant. After the providers' education campaign and reminders, an increase in the vaccine doses administered in the prenatal clinics was noted.

For the high risk clinic, the number of Tdap vaccines administered increased from 9 doses during 2012 season to 90 doses in 2013 season ($P<0.001$). For the influenza vaccines given in the high risk clinic, the number of vaccinations increased from 48 to 135 ($P<0.01$) (Figure 3).

For the low risk clinic, the number of Tdap vaccine doses increased from 86 doses administered during 2012-2013 influenza season to 303 doses of influenza vaccine administered during 2013-2014 influenza season ($P<0.01$). The number of influenza vaccines administered remained relatively constant with 527 vaccines administered during 2012 season and 533 vaccines administered during 2013 influenza season ($P<0.3$).

The total number of Tdap vaccines administered between the antepartum clinic and postpartum floor did not change significantly between the study periods (634 versus 605 doses); the total number of influenza vaccines slightly increased during 2013-2014 periods (704 versus 770 doses).

DISCUSSION

The vaccination rates of pregnant women in the US remains low, despite clear guidelines and endorsements from both ACOG and CDC. In recent years, with a greater emphasis on quality and safety, there is an increased understanding that even the best evidence based guidelines may not translate into compliance and sound medical practice without a clear implementation plan. There are low and high reliability strategies to improve adherence with proposed interventions. Low reliability strategies include education and reminders, and high reliability strategies include system engineering, computerized automatic reminders, hard stops, incentives and real time feedback. Low reliability systems are cheap and readily available, and high reliability systems are expensive and often difficult to implement. This study showed that even the most basic interventions, such as targeted education and reminders, can increase vaccination rates.

Computerized Electronic Medical Record (EMR) reminders can also increase vaccination rates, as well as standing nursing orders, that do not require provider encounters [9,10]. Opt out policies combined with standing orders may further improve vaccination compliance. The best systems combine low and high reliability strategies, and at the same time, are cognizant of providers' time. These strategies work well with other reminders without overburdening the system with checks and hard stops from multiple competing initiatives that can result in alert fatigue, and an inability to complete required work in a timely fashion. High compliance also has to be linked with correct incentives to encourage quality. Provider education may work two fold; on one hand, it serves to remind providers to vaccinate patients, and on the other hand, it encourages providers to get vaccinated themselves, which was noted to correlate with decreased influenza rates among patients.

For the vaccination program to work as intended, multiple factors have to be addressed simultaneously, that is, the

Figure 2. Number of OB patient's visits

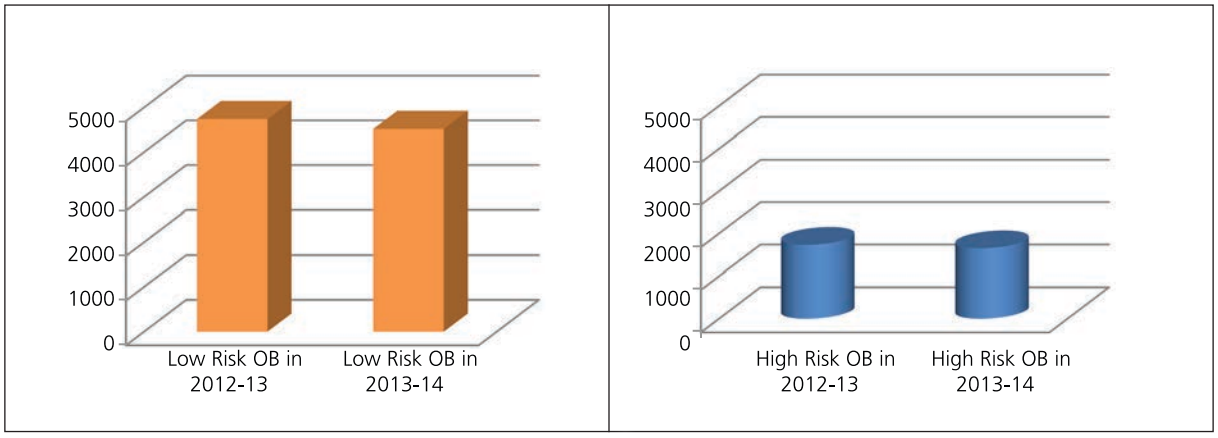


Figure 3. High risk clinic vaccinations

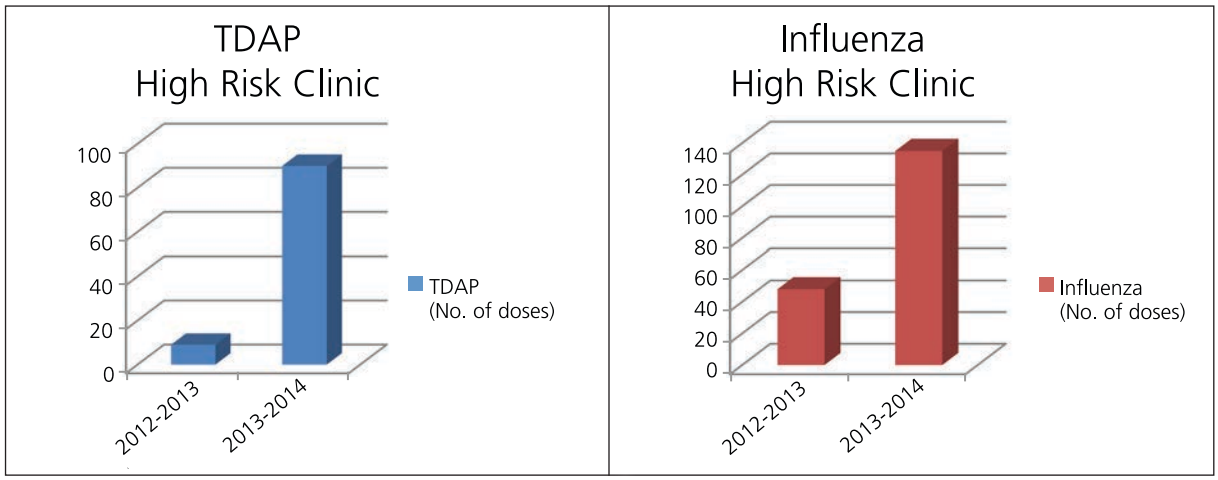
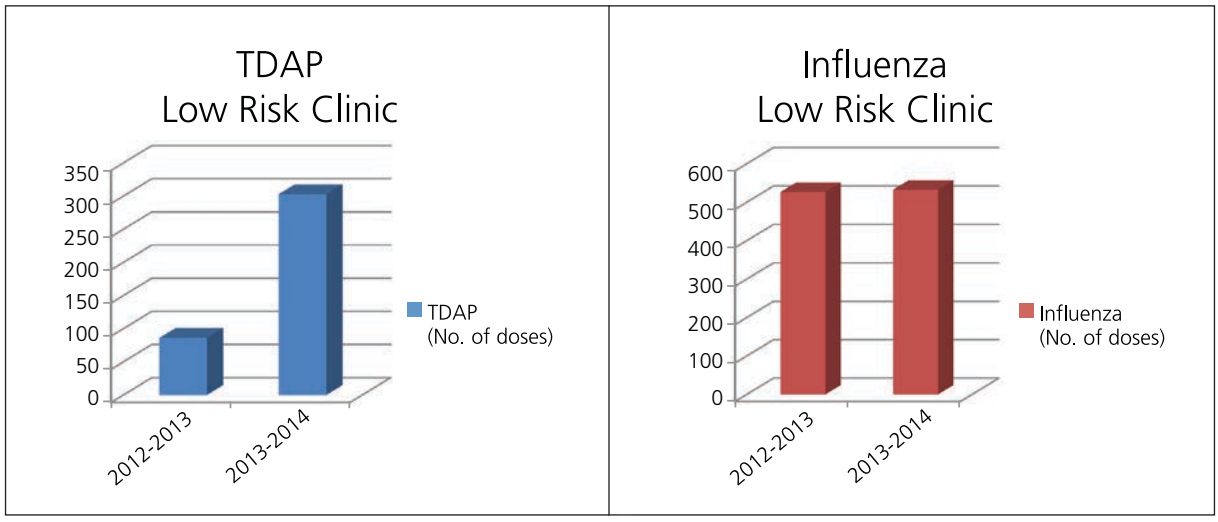


Figure 4. Low risk clinic vaccinations



availability of vaccines (we experienced shortages of Tdap in part of 2013-2014 study period when there was nationwide shortage); storage; counseling; insurance coverage; reimbursements; the availability of nurses to administer vaccinations; and an easy way to document the patient encounter. A breakdown in any element of the chain will result in decreased vaccination rates.

Comparing to the low risk clinic, our high risk clinic had more pronounced improvements in the vaccination rates, most likely due to the fact that vaccination rates were very low to start with, and the high risk clinic also had a spreadsheet documenting whether the patient was vaccinated or not, which could be visually demonstrated at a glance without searching in EMR. This confirms the idea that the creation of staggered system and redundancies improved results. Also, people tend to perform better when they know that they are being monitored.

During this study, we emphasized the administration of vaccines during prenatal care visits, so the total number of TdAP vaccines administered slightly decreased, and the total number of influenza vaccines slightly increased in 2013 season compared to previous year. That occurred as a result of decreased vaccine administration postpartum. This is more in line with current CDC and ACOG recommendations, which state that pregnant women should receive vaccines during prenatal care as opposed to postpartum. The current study focused on antepartum services and this observation confirms the old quote "what gets measured, gets improved." However, we should use postpartum vaccinations as a catch up time, when pregnancy is no longer a concern, and additional vaccinations such as MMR (measles, mumps, rubella) and human papilloma virus vaccination can also be administered to eligible patients.

The limitations of the study include the absence of demographic information, so we cannot address whether the intervention described would work in certain populations better than others. We serve a mostly inner city population, where the majority of patients are uninsured or underinsured, and may have decreased access to health care. In addition, health care in this population may be affected by other social determinants of health. It is presumed that they rely on physician or health care provider advice more than on information in the media. Also, there is not information on the number of patients seen in the clinic during study period, as patients have recurrent visits, and some patients enroll and drop out, but the total number of visits did not significantly change during study period. The number of deliveries at the hospital during study period remained constant, from which we can infer constant number of patients enrolled in prenatal care during period studied.

We also do not have information regarding why some patients did not receive vaccines, whether they were offered and declined, or were not offered vaccinations at all. We also do not know whether any media or prior knowledge regarding vaccinations influenced the decision of patients to receive or not to receive vaccinations. The impact on family opinion on medical decision making was also not evaluated.

This study illustrates that even simple and inexpensive targeted interventions, such as education and paper reminders improved influenza and TdAP vaccination rates in our obstetrics and gynecology clinics. Future research goals include an evaluation of the impact of provider education on vaccination uptake or acceptance.

CONFLICT OF INTEREST

The authors do not have any conflict of interest.

ACKNOWLEDGEMENT

We would like to express our deep gratitude to Chicke Igboechi, Pharm D, PhD, Carmen Lanzo, RN, Mercedes Dewar RN and Mary Carty ADN for their help in collecting data and facilitating this project.

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ORIGINAL RESEARCH

URBAN MEDICINE

A Retrospective Analysis of Unapproved Medical Abbreviation Usage among Various Consultation Services within Inpatient Physical Medicine and Rehabilitation Department

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ABSTRACT

PURPOSE: The aim of this study was to evaluate consultant compliance with recommended standards for unapproved abbreviations.

METHODS: During the month of December 2013, using the Quadramed Electrical Medical Record (EMR), eighty one consultations from outside departments was screened for unapproved abbreviations. The unapproved abbreviations were selected from the Joint Commission "Do Not Use" list.

RESULTS: Consultations from nineteen departments (Geriatrics, Podiatry, Internal Medicine, Neurology, Renal, Infectious Disease, Psychiatry, Medical Intensive Care Unit (MICU), Cardiology, Dermatology, Endocrinology, Surgery, Rheumatology, Pain and Palliative, Urology, Orthopedics, Gastrointestinal, Vascular) were reviewed for this study. Among them, 11 unapproved abbreviations were noted in the medical records.

Conclusion: We think that not only monitoring consultation notes for unapproved abbreviations but also setting up in-service educational meetings to offer education will be needed. *(Urban Medicine Vol. 1 No. 1 (2015) 24-26)*

KEY WORDS: Physical and rehabilitation medicine, Abbreviations, Consultation

INTRODUCTION

Medical abbreviations are often used by healthcare professionals. This practice may be helpful for time management and efficiency but can lead to medical errors.

