

Wrong Tooth Extraction - A Cut Throat in Dental Practice: An Evidence Based Literature Review

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INTRODUCTION:

A complication that every dentist believes can never happen - but happens surprisingly often is extraction of the wrong tooth.¹ In view of the complex therapeutic and medico legal problems associated with erroneous extraction, this complication deserves more

attention. Wrong- site tooth extraction (WSTE) is defined as the extraction of a tooth other than the one intended by the referring dentist with negative consequences.²

Wrong- site tooth extractions continue to be one of the major reasons for filing malpractice claims

ABSTRACT:

Background: Despite the fact that many interventions are followed, medical error such as wrong site, wrong person and wrong procedure continues to be a menace amongst the medical fraternity. Although lot of protocols exists to prevent this medical error, the measures taken at the outpatient department are still sparse. The main purpose of this study is to analyze the basis of wrong site tooth extraction, medico legal issues concerned and measures taken to prevent this medical error.

Materials and methods: The database used in the study was Pubmed using search terms "wrong site surgery" and "wrong tooth extraction". Professional strategies followed at various hospital setups were the major inclusion criteria. Articles reviewed were literature reviews, questionnaire based surveys, clinical experiences of various authors and self reports.

Results: A total of 200 articles were thoroughly reviewed from 1991 onwards to recent and 73 articles were selected for the study. Amongst 73 articles, 11 articles were belonging to specialty of Oral Surgery. All the studies analyzed the incidence of wrong site tooth extraction.

Conclusion: Patient safety should be the prime goal and various organizations have put up their protocols to achieve it. Dictum of every clinician should be "primum non nocere"- first do no harm.

Key words: Dental negligence, Wrong Site Surgery, Wrong Site Tooth Extraction

against oral and maxillofacial surgeons, despite education, training and the requirements for risk management.³ Specific clinical interventions are needed to reduce wrong-site surgery (WSS), including wrong-site tooth extraction which is a rare but potentially disastrous clinical error. The introduction of organizational and professional clinical strategies may have a role in minimizing WSS.⁴

MATERIALS AND METHODS

The database used in the study was Pubmed under the search terms "wrong site surgery" and "wrong tooth extraction". The inclusion criteria for the study emphasized on the professional strategies followed at various hospital setups and major operation theatres to reduce surgical errors. Studies which were in different languages, articles which had the incidence rates of surgical errors and statistical analysis only were not a part of the study. The cross references of key articles was reviewed to get relevant articles. A total of 200 articles were thoroughly reviewed from 1991 onwards and 73 articles were selected for this study. The articles reviewed were literature reviews, questionnaire based surveys, clinical experiences of various authors and self reports.

RESULTS

Amongst 73 articles, the occurrence of wrong site, wrong procedure and wrong person surgery for various procedures, including wrong site tooth extraction is distinguished. Lot of interventions and protocols to prevent the medical error is in place but strict adherences to them by the treating surgeons are sparse. Incorporation of Universal Protocol into routine clinical practice definitely reduced the error.³ Despite of the combination of stringent measures and protocols, the surgical error continues to happen.⁵ Longo UG still opines that the existing strategies wouldn't suffice this enormously growing incidence of wrong surgery.⁶ Neily J et al have concluded that additional focused Medical Team Training is needed.⁷

Clinically relevant studies belonging to specialty of Oral Surgery were eleven amidst 73 selected articles. All the studies analyzed the commonness of wrong site tooth extraction at various institutes and hospitals. The major causes for WSTE are established and various measures taken to prevent them are setup.

Clinical situation and consequence where WSTE occurs:-

Oral surgeons or general dentists often carry out extractions after referral of the patients by other practitioners'. In a clinical setup where wrong-site extraction be identified immediately, disclosure of the event must be presented to the patient for improved clinical outcome and diminished legal liability'. When the wrong-site extraction is identified immediately,

reimplantation with subsequent endodontic therapy might enable retention of the involved tooth.³

The wrong tooth is most commonly extracted when the dentist is asked to remove teeth for orthodontic purposes, especially patients who are in mixed dentition stages.¹ The possibilities of potential risks and unforeseen circumstances of extraction such as dry socket, sinus involvement, root tips left behind, jaw fracture and aspiration of foreign bodies should be discussed before the procedure is performed.³

