

# Editorial

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## Professional Management of Health Care Institutions

### INTRODUCTION

Health care sector is the most dynamic and evolving field in the country today. Health care organizations are gradually expanding in both public as well as private sector. Indian health care delivery system is categorized into two major components—public and private. The government, i.e., public health care system comprises of primary, secondary, and tertiary care institutions. The private sector also augments the facilities by providing health care facilities at various strata of Indian society.

In India, most of the health care service providers are organizations run by individuals or small nursing homes run by individual or group of doctors. These personnel are not adequately trained in the field of hospital administration. Despite numerous growth potential, the hospital industry faces multiple challenges owing to being managed by ill-trained personnel.

### CHALLENGE OF MANAGING HEALTH CARE FACILITIES

Along with all this comes the inherent challenge of managing the expanding health care organizations. It is very important to understand why trained health care professionals are needed to manage the health care organizations. It is paradoxical that persons by virtue of their seniority hold top positions in such organizations in age and service without any frank exposure to formal training in health care management and administration, viz. directors, medical superintendents, and so on. These professionals have no knowledge of human resource management, inventory and logistic management, best procurement practices, legal, and ethical issues, and financial management. It is relevant that 204 laws are applicable to hospitals right from commissioning to day-to-day operations and if the concerned personnel lacks the basic knowledge then it would be a herculean task to handle the hospital affairs.

Health care professionals who have an in-depth knowledge of dynamic environment of health care is the need of the hour. These professionals have a cutting edge over others due to their inherent knowledge and foresight of how actually intangibles can compromise the delivery facet. The novelty of Indian health care system lies in the fact that still more than 80% health care expenditure is out of the pocket. Hence, it is imperative that experts with basic foundation of health care administration are allowed to manage the already decompensated ecosystem.

In India, there is a huge rural urban divide and inequitable distribution of resources. There is a need of 3 million more hospital beds to match the global average of 3 beds per 1000 population and an additional 700,000 doctors will be required by 2025 to reach a ratio of one medical doctor per 1,000 individuals.

The various important issues which need the active involvement of trained professionals to plan the organizations are as follows:

*Trained manpower:* A major challenge for our nation and the health care industry would be not only to retain the health care workforce but also to attract the best talent to work in Tier II cities and rural areas. The foremost amidst them is the availability of health care professionals. As per the 12th 5-year plan document, the country faces a shortage of physicians and nurses. Despite the steps to increase number of colleges and training institutes, the number of such professionals is the issue, which needs to be addressed.

*Health care technology:* Latest advance in information technology needs to be utilized to make hospitals paperless and seamless job arenas. Telemedicine and information technology have progressed by leaps and bounds to be an integral part of health care delivery. India's medical device market worth is about \$2.5 billion. The current annual growth rate for the medical device sector is more than 6%. Some innovative technologies like radiofrequency identification, barcode, smart cards, dictaphones, and speech-to-text software have been the driving forces of innovations in health care. Innovations have made day-to-day functioning much more easy.

*Accreditation and quality:* Accreditation and assessment of health care institutions have been recognized as the quality ensuring mechanism. The criteria for assessment must be relevant, understandable, measurable, and achievable. Accreditation aids in establishing standards, measuring performance, and in identifying areas of improvement.

Accreditation of health care delivery places like hospitals and laboratories are helping in medical tourism. Now is the time to share progress, challenges and best practices to enable interoperability and link the ecosystem in the delivery of better quality care. The growing demand for quality health care and the absence of matching delivery mechanism pose a great challenge.

*Teaching faculty:* There is an acute shortage of faculty of medical teachers all over the country. One of the pivotal factors to sustain the projected growth of the health care industry in India would be the availability of a trained workforce, besides cheaper technology, better infrastructure, and so on.

*Patient safety:* Patient safety is a new health discipline that emphasizes the reporting, analysis, and prevention of medical error that often leads to adverse health care events. The patient safety knowledge helps in changing the processes to make hospitals safe for patients.