Medical abbreviation errors over the past decade have been presented as a significant patient safety issue. According to some studies, abbreviation errors have accounted for up to seven thousand deaths per year [1]. High error rates with serious consequences are most likely to occur in intensive care units, operating rooms, and emergency departments. Preventable medical errors have been estimated to result in cost effecting up to 29 billion per year in hospitals nationwide [2]. Errors due to abbreviations can also cause intangible costs as they harm patients' trust and satisfaction with the health care system. Accordingly, there have been concerted efforts to address these concerns.

In the Physical Medicine and Rehabilitation Department, we regularly monitor and control the use of unapproved abbreviations by our staffs. However when physicians visit our department to perform consultations, they are not under such scrutiny.

The aim of this study was to evaluate consultants' compliance with recommended standards for unapproved abbreviations.

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METHODS

Study Design

Design

Retrospective chart review for month of December 2013.

Setting

University Based – Community Hospital located in New York City

Population

Patients admitted to Physical Medicine and Rehabilitation Department at Metropolitan Hospital Center (MHC) during the month of December 2013. Quadramed Electrical Medical Record (EMR) chart review of eighty one consults from outside

departments for month of December 2013 was screened for unapproved abbreviations. The unapproved abbreviations were selected from the Joint Commission "Do Not Use" list.

RESULTS

Using the Quadramed EMR, consultations from nineteen departments (Geriatrics, Podiatry, Internal Medicine, Neurology, Renal, Infectious disease, Psychiatry, MICU, Cardiology, Dermatology, Endocrinology, Surgery, Rheumatology, Pain and Palliative, Urology, Orthopedics, Gastrointestinal, Vascular) were reviewed for month of December 2013 (Figure 1). Among them, 11 unapproved abbreviations were noted in the medical records (Figure 2).

Intervention and Quality Measures

In Rehabilitation we have an ongoing Quality Improvement project to monitor unapproved abbreviations. For outside departments, there is no safeguard or standardization of education about unapproved abbreviations.

Resident Education

Despite numbers, no single department or individual can account for a majority of the incorrect usages (highest N = 3). Initial attempts were made to contact individual physicians. However, this met with little success.

Quality Measures

Continue to monitor consultation notes for unapproved abbreviations.

Set up in-service educational meetings by department to offer education about unapproved abbreviations. Contact Information Technology to determine if some abbreviations can be automatically changed using the Microsoft Word in Quadramed.

Figure 1.
The numbers of consultations by departments

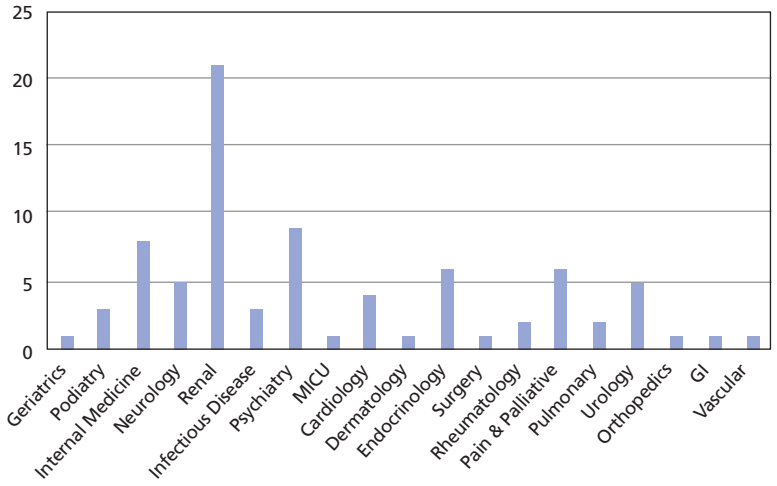
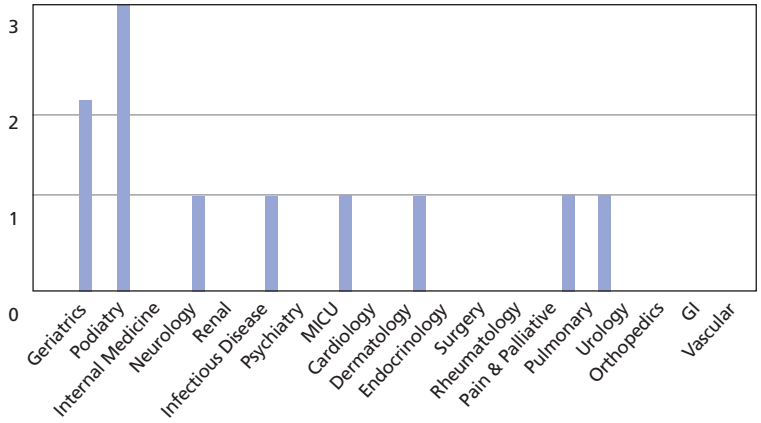


Figure 2.
The numbers of medical records with unapproved abbreviations



DISCUSSION

The Joint Commission released a universal "Do Not Use" abbreviation list in 2004 [3]. This list was included as part of the requirements for meeting National Patient Safety Goals. This addresses the effectiveness of communication and also requires organizations to have a standardized list of abbreviations that should not be used. However, noncompliance has been found at up to 23 percent during various Joint Commission surveys despite the list being available since 2004. The annual Joint Commission survey results have shown a decreasing trend in compliance from 75.2% to 64.2% in hospitals from 2004 to 2006 which are even more troubling [4]. Brunetti L. reported nearly 5% of the 643,151 errors reported to medical records were attributable to abbreviation use [5]. It has been suggested that hospitals not only use the "Do Not Use" list but also implement hospital specific lists of their own [1]. Others have gone as far as attempting to automate the removal of unapproved abbreviations but still there is no consensus on how best to approach this problem [6].

Unapproved abbreviations are also known as "error-prone abbreviations". They are referred to as "dangerous" or "error-prone" because they can lead to misinterpretation of orders and other communications, resulting in patient harm or death [7].

In our study, we found that unapproved abbreviations were used in various departments. We proposed to conduct a series of ten minute in-service educational lectures to review the Joint Commission "Do Not Use" abbreviations. Additionally, a follow-up study should be administered with both appropriate abbreviations and inappropriate abbreviations for test takers to identify.

CONFLICT OF INTEREST

We declare hereby that we do not have competing interests.

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ORIGINAL RESEARCH

URBAN MEDICINE

Sepsis: How Much Do We Know about It?

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ABSTRACT

PURPOSE: The purpose of this Quality Improvement (QI) project is to determine how much we know about the definitions of sepsis and systemic inflammatory response syndrome (SIRS), and the appropriate intervention among the staffs in the emergency department (ED) and department of internal medicine (IM) working in intensive care units and the hospital wards.

METHODS: From January to 2014, a question survey was distributed to residents, nurses and attending physicians working in the ED and IM in Metropolitan Hospital Center. Following collection of the survey, we reviewed the correct answers and explained the salient aspects of sepsis or SIRS, including proper methods of early recognition, diagnosis, and management.

RESULTS: Of 61 survey papers distributed, 61 (100%) were returned for data analysis. Among the respondents, 32 were residents (52.46%), 20 were nurses (32.79%), 8 were attending physicians (13.11%) and 1 was physician assistant (1.64%). About sixty percent of the respondents correctly identified the SIRS criteria. Fifty seven percent of the respondents knew the initial management of sepsis or SIRS. Among respondents, 26 (42.62%) answered that they had previously been educated on sepsis protocol whereas 35 (57.38%) had not been educated.

CONCLUSION: Given the high rate of staffs who do not know the SIRS and severe sepsis criteria for diagnosis, in order to enhance patient safety, there is need for improved education to ensure that staffs are knowledgeable about these conditions. There should be a greater emphasis on educating staffs on how to maximally identify sepsis for early intervention. *(Urban Medicine, Vol. 1 No. 1 (2015) 27-34)*

KEY WORDS: Sepsis, Quality improvement, Patient safety

INTRODUCTION

The systemic inflammatory response syndrome (SIRS) can be self-limited or can progress to severe sepsis and even septic shock [1]. Along this continuum, circulatory abnormalities such as intravascular volume depletion, peripheral vasodilatation, myocardial depression, and increased metabolism lead to an imbalance between systemic oxygen delivery and oxygen demand, resulting in global tissue hypoxia, or shock [2]. An indicator of serious illness, global tissue hypoxia is a key development preceding multiorgan failure and death. The transition to serious illness occurs during the critical "golden hours," when definitive recognition and treatment provide maximal benefit in terms of outcome. These golden hours may elapse in the emergency department (ED), hospital ward, or the intensive care unit (ICU) [3-5].

In United States, the number of sepsis cases per year has been on the rise [6]. This may be due to a large aging population, the spread of antibiotic-resistant organisms, the increased longevity of people with chronic diseases, upsurge in invasive procedures or the broader use of immunosuppressive and chemotherapeutic agents [6-8].

Approximately 750,000 Americans are struck by severe sepsis every year [1,9]. Sepsis is recognized as a challenging disease to overcome. The progression of sepsis to severe sepsis and septic

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shock is devastating, yielding a mortality of 40-50% [10].

The purpose of this Quality Improvement (QI) project is to determine if healthcare providers are aware of the definition, signs and symptoms, and early management of sepsis or SIRS in the ED, ICU and the hospital wards at Metropolitan Hospital Center. The long term goal of this project is to establish a standardized sepsis protocol across Health and Hospitals Corporation (HHC) hospitals, to increase the rate of early identification of sepsis and appropriate intervention among the HHC staff in the ED, ICU and the hospital wards.

METHODS

From January 2014 to 2014, this survey was distributed to the staffs working in the ED, ICU and the hospital wards at the department of Internal Medicine (IM) and ED at Metropolitan Hospital Center, New York Medical College. A questionnaire was developed by the HHC as one of the QI projects aimed at increasing awareness of sepsis or SIRS. Verbal consent was given by each staffs and survey was done using the paper interview. This survey study is non-intentional and it does not involve patients and hence no ethical approval was needed.

Following collection of the survey, we reviewed the correct answers and explained salient aspects of sepsis, including proper methods of early recognition, diagnosis, management, and prevention to all the staffs.

RESULTS

Of 61 survey papers distributed, 61 (100%) were returned for data analysis. Among the respondents, 32 were residents (52.46%), 20 were nurses (32.79%), 8 were attending physicians (13.11%) and 1 was physician assistant (1.64%), (Figure 1). Among them, 26 (42.62%) had previously been educated on sepsis protocol whereas 35 (57.38%) have not been educated (Figure 2).

Identification of Sepsis or SIRS

Regarding the question asking the definition of the SIRS criteria, 37 (60.66%) respondents chose the right answer. The criteria include: temperature <36 C° or >38 C°, RR>20/min, WBC <4000/uL or >12,000/uL, HR>90/min. About 40% of the respondents did not know the exact definition of the SIRS criteria (Figure 3). The most common presenting symptoms of severe sepsis are respiratory and renal dysfunction, and 38 (62.30%) of the respondents selected this answer as the definition of SIRS (Figure 4).

Management of Sepsis or SIRS

After identification of sepsis or SIRS, the initial management is very important to reducing mortality rates [11]. Administration of 20-30 ml/kg of isotonic crystalloid over 30 minutes is the treatment of choice for the recommended treatment for the sepsis or SIRS. Thirty five (57.38%) respondents selected this answer. Almost 43% of the respondents were not aware of the initial treatment of the sepsis or SIRS (Figure 5). A particular question asked "Within what time frame should broad spectrum antibiotics be initiated in the ED from the time of presentation and identification of sepsis?" Forty (65.57%) answered one hour, which was the correct answer (Figure 6). For the selection of the patients needing severe sepsis collaborative noninvasive or invasive protocol, the next question asked about the guidelines of this protocol. Among respondents, 57 (93.44%) selected "those who are hypotensive after being given 2L of intraveneous fluids or those with an elevated lactate" which was the right answer (Figure 7). Irrespective of fluid loading, if mean arterial pressure (MAP) remains less than 65 mmHg, we should switch to invasive protocol, including placing a central line, starting a vasopressor and titrating to a MAP>65 mmHg. Thirty nine (63.93%) respondents selected this answer (Figure 8). After initial treatment of sepsis or SIRS, patients should be admitted to ICU or monitored bed, and have their MAP, mental status, lactate and urine output rechecked. Among respondents, 42 (68.85%) knew the correct answer (Figure 9).

