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Patient Safety from Surgical Perspective: Evaluation and Review of the Literature

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Abstract: **In the modern medicine, there are plenty of evidences to show, those patients who undergo a surgical or invasive procedure are at increased risk of suffering an adverse event. This is not because the surgeons and proceduralists are careless or incompetent; rather it is an issue, because there are many opportunities for things to go wrong because of the many steps involved in surgical procedures with all the perioperative issues.**

Why patient's safety is relevant to surgery and invasive procedures, is a topic which is discussed frequently. In addition, there are the problems caused by surgical site infections, miscommunication and mismanagement, that account for a significant proportion of all health care-associated mistakes, failures and infections as well.

This topic in this evaluation will discuss and review the literature in order to understand how patient safety principles can contribute in optimizing patient care, minimizing medical errors and adverse events associated with invasive procedures. There are many validated guidelines now available to assist the health-care team deliver safe surgical care, minimize the mistakes and to continue the care of the patient after discharge from the hospital.

There may not be many opportunities for all professionals in health care to implement many of these steps to improve surgical outcomes. Nonetheless it can be easily learned and realized, how the health professionals communicate with one another and what techniques are used to make sure that they are operating on the correct person or doing the procedure on the correct body part / site / side with all relevant precautions and devices. The health care providers can also optimize their knowledge and recognize, what can happen when healthcare professionals appear not to follow well-defined protocols and steps, in order to avoid many dangerous mistakes in the health care sectors.

Therefore, surgical safety checklists were initiated and developed to reach the optimal and best implementation and optimization of patient care in all stages of the treatment of the patient in surgical procedures; during hospitalization and after discharge.

Keywords: **Patient safety is paramount, To Err Is Human, primum non nocere "first do no harm", surgical and procedural site infections / errors, adverse events, operation room (OR), communication / miscommunication / coordination / failures, surgical mortality / morbidity meetings, quality assurance, teamwork, surgery checklist, time-in, time-out, briefing, debriefing, hand-offs of patients results, antibiotic prophylaxis (ABP), Electronic medical record (EMR), American Society of Anesthesiologists (ASA), ASA-score, leadership in the OR, World Health Organization (WHO), Electronic Health Record (EHR), Anesthesia Patient Safety Foundation (APSF), Hospital Patient Safety Indicators (PSI). Institute of medicine (IOM), National Health Services (NHS).**

1. INTRODUCTION

Essential Learning Objectives: It is absolutely important to evaluate, to analyze and to understand the main causes of medical errors and adverse events in surgical and invasive procedural care and how the use of guidelines and verification processes can facilitate the correct patient receiving the correct procedure at the appropriate time and place. Although the

principles described in this topic are important for both surgical and invasive procedures, most of the evidence in the literature relates to surgical care.

The traditional way of explaining adverse events associated with surgery and invasive procedures is usually related to the skills of the surgeons and the age and physical conditions of the patients. Vincent et al. [1-18, 29-40, 56-77, 89-115, 14-149] believed that adverse surgical (and other procedural) outcomes are associated with many other factors such as quality of the design-interface, teamwork and organizational culture. A systems approach to surgical and procedural adverse events requires professionals in the health care to examine both latent factors such as teamwork and inadequate leadership and sharp end factors such as communication during handoffs and poor history taking.

Patient safety is a discipline that emphasizes safety in health care through the prevention, reduction, reporting, and analysis of medical error that often leads to adverse effects. The frequency and magnitude of avoidable adverse events experienced by patients was not well known until the 1990s, when multiple countries reported staggering numbers of patients harmed and killed by medical errors. Recognizing that healthcare errors impact 1 in every 10 patients around the world, the World Health Organization calls patient safety an endemic concern. [1-11, 18-27, 29-43, 55-70] Indeed, patient safety has emerged as a distinct healthcare discipline supported by an immature yet developing scientific framework.

There is a significant transdisciplinary body of theoretical and research literature that informs the science of patient safety. [2, 14, 18, 30, 39-58, 77-101, 109-134, 160-167] The resulting patient safety knowledge continually informs improvement efforts such as: applying lessons learned from business and industry, adopting innovative technologies, educating providers and consumers, enhancing error reporting systems, and developing new economic incentives.

First do not harm: Millennia ago, Hippocrates recognized the potential for injuries that arise from the well-intentioned actions of healers. Greek healers in the 4th century BC drafted the Hippocratic Oath and pledged to "prescribe regimens for the good of my patients according to my ability and my judgment and never do harm to anyone." [3-9, 17-27] Since then, the directive (primum non nocere) ((“first do no harm”)) has become a central tenet for contemporary medicine. However, despite an increasing emphasis on the scientific basis of medical practice in Europe and the United States in the late 19th Century, data on adverse outcomes were hard to come by and the various studies commissioned collected mostly anecdotal events. [4-18, 29-45]

In the United States, the public and the medical specialties of surgery and anesthesia were shocked in April 1982 by the ABC television program 20/20 entitled The Deep Sleep. Presenting accounts of anesthetic accidents, the producers stated that, every year, 6,000 Americans die or suffer brain damage related to these mishaps. [5-9] In 1983, the British Royal Society of Medicine and the Harvard Medical School jointly sponsored a symposium on anesthesia deaths and injuries, resulting in an agreement to share statistics and to conduct studies. [6-19, 28-37, 44-63, 103-119, 143-150, 152-163]

By 1984 the American Society of Anesthesiologists (ASA) had established the Anesthesia Patient Safety Foundation (APSF). The APSF marked the first use of the term "patient safety" in the name of professional reviewing organization. [7-16, 28-39, 44-51] Although anesthesiologists comprise only about 5% of physicians in the United States, anesthesiology became the leading medical specialty addressing issues of patient safety. [8-18, 21-37, 49-61] Likewise in Australia, the Australian Patient Safety Foundation was founded in 1989 for anesthesia error monitoring. Both organizations were soon expanded as the magnitude of the medical error crisis became known. [66-69, 78-86, 89-96, 98-109, 118-130, 145-163].

To Err is Human: In many developed countries, such as in the United States, the full magnitude and impact of errors in health care was not appreciated until the 1990s, when several reports brought attention to this issue. [9-10, 14-19] In 1999, the Institute of Medicine (IOM) of the National Academy of Sciences released a report, To Err is Human: Building a Safer Health System. [11-16, 26-49, 57-80, 89, 104-119] The IOM called for a broad national effort to include establishment of a Center for Patient Safety, expanded reporting of adverse events, development of safety programs in health care organizations, and attention by regulators, health care purchasers, and professional societies. The majority of media attention, however, focused on the staggering statistics: from 44,000 to 98,000 preventable deaths annually due to medical error in hospitals, 7,000 preventable deaths related to medication errors alone.

Within 2 weeks of the report's release, Congress began hearings and President Clinton ordered a government-wide study of the feasibility of implementing the report's recommendations. [12-23, 45, 78, 103-119] Initial criticisms of the methodology in

the IOM estimates focused on the statistical methods of amplifying low numbers of incidents in the pilot studies to the general population [13-27, 77-89, 100-123].

However, subsequent reports emphasized the striking prevalence and consequences of medical error. The experience has been similar in other countries. [14-25, 35-49, 55-69, 77-84, 102-118, 141-162]

Ten years after a groundbreaking Australian study revealed 18,000 annual deaths from medical errors, [15-38] Professor Bill Runciman, one of the study's authors and president of the Australian Patient Safety Foundation since its inception in 1989, reported himself a victim of a medical dosing error. [16-24, 27-37, 44-57, 65-84]

The Department of Health Expert Group in June 2000 estimated that over 850,000 incidents harm National Health Service hospital patients in the United Kingdom each year. On average forty incidences per year contribute to patient deaths in each NHS institution. [17-33, 73-90, 98-110]

In 2004, the Canadian Adverse Events Study found that adverse events occurred in more than 7% of hospital admissions, and estimated that 9,000 to 24,000 Canadians die annually after an avoidable medical error. [18-25, 27-37, 40-51, 66-77, 88-93]

These and other reports from New Zealand, [19-25] Denmark [20-28] and developing countries [21-29] have led the World Health Organization to estimate that one in ten persons receiving health care will suffer preventable harm. [22-27, 33-39, 42-47, 51-60, 73-79, 88-100, 106-115]

Effective and ineffective communication: With provisioning of available information on any operational site especially in mobile professional services, communication is extremely essential.

Communicating continues with the reduction of administrative burden, releasing the operating staff and easing the operational demand by model driven orders, thus enabling adherence to a well executable procedure finalized with a qualified minimum of required feedback [11-13, 67-102, 109-119,140-163].

The use of effective communication among patients and healthcare professionals is critical for achieving a patient's optimal health outcome. However, according to the Canadian Patient Safety Institute, ineffective communication has the opposite effect as it can lead to patient harm. [23-29] Communication with regards to patient safety can be classified into two categories: prevention of adverse events and responding to adverse events.

Use of effective communication can aid in the prevention of adverse events, whereas ineffective communication can contribute to these incidences. If ineffective communication contributes to an adverse event, then better and more effective communication skills must be applied in response to achieve optimal outcomes for the patient's safety. There are different modes in which healthcare professionals can work to optimize the safety of patients which include both verbal and nonverbal communication, as well as the effective use of appropriate communication technologies. [23, 25-29, 33-38, 45-68, 109-123]

Methods of effective verbal and nonverbal communication include treating patients with respect and showing empathy, clearly communicating with patients in a way that best fits their needs, practicing active listening skills, being sensitive with regards to cultural diversity and respecting the privacy and confidentiality rights of the patient. [18-23]

To use appropriate communication technology, healthcare professionals must choose which channel of communication is best suited to benefit the patient. Some channels are more likely to result in communication errors than others, such as communicating through telephone or email (missing nonverbal messages which are an important element of understanding the situation).

It is also the responsibility of the provider to know the advantages and limitations of using electronic health records, as they do not convey all information necessary to understanding patient needs. If a health care professional is not practicing these skills, they are not being an effective communicator which may affect patient outcome. [23-26, 38-41, 49-52, 60-69, 107, 115, 118, 119]

The goal of a healthcare professional is to aid patients in achieving their optimal health outcome, which entails that the patient's safety is not at risk. Practice of effective communication plays a large role in promoting and protecting patient safety. [23-32, 47-51, 67-70]

Teamwork and communication: During complex situations, communication between health professionals must be at its best. There are several techniques, tools, and strategies used to improve communication. Any team should have a clear purpose and each member should be aware of their role and be involved accordingly. [23-25, 29-33, 46-49, 79-89, 111-129, 136-148]

To increase the quality of communication between people involved, regular feedback should be provided. Strategies such as briefings allow the team to be set on their purpose and ensure that members not only share the goal but also the process they will follow to achieve it. [23-34] Briefings reduce interruptions, prevent delays and build stronger relationships, resulting in a strong patient safety environment. [18, 21, 23, 44, 56-71, 78-88, 100, 109, 113-119, 132-144]

Debriefing is another useful strategy: Healthcare providers meet to discuss a situation, record what they learned and discuss how it might be better handled. Closed loop communication is another important technique used to ensure that the message that was sent is received and interpreted by the receiver.