*Facility management:* There is a lot of emphasis on facility management. It encompasses all the various systems that need to be put in place so as to utilize the infrastructure and equipment that are being installed in any health care set up. Presently, the availability of trained manpower is very difficult; thus, facility management helps us to plan and foresee these needs well in time.

*Cost containment:* Cost containment in hospitals can be defined as the conscious activities and policies, processes and norms adopted for reducing the cost without compromising the outcome and quality of care. In today's health care scenario, health care expenditure even in developed countries has increased by 5 to 7% of gross domestic product. Per capita cost of health care has similarly increased. Elderly representing 11% use about 30% of health care costs. In this dynamic environment, it is imperative that cost containment is one of the major drivers for health care industry to grow further.

Various operational research tools, such as cost-benefit analysis, program evaluation and review technique, break-even analysis, and operational audits are some of the methods to monitor cost containment. Thus, cost containment policies in the health sector do not mean cuts in health expenses, but rational and efficient allocation of scarce resources.

*Marketing and branding:* Every hospital should have a mission statement and vision statement. They should position themselves with certain niche areas as their prime deliverables. This will help them stand out. Every hospital epitomizes a brand value either low cost care or specialized services. It is of essential importance that everyone on staff---from the CEO to the volunteer at the reception desk should communicate the organization's mission effectively. The result is a brand-guided organization.

A favorable hospital brand image stimulates patient loyalty directly and also enhances patient satisfaction through the improvement of service quality, which in turn promotes the revisiting intention of patients.

*Medical tourism:* The Indian medical tourism industry is pegged at US\$ 3 billion per annum, with tourist arrivals estimated at 230,000. The Indian medical tourism industry is expected to reach US\$ 6 billion by 2018, with the number of people arriving in the country for medical treatment set to double over the next 4 years. With greater number of hospitals getting accredited and receiving recognition, and greater awareness on the need to develop their quality to meet the requirements.

India is one of the top global health care destinations because the expertise of doctors is at par with the best clinicians across the globe, health infrastructure is excellent and latest technology is available across the country. Medical tourism is sustainable in India because of the necessity and the waiting period, i.e., there abroad. It is right time that this window be utilized for maximum boost to our Health sector.

*Health insurance:* Health insurance in India is expanding. It is important that at this stage professionals ensure regulations and monitoring of this sector. Government is also stressing on the need for wide insurance cover, as the out of pocket expenditure is maximum for Indians. Health sector policy formulation, assessment, and implementation is an extremely complex task especially in a changing epidemiological, institutional, technological, and political scenario. Proper understanding of the Indian health situation and application of the principles of insurance keeping in view the social realities and national objective are important.

*Legal issues:* Contemporary legal issues like CPA, right to information, and so on are now prevalent on the decision making process of health care ecosystem. The health organizations have to keep themselves abreast to handle these issues, which keep on coming more frequently now. Patient grievances have to be addressed on priority and with compassion. Hence, professional administrators who are qualified have a better insight into handling legal nuances.

*Citizen's charter:* It is imperative that every hospital should have a citizen's charter depicting the rights of a patient and responsibilities. This will help the hospitals create awareness about the various issues and will make the society a part of health care delivery.

## **NEED OF THE HOUR**

Thus, it is important that health care organizations up to district level are managed by trained hospital administrators. We have to understand that resources in terms of money, manpower, and materials are limited, whereas the demand for the same is increasing day by day in any health care set up. A professionally trained administrator can utilize these resources optimally and efficiently. The basic principle of economics has to be the guiding beacon for any health care organization "Stretching limited means to meet unlimited ends."

