Quality Control in Linen and Laundry Service at A Tertiary Care Teaching Hospital in India

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Abstract:

Introduction: The clean bedding and clean clothes installs psychological confidence in the patients and the public and enhances their faith in the services rendered by the hospital. Being an important Component in the management of the patients, a study was carried out to find out the current quality status and its conformity with the known standards and identify the areas of intervention in order to further increase the patient and staff satisfaction regarding the services provided by linen and laundry department

Methods: Quality control practised in the Linen and Laundry Service was studied by conducting a prospective study on the concept of Donabedian model of structure, process and outcome. Study was done by pre-designed Proforma along with observation / Interviews / Questionnaire and study of records. The input studied included physical facilities, manpower, materials, equipments and environmental factors. The various elements of manpower studied consisted of number of staff working, their qualification, training, promotion avenues, motivation and job satisfaction. Process was studied by carrying out observations in linen and laundry service through a predesigned flow chart which was supplemented by interviews with different category of staff. Patient satisfaction, staff satisfaction and microbial count of laundered linen (quality dimensions) were studied in the outcome.

Results: The current study found that in spite of certain deficiencies in the equipment, manpower and process, the linen and laundry service is providing a satisfactory service to its users. However the services can be further improved by removing the present deficiencies both at structure and process level.

Keywords: Linen and laundry service, Hospital linen, physical facilities, Quality control.

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Introduction

Hospital management in modern milieu has become patient oriented. It is a established fact that the patient outcome is a result of efficient and appropriate medical, nursing and allied care along with provision of good hygienic food, clean linen, safe environment, congenial atmosphere and good interpersonal relationship.[1]

The support services for patient care are indispensable for a hospital to perform in true perspective and facilitate the patient care process. Linen and laundry is a recognized support service which not only ensures prevention and containment of hospital infection but also contributes to widen the image of the hospital in the eyes of public. The dictionary meaning of linen is a flex or an article of cotton. However, in hospital the term is used for clothing of the patient, medical and Para-medical staff and also the clothing material used for the patients care services in operation theatres, beds trolleys including the mattresses, pillows, blankets, sheets and towels etc. [2]

The Clean linen installs psychological confidence in the patients and the public and enhances their faith in the services rendered by the hospital.[3] Simultaneously an efficient linen and laundry service is of advantage for hospital marketing [4] and speaks of ability of the medical care service.[1]

Being an important component in the management of patients, a study was carried out to find out the current quality status and its conformity with the known standards and identify the areas of intervention in order to further increase the patient and staff satisfaction regarding the services provided by linen and laundry department at Sher-i-Kashmir Institute of Medical Sciences (SKIMS), a tertiary care teaching and research hospital.

Methods

Quality control in linen and laundry service was a prospective study of six months duration from January 2005 to June 2005 as well as a retrospective study of five years from 2000 to December 2004 carried out at SKIMS.

Motivation and Job Satisfaction of the staff working in the Linen and Laundry Service was studied by subjecting them to pre-designed semi-structured questionnaire. The present study was conducted on the concept of Donabedian model ie structure, process and outcome.

Structure

The employees working in linen and laundry service was subjected to a questionnaire and was supplemented by study of relevant records regarding various structural aspects available with the personnel section, linen and laundry service and hospital administration department. Physical facilities of the linen and laundry service studied were layout, design, space, etc. A drawing of physical and architectural layout was obtained and later verified. A study of available records in the linen and laundry service, Medical Superintendent's Office and other administrative sections of the hospital was carried out. Interviews with relevant functionaries was also conducted to obtain information on the various organizational aspects, which included hierarchy, span of control, jobs specification and job description, supervision, co-ordination, communication channels and reporting methods in linen and laundry service.

Materials: The availability and quality of the material and machinery plays a vital role in achieving the desired results. These aspects were studied along with availability of services like water, steam, Power supply, etc. For this purpose discussions were held with the concerned engineering department and material management officer.

Equipment: Equipment was studied by conducting on spot observational study and study of records available in the material management and linen and laundry services and various other relevant administrative sections.

Environmental Factors: Various aspects of environmental factors prevalent in the Linen and Laundry Service were studied which included lighting, ventilation, temperature, humidity, noise pollution, pesticide control and disposal of waste. These were studied by weekly visits to the laundry to make direct observations. The study was supplemented by the study of available records from Linen and Laundry Service and engineering department. Interviews with the concerned staff were also conducted to fill in the gaps in the information required.

