

STUDY OF IMPACTS OF SOUND HEALTHCARE WASTE MANAGEMENT ON HOSPITAL ASSOCIATED INFECTIONS IN A TEACHING HOSPITAL, BANGALORE

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INTRODUCTION:

A hospital in India generates around 0.5 to 2 kg of waste per bed per day with 70-80 percent of that being general waste, 15-20 percent infectious waste, 5-10 percent pathological waste, 0.5 to 1 percent being chemical and sharp wastes. Currently, waste management in India commonly means dumping at landfill sites. In most cities of India, outsourced private agencies and municipalities do the waste collection. Some restraints faced by the sector are insufficient focus on policies and procedures by Government facilities and little regard for stringent and mandatory laws at state, district and city levels. Lack of a proper waste collection and transportation system, common biomedical waste treatment facilities add to the pressures. The regional distribution is also highly skewed.

Unsafe injection practices are prevalent worldwide and may result in spread of infection. According to Rehan HS et al study was planned to observe the injection practices of healthcare professionals (HCP), including aseptic precautions and disposal of used

syringes/needle. Injection practices were observed in the outpatients and inpatients departments. Questionnaire was designed, tested and administered for this purpose. 130 patients receiving injections were observed. Overall injection practices of the HCP were satisfactory. However, unsafe practices with respect to not washing hands (95.4%), not wearing/changing gloves (61.6%), recapping of needles (12.2%), wiping of needle with swab (15.4%) and breaking of ampoule with solid object (44.4%) were observed. The problem of unsafe injections can be successfully addressed by organizing continuing medical education / symposium / workshops for improving the knowledge, attitude and practices of the HCP. Periodic monitoring and such interventions may also further improve safe injection practices.

As per WHO estimates (2000), sharps injuries to health-care workers were estimated to have caused about 66 000 hepatitis B (HBV), 16 000 hepatitis C (HCV) and 5000 HIV infections among health-care workers (Prüss-Ustun et al., 2005). It is estimated that more than two million health-care workers are

exposed to percutaneous injuries with infected sharps every year. In certain facilities and countries, health-care workers may have several percutaneous sharps injuries per year, although this could be avoided by training on the safe management of sharps. The common medical and waste-management procedures that led to a sharps injury, in selected countries. Scavengers on waste disposal sites are also at significant risk from used sharps (although these risks are not well documented).

Hospitals will increasingly bear the costs for HAIs. According to Roberts R R et al attributable mortality was estimated using logistic regression. Among 1253 patients, 159 (12.7%) developed HAI. Using different methods, attributable total costs ranged between \$9310 to \$21,013, variable costs were \$1581 to \$6824, LOS was 5.9 to 9.6 days, and attributable mortality was 6.1%.

The semi-log transformation regression indicated that HAI doubles hospital cost. This suggests that HAI prevention expenditures would be balanced by savings in medical costs, lives saved and available hospital days that could be used by overcrowded hospitals to enhance available services.

In view of the above it becomes prime responsibility of all stake holders such as the government, professional bodies, the WHO and others to demonstrate that scientific and proper management of biomedical waste can reduce hospital associated infections, associated morbidity and mortality, use of costly antibiotics, average length of stay (ALS), high costs and poor outcome of patient care. There is dearth of good evidence to show if there is a close relationship between healthcare associated infections and healthcare waste management.

Table 1.1 Potential infections caused by exposure to health-care wastes, causative organisms and transmission vehicles		
Type of infection	Examples of causative organisms	Transmission vehicles
Gastroenteric infections	Enterobacteria, e.g. <i>Salmonella</i> , <i>Shigella</i> spp., <i>Vibrio cholerae</i> , <i>Clostridium difficile</i> , helminths	Faeces and/or vomit
Respiratory infections	<i>Mycobacterium tuberculosis</i> , measles virus, <i>Streptococcus pneumoniae</i> , severe acute respiratory syndrome (SARS)	Inhaled secretions, saliva
Ocular infection	Herpesvirus	Eye secretions
Genital infections	<i>Neisseria gonorrhoeae</i> , herpesvirus	Genital secretions

Skin infections	<i>Streptococcus</i> spp.	Pus
Anthrax	<i>Bacillus anthracis</i>	Skin secretions
Meningitis	<i>Neisseria meningitidis</i>	Cerebrospinal fluid
Acquired immunodeficiency syndrome (AIDS)	Human immunodeficiency virus (HIV)	Blood, sexual secretions, body fluids
Haemorrhagic fevers	Junin, Lassa, Ebola and Marburg viruses	All bloody products and secretions
Septicaemia	<i>Staphylococcus</i> spp.	Blood
Bacteraemia	Coagulase-negative <i>Staphylococcus</i> spp. (including methicillin-resistant <i>S. aureus</i>), <i>Enterobacter</i> , <i>Enterococcus</i> , <i>Klebsiella</i> and <i>Streptococcus</i> spp.	Nasal secretion, skin contact
Candidaemia	<i>Candida albicans</i>	Blood
Viral hepatitis A	Hepatitis A virus	Faeces
Viral hepatitis B and C	Hepatitis B and C viruses	Blood and body fluids
Avian influenza	H5N1 virus	Blood, faeces

Main Objective:

- To understand the linkage between Hospital Associated Infections and sound management of healthcare wastes.

