

Patient Safety and organizational Safety Culture in Surgery: A Need of an Hour in the developing countries

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Abstract

Every year, more than 200 million surgeries are performed around the world, and recent statistics show that adverse event rates for surgical pathologies remain unacceptably high, despite several national and global patient safety initiatives over the last decade. Patient safety is diverse and highly complicated in nature, with several critical components. Although concern for patient safety is fundamental in health care practice, its transition into knowledge is comparatively recent, and hence patient safety may be deemed a "new" field. Current surgical safety guidelines and checklists are generic and not adapted to specific patient concerns and risk factors in surgical subspecialties. All surgical practitioners and health care organizations must therefore become better aware of the fundamental context of patient safety, actively participate in endeavors to integrate patient safety measures in daily practice, and foster a patient safety culture. The purpose of this review article is to outline patient safety in surgical techniques that should be adopted and implemented.

Keywords: Patient safety; Quality; Health professions; Surgery.

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Introduction

Health care systems are under growing pressure to create effective, sound hospital systems in order to avoid sentinel events. The development of a patient-safety culture is critical in a systems-based approach to patient care and is the administrative focus of many surgical departments.¹ The recent surgical malpractice crisis, which revealed hospitals' susceptibility and the catastrophic effects that might result from public broadcast of a sentinel occurrence, has stimulated the promotion of patient safety. Errors in the operating room, in contrast to other medical settings, can be particularly devastating, with potentially high-profile ramifications for the surgeon and the institution. Numerous examples of potentially disastrous events, such as operating in the wrong location, performing the wrong procedure, forgetting sponges, unchecked blood transfusions, mismatched organ transplants, and unnoticed allergies, can be alleviated through better communication and safer hospital systems.²

Given the hazards of errors and bad events, as well as morbidity and death, the healthcare environment is seen as a high-risk setting, and health care services as a high-hazard sector. Damage, however unforeseen, has existed from the dawn of medical practice.^{3, 4} Patient safety is embedded in the practice of medicine and is a serious concern. However, it is only recently that it has been transformed into a specialized body of knowledge, and the objectification of the issue as a whole for health care practitioners, health managers, and policymakers has begun to evolve. To err is human: establishing a safer health system, an infamous report from the United States Institute of Medicine released in 1999, highlighted the fact that up to 98,000 people die in US hospitals each year due to preventable medical errors. These medical errors are frequently the consequence of human error, and they can be avoided with more effective practices and a strong organizational safety culture.⁵

Table 1. Common terminologies related to patient safety

| Terminologies | Definition |
|------------------------|--|
| Patient safety | Reduction (or elimination as far as possible) of damage to patients resulting from health care processes or accidents associated with them. |
| Health risk Management | Identification, evaluation, and treatment of problems that can cause harm to patients, lead to malpractice claims, and cause unnecessary economic losses to health care providers |
| Adverse event | An unanticipated side effect of medical treatment that results in treatment prolongation, morbidity, mortality, or other harm to which the patient should not have been exposed. |
| | Includes errors, accidents, delays in care, negligence, complications associated with treatment, etc. It does not include the symptoms of the patient's presenting illness. |
| | Adverse events may be preventable (e.g., prescription of a drug to which a patient is allergic as a result of failing to consult clinical records) or non-preventable (e.g., an adverse reaction to the administration of a local anesthetic in a patient without clinical pathology or an allergic history). However, the fact that an adverse event is not preventable does not imply that we should be unprepared to act promptly and appropriately if it occurs. |
| Error | A mistake made in health care practice by omission or commission, whether in planning (a planning error) or execution (an execution error). |
| | The error may or may not cause the occurrence of an adverse event. Although, by definition, all errors should be avoidable, the repetition of similar acts, in combination with organizational failures, makes this task particularly difficult. |
| Incident ('Near miss') | An event that almost causes harm to a patient, and that is avoided by luck or by an act at the last moment. |
| | Example: Administration of a penicillin-based antibiotic to an allergic patient because this information is missing from the patient's clinical records, which is avoided because the patient reads the prescription and reminds the practitioner of the allergy. |
| | Various studies estimate that many more near-miss incidents occur than real adverse events. In relation to the prescription of drugs, about seven times more incidents than complete adverse events are estimated to occur. |
| Accident | A random event that is unforeseen and unexpected, and causes damage to the patient, to materials, or to health care staff |
| Negligence | Mistake that is difficult to justify because it occurs through a lack of knowledge or basic skills, the omission of minimal precautions, or neglect. |
| Safety culture | An organization's culture of safety is the product of individual and group values, attitudes, perceptions, skills, and patterns of behavior, which lead to commitment, style, and ability in the management of the health and safety of an organization. |
| | Those organizations with a positive safety culture are characterized by communication based on mutual trust, shared perceptions of the importance of safety, and trust in the effectiveness of measures for prevention. |