Figure 1.
Respondents consist of attending physicians (13.11%), residents (52.46%), nurses (32.79%) and physician assistant (1.64%)

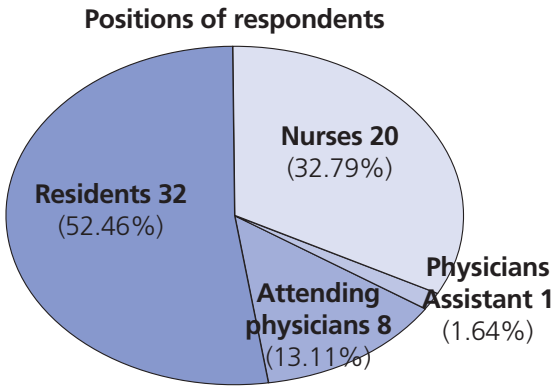


Figure 2.
Twenty six respondents (42.62%) answered they have been educated on the sepsis protocol

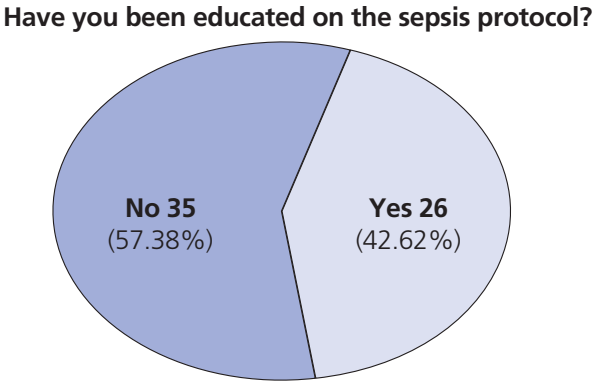
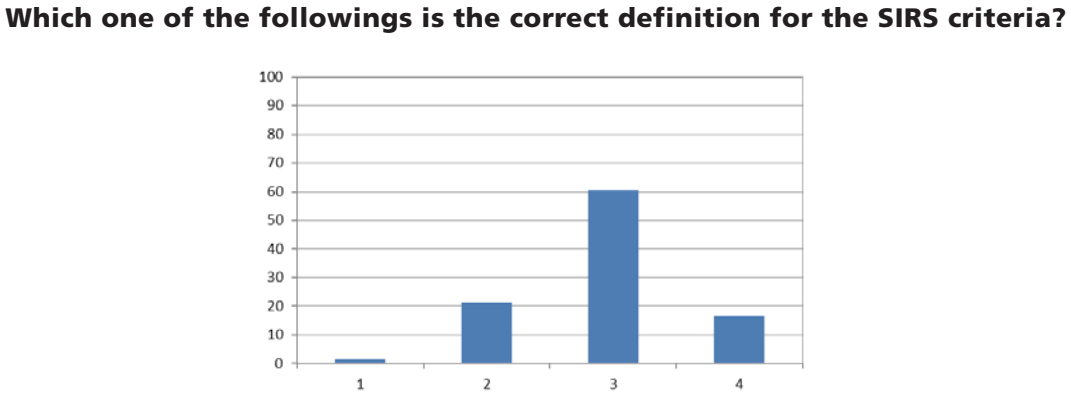


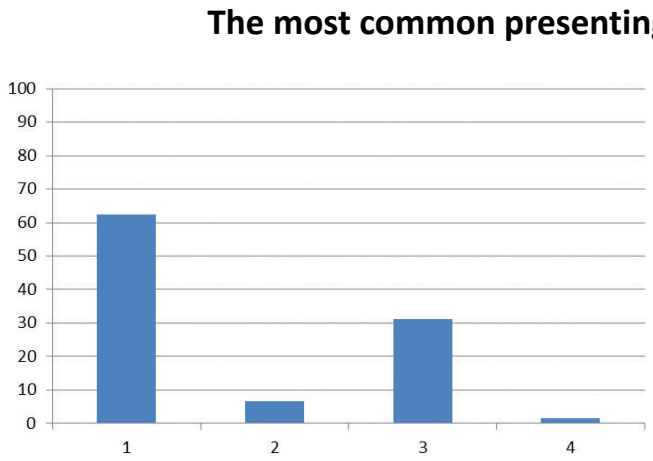
Figure 3. Thirty seven respondents (60.66%) answered correct definition for the SIRS criteria



Answer Choices	Responses, n (%)
1. BT< 34 C° or 36 C°, RR>18/min, WBC < 4000/uL or >12,000/uL, HR > 90/min	1 (1.64%)
2. BT <36 C° or >38 C°, RR>22/min, WBC <4000/uL or >10,000/uL ,HR>120/min	13 (21.31%)
3. BT <36 C° or >38 C°, RR>20/min, WBC <4000/uL or >12,000/uL, HR>90/min	37 (60.66%)
4. BT <36 C° or >38 C°, RR>18/min, WBC <4000/uL or >12,000/uL, HR>100/min	10 (16.39%)
Total	61 (100%)

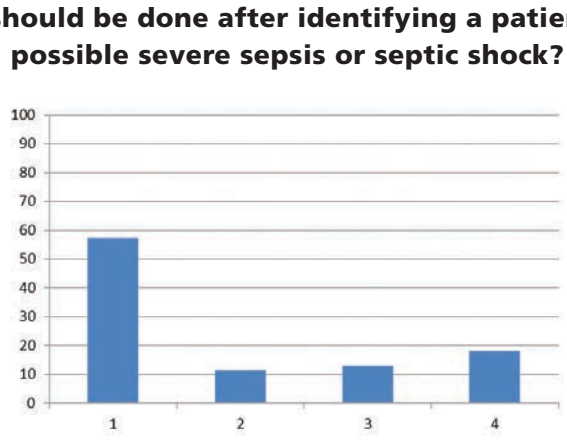
Abbreviations; BT: body temperature, RR: respiration rate, WBC: white blood cell, HR: heart rate

Figure 4. **Respiratory and renal dysfunctions are the most common symptoms of sepsis**
Among respondents, 38 (62.30%) chose the right answer



Answer Choices	Responses, n (%)
1. Respiratory and Renal dysfunction	38 (62.30%)
2. Cardiac and Neurologic dysfunction	4 (6.56%)
3. Respiratory and Cardiac dysfunction	19 (31.15%)
4. Endocrine and Gastrointestinal dysfunction	1 (1.64%)
Total	61 (100%)

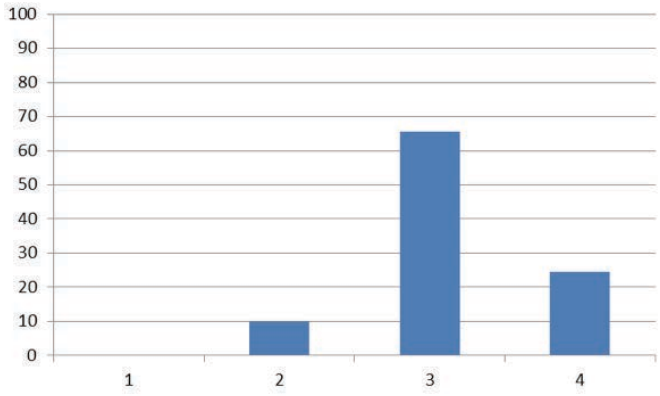
Figure 5. **For the initial treatment, administration of 20-30 ml/kg isotonic crystalloid over 30 minutes could be the right treatment**



Answer Choices	Responses, n (%)
1. Administer 20-30 ml/kg isotonic crystalloid over 30 minutes	35 (57.38%)
2. Administer 10-20 ml/kg isotonic crystalloid over 60 minutes	7 (11.48%)
3. Administer 10-20 ml/kg isotonic crystalloid over 30 minutes	8 (13.11%)
4. Administer 20-30 ml/kg isotonic crystalloid over 60 minutes	11 (18.03%)
Total	61 (100%)

Figure 6. **Broad spectrum antibiotics should be started within 1 hr.**
Forty respondents (65.57%) selected 1 hour

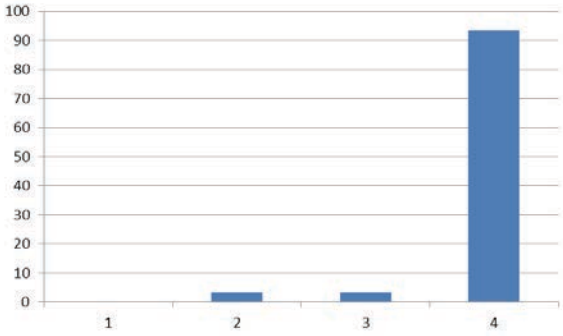
From the time of presentation and identification of Septic patient, within what time frame should broad spectrum antibiotics be initiated in the Emergency Department?



Answer Choices	Responses, n (%)
1. 5 hours	0 (0.0%)
2. 3 hours	6 (9.84%)
3. 1 hour	40 (65.57%)
4. 30 minutes	15 (24.59%)
Total	61 (100%)

Figure 7. **Among respondents, 57 (93.44%) selected those who are hypotensive after being given 2 L of fluids or those with an elevated lactate**

To which patients do the sepsis collaborative noninvasive and invasive severe sepsis protocols apply?

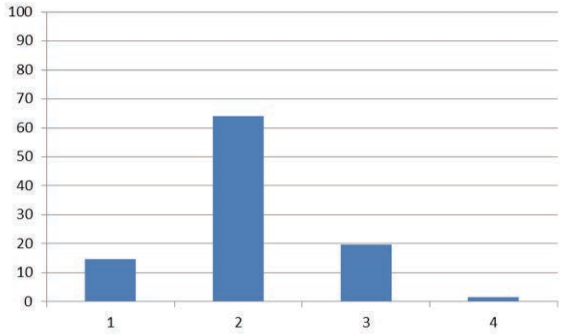


Answer Choices	Responses, n (%)
1. Those who are hypotensive after being given 1L of Fluids	0 (0.00%)
2. Those who have lactate greater than 4mmol/L	2 (3.28%)
3. Those who are hypotensive after 2L of Fluids	2 (3.28%)
4. Those who are hypotensive after being given 2L of fluids or those with an elevated lactate(>4mmol/L)	57 (93.44%)
Total	61 (100%)

Figure 8. **If MAP is less than 65 irrespective of initial fluid loading, we should switch to invasive protocol placing a central line and start vasopressor and titrate MAP>65 mmHg**

Abbreviation; MAP: mean arterial pressure

What should we do if patients MAP are less than 65 after initial fluid loading?

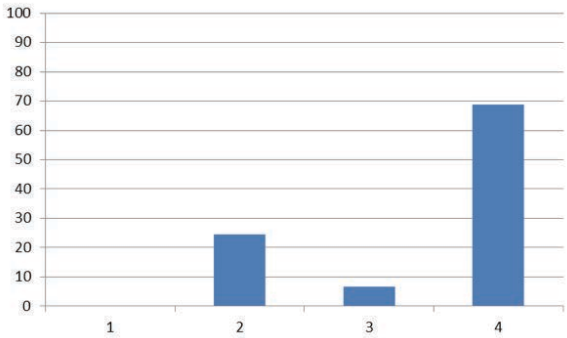


Answer Choices	Responses, n (%)
1. Administer 10-20 ml/kg isotonic crystalloid over 60 minutes	9 (14.75%)
2. Switch to invasive protocol placing a central line and start vasopressor and titrate to MAP >65 mmHg	39 (63.93%)
3. Start vasopressor and titrate to MAP>65 mmHg	12 (19.67%)
4. Administer Hydrocortisone	1 (1.64%)
Total	61 (100%)

Figure 9. **Patients with sepsis should be admitted to ICU or monitored bed and rechecked MAP, mental status, lactate and urine output**

Among respondents, 42 (68.85%) selected right answer

How should we monitor patients that were treated for severe sepsis and septic shock?



Answer Choices	Responses, n (%)
1. Admit to monitored bed. Recheck the patient's lactate q 2-4 hours	0 (0.0%)
2. Admit to ICU and Recheck the patients MAP, mental status and urine output	15 (24.59%)
3. Admit to ICU or monitored bed. Recheck patient's MAP, urine output, mental status	4 (6.56%)
4. Admit to ICU or monitored bed and recheck patient MAP, mental Status, lactate and urine output	42 (68.85%)
Total	61 (100%)

LIMITATION

In our study, we distributed survey papers to only 61 staffs working in ED, ICU and hospital wards. This number of the respondents might not represent the whole staff's status. Furthermore, this study was done with the staffs working in only the ED and IM, which does not represent the whole staffs' status in Metropolitan Hospital Center. However, large percentages of the sepsis patients have been treated initially in the ED or IM. Thus, this survey's results are considered meaningful.