Specific objectives:

- To carry out baseline survey of the existing situation of the hospital associated infections as well as the practices and procedures of health care waste management (HCWM) in the identified hospital.
- To assess the level of compliance to the biomedical waste management rules.
- To conduct capacity building and awareness trainings for improving the

knowledge and skills of the different categories of hospital staff.

- To improve and streamline the HCWM practices including compliance with hand hygiene practices among health care workers

To analyze hospital associated infections after the intervention period of one year.

Materials and Methodology: This study was carried out in a government teaching hospital in Bangalore during September 2013 to December 2015. The WHO SEARO supported the study.

The primary and secondary data was generated and used through interviews, onsite observations, trainings & meetings, questionnaire, interventions and checklists.

The base line survey was conducted to study the existing/prevaling practices for healthcare waste management, prevalence of hospital associated infections, average length of stay, needle stick injuries and expenditure incurred per bed. The intervention in the form of capacity building/training and orientation of health care workers (doctors, nurses, paramedical and support staff), scientific waste segregation, collection, transportation and disposal was undertaken as per BMW Rules. Special focus was made on standard precautions and sharps management.



A **Gantt Chart** was drawn and the Research Project was carried out as per schedule. The old tool to assess the handling, storage and transportation of Biomedical Waste was modified and updated as per the latest amendments made in the *Bio Medical Waste Management Guidelines*.

The Bio Medical Waste Management Questionnaire - New Tool was prepared in November 2013. This questionnaire assesses knowledge in areas of segregation of waste by color coded bins, biohazard symbols,

awareness of hospital associated infections, storage and transportation of Bio Medical Waste and its final treatment at the Bio Medical Waste Treatment Plant. The new tool was administered to the staff at Bowring and Lady Curzon Hospital, Bangalore. Testing of the Tool was completed by December 2013.

Baseline Analysis:

The data collected was analyzed and the results of the tool tested at this hospital are as follows:

44 % were aware of the date when the Biomedical Waste Management Rules were published in the Gazette of India.

40% knew the authority for Biomedical Waste Management Rules

50% knew the exact number of Categories of biomedical waste

80% were aware of the correct Hazard Symbol of biomedical waste

75% said Yes to labeling of the color coded plastic bag being mandatory

40% stated that hospitals are required to do Monthly reporting to State Pollution Control Board.

56% stated Hospital associated infections are those that occur after 48hrs of patient's admission in the hospital.



A workshop was conducted on healthcare waste management on 16 December 2013, for doctors, nurses and paramedical staff of the hospital. Noted and eminent researchers in the field of Bio Medical Waste Management made scientific presentations. The Investigators spoke on the Recent Advances in Segregation , Collection and Transportation of Bio Medical Waste, the importance of segregating hazardous waste, symbols of biomedical waste, infections waste, Biomedical Waste Management Handling Rules. Appropriate management of biomedical waste in terms of discarding in the appropriate containers, transportation to storage area and finally to the waste management site were also highlighted.

Situation analysis and observation visit was conducted on 25th & 26th April, 2014 to check status of infection control committee, officers responsible for stock management of healthcare waste equipment/consumables and officials responsible for preparing hospital indices and collected baseline data for formulating further training programs.



After the through inspection of Health care waste management practices in hospital on 25th April, 2014. Visits were carried out to Microbiology and Pathology laboratories, ICU, NICU, Postoperative wards and general wards of the hospital. It was observed that there was a mismatch in the colors of bins and liners (as in the photo). The team advised that this needs to be rectified to avoid confusion in segregation of waste.

A Gantt Chart of the activities in this study is given below.