Clinical evidences of wrong site surgeries:-

Until the 1999 Institute of Medicine (IOM) report, To Err Is Human, clinicians were unaware of the number of surgery-associated injuries, deaths and near misses because there was no process for recognizing, reporting and tracking these events.⁸ Wrong site surgery is the fourth commonest sentinel event after patient suicide, operative and post-operative complications and medication errors.⁹ The quarterly Pennsylvania Patient Safety Advisory article summarizes and updates the evidence base for the twenty best practices for preventing WSS that are associated with the Joint Commission's Universal Protocol (JCAHO-UP) for preventing Wrong Site, Wrong Procedure and Wrong Person Surgery.¹⁰

Among 4074 sentinel events reviewed by the Joint Commission (JC), January 1995 through December 2006, 531 events of wrong site surgery were reported. The sentinel events reported specialty wise for Dental and Maxillofacial cases were 8% as compared to 13% during 2004 to 2005.¹¹ Data obtained from Oral and Maxillofacial Surgeons National Insurance Company (OMSNIC), USA showed an average of 48 practitioners per year involved in wrong tooth or site surgery with a limited number of repeat offenders.³

The Cochrane Databases reviewers have given the evidence based on randomized control trials, non-randomized controlled trials, one interrupted time series (ITS) study evaluated a targeted educational intervention aiming at reducing the incidence of WSTEs.⁴ The experience among Nigerian dentists of WSTE evidenced that the dental surgeons who committed the error hesitated to reveal the error. From these reports, it is understood that unlike other medical errors, dental errors are also underreported.¹² Intervention such as education programs and specific clinical guidelines reduced WSTE.^{2-4, 12, 13.}

Ethical and legal issues:-

When a wrong extraction is done, it presents with both ethical as well as legal issues. The ethical issues center around being truth and deception and the impact on the principle of respect for patient autonomy. The legal issues deal with the effect of deliberately concealing the information from a patient and how this concealment affects the risk of litigation.¹⁴

The reasons for informing the patient are in three places:¹⁵

- If the doctor was negligent, hiding it does not change anything; it makes patients angrier when they find out.
- Many acts of negligence can be corrected, or their consequences are of a minor nature limiting liability. Intentional misrepresentation is one of the only reasons a doctor can be successfully sued for punitive damages.
- The negative sequel, whether committed by you or not, may not be negligence, just an unfortunate occurrence, thus no liability is imposed on the doctor.

It is suggested that the risk of a lawsuit may actually be reduced by immediately telling the patient that a mistake was made, how it was made and what is being done to rectify it.¹⁶ The risk of litigation is increased by covering up an error.¹⁷ If it is difficult for the doctor to disclose the mistake at that instant, it will be far more difficult to disclose it later, after a poor outcome is discovered. The latter explanation will need to address the mistake, its relationship to the poor outcome and most difficult of all, why the error was not revealed until the poor outcome occurred.

The treatment error may or may not be of any consequence relative to the clinical outcome but the fact that this uncertainty exists creates an obligation to reveal the error at the time it is discovered; to reassure the patient and family that the error may have no effect what-so-ever; to explain the need for any necessary consultation. To arrange for second opinion to confirm the prognosis relative to the error and to state what measures will be taken to ensure the optimal outcome of treatment.¹⁴

Informed consent:-

The principle of respect for autonomy is placed into operation via the process of informed consent. The informed consent process is divided into five elements or requirements: competence, disclosure, understanding, voluntariness and consent.¹⁴

Consent is an ongoing dialogue between the health provider and the patient in which both the parties exchange information, ask questions and come to an agreement on the course of specific dental treatments. Consent is not limited to obtaining permission for treatment, it continues throughout the course of treatment and alterations of the course of the treatment, during follow-up evaluations and as unexpected results or procedural mishaps occur.¹⁸

Documentation:-

Regardless of containing the patient's demographics and personal identification information, the record should include a current and thorough

medical questionnaire. It should include current dental history, complete oral, head and neck examination, documentation of diagnostic tests and results, a memorialization document of informed consent and notes regarding any changes in the treatment plan. Diagnostic evidence such as radiographs, photographs and study models are other integral parts of a dental record.^{18, 19}

