AMERICAN UNIVERSITY OF BEIRUT

QUALITY IMPROVEMENT OF INTERDEPARTMENTAL PATIENT HANDOFF INVOLVING ADULT PATIENTS ON HIGH ALERT MEDICATION

by
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AN ABSTRACT OF THE PROJECT OF

Hayat Adib Zaatar for Master of Science
Major: Nursing Administration

Title: Quality Improvement of Interdepartmental Patient handoff Involving Adult Patient on High Alert Medication

Background:

Hand-off communication, referred to as the real-time process of passing patient-specific information from one caregiver to another or from one team of caregivers to another, is a high risk area for adverse events affecting patient's safety, quality and continuity of care. Patients' admission through the Emergency Department (ED) is an area with the highest volume of hand-off processes often associated with high incidence of adverse events due to ineffective communication. Of particular concern are those patients admitted on high alert medications defined as drugs that bear a heightened risk of causing significant patient harm when they are used in error. To reduce the incidence of these adverse events, several institutions, including the institution where this study is conducted, adopted the Situation, Background, Assessment and Recommendation (SBAR) tool for standardizing the hand-off process and to guide communication.

Purpose:

This quality improvement project aims to examine the completion and accuracy of using the SBAR handoff communication involving adult patients on high alert medication admitted through ED to inpatient units in one health care institution in Lebanon

Design:

Approach: Retrospective medical records review was conducted using a data abstraction form. SBAR electronic sheet completion and accuracy was evaluated and adverse events were checked.
Sampling: Eligible adult patients 18 and older admitted to ED between January 1st and October 31st2015 and transferred to in-patient units on high-risk alert medication were identified.
Data analysis: Descriptive statistics were used to describe the demographic and process characteristics, completeness and accuracy of documentation, as well as adverse event incidence. Bivariate association between incomplete and inaccurate sections versus explanatory (age, gender, main diagnosis and medical history) and predictor variables (shift, disposition, length of stay in ED and high alert medication) was conducted. Fisher test for categorical data (F-value < 0.05) and Mann- Whitney non-parametric test for nominal data (P-value<0.05) were used to test for association.Bivariate (Pearson) correlation between adverse events and high alert medication was done as a secondary analysis.

Results:

Sixty two adult patients met the inclusion criteria. Overall, SBAR completion was 90.3%. Assessment and recommendation were 87.1% & 93.5% respectively accurate. High alert medication name and dose were mentioned in most electronic SBAR sheets (N=59, 95.2%) but details such as period of administration rate (N=50, 80.6%) and end time (N=39, 63%) were less than optimally completed. Association was found between the background section's completeness and age: as age increased background completeness decreased (Mean Rank=58.75, Mann-Whitney U= 5.50 with a corresponding P-value= 0.03). While recommendation section completeness was associated with shift: night shift admissions were related to incomplete recommendation section. Out of 6.5% incomplete recommendation, 75% occurred in night shift (Fischer's exact test=0.08). Assessment accuracy was found to be associated with disposition, main diagnosis and medical history. Out of 12.9 % inaccurate assessment 100% were in medical surgical disposition (Fischer's exact test=0.08), while no inaccurate assessment in critical care admission. As for main diagnosis, out of 12.9% inaccurate assessment 100 % were in patient with non-cardiac diagnosis (Fischer's exact test=0.05), while patients with cardiac diagnosis had 100% complete assessment. Medical history was also related to inaccurate assessment section. Out of 12.9% inaccurate assessment 87.5% were in patients with non-cardiac medical history and 12.5% were in patient with cardiac medical history (Fischer's exact test=0.02).

Recommendation accuracy was found to be associated with age and medical history. Advance age tend to have more accurate recommendation section (Mean Rank= 32.81, Mann-Whitney U= 40.00 with a corresponding P-value= 0.02). Medical history was also related to inaccurate recommendation section. Out of 6.5 % inaccurate recommendation 100% were in patients with non-cardiac medical history, while patients with cardiac diagnosis had 100% accurate recommendation. Adverse events and high alert medication was found to be inversely correlated as for name and dose Pearson = - 0.29, P value= 0.018), period of administration (Pearson= - 0.27, P value= 0.03) and end time (Pearson= - 0.29, P value=0.02)

Conclusion:

The present electronic SBAR handoff sheet demonstrated that it is a sufficient tool to communicate high alert medication; however there is still room for improvement. Section related to high alert medication need to be added. Recommendation section is limited in terms of options, future SBAR needs to consider adding more options as well as open-ended entries

Recommendations:

Modify the current handoff tool by adding medication details. Redesign the current SBAR electronic sheet, making it more automated. Involve front line nurse in the redesigning process. Provide more education to nurses about handoff process and increase awareness about its importance.

TABLES

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CHAPTER I
INTRODUCTION

A. Background:

Patients admitted through the Emergency Department (ED) to specialized services undergo numerous episodes of care provided by different health care professionals based in different departments. The information exchange, referred to as the patient handoff, throughout this pathway is important to ensure safety and continuity of care. Patient handoff is defined as "the exchange between health professionals of information about a patient accompanying either a transfer of control over, or of responsibility for, the patient" (Cohen &Hilligoss, 2010, P 494).

The goal of the patient handoff is to summarize the patient's health status, health history and treatment received thus far and is meant to transfer the responsibility over from one department to another (Cohen &Hilligoss, 2010). In ED, the handoff process is usually verbal face to face or over the phone, and written: hard copy or electronic, occurring at any time: beginning, during and end of shift (Joint Commission, 2008).

In recent years, a growing interest in the handoff process emerged as a result of the role that breakdown in the handoff process has on adverse events which resulted in an increased interest in regulating and standardizing the handoff practices (Phillip Brian Hilligoss, 2011). Extensive literature showed that breakdown in the handoff process compromised patient safety and quality of care (Nadzam, 2009, Carayon et al., 2014, Reisenberg et al, 2009, Solet et al, 2005 & WHO, 2007). One of the most cited evidence to support this claim is the report by the Joint Commission International (JCI) which indicated that two third of preventable medical treatment adverse events and un-expected occurrence resulting in death or serious physical or psychological injury to

patients, not related to the natural course of the patient's illness referred to as sentinel events were associated with breakdown in communication (Joint Commission, 2010). Communication breakdowns included failure to transfer accurate and essential information such as administration of high-risk medications (Carayon et al. 2014). High risk or high alert medications are drugs that bear a heightened risk of causing significant patient harm when they are used in error (Institute for Safe Medication Practices & Department of Health 2014).

These concerns led to a movement to standardize the handoff process. Several healthcare and hospital accreditation organizations added the handoff process as quality criteria for accreditation (Australian Healthcare & Hospitals Association, 2009; Australian Medical Association, 2006; British Medical Association et al., 2005; Garling, 2008; Joint Commission, 2006a; World Health Organization & Joint Commission, 2007). In United States, the Joint Commission recommended using the Situation, Background, Assessment and Recommendation (SBAR) protocol (explained in more details below) (Joint Commission, 2008) as a standardized approach for the handoff process and so the World Health Organization (WHO, 2007). However, its implementation remains discretionary and varied.