Expert health care professionals also have the ability to present convincingly to individuals and group the evidence to support a point of and scientific interpretation of data augmenting the strengths and developmental needs of the health ecosystem in totality. A professional administrator with multidisciplinary training would ensure the optimal use of resources. This is a technology-driven era; hence, professional experts are better placed to charter the course of successful health care delivery. Presently, SMART hospitals and SMART health care is the order of the day. The concept of smart hospital has been designed to achieve safety, clinical quality, productivity, service excellence, and optimal integration of technologies. "Internet of things" and mobile health care delivery will boost up the technology-driven health care. The central government of India has prepared a blueprint for the development of SMART cities in the country. With the advent of SMART cities in our country, SMART hospitals will synergize the efforts of delivery of holistic health care.

Better management or lack of it will determine the future of health service. Hence, it is best to leave the expert delivery to domain experts of health care. Hospitals of tomorrow should be IT-enabled, flexible, paperless, filmless, and green hospitals. These hospitals will be boundary less and will aim for optimal conservation of resources. Healing architecture and esthetic design will make hospitals more a temple of healing than a corporate structure. Hence, it is prudent that trained hospital administrators are handed over the reins of Indian health care system.

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# Guest Editorial

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## Organ Donation: Lighting Lives of Needy

Organ donation is an extremely noble deed that all of us are empowered to carry out irrespective of the social, academic, and religious strata that we are from and this single act of benevolence can lead to adding years of life to many. Imagine this step forward can be the decisive change for so many lives around us who are yearning to spend few more productive years.

The history of organ transplant goes back to 1954 when on December 23, the first successful living-related kidney transplant was done, which was led by Dr Joseph Murray and Dr David Hume at Brigham Hospital in Boston, wherein a kidney was transplanted from Ronald Herrick into his identical twin, Richard. In 1963, the first successful lung transplant, led by Dr James Hardy at the University of Mississippi Medical Center in Jackson, was carried out. In 1966, the first successful pancreas/kidney transplant led by Drs Richard Lillehei and William Kelly at the University of Minnesota in Minneapolis was carried out. In 1967, the first successful liver transplant led by Dr Thomas Starzl at the University of Colorado in Denver was carried out. Also in 1967, the first successful heart transplant led by Dr Christiaan Barnard at Groote Schuur Hospital in Cape Town, South Africa was done.

In India, I had the honor of being one of the pioneers to carry out heart transplant. Before 1994, the only way to get a heart transplant for Indians was to go abroad which was not affordable by many.

After the Transplantation of Human Organs Bill finally received the President's assent on 7 July 1994, we performed India's first heart transplant at the All India Institute of Medical Sciences (AIIMS) on 3rd August the same year.

It was a landmark legislation to regulate the removal, storage, and transplant of human organs. I still remember Devi Ram, a 40-year-old heavy industry worker suffering from cardiomyopathy, had been admitted in AIIMS for 3 months. The patient belonged to the AB+ blood group, a universal recipient blood group. It was a critical situation of "Do or Die" and heart transplant was the only way ahead that we could offer to him. Providentially, a 35-year-old lady who had suffered brain hemorrhage was brought into the hospital and her family agreed for the heart transplant. Devi Ram also got convinced and the rest as they say is history for Indian transplantation scenario. On 3rd August 1994, in a 59-min procedure, a team of 20 surgeons who were guided by me conducted the successful heart transplant surgery. Devi Ram lived on for 15 more years until he died of unrelated brain hemorrhage. That was the opening chapter of a long saga that organ transplantation has gone through in our country.

India is a country where by virtue of its size of population the demand of health care is always a challenge. To add to it, its diverse religions and cultural ethos also adds constraint to any new procedure, i.e., to be introduced. More so when it comes to the terminally ill and death the emotional issues outweigh any rational and scientific thinking. Scientific studies have proven that in Europe, Baptists approved of this method more often than persons of other religions. In Indian context also it is difficult to motivate people as they feel that the body should not be tampered with. Religious and cultural traditions may be the major determinant preventing Asians from donating organs. However, it is time that religious heads make a more concerted effort toward this noble endeavor.