DISCUSSION

Severe sepsis is a major cause of morbidity and mortality in both developed and developing countries [12]. Mortality rates remain high at 30% and rise to 60% in the presence of septic shock despite significant advancement in treatment modalities [13]. Bacteria are by far the most common causative microorganisms in sepsis, and cultures are positive in about 30-50% of cases [14,15]. Failure to administer antibiotics to which the pathogens are susceptible is associated with increased mortality [16]. Thus, early identification of sepsis and administration of broad-spectrum antibacterial agents are recommended as a means to improve survival [11].

The concept of SIRS, used to describe the complex pathophysiologic response to an insult such as infection, trauma, burns, pancreatitis, or a variety of other injuries, came from a 1991 consensus conference charged with the task of developing an easy-to-apply set of clinical parameters to aid in the early identification of potential candidates to enter into clinical trials to evaluate new treatments for sepsis [17,18]. It was felt that early clinical manifestations might be more readily available to physicians than more sophisticated and specific assays for inflammatory substances that were systemically released by the network of injurious inflammatory events. Therefore, the early definition of a SIRS was built upon a foundation of basic clinical and laboratory abnormalities that were readily available in almost all clinical settings [19-21].

Early recognition of sepsis or SIRS relies on obtaining an attentive clinical history, accurate vital signs, and a physical examination focused on mental status, breathing effort, and circulatory status [22,23]. Laboratory findings may support the diagnosis but are not reliable in isolation [22,23]. To identify and treat sepsis or SIRS in the early phase, it is essential for all the staffs to know the definition of sepsis and SIRS. In our study, the survey question regarding the definition of the SIRS criteria, 37 (60.66%) respondents identified the correct definition.

At present, the mainstay of therapy remains prompt resuscitation to eliminate regions of hypoperfusion, as well as limit any factors that could predispose the patient to further organ injury while the source of inflammatory stimulation is being identified and controlled [22-24]. In our study, about 60-70% of the respondents properly identified initial therapy (intravenous fluids) and follow up management for the patients with sepsis or SIRS.

According to the international guidelines for the immediate treatment of severe sepsis, antibiotic administration should be done within the first hour of recognition as it directly impacts mortality rates [11,25]. Weiss SL et al. [26] reported that delayed antimicrobial therapy was an independent risk factor for mortality and prolonged organ dysfunction in sepsis [26]. In our study, 65.57% of the respondents were aware of this one hour time period. 9.84% answered three hours.

Sepsis is a time-critical illness, requiring early identification and prompt intervention in order to improve outcomes [9]. The results of our study have helped to increase awareness and education in both the emergency and internal medicine fields. It has also outlined the importance of implementing critical interventions early in the course of patient management, specifically early goal-directed therapy, and rapid administration of appropriate antimicrobials.

Our efforts must be geared towards a more structured education of early diagnosis and treatment of sepsis, and also the implementation of a sepsis intervention program as a standard of care in a typical hospital's protocol. This will inevitably lead to improvements in processes of treatment. With the right tools and approach, we will be able to keep ourselves ahead of this condition in order to improve the mortality rates of the sepsis or SIRS.

CONFLICT OF INTEREST

All the authors declare that they have no competing interests associated with this study.

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ORIGINAL RESEARCH

URBAN MEDICINE

Elective Hepatitis B Vaccination to High-Risk Patients

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ABSTRACT

PURPOSE: The purpose of this project is to increase population immunity to the hepatitis B virus (HBV) by identifying patients in a high risk group who are candidates for HBV vaccination.

METHODS: From March 2014 to June 2014, patients who tested as non-reactive for HBV surface antibody (HbsAb) were offered prophylactic vaccination prior to discharge from the detoxification unit in Metropolitan Hospital Center. If they accepted, they were given one dose before discharge, and they were given an appointment in our clinic to complete the other 2 doses.

RESULTS: Two hundred and forty five patients were tested upon admission to the detoxification unit over a period of 119 days. One hundred and twenty patients were reactive for HBsAb. One hundred and twenty five patients were non-reactive and therefore they were candidates for vaccination. Of 125 eligible patients, 87 (72.5%) refused vaccination and 38 (27.5%) accepted and were vaccinated.

CONCLUSIONS: The screening for susceptible infection and offering HBV vaccination to high-risk patients is our current standard of care. A significant proportion of our cohort (49%) was found to be non-reactive to HBsAb, and of those patients 27.5% received 2 more HBV vaccinations. *(Urban Medicine, Vol. 1 No. 1 (2015) 35-37)*

KEY WORDS: Hepatitis B vaccines, High-risk, Patients

INTRODUCTION

Metropolitan Hospital Center, located in East Harlem, has a nineteen bed inpatient detoxification unit. Substance dependent patients may be admitted for inpatient detoxification from opioids, alcohol or sedative/hypnotics as a bridge from substance dependence to long term rehabilitation. Patients' concurrent chronic and often acute medical problems are managed while they receive appropriate medications for detoxification during a 5-7 day admission. All patients admitted to the unit are routinely tested for hepatitis B (HBV).

The purpose of this project is to increase population immunity to the HBV by identifying patients in a high-risk group who are candidates for HBV vaccination.

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METHODS

From March 2014 to June 2014, patients who were admitted to the detoxification unit in Metropolitan Hospital Center were offered testing for the HBV surface antibody (HbsAb). With their consent, those who were non-reactive for HbsAb were offered prophylactic vaccination prior to discharge from the detoxification unit and provided with follow up appointments to complete the 2 more doses.

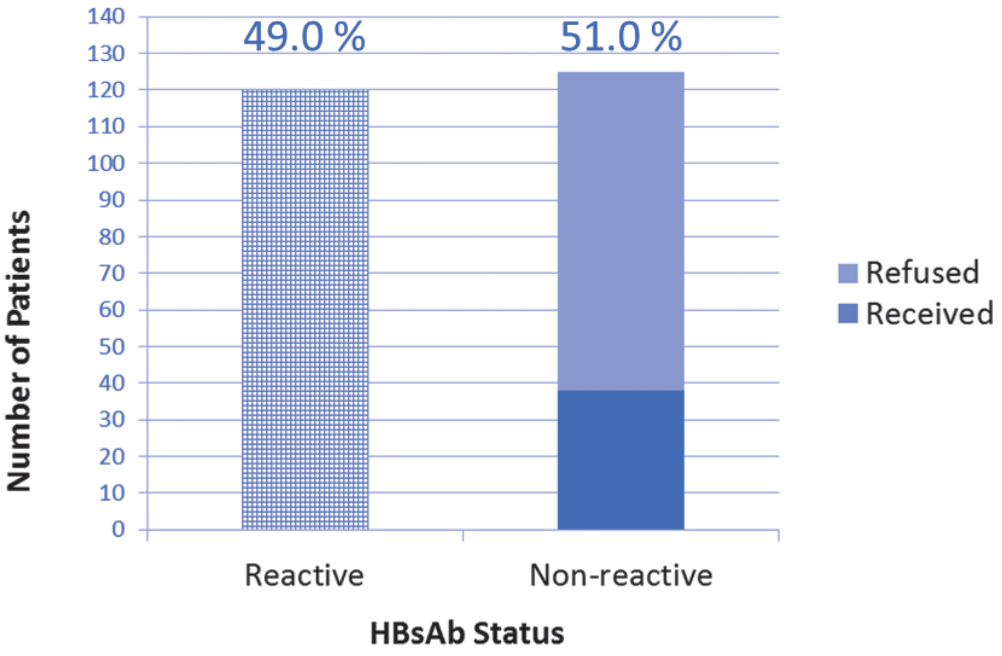
RESULTS

Two hundred and forty five patients over a period of 119 days were tested for HBsAb. One hundred and twenty patients were reactive for HbsAb and one hundred and twenty five patients were non-reactive. Those who were non-reactive were offered the HBV vaccination. Of 125 eligible patients, 87 (72.5%) refused vaccination and 38 (27.5%) accepted and were vaccinated (Figure 1).

LIMITATION

In this study, we did not evaluate the HBsAb seroconversion rate of the patients who completed the 3 doses of HBV

Figure 1. **HBsAb status and HBV vaccination of the patients admitted to the detoxification unit**



vaccination. Rumi M et al. [1] reported a suboptimal response to HBV vaccine in drug users. They said the drug users who did not respond to vaccination were more likely to be those with evidence of prior HBV infection and anergy to skin tests. They postulated that unresponsiveness to HBV vaccine in drug users may be due to altered immunity. Further quality improvement project to increase the HBV vaccination rate as well as a study about seroconversion rate of HBsAb in drug users will be needed.

DISCUSSION

Those who engage in the use of illicit drugs, especially injectable, are considered to be at high risk for HBV infection and transmission [2,3]. The HBV vaccination given as part of the routine child/adolescent immunization schedule seems to be the most effective method in decreasing the incidence of infection [4,5]. It is estimated that over 95% of new cases occur among unvaccinated adults, adults with behavioral risk factors or close contacts of HBV infected people [6,7]. Since the estimated annual cost per patient for the treatment of chronic HBV infection is between several hundred and several thousand dollars, reducing the infection rate can reduce a major health and economic burden to communities, patients, and the health care system [8,9].

Studies done on high risk populations have demonstrated that knowledge regarding HBV, as well as recommended vaccination practices and communication with a health care provider, among other factors, are associated with a statistically significant increase in having received the HBV vaccination [5]. This demonstrates the role of health care providers play in promoting community immunity against this virus that is responsible for an estimated 40,000 new infections in the United States annually [10]. Detoxification units, such as ours, are ideal settings for educating at-risk patients.

Based on this project, screening for infection and offering HBV vaccination to at-risk patients is worthwhile and should be the standard of care. A significant proportion of our cohort (49%) was found to be non-reactive to HBsAb, and of those patients 27.5% agreed to accept the vaccine. Further studies should aim to identify possible barriers, such as education about the illness, age, sex, race, socioeconomic status, and education level which may lead to differences in vaccination rates in order to improve patient compliance. Ultimately, further patient education is necessary to increase vaccination rates in HBsAb negative individuals in an effort to minimize the incidence of HBV infection and reduce the health and economic burden of HBV infection in our patient population.

CONFLICT OF INTEREST

All the authors declare that they have no competing interests.

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ORIGINAL RESEARCH

URBAN MEDICINE

Atlas of Central Venous Access: an Illustrated Guide for the Physicians

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ABSTRACT

PURPOSE: The purpose of this study is to create an atlas to provide the internal medicine residents at Metropolitan Hospital Center (MHC) with a visually enriched text containing important evidence based information related to the different types of central catheters used in our hospital.

METHODS: The authors performed a search through the use of PubMed, MEDLINE and GOOGLE of medical and scientific literature related to the technique of central line placement. Except theses, original research studies, guidelines, book chapters, and videos about the central vascular access technique were reviewed. A total of two guidelines and thirty seven articles were finally used to create this manual.

RESULTS: A comprehensive written manual covering all aspects of central line placement with pictures and drawings has been created. This manual has been distributed in the medical intensive care unit and the emergency department to be used by residents for reference prior to and during insertion of central lines.

CONCLUSIONS: By creating of the written manual for aseptic central venous catheter placement, it will improve the quality and the safety of central line insertion technique. *(Urban Medicine, Vol. 1. No 1. (2015) 38-40)*

Key Words: Physicians, Central venous catheterization, Quality improvement

INTRODUCTION

In the United States, more than 5 million central venous catheters are inserted every year [1]. Among these, more than fifteen percent of patients develop complications which can be fatal or severely disabling. Using a correct technique to avoid complications and septicemia from central lines has been stressed by the Joint Commission in the 2014 Hospital National Patient Safety Goals [2]. In Metropolitan Hospital Center (MHC), measures have already been taken to improve the quality and the safety of central line insertion technique, such as creation of guidelines for aseptic central venous catheter placement, using bundles and training sessions in the Institute for Medical Simulation and Advanced Learning (IMSAL). Despite these efforts, complications related to central catheters still occur.

At the present time, residents at MHC in New York City receive their training for central line placement in the IMSAL. The IMSAL has excellent facilities, learning material, and personnel, but unfortunately, internal medicine residents usually have only one training session for central line placement along their residency. Lacking a quick reference material to be consulted prior to or during insertion of central lines, the internal medicine residents at MHC would benefit from a reference book specifically created to show the catheters, central line kits, and ultrasound machines used in our hospital. Ideally, this material should also explain in detail every step of the central cannulation procedure, possible pitfalls, and solutions.

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OBJECTIVE

To create an atlas to provide the internal medicine residents at MHC with a visually enriched text containing important evidence based information related to the different types of central catheters used in our hospital, ultrasound basic principles, anatomy of the veins used for central access, proper technique with and without ultrasound guidance, confirmation of venous puncture, and possible complications related to central vein catheterization.