Handoff processes for patients admitted through ED, despite that 50% of hospital admissions occur through ED (Jiang et al. 2000), remain poorly under studied and very few explored the impact of under reporting high alert medication on sentinel events (Winterstein et al., 2002). These studies looked for vulnerabilities and barriers to handoff communication. Poor communication and conflicting communication physicians' practice: different handoff expectations of the ED versus inpatient physicians; and ineffective current information technology were found barriers and

challenges affecting negatively the patient transfer workflow from ED to inpatient units (Apker et al, 2007 & Abraham & Reddy, 2010), leading in some instances to adverse events such as error in diagnosis and treatment, or improper disposition (Horwitz et al., 2009). High workload, crowding, difficulty in retrieving information, and non linear patient flow were also identified as barriers of handoff process in ED (Horwitz et al., 2009). Majority of studies conducted to improve handoff process in ED recommended standardization of handoff process: standardizing the information to be shared and the use of a standard handoff tool (Horwitz et al., 2009; Dihngra et al, 2010) and the utility of electronic reporting (Apker et al, 2007; Benham-Hutchins & Effken, 2010).

Lebanon:

In Lebanon, where this study is conducted, handoff process was identified at national level as a safety area that needs to be addressed. A national patient safety culture survey in hospital settings was conducted in 68 hospitals in Lebanon with 6,807 responding hospital employees (including hospital-employed physicians, nurses, and clinical and nonclinical staff). Hospital handoffs and transition were one of the survey composites. 58.9 % of respondents agreed that things 'fall between the cracks', i.e. things might go uncontrolled and get lost (e.g. medical records, medical treatment, patient information and education, discharge criteria) when transferring patients from one unit to another.27.4 % of respondents agreed that problems often occur in the exchange of information across hospital units (Jardali et al, 2009). However, very few studies provided solid evidentiary evidence on the handoff process in Lebanese hospitals (Younan &Farlic, 2013) and to our knowledge no previous study explored the handoff process in ED.

Dr. Younan et al. conducted a study, the only published study so far, aiming to improve the quality of intershift handoff in one of the Lebanese hospitals. A team was developed who reviewed the literature, revised reported patient safety incidents related to communication failure and come up with improvement initiatives. The following was implemented: a standardized handoff tool was developed, nurses were trained on the new handoff process and innovations were taken to decrease interruptions. Interventions taken to decrease interruption included: raising awareness of patients' family about the time of handoff process; avoid cold case admission (cases that do not immediate care) during intershift handoff and this was done in agreement with admission office staff, and finally physicians were asked to have their rounds done after nursing intershift handoff. The quality improvement project resulted in decrease in information omission, decrease interruption and better communication among nurses (Younan & Farlic, 2013).

In 2006, a tertiary medical center affiliated with Johns Hopkins Hospital located in Beirut, Lebanon was in the commissioning phase of the JCI accreditation. The hospital adopted the SBAR model to respond to the JCI international patient safety goal 2 (IPSG. Number 2) and to guide healthcare providers during verbal handoff communication: face to face and / or over phone. A policy was developed, staff training on the model was done, model was posted at bulletin boards and the intershift handoff procedure was observed as part of nursing education division coaching and mentoring program.

Since the launch of this initiative in 2006, no study was done on the handoff process. In April, 2014 a new edition of JCI accreditation was issued where more details related to handoff measurable elements were added and were addressed in IPSG.2.2., which stated that hospitals shall develop and implement a standardize handoff

communication process: defining critical information to be shared, use a standardized handoff tool, measure the process and use the data derived from measurement in improving the process (JCI accreditation for hospitals standards, 5th edition). Based on this and in an effort to improve communication among staff, unit-specific handoff tools were developed by nursing executive council members, nurse managers and a number of selected registered nurses, among them was the ED handoff tool. The ED handoff tool was divided into four sections: Situation, Background, Assessment and Recommendation (Appendix A). Within each section a set of related criteria were added. In the situation section, criteria related to patient's current health status were added: admission date and time, mode of admission, chief complaint, triage level, treatment done in ED and medication administered, laboratory and diagnostic tests done. In the background section, information related to patient medical history was set as criteria: past medical, surgical and family history, allergies and communication barriers and special needs. In the third section, the assessment part: investigator examination of the patient, body systems with relevant criteria were added, in-addition to safety part covering fall precaution and isolation. And in the last section, the recommendation, criteria related to how the patient's needs are to be followed were added: vital signs, dextrose level, pain scoring and pending consultations and laboratory tests. With the help of the Information Technology department and post the approval of the Control Data and Documentation Committee (CDDC) the sheet was added to the electronic medical record sheets in June-2014. The sheet is a standalone document not driven (or is it derived?) from other electronic medical record sheets. Handoff policy was then modified, staff awareness and training on SBAR handoff tool was done. ED nurses had to complete each section within the electronic SBAR with the information

pertinent to patient condition using drop list in addition to free textboxes. ED handoff tools, once completed and saved by ED nurse; they can automatically be viewed by unit nurse Handoff communication is over the phone when the patient is transferred to general wards and face-to-face when transferred to critical care units. Completion of the SBAR handoff sheet was taken as a patient safety key performance indicator and a 90 % target was set. This measurement was benchmarked with Johns Hopkins Hospital affiliates. A quality improvement study conducted between August and October 2014 showed that completion was far below, which resulted in the development of performance improvement plan. FOCUS-PDCA (Acronym of F: find a problem, O: organize a team, C: clarify the current process, U: understand the deviations, S: select interventions for improvement, P: plan the improvement action, D: Do it, C: check, follow up after action and putting quality measures and A: act by generalization) quality method was developed. A team was formed, the literature was reviewed, root cause analysis was done and improvement measures were taken. Of these improvement initiatives: process of handoff between ED and inpatient unit was modified where some best practices were taken to bridge the gaps identified. Of these: 1- limitation of distraction and interruption by changing the location on interdepartmental handoff from nursing to station to nurse manager's office; 2-development and implementation of electronic standard handoff tool, adopting SBAR mnemonic; 3- multidisciplinary and bedside handoff for patients to be transferred to intensive care units; 4- elimination of unnecessary handoff that is to avoid multiple handoff. Call conference was done with JHI affiliates in the presence of physicians, nurses and quality staff, and post this peer review was adopted as an improvement initiative. Formal education was provided to all ED nurses about handoff and about the new process and coaching and mentoring. Post

intervention, handoff completion compliance rate, went up to above 90% in the last quarter of 2015.The post intervention evaluation covered the completion but not the accuracy of the sheet.

B. Purpose statement:

The purpose of this study is to examine the completeness and accuracy of the current electronic SBAR handoff tool and whether this tool is being used to communicate high alert medications involving adult patients admitted through the ED to inpatient units.

Objectives of the project:

1. To assess the completeness of the current electronic SBAR handoff sheet.
2. To evaluate the accuracy of the current electronic SBAR handoff sheet especially in terms of communicating high alert medications.
3. Provide recommendation for an improved SBAR nursing handoff tool, if needed, that will include high alert medication communication between ED and clinical units.