The public outrage caused by the disclosure of these numbers impelled the problem of patient safety to the top of the priority lists of health professionals, managers, and hospital administration. As a result, patient safety has become a primary concern for everyone involved in health care.^{6,7} The goal of this review paper is to provide an overview of patient safety and organizational safety culture that should be adopted and executed to achieve safe patient care.

PATIENT SAFETY

Patient safety is perceived as the provision of safe health care or the protection of patients from harm by health care providers. This definition, however, does not comprise other key elements and facets of this complex discipline. Although both the patient and the practitioner are inherently involved in patient safety, economic, fiscal, social, cultural, and organizational aspects must also be acknowledged. Patient safety, though relatively a new discipline, has as its main objectives to facilitate the avoidance of preventable adverse events (accidents, errors, and complications) associated with health care and to limit the impact of inevitable adverse events.¹

The terminology 'patient safety' has pertained to the lack of a common terminology. To overcome this problem, the WHO has undertaken an ongoing project to develop a unified taxonomy. **Table 1** shows definitions proposed to facilitate a better understanding of the exact nature of patient safety based on the International Patient Safety Classification (ICPS) and other available sources.⁸⁻¹⁵

Patient safety also focuses on the analysis of the characteristics of health-care systems and on the identification of "latent risks." These latent risks are the system's characteristics, which can allow or even promote an adverse event to occur while providing care. The potential latent risks in a system are vast, including but not limited to the installation of a floor that becomes slippery when it is wet, the necessity that personnel work excessively long hours, and the manner in which clinical information is transferred between professionals. Typically, an undesirable outcome arises when many latent risks coexist. Therefore, the "Swiss Cheese Model," originally and formally propounded by Dante Orland ella and James T. Reason of the University of Manchester, represents the systems failure model.¹⁶ To varying degrees, every phase in a process has the potential for failure. The ideal system is analogous to a stack of Swiss cheese slices. The holes in the slices reflect the chances of a process failing, and each slice represents a "defensive layer" in the process. An issue may flow through a hole in one layer as a result of an error, but because the holes in the subsequent layers are in different locations, the problem is contained. Each layer would act as a barrier against potential errors that could influence the outcome. The greater the number of defenses and the fewer and smaller the holes, the more likely you are to detect and prevent errors.¹¹ The Swiss cheese model of accident causation illustrates that if hazards are aligned and levels

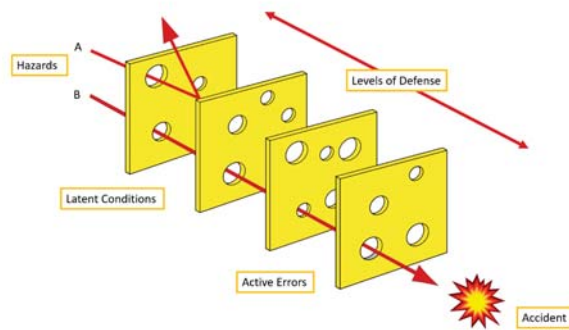


Figure 1. Swiss Cheese Model: A) Hazards are not aligned with the "holes" in the levels of defense, therefore, accidents are less likely to occur. B) Hazards are aligned and levels of defense do not lie between, therefore accidents can occur.

of defense do not lie between, the "holes" in each layer can allow the accident to occur (**Figure 1**).