Human Resource: The various elements like the number of staff working, their qualification, training, promotion avenues in addition motivation and job satisfaction were studied. Motivation and job satisfaction of the staff working in Linen and Laundry Services was studied by subjecting the staff to a pre-designed semi-structured questionnaire. Positive answer (Yes) indicated motivated and satisfied and negative answer (No) signified unsatisfied. Questionnaire giving positive response of 70% or more were considered satisfied and motivated.

Process

The process was studied by developing the flow chart of the processes in consultation with the officer in-charge of Linen and Laundry Service (Fig. 1).

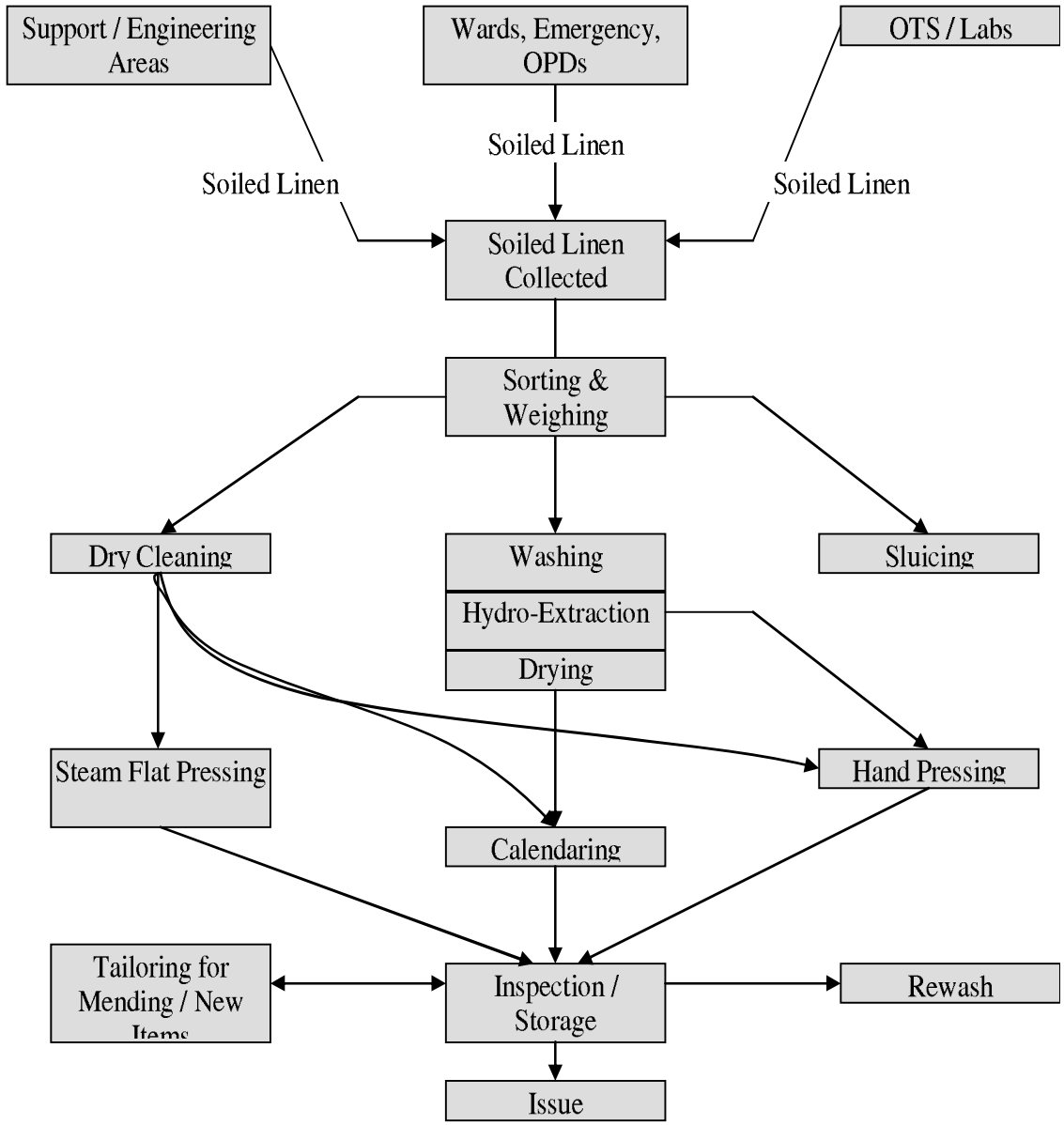

Fig. (1). Flow Chart: Linen and Laundery Service.