Medical history: In the event of underlying medical condition, the dentist is obligated to consult the patient's physician before commencing with treatment. It is important to receive instructions from the patient's physician regarding the use of premedication antibiotics and /or anticoagulant therapy prior to proceeding with dental treatment.¹⁸

Medical negligence:-

Medical negligence may be defined as want of reasonable degree of care and skill or willful negligence, on the part of a medical practitioner in the treatment of a patient with whom a relationship of professional attendant is established, so as to lead to his bodily injury or to the loss of his life. In medical malpractice litigation, negligence is the predominant theory of liability. Medical negligence calls for both ethical as well as legal concerns. In India, ethical issues are regulated by The Dentists (Code of Ethics) Regulations, 1976 and legal issues are regulated under the Indian Penal Code 1860.²⁰

Dental Malpractice generally refers to an injury caused by a negligent dentist. Any kind of negligence or poor quality dentistry can be defined as *dental malpractice*, which could result in a dental malpractice lawsuit. Special types of dental negligence include abandonment, failure to refer, failure to obtain informed consent and failure to follow manufacturer's directions.¹⁸

Preventive measures for WSTE:-

The Joint Commission on Accreditation of Health Care Organizations (JCAHO) mandated that, effective July 1, 2004, there must be compliance with the Protocol for preventing Wrong site, wrong procedure, wrong person surgery by all JCAHO accredited organizations to decrease preventable medical errors. In development of this protocol, a consensus was reached on eight principles. In concert with these principles, the following comprise the Universal Protocol (UP):

- 1) Preoperative verification process
- 2) Marking the operative site
- 3) "Time out" immediately before starting the procedure^{3,21}

The ADA and JCAHO concur with and recommend the following³:-

- 1) Review the dental record including the medical

history, laboratory findings and dental radiographs. Indicate the tooth number(s) or mark the tooth site or surgical site on the diagram or radiograph to be included as part of the patient record.

- 2) Ensure that radiographs are properly oriented and visually confirm that the correct teeth or tissues have been charted.
- 3) Conduct a "time out" to verify patient, tooth, and procedure with the assistant present at the time of extraction.

The preventive measures like site marking initiatives, operating room (OR) briefings and their roles are limited for outpatient departments. The incorporation of surgical checklists has been proven effective to prevent this threat.^{9, 22-33} The role of an educational program followed by the incorporation of clinical guidelines during extraction has shown to mitigate the WSTE.^{2, 4} Different additional authors have suggested that educational program can minimize wrong site surgery.³⁴⁻³⁶ See LC et al devised an animation program as education tool to eliminate WSS.³⁷ The clinical guidelines are presented in table 1.

Human decisions that result in errors usually occur in two ways- active failures and latent failures. Active failures are "unsafe acts or omissions by those, whose actions can have immediate adverse consequences" such as cognitive failures including memory lapse. Latent failures stem from fallible decisions and "provide conditions in which unsafe acts occur" such as inadequate supervision or inadequate systems of communication.^{2, 3}

The novel tooth identification system- Molar, Incisor, Canine, Premolar (MICAP) system is an alternative for preventing the errors in referral forms as well as during communication.³⁸ Knepnil GJ discussed site marking for maxillofacial surgical procedures and it aided for the World Health Organization (WHO) surgical checklist.³⁹ Thakkar SC compared two solutions for marking surgical sites. Similarly, henna was used for varicose vein surgery.⁴⁰ ⁴¹ The anatomic marking form has been established as an alternative for the Universal Protocol.⁴²

The "timeouts" performed has set standards for invasive procedures as well as for outpatient dental procedures.^{3, 32, 33, 36} Kelly JJ concluded that time out was an effective tool in emergency room also.⁴³ According to experiences of authors and institutions' protocols, time out has been modified and adopted to otolaryngology, cardiothoracic surgeries and duration of time out has been extended.⁴⁴⁻⁴⁹ "Timeouts" increases collaboration amongst the health care providers. Near miss analysis, site verification radiographic marking

and intraoperative imaging are additional effective protocols.⁵⁰⁻⁵⁸

Warren RJ utilized radioopaque stickers during upper tract endoscopy.⁵⁹ Awareness of high risk areas amongst the surgeons minimizes the error.⁶⁰⁻⁶² Sharing Surgery lessons, feed backs, audit, no interruption zones, computerized prompt systems to verify patients information have reduced mistakes. However, these will not be effective without attention to teamwork and communication.⁶³⁻⁶⁵