Gantt Chart

S No.	Proposed Activities	Months 2013 - 2014											
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
A	Activity - Project First year												
1	Pre project Advocacy meeting of Stakeholders/briefing												
2	Situation Analysis												
3	Preparation of Tools												
4	Testing of Tools												
5	Baseline data collection												
6	Data Compilation												
7	Assessing Correlation between Health care waste management and Hospital Stay												
B	Activity - Project Second year	January 2015 – December 2014											
1	Formulation of Intervention Strategies as per objectives.												
2	Advocacy with stake holders												
3	Training of Medical and paramedical staff												
4	Implementation of strategies												
5	Monitoring of Healthcare Waste management												
6	Ensuring logistic support by Concerned institution												

C	Activity - Project Third year	January 2015 - December 2015											
1	Post intervention data collection												
2	Data compilation												
3	Data analysis and report writing												
4	Debriefing												
5	Report Dissemination												
6	Submission of final report												

Action points following the meeting:

1. Appointment of Nodal officers in each department to monitor waste management practices regularly.

Action : Medical superintendent

2. Establishment of Hospital Infection Control/ Waste management Committee and regular conduct of meetings.

Action : Medical superintendent

3. Provision of Incentives/certificates for best practices.

Action : Project team

4. Conduct of training programmes to nodal officers/Committee members.

Action : Project team

5. Ensure adequate supply of colour coded bins/liners.

Action : Director, BMCRI to be followed up by local coordinators.

6. Monitoring Hospital infection control rates and reporting to MS.

Action : Dr Asima Banu, Microbiology head and project coordinator

Data Analysis, Results & Discussions

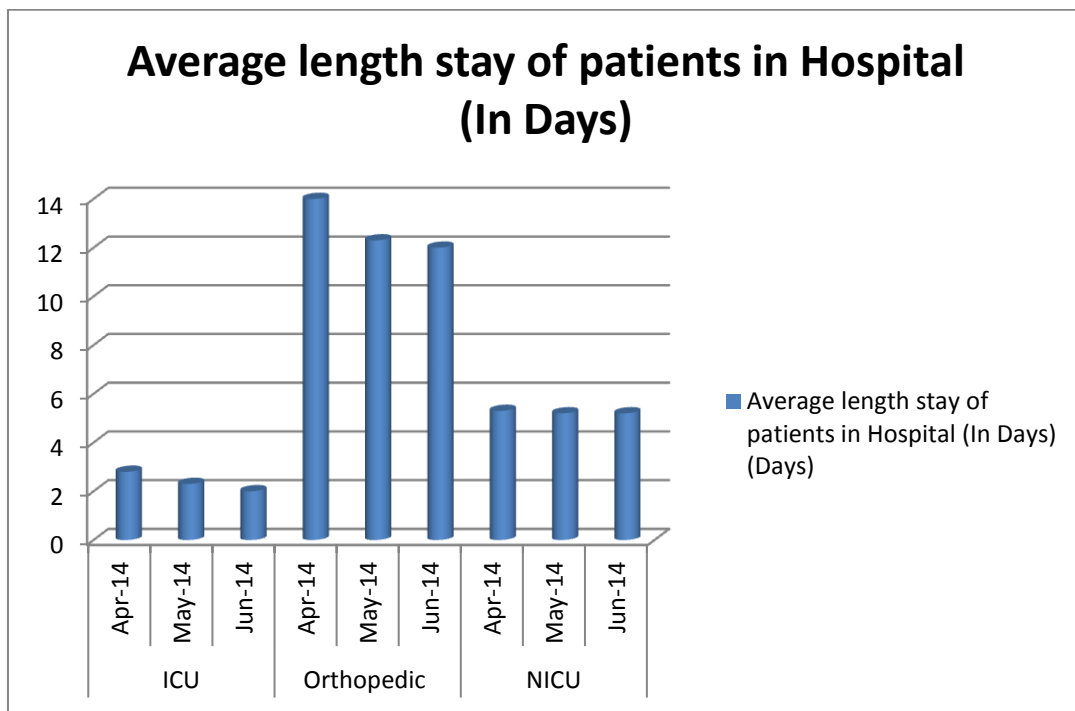
Framework of Data collection: Before undertaking the study, permission was obtained from the hospital authorities for undertaking. A meeting of the Medical superintendent (MS) and senior staff members of the hospital was organized to sensitize them about sound healthcare waste management and its relationship with HAIs. During this meeting, staff members were made aware of the hospital waste management and the importance of reducing the burden of hospital associated infections. The post intervention data was collected, analyzed and collated to assess the impact of interventions. It helped in comparing the improvement in prevalence of hospital associated infections of quality of health care waste management and average length of stay.

Baseline survey was done in October 2013 with regards to average length of stay in hospital which was 4.5 days and the

commonest HAIs infections were urinary tract infections, post operative wound infections and respiratory infections. The incidence of HAI was about 10%. MRSA screening was done for nursing staff working in the intensive care units of the hospital and those who were found positive were treated as per the guidelines.