The literature was reviewed and views of experts were also sought. After designing of flow chart an observational study was carried out to assess the process of linen and laundry in comparison with the flow chart already designed. The observational study was supplemented by carrying out interviews with different categories of staff involved in the laundering process.

Outcome

The ultimate implication of any service is to deliver the desired result in the shape of finished product or service. In order to study the quality service provided by the Linen and Laundry Service, the parameters (quality dimensions) studied were patient satisfaction, staff satisfaction and microbial count of laundered linen.

Patient Satisfaction: To study the patient satisfaction with linen and laundry Services, a semi-structured questionnaire was designed. The questionnaire included questions pertaining to various aspects of user satisfaction with the laundered products and its services. Area for patient satisfaction survey included Observation Ward, General Surgery and General Medicine wards. The reason for selecting these wards was that they represent the major user of the laundry services, with Observation ward representing Accident and Emergency Department and General Medicine and General Surgery representing the in-service area of the hospital. The questionnaire was administered to the patients or attendants of the patients at the time of discharge from the hospital. The study was carried for a period of six months from January 2005 to June 2005. The questionnaire was administered to 1000 patients/ attendants who were selected randomly at the time of discharge. The random distribution of questionnaire was done by the in-charge nursing of their respective wards with whom the questionnaire was kept. The questionnaire included seven questions regarding patient satisfaction with Linen and Laundry Services. The questions were close ended with dichotomous responses (Yes, No). 'Yes' / positive response signified satisfaction. The positive responses to these questions were cumulated and average taken for analyses.

Staff Satisfaction: To study the staff satisfaction with the Linen and Laundry Services a pre-designed questionnaire was administered to the staff involved in the patient care. The questionnaire was distributed to 200 staff personnel who were selected randomly. The categories of staff included doctors, nurses, lab technicians, theatre assistants and technicians, drivers, security personnel, landscape and housekeeping personnel. The questionnaire contained ten questions covering most of the aspect of the staff satisfaction with Linen and Laundry Services. The questionnaire was analyzed by cumulating the positive response and calculating the average for the same.

Microbial Count of laundered linen: Microbial count of the linen and laundry was studied by taking swab culture from linen ready for dispatch to various user areas of the hospital. The samples were taken at weekly interval for a period of three month from Jan 2005 to March 2005 and submitted to the microbiology department for investigation. The data regarding the sample and results obtained were entered on pre-designed questionnaires. The data collected was analyzed by assessing the percentage of samples found infected against the total sample taken for the period of study.

Results

This study was carried out in three steps based on the concept of input / output model.

Structure

Linen and laundry service is located in the ground floor (in the services core area of the hospital). The location of the department provides easy access to user area i.e. Emergency Service, Operation Theatre, Wards, etc. Linen and Laundry service area has a separate entrance and exit with unidirectional flow of linen which reduces the chances of dirty linen contaminating the clean product. Linen and Laundry service has rectangle shape with space area of 8400 square feet. The layout allows unidirectional flow of the product with least chances of contamination. The laundry layout is broadly divided into four basic areas: Reception and Sorting Area, Processing Area, Clean Linen Store and Tailoring Section.

Flooring is smooth, non-slippery, water impervious. Walls are smooth, washable surfaces and free from all unnecessary corners, edges and projections with glazed ceramic tiles fixed up to 8 feet height. Ceiling is smooth, washable surface and is high enough to allow installation and repair of all

equipments, the main building is having clear headroom of 14 feet and the roof is build free from dust collecting surfaces. Doors are wide enough to admit heavy machinery and trolleys. Sanctioned strength of staff for Linen and Laundry section is 64 but functional strength is 42. Twenty two posts are lying vacant. However, the above shortage of manpower include the manpower required for the beds located in paying wards yet to be commissioned (which include Laundry Operators 4, Linen Assistants 3 and Linen Attendants 4). Thus the actual shortage of manpower in Linen and Laundry Services is 11 (17.40%). Qualification of staff has a bearing on the motivation and effectiveness of services delivered. This aspect of the various staff working in Linen and Laundry Services was studied and following observations were noted. Chief Manager of Laundry Services is a qualified Chemical Engineer, Laundry Superintendent is B. Sc. Technology, Head Assistant and Store Keepers are graduates in arts. Most of the other technical staff is having under-matriculate qualification and have received informal training or in-service training. Most of the base line workers or operators were washer men by profession before their appointment as laundry operators. Tailors were in tailoring trade before appointments. Promotion to higher grade was achieved with the length of service and performance appraisal for all the staff in the linen and laundry service.