CHAPTER II

LITERATURE REVIEW

In-order to fully understand the effect of handoff on patient safety, the following consolidated review was conducted. Database utilized were: Google Scholarship, PubMed, Web of Science and Elsevier Science Direct. Key words used were: effective communication, patient handoff, patient safety, emergency department, SBAR, care transitions, medication communication, high alert medication and inpatient.

The literature review is presented in 4 sections. The first section describes the relationship between handoff communication failure and the occurrence of patient adverse events. The second section explains the barriers and facilitators in handoff process. The third section demonstrates the effectiveness of the standardization in improving handoff process and promoting patient safety in healthcare setting. The fourth section presents the scarcity of evidence on medication handoff during patient care transition from ED to in-patient units

A. Handoff communication failure and adverse events:

It is well established that patient handoff is a patient safety high risk area. Solet et al. found that 80% of serious medical adverse events, including medication errors were attributed to miscommunication between healthcare providers (Solet et al, 2005). Between 1995 and 2006, breakdown in communication among healthcare givers was the root-cause of 70% of sentinel events reported to Joint commission in United States, 75% of those adverse events led to death. In another review of sentinel events reported to Joint Commission between 1997-2007, 9.3 % of them were contributed to medication errors. A WHO report stated also that data from Europe indicated that one in ten patients treated in some European hospital had been suffering from a medical mistake

such as wrong medical orders or being harmed because of patient safety incidents such wrong diagnosis and treatment that was in fact preventable (WHO, 2007). Adverse events were revealed to be encountered during patient transfer from ED to inpatient units as a result of improper and conflicting communication practices, where there is different expectation between ED physicians and inpatient ones as for handoff information needed for patient transfer (Horwitz et al., 2009 and Apker et al, 2007).

Medication errors are common occurrences in specialty areas such as ED and critical care units due to enormous prescription and the complexity of care in these areas (Carayon et al. 2014, Laxmisan et al, 2006 &Leape et al, 1991). High alert medication errors were found in one study to account for 48% of adverse events encountered in a medical center (Winterstein, 2002). And in an Australian study, it has also been shown that 2-4% of all admissions to Australian hospitals, and up to 30% for patients over 75 years of age, experience adverse events which are medication-related; up to three-quarter are potentially preventable by better communication methodologies (Runciman et al, 2003).

Potential for harm from medication discrepancies during written handoff was studied by Arora et al in 2007 in a retrospective cohort study. The study found 27% medication discrepancies in 165 patient charts when compared to residents' written handoff, 54% of these medication discrepancies were moderately to severely harmful. Medication discrepancies were defined as either omission or commission. Omission is the missing medication in physician handoff when compared to patient chart while commission is the opposite. These discrepancies were the root of medication errors: incorrect name and dose, frequency or route.

B. Handoff communication and associated barriers and facilitators:

Further studies were done to identify barriers and facilitators in the handoff process aiming to identify opportunities for improvement. Reisenberg et al. conducted a systematic review to identify nursing barriers to effective communication. Multifactorial barriers were identified for ineffective nursing handoff:1-system factors such as lack of handoff process standardization, human resources shortages and high nursing turn over, and lack of training on the handoff process; 2- environmental factors such as interruption, distraction, multitasking during reporting, too much noise, poor lighting and lack of privacy; provider factors including lack or misuse of time; limited time to ask questions; and, sensory and information overload; 3- Provider factors: Lack or misuse of time and complexity of cases or high caseload (Reisenberg et al, 2010). Many similarities were found by researchers when studying barriers in ED handoff. Cheung found that problems with handoff can be related to patient, provider, task, technology, environment and team factors. High signal-to noise, lack of standard approach and clear high-risk triggers for the dangerous handoff, patients' language barriers and ED chaotic environment are the most leading causes of handoff process breakdown (Cheung et al, 2015 & Leora et al., 2009), longer handoff time and patient length of stay in ED and minimal use of electronic support systems are factors associated with handoff errors in ED (Maughan, 2009) (Leora et al., 2009)..

Despite of the positive impact of the electronic medical record (EMR) in heath sector, adoption rate of these systems are still low and meet resistance from physicians and nurses (Ajami & Bagheri-Tadi, 2013 &Staggers et al, 2011b).

C. Handoff communication and Standardization:

Strategies to improve handoff communication included standardization of the process by developing guidelines and using tools to ensure that essential information is consistently included; harnessing the power of electronic technology through using electronic handoff system; 3- Training and educating front liners such as nurses on the handoff process (Riesenberg et al, 2010)

Situation, Background, Assessment and Recommendation tool (SBAR) is the most cited handoff mnemonic (82.6%) (Riesenberg et al, 2009; Leitzsch& little, 2009). The SBAR model was first developed by the United States Navy as a communication technique that can be used by nuclear submarines, and later on adopted by World Health Organization (WHO, 2007) and the Agency of Healthcare Research and Quality and the Institute for Healthcare Improvement to improve patient safety (Rockville, 2008 & Berwick, 2011).

SBAR tool includes the following sections: explains the patient current situation (S) (medical condition & treatment regimen including medication), give some background (B) information about patient's condition (past medical & surgical history, allergies & special need) that lead to the current status, provide an assessment (A) and then give recommendation (R) on how patient condition is to be followed and needs to be met.

SBAR tool has been widely used in United State of America (USA), Canada, Austria, Belgium, United Kingdom (UK) and Switzerland. SBAR has been implemented effectively in high-risk settings, including perinatal care, operating rooms, intensive care and emergency departments (Leonard et al. 2004; McFerran et al. 2005; Uhlig et al. 2002) and pediatric intensive care unit (Panesar et al, 2016). It has been also

implemented in rehabilitation centers and long term facilities (Velji et al, 2008). Medication in general, and not high alert medication in specific, is a component of most SBAR handoff tools with no specification of the drug administered: time and route of administration.

Studies evaluating SBAR have been conducted worldwide: USA (Renz et al, 2013 & Compton et al, 2012), Canada (Helji et al, 2008), Australia (Andreoli et al, 2010), the UK (Cunningham et al, 2012), Belgium (Marshall et al, 2009) and the Netherland (Christie & Robinson, 2009). Improvements in collaboration, team communication and safety culture have been a common result among these studies.

In acute care setting, SBAR was found to be effective in communicating high urgency situations for patients in ED. The Effectiveness was measured in terms of staff perception of team communication and safety culture and safety reporting. All measurements improved by 5 % but not highly significant. (Velji et al, 2008).

Electronic SBAR sheet, partially completed automatically, was also found by physicians and nurse to be helpful during patient transfer to and from the progressive care unit and cardiac laboratories. Minimal hand entry and reducing documentation redundancy was found to be associated with this sheet (Wentworth, 2012). Electronic SBAR sheet has also been found to be associated with more complete documentation and more frequent documentation between nurses and physician in pediatric intensive care unit setting (Panesar et al, 2016). However, nurses continue to rely on paper-based forms despite of the presence of automated sheets (Staggers, Clark, Blaz, &Kapsandoy, 2011b).

