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HOSPITAL ACQUIRED BURNS

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ABSTRACT

Burns to patients in the operating room (O.R.) or unit can occur from dramatic events such as fire, cautery machines or relatively activities such as maintenance of normothermia. Burns in the Operation room or units are significant source of morbidity for patients and a source of liability for anaesthesiologists in Operation room or assigned nurse in units. Medical equipment such as Cautery machine, Patient warmer, Syringe /Infusion pump, laser fires, baby warmer are the major devices those are hindering patient safety & these devices are vital part of medical care and also referred to as a "primary fraction of proficient practice". Following an investigation, this malfunction was attributed to burns on different location on patient's body e.g.: Arms/hands/fingers, trunk including axilla, buttocks/legs/thigh/feet's. These machines are electronic systems and sometimes extraneous conductive material are used with these systems hence becomes a daunting task .As there was a steep rise in the number of hospital acquired burns in Indraprastha Apollo ,New Delhi, a Root cause analysis was mapped . After the RCA an awareness program was introduced in Indraprastha Apollo Hospital. The Burn Safety Program (BSP) was created & Staff education program was planned on different levels. The project produced a sustainable results in improved patient care and safety and cost benefits.

Key words: Burns, Medical equipment, Root cause analysis, Burn safety program.

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INTRODUCTION

Medical equipment used to diagnose, treat, or monitor is designed to come into direct contact with the patient hence the medical Devices Isolation plays a vital role in this industry. The use of electricity for medical diagnostic, measurement, and therapy equipment potentially exposes patients and even care givers to the risk of electrical shock, burns, internal-organ damage, and cardiac arrhythmias directly due to leakage current resulting from improper grounding and electrical isolation. The electrical conductivity of body fluids and the presence of various conductive solutions and gels in the patient care system make this environment even more vulnerable. [1] Despite a great deal of care and concern by medical, nursing, surgical, and engineering personnel, patients continue to suffer inadvertent skin injury in the operating room (OR) and in special care areas (e.g., intensive care units [ICUs], cardiac care units [CCUs]) of the hospital. Such injuries can prolong morbidity and extend hospitalization, appreciably increasing medical costs to the patient and hospital. The hospital and surgical team may also face liability costs if the injured patient brings suit. [2]

The use of alcohol and spirit based skin preparation solutions is another risk factor for fires and burn injuries in the operating room. The solution, if not evaporated before employing the cautery, will lead to fire and burn injury. The electrosurgical diathermy unit is the usual source of heat to ignite the flammable substance, although lasers and fibrotic lights can also be potent heat sources. The fuel is provided by alcohol-based prep solution, drapes, sponges, and endotracheal tubes. In the

presence of a high oxygen environment, all of these substances can burst into flames and burn intensely. When alcohol-based prep is used and the patient is draped before the solution is completely dry, alcohol vapors can be trapped and channeled to the surgical site or the solution wick may get into the surrounding linen, where a heat source can ignite the vapors. [3, 4, 5, 6, 7].
Ignorance or negligence regarding standard safety protocols often underlies such mishaps. [8]

CAUSES OF HOSPITAL ACQUIRED BURNS

Electrical

- Radio frequency (RF; electro surgery, magnetic resonance imaging [MRI] field coils) DC (batteries, circuit continuity monitors, pacemakers, nerve and muscle stimulators) AC (60 Hz line voltage)

Thermal

- Direct contact (heating pads, diathermy, electro cautery, unlubricated surgical drill shank, flash-sterilized surgical instruments, heated probes)
- Irradiant (radiant warmers, exam and operating lights, fiber optic light cables, lasers)
- Exothermic chemical reaction (Merthiolate on aluminum electrode)

Chemical

Povidone-iodine prep solutions (problems with lot-specific formulations or solution pooled under a patient that reacts with other solutions or with residual laundry chemicals in linens)

- Ethylene trioxide (ETO; improper aeration of ETO-sterilized devices)
- Improper electrode (ECG) plating components reacting with conductive paste

Mechanical

- Constant high pressure in excess of two to three hours (e.g., positioning, supports, straps, pinching); time required may be shorter with very high pressure

CASE SCENARIO

Case: 1 [Thermal]

An eighteen-year-old female underwent laparotomy for peritonitis due to burst appendix. On operation table, once general anaesthesia was given, the abdomen was cleaned twice with povidone iodine followed by spirit as per hospital routine. Sterile drapes and cotton wound towels were applied. The skin was incised with a knife. Thereafter, the subcutaneous tissue was divided using monopolar blend cautery. As soon as the cautery was used, the cotton wound towels applied on the two sides of the incision caught fire due to a flame arising from the under surface of the towel. It was extinguished using another sponge but not before producing deep dermal burns on two sides of the skin incision. The cautery was checked and found to be correctly installed. On careful examination, it was observed that the skin was still wet with the last coating of spirit which was not dried up properly. The residual spirit film on the skin caught fire from the spark of the cautery leading to burns involving the lower part of the anterior abdominal wall. The operative and post-operative period of the patient remained uneventful except that it took three weeks for the deep dermal burns to heal with residual scarring.(Fig:1).