METHODS

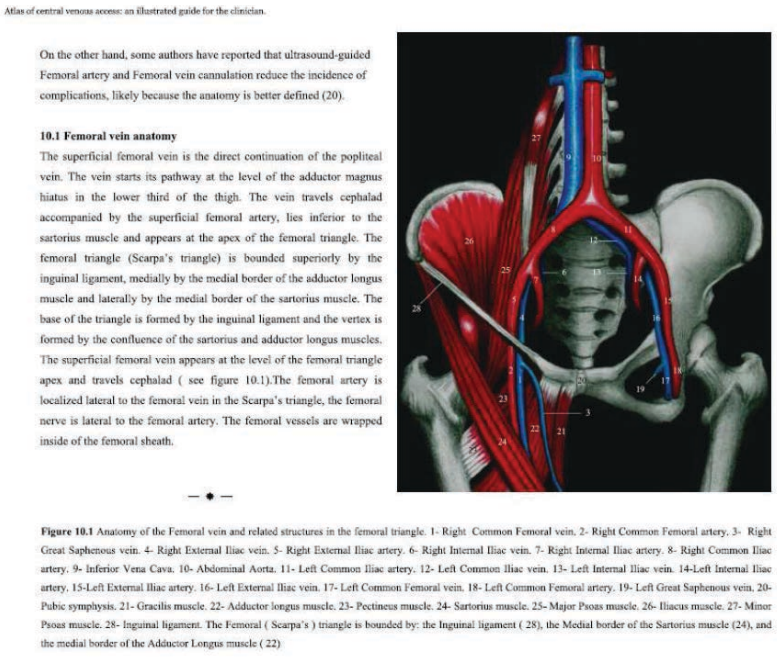
The authors performed a comprehensive search of medical

and scientific literature related to the technique of central line placement. This search was conducted through the use of PubMed, MEDLINE, and GOOGLE. Original research studies, guidelines, book chapters, and videos relevant to the central vascular access technique were reviewed. A total of two guidelines and thirty seven articles were finally used to create this manual. Its content was enriched with anatomic and medical drawings (created by Dr. Guerra), and sonographic pictures obtained during actual placement of central lines.

RESULTS

The bibliographic research and the redaction of this project took place between November 2011 and January 2013. A comprehensive written manual covering all aspects of central line placement with pictures and drawings has been created. Copies of this manual have been placed in the medical intensive care unit and the emergency department at MHC to be used by residents for reference prior to and during insertion of central lines (Figure 1 and 2).

Figure 1.
Illustrations about the anatomy of the femoral vein and related structures in the femoral triangle


Atlas of central venous access: an illustrated guide for the clinician.

On the other hand, some authors have reported that ultrasound-guided Femoral artery and Femoral vein cannulation reduce the incidence of complications, likely because the anatomy is better defined (20).

10.1 Femoral vein anatomy

The superficial femoral vein is the direct continuation of the popliteal vein. The vein starts its pathway at the level of the adductor magnus hiatus in the lower third of the thigh. The vein travels cephalad accompanied by the superficial femoral artery, lies inferior to the sartorius muscle and appears at the apex of the femoral triangle. The femoral triangle (Scarpa's triangle) is bounded superiorly by the inguinal ligament, medially by the medial border of the adductor longus muscle and laterally by the medial border of the sartorius muscle. The base of the triangle is formed by the inguinal ligament and the vertex is formed by the confluence of the sartorius and adductor longus muscles. The superficial femoral vein appears at the level of the femoral triangle apex and travels cephalad (see figure 10.1).The femoral artery is localized lateral to the femoral vein in the Scarpa's triangle, the femoral nerve is lateral to the femoral artery. The femoral vessels are wrapped inside of the femoral sheath.

Figure 10.1 Anatomy of the Femoral vein and related structures in the femoral triangle. 1- Right Common Femoral vein. 2- Right Common Femoral artery. 3- Right Great Saphenous vein. 4- Right External Iliac vein. 5- Right External Iliac artery. 6- Right Internal Iliac vein. 7- Right Internal Iliac artery. 8- Right Common Iliac artery. 9- Inferior Vena Cava. 10- Abdominal Aorta. 11- Left Common Iliac artery. 12- Left Common Iliac vein. 13- Left Internal Iliac vein. 14-Left Internal Iliac artery. 15-Left External Iliac artery. 16- Left External Iliac vein. 17- Left Common Femoral vein. 18- Left Common Femoral artery. 19- Left Great Saphenous vein. 20- Pubic symphysis. 21- Gracilis muscle. 22- Adductor longus muscle. 23- Pectineus muscle. 24- Sartorius muscle. 25- Major Psoas muscle. 26- Iliacus muscle. 27- Minor Psoas muscle. 28- Inguinal ligament. The Femoral (Scarpa's) triangle is bounded by: the Inguinal ligament (28), the Medial border of the Sartorius muscle (24), and the medial border of the Adductor Longus muscle (22)

Figure 2.
Illustrations on how to insert central venous catheter

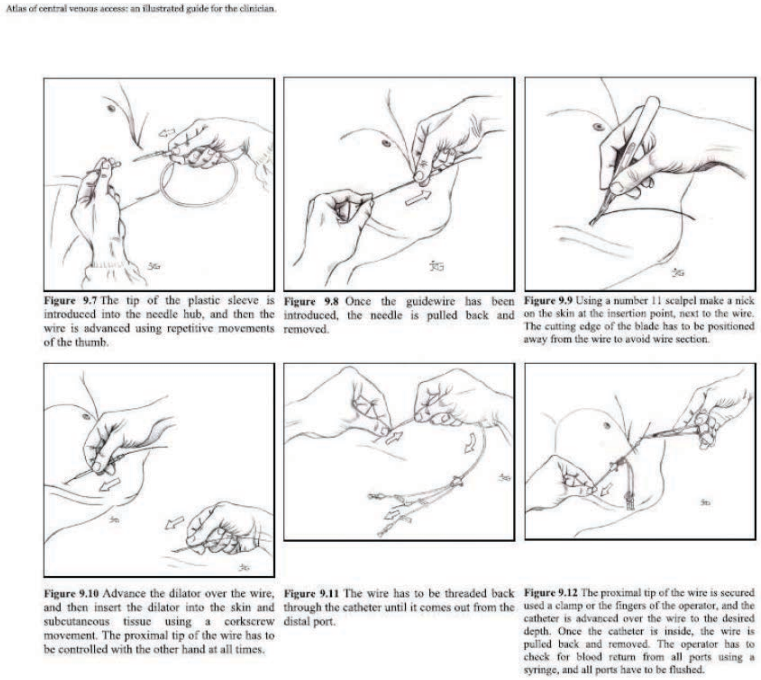

Atlas of central venous access: an illustrated guide for the clinician.

Figure 9.7 The tip of the plastic sleeve is introduced into the needle hub, and then the wire is advanced using repetitive movements of the thumb.

Figure 9.8 Once the guidewire has been introduced, the needle is pulled back and removed.

Figure 9.9 Using a number 11 scalpel make a nick on the skin at the insertion point, next to the wire. The cutting edge of the blade has to be positioned away from the wire to avoid wire section.

Figure 9.10 Advance the dilator over the wire, and then insert the dilator into the skin and subcutaneous tissue using a corkscrew movement. The proximal tip of the wire has to be controlled with the other hand at all times.

Figure 9.11 The wire has to be threaded back through the catheter until it comes out from the distal port.

Figure 9.12 The proximal tip of the wire is secured used a clamp or the fingers of the operator, and the catheter is advanced over the wire to the desired depth. Once the catheter is inside, the wire is pulled back and removed. The operator has to check for blood return from all ports using a syringe, and all ports have to be flushed.

A fund request has been submitted to the Committee of Interns and Residents (CIR) to print more copies of this manual, which will be distributed to the internal medicine residents at MHC.

DISCUSSION

Placement of central venous catheters via a jugular or subclavian vein is becoming increasingly common [3]. Although the great majority of these catheters are successfully placed by physicians using anatomic landmark techniques, this procedure is neither innocuous nor always successful [3]. Serious complications, including hematomas, arterial injury, and pneumothorax can occur. The patient may experience considerable discomfort when multiple needle passes are made [3,4].

Medical schools and residencies are currently facing a shift in their teaching paradigm. As central venous catheter insertions are performed frequently by internal medicine residents, various methods to educate the resident have been tried [4]. Barsuk JH et al. [4] evaluated the effect of simulation-based mastery learning on central venous catheter insertion skill and they reached a conclusion that it increased residents' skills in simulated Central Venous Catheter insertion, decreased the number of needle passes when performing actual procedures as well as decreased the complication rate, and increased resident self-confidence [4]. The use of ultrasound guidance to improve patient safety during placement of central venous catheters has also been studied [3,5]. Sonographic imaging of the jugular and subclavian veins can significantly improve the safety, speed, and comfort of the procedure by defining the vascular anatomy of the jugular and subclavian veins before puncture, showing complications from prior attempts or placements of central venous catheters in these vessels, and providing guidance for needle puncture of the jugular and subclavian veins [5].

However, it is a difficult and constant challenge to provide appropriate training of procedural skills to residents while ensuring patient safety through trainee supervision [6]. To prevent the failure and occurrence of complications of the central venous catheterizations by the resident physicians, we created a detailed manual and distributed it to the areas in the hospital that initiate central line placement.

A detailed procedure manual guiding the residents on site during the insertion of the central venous catheter will eliminate the errors. The manual has photos, pictures as well as the explanations of each step of the procedures to prevent the residents from making a mistake.

We hope this manual will be effective to train the residents and improve patient safety during central venous catheterizations.

ACKNOWLEDGEMENT

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CONFLICT OF INTEREST

We declare that we do not have conflict of interest.

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CIR RESIDENTS UNITED *for* QUALITY

Patient Advocacy, Learning, Building a Physician Community, and Community Service are the core values of members of the Committee of Interns and Residents. As such, CIR is committed to developing resident leaders in patient safety and quality improvement. To learn more about the quality and safety work of our residents, as well as scholarships, programming, and other opportunities to engage in QI and patient safety, visit www.gateway.org, or email Vivian Fernandez at vfernandez@cirseiu.org.

SPECIALIST PERSPECTIVE

URBAN MEDICINE

Filling the Gaps in Resident Engagement on Quality Improvement

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ABSTRACT

Hospitals are struggling to respond to the mandate to integrate residents into the organizational quality improvement (QI) and patient safety efforts. In the absence of infrastructure such as curricula and a body of faculty formally trained in QI, hospitals can engage housestaff in a meaningful way by creating opportunity for resident to work with hospital leadership on the planning and implementation of QI and safety work. In additional to securing this critical front-line provider perspective, these types of partnerships provide residents with the learning necessary to become champions in safety and quality. *(Urban Medicine, Vol. 1 No. 1 (2015) 42)*

KEY WORDS: Residency training, Quality improvement, Patient safety

Front-line providers of care have a fundamental role in identifying and analyzing problems, intervening, and measuring the effects of an intervention. The Accreditation Council for Graduate Medical Education (ACGME), recognizing the heretofore-untapped potential of residents in improving the quality and efficiency of care delivery, implemented new regulations requiring meaningful engagement of housestaff in patient safety and quality improvement. As a result, hospitals have trained residents in the science of improvement and enlisted them in institutional quality and safety efforts, but with varying degrees of success.

Residents understand the case for quality. They are well aware that inefficiencies are a main driver of healthcare costs in the United States limiting equitable access to necessary care, and that there can be no health justice without the safe provision of care. "Do No Harm" is a powerful appeal to their professionalism, and residents' staggering workloads are a prime incentive to identify and address barriers to care. So why is it that some programs and hospitals are developing residents into leaders in quality and safety, while others struggle with leveraging the collective power of residents to improve patient care? Dr. Sepideh Sedgh, former President of the Committee of Interns and Residents, offers an explanation:

"Philibert I. [1] discusses 'top-down' and 'bottom-up' approaches to teaching residents quality and safety, contrasting institution-initiated quality improvement (QI) models and resident-initiated QI models. However, our experience demonstrates that the best learning and outcomes for patients are achieved when front-line providers with a unique understanding of local realities work together with clinical and administrative leadership to create shared ownership of institutional improvement efforts."