The Veterans Affairs (VA) added two steps to the Joint Commission's UP: ensuring the consent form is administered and used properly; having two members of the surgical team review patient information and radiological images preoperatively. The British National Patient Safety Agency has introduced a risk management tool, setting forth a process for double-checking and identifying who is accountable at each stage for ensuring surgical markings on the right site to avoid WSS.⁸

DISCUSSION:-

"To err is human". Prevention of wrong site, wrong person and wrong procedure (WSP) errors in the perioperative setting are one of the priority initiatives in a majority of operating rooms around the globe.⁶⁵ WSS is a broad term that encompasses surgery performed on the wrong body part, wrong side of the body, wrong patient, or at the wrong level of the correctly identified anatomical side.⁹

Peleg O discussed that miscommunication between the clinicians was the root cause for WSTE.^{66,67} The evidence based analysis by the Joint Commission has reported that procedural compliance as the prime cause for wrong site surgeries.¹¹ Further causes and risk factors have been proposed which are variable and complex such as multiple condemned teeth, partially erupted teeth mimicking third molars, missing teeth allow for drifting of teeth and use of different tooth numbering systems.³

Certainly this medical error can be prevented. The legend of documenting the medical error and its precautionary strategies continues through decades. The first initiative taken by the Canadian Orthopedic Association by "Operate through your site" as early as 1994, targeted at reducing the WSS. The other remarkable events in this line were the JCAHO's Universal Protocol, WHO surgical checklists, the Correct Surgery tool kit and "patient safety first campaign" by Association of Registered Nurses (AORN) and duplication of surgical site.⁶⁸ Special techniques like photography have been utilized in Dermatology for surgical site identification.⁶⁹⁻⁷¹

The recently added to these interventions is the Targeted Solutions Tool (TST) which offered a step by

TABLE 1: Clinical Guidelines

SL NO.	GUIDELINES
1	Include in the written order for tooth extraction a brief description of the condition of the tooth that is to be extracted and of the adjacent teeth if necessary
2	Inform the patient (or the patient/guardian in the case of a child) about the position of the tooth that is going to be extracted and the reason why it should be extracted
3	The operator should verify the order with the patient (or the parent/guardian) and carefully identify the position of the tooth in question to the patient (or the parent/guardian).
4	Do not hesitate to communicate verbally with the referring dentist whenever it is thought necessary
5	Check the tooth position before and after application of the forceps. ²

step process to identify measure, reduce risk in wrong site and patient processes by the Joint Commission Centre for Transforming Health Care in 2012.⁶⁶ Organizations that have incorporated the TST reduced the number of cases with risks by 46% in the scheduling area, by 63% preoperatively and by 51% in the OR.^{66,72}

Hospitals were provided with an Observational Assessment Tool to periodically track compliance with key elements of proposed interventions in the crucial processes for preventing WSS including

- Scheduling
- Preoperative verification and reconciliation of essential patient information
- Site marking
- Time outs
- OR turnover⁷³

Miscommunication is a definite risk factor for the error.^{3,13,74} Patient safety in OR setting, at Out Patient Department are the most important aspects. Reviewing of correct data through documentation, strict adherence of protocols, good patient participation and coordinating team work are absolutely essential. Good, harmonious communication between the professionals and optimum cognition are the key to diminish the errors while rendering service.⁷⁵⁻⁸⁶

Risk management for Oral Surgeons:-

Risk management is the identification, assessment, prioritization of risks (the effect of uncertainty) and the application of resources to minimize, monitor and control the probability or impact of adverse events. It specifies information needed by providers, leaders and staff to minimize risks for their oral health programs and next steps if an error occurs. It aids organizations in providing quality services while reducing liabilities. It protects both the providers and patients from negative consequences.