Presently, India is struggling with acute shortage of organs. At least 15 patients die every day waiting for organs and every 10 minutes a new name is added to this waiting list. Undoubtedly, the demand far outstrips the availability of organs. In India, less than 5000 kidney transplants are carried out annually against an estimated requirement of over 175,000. The rate of organ donation, on the contrary, is as low as 0.34 per million population.

In our country, the enactment of the Transplantation of Human Organ Act 1994 was a major milestone. It provides for the regulation of removal, storage, and transplantation of human organs for therapeutic purposes and for the prevention of commercial dealings in human organs. It defines transplantation as a means of grafting any human organs from any living person or deceased person to some other living person for therapeutic purposes.

In 2014, the government implemented Transplantation of Human Organs and Tissues Rules, 2014. These rules override Transplantation of Human Organs Rules, 1995, with certain exceptions.

The government on its part has taken the step forward by establishing the National Organ and Tissue Transplant Organization set up under Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India. It can be accessed at [notto.nic.in](http://notto.nic.in). This web site enlists various guidelines and highlights the government's



vision. Patients need to register there and would be given an organ depending on availability regardless of their financial or social status.

The enrollment can be done online on a common portal which is accessible to all the hospitals such that when every potential case of brain death or head trauma, i.e., that is recorded, the authorities can look up if the given person has ever registered himself/herself as an organ donor.

For eye donation there should be a law that any person who dies, it will be presumed that he has given consent for removal of eyes unless he has given in writing that his eyes should not be removed. It will fulfill requirement of eyes for the needy in a huge country like ours.

Along with all these systems in place there are various challenges, which one has to counter, notably amidst it in India are Kidney marriages. Government on its part is trying hard to put the processes in place but alas the need supply mismatch has become a ready source of commercial opportunity for many. In recent past, the Mumbai police have arrested senior doctors from a renowned corporate hospital in connection with a racket in kidney sales. Even in national capital, a similar racket has been unearthed in one of the leading corporate hospitals. These are the tip of iceberg in a country huge as ours, where the health sector is dominated by private players and out of pocket expenditure is the main stay of health care delivery. All of us are to be blamed as the existing rules have so many loopholes that misuse of it is a commonality rather than rarity. The presence of a growing middle class, the lack of a national health insurance scheme, and attractive business proposition for some and a solution for others is leading to unethical practices. In many affordable middle class or upper class families, even when there are relatives in good health who can donate, there is hesitation in undergoing the process and they tend to opt for the commercial route. Organ trade in India has also assumed huge commercial dimensions. It relates to the exploitation of the poor in form of money or other benefits.

It is time that focused effort needs to be put in not only by the government but also by the medical fraternity and nongovernmental organizations. It is heartening to note that various agencies of government unite at the time of need and Green Corridors, which are a special route, where all the street signals between the hospital where the organ is harvested and the hospital where it is to be transplanted are manually controlled and the vehicle transporting the organ is given a traffic-free passage. Sometimes, organs are available only in other cities, in which case they are airlifted. Efforts should be streamlined and government should encourage it. The other steps which can take this process ahead is spreading awareness and its relevance to the deep interior rural populace and opening satellite centers for convincing and allowing people to make informed decisions. Awareness drive should focus in schools and teaching institutes where the younger generation can imbibe the relevance of organ donation. Fleet of helicopter ambulances should be ear marked and the effort can materialize by public--private partnerships and corporate social responsibility. It is also important that digitization of various nodal centers should be done. There is an urgent need for networking amongst identified nodal hospitals and centers across the country for organ harvesting and sharing for optimal utilization of this scarce resource which can be gainfully utilized. Most important of the lot is changing the thought process of society to usher in an era of scientific and ethical utilization of human organs.

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# Good Clinical Practices toward Safe Blood Transfusion: A Study of Blood Transfusion Process and providing Suggestions for streamlining the Same

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## ABSTRACT

**Introduction:** Wrong blood transfusion (BT) is a medical negligence. Every hospital must have a strong policy to check incorrect BT and see to it that these policies are strictly implemented at the time of transfusion.