SBAR (see below) is a structured system designed to help team members communicate about the patient in the most convenient form possible.[23-29] Communication between healthcare professionals not only helps achieve the best results for the patient but also prevents any unseen incidents. [16-23, 25-29, 34-38, 46-58, 100-111, 123-141, 162]

Safety culture: In the modern health care, there is a move towards a patient safety culture. [25-35, 39-56, 69-76, 83-92, 118-119] This applies the lessons learned from other industries, such as aviation, marine, and industrial, to a health care setting.

When assessing and analyzing an incident, individuals involved are much more likely to be forthcoming with their own mistakes if they know that their job is not at risk. [5, 7, 13-20, 22-24, 26-34, 59-78, 101-123, 156-163] This allows a much more complete and clear picture to be formed of the facts of an event. From there, root cause analysis can occur. There are often multiple causative factors involved in an adverse or near miss event. [5, 9, 27, 29, 33, 36, 43-49, 56-70, 111-118, 135-163] It is only after all contributing factors have been identified that effective changes can be made that will prevent a similar incident from occurring.

Disclosure of an incident: After an adverse event occurs, each hospital has its own way of dealing with the incident. In Canada, a quality improvement review is primarily used.

A quality improvement review is an evaluation that is completed after an adverse event occurs with the intention to both fix the problem, as well as preventing it from happening again. [28-36]. The individual provinces and territories have laws on whether it is required to disclose the quality improvement review to the patient. Healthcare providers have an obligation to disclose any adverse event to their patients because of ethical and professional guidelines. [29-34]

If more providers participate in the quality improvement review, it can increase interdisciplinary collaboration and can sustain relationships between departments and staff. [29-37, 39-45, 50-67, 79-90, 106-119] In the US, clinical peer review is used: uninvolved medical staff review the event and work toward preventing further incidents.

The disclosure of adverse events is important in maintaining trust in the relationship between healthcare provider and patient. It is also important in learning how to avoid these mistakes in the future by conducting quality improvement reviews, or clinical peer review. If the provider accurately handles the event, and disclose it to the patient and their family, he/she can avoid getting punished, which includes lawsuits, fines and suspension. [30-36, 39-47]

Causes of healthcare error: The simplest definition of a health care error is a preventable adverse effect of care, whether or not it is evident or harmful to the patient. Errors have been, in part, attributed to the previously mentioned fact. [31-39]

Human Factors: These can be variations in healthcare provider training & experience, [33-39] fatigue, [35-46] depression and burnout, [38-48] diverse patients, unfamiliar settings, time pressures, Failure to acknowledge the prevalence and seriousness of medical errors, [39-49] increasing working hours of nurses, medical complexity, complicated technologies, powerful drugs, intensive care, prolonged hospital stay, system failures, poor communication, unclear lines of authority of physicians, nurses, and other care providers [34-39], complications increase as patient to nurse staffing ratio increases. [41-59, 66-69, 73-77, 89-102, 105-119, 143-156, 160-163]

Disconnected reporting systems within a hospital: Fragmented systems in which numerous hand-offs of patients results in lack of coordination and errors can lead to problems in the safety issue of each patient [42-47, 49-55, 58-69] and drug names that look alike or sound alike. [43-40] The impression, that action is being taken by other groups within the institution, can

cause confidence in the patients. Reliance on automated systems to prevent error can help in this kind of difficulties. [44-56, 61-76, 80-95, 102-112, 140-151, 160-162]

Environment and design factors: In emergencies, patient care may be rendered in areas poorly suited for safe monitoring. [47-58, 69-79, 84-99, 110-119, 143-157] Infrastructure failure is according to the WHO very significant, whereas 50% of medical equipment in developing countries is only partly usable due to lack of skilled operators or parts. As a result, diagnostic procedures or treatments cannot be performed, leading to substandard treatment. [22, 27, 29-35]

The Joint Commission's Annual Report on Quality and Safety 2007 found that inadequate communication between healthcare providers, or between providers and the patient and family members, was the root cause of over half the serious adverse events in accredited hospitals. [48-58, 101-114, 116-126, 133-139, 141-152, 157-160] Other leading causes included inadequate assessment of the patient's condition, and poor leadership or training.

Common misconceptions about adverse events are: Incompetent health care providers are a common cause." Many of the errors are normal human slips or lapses, and not the result of poor judgment or recklessness. [32-39] "High risk procedures or medical specialties are responsible for most avoidable adverse events". Although some mistakes, such as in surgery, are easier to notice, errors occur in all levels of care. Even though complex procedures entail more risk, adverse outcomes are not usually due to error, but to the severity of the condition being treated. [34-49]

However, it has been reported that medication errors during the course of a surgical procedure are three times more likely to cause harm to a patient than those occurring in other types of hospital care. [42-49] "If a patient experiences an adverse event during the process of care, an error has occurred". Most medical care entails some level of risk, and there can be complications or side effects, even unforeseen ones, from the underlying condition or from the treatment itself. [50-65]

Unintended consequences may occur as improvements in safety are undertaken. It may not be possible to attain maximum safety goals in healthcare without adversely affecting patient care in other ways. An example is blood transfusion; in recent years, to reduce the risk of transmissible infection in the blood supply, donors with only a small probability of infection have been excluded. The result has been a critical shortage of blood for other lifesaving purposes, with a broad impact on patient care. [49-53] Application of high-reliability theory and normal accident theory can help predict the organizational consequences of implementing safety measures. [60-67, 69-75, 76-85, 98-116, 119-125]

Types of healthcare technology: Handwritten reports or notes, manual order entry, non-standard abbreviations and poor legibility lead to substantial errors and injuries. A New Health System for the 21st Century advised rapid adoption of electronic patient records, electronic medication ordering, with computer- and internet-based information systems to support clinical decisions. [18-29, 46-59, 63-69, 71-83, 95-99, 115-126, 129-136, 143-150]

Electronic Health Record (EHR): Previously known as the Electronic medical record (EMR), HER reduces several types of errors, including those related to prescription drugs, to emergency and preventive care, and to tests and procedures. [33-40, 64-76, 87-99, 105-116, 119-127, 133-147]

Important features of modern EHR include automated drug-drug/drug-food interaction checks and allergy checks, standard drug dosages and patient education information. Drug Information at the point-of-care and drug dispensing points help in reducing errors.

Portable offline emergency medical record devices have been developed to provide access to health records during widespread or extended infrastructure failure, such as in natural disasters or regional conflicts. [9, 11, 14-19, 38-49, 56-66, 68-77, 90, 104, 107, 109, 112, 114-130, 146, 157, 159-161]

Automatic identification upon entry of patient: An automatic identification check is carried out on each person with tags (primarily patients) entering the area to determine the presented patient in contrast to other patient earlier entered into reach of the used reader. Automatic identification and range estimation upon approach to most proximate patient, excluding reads from more distant tags of other patients in the same area. [11, 15, 19, 23, 28-40, 57-66, 69-78, 83-96, 98-118]

Complete Safety Medication System: A standardized bar code system for dispensing drugs might prevent 25% of drug errors. [70-78] Despite ample evidence to reduce medication errors, compete medication delivery systems (barcoding and Electronic prescribing) have slow [73-97] adoption by doctors and hospitals in the United States, due to concern with interoperability and compliance with future national standards, which are intermittently not inconsequential.

Technological Iatrogenesis: Technology induced errors are significant and increasingly more evident in care delivery systems. [74-89] These idiosyncratic and potentially serious problems associated with HIT implementation had recently become a tangible concern for healthcare and information technology professionals.

As such, the term technological IATROGENESIS describes this new category of adverse events that are an emergent property resulting from technological innovation creating system and microsystem disturbances. [46, 48, 55, 58, 61, 70, 75-100]

Evidence-based medicine: It integrates an individual doctor's examination and diagnostic skills for a specific patient, with the best available evidence from medical research. The doctor's expertise includes both diagnostic skills and consideration of individual patient's rights and preferences in making decisions about his or her care.

The clinician uses pertinent clinical research on the accuracy of diagnostic tests and the efficacy and safety of therapy, rehabilitation, and prevention to develop an individual plan of care. [24, 28, 50, 61, 63, 69-75, 78-94, 101-122, 160-162]

The development of evidence-based recommendations for specific medical conditions, termed clinical practice guidelines or "best practices", has accelerated in the past few years. Evidence-based medicine may reduce adverse events, especially those involving incorrect diagnosis, outdated or risky tests or procedures, or medication overuse.

Clinical guidelines: These can provide a common framework for improving communication among clinicians, patients and non-medical purchasers of health care. Errors related to changing shifts or multiple specialists are reduced by a consistent plan of care.

Information on the clinical effectiveness of treatments and services can help providers, consumers and purchasers of health care make better use of limited resources.

Managed care plans may attempt limit "unnecessary" services to cut the costs of health care, despite evidence that guidelines are not designed for general screening, rather as decision-making tools when an individual practitioner evaluates a specific patient.

Quality assurance (QA) and safety initiatives in community pharmacy practice: Community pharmacy practice is making important advances in the quality and safety movement despite the limited number of federal and state regulations that exist and in the absence of national accreditation organizations such as the Joint Commission: A driving force for performance improvement in health care systems.

Pediatric patients: As children mature both cognitively and physically, their needs as consumers of health care goods and services change. Therefore, planning a unified approach to pediatric safety and quality is affected by the fluid nature of childhood development. Hospitalized children, especially those who are very young and/or nonverbal, are dependent on caregivers, parents, or other surrogates to convey key information associated with patient encounters.

Even when children can accurately express their needs, they are unlikely to receive the same acknowledgment accorded adult patients. In addition, because children are dependent on their caregivers, their care must be approved by parents or surrogates during all encounters.

Different epidemiology: Most hospitalized children require acute episodic care, not care for chronic conditions as with adult patients. Planning safety and quality initiatives within a framework of "wellness, interrupted by acute conditions or exacerbations," presents distinct challenges and requires a new way of thinking.

Regarding demographics, children are more likely than other groups to live in poverty and experience racial and ethnic disparities in health care. Children are more dependent on public insurance. One of the main challenges faced by pediatric safety and quality efforts is that most of the work on patient safety to date has focused on adult patients. In addition, there is no standard nomenclature for pediatric patient safety that is widely used.