PATIENT SAFETY IN SURGERY

For more than a century, surgical treatment has been a vital component of global health care. The impact of surgical intervention on public health systems will expand as the incidences of traumatic injuries, malignancies, and cardiovascular disease continue to rise. Every year, an estimated 234 million major procedures are conducted around the world, equating to one operation for every 25 people alive. However, surgical services are unevenly dispersed, with 75% of major procedures being performed on just 30% of the world's population. Despite the fact that surgical procedures can be cost-effective in terms of lives saved and disability avoided, access to high-quality surgical care remains a serious issue in much of the world.¹⁷⁻²⁰

Surgery is frequently the sole treatment that can alleviate impairments and lower the mortality risk from common diseases. Every year, an estimated 63 million people undergo surgical treatment for severe injuries, another 10 million for pregnancy-related problems, and 31 million more for malignancies. While surgical operations are meant to save lives, poor surgical care can cause significant harm. Regarding the ubiquity of surgery, this has serious public health implications.²¹ According to research, significant complications occur in 3–16% of inpatient surgical procedures in developed nations, with permanent impairment or mortality rates ranging from 0.4%–8.2%. According to studies, 5–10% of people die following major surgery in underdeveloped countries.²² The issue of surgical safety is well known around the world. Studies in wealthy countries demonstrate the scope and pervasiveness of the problem. Poor infrastructure and equipment, unreliable supply and drug quality, inadequacies in organizational management and infection control, insufficient personnel capacity and training, and chronic underfunding all contribute to the issues in developing countries. As a result,

a global effort to advocate a system-wide approach to safer surgical treatment has the potential to save the lives of millions of people around the world.²³⁻²⁷

To address surgical safety, WHO has launched a number of global and regional programs. The Global Initiative for Emergency and Essential Surgical Care and the Guidelines for Essential Trauma Care were both concerned with accessibility and quality. The second Global Patient Safety Challenge, Safe Surgery Saves Lives, focuses on surgical care safety. In January 2007, the World Alliance for Patient Safety began work on this challenge.²⁸ The purpose of this challenge is to improve surgical care safety worldwide by creating a core set of safety criteria that can be adopted in all WHO Member States. Working groups of international experts were formed to study the literature and the experiences of doctors worldwide. They came to an agreement on four areas where major improvements in surgical safety may be realized. These are: surgical site infection control, safe anesthesia, safe surgical teams, and surgical service measurement (**Table 2**).²⁹⁻³¹

The nature of the challenge Teamwork, safe anesthesia, and prevention of surgical site infection are fundamental to improving the safety of surgery and saving lives. Basic issues of infrastructure and the ability to monitor and evaluate any changes instituted must be considered and addressed.³⁰

Table 2. Four areas of major improvements needed for surgical safety

| Surgical resources and environment | | |
|---|--|--------------------------------------|
| Trained personnel, clean water, a consistent light source, consistent suction, supplemental oxygen, functioning surgical equipment, and sterile instruments | | |
| Prevention of Surgical Site Infection | Safe Anesthesia | Safe Surgical Teams |
| Hand washing | Presence of a trained anesthesiologist | Improved communication |
| Appropriate and judicious use of antibiotics | Professional anesthesia machine and medication | Correct patient, site, and procedure |
| Antiseptic skin preparation | Safety check | Informed consent |
| Atraumatic wound care | Pulse oximetry | Availability of all team members |
| Instrument decontamination and sterility | Heart rate monitoring | Adequate team preparation and |
| | Blood pressure monitoring | Planning for the procedure |
| | Temperature monitoring | Confirmation of patient allergies |
| Measurement of Surgical Services | | |
| Quality assurance | | |
| Peer review | | |
| Monitoring outcomes | | |

The conventional framework for safe intraoperative care in hospitals consists of a routine series of events - preoperative patient evaluation, surgical intervention, and preparation for proper postoperative care - each with its own set of hazards that can be reduced. Obtaining informed consent, confirming the patient's identity, the operating site, and the procedure to be performed, checking the integrity of the anesthetic machine and the availability of emergency drugs, and ensuring proper preparedness for intraoperative occurrences are all interventions that can be made during the preoperative phase.³² Appropriate and cautious antibiotic use, the availability of critical imaging, appropriate patient monitoring, efficient teamwork, competent anesthetic and surgical judgments, meticulous surgical technique, and good communication among surgeons, anesthesia professionals, and nurses are all expected to ensure a successful operation. Following the procedure, a clear plan of care, an understanding of intraoperative events, and a commitment to high-quality monitoring may all help to strengthen the surgical system, increasing patient safety and improving results. There is also an acknowledged requirement for qualified employees and operational resources, such as proper lighting and sterilization equipment. Finally, safe surgery necessitates continuous quality assurance and monitoring.³³⁻³⁵