In Lebanon, to our knowledge no previous report/study explored SBAR tool utilization despite that standardization of handoff process have been done in most

hospitals in response to the safety culture survey conducted in hospitals (Jardali et al., 2009).

D. Handoff communication and medication reporting

Scarcity of evidence:

The importance of cross checking of the medication administration record during intershift handoff between coming and leaving nurses have been emphasized in many literature (McMurray et al., 2010; Welsh et al., 2010). It was also recommended that during handoffs, leaving nurses are required to make interpretation of medication chart as well as other patient charts (Hagler and Bren, 2008).

In nurses' handoff informations related medication effectiveness, details and specific contents were poorly communicated. This was contributed to that nurses emphasize more on the patient medical condition and organizational aspects rather than medication. (Braaf et al, 2015 & Coutsouvelis et al, 2010). Based on this it was recommended that information about all types of prescribed medication is essential during handoff to ensure patient safety and quality care (Braaf et al, 2015).

While an extensive body of literature exists on clinical handover communication and Handoff standardization, little focus has been placed on how medication management is communicated during clinical handover (Arora et al. 2007). This study aim to contribute to his poorly studies area.

CHAPTER III

THEORATICAL FRAMEWORK

The theoretical framework governing this quality improvement project is the Donabedian's structure, process, outcome (SPO) developed by Avedis Donabedian, a physician and health services researcher at the University of Michigan (Donabedian, 1988). SPO is a widely used framework to measure the quality of health care. SPO is usually presented by a chain of three boxes including connected by a unidirectional arrow indicating that improvement in structure component will lead to improvement in process and eventually to improvement in outcome. In this quality improvement project, the structural component describes the context in which the care is provided (Donabedian, 1988) including human factors (such as staff competency level), material resources (such as electronic medical record) and organizational structure (Donabedian, 1988). In our project the structural factors that ought to be considered but not necessarily addressed in this study include: handoff process and high alert medication policies; staff training and competency level in handoff area; electronic medical record availability and complexity level. Availability, accessibility and ease of use of these elements are to be considered while planning for our improvement project.

The process dimension is when the structural components are put into action to achieve the quality care (Donabedian, 1988). It is the process of completing the electronic SBAR sheet by competent nurses and the use of this sheet during handoff. The nurses complete the sheet by either checking or completing pertinent data related to patient condition. The more the electronic handoff sheet completeness and accuracy, in particular high alert medication, as well as their usage during the process the better the outcome results.

The outcome dimension includes the effect of healthcare on patients' health status: patient safety adverse events (Donabedian, 1988). In this project, incomplete or inaccurate handoff sheets as well as the missing of high alert medications are the outcome measurements. Adverse events as a result of missing high alert medication documentation were explored in a secondary analysis.

CHAPTER IV

METHODOLOGY

A. Design:

This study adopted a retrospective chart review research design. This research design is widely used in healthcare disciplines including quality assessment (Matt & Matthew, 2013). The main driver for choosing this design was easy access to objective secondary data using electronic medical record.

B. Population:

Inclusion criteria: Adult patients 18 and older admitted to ED between January and October, 2015 transferred to in-patient units (medical-surgical and critical care units) and who were started on high alert medication in ED (Appendix B for a full list of medications).

The Information technology department generated a list of all patients who met the eligibility criteria. This list included patient's name, date of admission, visit number and the high alert drug name. Based on input from the Information Technology, we had a total of 62 patients who were eligible for inclusion. Given the small population size, we included them all

C. Setting:

X Medical center is a 100-bed hospital located in Beirut, Lebanon. It is a Joint Commission accredited hospital and affiliated with Johns Hopkins Hospital. The average number of patients seen in ED is 1500 patients; 5-10% of these are admitted to inpatient setting. Patient heath information is entered into EMR system that includes the handoff sheet.

D. Data Collection:

A data abstraction form capturing the completeness and accuracy of SBAR as well as patient outcome was used (Appendix C for full data abstraction form). The form is divided into eight sections:

1. Demographic data: patient date of birth and gender
2. Admission data: admission date and time, length of stay in ED and disposition
3. Patient medical history and diagnosis
4. Prescribed high alert medication name
5. SBAR sheet completeness: completeness of each SBAR sections: situation, background, assessment and recommendation.
6. SBAR sheet accuracy: accuracy of each SABR sections and their corresponding subsections. Situation subsections are: **Chief complaint,** diagnosis, triage level treatment provided in ED, Laboratory and diagnostic studies done. Background subsections are: past medical and surgical history, allergies, and patient special and communication needs.

   Accuracy is defined in-term of the correctness and pertinence of the patient's information within each section and subsection.
7. Reflection of high alert medication in SBAR: presence and correctness of medication' name and dose start time, end time and method / period of administration.
8. Patient outcome: incidence of any adverse event including but not limited to medication error, delay in treatment, wrong treatment, duplication of laboratory/diagnostic tests

The data was abstracted by the investigator who retrieved data from patient chart and entered it into the electronic data abstraction. A data abstraction manual was developed and used to guide the abstraction procedures (Appendix D). Three main sheets were reviewed to complete the data abstraction form. These sheets are the ED electronic SBAR sheet, ED record and progress note. Demographic data were driven from the handoff sheet and ED record, SBAR completeness and accuracy data were abstracted from the SBAR handoff sheet while adverse events were derived from the progress note. The institutional safety net was utilized to look for details related to encountered adverse events.

The data abstraction form was first piloted on 5% of the sample size before proceeding to the complete data collection. The piloting demonstrated that it is a satisfactory tool; however two more diagnoses were added: neurological disorders and congestive heart failure.

Ten percent of the final collected data was validated by another organizational staff, who independently and randomly reviewed seven medical records (representing 10% of the total sample) and completed the data abstraction form. No discrepancy was revealed during the data validation procedure.

E. Data analysis:

Main variables understudy were categorized: dependent and independent.

1. ***Dependent variables or the outcomes:*** SBAR sheet section completeness and accuracy; and the adverse events experienced by patient during the current hospital stay.

2. ***Independent variables:***

    a. Explanatory variables: Patient age, gender, medical history and diagnosis.

    b. Predictors: shift, disposition, length of stay in ED and reflection of high alert medication in SBAR

Both the dependent and the independent variables were categorical data (except for age; continuous).

Data analysis was done at three levels:

- In the first level, descriptive statistics was used to describe the population demographic data (patient age, gender, medical history, diagnosis); process data: length of stay in ED, disposition, and high alert medication; SBAR sheet completeness, SBAR accuracy, reflection of high alert medication and patient outcome. Frequency, relative frequencies, mean, standard deviations and range were used as appropriate.
- In the second level: inferential statistics using bivariate statistics (cross tabulation) allowed us to study the relationship between outcome variables and explanatory as well as predictor variables. It was used only for incomplete and inaccurate descriptive findings. Non-parametric statistical tests were used to determine the significance level: Fisher test for categorical variables (F-value < 0.05) and Mann Whitney test for continuous ones (P-value < 0.05).
- Since the sample is small (N=62), it was decided to use the exact logistic regression for significant bivariate results. A series of models were supposed to be run adjusting for patient demographics (age, gender, diagnosis, co-morbidity), and predictor variables (shift, disposition, length of stay in ED and

reflection of high alert medication variables). Significance was set at 95% confidence interval. However it was not used since only one significant bivariate resulted in each SABR section not allowing us to adjust.