However, a standard framework for classifying pediatric adverse events that offers flexibility has been introduced. [13, 18, 23, 33, 45-49, 54-63, 71-89, 95-104, 109-116, 119-126, 129-142] Standardization provides consistency between interdisciplinary teams and can facilitate multisite studies. If these large-scale studies are conducted, the findings could generate large-scale intervention studies conducted with a faster life cycle. [16, 19, 28-40, 89-104, 107-112, 115-119, 125-139, 142-152, 159-162]

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2. MAIN TOPICS OF PATIENT SAFETY IN SURGICAL PROCEDURES

2.1. SAFETY IS PARAMOUNT:

The main goal in the health care in general is to improve the medical condition of the patient. The rule is ((“Primam non nocere”)); first do no harm. But patient safety is compromised by errors, which are in health care the eighth leading cause of death in the USA and accounts for 120,000 deaths annually. See Figure 1 and Tables 1-2 for rates and types of adverse events.

Data / Statistics and assessments / evaluations of the severity of Adverse Events are shown in the following Figures (1-9) and Tables (1-7) from official Data in the State of New York and USA (in general) from studies and statically significant considerations done between the years 1982 - 2006.

Figure 1: Comparison of accidental deaths and deaths from medical errors in the USA in 2009.

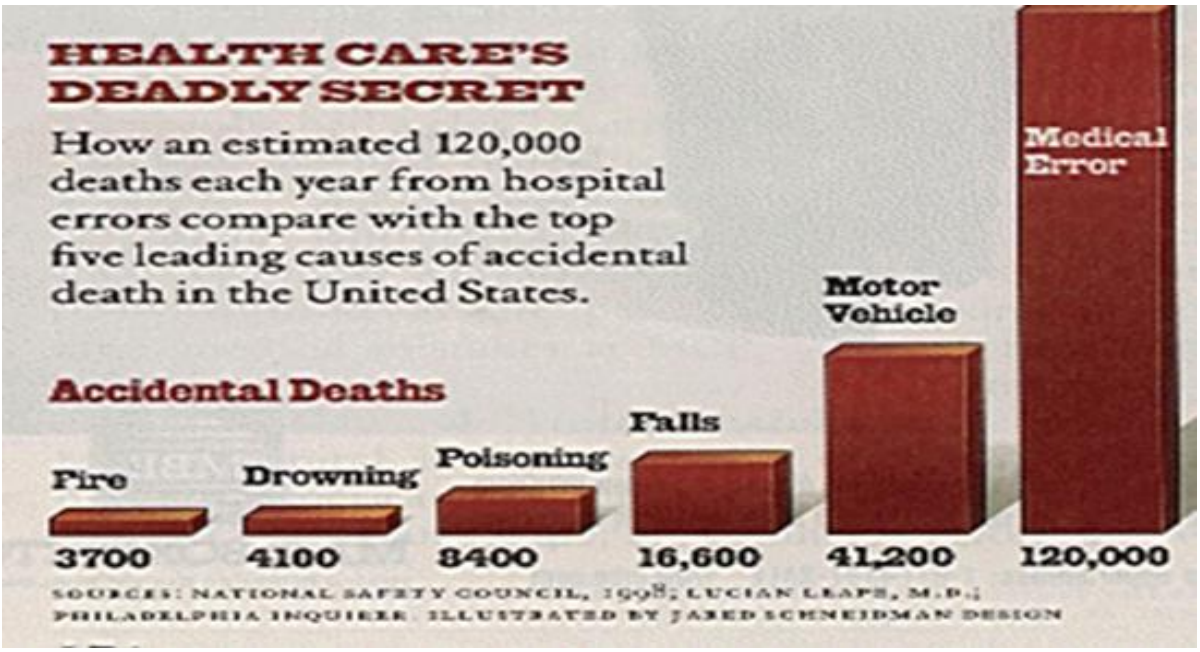

Table 1: Rates of Adverse Events and Negligence among Clinical-Specialty Groups in New York State (1984).

Specialty	Rate of Adverse Events(%)	Rate of Negligence(%)
Orthopedics	4.1	22.4
Urology	4.9	19.4
Neurosurgery	9.9	35.6
Thoracic and cardiac surgery	10.8	23.0
Vascular surgery	16.1	18.0
Obstetrics	1.5	38.3
Neonatology	0.6	25.8
General surgery	7.0	28.0
General Medicine	3.6	30.9
P value	<0.001	0.64

Brennan TA, et al. Incidence of adverse events and negligence in hospitalized patients: results of the Harvard Medical Practice Study I. N Engl J Med. 1991;324:
370-6.

Table 2: Types of Adverse Events and Proportion of Events Involving Negligence in New York State (198.4)

Type of Event	In Population(%)	Due to Negligence(%)	With Serious Disability(%)
Operative			
Wound infection	13.6	12.5	17.9
Technical complication	12.9	17.6	12.0
Late complication	10.6	13.6	35.7
Non-technical complication	7.0	20.1	43.8
Surgical Failure	3.6	36.4	17.5
Non-operative			
Drug-related	19.4	17.7	14.1
Diagnostic mishap	8.1	75.2	47.0
Therapeutic mishap	7.5	76.8	35.0
Procedure-related	7.0	15.1	28.8
Fall	2.7	--	--
Fractures	1.2	--	--
Postpartum	1.1	--	--
Anesthesia-related	1.1	--	--
Neonatal	0.9	--	--
P value	<0.01		

Leape LL, et al. The nature of adverse events in hospitalized patients: results of the Harvard Medical Practice Study II. N Engl J Med. 1991;324:377-84.

2.2. GOALS, WHICH CAN BE REACHED BY TEACHING THE MEDICAL AND NURSING TEAMS:

(1) To become familiar with common patient safety definitions.

(2) To become familiar with the theory for the occurrence of adverse events/medical errors in the healthcare system.

(3) To become familiar with major inpatient studies and reports on adverse events/medical errors.

(4) To become familiar with major post discharge studies on adverse events/medical errors.

(5) To become familiar with the common types of adverse events.

(6) To become familiar with recommendation that may prevent adverse events/medical errors in the healthcare system.

3. PATIENT SAFETY: DEFINITIONS AND APPLICATIONS

In the medical sector, errors / adverse events can occur whether as result of execution: Failure of the planned action to be completed as intended or mistakes of planning in sense of having a wrong plan to achieve an aim. See Figures 2-8 and Tables 3-7.

Errors can be defined as: Medical error, defined as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim:

- Adverse event, defined as an injury caused by medical management rather than by the underlying disease or condition of the patient.
- Preventable adverse event, defined as an adverse event injury that could have been avoided as a result of an error or system design flaw.
- Ameliorable adverse event, defined as an injury whose severity could have been substantially reduced if different actions or procedures had been performed or followed.
- Negligence, defined as whether the care provided failed to meet the standard of care reasonably expected of an average physician qualified to take care of the patient in question.
- Error of omission, occurs when a necessary procedure or intervention failed to be performed leading to morbidity or mortality to the patient involved.

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- Most medical errors do not result in medical injury, though some do, and these are termed preventable adverse events.
- Many adverse events are neither preventable nor ameliorable.
- If mistakes were caused by error(s) – it is preventable.
- 66% of all adverse events are surgical.
- 50% of all adverse events are preventable.

Figure 2: Relationship between medical errors, potential adverse events and adverse events.

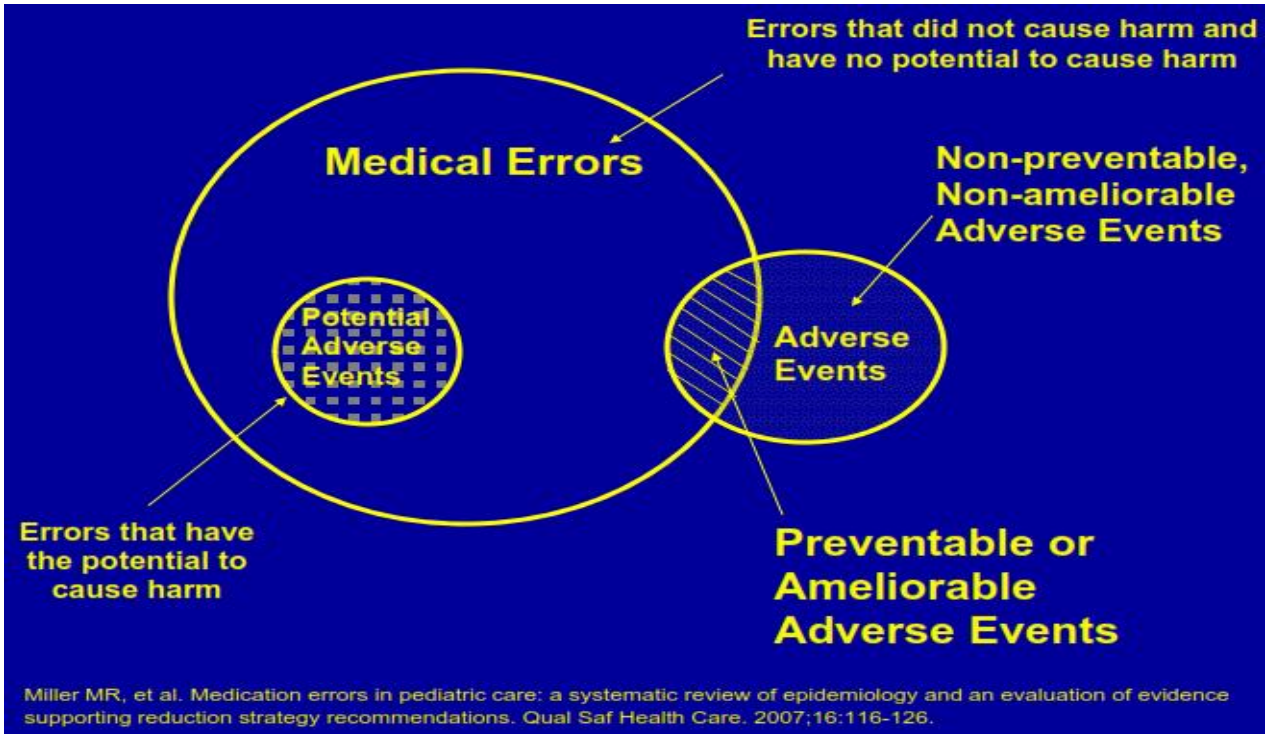

Figure 3: Patient safety and the correct environment as prime duty of several professionals in the health care.