The rational assertive response to particular question has been considered satisfactory, while summing up responses of an employee, predicted overall motivation and job satisfaction. However, we considered more than 70% assertiveness as satisfactory. Hence we concluded that 50% of the employees in the age group of 20 to 40 years were satisfied with respect to overall motivation and job satisfaction, whereas only 40.5% employees in the age group of 41 to 60 years were satisfied. 30.5% male employees were motivated and satisfied whereas females were 100% motivated and satisfied with working conditions. With regard to the time of recruitment > 10 years, 41.5% employees were motivated and satisfied with job. The supervisory staff was 100 percent motivated and job satisfied, as compared to non-technical staff 11.1% and technical staff 46.7% respectively. 40% of employees having formal technical qualification were motivated and job satisfied where as employees having informal technical qualification had 42.3% motivation and job satisfaction (Table 1).

Table (1). Overall Job Satisfaction and Motivation.

		Overall Job Satisfaction & Motivation			
		Unsatisfied		**Satisfied**	
		number	**Row %**	**number**	**Row %**
Age	20 to 40	2	50.0	2	50.0
	41 to 60	22	59.5	15	40.5
Gender	Male	24	61.5	15	38.5
	Female			2	100.0
Time of Recruitment	> 10 yrs	24	58.5	17	41.5
Pay Scale	< 10000	23	65.7	12	34.3
	> or = 10000	1	16.7	5	83.3
Qualification	< 10 + 2	19	55.9	15	44.1
	>= 10 + 2	5	71.4	2	28.6
Designation	Supervisor			2	100.0
	Non Tech.	8	88.9	1	11.1
	Tech.	16	53.3	14	46.7
Tech. Qualification	Formal	9	60.0	6	40.0
	Informal	15	57.7	11	42.3

Material resources constitute an important aspect of Input for delivery of services along with manpower and machinery. Linen and Laundry Service of hospital was observed for the same and the observations recorded. The various materials used included Linen, Detergents, Whitening Agents, Soda Ash, Bleaching Powder, Spotting Chemical, Dry Cleaning Agents and Stain Removing Agents. Requirement of all these items is calculated on the basis of average linen load, beds and number of employees to be provided with uniforms, etc. These requirements are submitted to the purchase department for procurement on yearly basis. These items are stored in various stores of Linen and Laundry viz. Linen store, uniform store and chemical stores. These materials are issued to the user section on proper requisition and record of all these items is well maintained in the linen and laundry services.

Water supply, both hot and cold, is uninterrupted and it ranged from 50 – 100 litres / bed. The electric supply of Linen and Laundry Services is 220 – 240 Watts, 3-phase AC connected to alternate standby generator. Linen and Laundry Services share the steam generated in the boiler house with other services like Central sterile Supplies Department (CSSD), Theatre Sterile Supplies Unit (TSSU), etc. The steam is supplied at 178 C with 100 psi (pounds per square inch). However, specifications given by the manufacturers of washers and calendaring machine are also adhered to.

Equipments in the laundry are mainstay in the maintenance of quality linen and laundry services. Maintenance of the equipment was done six monthly by the in-house maintenance cell in the hospital under the supervision of mechanical and chemical engineer, and service engineers of the companies who installed the equipment.

There is sufficient amount of daylight. Ten air changes per hour are maintained. Temperature of 20 – 30^0 C and relative humidity of 35 to 50% is maintained for comfort and efficient working of laundry workers.

Fire extinguishers were not located in the Linen and Laundry Section. So in case of fire in Linen and Laundry Section they have to contact Security and Fire Fighting personnel's. There is lot of noise pollution in Linen and Laundry Section, which is generated by the machines. There is no specific mechanism and equipment available to measure and control the noise pollution. Sanitation department carries out pesticide control. Effective use of Baygon (insecticide) and other chemical measures are carried out on a regular basis in the service area for effective pest control.

Waste generated in the Linen and Laundry Service consists of both solids and liquids. The bulk is constituted of liquid washout, which goes to sewerage treatment plant of the hospital after treatment. The solid waste generated is disposed off as per the norms of the solid domestic waste generated in other areas of the hospital.