Ethical practices are the foundation of risk management programs and both ultimately benefit the patients and improve the Health Center’s quality of

care. When providers practice ethically, they mitigate many of the Health Center’s risks—it can act as a tool to manage risks.⁸⁷

LIMITATIONS:-

The medical error data is not easy to extract. Faulty data are transferred to medical claims data and medical liability, further preventing their sharing. Estimates of the incidence of WSS derived from litigation data likely underestimate the true prevalence of this problem, as do estimates based on incident reports.⁸ It is strange how effective surgical teams are in complying with the protocol on a daily basis. It is indefinite what factors or barriers exist to implement the Universal Protocol for WSS. It is doubtful that WSS will fully be reported because of industry wide report cards, fear of litigation and difference of opinions. Although absolute numbers of WSS may not be striking, the consequences to the patient on whom it occurs are dire.

There is little empirical evidence regarding prevention of WSS or quantitative evaluation of implementation of strategies to prevent WSS. There is limited research on WSS. The majority of studies have been retrospective, chart reviews, case studies and surveys of various professional organizations. There are no randomized controlled studies to evaluate the effect of the Universal Protocol on WSS.⁸

CONCLUSION:-

The healthcare arena or clinical setting is rapidly undergoing not only change but scrutiny. The medical profession must be conducted with highest degree applied ethics. The transition throws a challenge for the clinicians to deliver optimum treatment emphasizing on patient’s safety as the prime goal. This article opens up to various chair side discussions, educate practitioners regarding prevention of problems and en route the methods of ethical problem solving. The ultimate aim for any clinician, higher level of appreciation and deeper commitment to both our patients and our specialty are hoped to be achieved in this manner. Finally, the dictum of every clinician should be “primum non nocere”- first do no harm.