Although it has been nearly fifteen years since *To Err is Human* rocked the healthcare industry with its shocking revelation of the profound problems in quality in safety, creating a culture of safety and quality remains a work in progress. There is still a tremendous gap in formal curricula and the availability of mentors formally trained in QI. However, when residents work with hospital leadership to improve safety and quality, they are by definition immersed in the principals of systems-based practice, and create a culture where they are empowered to identify and resolve barriers to patient care. Residents are the ideal partners for hospital leadership to spur innovations in safety and quality. The individuals in this next generation of physicians are truly the ones who can cross the quality chasm.

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SPECIALIST PERSPECTIVE

URBAN MEDICINE

Augmenting Gestalt in Pursuit of Shared Decision Making

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ABSTRACT

Given the quality and ease of access of modern medical literature, as well as the work of multiple groups which attempt to quantify that literature into treatment outcomes, we can easily assign relative values and occasionally concrete numbers to treatment efficacy and treatment risks. While providers frequently access this information to aid in their decision making, they rarely involve patients in this decision making. While historically it has been accepted that the provider can evaluate all of the data available to him or her and inform the patient of the decision they come to, in the modern medical society we must seek to involve the patient in their own care. The idea of patient autonomy in regards to being educated on the risks and benefits of treatment, as well as being a participant in the decision making process, is explored. *(Urban Medicine, Vol.1 No.1 (2015) 44-46)*

KEY WORDS: Gestalt, Decision making, Patient safety

Your patient is a screaming three year old child. He is red in the face and tugging at his right ear as if that downward traction is the only thing keeping his heart beating. Perhaps more notably, his parents are there and they both look as if they haven't slept in well over 24 hours, appearing as desperate for a cure as the child is. Your exam shows nothing more than a small amount of tympanic membrane erythema, perhaps a small effusion on one side. You now have a decision to make; to treat or not to treat.

This is a daily battle we face as physicians and one that we would argue we are handling wrongly. Most people will probably be okay with telling this family that the exam suggests a viral infection and that antibiotics will do more harm than good. We may cite the American Academy of Pediatrics (AAP) guidelines which give the option of not treating these ear infections [1]. We will explain that the guidelines are vague on what to do but our feeling is the risk of treatment outweighs any possible benefit. Almost certainly these issues are discussed in vague terms, clouded in the 'mystique of a physician' where we imply we know exactly the amount of risk or benefit and have done the calculation for the patient. We may all leave this encounter feeling that we have done well for the patient

What if this same patient has bilateral bulging tympanic membranes? Many of us would suddenly rush to treat, using the AAP guideline for bilateral effusion as justification [1]. Again we would give a similar speech, again acknowledging that this is likely viral, but now saying how the benefits outweigh the risks and if it is bacterial our antibiotic therapy will help. Some of us would continue to approach the patient and state that it is irrelevant if it is bacterial or viral, as the rate of complications of otitis media in this day and age of pneumococcal vaccines approximates zero, the risk of therapy adverse events is still pronounced while the benefit is minimal [2,3]. What if that child had bilateral ruptured tympanic membranes with purulent discharge? Would this alter your care? Some of the most robust data sources on otitis media treatment use these types of patients and still show that treatment serves only to lessen symptoms by less than one day and that adverse outcomes of no treatment are exceptionally minimal [3-5]. We believe at some level we have all internalized this before, but when we see this patient we may not act according to the evidence. We see something that looks like it should be treated, a patient that looks like they want a treatment, and our desire to treat 'for' the patient makes us ignore the literature-based evidence and treat in a situation where treatment may still cause more harm than good.

Our point is not to question the guidelines or the latest

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research since the release of the guidelines. The issue we wish to stress here is twofold and as follows. We are physicians, ostensibly men and women of science, who should be making as few decisions as possible based on gestalt in this world of such robust data on nearly every condition at our fingertips. Secondly, our patients have autonomy and the overwhelming approach to treatment decisions in the hospital setting involve telling the patient what will be done to or for them, rather than involving them in the decision making process for their own health. When we presume to be able to weigh costs and benefits for our patients, especially in the grey areas of treatment, we are doing a direct disservice to our patients. When we can truly quantify the reasons for or against, we can not only educate ourselves to not choose poorly in these situations, but also involve patients more fully in their own path to wellness.

We live in an era where we need not rely on gestalt for many of the treatment decisions we make. There are numerous organizations and individuals who have taken steps to make the decision making data as quantifiable as possible. While we do not specifically endorse any specific product or website, resources such as TheNNT.com [6] and XRayRisk.com [7] exist specifically to streamline our ability to condense all of the available data into concrete numbers which we can then use to make a decision. Many physician use TheNNT.com, to establish the odds of benefit and the odds of harm for numerous treatments. Similarly many use XRayRisk.com, to establish exact values for the amount a given radiograph is estimated to increase a person's lifetime cancer risk. What we have never seen is physicians then take this data, walk over to the patient, and present it directly to the patient. I have never seen a physician truly invite a patient to be a part of the decision making team, to understand what the best estimate odds of success, failure, and adverse event are, and ask the patient for their opinion.

A search of the literature shows a dearth of studies that measure outcomes of such patient involvement, but it is safe to assume that a more educated patient populace should be a safer patient populace. At the very least, a more educated populace should be more pleased with their care. Patients have autonomy, and by consistently closing the decision making loop in a way that excludes them we are frequently circumventing their autonomy by limiting their ability to understand the option available to them. A culture of providers who want to work with patients to reach a common accord is the goal we should be striving to. The era of medical knowledge being limited to only those with advanced degrees and limited understanding of the decision making process by the patient has long-ago changed to a collaborative society where a patient who isn't directly well educated by the provider will educate themselves, often erroneously, with the electronic resources available on the internet.

The next steps in patient care will hinge on this. A patient who develops a clinically apparent sinusitis may or may not need antibiotic treatment and the entire history of medical care up to this point has hinged on a physician telling a patient what they must do and the patient choosing to adhere to therapy or not based on their interpretation of the interaction with the physician and a myriad of different social and psychological issues that could be at play. An ideal future for medicine should be a physician explaining that the latest research shows that 80% of all sinusitis cases resolve without antibiotics, that treatment helps enough to be noticed about 1 in every 15 times and that you are twice as likely to have a side effect, such as diarrhea or a rash, as you are to see any benefit. The patient then knows the important decision making information the physician used to come to his or her decision. Then have a discussion. Ask the patient if they understand what these numbers mean, and ask them if they want the therapy still and why or why not. Also explain to the patient that since good medical follow up is key to nearly every physician interaction, they will likely have an opportunity to evaluate the efficacy of their choice regardless of which choice they make, and could perhaps start treatment later. You could even stress that starting later, in select pathologies, has been shown to have few-to-no adverse outcomes. It is very likely that we overprescribe medication out of a mixture of opinions that we carry, that won't carry over to a patient who sees the numbers laid out plainly. Of all the methods to minimize antibiotic over-use, giving the patient objective evidence and a choice may be the most simple method of all [8].

Your next patient is a 25 year-old female using oral contraceptives who just came back from an intercontinental flight. She has been been short of breath since just after landing. You are sure it is just some asthma, but you can not comfortable rule out a pulmonary embolism. Perhaps this time you will go to the patient directly and have a frank conversation with her. Explain to her that the best knowledge we have says that the risk of radiation is cumulative throughout her life and that the study you want to do increases her lifetime cancer risk by about 0.3% [9-11]. That while that risk is not very large, it is an increase she will carry with her for the rest of her life and every other radiograph she gets will increase it further. Explain to her how strongly you truly feel she needs a study for pulmonary embolism, the risks you run of missing it, and the likelihood of actually finding it. Ask her what she thinks, and then listen.

In conclusion, you should listen to the future of patients' care, educate patients making their own decisions and take the responsibility for their own care.

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SPECIALIST PERSPECTIVE

URBAN MEDICINE

Understanding Roles and Work Processes Supports Good Teamwork in a Busy NYC Emergency Department: Better Collaboration among ED Services Gets the Job Done Safely and Enhances Staff Safety and Patient Satisfaction

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ABSTRACT

A proactive approach to reduce the risk of workplace violence in the Emergency Department by educating all staff in their specific roles and responsibilities has created a safer atmosphere for the employees and patients. *(Urban Medicine, Vol. 1 No. 1 (2015) 46-47)*

KEY WORDS; Emergency department, role, work, collaboration, safety, satisfaction

Role definition and workflow processes, with the requisite employee understanding of these roles and processes, are pivotal to the successful implementation of a security program in an Emergency Department (ED). Often, when workflow processes are looked at in isolation the processes appear to be working, however, when a closer review of workflow process and how they interact with each other is made, complexities arise that may exacerbate conflicts in the priorities of different roles the employees in the organization have [1]. Similar conflicts may arise if employees don't understand what each other's roles are and how they interact in the same environment and situation.

According to the Emergency Nurses Association and the American College for Emergency Physicians, violence in healthcare settings in general is on the rise. Specifically, the ED is the most prevalent and predictable location of violent occurrences against providers as they are routinely exposed to volatile patients and visitors with drug and/or alcohol impairment, or with psychiatric disorders. Add the stress of traumatic injuries, long wait times, and slow throughput processes and you have a ripe recipe for ED violence [2]. This dynamic environment has security professionals and ED staff searching for solutions.

In August 2013 Metropolitan Hospital Center (MHC) utilized their "Breakthrough"[1] process to bring together all ED staff – physicians, social workers, nurses, patient care associates, and security (Hospital Police) – in order to form a more collaborative team focused on reducing violence to providers and effectuating better patient care. Initially, ED staff voiced concerns of patient abuse towards ED staff and the accompanying perception that the hospital, specifically its security component – Hospital Police – was not adequately addressing their security concerns. During the course of initial meeting, ED staff revealed that they were unsure of what role and what legal authority Hospital Police have in the ED. Questions from ED staff arose as to when arrests can be made by Hospital Police Officers, what the Hospital Police role in the de-escalation process was, can Hospital Police participate in the medication and restraint of patients. These questions and others were the backbone of the concern for staff security in the ED. Similarly, the Hospital Police concerns were provided to the ED staff, such as when should an agitated, out of control patient be restrained so he/she doesn't hurt himself/herself or others and why aren't patients being treated with respect, regardless of their social situation, which in turn agitates the patients, and causes

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1 The New York City Health and Hospitals Corporation utilize L.E.A.N. management processes, the core idea being to maximize customer value while minimizing waste. Simply, lean means creating more value for customers with fewer resources. L.E.A.N. has been customized to HHC's specific need, known as Breakthrough.

them to direct their anger at caregivers who then call Hospital Police to settle the situation. Officers are left with the feeling that the providers are causing the agitation that they eventually have to deal with. Additionally, the lack of communication between clinical staff and officers is cause for concern, especially when interacting with combative individuals. Many times officers felt they were not part of the treatment team.

After the initial meeting, a target state was prescribed, gaps were identified, and rapid experiments were designed based on a collaborative solution approach. ED staff would conduct frequent huddles in the ED whenever an issue with a patient was identified – the Hospital Police would be included in these huddles – and following HHC's TeamStepps[2] protocols for patient safety, all participants had the opportunity to voice their opinion and contribute to the treatment plan. Hospital Police Administrators created a workflow process in the form of an algorithm similar to that employed in the Patient Safety Just Culture[3]. This algorithm was designed around patients that are or become verbally or physically combative towards other patients, staff, and visitors.

This workflow process is clear and concise and is easily understandable by all staff. Hospital Police Administrators met with and presented the workflow process to the front line Hospital Police Officers for review, input, and recommendations. Once the Hospital Police Department was comfortable with the workflow, Hospital Police Administration met with and presented the workflow process to the ED Administration. During this meeting, there were many questions and answers exchanged, clarifications made, and substantial progress made in helping the ED staff better understand the role of a Hospital Police Officer in the ED, what law enforcement actions they can take and when they can take those actions, and what other actions they can do to assist staff with difficult patients. The workflow process was also presented to MHC's Patient Safety Steering Committee and was accepted positively for its patient and staff security and safety considerations.

As a result of the collaborative effort and the emphasis on defined roles and expectations of all staff involved in patient care in the ED, there has been a profound and noticeable difference in the perception of patient and staff safety in the ED. In addition to the workflow process, ground work for implementation of TeamSTEPPS, workplace violence prevention, and Preventing and Managing Crisis Situation (de-escalation) training has been established for all ED staff. Concurrently, ED team huddles continue at regularly scheduled intervals and when necessitated by circumstances. In addition, Hospital Police have selected and dedicated a core group of officers who are assigned to the ED daily, around the clock. This forms a more cohesive unit better able to merge with the "regular" ED staff. Having the same personnel working in the same work area on a daily basis creates a better team bond.