Process

There were no written manual policies for collection, washing, calendaring, storage, distribution, etc. in the Linen and Laundry Services at the time of this study. However, the standard guidelines were followed. Delivery and collection of linen is done by the laundry staff using different trolleys for each purpose. The dirty linen from the wards is kept in the dirty utility room till they were sent for laundering. After receiving the linen in laundry, it was sorted and inspected. If not infected or soiled it is weighted. If it is infected or fouled then it is processed through sluicing machine. For sluicing, linen is washed in cold water to remove dirt, vomitus, faecal matter, blood and body fluids deposited on cloths but sluicing machine at the time of study was out of order, so dirty linen after weighing was directly sent for washing.

For optimal removal of dirt from clothes, combined action of detergents and mechanical washers is used. The standard input for this operation is steam for heating and the following washing formula is followed.

Washing formula

For one Kilogram of linen, 12 grams of detergent, 20 grams of Soda ash, 5 grams bleaching powder, 5 grams Acetic acid, ½ gram *Neel (fabric whitener)*. By process of centrifugation, hydro-extractor machine extracts or expels water from damp washed clothes. Drying tumblers agitate the hydro-extracted mass of washed linen inside a cylinder so that steam passes through the clothes at high temperatures (60^0 – 70^0 C). This results in drying of linen. Flat bed steam press consists of concave, convex process with tiny holes for

passage of steam. Fabrics get processed by mechanical pressure and steam. Inspection, storage and packing is adequate.

The linen and laundry services after assessment of requirement identify specification for quality and quantity of the various items to be processed for purchase. These specifications are submitted to purchase section on yearly basis for tendering and procurement. After the invitation of tenders, the tenders along with samples where ever required are received by the material management department. The comparative statement are prepared and sent to Accounts department for recheck. During that course the technical / source identification committees are constituted. These committees have representation from users, Hospital Administration, Accounts, Material management and the linen and laundry services. The recommendations made by the committees are evaluated and put up to purchase committee for consideration. Based on the recommendations of purchase committee, the purchase orders are placed and the allotments are made to lowest bidder by purchase section. The items are received by central stores and inspected for specification by inspection committee with senior Material management officer stores as convener .The other members of the committee include representation from users and Hospital administration. The items are issued to the linen and laundry service on proper indent. The items are stored in various stores of linen and laundry viz. linen store, uniform store, and chemical store. The materials are issued to the user section on proper requisition and record of all the items is well maintained in the Linen and Laundry Service in accordance with the standard guidelines and govt. rules on the subject.

Outcome

Table (2). Patient satisfaction about linen and laundry services.

Patient Satisfaction about Linen and Laundry		
1	Bedding Impressiveness (+)	96.6%
2	Proper Linen Change	84.8%
3	Laundry Process	95.6%
3	Dryness of Linen	98.7%
5	Sufficiency of Linen	84.8%
6	Non-Additional Home Linen Utilization	64.6%
7	Better quality of Linen at our hospital than other health care centers.	90.6%

Table (3). Staff satisfaction about linen and laundry services.

	Satisfaction with respect to	*Doctor*	*Nurse*	*Others*	*Overall*
1.	Quantity of linen is adequate	98.9	58.0	89.7	86.0
2.	Do you need additional linen	98.9	42.0	10.3	13.5
3.	Linen provided to you is clean	100.0	100.0	100.0	100.0
4.	Linen is ironed or not	100.0	100.0	100.0	100.0
5.	The line you receive is dry	100.0	100.0	100.0	100.0
6.	Patient linen is impressive	100.0	100.0	100.0	100.0
7.	Transport of linen is proper	100.0	100.0	98.3	99.5
8.	Is the linen of this hospital is better then other hospital	100.0	100.0	100.0	100.0
9.	Is linen and laundry is properly situated	100.0	100.0	100.0	100.0
10.	Is the Linen & Laundry the staff cooperative	100.0	100.0	100.0	100.0

In this study, 87.96% of patients and 99% doctors (Tables 2,3) were satisfied with the linen and laundry services, however only 58% of nurses and 90% of other staff were found satisfied. One percent of doctors required additional linen, where as 58% of nurses and 90% of other staff required additional linen. All the doctors and nurses and 98% of other staff were satisfied about the transportation mechanism of the linen in hospital. The co-operation of linen and laundry staff was appreciated by all. Regarding cleanliness, proper ironing, dryness, all the staff members (doctor nurses and other) were found satisfied. All the staff members were found satisfied regarding location of linen and laundry service and capabilities to meet the requirements of hospital (Table 3). Overall satisfaction among the doctors, nurses and other staff regarding the linen and laundry services was found more than 90%.