References

- Hupp JR. Prevention and management of surgical complications. In: Hupp JR, Edward III E., Tucker MR. Contemporary Oral and Maxillofacial Surgery 5th ed. Mosby Elsevier 2008; 185-199.
- Chang HH et al. Effectiveness of an educational program in reducing the incidence of wrong- site tooth extraction. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2004; **98**(3):288-294.
- Lee JS, Curley AW, Smith RA. Prevention of Wrong- Site Tooth Extraction: Clinical Guidelines. J Oral Maxillofac Surg 2007; **65**:1793-1799.
- Mahar P et al. Interventions for reducing wrong-site surgery and invasive procedures. Cochrane Database of Systematic Rev 2012.
- Groff MW et al. A survey-based study of wrong-level lumbar spine surgery: the scope of the problem and current practices in place to help avoid these errors. World Neurosurg. 2013; **79**(3-4):585-592.
- Longo UG, Loppini M, Romeo G, Maffulli N, Denaro V. Errors of level in spinal surgery: an evidence-based systematic review. J Bone Joint Surg Br 2012; **94**(11):1546-1550.
- Neily J et al. Incorrect surgical procedures within and outside of the operating room: a follow-up report. Arch Surg 2011; **146**(11):1235-1239.
- Mulloy DF, Hughes RG. Wrong-Site Surgery: A Preventable Medical Error. Chapter 36.
- Hanchanal V, Rao AR, Motiwala H, Karim O. Wrong site surgery! How can we stop it? Urol Ann 2014; **6**:57-62.
- Pennsylvania Patient Safety Authority. Quarterly Update: The Evidence Base for Best Practices for Preventing Wrong-Site Surgery. Pa Patient Saf Advis 2010; **7**(4):151-154.
- Croteau RJ. Wrong site surgery the evidence base. NYS Patient Safety Conference 2007. Available at www.JCAHO.org.
- Adeyemo WL et al. Experience of wrong site tooth extraction among Nigerian dentists. Saudi Dent J 2011; **23**(3):153-156.
- Peleg O, Givot N, Halamish-Shani T, Taicher S. Wrong tooth extraction: Root cause analysis. Quin Int 2010; **41**(10):869.
- Chiodo G, Tolle S, Jerrod L. Ethics case analysis: The extraction of the wrong tooth. Am J Orthod Dentofacial Orthop 1998; **114**:721-723.
- Jerrod L. Hiding the truth. Am J Orthod Dentofac Orthop 1997; **111**(4):455-456.
- Wu AW, Cavanaugh TA, McPhee SJ, et al: To tell the truth: Ethical and practical issues in disclosing medical mistakes to patients. J Gen Intern Med 1997; **12**:770-775.
- Kapp MB. Legal anxieties and medical mistakes: barriers and pretexts. J Gen Intern Med 1997; **12**:787-788.
- Seidberg BH. Dental Litigation Triad of Concerns. in Legal Medicine. 6th ed. Philadelphia: Mosby 2004; Ch **48**:490.
- Braaf S, Manias E, Riley R. The role of documents and documentation in communication failure across the perioperative pathway. A literature review. Int J Nurs Stud. 2011; **48**(8):1024-1038.
- Modi JP. Medical negligence and consumer protection act. In Mathiharan K, Patnaik AK ed. Medical Jurisprudence and toxicology. 23rd ed. Ch 5. Pg 153. Lexis Nexis Butterworths Wadhwa, Nagpur.
- Implementation expectations for the universal protocol for Preventing Wrong site, Wrong procedure, Wrong person surgery. www. JCAHO.org. accessed 2003.
- Canale ST. Wrong- site surgery: A preventable complication. Clin Orthop Relat Res 2005; **26**:433.
- James MA1, Seiler JG 3rd, Harrast JJ, Emery SE, Hurwitz S. The occurrence of wrong-site surgery self-reported by candidates for certification by the American Board of Orthopaedic Surgery. J Bone Joint Surg Am 2012; **94**(1):1-12.
- Makary MA et al. Operating room briefings and wrong-site surgery. J Am Coll Surg 2007; **204**(2):236-243.
- Fyfe E., Fleming C. The WHO surgical safety checklist in a dental-teaching hospital department of oral surgery – a model for implementation. Oral Surg 2013; **6**(4):180-185.
- Munigangaiah S, Sayana MK, Lenehan B. Relevance of World Health Organization surgical safety checklist to trauma and orthopaedic surgery. Acta Orthop Belg 2012; **78**(5):574-581.
- Fudickar A, Hörle K, Wiltfang J, Bein B. The effect of the WHO Surgical Safety Checklist on complication rate and communication. Dtsch Arztebl Int 2012; **109**(42):695-701.
- Treadwell JR, Lucas S, Tsou AY. Surgical checklists: a systematic review of impacts and implementation. BMJ Qual Saf. 2014; **23**(4):299-318.
- Panesar SS. et al. Can the surgical checklist reduce the risk of wrong site surgery in orthopaedics?-Can the checklist help? Supporting evidence from analysis of a national patient incident reporting system. J Orthop Surg Res 2011; **6**:18.
- Cobb TK. Wrong site surgery-where are we and what is the next step? Hand (N Y). 2012; **7**(2):229-232.
- Porter AJ, Narimasu JY, Mulroy MF, Koehler RP. Sustainable, effective implementation of a surgical preprocedural checklist: an "attestation" format for all operating team members. Jt Comm J Qual Patient Saf 2014; **40**(1):3-9.
- Lee AJ et al. The Time Out Procedure: have we changed our practice? N Z Med J 2012; **125**(1362):26-35
- Haugen AS, Muruges S, Haaverstad R, Eide GE, Søfteland E. A survey of surgical team members' perceptions of near misses and attitudes towards Time Out protocols. BMC Surg 2013; **13**:46.
- Steelman VM, Graling PR, Perkhounkova Y. Priority patient safety issues identified by perioperative nurses. AORN J 2013; **97**(4):402-418.
- Yoon RS, Alaia MJ, Hutzler LH, Bosco JA 3rd. Using "Near Misses" Analysis to Prevent Wrong-Site Surgery. J Healthc Qual. 2013 Aug 23. doi: 10.1111/jhq.12037. [Epub ahead of print]
- Harrington JW. Surgical time outs in a combat zone. AORN J 2009; **89**(3):535-537.
- See LC et al. Animation program used to encourage patients or family members to take an active role for eliminating wrong-site, wrong-person, wrong-procedure surgeries: preliminary evaluation. Int J Surg 2011; **9**(3):241-247.
- Akram A., Zaki AH., Hamid A., Razak J., Hock TT. MICAP-a novel system for identification and communication of dental problems. Int Dent J 2011; **61**(1):31-36.
- Knepil GJ, Harvey CT, Beech AN. Marking the skin for oral surgical procedures: improving the WHO checklist. Br J Oral Maxillofac Surg 2013; **51**(5):413-415.
- Thakkar SC, Mears SC. Visibility of surgical site marking: a prospective randomized trial of two skin preparation solutions. J Bone Joint Surg Am 2012; **94**(2):97-102.
- Mehendale VG, Chaudhari NC, Shenoy SN, Mehendale AV. Henna as a durable preoperative skin marker. World J Surg 2011; **35**(2):311-315.
- Knight N, Aucar J. Use of an anatomic marking form as an alternative to the Universal Protocol for Preventing Wrong Site, Wrong Procedure and Wrong Person Surgery. Am J Surg 2010; **200**(6):803-807.