There are many factors that contribute to violence in ED. There isn't a single solution that will eliminate the problem. However, hospital administrators have a responsibility to make their ED as safe as possible[3]. Metropolitan Hospital Center has learned that a multi-faceted, team-oriented approach crafted towards patient and staff safety through better understanding of roles, responsibilities, and workflow processes, forms a solid foundation for risk mitigation and positive outcomes. Optimal patient care is achieved when patients, staff, and visitors are protected against violent acts – a safe working environment is conducive to improved staff morale and enhanced productivity [4]. Protecting ED patients and staff from violent acts is fundamental to ensuring quality patient care.

2. TeamSTEPPS is a teamwork system designed for health care professionals developed by the US Health and Human Services Department, Agency for Healthcare Research and Quality. It is an **evidence-based teamwork system** to improve communication and teamwork skills among health care professionals

3. "Just Culture" is the system we HHC uses to implement organizational improvement, presenting a set of design laws that influence our ability to create the societal outcomes we desire

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SPECIALIST PERSPECTIVE

URBAN MEDICINE

Medication Safety: A Focus on Antiretroviral Therapy

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ABSTRACT

The complexity of antiretroviral therapy and the potential risks of drug-drug and drug-disease interactions are discussed. The prognosis of HIV disease improved dramatically since the advent of HAART regimen. The patients live longer and now face the complications of comorbidity. Clinicians should understand the basis of drug regimen-based interventions in order to optimize therapy, minimize side effects and enhance adherence to therapy. *(Urban Medicine, Vol. 1 No. 1 (2015) 48-51)*

KEY WORDS: Medication safety, Drug-drug interaction, Antiretroviral therapy, HAART

INTRODUCTION

Medication safety is about ensuring that the right drug or drug combinations are given to the right patient in the right doses and for the right indications. It includes the knowledge that all known side effects, potential drug-drug and drug-disease interactions are adequately addressed and managed to produce the best possible outcome for the patient. Poorly managed medication side effects create medication adherence issues including patients discontinuing medications on their own. The complexity of antiretroviral therapy (ARV) since the advent in 1995, of highly active antiretroviral therapy (HAART) combinations and the potential risk of developing resistant strains make Human Immunodeficiency Virus (HIV)-infected patients particularly vulnerable to the negative consequences of drug-related adverse effects and treatment failure [1]. Clinicians providing care to HIV-infected patients must be cognizant of the potential for dug-drug and drug-disease interactions. This perspective on medication safety focuses on how to identify the peculiarities of various HAART regimens and to highlight factors that should form the basis for drug regimen-based interventions.

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The prognosis of HIV disease improved dramatically because of the effectiveness of highly effective ARV therapies. Unfortunately, HIV is still incurable and never completely cleared from the body and as a result, treatment is expected to continue indefinitely. The goals of ARV therapy are therefore aimed at achieving non-detectable level of viral load (approximately ≤ 50 copies/mL), restoring and preserving immune function, reducing morbidity and prolonging life. The proper use and management of HAART combination drugs are required to avoid poor virologic and immunologic responses and to prevent the development of drug-resistant virus. Drug regimen-based interventions require the recognition of the right drug combinations and identifying potential side-effects and drug interactions.

Accuracy and Appropriateness of HAART Regimens

A HAART regimen consists of a dual nucleoside reverse transcriptase inhibitor (NRTI) backbone. This may be combined with either a non-nucleoside reverse transcriptase inhibitor (NNRTI) or a protease inhibitor (PI) with or without a booster, or an integrase strand transfer inhibitor (INSTI), also with or without a booster (Table I). Typically, a HAART regimen will contain 3 or 4 drug combinations. The factors considered when selecting a HAART regimen include co-morbidity (liver disease, renal function, cardiovascular disease, depression), pregnancy status, adverse drug effects and potential drug-drug interactions [2]. Generally, when a patient is admitted to the hospital, the common approach is to re-start all of the patient's pre-admission drugs. However, in the case of patients on ARV therapy, it is imperative that a careful assessment is done to ensure that the right combination of ARV drugs is on board, and the

regimen reviewed for drug-drug and drug-disease interactions. The choice of the two NRTIs forming the HAART backbone is generally based on using synergistic analogs. Pyrimidine analogs include thymidine derivatives (zidovudine, AZT and stavudine, d4T) and cytosine derivatives (lamivudine, 3TC; emtricitabine, FTC; and zalcitabine, ddC. *Note that ddC is no longer in use*). Purine analogs include derivatives of guanosine (abacavir) and adenosine derivatives (didanosine, ddI; and tenofovir, TDF). Tenofovir is a nucleotide reverse transcriptase inhibitor while the others are nucleoside reverse transcriptase inhibitors. Stemming from years of experience and complementary studies, there are now about 3 combinations commonly used as the dual NRTI backbone (Table II). Certain combinations are simply bad news and do require immediate corrective actions. Combinations like stavudine (d4T) and zidovudine (AZT) which are both thymidine derivatives (T drugs) exhibit pharmacologic and *in vivo* antagonism. Lamivudine (3TC) and emtricitabine (FTC) are also drugs of the same derivatives (C drugs) and do exhibit antagonism and selection of resistant mutants. Didanosine and tenofovir are both derivatives of adenosine. When used together, they are associated with high rate of virologic failure and rapid selection of resistant mutants. Stavudine and didanosine are not used together. Though they are different derivatives, both have overlapping mitochondrial toxicities such as peripheral neuropathy and lipodystrophy [3,4]. It is worthy to note that the rare combination of 3 NRTIs still in use in HAART regimen for post exposure prophylaxis consisting of zidovudine (thymidine derivative), tenofovir (adenosine derivative) and emtricitabine (cytosine derivative) is now being supplanted by replacing zidovudine with an NNRTI or an INSTI in the 2014 guidelines [5]. ARV therapy assessment should be executed by the physician at the medication ordering or prescribing stage or by the pharmacist at the medication order review or prescription filling stage. Another triple NRTI HAART regimen containing abacavir (guanosine derivative), zidovudine (thymidine derivative) and lamivudine (cytosine derivative) is the treatment of choice only when an NNRTI or protease inhibitor or

TABLE I. Commonly used HAART regimen

NNRTI[a]-Based Regimen	PI[a]-Based Regimen	INSTI[a]-Based Regimen
Rilpivirine Etravirine Efavirenz Nevirapine	Atazanavir[b] + Ritonavir Darunavir + Ritonavir Fosamprenavir[b] + Ritonavir Lopinavir + Ritonavir Saquinavir + Ritonavir	Elvitegravir/Cobicistat Dolutegravir Raltegravir

Abbreviations: HAART, highly active antiretroviral therapy; NNRTI, non-nucleoside reverse transcriptase inhibitor; PI, protease inhibitor; INSTI, integrase strand transfer inhibitor

There are a number of less common HAART regimens that involve agents belonging to classes not mentioned here. These do require expert consultation.

a. Any of the listed agents may be combined with a selected dual NRTI backbone.
b. Some regimen use these PIs unboosted.

Table II. 3 Commonly used dual NRTI backbone in HAART regimens

Dual NRTI Agents	Co-Formulations
Thymidineb derivative: Zidovudine (AZT) + Cytosineb derivative: Lamivudine (3TC)	Combivir®
Cytosine derivative: Lamivudine (3TC) + Guanosinea derivative: Abacavir	Epizicom®
Cytosine derivative: Emtricitabine (FTC) + Adenosinea derivative: Tenofovir (TDF)	Truvada®

NRTI, nucleoside/nucleotide reverse transcriptase inhibitor;
Adenosine and guanosine derivatives are purine analogs.
Thymidine and cytosine derivatives are pyrimidine analogs.

integrate strand transfer inhibitor cannot or should not be used. A clear understanding of the intricacies that can impact the accuracy and appropriateness of the HAART regimen and host factors will enhance the decision making process that will greatly increase the likelihood of treatment success for patients on ARV therapy.

Drug Related Adverse Effects

NRTIs: All nucleoside reverse transcriptase inhibitors are associated with lactic acidosis and hepatic steatosis with the highest incidence seen with stavudine. Use of stavudine in HAART regimens has declined significantly as a result. Zidovudine is frequently associated with headache, gastro intestinal (GI) intolerance and bone marrow suppression. Elevated mean corpuscular volume (MCV) seen with zidovudine is not considered a treatment-limiting side effect and was used in earlier years as a surrogate marker for determining treatment adherence. Tenofovir, in addition to headache and GI intolerance, is frequently associated with nephrotoxicity [6]. If a patient started on a HAART regimen containing tenofovir develops renal insufficiency the main culprit for consideration is tenofovir. Mitochondrial toxicities such as peripheral neuropathy, hepatic steatosis, pancreatitis, myopathy, are more common with the "d" drugs (ddI, ddC, and d4T)

NNRTIs: NNRTIs bind noncompetitively to reverse transcriptase. There is no documented benefit to combining two NNRTIs. So the presence of two NNRTIs in a patient's drug regimen should be immediately suspect. NNRTIs as a group are commonly associated with rash, elevated liver function tests/ hepatitis and a low barrier to resistance especially with the first generation of NNRTIs (efavirenz and nevirapine). Low genetic barrier to resistance increases the likelihood of virologic failure on an NNRTI-based regimen. NNRTIs are known inducers of several CYP enzymes (particularly CYP3A4) and have the potential to reduce plasma levels of concomitant medications whereas PIs are mostly inhibitors of the same enzyme system. Efavirenz is classified pregnancy category D because of increased risk of neurological birth defects reported in children born to mothers receiving efavirenz during the first trimester. This finding is now controversial in light of more recent data [7]. However, the conventional wisdom remains to withhold efavirenz-containing regimen from women of child bearing potential who desire pregnancy or who are actively trying to become pregnant. Another disadvantage with efavirenz is the nearly universal neurocognitive adverse effects associated with its use. Patients beginning efavirenz should be advised that initiation of treatment is often associated with morning drowsiness, alteration in dreams, and vestibular-like symptoms often seen when patients awaken at night after taking efavirenz before going to bed. The neurologic effects tend to clear by week 4 of therapy and patients should be advised accordingly. The newer generation NNRTIs – Rilpivirine and Etravirine have lower rates of CNS side effects. Co-administration of rilpivirine with medications that elevate gastric pH such as proton pump inhibitors (PPIs), H_2-receptor antagonists and antacids may decrease serum concentration of rilpivirine resulting in potential virologic failure and possible resistance [8]. Rilpivirine should be given about 4 hours before or 12 hours after such drugs. However, use of rilpivirine with PPIs is actually contraindicated. Any indication of suspected suboptimal virologic response with regimens containing this class ARVs should be cause for a review by the Infectious Diseases Service.

PIs: Protease inhibitors block HIV protease and interfere with the cleavage of viral proteins necessary for the final assembly into new mature viral particles. Currently available PIs include atazanavir, darunavir, fosamprenavir, indinavir, lopinavir, nelfinavir, ritonavir, saquinavir and tipranavir. Ritonavir is now mostly used as a booster for other PIs at a daily dose of 100mg to 200mg. PIs are predominantly metabolized by the CYP 450 enzyme system, in particular CYP 3A4. Ritonavir is a potent inhibitor of CYP 3A4. Co-administration of ritonavir with other PIs leads to a higher plasma concentration and often leads to a reduction in dosing frequency of the boosted PI. Studies [9, 10] have shown that the observed pharmacokinetic benefits are associated with greater virologic efficacy. In some recent developments, cobicistat is used in place of low dose ritonavir as the pharmacologic booster. Most PIs are associated with GI upset, hyperlipidemia, insulin resistance, lipodystrophy and elevated liver function tests. Boosted PIs have few central nervous system (CNS) adverse effects, low potential for development of resistance and are preferred agents in pregnancy. However, they are associated with a higher incidence of GI adverse effects and more drug-drug interactions. Significant drug-drug interactions complicate concomitant treatment of HIV and tuberculosis (TB). Co-treatment of HIV and TB requires careful consideration of potential drug interaction and the need for patient monitoring. Rifampin decreases serum concentration of most PIs particularly the boosted PIs. No boosted PI-based regimen has been found to be safely administered with rifampin which is a particularly challenging problem with concomitant tuberculosis [8]. Efavirenz-based or INSTI-based regimens with dose adjustments are the recommended options for patients receiving rifampin-based TB regimen.