- Bivariate (Pearson) correlation between adverse events and high alert medication was done as a secondary analysis. Correlations were reported significant at 0.05 levels (2-tailed).
- STATA was used to conduct the analysis (reference for STATA)

F. Ethics:

Permission to conduct this project was obtained from the Medical Center ethics committee. American University in Beirut IRB approval was not required, since the project falls under quality assurance and improvement. Patient identification was kept confidential as well as the organization. Collected data were kept in a secured electronic folder within the organization.

CHAPTER V

FINDINGS

A. Demographic characteristics:

Sixty two adult patients admitted to clinical units through ED on high alert medication were identified. Mean age was 61.3 years (95% confidence interval (CI), Range (min-max) = 21-95 years), N= 35 (56.5 %) were males and N= 27 (43.5 % females). Medical disease history, mostly cardiovascular diseases and diabetes, was reported among 51.6% (N=32) of cases while 48.8% (N= 30) had no reported medical history. Infectious diseases were the main reason for seeking ED services (N=39 (59.7%)) followed by cardiovascular disorders (N=18 (29.0%)).

B. Process characteristics:

Majority of patients were admitted to ED during the night shift (N=43 (69.4%)), and most stayed in ED for more than 2 hours (N=47 (77%)). More subjects were transferred to medical-surgical wards (N=37 (59.7%)) than to critical care units (N=25 (40.3%)). A summary of demographic and study characteristics is in Table-1

First dose intravenous antibiotics (N=34 (54.8 %)) was the most common prescribed high alert medication in ED followed by anti-arrhythmic drugs (N=11 (17.8%), cardiovascular agents (N=11 (17.7%) and then hypoglycemic agents (N=6 (9.6%) (Table-2).

SBAR sheet completion for all sections was 90.3%, 3 sheets (95.2%) completed after patient admission to inpatient units (Table-3). SBAR accuracy was above 90% for all its sections except for Assessment which was 87.1%. (Table-4).

High alert medication name and dose was mentioned in most electronic SBAR sheets (N=59) while the route and rate/period of administration was less recorded

(N=50, %). High alert medication start time was better documented in SBAR sheet more than end time, 85.5 % and 63 % respectively. (Table-5)

Three subjects developed adverse events: 2 had delayed treatment and 1 medication error (wrong medication) with no negative impact on patient medical condition.

Table-1: Demographic and Process Characteristics:

Characteristics	n=62
Age in years: Mean (SD)*	61.3 (18.8)
Gender, n (%)	
Males	35(56.5)
Females	27 (43.5)
Main diagnosis, n (%)	
Infections	38 (59.7)
Cardiovascular disorders	18 (29.0)
Endocrinology disorders	4 (6.5)
Respiratory disorders	3(4.8)
Neurological disorders	1 (1.6)
Medical history, n (%)	
Cardiovascular diseases	32 (51.6)
Diabetes	14 (22.6)
Respiratory diseases	3 (4.8)
Neurological diseases	3 (4.8)
Cancer	3 (4.8)
Renal failure	3 (4.8)
No medical history	30 (48.4)
Admission shift to ED, n (%)	
Day	43(69.4)
Night	19(30.6)
Length of stay in ED, n (%) (total=61; 1 missing)	
≤ 60 min	5 (8.2)
61-120 min	9 (14.8)
> 120 min	47 (77.0)
Patient disposition, n (%)	
Medical-surgical ward	37 (59.7)
Critical care units	25 (40.3)

*standard deviation

Table-2: Distribution of prescribed High Alert Medication (HAM) by type:

Type of HAM	n (%)
First dose antibiotics	33 (53.2)
Anti-arrhythmic agents	12 (19.4)
Cardiovascular agents	10 (16.1)
Hypoglycemic Agents	7 (11.3)

Table-3: SBAR sheet completion

SBAR sections	n (%)
Situation	62 (100.0)
Background	60 (96.7)
Assessment	62 (100.0)
Recommendation	58 (93.5)
Overall completion	59 (95.2)
Completed before transfer to inpatient units	59 (95.2)
Completed after patient transfer to inpatient units	3 (4.8%)

Table-4: SBAR sheet accuracy

SBAR sections	n (%)
Situation accurately states the patient condition as for	
Chief complaints	62 (100.0)
Diagnosis	61 (98.4)
Triage level	62 (100.0)
Lab & diagnostic studies done	62 (100)
Treatment done in ED	62 (100.0)
Background provides accurate and relevant background information	61 (98.4)
Patient medical /surgical history	61 (98.4)
Allergies	62 (100.0)
Special needs (such as hearing aids, walker, …)	62 (100.0)
Assessment reflects patient clinical condition	54 (87.1)
Recommendation states how patient needs to be followed up	58 (93.5)

Table-5: SBAR sheet reflecting High Alert Medication (HAM)

High alert medication documentation in the Situation section	n (%)
HAM (name & dose)	59 (95.2)
HAM route &period of administration & rate	50 (80.6)
HAM start time	53 (85.5)
HAM end time	39 (63.0)

C. Inferential statistics- Bivariate:

1. *SBAR sheet completeness*:

All sections of the ED electronic handoff sheet were filled: situation, background, assessment and recommendation:

Overall completeness of SBAR was 90.3 %. Situation and assessment were 100 % completed, while background and recommendation were completed by 96.7 % and 93.5 % of cases respectively. These proportions are considered a very good compliance rate and met the organization target of 90%.

Bivariate analysis of SBAR completeness outcome:

It was done only for the background and recommendation sections, since they were found to be incomplete in the descriptive level:

a. Background section completeness was found to be only associated with age.
    i. Advance age tend to have more incomplete background section (Mean Rank=58.75, Mann-Whitney U= 5.50 with a corresponding P-value= 0.03). This can be explained by the fact that patient with advanced age tend to have more past medical and surgical history which will take more documentation time by nurses so the nurses are omitting some informations to save time and do other tasks (Table-6).
b. Recommendation section completeness was only associated with shift.
    i. Night shift admissions were related to incomplete recommendation section. Out of 6.5% incomplete recommendation 75% occurred in night shift (Fischer's exact test=0.08), which give us a hint that incomplete recommendation

section is in association with night shift. This is expected since nurses' performance tends to decrease over night shift in general, either due to fatigue or lack of supervision (Table-7).