43. Kelly JJ. A survey of the use of time-out protocols in emergency medicine. *Jt Comm J Qual Patient Saf* 2011; **37**(6):285-288.
44. Shah RK, Arjmand E, Roberson DW, Deutsch E, Derkay C. Variation in surgical time-out and site marking within pediatric otolaryngology. *Arch Otolaryngol Head Neck Surg* 2011; **137**(1):69-73.
45. Backster A1, Teo A, Swift M, Polk HC Jr, Harken AH. Transforming the surgical "time-out" into a comprehensive "preparatory pause". *J Card Surg* 2007; **22**(5):410-416.
46. Lee SL. The extended surgical time-out: does it improve quality and prevent wrong-site surgery? *Perm J* 2010 Spring; **14**(1):19-23.
47. Johnston G, Ekert L, Pally E. Surgical site signing and "time out": issues of compliance or complacency. *J Bone Joint Surg Am* 2009; **91**(11):2577-2580.
48. Dillon KA. Time out: an analysis. *AORN J* 2008; **88**(3):437-442.
49. Altpeter T1, Luckhardt K, Lewis JN, Harken AH, Polk HC Jr. Expanded surgical time out: a key to real-time data collection and quality improvement. *J Am Coll Surg* 2007; **204**(4):527-532.
50. Poore SO, Sillah NM, Mahajan AY, Gutowski KA. Patient safety in the operating room: I. Preoperative. *Plast Reconstr Surg* 2012; **130**(5):1038-1047.
51. Devine J, Chutkan N, Norvell DC, Dettori JR. Avoiding wrong site surgery: a systematic review. *Spine (Phila Pa 1976)* 2010; **35**(9):28-36.
52. Blanco M1, Clarke JR, Martindell D. Wrong site surgery near misses and actual occurrences. *AORN J* 2009; **90**(2):215-218.
53. Giles SJ et al. Patient safety practices in the operating room: correct-site surgery and nothing left behind. *Qual Saf Health Care* 2006; **15**:363-368.
54. Kwaan MR, Studdert DM, Zimmer MJ, Gawande AA. Incidence, patterns, and prevention of wrong-site surgery. *Arch Surg* 2006; **141**(4):353-357.
55. Rhodes P et al. Assessment of the implementation of a national patient safety alert to reduce wrong site surgery. *Qual Saf Health Care* 2008; **17**(6):409-415.
56. Marichal DA1, Barnett DW, Meler JD, Layton KF. Fiducial marker placement for intraoperative spine localization. *J Vasc Interv Radiol* 2011; **22**(1):95-97.
57. Clarke JR1, Johnston J, Blanco M, Martindell DP. Wrong-site surgery: can we prevent it? *Adv Surg* 2008; **42**:13-31.
58. Hsiang J. Wrong-level surgery: A unique problem in spine surgery. *Surg Neurol Int* 2011; **2**:47.
59. Warren GJ, Roberts WW, Hollingsworth J, Wolf JS Jr, Faerber GJ. Prevention of wrong site surgery during upper tract endoscopy. *Urology* 2012; **79**(2):475-457.
60. Shah RK, Boss EF, Brereton J, Roberson DW. Errors in Otolaryngology. *Otolaryngol Head Neck Surg* 2014. Epub ahead of print PMID: 24500876
61. Matsen FA 3rd, Stephens L, Jette JL, Warme WJ, Posner KL. Lessons regarding the safety of orthopaedic patient care: an analysis of four hundred and sixty-four closed malpractice claims. *J Bone Joint Surg Am* 2013; **95**(4):201-208.
62. Shah RK et al. Wrong-site sinus surgery in otolaryngology. *Otolaryngol Revisited Head Neck Surg* 2010; **143**(1):37-41.
63. Neily J et al. Sharing lessons learned to prevent incorrect surgery. *Am Surg* 2012; **78**(11):1276-1280.
64. Garnerin P1, Arès M, Huchet A, Clergue F. Verifying patient identity and site of surgery: improving compliance with protocol by audit and feedback. *Qual Saf Health Care* 2008; **17**(6):454-458.