Microbial Count

Table (4). Frequency distribution of various samples studied.

Samples	Frequency	%	Cumulative %
Blanket	5	7.2	7.2
Draw Sheet	6	8.7	15.9
Surgeon Gown	5	7.2	23.9
Hydro-extractor	6	8.7	31.9
Handcuffs	6	8.7	40.6
Blanket cover	6	8.7	49.3
Bed Sheet	5	7.2	56.5
Apron	5	7.2	63.8
Rack	5	7.2	71.0
Patient Suits	5	7.2	78.3
Trolley	5	7.2	85.5
Surgeon Suit	5	7.2	92.8
Pillow Cover	5	7.2	100
Total	69	100%	

Table (5). Frequency distribution Culture Report of various Samples from Linen & Laundry.

Culture Report	Frequency	%age	Cumulative
Sterile	60	87	87
Pseudomonas	4	5.5	92.8
Klebsiella	1	1.4	94.2
Aerobic Spores	4	5.8	100

Table (6). Culture Sensitivity Report of samples collected from Laundry.

Sample	Culture Report				Total
	Sterile	Pseudomonas	Klebsiella	Aerobic spores	
Blanket	3 (60%)	1(20%)	0	1(20%)	5
Draw Sheet	6 (100%)	0	0	0	6
Surgeon Gown	4 (80%)	0	0	1(20%)	5
Hyde Extractor	6 (100%)	0	0	0	6
Hand Cuff	6 (100%)	0	0	0	6
Blanket cove	4 (66%)	1(16.7)	0	1(16.7%)	6
Bed Sheet	5 (100%)	0	0	0	5
Apron	5 (100%)	0	0	0	5
Rack	5 (100%)	0	0	0	5
Patient Suits	4 (805)	0	1(20%)	0	5
Trolley	3 (60%)	2(40%)	0	0	5
Surgeon Suits	5 (100%)	0	0	0	5
Pillow Cover	4 (80%0	0	0	1(20%)	5
Total	60	4	1	4	69

With respect to microbial count our study found 40% of blankets studied were culture positive, which include 20% pseudomonas and aerobic spores each. Forty percent of trolleys were found positive for Pseudomonas. 34% of blanket covers were culture positive. 16.7% grew Pseudomonas and rest 16.7% aerobic spores. 20% of surgeon gown showed positive culture for aerobic spores. 20% of patient suits showed positive culture for Klebsiella. 20% of pillow covers were positive for aerobic spores (Table 4, 5, 6).

Discussion

Linen and Laundry Service is located in the service core area of the hospital housed in the ground floor. The location of the department provides easy access to user areas i.e. Emergency department, Operation Theatre and wards etc. Linen and Laundry Service area has a separate entrance and exit with unidirectional flow of linen. It is also in the close proximity to Central sterile Services Department (CSSD), Dietary services and Central Boiler House because of central piped steam supply from the boiler house. The location of the linen and laundry service at our hospital is in consonance with the guidelines recommended by McGibnoy.[4]

Linen and laundry service currently catering to 570 beds and has a total area of 8400 square feet. When compared to norms available this space is quite adequate and can cater to about 250 additional beds. McGibony has recommended a space of 4500 square feet for 500-600 bedded hospital and for a teaching hospital of same bed compliment recommended a space of 5800 square feet [5] SKIMS hospital also satisfy the linen and laundry space against the bed compliment recommended by Indian Standards Institution. [5] The structure including physical facilities, ancillary facilities, water, electric supply and steam (as discussed above) are according to recommended standard engineering norms.[4,5]

Linen and Laundry Service have well-structured organizational framework which clearly explains the hierarchal network, number of staff working and the span of control exercised at various levels of supervision. There are also definite channels of communication, well-defined job specification, job description and supervision. The organizational structure meets the required guidelines on similar pattern recommended by the Institute of Sciences and Technology (IST) University of Michigan USA for Hospital Staffing Methodology. [6] Study of the Manpower revealed total sanctioned staff strength of sixty four with shortage of 17.4%. Extent of automation and type of machine location of the laundry and also methodology of the linen supply system will be an important factor to determine the number of staff needed. According to U.S Department of Health[6] approximate number of personnel excluding the manager required in a mechanized hospital laundry based on the number of beds is: 7 personnel for 75 beds, 12 for 100-175 beds and 15 for 200-300 beds.