ORGANIZATIONAL SAFETY CULTURE

The organizational safety culture is a critical part of patient safety and a complex phenomenon, since safety is regarded as an important aspect of service quality. It has even been proposed that patient safety begins with the implementation of a safety system at the organizational level, and that clinical error in acute-care hospitals can only be addressed by creating a safety culture.³⁶ A safety culture can be defined as "the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management" or "the shared attitudes, beliefs, values, or assumptions that underline how people perceive and act upon safety issues within their organizations."¹⁵ A culture of patient safety reflects an attitude that should permeate all activities of health professionals, the main objective of which is to avoid the occurrence of unnecessary damage to patients as a result of treatments provided in the field of healthcare.³⁸ A culture of patient safety differs totally from a "culture of blame." It does not look for individuals on whom to lay blame, but, rather, it identifies the "latent system mistakes" that can lead to errors by the whole surgical team. Finally, and fundamentally, it is a culture that compels us to share our experiences and data, both good and bad, with our colleagues so that everyone can learn from them.²⁷⁻³⁹ Although these terms are used interchangeably, the exact meanings of "safety culture" and "safety climate" are claimed to differ. As all health care organizations are expected to create a climate of patient safety as an organizational goal and a priority, the concepts of patient safety culture and safety climate and their implications for health care and organizations must be correctly understood by everyone involved in health care.⁴⁰⁻⁴²

Success in establishing a safety culture, with associated practices, may depend on prior success in achieving unidirectional, positive change in attitudes in order to create a safety climate. Although it is difficult to identify all of the specific elements of a safe health care organization, a recent literature analysis identified leadership, teamwork, evidence-based care delivery, communication, learning, and being just and patient-centered as important domains (subcultures) or core values of a safety culture. An institutional culture for safety survey highlighted design improvements in health care, strategic planning, learning from errors, commitment to leadership, documenting and improving patient safety, encouraging and practicing teamwork, detecting possible risks, and employing procedures for reporting and analyzing adverse events and assessing improvements as relevant.³⁷⁻³⁸

Key areas identified included strategic orientation to the establishment of a safety culture and quality improvement, open and transparent disclosure principles, health professional human resources crucial to ensuring patient safety practices, effective linkage between institutions involved in patient safety, national patient safety accountability initiatives, and collaborative team practice. In another survey, six cultural scales that emerged as relevant to patient safety were: making patient safety everyone's priority; teamwork; valuing individuals; open communication; learning, and empowering individuals.

Other authors have emphasized the importance of developing a "safety atmosphere" and predicting measurements of patient safety, as well as cultivating a non-punitive, open, and stimulating health care culture.^{27,39,40}

A safety culture is also suggested in order to demand the greatest level of professionalism while being firm and proactive. Because a supportive culture of patient safety is considered vital for enhancing patient safety, organizations have to attempt to define the concept of "safety culture," conduct staff surveys, develop performance improvement measures related to patient safety, develop tools, and identify failures in order to reorganize their organizations' work and culture.⁴¹⁻⁴⁵

Conclusion

Current surgical safety, guidelines and checklists are comprehensive and not optimized for specific patient issues and risk factors in various surgical subspecialties. As a result, it is critical for all surgical practitioners and health care organizations to become more aware of the overall context of patient safety, to actively participate in efforts to apply patient safety measures in everyday practice, and to develop a patient safety culture. The purpose of this review paper is to outline patient safety in surgical techniques that should be implemented and followed for safe patient care.

References

1. Vincent C, Moorthy K, Sarker SK, Chang A, Darzi AW. Systems approaches to surgical quality and safety: from concept to measurement. *Annals of surgery*. 2004 Apr;239(4):475.
2. America IO, Staff IO. Crossing the quality chasm: a new health system for the 21st century.
3. Sammer CE, Lykens K, Singh KP, Mains DA, Lackan NA. What is patient safety culture? A review of the literature. *Journal of nursing scholarship*. 2010 Jun;42(2):156-65.
4. Colla JB, Bracken AC, Kinney LM, Weeks WB. Measuring patient safety climate: a review of surveys. *BMJ Quality & Safety*. 2005 Oct 1;14(5):364-6.
5. Donaldson MS, Corrigan JM, Kohn LT, editors. *To err is human: building a safer health system*.
6. Singer SJ, Gaba DM, Falwell A, Lin S, Hayes J, Baker L. Patient safety climate in 92 US hospitals: differences by work area and discipline. *Medical care*. 2009 Jan 1;23-31.
7. Nicklin W, Mass H, Affonso DD, O'Connor P, Ferguson-Paré M, Jeffs L, Tregunno D, White P. Patient safety culture and leadership within Canada's Academic Health Science Centres: towards the development of a collaborative position paper. *Nursing Leadership (Toronto, Ont.)*. 2004 Mar 1;17(1):22-34.
8. Hofer TP, Kerr EA, Hayward RA. What is an error?. *Effective Clinical Practice*. 2000 Nov;3(6).
9. Bernstein M, Hebert PC, Etechells E. Patient safety in