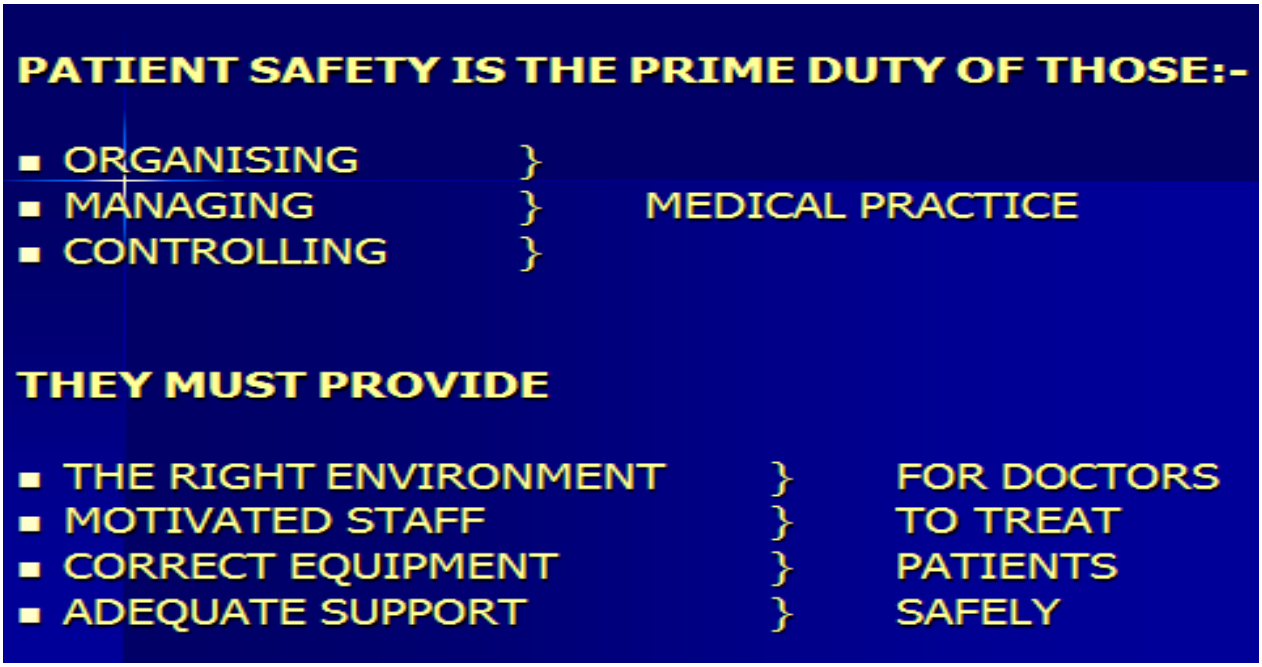

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Figure 4: Comparison of Median Length of Stay (Days) for Hospitalizations with Patient Safety Indicator (PSI) Events Versus Hospitalizations without PSI Events in the VA (Year 2001). VA: Veterans Health Administration; VA is an ideal setting in which a comprehensive, clinically integrated electronic medical record (EMR) is available, which enables centralized access to detailed clinical data and provides a reliable and efficient method for data collection.

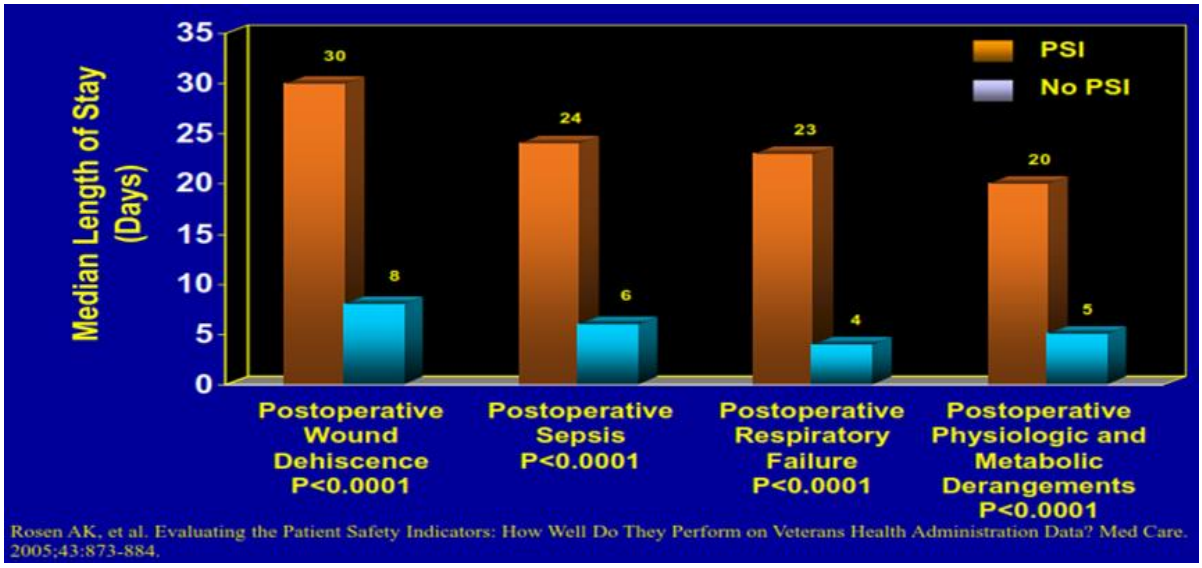

Figure 5: Comparison of In-Hospital Mortality (Deaths per 1000) for Hospitalizations with PSI Events Versus Hospitalizations without PSI Events in the VA (Year 2001).

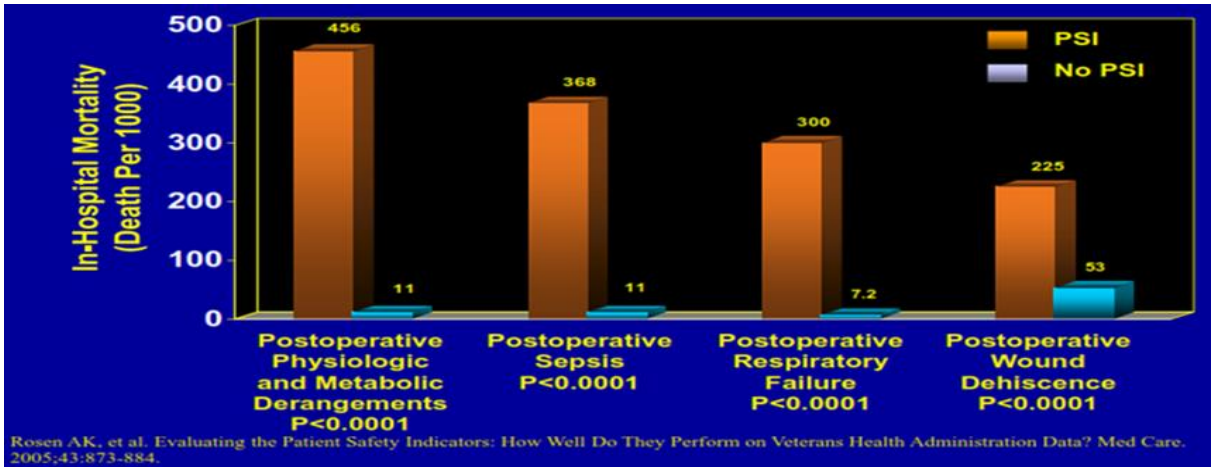

Figure 6: Causes of medical errors and adverse events: Up to 93% of the errors and adverse events are according poor information transfer and faulty communication.

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Figure 7: The Most Common Drugs Causing Post-Discharge Adverse Events. Notice: Most of the adverse events are caused by antibiotics.

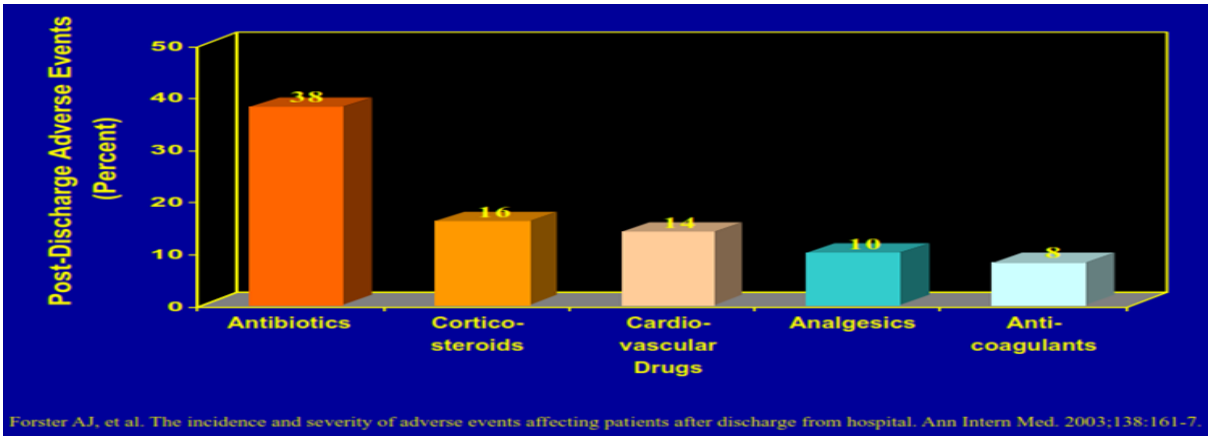

Figure 8: The adverse event (AE) rate after discharge from the hospital. (1): 19-23% of patients had been presented with 58% of the AE, (2) 15-18% of patients had been presented with 35% of the AE and (3) 4-7% of the patient had been presented with 8% of the AE.

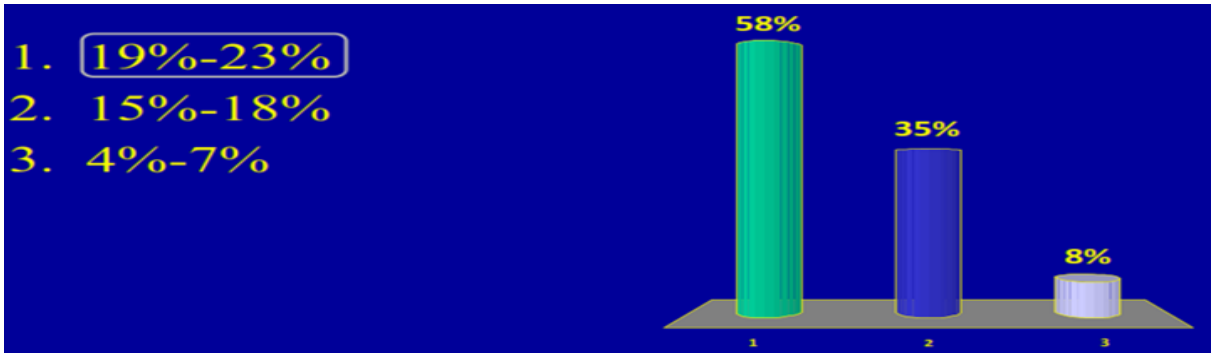

Table 3: Sites of Care that Resulted in Adverse Events in- and outside the hospital in New York State (1984).

