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Organization and workflow management of central sterile supply department of a tertiary care hospital of Haryana

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ABSTRACT

Background: Nosocomial infection cause significant health issues and economic loss to the patients as well as the health care facilities. To combat hospital acquired infections, hospitals need an effective method of disinfection and sterilization which can be taken care by the central sterile supply department (CSSD). The objective of establishing a CSSD is to make reliably sterilized articles available at the required time and place. Aim and objectives were to study the organization and workflow management of CSSD of a tertiary care institution.

Methods: This observational study was carried out from February 2018 to April 2018. An observation checklist was used for the purpose of study after obtaining permission from appropriate authorities.

Results: CSSD of the institution is centrally located within the hospital premises and has 11 staff members. Linen, cotton, dressings, instruments and trays are sterilized in the CSSD. Sterilization is done by steam sterilization and gas sterilization with a total of seven autoclaves and two ETO machines. Physical, chemical and biological indicators are regularly used during the process of sterilization.

Conclusions: CSSD of the institution is contributing its part towards reduction of nosocomial infections. Quality of standards for sterilization and disinfection is maintained.

Keywords: CSSD, Infection, Soiled, Sterilization

INTRODUCTION

Hospital acquired infection or 'nosocomial infection' adversely affects both patients and hospitals. Impact of nosocomial infections ranges from increased length of hospital stay, emotional stress, disability, death of the patients as well as increased hospital cost for the patients and providers. Studies in India have reported nosocomial infection rates from 8% to 58%. To combat these infections, hospital needs effective methods of disinfection and sterilization which has nowadays been centralized into a single department called CSSD. In 1928, the American college of surgeons initiated

centralization of all surgical supplies and dressings in one unit for supply to all departments of the hospital. Thus, the concept of CSSD began in the hospitals. During the Second World War, the British Army established a CSSD in Cairo for supply of sterile items to mobile units. In India, one of the earliest CSSDs was established by Safdarjung hospital, Delhi and christian medical college, Vellore during 1957-60.³

Organization and functioning of CSSD

CSSD is an independent department with facilities to receive, clean, pack, disinfect, sterilize, store and

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distribute instruments, as per well-delineated protocols and standardized procedures.⁴ The workload in a CSSD varies from hospital to hospital.

The objective of establishing a CSSD is to make reliably sterilized articles available at the required time and place for any agreed purpose in the hospital as economically as possible, having regard to the need to conserve the time of users.⁵

The location of CSSD should be convenient to its principal consumers like nursing units, labor rooms and operation theatres. There should be a minimum of 7 square feet on a per bed basis is considered essential for planning a CSSD with scope for future expansion and growth. Functional areas of CSSD are the receiving area, decontamination area, packing area, sterilizing and cooling area, dispatch area, administrative areas and staff amenities. Broadly, the functions of the department are to receive and process used and unsterile supplies and sets; to maintain uninterrupted and bacteriologically safe supplies at all times; to participate in hospital infection control programme and to provide advice and training to hospital administration on suitability of supplies and equipment from sterilization point of view.

CSSD aims to maintain high quality of sterilization services. Several indicators are used to assess the quality of services. These may be,

- Mechanical indicators are monitoring instruments which record time, temperature, humidity and pressure during the sterilization cycle.
- Chemical indicators are devices with a sensitive chemical or dye to monitor one or more parameters of a sterilization cycle.
- Biological indicators employ the principle of inhibition of growth of microorganism of high resistance to the mode of sterilization. Subsequent failure of growth of microorganism indicates adequacy of sterilization.

CSSD is an essential component of every health institution to ensure high quality of health services and reduction of hospital acquired infections. So this study was conducted to understand the organization and workflow management of CSSD and provide recommendations to institution for further improvement.

Aim and objectives

To study organization, workflow management and staffing pattern of CSSD of a tertiary care hospital of Haryana.

METHODS

This observational study was conducted in CSSD of a 1700 bedded tertiary care government hospital of district Rohtak (Haryana) over a period of three months i.e.

February 2018 to April 2018. An observation checklist based on CSSD standards as prescribed by World Health Organization (WHO) and the Ministry of Health and Family Welfare (MoHFW), Government of India was used for data collection. Prior permission was obtained from appropriate authority before conducting the study. The investigator visited the CSSD of the institution and collected data regarding infrastructure, staffing pattern, workflow management, items sterilized, process of sterilization and quality control operations in CSSD. Confidentiality of information was maintained.

RESULTS

Physical infrastructure and layout

The CSSD of the institution is centrally located within the hospital building which is convenient to all operation theatres and wards. There is provision of restricted access into CSSD and separate slippers/shoe covers have to be worn before entering.