For the effective and efficient functioning of the Linen and Laundry Service relevant training and qualification are essential and we should have right person for the right job, thus academic and professional training and right experience is very important aspect of manpower. The Chief Manager of the Linen and Laundry Service is a qualified chemical Engineer. Laundry Superintendent is B. Sc. in laundry Technology. Most of the technical staff (Operators/Tailors) is under 10th. class. However; all of them have received in-service training. Most of the Operators were traditional washer men (Dhobis) by profession before their appointment as laundry operators. Tailors were running their private tailoring shops before appointment. The observation regarding motivation and job satisfaction of various cadres of linen and laundry services revealed that 50% of the employees in the age group of 20 – 40 years were satisfied as compared to 40.5% employees in the age group 41 to 60 years. Gender wise comparison of job satisfaction and motivation of employees revealed 30.5% males and 100% females were motivated and job satisfied. The more females were satisfied because of the fact that laundry work suites them.With regards to length of service, those having more than 10 years of service 41.5% employees were motivated and job satisfied. 34.3% of employees having pay scale less than 10,000 rupees per month were motivated and job satisfied, whereas among employees having pay scale more than Rupees 10,000 per month (83.3%) were motivated and job satisfied. The results of the study indicate that higher percentage of motivation and job satisfaction among the staff working in linen and laundry services is attributable to their higher grade of salary, length of service and promotion avenues.

Material resource along with manpower and machinery is an important component of input for effective delivery of services in laundry department. Requirement of these items is calculated on the basis of average linen load of patient, employee and user department. Equipment of the laundry is an important pillar next only to manpower. It is this resource on which the workforce uses their skill to deliver quality care service. The plan of maintenance of various equipments of linen and laundry services is on the basis of planned preventive and breakdown maintenance through maintenance cell under the supervision of engineer and is complemented by the service engineers of the companies who had supplied and installed the equipments as and when required. In the study it has been found that laundry currently is in need of replacement of defunct Sluicing machine and Dry Cleaning machine. The equipment is required by the department for effective and efficient operation and is in line with the recommendations made by Poussas. [7]

The optimal environmental conditions like lighting, ventilation, temperature and humidity facilitating the utilization of inputs for effective operations in laundry services in a hospital situation is an essential requirement . The study revealed that all these retirements are most of the time ensured and are in conformity with those stated by McGibnoy[4,5]

Our study had observed that neither there were fire extinguishers nor the workers were trained to deal with the fire hazards. But workers were instructed not to smoke and no electrical equipment should be left 'on' after working hours. Macaulay, HMC et al recommends that the fire extinguishers are must throughout the laundry. The laundry workers should be aware of the use of fire fighting extinguishers and should be trained in fire fighting.[8] No Specific mechanism and equipment was available to check and control the noise pollution in the linen and laundry services. U.S Department of labour occupational safety and health administration recommends safety and health programme to recognize and addresses the hazards created by noise pollution. [9]

Process

Although there are no written guidelines in the shape of Manual on various operational aspects in linen and laundry services e.g. collection, washing, calendaring, storage, distribution etc. However standard guidelines are followed for processing the linen. Ideally there should be written policy manual on various aspects of operation of linen and laundry services, which will help in ensuring effective and efficient working of the department and even could be used to monitor and evaluate the laundry process. The policy statements regarding laundry process according to Damani N [10] are:

All personnel involved in collection, transport sorting and washing of soiled linen should be adequately trained to wear appropriate protective clothing and have access to hand washing facilities. Used linen must be put into the appropriate colour coded containers as soon as possible after removal and must be handled with care at all times, as agitation of fabrics can markedly increase the number of airborne bacteria.[10]

Delivery and collection of linen from the user departments is done by the laundry staff using same mobile trolleys, this leaves scope for the contamination of the washed linen. However educating the staff regarding separate trolleys for collection and distribution is necessary to prevent contamination. Hospital Centre London also recommends the use of separate mobile covered trolleys for collection and distribution for reducing the chances of cross infection.[5] The dirty linen from the wards is kept in the dirty utility room of the ward till its transportation to the laundry and linen service. There is no practice of removing or washing the blood / vomit us soaked linen in the ward as it increases spread of infection. The workers handling dirty linen practice Universal Precautions. U.S department of Labour Occupational Safety and Health Administration recommends the use of Personal Protective Equipment such as gloves, gowns, and masks while handling and sorting contaminated linen.[9] Infected or fouled linen after weighing then should be processed first in sluicing machine as per the standard recommendations. But our linen and laundry service sluicing machine at the time of study was out of order. So dirty linen after weighing was directly subjected to washing.