Wards	Month & Year	Average Days
ICU	Apr-14	2.8
	May-14	2.3
	Jun-14	2
Orthopedic	Apr-14	14
	May-14	12.3
	Jun-14	12
NICU	Apr-14	5.3
	May-14	5.2
	Jun-14	5.2

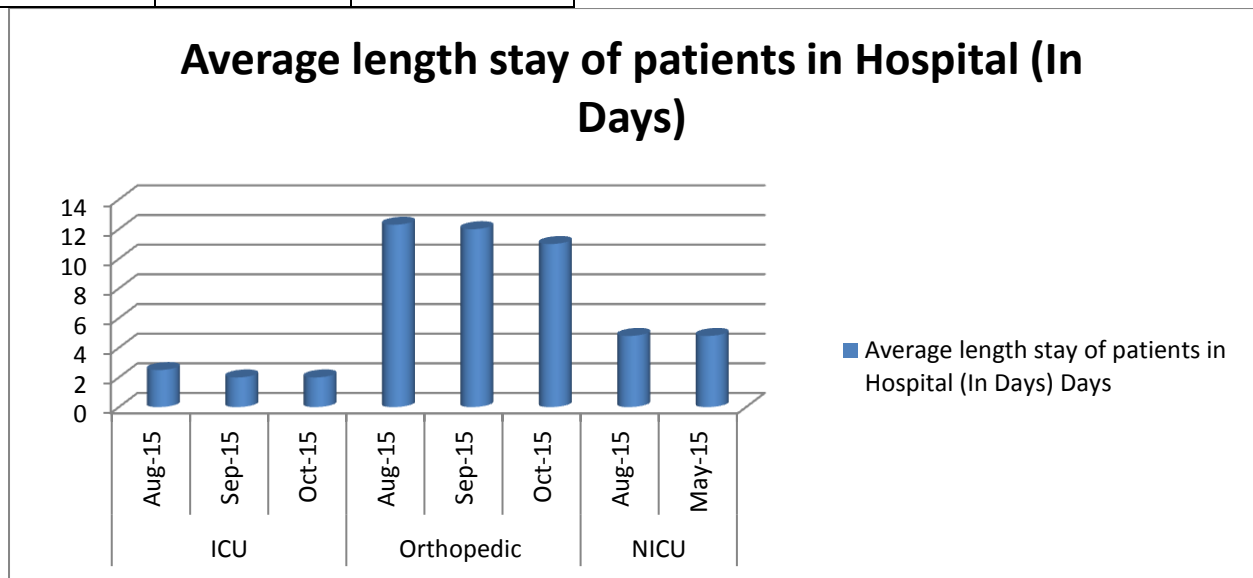
Before study. Average length stay of patients at Lady Curzon Hospital in 2014.



After study, Average length stay of patients at Lady Curzon Hospital in 2015

Wards	Month & Year	Average Days
ICU	Aug-15	2.5
	Sep-15	2
	Oct-15	2

Orthopedic	Aug-15	12.3
	Sep-15	12
	Oct-15	11
NICU	Aug-15	4.8
	15-May	4.8



Average length of stay of patients in hospital was more due to infections before conducting of the study. Wherever average length of the stay of patients after the study is less as described above in graphical representation.

The biomedical waste management scenario was analyzed at various wards: ICU, Orthopedic, NICU. Waste audit, training and seminars were also used as a means to investigate waste management in this hospital at periodic intervals in over 2 year of study period. Average length stay of patients due to infections in the hospital is reduced by implementation of hospital waste management guidelines and application of NABH-Safe I PROGRAMME for infection control.

CONCLUSIONS

Safe and effective management of bio medical waste is not only a legal necessity but also a social responsibility. Lack of knowledge and communication among persons working in that area, lack of motivation, training, awareness and cost factor are some of the problems faced in the proper hospital waste management. Proper surveys of waste management procedures in various practices are needed. An effective communication strategy and knowledge is imperative keeping in view the low awareness level among different category of staff in the health care establishments regarding biomedical waste management. In order to have effective waste management the appointment of Nodal

Officers for all the departments in the hospital proved to very useful. There is need for Hospital infection control/Waste management committee to monitor waste management practices regularly and to develop guidelines and protocols. Biomedical waste label on waste bags and waste trolley and also posters put on the wall adjacent to the bins (waste) giving details increased awareness among staff and patients. Carry bags also have the biohazard symbol on them.

RECOMMENDATIONS

All institutions generating biomedical waste must be registered with central/state pollution control boards. All health care personnel involved in the generation, segregation or handling of biomedical waste must be trained in biomedical waste management including health and safety

measures. All institutions generating biomedical waste must segregate waste in the prescribed colored containers with matching liners. Regulation about the non chlorinated liners/bags, labeling of biomedical waste containers should be implemented. Use of offsite treatment facility for disposal of biomedical waste should be encouraged. Accident reporting system for accidents related to the handling or transportation of biomedical waste should be implemented. Sharp waste should be disinfected before disposal and should be containerized in color coded containers as per rules & regulations. Another important recommendation is to integrate the waste management committee with the hospital infection control committee. Regular and periodic monitoring needs to be carried out for all such aspects.