Timings of operation

The CSSD operates from 7 am to 6 pm daily. It also operates on sundays and holidays.

Division of CSSD area

- Receiving area
- Cleaning/washing area
- Packing area
- Sterilization area
- Sterile storage area
- Administrative area
- Other basic amenities area like potable drinking water, separate toilet for males and females, changing area, hand washing facility, fire safety arrangements and adequate ventilation is present. There is a need for separate changing area for males and females.

Zones of CSSD: The CSSD is divided into 3 zones

- Soiled zone: In this zone, soiled items from various departments are received through the receiving window, segregated and sent towards the clean zone as per their specifications.
- Clean zone: In this zone, equipments for cleaning and sterilization are located. The process of washing, disinfection and sterilization is undertaken in this area and later, sterilized items are sent towards the sterile store. Ethylene oxide sterilizers have been placed in this zone.
- 3. *Sterile zone:* This zone consists of sterile store where sterilized items are stored till they are distributed to user departments. Later, sterilized items are issued through dispatch/issuing window.

Floor and walls of CSSD are plastered and impervious while the workbenches are made of marble.

Cleaning/decontamination of CSSD is done daily with sodium hypochlorite solution and phenol. There is shortage of housekeeping staff in CSSD. Fumigation is performed every month using Potassium permanganate with formaldehyde (37-41%). On the next day of fumigation, four samples (each from store racks, slabs, floor and wall) are taken for culture in culture tubes and sent to microbiology department laboratory to check for growth of microorganisms.

Workflow management of CSSD:

- Receiving items from user departments: Soiled items are received from user departments through receipt window. Records are maintained and issue slips are also provided. Articles are further sorted to be sent for cleaning and sterilization.
- Cleaning: Ideally, pre-cleaned instruments must be received from the respective wards. Soiled instruments or instruments used in case of HIV/Hepatitis B patients are soaked in 1% sodium hypochlorite solution for 3 days in CSSD. Clean washed linen is received from laundry and sent for further processing.
- *Drying*: Items are either air dried or dried within the drying cabinet.
- Packing: Linen is folded and packed. Instrument trays are prepared. Plastic and rubber items are packed in medical grade paper before sterilization.
- *Sterilization:* Articles are sterilized either by steam sterilization (Autoclave) or gas sterilization (ETO machine).
- Storage: Sterilized articles are stored in racks located in sterile store and records are maintained.
- *Issue of sterile items:* This is done through issue window and sterilized items are transported back to user departments over carbolized trolleys.

Staffing pattern of CSSD

There are a total of 11 staff members including the in charge of CSSD, CSSD supervisors, sterilization technician, attendants, store keeper and other support staff. The investigator observed that the staff does not wear proper uniform and all personal protection equipments except gloves during working. Most of the staff is fully immunized for hepatitis B and tetanus except the new recruits. Qualified staff has been employed in CSSD but regular refresher trainings for staff is not conducted by the CSSD department/hospital administration.

Operating policy

The CSSD of the institution has its own Standard Operating Procedures (SOPs) and operates accordingly. There is a need to mention recall procedure in the SOPs.

Table 1: Equipments available in CSSD.

Si no.	Name of equipment	Number	
1	Gauze cutter	2	
2	Autoclaves (rectangular horizontal type)	7	
3	Ethylene oxide sterilizer (8XL)	2	
4	Work benches with marble or stainless steel top	Available	
5	Storage cupboards and racks 34		
6	Linen folding table	Available	
7	Soaking sinks	2	
8	Drying cabinets	1	
9	Trolleys	10	

Table 2: Items sterilized in CSSD.

Si no.	Items	Numbers sterilized	Method of sterilization used
1	OT linen	27 packets/day	Steam sterilization
2	Bowls and trays	86/day	Steam sterilization
3	Dressing drums	6-8/day	Steam sterilization
4	Other item like dressing, sponges, gauze and cotton material	-	Steam sterilization
5	Ward articles	200/day	Steam or gas sterilization (depending upon the type of article)
6	Instruments	Rubber and plastic articles-400/month	Gas sterilization
7	Gloves	Not reused	-

Biomedical waste management

Biomedical waste generated during the process of cleaning, disinfection and sterilization is disposed according to biomedical waste management guidelines. Colour coded bins are available in CSSD.

Maintenance and repair of equipments

Autoclaves and ETOs are under annual maintenance contract. Minor machinery faults are repaired by the workshop of the institution while in case of major ones, the supplier repairs the machine.

Monitoring and evaluation

Periodic internal audits and monitoring is performed by the in charge and supervisor of CSSD. Yearly financial audits are undertaken to assess the utilization of budget. Records are maintained by the store keeper.