Cunliffe in his manual, Hospital Laundry Arrangements recommends that hand sluicing in wards should be replaced by machine sluicing in the hospital.[11]

Colour coding was not followed in the Linen and Laundry Services for sorting and transport of the contaminated linen. Damini NN in his manual of infection control procedures recommends Colour coding for dirty linen. Soiled linen should be put into white fabric bags, fouled linen should be first put into a clear white (or off-white plastic) bag and then placed into the white fabric bags. Infected linen should be placed in double bag using an inner water-soluble bag (or bag with water soluble membrane) and then out into a red plastic bag. Additionally it should carry a prominent yellow label marked "infected linen". Heat liable linen should be put into a white bag with prominent orange strips. [10]

For removal of dirt from clothes combined action of detergent and mechanical movements of clothes through water is required and applied in mechanical washers. The standard input for this operation is steam for heating. American Hospital Association Chicago[12] recommends scale of washing material, which is almost similar to what is being used in our hospital for washing of dirty linen.

Other operational aspects of the washing i.e. Breaking, Sluicing, Bleaching, Rinsing, Starching, Soursing, Blueing, Ironing are followed as per the standards set by American Hospital Association Chicago. Hydro-extraction, Drying, Calendaring/Hot ironing, Pressing or Hand ironing, Inspection, Mending/Rewashing, Folding/Packing/Storage and Issue procedure were also on similar lines as have been recommended by American Hospital Association.[12]

Outcome

The patient's Satisfaction is the real testimony to the efficiency of the hospital. It becomes important observe the relationship between the management and patient satisfaction. In our study Overall 87.96% of the patients and their attendants were satisfied with the Linen and Laundry Services. The result of our study was better than results of another study by Shreenivas et al on Patient Satisfaction Survey in various hospitals in India. [13]

The ultimate outcome of the services rendered in a hospital is judged by the level to which it satisfies its users. In our study, 200 personnel working in various department of the hospital directly linked with the patient care were randomly selected and studied .The category of the staff studied included doctors, nurses and other staff (Technologists, Theatre Assistants, Security Personnel, Sanitation, Transport staff and Landscape personnel etc). It was found that 90% of the staff was satisfied with the services provided by the Linen and Laundry.

In our study, 20% of pillow covers were positive for aerobic spores, which are consistent with other studies. A study conducted revealed increase in the number of isolation of Acinetobacter in a community hospital in the Netherlands. The feather pillows were the suspected common source through which the organism spread to different parts of the hospital and were found to harbour high number of Acinetobacter. Replacement with synthetic pillows and correction of laundry procedure resulted in a significant reduction of Acinetobacter isolation.[14] Blankets may act as reservoirs from which new patients may be infected. Regular disinfection of blankets was reported to result in marked reduction in number of (Staphylococci aureus) setting on culture media. In another study it was revealed that disinfected blankets become highly contaminated within a period of four to six days of use by a patient.[15]In our study 40% of blankets sample were culture positive, 20% each for pseudomonas and aerobic spores. Thirty four Percent of blanket covers were culture positive for pseudomonas (16.7%) and aerobic spores (17.3%). Surgeon gown (20%) and patient's suit (20%) showed positive culture for aerobic spores and Klebsiella respectively. Collins et al, 1987, suggested that total counts on finished linen should not exceed one organism per $10cm^2$ on a regular basis. Similarly Walter and Schillinger [16] proposed that bacterial counts on processed linen of < 20 colony forming units /100 cm2 are equivalent to complete pathogen removal, and Christian et al [17] suggested that 106 – 107 reductions in viable bacteria would be effective in reducing risk of infection. However, at present no standards for maximum safe bacterial level exist.[18] English M.P et al reports an outbreak of Tinea Pedis in a residential care hospital, suggesting that the source of infection was contaminated linen.[19] Our study has also shown 40% of trolleys positive for pseudomonas. Trolleys and vans used for the carriage of linen

should be marked separately for clean and dirty linen and should be regularly washed and periodically disinfected to minimize the danger of the re-infection of clean linen.

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