- neurosurgery: detection of errors, prevention of errors, and disclosure of errors. *Neurosurgery Quarterly*. 2003 Jun 1;13(2):125-37.
10. Bates DW, Cullen DJ, Laird N, Petersen LA, Small SD, Servi D, Laffel G, Sweitzer BJ, Shea BF, Hallisey R, Vander Vliet M. Incidence of adverse drug events and potential adverse drug events: implications for prevention. *Jama*. 1995 Jul 5;274(1):29-34.
11. Robertson L. 1998. *Injury epidemiology*. New York: Oxford University Press.
12. Leape LL, Brennan TA, Laird N, Lawthers AG, Localio AR, Barnes BA, Hebert L, Newhouse JP, Weiler PC, Hiatt H. The nature of adverse events in hospitalized patients: results of the Harvard Medical Practice Study II. *New England journal of medicine*. 1991 Feb 7;324(6):377-84.
13. Health & Safety Commission. ACSNI human factors study group: third report. *Organising for safety*. London: HMSO. 1993.
14. Angelos P. Surgical ethics and the challenge of surgical innovation. *The American Journal of Surgery*. 2014 Dec 1;208(6):881-5.
15. Reason J. Human error: models and management. *Bmj*. 2000 Mar 18;320(7237):768-70.
16. Sickbert-Bennett EE, Weber DJ, Gergen-Teague MF, Sobsey MD, Samsa GP, Rutala WA. Comparative efficacy of hand hygiene agents in the reduction of bacteria and viruses. *American journal of infection control*. 2005 Mar 1;33(2):67-77.
17. Pittet D, Allegranzi B, Storr J, Donaldson L. 'Clean