DISCUSSION

Sterilization is the complete destruction or removal of microorganisms, including bacterial spores i.e. sterilization may be defined as a validated process used to render a product free from viable microorganisms. The European standard defines that a medical device determined to be "sterile" should reach a SAL (sterilization assurance level) of 10⁻⁶ colony-forming units (CFU) when it undergoes a validation process. Cleaning is physical removal of body materials, dust or foreign material whereas disinfection is the destruction or removal of microorganisms at a level that is not harmful to health and safe to handle. This process does not necessarily include the destruction of bacterial spores.

The CSSD of this tertiary care institution of Haryana is ideally located and lies centrally within the hospital building. According to WHO, there is no strict regulations or criteria regarding space measurements.⁶ The space estimate might be based on some or all of the following:

- Size of the institution.
- Average number and type of surgical procedures per day.
- Number of beds relying on the supply from CSSD.

According to Indian health facility guidelines for CSSD, there is no major restriction of timings for receipt and issue of items in CSSD because in departments like OT, ICU, emergency department etc. is exempted from time dimensions since it is difficult to restrict their activity within specific time limit due to the emergency nature of care provided by the department.⁶ This is similarly followed in CSSD of our institution. Basic amenities for staff like drinking water, hand washing and toilet facility, changing room etc. are available in the CSSD. There is need to focus on the aspect of construction of separate changing rooms for males and females.

According to WHO, staffing levels will depend also upon the facility financial investment in CSSD, number of operating theatres, requirement of sterilized materials. Shortage of manpower leads to increased workload on the existing staff and may compromise the quality of operations. There is a need of regular refresher training for CSSD staff of this institution because enhancement of skills is one of the basic parameters of quality assurance.

The investigator noted that the CSSD of the institution follows clean for dirty exchange system i.e. soiled items from the user department are replaced by another set of sterilized articles. This may be advantageous as it maintains the adequate number of sterilized articles to be used when needed.

Sakharkar states that the main equipment in the CSSD is the autoclave. At least one additional autoclave other than the main one should be provided to cater for failure or extra workload. Autoclaves must function according to manufacturer's instruction, regularly cleaned and quality checks must be performed. In CSSD of study institution, seven functional autoclaves and two ETO machines are available for sterilization which is quite a sufficient number. Autoclaves function according to SOPs of CSSD, regularly cleaned and quality checks of sterilized items are undertaken regularly. Shetty reported that steam sterilization was the only sterilization method practiced in the selected hospital of Mangalore and physical, chemical and biological indicators were regularly being used. 10

In case of return of unutilized packs, our CSSD follows the policy of repetition of the whole cycle of decontamination and sterilization. This indicates high quality of operating standards in the institution.

Though earlier gloves were recycled in this CSSD but now this operation has been discontinued. The practice of using disposable gloves proves to be highly beneficial for infection control within the hospital. In a study conducted by Arora et al in a 1700 bedded public sector tertiary care teaching hospital of North India it was reported that that the purchase of sterile disposable single-use gloves was cheaper than the process of recycling. Reprocessing of gloves was not economical on tangible terms even in resource-limited settings, and from the perspective of better infection control as well as health-care worker safety.¹¹

There is a necessity of inclusion of recall procedures in the SOPs of CSSD. Recall procedure must specify who to report first in case of failure of sterilization, actions to be undertaken and format for recall report. Though periodic internal audits and supervision is performed in CSSD, it may be emphasized that there is a need of conducting regular external audits as they provide a clearer unbiased picture of operations of CSSD and thus help in overall quality improvement.

CONCLUSION

Nosocomial infection cause significant health issues and economic loss to the patients as well as the health care facilities. CSSD ensures that reliably sterilized articles available at the required time and place. An efficient CSSD not only improves patient outcomes and reputation of the institution but also reduces the wastage of healthcare expenditure. CSSD of the institution is contributing its part towards reduction of nosocomial infections. Articles are sterilized using steam sterilization (autoclave) and gas sterilization (ETO). Quality of standards for sterilization and disinfection are well

maintained and physical, chemical and biological indicators are regularly employed.

Recommendations

An efficient CSSD not only improves patient outcomes and reputation of the institution but also reduces the wastage of healthcare expenditure. Though the CSSD of the institution is operating effectively, however, this study suggests a few recommendations for the enhancement of quality of operating standards. Staff must be provided refresher training to update them regarding the latest advancements in the field of infection control. Importance of personal protective equipments and vaccination must be clearly explained for their own health and the control of nosocomial infections. Recall procedure must be included in SOPs of the CSSD.

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Institutional Ethics Committee

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