Following observations were made on very incident:

- Consideration of the incident report and collected evidence, such as photographs
- Collection of baseline patient and equipment information

Case: 2 [Thermal]

Post operatively it was seen that patient had blisters on the left forearm and the dorsal side of the hand. Intraoperative anesthesia monitoring as well as Procedure report do not mention the occurrence of such event. The body warmer was used during surgery. The dermatologist examined the patient and diagnosed as heat induced blister formation. The treatment for the same was advised accordingly. (Fig: 2).

Case: 3 [Thermal]

As per the operative notes, patient had cardiac arrest intraoperative for which patient was managed as per the protocol and IV fluids were administered using pressure pump. Accidentally the cannula got displaced leading to immediate blistering on right arm. The plastic surgeon visited the patient and advised the management. (Fig: 3).

Case: 4 [Thermal]

Patient had blisters on the right arm observed intraoperative and immediately the body warmer was discontinued. Intraoperative notes suggested the possibility of heat induced or drug induced allergic reaction. Dermatologist diagnosed it as acute contact dermatitis and advised management according. (Fig: 4).

Case: 5[Chemical]

Patient had blisters on the inner side of right arm and adjacent area on the right chest. Post operatively patient was shifted to SICU at 8.00 pm on 25th March 2015; in the progress notes of same day (i.e. 25th March 2015) at 9:20 pm there is a mention about blisters being observed and dressing was advised. On discussion the anaesthetist expressed the possibility of Chemical Burn related to prolonged exposure to Providone iodine (due to potential soaking of Providone Iodine by the gauge which is being placed under the arm to position the patient intra-operatively. (Fig: 5)

IDENTIFYING THE CAUSE [ROOT CAUSE ANALYSIS]

- Documentation and assessment of the lesion's appearance and progression
- Inspection and testing of equipment used
- Interviews with involved personnel

Awareness on identified cause

- Electrical, thermal, chemical, mechanical and medical situation that are leading burns.
- Operator or patient error.
- Faulty repair, inspection, or calibration that can lead to burns.
- Leaking of Saline.
- Wrong balancing IV bag on pole.
- Lack of User Training.
- Knowledge on electrical safety, placement, quality& fitness checks for the power cords & accessories.
- Knowledge on type of power cords to be used
- Labeling of the medical drug running of syringe /infusion pump and cleaning

Other initiatives

- Replacement of 2 pin to 3 pin power cords.
- A comparative study on power cords.
- Electrical safety checks once in a year

UPSHOTS OF THE PROJECT.

a.Increased in patient satisfaction by improved management of the devices

b. Increased in the knowledge of the staff regarding medical equipment handling

c.Decreased number of complaints from patients as they feel safe

d. Increased patient safety from fire & electrical hazards

e.A steep decline in number of incidents. (Fig:6)

f. Increased VOC. (Fig:7)

COST BENEFITS

a. Decreased number of burns from 11 to 0.

b. Decreased in the material and medical cost after every incidence – 89 % to 0(Fig:8)

c. Decreased in the medical cost from 10,000/- per person to Nil

d. Deceased in the cost to medical equipment i.e., from 45000/- (average cost of syringe & infusion pump) per incident to Nil

e. Decreased in the cost of power cord from i.e., from 250/- to Nil

f. Decreased in servicing cost of medical equipment i.e., from 79200 /- to Nil

g. Cost of repairing severe burns Rs.67,570 to 0

BURNS SAFETY PROGRAM (Fig: 9, 10)

Levels of Education:

1. Entry level: for newly joined staff

Functional training.
Demonstration and return demonstration
Laser safety
Baby warmer
Infusion/syringe pump safety
Patient warmer
Cautery machine

2. In service training: For working staff

Root cause analysis of the incidence every incident and make staff aware of the it Weekly Unit training sessions on burn safety and other safety issues Random audits & training on :Laser safety, Patient warmer , Infusion/ syringe pump safety, Cautery machine

3. Post error training: For the concerned staff & unit staff

Reinforcement training for concerned staff and the other staffs of the incident unit & entire staff Special safety training sessions: once in a year for all the nursing staff

Fig 1.

Fig 2.

Fig 3.

Fig 4.