2. SBAR sheet Accuracy:

Done for all SABR sections; however significance was found only in assessment and recommendation sections:

a. The assessment is accurately reflecting patient clinical condition:

87.1% of patients had the assessment accurately reported (what was not accurate)

Assessment accuracy was found to be associated with disposition, main diagnosis and medical history:

i. Disposition was related to inaccurate assessment section. Out of 12.9 % inaccurate assessment 100% were in medical surgical disposition (Fischer's exact test=0.08), while no inaccurate assessment in critical care admission. This gives us a hint that assessment section accuracy is in association with disposition. It is a staff attitude related, since the assessment section is an objective part and completed by ticking the checkboxes present within each body system definitions by the nurses. Nurses were found to document more accurately for critically ill patients (Table-8).

ii. Main diagnosis was related to inaccurate assessment section. Out of 12.9% inaccurate assessment 100 % were in patient with non-cardiac diagnosis (Fischer's exact test=0.05), while

patients with cardiac diagnosis had 100% complete assessment. Patient with cardiac diagnosis most of the time are admitted to critical care, so the reason beyond accuracy is the same as that of disposition (Table-9).

iii. Medical history was also related to inaccurate assessment section. Out of 12.9% inaccurate assessment 87.5% were in patients with non-cardiac medical history and 12.5% were in patient with cardiac medical history (Fischer's exact test=0.02) (Table-10).

b. There is a recommendation for how this patient needs to be followed up: 93.5% of the sample had this section filled accurately. Recommendation accuracy was found to be associated with age and medical history

i. Advance age tend to have more accurate recommendation section (Mean Rank= 32.81, Mann-Whitney U= 40.00 with a corresponding P-value= 0.02) (Table-11).

ii. Medical history was also related to inaccurate recommendation section. Out of 6.5 % inaccurate recommendation 100% were in patients with non-cardiac medical history, while patients with cardiac diagnosis had 100% accurate recommendation (Table-12).

3. Correlation between adverse events &High Alert Medication:

When studying the correlation between HAM and adverse events, Pearson correlation analysis showed negative significant correlation for all HAM elements except for start time (Table-13):

Name and dose (Pearson = - 0.29, P value= 0.018),

Period of administration (Pearson= - 0.27, P value= 0.03)

End time (Pearson= - 0.29, P value=0.02)

SBAR completeness

Table-6: Background Section completeness by Age:

	Background	N	Mean Rank
Age	Incomplete	2	58.75
	Complete	60	30.59
	Total	62	

Mann-Whitney U= 5.50, P-value= 0.03

Table-7: Distribution of Recommendation completeness by shift:

			Shift		Total
			Day	Night	
Recommendation completeness	Incomplete	Count	1	3	4
		% within Recommendation completeness	25.0%	75.0%	100.0%
		% within shift	2.3%	15.8%	6.5%
		% of Total	1.6%	4.8%	6.5%
	Complete	Count	42	16	58
		% within Recommendation completeness	72.4%	27.6%	100.0%
		% within shift	97.7%	84.2%	93.5%
		% of Total	67.7%	25.8%	93.5%
Total		Count	43	19	62
		% within Recommendation completeness	69.4%	30.6%	100.0%
		% within shift	100.0%	100.0%	100.0%
		% of Total	69.4%	30.6%	100.0%

Fisher Exact Test = 0.08

SBAR accuracy: **Assessment Section**

Table-8: Distribution of Assessment accuracy by cardiovascular (CV) main diagnosis (Dx):

			CV main Dx		Total
			Non CV	CV	
Assessment accuracy	Inaccurate	Count	8	0	8
		% within assessment accuracy	100.0%	.0%	100.0%
		% within CV main Dx	18.2%	.0%	12.9%
		% of Total	12.9%	.0%	12.9%
	Accurate	Count	36	18	54
		% within assessment accuracy	66.7%	33.3%	100.0%
		% within CV main Dx	81.8%	100.0%	87.1%
		% of Total	58.1%	29.0%	87.1%
Total		Count	44	18	62
		% within assessment accuracy	71.0%	29.0%	100.0%
		% within CV main Dx	100.0%	100.0%	100.0%
		% of Total	71.0%	29.0%	100.0%

Fisher Exact Test = 0.05

Table-9: Distribution of Assessment accuracy by Cardiovascular (CV) medical history:

			CV history		Total
			Non CV	CV	
Assessment accuracy	Inaccurate	Count	7	1	8
		% within assessment accuracy	87.5%	12.5%	100.0%
		% within CV history	23.3%	3.1%	12.9%
		% of Total	11.3%	1.6%	12.9%
	Accurate	Count	23	31	54
		% within assessment accuracy	42.6%	57.4%	100.0%
		% within CV history	76.7%	96.9%	87.1%
		% of Total	37.1%	50.0%	87.1%
Total		Count	30	32	62
		% within assessment accuracy	48.4%	51.6%	100.0%
		% within CV history	100.0%	100.0%	100.0%
		% of Total	48.4%	51.6%	100.0%

Fisher Exact Test = 0.02

Table-10: Distribution of Assessment accuracy by Disposition:

			Disposition		Total
			Medical Surgical ward	Critical Care	
Assessment accuracy	Inaccurate	Count	8	0	8
		% within assessment accuracy	100.0%	.0%	100.0%
		% within disposition	21.6%	.0%	12.9%
		% of Total	12.9%	.0%	12.9%
	Accurate	Count	29	25	54
		% within assessment accuracy	53.7%	46.3%	100.0%
		% within disposition	78.4%	100.0%	87.1%
		% of Total	46.8%	40.3%	87.1%
Total		Count	37	25	62
		% within assessment accuracy	59.7%	40.3%	100.0%
		% within disposition	100.0%	100.0%	100.0%
		% of Total	59.7%	40.3%	100.0%

Fisher Exact Test = 0.01

SBAR accuracy: **Recommendation Section**

Table-11: Recommendation accuracy by Age

	Background	N	Mean Rank
Age	Inaccurate	4	12.50
	Accurate	58	32.81
	Total	62	

Mann-Whitney U= 40.00, P-value= 0.02

Table-12: Distribution of Recommendation accuracy by Cardiovascular (CV) medical history:

			CV history		Total
			Non CV	CV	
Recommendation accuracy	Inaccurate	Count	4	0	4
		% within Recommendation accuracy	100.0%	.0%	100.0%
		% within CV history	13.3%	.0%	6.5%
		% of Total	6.5%	.0%	6.5%
	Accurate	Count	26	32	58
		% within Recommendation accuracy	44.8%	55.2%	100.0%
		% within CV history	86.7%	100.0%	93.5%
		% of Total	41.9%	51.6%	93.5%
Total		Count	30	32	62
		% within Recommendation accuracy	48.4%	51.6%	100.0%
		% within CV history	100.0%	100.0%	100.0%
		% of Total	48.4%	51.6%	100.0%

Fisher Exact Test = 0.04

Table-13: Correlation between HAM characteristics and adverse events:

Outcome: Adverse Events		
HAM characteristics	**Pearson Correlation**	**P-value**
HAM name	- 0.299	0.018
HAM dose	- 0.299	0.018
HAM period of administration	- 0.270	0.034
HAM end time	- 0.294	0.021

CHAPTER VI

DISCUSSION

Based on the results from the conducted study, the following can be concluded:

- The present electronic SBAR handoff sheet demonstrated that it is a sufficient tool to communicate high alert medication, where high alert medications were present (name & dose) in 95.2% of the SBAR sheets. This goes in congruent with JCI and WHO recommendations (WHO, 2007) and a number of studies which concluded that SBAR is effective in ED (Leonard et al., McFerrab et al., Uhling et al., 2002). However; there is still room for improvement as for medication specifications.
- High alert medication option needs to be included in the SBAR with more details such as start and end-time as well as the rate of infusion. This goes with the emphasizes addressed in literature to consider medication information as part of intershift handoff (McMurray et al., 2010; Welsh et al., 2010) and interdepartmental (Braaf et al., 2015).
- Nurses' compliance was assumed to be the main factor for inaccurate assessment and background completeness. Since all needed information are present within the sheet and all what nurses need to do is to tick the checkboxes within the assessment section and fill the open boxes in the background one. Similar findings was evident in one study conducted by Ludikhuize & Goossens where low adherence to SBAR by health care providers has been found in one simulation study for nurses working in medical and surgical wards (Ludikhuize & Goossens, 2011).