Site of Care	In Sample(%)	Due to Negligence(%)	With Serious Disability(%)
In hospital			
Operating room	41.0	13.7	22.0
Patient's room	26.5	41.1	30.4
Emergency room	2.9	70.4	24.8
Labor and delivery room	2.8	27.7	9.8
Intensive care unit	2.7	30.2	50.4
Radiology	2.0	36.9	35.4
Cardiac catheterization laboratory	0.9	--	--
Ambulatory care unit	0.8	--	--
Outside hospital			
Physician's office	7.7	31.2	21.0
Home	2.7	11.4	8.2
Ambulatory care unit	1.4	53.6	13.7
Nursing home	0.9	--	--
P value	<0.01		

Leape LL, et al. The nature of adverse events in hospitalized patients: results of the Harvard Medical Practice Study II. N Engl J Med. 1991;324:377-84.

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Table 4: Types of Adverse Events and Proportion of Events Involving Negligence and serious disability incidences of patients with surgical and non-surgical issues in New York State (1984)

Type of Event	In Population(%)	Due to Negligence(%)	With Serious Disability(%)
Operative			
Wound infection	13.6	12.5	17.9
Technical complication	12.9	17.6	12.0
Late complication	10.6	13.6	35.7
Non-technical complication	7.0	20.1	43.8
Surgical Failure	3.6	36.4	17.5
Non-operative			
Drug-related	19.4	17.7	14.1
Diagnostic mishap	8.1	75.2	47.0
Therapeutic mishap	7.5	76.8	35.0
Procedure-related	7.0	15.1	28.8
Fall	2.7	--	--
Fractures	1.2	--	--
Postpartum	1.1	--	--
Anesthesia-related	1.1	--	--
Neonatal	0.9	--	--
P value	<0.01		

Leape LL, et al. The nature of adverse events in hospitalized patients: results of the Harvard Medical Practice Study II. N Engl J Med. 1991;324:377-84.

Table 5: Drug-Related Adverse Events, According to Class of Drug Involved in New York State (1984). Notice: The most adverse events are related to antibiotic medication.

Drug Class	Adverse Events (%)
Antibiotic	16.2
Anti-tumor	15.5
Anticoagulant	11.2
Cardiovascular	8.5
Anti-seizure	8.1
Diabetes	5.5
Antihypertensive	5.0
Analgesic	3.5
Anti-asthmatic	2.8
Sedative or hypnotic	2.3
Antidepressant	0.9
Antipsychotic	0.7
Peptic ulcer	0.5

Leape LL, et al. The nature of adverse events in hospitalized patients: results of the Harvard Medical Practice Study II. N Engl J Med. 1991;324:377-84.

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Table 6: Sites of Care that Resulted in Adverse Events (in hospital and outside hospital) in New York State (1984).

Site of Care	In Sample(%)	Due to Negligence(%)	With Serious Disability(%)
In hospital			
Operating room	41.0	13.7	22.0
Patient's room	26.5	41.1	30.4
Emergency room	2.9	70.4	24.8
Labor and delivery room	2.8	27.7	9.8
Intensive care unit	2.7	30.2	50.4
Radiology	2.0	36.9	35.4
Cardiac catheterization laboratory	0.9	--	--
Ambulatory care unit	0.8	--	--
Outside hospital			
Physician's office	7.7	31.2	21.0
Home	2.7	11.4	8.2
Ambulatory care unit	1.4	53.6	13.7
Nursing home	0.9	--	--
P value	<0.01		

Leape LL, et al. The nature of adverse events in hospitalized patients: results of the Harvard Medical Practice Study II. N Engl J Med. 1991;324:377-84.

Table 7: Common Types of Post-Discharge Adverse Events with Incidence Rates (IR), preventable and ameliorable.

Adverse Event Type	IR	Preventable IR	Ameliorable IR
Drug Related*	72%	N/A	N/A
Drug Related¶	66%	50%	76%
Drug Related†	25%	11%	28%
Procedure Related¶	17%	8%	12%
Procedure Related*	7%	N/A	N/A
Therapeutic Errors*	16%	N/A	N/A
Nosocomial Infections*	11%	N/A	N/A
Nosocomial Infections¶	5%	0%	4%
Pressure Ulcers*	7%	N/A	N/A
Diagnostic Errors*	6%	N/A	N/A
Falls¶	4%	8%	0%
Falls*	2%	N/A	N/A

IR=Incidence Rate. N/A=Not Available.
*Forster AJ, et al. Adverse events among medical patients after discharge from hospital. CMAJ. 2004;170:345-349.
¶Forster AJ, et al. The incidence and severity of adverse events affecting patients after discharge from hospital. Ann Intern Med. 2003;138:161-7.
†Gandhi TK, et al. Adverse drug events in ambulatory care. N Engl J Med. 2003;348:1556-64.

3.1. DIAGNOSTIC ERRORS:

Diagnostic error is defined as a diagnosis that is missed, wrong, or delayed, as detected by some subsequent definitive test or finding. Not all diagnostic errors result in harm to the patient, and harm may be due to either disease or intervention.

Misdiagnosis related harm, is defined as preventable harm that results from the delay or failure to treat a condition actually present (when the working diagnosis was wrong or unknown) or from treatment provided for a condition not actually present.

See also: Tsilimingras D, et al. Patient Safety in Geriatrics: A Call for Action. J Gerontol Med Sci. 2003;58A:813-819.

Newman-Toker DE, et al. Diagnostic errors: the next frontier for patient safety. JAMA. 2009;301:1060-1062.

An estimated 40,000 to 80,000 hospital deaths result from misdiagnosis annually in the USA. Approximately 5% of autopsies reveal lethal diagnostic errors. During a hospitalization (Harvard Medical Practice Study), 8% of adverse events resulted from misdiagnoses, 75% of misdiagnoses were considered negligent, and 47% of misdiagnoses resulted in serious disability to the patient. After discharge from the hospital (Canadian PostDischarge Study), 6% of adverse events resulted from misdiagnoses. See Figures 8-9.

See also: Newman-Toker DE, et al. Diagnostic errorsthe next frontier for patient safety. JAMA. 2009;301:1060-1062.

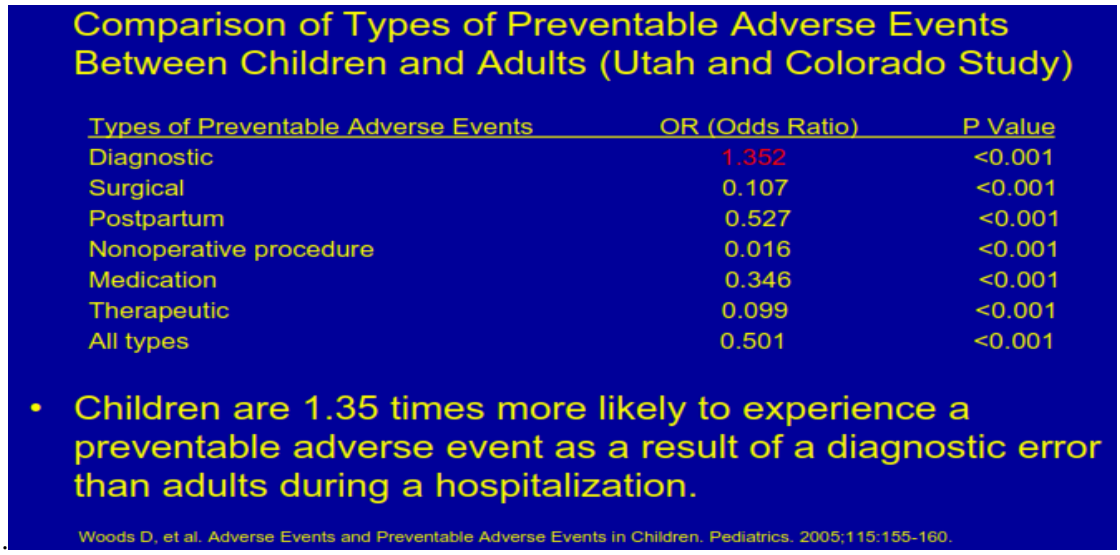
Leape LL, et al. The nature of adverse events in hospitalized patients: Results of the Harvard Medical Practice Study II. N Engl J Med. 1991;324:377-84.

Forster AJ, et al. Adverse events among medical patients after discharge from hospital. CMAJ. 2004;170:345-349.

3.2. PATIENT SAFETY IN CHILDREN AND ADULTS:

Healthcare is a working practice with possible deficits during transfer of patient, poor team coordination, time pressure, poor awareness of handover protocols, lack of consistency in handover practice, poor handover / endorsement of important information and awareness, that handover was a potential threat to patient safety; especially in pediatric patients, who normally cannot recognize or prevent the mistakes in the health care [46-59, 67-84, 90-93, 95-103, 124-139, 158-162]. Types of preventable adverse events in pediatric and adult patient are different. Many studies revealed this fact. (See Figure 9)

Figure 9: Diagnostic Errors in pediatric and adult patients. Notice: Pediatric patients are 1.35 times more likely to experience preventable adverse events than adult patients.



3.3. RECRUITMENT FOR SURGICAL TRAINING:

Special skills are required such as communication, clinical aptitude and attitude, manual dexterity, physical skills, psychometric testing. It is extremely necessary to select, with these criteria, surgeons for training on patient safety in surgical procedures.

3.4. HOW TO IMPROVE PATIENT SAFETY?:

A good surgeon knows when not to operate. However, big incisions are sometimes more effective than small incisions. Use of drains and nasogastric tubes is sufficient in many cases. Colon preparation might help in many abdominal surgeries along with perioperative application of antibiotics. Following facts are important:

- Investgative facilities should be available such as MRI, CT and US.
- Good clinical skills are essential.
- Dedication and work discipline are required (repeated frequent examinations).
- Basic laboratory facilities should be available.
- Surgery without proper resources is bad practice, potentially dangerous and unacceptable.
- Surgery of contaminated areas should be discouraged if appropriate antibiotics are not available.
- Surgery without proper resources is bad practice, potentially dangerous and unacceptable.

3.5. THE THREE MAIN CAUSES OF ADVERSE EVENTS IN SURGICAL CARE:

1. Poor Infection Control Methods: Everyone has a responsibility to decrease the opportunities for contamination of clothing, hands and equipment that have been associated with transmission routes.

2. Inadequate Patient Management can cause infections and postoperative sepsis, cardiovascular complications, respiratory complications, thromboembolic complications and implant problems.

3. Failure by Health-Care Providers to communicate effectively: Communication before, during and after operative procedures is very necessary. One of the biggest problems in the operating environment is miscommunication between surgeons, anaesthesists and nursing.

3.6. HEALTH PROVIDERS IN SURGERY:

Each member's role should be well and clear defined for doctors and nursing. Use of checklists should be a routine method to prevent errors in surgical procedures. Anesthesia providers lead in Operating Room and Intensive Care Unit (OR-ICU) and to hand-over the patient to normal ward and / or ICU. Healthcare studies showed that 2/3's fewer technical errors can be avoided, if there is a leadership / coordination model.