INSTIs: Integrate strand transfer inhibitors are among the newest class of ARV drugs. They inhibit HIV integrase by competitively binding with the host DNA thereby interfering with the ability of viral integrase to insert viral genome into the host DNA. Currently available INSTIs include raltegravir, dolutegravir

and elvitegravir (in combination with cobicistat as pharmacologic booster). As a class, the INSTIs have few side effects. They are CYP 3A4 substrates so there are potential drug interactions. Elvitegravir/cobicistat is associated with an increase in serum creatinine within the first few weeks of treatment and then stabilizes. However, it is recommended that the drug be discontinued in patients with CrCl < 50 mL/min [9,10]. Dolutegravir is known to cause an increase in serum creatinine resulting from its ability to inhibit the organic cation transporter [11]. Raltegravir is associated with GI adverse effects, headache and CPK elevations. Some drug reactions are progressive with continued exposure and can be potentially life threatening if not recognized by the clinician.

CONCLUSION

Antiretroviral therapy using the HAART regimen has dramatically improved the lives of HIV-infected patients. HIV treatment with HAART has resulted in the rapid disappearance of virus from the plasma and from the blood but the virus is not completely cleared from the body. If HIV therapy is stopped after a period of several years, almost uniformly, within a matter of weeks the virus inevitably returns [12]. Treatment is expected to continue indefinitely. It is critical that clinicians understand the pharmacokinetics and pharmacodynamics of antiretroviral therapy so as to be equipped to optimize therapy, reduce or manage drug interactions, improve tolerability of the regimen and reduce toxicity. At every opportunity, antiretroviral medications need to be reviewed for accuracy and potential side effects. The clinicians should be able to differentiate between mild and potentially serious adverse events when making decisions about continuing therapy. Patients need to be counseled about what symptoms to anticipate and what they need to do. Poorly managed side effects can lead to decreased adherence and drug resistance, and ultimately failed therapy.

CONFLICT OF INTEREST

No conflicts of interest to declare.

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REVIEW ARTICLE

URBAN MEDICINE

The Prevention of Medication Errors in the Pediatric Emergency Department

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ABSTRACT

Medication errors pose a substantial danger to pediatric patients visited in emergency department (ED). In addition to the complex working environment in the ED, age group–specific contraindications and the need for personalized dose calculation put children at particularly high risk for medication errors. In general, raising healthcare providers' awareness of this issue and requirements around relevant continuing education has resulted in lowering the rate of medication errors. The same is true of all measures that lead to a reduction in the cognitive effort required for medication prescription, dispensing and administration. Here we review prevention strategies to minimize the medication errors in pediatric ED. *(Urban Medicine, Vol. 1 No. 1 (2015) 53-57)*

Key Words: Prevention, Medication errors, Pediatric, Emergency department

INTRODUCTION

Medication errors are a common cause of iatrogenic adverse events [1]. They can lead to severe consequences, including prolonged hospitalization, unnecessary diagnostic tests and treatments, and even death [1,2]. Pediatric emergency medicine is a specialized area of practice. In addition to the challenges of the typical emergency department (ED) working environment such as frequent interruptions, the variable nature of each patient case, the speed and complexity of medication use, and the high stress levels that make the ED prone to medical errors, healthcare providers working in the pediatric ED are also required to pay attention to dosing required weight-based requirements of administered medications [3,4]. Many mechanisms have been put in place to prevent medication errors from happening, ranging from computerized physician orders, automatic weight-based dosage calculators, built in allergy and drug interaction prompts, to the use of dual patient identifiers [5-7]. In spite of these efforts, approximately 10-15% of children who visited the ED experienced medication errors in the pediatric ED [6,8,9].

In an environment where the risk of error is high, it is imperative that healthcare providers be aware of prevention mechanisms to keep these errors from occurring. Medication errors can occur at any step, from prescription, dispensing, delivery of the medication, or medication administration [10]. Here, we will review the literature regarding how to prevent the medication errors at each step in the pediatric ED.

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Prevention of Medication Error during Prescription of the Medication

Provider Education

Most medication errors occur at the time of physician prescribing, and the most frequent type of medication error was a prescription error [5,11,12]. The use of weight-based dosing, off-label drug usage, limited reserves to withstand dosing errors, and inability to communicate with health care personnel to prevent an error or to signal that one has occurred are contributing factors [12,13]. In addition to these factors, children have significant pharmacokinetic and pharmacodynamic differences compared to adults, which make them more susceptible to medication errors. Small calculation errors may translate into large complications, such as a decimal error causing a 10-fold dose increase [14].

Education and training in both knowledge of pediatric drug therapy and the causes of drug errors and how to resolve them have been suggested as strategies to reduce the rate of prescribing errors in pediatric fields [15-18]. Kozer E et al. [6] found an increased risk for errors when trainees ordered medications. They also found that trainees committed more errors at the beginning of the academic year. To address these issues, they identified the typical types of errors occurring in their ED, and gave a short tutorial in which they discussed these errors and how to avoid them. To determine whether a short educational intervention reduces the incidence of prescribing errors among trainees in a pediatric ED, all fellows and residents arriving at the ED at the beginning of the academic year were invited to participate in a 30-minute tutorial focusing on appropriate methods for prescribing medications, followed by a written test. The study identified 66 (12.4%) errors in 533 orders given by those who attend the tutorial, and 46 (12.7%) errors in 363 orders given by those who did not attend tutorial. The adjusted odds of a medication error were not significantly different between those who did not attend the tutorial and those who did. They concluded that a short tutorial followed by a written test administered to trainees before entering their rotation in the pediatric ED did not appear to reduce prescribing errors. [19]. However, the effect of a more detailed educational intervention specific to emergent situations on the rate of prescribing errors is yet to be proven, suggesting that practical education strategies related to the patients in the pediatric ED need to be developed.

The Role of the Pharmacist

The incorporation of a pharmacist into the resident educational curriculum permits physicians to learn early on in their careers how pharmacists can assist with optimization of individualized patient care and medication-related issues [20,21]. Foster ME et al. [21] studied the effects of a resident physician educational program in a pediatric ED on pharmacy interventions and medication errors, particularly dose adjustments, order clarifications, and adverse drug events (ADE). The study period spanned a 9-month period, consisting of preobservational (Quarter 1), observational (Quarter 2), and interventional (Quarter 3) phases, during which ED pharmacists recorded all interventions and medication errors on weekdays from 3 p.m.- 11 p.m. Program implementation occurred in Quarter 3 with an initial 3-hour lecture during the ED orientation, followed by daily patient case discussions. The authors showed a statistically significant decrease between Quarters 1 and 3 in the number of dose adjustments and order clarifications after initiation of the program. Survey results were positive about the program. They concluded that the implementation of a resident physician educational program in the pediatric ED significantly decreased the number of medication errors, increased resident physician awareness of the potential for errors, and increased ED pharmacist utilization. Apart from this, the role of pharmacist in reviewing and revising medication as a the second intervention has been regarded as an important role in the pediatric ED [22]. Smith et al. [23] described how pharmacists clearly have a place in the medical home, as they can perform comprehensive reviews of patient therapies, identify or resolve medication-related complaints, optimize treatment, and prevent or identify drug-drug interactions..

Computerized provider order entry (CPOE) systems

Computer-assisted dosing in pediatric medicine has increased, with the goal of reducing medication dosing errors and preventing adverse medication reactions. In 2002, Shannon T et al. [24] developed a web-based computer program in order to increase accuracy and speed up calculations during resuscitations. They performed a validation study comparing accuracy and speed of the computerized calculator with the conventional paper-based calculation methods. The computerized program required input of the patient's age, which was then used to calculate an average weight based on the 50th percentile for children. The system was tested on 20 medical staff members in a controlled setting, in which each participant was asked to calculate the weight and then a set of resuscitation requirements for 3 patients. On average, using the computer program afforded 21.4% greater accuracy than the paper-based method. Additionally, participants completed tasks 11.5 minutes quicker, on average, when using the computer program [24,25].

CPOE systems with clinical decision support (over/under dose alarms, interactions, allergies, etc) have the potential to reduce medication errors [26]. Sard BE et al. [12] studied the impact of CPOE on medication errors in a pediatric ED. They designed a medication "quicklist" that provides decision support by supplying pediatric weight-based doses of formulary-approved drugs for the most commonly prescribed medications in the pediatric ED. They found an overall reduction in medication prescribing errors of 55% after adapting pediatric emergency CPOE system by introducing the quicklist. More importantly, the error rate was 10-fold less when medications were ordered by using the quicklist.

Non-FDA Approved Drugs and Generics

Furthermore, elimination of non-US Food and Drug Administration-approved drugs and use of generics have been proposed to narrow prescription error margins [27]. McKinzie JP et al. [27] reviewed the charts of all children presenting to a university hospital pediatric ED during a 30-day period. Of the

359 children who received drug therapy in the ED, 43% received one or more drugs not approved for use at the patients' respective ages. Of 296 children discharged with one or more prescriptions, 16% received a drug prescribed outside of FDA-approved guidelines based on age criteria. Overall, 34% of children who received drug therapy in the ED or by prescription did not meet age-specific FDA-approved prescribing guidelines.

Patient-provider Communication

Communication failures have been implicated as the root causes of greater than 60% of sentinel events reported to the Joint Commission on Accreditation of Healthcare Organizations [28]. Breakdowns in communication lead to most of the adverse events in studies from ED [29]. Most errors linked to communication failures, however, have been shown to be preventable. Moreover, it is necessary to recognize the crucial role of communication within and between clinical teams for safe clinical practices and effective organizational performance [30].

Good communication with parents during history taking, explaining treatments and their possible effects and side effects plays a key role in minimizing medication errors [31,32]. Parent-provider communication may be more difficult with parents who have limited health literacy or English-language fluency [33]. Samuels-Kalow ME et al. [33] conducted a prospective observational study of the ED discharge process using a convenience sample of English- and Spanish-speaking parents of children. A bilingual research assistant interviewed parents to ascertain their primary language and health literacy and observed the discharge process. The primary outcome was parental demonstration of an incorrect dose of acetaminophen for the weight of his or her child. A total of 259 parent-child dyads were screened. There were 210 potential discharges, and 145 (69%) of 210 completed the post discharge interview. Forty-six parents (32%) had an acetaminophen dosing error. Spanish-speaking parents were significantly more likely to have a dosing error.

Prevention of Medication Error during Disposition and Delivery

Dispensing errors occur in about 2% of all dispensed items [34]. About 1 in 100 of these is missed by the final check [34]. Technologies have been developed over the past 20 years to automate the stages of drug distribution in hospitals, including ordering, dispensing, delivery, and administration of medications, in attempts to decrease medication error rates. Although the data is sparse, bar coding of drugs also seems useful for reducing error rates [35,36]. The major barrier to implementation has been that drug manufacturers have not agreed on a common approach; legislation might be considered in this regard. Bar coding is widely used in many industries outside medicine; it results in error rates about a sixth of those due to keyboard entry and is less stressful to workers. Bar coding can rapidly ensure that the drug at hand is actually the intended one and can be used to record who is giving and receiving it at specific time intervals [35]. Decentralized automated dispensing devices (ADDs) represent one such technology can be used to hold drugs at a location and dispense them only to a specific patient [37,38]. Such devices, especially if linked with bar coding and interfaced with hospital information systems, can decrease medication error rates substantially [38].

Prevention of Medication Error during Administration

In most clinical situations, preparing a drug solution of the required concentration and administering the necessary dose in the the indicated quantity is the task of the nurse in the pediatric ED. In the prospective observational study mentioned above involving simulated resuscitation events in a pediatric ED, the prepared syringes were collected. A concentration that deviated from the stated concentration by more than 50% was found in 7% of the syringes [39]. To reduce the administration error, Kaufmann J et al. [40] suggested the number of concentrations used should be kept to the minimum required wherever possible. If drug administration is followed by flushing, the undiluted drug solution is often used with small syringes (1 mL syringes calibrated in 0.01 mL increments). Syringes containing various concentrations of the same active substance should be avoided. The necessary solution concentrations must be observed precisely. Commercially prepared, labeled syringes achieve higher levels of safety, as quality control is incorporated into the manufacturing process [41].

Another key part of the medication use process is the medication administration record, on which the clinicians who actually administer drugs record what has been given. Computerization of this part of the process, especially if linked to computerized order entry, could reduce errors and allow detection of other types of errors relating to the quantities of drugs that are to be taken "as needed" [35].

CONCLUSION

Pediatric patients, who often need individual dose calculations which can require modifications in a short time, are especially vulnerable to medication errors. However, medication errors are a preventable cause of morbidity and mortality that have come to the forefront of medical practice as a prime opportunity to improve safety. Teamwork and communication are very important to decrease the medication errors in any steps of prescription, disposition and delivery and administration.

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2. Bennett J, Cervantes C, Pacheco S. Point-of-care testing: inspection preparedness. Perfusion 2000:15(2):137-142.
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