- Sheet design was assumed to be the main factor for inaccurate recommendation and incomplete background:
- Shift to partially automated SBAR completion. Situation and background section can be automated, since information within these sections is completed in ED triage sheet and they do not change. By doing this more complete and accurate sections will be secured and documentation redundancy will be decreased and we will overcome the problem of nurses' non-compliance issue.
- Recommendation section is limited in terms of options. Future SBAR needs to consider adding more options as well as open-ended entries

A. Strengths and Limitations

Strengths:

It is a secondary data analysis using electronic medical data, making data retrieval simple and easy to access. The principal investigator is regularly involved in quality improvement projects including SBAR completion.

Limitations:

Study was conducted in one setting on small population size and confined to adult population because the organization does not admit pediatric patients to critical units. Based on what mentioned previously generalizability of findings cannot be done.

CHAPTER VII

CONCLUSION

A. Implication for practice:

Modify the current ED handoff sheet by adding section related to high alert medication with details is to be added and by adding more options to the recommendation section.

Redesign the existing SBAR, so that some cells within the sheet are pre-populated: data are pulled by system from other previously completed sheet within the same visit such as assessment sheets and medical order. This is will save time, reduce documentation redundancy and improve SBAR completeness and accuracy ensuring by this that no vital informations are missing during handoff. Front line nurses and information technology staff are to be part of the redesigning process.

B. Implication for education:

Better education on the importance and proper use of interdepartmental handoff, in particular SBAR tool, is to be provided for nursing staff.

C. Implication for policy:

Nursing policy related to effective communication need to be reviewed in such a way to include SBAR handoff communication as a tool of communication and to specify that high alert medication is one of the handoff tool elements.

D. Implications for research:

Study can be repeated using the same research question and methodology; however bigger sample size to be taken. On the other hand further studies can be done in this regard utilizing different methodology such as observational method to study SBAR effectiveness and utilization.

APPENDIX A

ED HANDOFF ELECTRONIC SBAR SHEET

Situation					
	Admitted at:	**Admitted by:** ☐ **Family** ☐ **Ambulance**	**Admitted:** ☐ **Walking** ☐ **Wheel chair** ☐ **Carried** ☐ **Stretcher**		
	Chief complaints:				
	Triage assessment: ☐ **level 1** ☐ **level 2** ☐ **level 3** ☐ **level 4** ☐ **level 5**				
	Treatment done in ER: ☐ **IV therapy** ☐ **Blood withdrawal** ☐ **CX-Ray** ☐ **ECG** ☐ **CT scan of** ☐ **MRI of** ☐ **Ultra/Sound of:** ☐ **Oxygen therapy, type** **consultations done:**				
	Medication given in ER: Name & time:				
	Preliminary results of tests/diagnosis: refer to the system				
	Provisional diagnosis:				
Background	**Past Medical/Surgical/Family history**				
	Allergy:	**Height:**	**Weight:**	**Diet:**	
	Communication barrier/special needs:				

	Systems	**Day Shift**		**Night Shift**	
Assessment	**Neuro-logic**	**Conscious/oriented**	**conscious/disoriented**	**Conscious/oriented**	**conscious/disoriented**
		lethargic seizure activity	**Stuporous**	**lethargic seizure activity**	**stuporous**
		unconscious	**intact sensory/motor**	**unconscious**	**intact sensory/motor**
		altered sensory/motor		**altered sensory/motor**	
	Pain	☐ **Yes** ☐ **No, Score: at** _____		☐ **Yes** ☐ **No, Score: at** _____	
	Cardio-vascular	**Normal findings**	**Dysrhythmias**	**Normal findings**	**Dysrhythmias**
		hypotensive	**hypertensive**	**hypotensive**	**hypertensive**
		Poor capillary refill	**Weak pulses**	**Poor capillary refill**	**Weak pulses**
	Respiratory	**Normal breathing pattern**	**Labored**	**Normal breathing pattern**	**Labored**
		Dyspnea	**Cough**	**Dyspnea**	**Cough**
		Abnormal breath sounds	**Others:**	**Abnormal breath sounds**	**Others:**
	Gastrointestinal	**Normal findings**	**Distended abdomen**	**Normal findings**	**Distended abdomen**
		Tenderness	**Nausea**	**Tenderness**	**nausea**
		Vomiting	**Diarrhea**	**Vomiting**	**Diarrhea**
	Genito-urinary	**Normal findings**	**Incontinent**	**Normal findings**	**incontinent**
		Oliguria	**Anuria**	**Oliguria**	**Anuria**
		Menorrhagia	**Others**	**Menorrhagia**	**others**
	Integumentary	**Intact skin**	**Rash**	**Intact skin**	**Rash**
		Pressure ulcer	**Dehydrated**	**Pressure ulcer**	**Dehydrated**
	Muscoskeletal	**Normal findings**	**Abnormal, describe:**	**Normal findings**	**Abnormal, describe:**
	Fall precaution taken	☐ **Yes** ☐ **No**		☐ **Yes** ☐ **No**	
	Isolation:	☐ **Yes** ☐ **No type:**		☐ **Yes** ☐ **No type:**	

Recommendations	**Day Shift**	**Night Shift**
	V/S after:	**V/S after:**
	Dextro after:	**Dextro after:**
	Pain ascoring after	**Pain ascoring after**
	IV run to finish at	**IV run to finish at**
	Consultation still needed	**Consultation still needed**
	Pending studies to be taken at unit level	**Pending studies to be taken at unit level**
	Others	**others**
	Disposition **Receiving RN name** **RN Name & Signature**	**Disposition** **Receiving RN name** **RN Name & Signature**

APPENDIX B

LIST OF HIGH ALERT MEDICATIONS

Drug category	Drug name
Adrenergic agonists :	Epinephrine Phenylephrine Norepinephrine Dobutamine Dopamine Ephedrine Isuprel Bricanyl
Adrenergic antagonists :	Propranolol Esmolol Labetalol
Antiarrhythmic :	Adenosine Lidocaine, Amiodarone
Inotropic medications	Digoxin Milrinone
Thrombolytic :	Heparin Streptokinase Metalyse
Concentrated electrolytes	Undiluted KCL
IV insulin	Insulin
Nitrates	Nitroglycerine
First dose antibiotics	