3.7. STRENGTHS AND IMPACT OF A SURGICAL SAFETY CHECKLIST:

It should be deployable in an incremental fashion, supported by scientific evidence and expert consensus, evaluated in diverse settings around the world. It must ensure adherence to established safety practices. For the checklist, minimal resources are usually required to implement a far-reaching safety intervention. See Figure 10-12.

Figure 10: Evaluation of preoperative checklist; Article in the New England Journal of Medicine in the year 1986 about team briefing among surgeons, nurses and anesthesiologists to reduce failures in communication.

ORIGINAL ARTICLE

Evaluation of a Preoperative Checklist and Team Briefing Among Surgeons, Nurses, and Anesthesiologists to Reduce Failures in Communication

Lorelei Lingard, PhD; Glenn Regehr, PhD; Beverley Orser, MD, PhD; Richard Reznick, MD, MEd; G. Ross Baker, PhD; Diane Doran, RN, PhD; Sherry Espin, RN, PhD; John Bohnen, MD; Sarah Whyte, MA

Objective: To assess whether structured team briefings improve operating room communication.

Design, Setting, and Participants: This 13-month prospective study used a preintervention/postintervention design. All staff and trainees in the division of general surgery at a Canadian academic tertiary care hospital were invited to participate. Participants included 11 general surgeons, 24 surgical trainees, 41 operating room nurses, 28 anesthesiologists, and 24 anesthesia trainees.

Intervention: Surgeons, nurses, and anesthesiologists gathered before 302 patient procedures for a short team briefing structured by a checklist.

comes were the number of checklist briefings that demonstrated "utility" (an effect on the knowledge or actions of the team) and participants' perceptions of the briefing experience.

Results: One hundred seventy-two procedures were observed (86 preintervention, 86 postintervention). The mean (SD) number of communication failures per procedure declined from 3.95 (3.20) before the intervention to 1.31 (1.53) after the intervention ($P < .001$). Thirty-four percent of briefings demonstrated utility, including identification of problems, resolution of critical knowledge gaps, decision-making, and follow-up actions.

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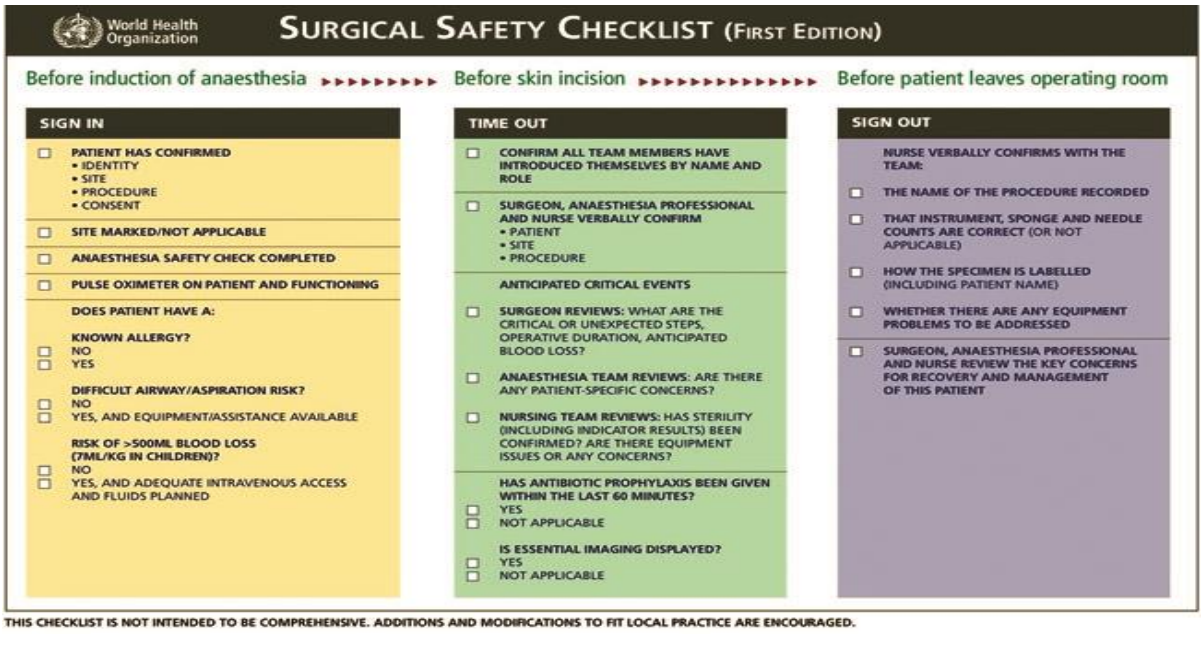
Figure 11: Overview about development of the surgical safety checklist

3.8. SURGICAL SAFETY CHECKLIST (PROOFED BY WHO);

It is a verbal tool, which is not intended to be part of the patient's health record. Value of the checklist is not reflected in the completion of a form. Important is to avoid the phenomenon of "tick and flick". Responsibility for implementing and ensuring adherence to all components rests with one or more representatives from surgeon, anesthesiologist, and nursing.

Figure 12: Surgical Safety Checklist, which is proofed by WHO for validity and practicability.



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3.9. ELEMENTS / OBJECTIVES OF SAFE SURGERY:

Hospitals and public health systems will establish routine surveillance of surgical capacity, volume, and results in order to achieve the most possible safety for the patient.

The team (with the members surgeon, anaesthesist, nursing) in the operation room (OR) will operate on the correct patient at the correct site, which was marked previously on the ward before shifting the patient to operation theatre (OT). The team will use methods known to avoid harm from the administration of anesthesia, while protecting the patient from pain. The team will recognize and effectively prepare for life threatening loss of the patient's airway or respiratory function and it will recognize and effectively prepare for the possibility of high blood loss. The team members will avoid inducing any allergic or adverse drug reaction known to be a significant risk for the patient and it will consistently use methods known to minimize the possibility of surgical site infection.

The team will work to avoid the inadvertent retention of instruments or sponges in surgical wounds and will secure and accurately identify all surgical specimens (for Laboratory / Histopathology / Microbiology / ETC.).

The team members will effectively communicate and exchange critical patient informations for the safe conduct of the operation.

3.10. COMPLETION OF THE CHECKLIST:

It is a verbal tool, which is not intended to be part of the patient's health record. Value of the checklist is not reflected in the completion of a form. Important is to avoid the phenomenon of "tick and flick". Responsibility for implementing and ensuring adherence to all components rests with one or more representatives from surgeon, anesthesiologist, and nursing.

Responsibility to carry out the checklist lies with all members of the team and every team member must feel comfortable in initiating the process.

3.11. PATIENT AWARENESS EDUCATION:

The nurse in the preoperative area shall review the purpose of the Surgical Safety Checklist with the patient during the preoperative assessment. Information reviewed with the patient should not be new information as all of the elements of the checklist should have been provided to the patient during the Informed Consent process.

3.12. COMPONENTS OF THE CHECKLIST:

Checklist is divided into three (3) components: Briefing, Time-Out and Debriefing. Items on the Checklist, that are not applicable to the procedure being performed, are not required to be completed.

3.13. BRIEFING:

At a minimum, required are the presence of anesthesiologist and nursing and this is performed before induction of anesthesia with the awake patient and participation. Refusal of patient to participate requires documentation. Verbal confirmation with the patient for the identity using two patient identifiers is necessary. Consent for surgery should be available with type of procedure planed, site (side and/or level of surgery) and the site should be marked, if possible. If patient does not want the surgery, this has to be documented and the patient goes straight back to the ward.

Allergies and any specific infection control precautions should be documented. Venous thromboembolism (VTE) prophylaxis should be confirmed if needed. Confirmations of throboembolic disease (TED) hose / Sequential Compression device (SCD) have or will be applied as per surgeon request &/or hospital policy. Equipment, instrument(s) and/or implant(s) concerns should have been clarified before surgery, especially to confirm availability of special equipment required.

Anesthesia safety checklist should have been completed in accordance with local / departmental policies: ASA score of the patient at least should be known to all team members in the OR. Specific problems with difficult Airway / Anesthesia Risk should be clear along with confirmation of a possible difficult airway anticipated or likelihood of pulmonary aspiration of gastric contents.

If there is a risk of > 500ml of blood loss, blood should be arranged along with included PT/PTT/INR concerns.

Medications or morbidities that may lead to complications and any intention to transfuse blood products should be clear before surgical interventions including confirmation of the availability of blood products, if these should be required.

Postoperative destination of the patient should be clear before start with surgery (ICU / normal ward.

3.14. TIME-OUT:

At a minimum, it requires surgeon, anesthesiologist, and nurse(s) to be present. This is performed after induction with preparing/draping immediately prior to surgical incision. Team members are identified by name and role. If previously introduced, it is not required to repeat this step. Then following to be confirmed:

- Team members verbally to confirm: Correct Patient; Correct Procedure; and Correct Site.
- Antibiotic prophylaxis (ABP) is to be given within the appropriate time frame.
- If ABP is administered, when is the next dose due and to consider antibiotic circulation time and duration of tourniquet time.
- Essential imaging should be available and displayed.
- Team communicates anticipated complications. If all these questions are answered, then surgery can be started.

3.15. DURING SURGERY:

Leadership in the OR is lying in the hand of anesthesia. It's always a team work and proper communication between all the team members. The surgeon should operate effectively, safely and properly. In case of life saving, priority is also given for safety. Surgeon should minimize blood loss / temperature loss and if possible to minimize duration of operation. Surgeon will operate with continuous communication with anesthesia and risky and uncalculated manouvres to be avoided. In case of complication, a senior surgeon / doctor should be called.

3.16. DEBRIEFING:

At a minimum, it requires surgeon, anesthesiologist, and nurse(s) to be present and it's performed during or immediately after wound closure before the patient is transferred from the operating room. It should be initiated when informing the surgeon that "Count is Correct". The nurse informs verbally confirms with the entire team. Confirmation of procedure performed as stated by surgeon, verbal confirmation of specimen details, verbal confirmation of surgical count; and identification of equipment problems.

Surgeon reviews with the entire team the summary of important intra-operative events and the surgeon indicates the management plans.

The anesthesiologist reviews with the entire team a summary of important intra-operative events, confirms blood/fluid loss, informs about recovery plans including concerns/issues related to postoperative care, confirms normothermia / haemodynamic stability. Handover to destination should be performed by Anaesthesist and Surgeon including postoperative and treatment Plan with endorsement & detailed documentation.

Discussion among all team members to be initiated about: Is there anything we could have done better / differently? What did we do well? What did we learn?