- care is safer care': the global patient safety challenge 2005–2006. *International Journal of Infectious Diseases*. 2006 Nov 1;10(6):419-24.
18. Pittet D, Donaldson L. Challenging the world: patient safety and health care-associated infection. *International journal for quality in health care*. 2006 Feb 1;18(1):4-8.
 19. Ahmed QA, Memish ZA, Allegranzi B, Pittet D. Muslim health-care workers and alcohol-based handrubs. *Lancet*. 2006 Mar 25;367(9515):1025-7.
 20. Jha AK, Prasopa-Plaizier N, Larizgoitia IA, Bates DW. Patient safety research: an overview of the global evidence. *BMJ Quality & Safety*. 2010 Feb;19(1):42-7.
 21. Bates DW, Larizgoitia I, Prasopa-Plaizier N, Jha AK. Global priorities for patient safety research. *Bmj*. 2009 May 14;338.
 22. Hospital Healthcare Europe. 2008. Clean Care is Safer Care: linking healthcare behaviour to health policy. [online] Available at: <<https://hospitalhealthcare.com/news/clean-care-is-safer-care-linking-healthcare-behaviour-to-health-policy/>> [Accessed 12 June 2022].
 23. Sax H, Allegranzi B, Uckay I, Larson E, Boyce J, Pittet D. 'My five moments for hand hygiene': a user-centred design approach to understand, train, monitor and report hand hygiene. *Journal of Hospital Infection*. 2007 Sep 1;67(1):9-21.
 24. Milne JK, Bendaly N, Bendaly L, Worsley J, FitzGerald J, Nisker J. A measurement tool to assess culture change regarding patient safety in hospital obstetrical units. *Journal of obstetrics and gynaecology Canada*. 2010 Jun 1;32(6):590-7.
 25. Makary MA, Sexton JB, Freischlag JA. Teamwork in the operating room: teamwork in the eye of the beholder. *J Am Coll Surg*. 2005.
 26. Cederholm S, Hill G, Asiimwe A, Bate A, Bhayat F, Persson Brobert G, Bergvall T, Ansell D, Star K, Norén GN. Structured assessment for prospective identification of safety signals in electronic medical records: evaluation in the health improvement network. *Drug safety*. 2015 Jan;38(1):87-100.
 27. Gu X, Itoh K. A pilot study on safety climate in Chinese hospital. *Journal of patient safety*. 2011 Dec 1;7(4):204-12.
 28. World Health Organization. World alliance for patient safety: forward programme 2008-2009. World Health Organization; 2008.
 29. MacDavitt K, Chou SS, Stone PW. Organizational climate and health care outcomes. *The Joint Commission Journal on Quality and Patient Safety*. 2007 Nov 1;33(11):45-56.
 30. Yamalik N. Quality systems in dentistry Part 1. The increasing pressure for quality and implementation of quality assurance and improvement (QA/I) models in health care. *International dental journal*. 2007 Oct 1;57(5):338-46.
 31. Yamalik N. Quality systems in dentistry part 2. Quality assurance and improvement (QA/I) tools that have implications for dentistry. *International dental journal*. 2007 Dec 1;57(6):459-67.
 32. Ruchlin HS, Dubbs NL, Callahan MA, Fosina MJ. The role of leadership in instilling a culture of safety: lessons from the literature. *Journal of Healthcare Management*. 2004;49(1):47
 33. Yamalik N. The responsibilities and rights of dental professionals 2. Professional responsibilities. *International dental journal*. 2006 Jun;56(3):168-70.
 34. Health & Safety Commission. ACSNI human factors study group: third report. Organising for safety. London: HMSO. 1993.
 35. Hunter T, Birmingham J. Preventing readmissions through comprehensive discharge planning. *Professional case management*. 2013 Mar;18(2):56-63.
 36. Nieva VF, Sorra J. Safety culture assessment: a tool for improving patient safety in healthcare organizations. *BMJ quality & safety*. 2003 Dec;12(suppl 2):ii17-23.
 37. Agrawal A. Medication errors: prevention using information technology systems. *British journal of clinical pharmacology*. 2009 Jun;67(6):681.
 38. Halligan M, Zecevic A. Safety culture in healthcare: a review of concepts, dimensions, measures and progress. *BMJ quality & safety*. 2011 Apr 1;20(4):338-43.
 39. Lippi G, Blanckaert N, Bonini P, Green S, Kitchen S, Palicka V, Vassault AJ, Mattiuzzi C, Plebani M. Causes, consequences, detection, and prevention of identification errors in laboratory diagnostics. *Clinical chemistry and laboratory medicine*. 2009 Feb 1;47(2):143-53.
 40. Pronovost PJ, Weast B, Holzmueller CG, Rosenstein BJ, Kidwell RP, Haller KB, Feroli ER, Sexton JB, Rubin HR. Evaluation of the culture of safety: survey of clinicians and managers in an academic medical center. *BMJ Quality & Safety*. 2003 Dec 1;12(6):405-10.
 41. DuPree E, Anderson R, McEvoy MD, Brodman M. Professionalism: a necessary ingredient in a culture of safety. *The Joint Commission Journal on Quality and Patient Safety*. 2011 Oct 1;37(10):447-55.
 42. Mehrotra S, Basukala S, Devarakonda S. Effective lighting design standards impacting patient care: a systems approach. *Journal of Biosciences and Medicines*. 2015;3(11):54.
 43. Larsen D, Peters H, Keast J. Using real time patient feedback to introduce safety changes. *Nursing Management*. 2011 Sep 27;18(6).
 44. Kant S, Patnaik SK, Kapoor P, Singh MM, Mehrotra S, Basukala S, Ranyal RK, Yadav P. Application of 3D Music inventory control technique for the controlled drugs in intensive care unit of a tertiary care hospital. *International Journal of Research Foundation of Hospital and Healthcare Administration*. 2015 Jun 1;3(1):5-9.
 45. DesHarnais SI, Nash DB. Reforming way medical students and physicians are taught about quality and safety. *Mount Sinai Journal of Medicine: A Journal of Translational and Personalized Medicine*. 2011 Nov;78(6):834-41.