APPENDIX C

DATA ABSTRACTION FORM

<table>
<tr><td colspan="4">ID number:</td></tr>
<tr><td colspan="2">Data abstraction date (dd/mm/yy)</td><td colspan="2"></td></tr>
<tr><td colspan="2">Date of birth (dd/mm/yy)</td><td colspan="2">Gender: F □ M: □</td></tr>
<tr><td colspan="2">Main diagnosis:</td><td colspan="2">Patient medical history:</td></tr>
<tr><td>1. Coronary artery diseases: angina, myocardial infarctions</td><td>2. Dysrhythmias</td><td>1. Coronary artery diseases</td><td>2. Congestive Heart failure</td></tr>
<tr><td>3. Hypertension</td><td>4. Hypotension</td><td>3. Hypertension</td><td>4. Cerebro-vascular accident</td></tr>
<tr><td>5. Hypoglycemia</td><td>6. Hyperglycemia /ketoacidosis</td><td>5. Diabetes</td><td>6. Renal failure</td></tr>
<tr><td>7. Sepsis</td><td>8. Shock</td><td>7. Cancer</td><td>8. Respiratory disease: COPD, emphysema</td></tr>
<tr><td>9. Pulmonary emboli</td><td>10. Renal failure</td><td colspan="2" rowspan="5">9. Other (please specify):</td></tr>
<tr><td>11. Stroke</td><td>12. Deep vein thrombosis</td></tr>
<tr><td>13. CHF: decompensated</td><td>14. Pneumonia</td></tr>
<tr><td colspan="2">15. Other (please specify):</td></tr>
<tr><td colspan="2">Admission date (dd/mm/yy)</td><td colspan="2" rowspan="2">Shift
□ D □ N</td></tr>
<tr><td colspan="2">Admission time to emergency department (ED):
Hour: minutes:</td></tr>
<tr><td colspan="4">Disposition: □ Medical Surgical Ward □ Critical Care Units (ICU & CCU)</td></tr>
<tr><td colspan="4">Disposition time: Hour: minutes:</td></tr>
<tr><td colspan="4">High-alert drug: IV form</td></tr>
<tr><td colspan="2">1. Adrenergic agonist□ epinephrine □norepinephrine □ dopamine □dobutamine</td><td colspan="2">2. Adrenergic antagonist□ Inderal (propranolol)</td></tr>
<tr><td colspan="2">3. Antiarrythmic□Cordarone □ verapamil</td><td colspan="2">4. Inotropic □ digoxin</td></tr>
<tr><td colspan="2">5. Thrombolytic □ streptokinase</td><td colspan="2">6. Concentrated electrolytes□ KCl</td></tr>
<tr><td colspan="2">7. Nitrates: nitroglycerine, isoket (isordil)</td><td colspan="2">8. Hypoglycemic: Insulin IV</td></tr>
<tr><td colspan="4">9. First dose antibiotics</td></tr>
<tr><td colspan="2">1. Was the SBAR ED handoff sheet completed before patient transfer</td><td>1: Yes
2: No</td><td></td></tr>
<tr><td colspan="2">SBAR handoff sheet completeness</td><td>Responses</td><td>Additional comments</td></tr>
<tr><td colspan="2">2. All sections of the ED electronic handoff sheet are filled:
Situation</td><td>1: Yes</td><td></td></tr>
</table>

	2: No	
Background	1: Yes 2: No	
Assessment	1: Yes 2: No	
Recommendation	1: Yes 2: No	
SBAR handoff sheet accuracy	Responses	Additional comments
3. **Is the situation clearly states the patient condition** as for: Chief complaint	1: Yes 2: No	
Diagnosis	1: Yes 2: No	
Triage level	1: Yes 2: No	
Lab and diagnostic studies done in ED	1: Yes 2: No	
Treatment provided in ED	1: Yes 2: No	
4. **Does the background provide** clear, relevant background information that relates to: Patient medical history	1: Yes 2: No	
Medication history	1: Yes 2: No	
Allergies	1: Yes 2: No	
Special needs	1: Yes 2: No	
5. **Is the assessment completed and** reflect patient clinical condition	1: Yes 2: No	
6. **Is there a recommendation for how this patient needs to be followed up:** E.g. 'Please ensure the patient received the next dose at 12:00 P.M.	1: Yes 2: No	
SBAR reflecting the high alert medication status		
7. High alert medications mentioned in the ED SBAR handoff sheet in the situation section: Name	1: Yes 2: No	
Dose	1: Yes 2: No	

Route	1: Yes 2: No	
8. High alert medication period / rate of administration is mentioned in the ED SBAR handoff sheet in the situation section	1: Yes 2: No	
9. High alert medication start time is mentioned in the ED SBAR handoff sheet in the situation section	1: Yes 2: No	
10. High alert medication end time is mentioned in the ED SBAR handoff in the recommendation section	1: Yes 2: No	
Patient outcome		
11. Did the patient develop any adverse event while in hospital (same episode of care)?	1: Yes 2: No	If yes, please indicate the type of adverse event: 1: Adverse drug reaction 2: Delay in treatment 3: No treatment 4: transfer to a higher level of care 5: deterioration in medical condition 6: other (please specify):

APPENDIX D

DATA ABSTRACTION MANUAL

This data abstraction form is intended to collect data related to SBAR completeness and accuracy. The form is divided into eight sections:

1. Demographic data: patient date of birth and gender. These are to be completed as indicated in the abstraction form and they can be retrieved from ED record.
2. Admission data: admission date and time, length of stay in ED and disposition. These are to be completed as indicated in the abstraction form and they can be retrieved from ED record.
3. Patient medical history and diagnosis: this is completed by ticking the correct disease from within the list within the data abstraction form. Data can be retrieved from ED record.
4. Prescribed high alert medication name: this is completed by ticking the correct medication family from within the list within the data abstraction form. Data can be retrieved from ED record and medical order.
5. SBAR sheet completeness: completeness of each SBAR sections: situation, background, assessment and recommendation. Completeness is considered if all required data within each section is completed. Circle 1 for complete data and 2 for incomplete data.
6. SBAR sheet accuracy: accuracy of each SABR sections and their corresponding subsections. Situation subsections are: **Chief complaint,** diagnosis, triage level treatment provided in ED, Laboratory and diagnostic studies done. Background subsections are: past medical and surgical history, allergies, and patient special and communication needs.

Accuracy is defined in-term of the correctness and pertinence of the patient's information within each section and subsection. Accuracy can be verified by comparing data recorded in ED handoff versus ED record. Circle 1 for accurate data and 2 for inaccurate data.

7. Reflection of high alert medication in SBAR: presence and correctness of medication' name and dose start time, end time and method / period of administration. Circle 1 for accurate data and 2 for inaccurate data. Reflection can be verified by comparing recorded data in ED handoff versus ED record and medical order.
8. Patient outcome: incidence of any adverse event including but not limited to medication error, delay in treatment, wrong treatment, duplication of laboratory/diagnostic tests. Circle 1 if adverse events and 2 if no adverse event took place. If 1 was circled type of adverse event is to be circled. Progress note on day of admission is to be reviewed to find out if adverse events occurred, once adverse event is identified safety net is to be reviewed for details of the incidence.

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