3.17. CENTRAL PROBLEMS IN SURGICAL SAFETY:

This issue is permanently unrecognized as public health issue. Lack of data on surgery and outcomes is almost there and even though the OR team members know what to do, but they do not do it consistently. It's extremely important to develop more awareness for this issue.

3.18. FOUR CATEGORIES FOR SURGICAL STANDARDS (BOX):

- (1) Control of infection and contamination.
- (2) Anesthesia and patient monitoring.
- (3) Surgical operator.
- (4) Quality assurance.

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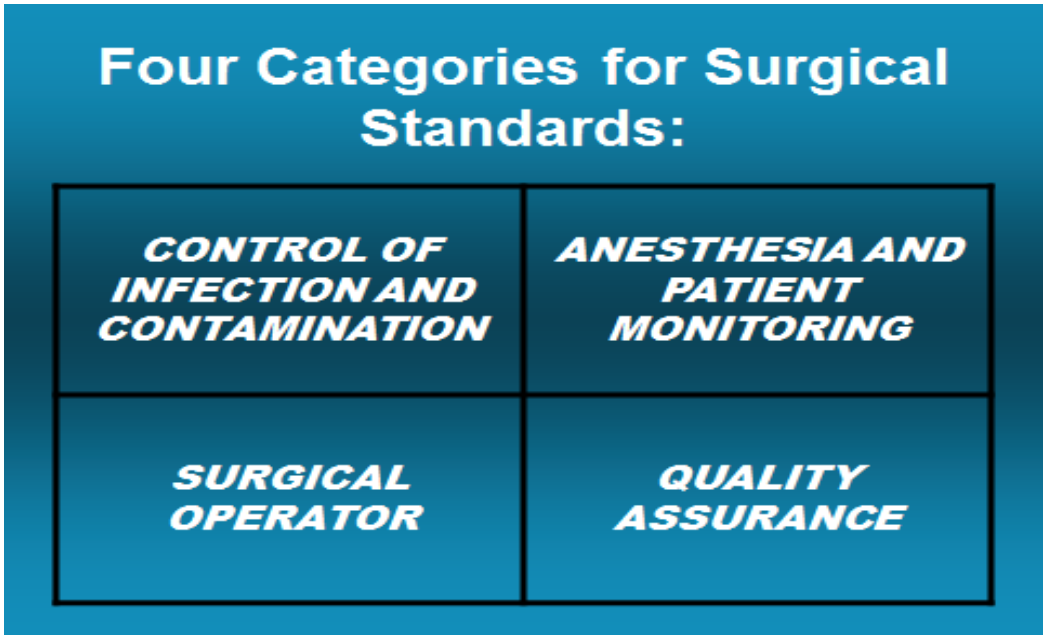
Box: Four categories for surgical standards



3.19. ACT TO MINIMIZE SPREAD OF INFECTION:

Before any contact with each and every patient:

- Clean hands before and after touching / contact with a patient, before an aseptic task, after any risk of exposure to body fluids and after contact with patient surroundings.
- Encourage Others to Participate in Infection Control.
- Correct hand washing / scrub for nurses and surgeons.

4. COMMUNICATION, COORDINATION AND LEADERSHIP

The root cause of nearly 70% of the events reported to the Canadian Joint Commission from 1995-2005 was communication. Medical errors and adverse events can result primarily and mainly because of miscommunication.

In the modern medical practice, the anesthesiologist is given the function of leadership in OR and coordination responsibility for hand over to ICU / normal ward. There are defined phases of equipment/technology handover, information handoff, discussion & further treatment plan for the patient.

Checklists are designed and used by all team members, who are involved in the treatment of the patient. All the concerned persons should have formal training on protocols, standards and guidelines for the patient safety in surgical procedures.

The surgical safety checklist is a tool to promote patient safety in the perioperative period and it's intended to give teams a simple, efficient set of priority checks for improving effective teamwork and communication and to encourage active consideration of the safety of patients as an important and necessary issue in every operation performed.

4.1. MODEL OF SBAR COMMUNICATION WITH PERFORMANCE / IMPROVEMENT:

The checklist is providing all important safety elements reviewed by all OR teams, for all patients at all periods of patient's presence in the OR, promote teamwork and communication. Surgical checklist offers preparedness for the unexpected and it promotes an environment that allows anyone on the team to speak up if patient safety is at risk with the aims: Correct patient, operation and operative site, safe anesthesia and resuscitation devices and to minimize the risk of infection perioperatively. Communication should be between all the members in the OR and it promotes patient safety. See Figures 13-15.

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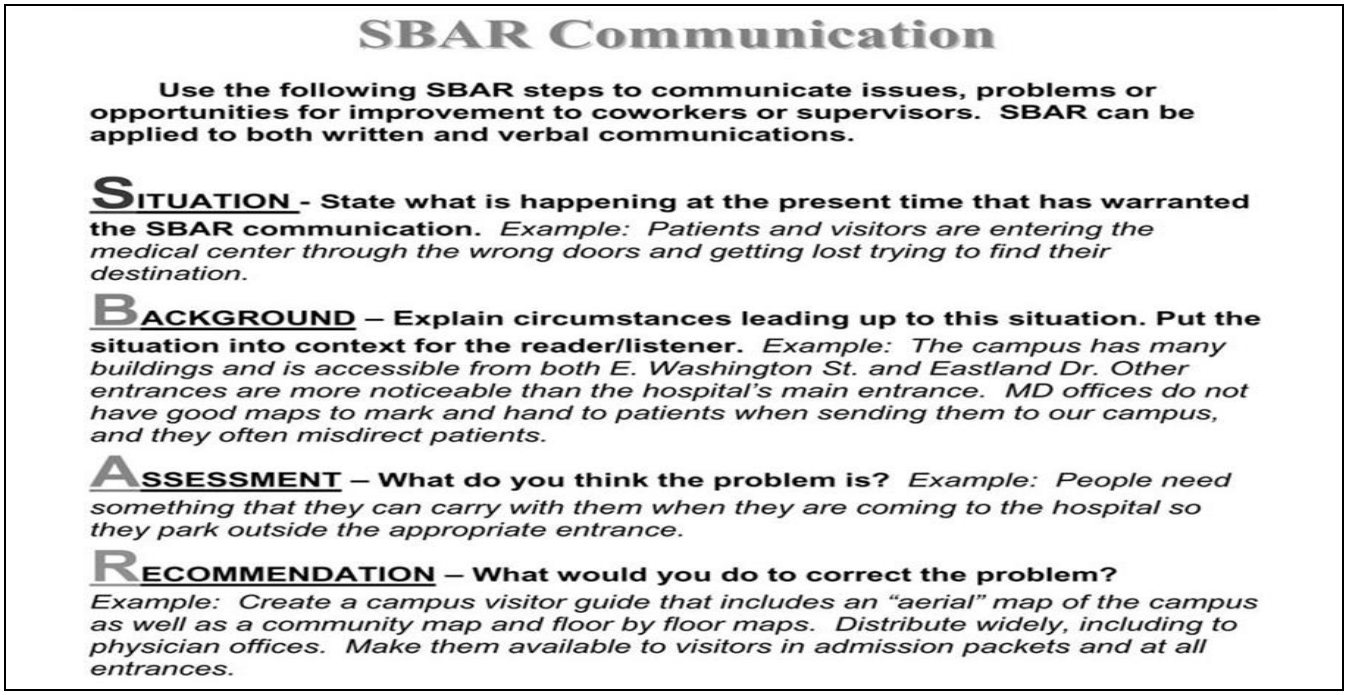
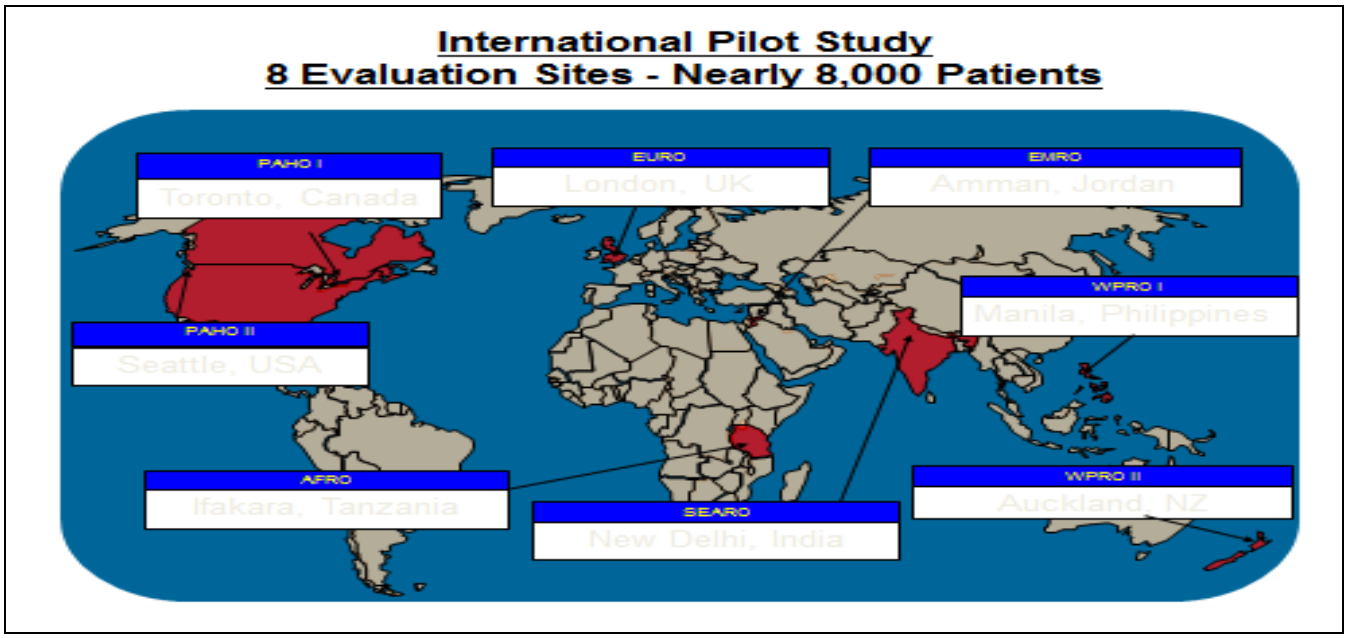
Figure 13: The SBAR model continues recognizing of situation / background & assessment/recommendations, how to correct the problems. Steps to communicate issues, problems or opportunities for improvement to co-workers or supervisors.



4.2. RESULTS FROM THE INTERNATIONAL PILOT STUDY:

- All of the centres have used the same Standards / Guidelines / Criteria / Checklist for the operative procedures.
- Minimizing of perioperative Risks / Complications / Mortality / Morbidity.
- Increasing of patient satisfaction and safety.
- Teamwork and Communication were established in a better way.
- If I were having an operation, I would want the checklist to be used. (Opinion of the majority of doctors and nurses with 92.6%, who were involved in the study).