Wrong BT can occur due to carelessness of the staff and shortcomings in verification of the blood bag. The reasons can be avoided and wrong BT can be prevented by the formation of a checklist consisting of the important details to be verified before initiating transfusion. The checklist should not be very long and time-consuming, but very comprehensive and consists of only absolutely essential things to be checked.

**Aim:** To study the BT process and providing suggestions for streamlining the process of BT.

### Objectives:

- To analyze the near miss incidents during BT.
- To identify the errors in the process of transfusion.
- To streamline the process by introducing checklist/work instructions for reducing errors.

### Materials and methods:

- Analysis of safety reports regarding BT.
- Process-based root cause analysis was done at the time of issue and at ward level.
- Feedback regarding BT was taken from the staff working at blood bank and nursing professionals.

The study was divided into two phases:

Phase 1: January–April 2014

Phase 2: May–August 2014

All the reports from phase 1 of the study were analyzed. Based on the observations, interventions in the form of checklist and work instructions to the nursing staff were implemented in the hospital in the month of April and then the safety reports for the next 4 months were analyzed.

Interventions done: A “4C” checklist was created with just four elements that could be orally or mentally reviewed before beginning transfusion. Specific work instructions were also issued to the nursing staff at the ward level to prevent any errors during labeling of the samples being sent for cross match and blood grouping before BT.

**Results:** The number of BT-related safety incidents observed in phase 1 reduced in phase 2 though the workload in terms of samples received remained comparable for the two phases. However, a declining trend for the reporting of incidents was also seen through the phases.

**Keywords:** Blood transfusion, Checklist, Process reengineering, Work instructions.

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## INTRODUCTION

“Wrong blood transfusion (BT) is an error, which no hospital/doctor exercising ordinary care would have made. Such an error is not an error of professional judgment but, in the very nature of things, a sure instance of medical negligence.”<sup>1</sup>

Every hospital must have a strong policy to check incorrect BT and see to it that these policies are strictly implemented at the time of transfusion.

The recent testing facilities have lowered the incidence of transfusion-transmitted diseases to minimum; however, the incidence of adverse events due to human errors, ABO incompatibility, alloimmunization, bacterial contamination, and immunomodulation phenomena remain a matter of concern.<sup>2</sup>

This study focused only on avoidable human errors in ABO incompatible BT and no other hemolytic transfusion reaction (Table 1).<sup>3</sup>

As Peter Drucker once said, “If you can’t measure it you can’t manage it.” Thus, the importance of effective measurement in checking any error cannot be overstated.

The study encompasses measuring of errors in the BT process, which could lead to potential mismatch transfusions, analyzing the errors and introducing focused interventions to bring down such errors, thereby making the transfusion process safer with no room for error, be it human or otherwise.

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**Table 1:** Transfusion-related fatalities due to ABO incompatible BT

Year	2007		2008		2009		2010		2011	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Hemolytic transfusion reaction	3	6	10	22	4	9	2	5	3	10
Total	52		46		44		40		30	

A “nearmiss” event refers to any error, which if undetected, could result in the determination of a wrong blood group or transfusion of an incorrect component, but was recognized before the transfusion took place.<sup>4</sup>

Definition of wrong blood in tube (WBIT) incidents<sup>5</sup>:

- Blood is taken from the wrong patient and is labeled with the intended patient’s details.
- Blood is taken from the intended patient, but labeled with another patient’s detail.

## MATERIALS AND METHODS

*Study period:* Eight months.

*Study design:* Prospective observational study.

Measurement of errors in the first half followed by implementation of policy in the form of checklist and work instructions in the second half and finally measuring the outcomes of the intervention.

- Analysis of safety reports regarding BT was carried out.
- Process-based root cause analysis was done at the time of issue and at ward level.

Data was collected from the Safety committee, Medical Records Department, and the Department of Immunohematology and BT.