65. McNamara SA, Guglielmin C. Prevention of perioperative wrong site, wrong person, wrong procedure errors. www.Sedwigk.com/newsrelease.
66. The Joint Commission Center for Transforming Healthcare. Storyboard: reducing the risk of wrong sitesurgery. www.centerfortransforminghealthcare.org/UserFiles/file/CTH-WSS-Storyboard-final-2011.pdf. Accessed 6/15/12.
67. Duggineni S. Wrong tooth extraction: root cause analysis. *Br Dent J* 2011; **210**:163.
68. Davis JS, Karmacharya J, Schulman CI. Duplication of surgical site marking. *J Patient Saf* 2012; **8**(4):151-152.
69. Nemeth SA, Lawrence N. Site identification challenges in dermatologic surgery: a physician survey. *J Am Acad Dermatol* 2012; **67**(2):262-268.
70. Rossy KM, Lawrence N. Difficulty with surgical site identification: what role does it play in dermatology? *J Am Acad Dermatol*. 2012; **67**(2):257-261.
71. Starling J 3rd, Coldiron BM. Outcome of 6 years of protocol use for preventing wrong site office surgery. *J Am Acad Dermatol* 2011; **65**(4):807-810.
72. Schmidt M. Error In Judgment: Why Wrong-Site Surgery Is Still A Problem. *Surg Products* 2014; Mar. Available at www.surgicalproductsmag.com.
73. Flynn K., Pelczarski K. ECRI institute. Health care improvement foundation 2008. www.ecri.org/clinical_RM_program.
74. Beckingsale TB, Greiss ME. Getting off on the wrong foot doctor-patient miscommunication: a risk for wrong site surgery. *Foot Ankle Surg* 2011; **17**(3):201-202.
75. Lee SH et al. Patient safety in spine surgery: regarding the wrong-site surgery. *Asian Spine J* 2013; **7**(1):63-71.
76. Vendramini RC1, da Silva EA, Ferreira KA, Possari JF, Baia WR. Patient safety in oncology surgery: experience of the São Paulo State Cancer Institute *Rev Esc Enferm USP* 2010; **44**(3):827-832.
77. Robinson PM, Muir LT. Wrong-site surgery in orthopaedics. *J Bone Joint Surg Br* 2009; **91**(10):1274-1280.
78. Clarke JR, Johnston J, Finley ED. Getting surgery right. *Ann Surg* 2007; **246**(3):395-403.
79. Bergal LM, Schwarzkopf R, Walsh M, Tejwani NC. Patient participation in surgical site marking: can this be an additional tool to help avoid wrong-site surgery? *J Patient Saf* 2010; **6**(4):221-225.
80. Stumpf PG. Practical solutions to improve safety in the obstetrics/gynecology office setting and in the operating room. *Obstet Gynecol Clin North Am* 2008; **35**(1):19-35i.
81. Cohen FL, Mendelsohn D, Bernstein M. Wrong-site craniotomy: analysis of 35 cases and systems for prevention. *J Neurosurg* 2010; **113**(3):461-473.
82. Wong DA. Spinal surgery and patient safety: a systems approach. *J Am Acad Orthop Surg* 2006; **14**(4):226-232.
83. Neily J. Incorrect surgical procedures within and outside of the operating room. *Arch Surg* 2009; **144**(11):1028-1034.
84. Liou TN1, Nussenbaum B. Wrong site surgery in otolaryngology-head and neck surgery. *Laryngoscope* 2014; **124**(1):104-109.
85. Wong DA et al. Medical errors in orthopaedics. Results of an AAOS member survey. *J Bone Joint Surg Am* 2009; **91**(3):547-557.
86. Gibbs VC. Patient safety practices in the operating room: correct-site surgery and nothing left behind. *Surg Clin North Am* 2005; **85**(6):1307-1319.
87. www.nnoha.org. Ch 4: Risk Management in Operations Manual For Health Center Oral Health Programs. Published by: National Network for Oral Health Access, Denver, Sept 2011.