Figure 14: International pilot study distributed all over the world for implementation of a WHO proven Surgical Safety Checklist Steps in Seattle, Ifakara, New Delhi, Auckland, Manila, Amman, London and Toronto.



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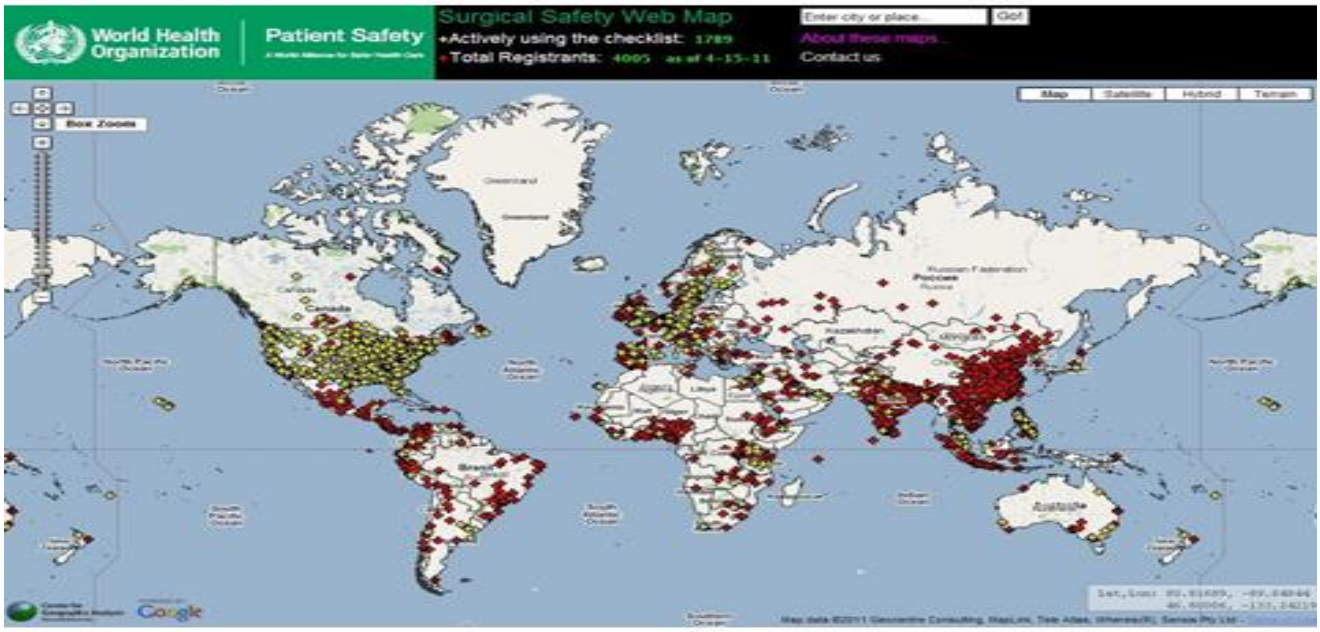
4.3. GLOBAL SURGICAL SAFETY WEB MAP:

After examination and evaluation of many centers worldwide, a web map was performed as assistance and assessment for improvement. (Developed by World Health Organization WHO).

Figure 15: Surgical Safety Web Map; Yellow to be considered with more, red with less patient safety.



5. RECOMMENDATIONS FOR IMPROVEMENT

(A) Identifying System Failures: If a misdiagnosis is not detected or reported, the identification of systemic failures and the initiation of immediate medical attention (for a condition that was missed) will not occur. The failure to identify systemic failures and to initiate immediate medical attention will result in avoidable harm to patients. Physicians must detect and report a misdiagnosis and he must identify underlying system failures that resulted in a misdiagnosis.

Tsilimingras D, et al. Patient Safety in Geriatrics: A Call for Action. J Gerontol Med Sci. 2003;58A:813-19.

By outlining the sequence of clinical events that led to a misdiagnosis, physicians would be able to identify systemic failures and develop solutions to reverse their outcome.

Tsilimingras D , et al. Addressing Post-Discharge Adverse Events: A Neglected Area. Joint Commission Journal on Quality & Patient Safety. 2008;34(2):85-97.

(B) Improving Information Transfer Through Strategic Use of Electronic Health Records (EHRs) with implementing inpatient and outpatient EHRs, Linking inpatient and outpatient EHRs and creating and linking patient personal EHRs.

Tsilimingras D, et al. Addressing Post-Discharge Adverse Events: A Neglected Area. Joint Commission Journal on Quality & Patient Safety. 2008;34(2):85-97. Tsilimingras D, et al. Addressing Post-Discharge Adverse Events: A Neglected Area. Joint Commission Journal on Quality & Patient Safety. 2008;34(2):85-97.

(C) Implementing Computerized Physician Order Entry (CPOE) & computerized alert monitors within EHRs in hospitals and home care, to properly transfer a patient's drug info between inpatient and outpatient pharmacies (and vice-versa), these systems have reduced prescribing errors by more than 50% and these systems are effective and imperative for reducing the rate of potential adverse drug events.

Tsilimingras D, et al. Patient Safety in Geriatrics: A Call for Action. J Gerontol Med Sci. 2003;58A:813-19.

(D) An early intervention by a pharmacist can improve poor information transfer and faulty communication between inpatient and outpatient care in addition to EHRs.

Tsilimingras D, et al. Addressing Post-Discharge Adverse Events: A Neglected Area. Joint Commission Journal on Quality & Patient Safety. 2008;34(2):85-97.

(E) Implementing structured database-generated physician discharged summaries and implementing structured cross-coverage sign-outs between physicians with implementing a comprehensive discharge planning process.

(F) Proper patient notification is required with follow-up of abnormal laboratory test results.

Tsilimingras D, et al. Patient Safety in Geriatrics: A Call for Action. J Gerontol Med Sci. 2003;58A:813-19. Tsilimingras D, et al. Addressing Post-Discharge Adverse Events: A Neglected Area. Joint Commission Journal on Quality & Patient Safety. 2008;34(2):85-97.

(G) Medication Reconciliation: A process of identifying the most accurate list of all medications a patient is taking at interfaces of care, which includes the identification of a medication's name, dose, frequency and route, and the subsequent use of this information to provide correct medications for patients within the health care system. This process also involves comparing a patient's current list of medications with a physician's admission, transfer, and/or discharge orders.

Tsilimingras D , et al. Addressing Post-Discharge Adverse Events: A Neglected Area. Joint Commission Journal on Quality & Patient Safety. 2008; 34(2):85-97.

(H) Utilizing Screening Methods to Identify Patients with Adverse Events: Proper inpatient computerized programs to identify medical or surgical complications and that combine microbiology, pharmacy, and clinical laboratory data to identify adverse events.

(I) Outpatient computerized programs which use proper codes and combine laboratory and pharmacy data to identify adverse events.

Tsilimingras D, et al. Addressing Post-Discharge Adverse Events: A Neglected Area. Joint Commission Journal on Quality & Patient Safety. 2008;34(2):85-97.

(J) Performing Root Cause Analysis (RCA) to identify the underlying system and organizational problems that led to the adverse event or events. It will not be practical for every adverse event and it should be performed when a pattern of events is identified or even a single very serious event. A systematic RCA may expose common root causes that link several serious adverse events at a particular time of occurrence and help design systems to prevent future incidents.

Tsilimingras D, et al. Addressing Post-Discharge Adverse Events: A Neglected Area. Joint Commission Journal on Quality & Patient Safety. 2008;34(2):85-97.

(K) Improving Residency and Fellowship Programs: No matter how clinically skilled physicians may be, they will not be able to provide optimal patient care unless the system is appropriately structured. Advocating for such a system is not easy and requires advocacy and management skills that are not part of current residency programs. Residency programs should emphasize the recommendations mentioned here and continue to emphasize skills in patient-centered care and evidence-based practice.

(L) Enhanced care can be achieved by adopting well established safety recommendations such as the ones mentioned above. The recommendations mentioned here, are only the tip of the iceberg in confronting the magnitude of this problem. Additional recommendations and further research in this area are critical in improving the quality and safety of patient care.

Tsilimingras D, et al. Addressing Post-Discharge Adverse Events: A Neglected Area. Joint Commission Journal on Quality & Patient Safety. 2008; 34(2):85-97. Tsilimingras D, et al. Patient Safety in Geriatrics: A Call for Action. J Gerontol Med Sci. 2003; 58A:813-19.

(M) Regular surgical mortality and morbidity meetings are extremely useful: Is the meeting structured? Is there an emphasis on education, re-evaluation / re-assessment and better understanding of patient's condition? Is prevention one of the discussion's goals? Do these meetings consider a core activity? Is everyone involved? Are all juniors encouraged to attend? How are deaths handled? Is a written summary of the discussions kept?

(N) The value of guidelines: Health-care professionals need to understand the reasons for the guidelines. Protocols and verification steps can minimize mistakes in patient identity. The benefit is, if everyday techniques can improve communication and minimize errors.

6. CONCLUSIONS

The safety and interests of the patient in invasive and surgical procedures are of paramount importance. These build the elementary rule in the health care system.

Safe surgery is a combination of three major elements: To ensure consistent outcomes, to prevent errors and to prevent patient's harm.

In surgical procedures, the checklist is more than a list of checks with steps to be done for every patient, at every time. It is a powerful tool to help health care providers to act, execute, facilitate and communicate, in order to achieve best safety for the patient.

In the modern medical practice, the anesthesiologist is given the function of leadership in OR and coordination responsibility for hand-over of the patient to ICU / normal ward.

Best proven practice tools (Checklists) must be implemented, and make them work for safety of patient is highly recommended. The entire team in the OR should be engaged to ensure safe patient care through competence, standardization, and consistent practice.

Healthcare providers should prevent harm through better communication and structured hand-offs. Guidelines can lead to prevent / minimize mistakes in patient safety.

Turn the hard-to-achieve into applicable and creative methods for professionals in health care.

Health care providers should participate in an educational process for reviewing surgical mortality and morbidity / case studies, should perform guidelines / standards / checklists in surgical care with well and clearly defined responsibilities in order to reach more

Safety / protection for the patient and support for healthcare providers are absolutely necessary and are goals, which cannot be divided from each other.

Regular mortality / morbidity meetings are very useful and can lead to better re-evaluation / understanding of the patient's findings / condition by the whole treating team members including the juniors. For the patient this can lead to minimize the mistakes, optimize the treatment plan and to avoid complications.

Patient's satisfaction and satisfaction of Physician / Nursing are reachable targets.

In the developed world, the foregoing items of patient safety are mostly available, so to improve patient safety, improvement of "safety culture" is concentrated upon. Some of the developing countries are far from above and a different forum is needed to address issues of provision of sound medical environment.

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