Fig 5.

Fig 6.

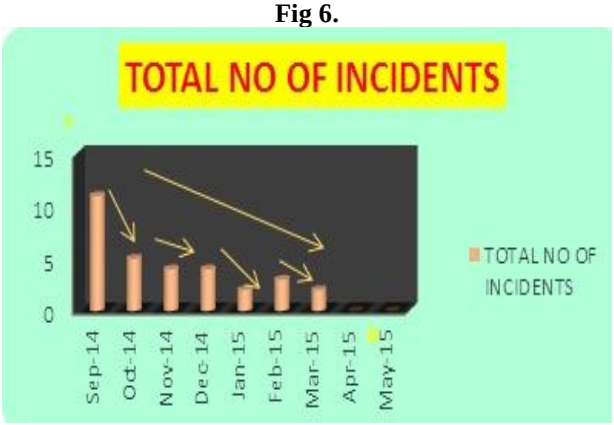

Fig 7.

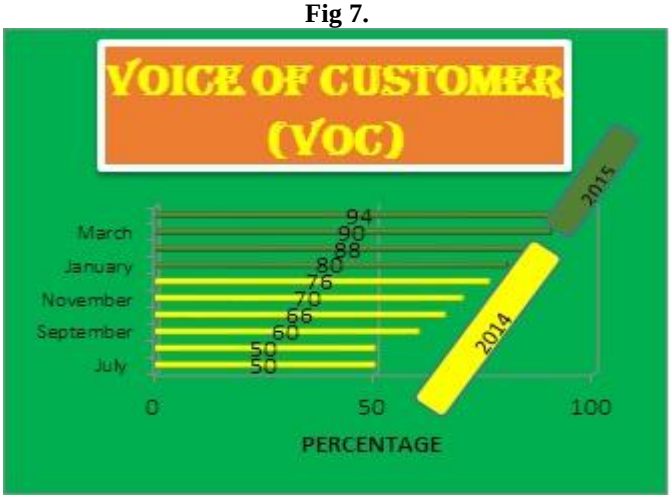

Fig 8.

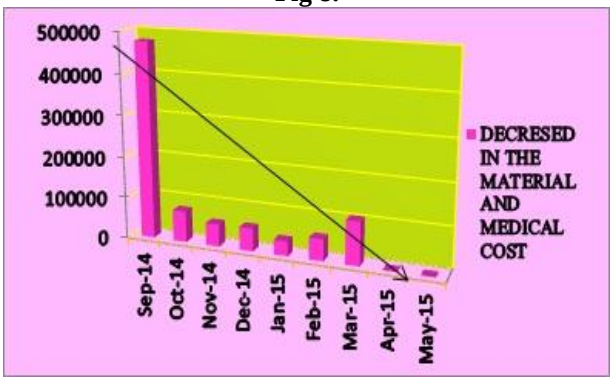

Fig 9.

Fig 10.

DISCUSSION & CONCLUSION

Hospital acquired burn is a medical error which also has medico legal and ethical implications. There is a long list of such errors, from simple misdiagnosis to more serious harm that may culminate in the patient's death. Such errors may emanate from negligence or system failure. Unfortunately such errors continue to occur in every part of the world. Ideally the professional staff and

hospital administration concerned should ensure patient safety by preventing such mishaps and compensate for the harm that ensues to the patients. Reporting such errors is imperative as this will ensure safer management of future patients by sensitizing the professionals involved, leading to the adoption of preventive strategies.

REFERENCES

1. Geojy Mathew (2002) Medical Devices Isolation-"How safe is safe enough, 4.
2. Medical device safety reports by ECRI Institute.
3. Marwah S, Singla SL. (2010) Spirit-induced cautery burns: An unusual Iatrogenic injury. The Internet Journal of Surgery: 22
4. Vilos G, Latendresse K, Gan BS(2001)Electrophysical properties of electrosurgery and capacitive induced current. *American Journal of Surgery*, 182, 222–5.
5. Smith TL, Smith MJ (2001) Electro surgery in otolaryngology-head and neck surgery: Principles, advances, and complications. *Laryngoscope*, 111, 769–80.
6. Patel R, Chavda KD, Hukkeri S (2010). Surgical field fire and skin burns caused by alcohol-based skin preparation. *J Emerg Trauma Shock*, 3, 305.
7. Spigelman AD, Swan JR (2005). Skin antiseptics and the risk of operating theatre fires. *ANZ J Surg*, 75, 556–8. [PubMed
8. Sheridan RL, Wilson NC, O'Connell MF (2003). Noncontact electrosurgical grounding is useful in burn surgery. *J Burn Care Rehabil*, 24, 400–1.