*Setting:* Conducted at National Accreditation Board for Hospitals and Health care Providers (NABH) accredited 2,032-bedded tertiary care teaching hospital with in-house blood bank.

The Ethics Committee of the institution approved the study.

## DATA SOURCES

- Incident reporting safety and sentinel forms.
- Feedback regarding BT taken from blood bank and nursing staff.

## Incident Reporting

The hospital has a policy to report all patient safety-related incidents through a safety/sentinel form with the details of the incident. The staff involved in the incident initiates the form by filling the details of the affected party like name, hospital number, and ward along with the details of the initiator. The completely filled form is sent to the head of the department or the nursing

superintendent depending on the department of the staff initiating the report (clinical or nursing). After perusal by the concerned authority, the form is sent to the Chairman of the Safety Committee. The Safety Committee conducts a root cause analysis of the report and suggests ways to prevent further incidents. The safety-related issues of the entire month are then compiled and presented in a safety meeting attended by medical superintendent, consultants of various departments, nursing in-charges, operations team, fire officer, security in-charge, and other staff.

For the study safety reports of 8 months from January to August 2014 were analyzed.

The study was divided into two phases:

*Phase 1:* January–April 2014

*Phase 2:* May–August 2014

All the reports from phase 1 of the study were analyzed. Based on the observations, interventions in the form of checklist and work instructions to the nursing staff were implemented in the hospital in the month of April and then the safety reports for the next 4 months were analyzed.

Meetings with all the stakeholders were called and initiatives to train the nursing staff focused on safe BT practices were taken.

## OBSERVATIONS

Process of blood requisition from the wards/intensive care units and issue of blood component from the blood bank:

- Treating doctor decides the need for transfusion of blood component.
- Patient is explained about the need of transfusion and consent is taken.
- The treating doctor fills blood requisition slip.
- Patient sample for grouping and cross-match is drawn and sent to blood bank with the requisition slip.
- Requisition slip and sample of the patient are received at the counter in blood bank.
- All details are filled in the software and a Blood Bank Registration (BBR) number is generated.
- The sample of the patient is sent for cross-match and grouping and for other investigation.
- Blood bag of the same group is cross-matched, tested for compatibility, and kept ready for issue.
- On receipt of issue slip from the ward, the blood is issued after checking for the details.

Processes identified where errors occurred: Step 4 and 9.

Reasons for error at ward for sending WBIT for grouping/cross-match:

- Same name of more than one patient admitted in the ward.
- The sample of one patient might be sent with the labeling of other patient (interchanging of labels).
- The Hospital number/IP number of the patient was not checked before labeling of the sample.
- Labeling of empty tube was done *before* drawing the blood.

Reasons for near missed wrong BT in ward:

- Blood transfusion required by more than one patient in the ward.
- Proper instructions not conveyed to the junior nursing staff by the in-charge.
- Patient details not verified before starting transfusion.

Reasons for error during issuing of the blood product from Blood Bank:

- The requisition slip of one patient might be sent with the blood product meant for some other patient.
- Blood/blood product dispatched from the Blood Bank for one patient maybe labeled for some other patient.
- The staff may not crosscheck the blood product before issue.

Process re-engineering:

Based on root cause analysis of safety reports, feedback of nursing and blood bank staff, interview with various stakeholders, and observation of workflow at the user level (wards) as well as at the dispatch level (blood bank), it was found that most of the errors took place in the wards.

Though a BT form in accordance with National AIDS Control Organization (NACO) guidelines with 18 entries like name and address of patient, IP number with blood group, blood unit received from blood bank, donor's ID number, reasons for transfusion, etc. is available in the wards, it failed to check the human error likely to take place before starting transfusion.

To address this problem a very short yet comprehensive checklist needed to be created, which would prevent wrong BT and still not add to the already overwhelming paperwork for the nursing staff.

Therefore a "4C" checklist was created with just four elements that could be orally or mentally reviewed before beginning transfusion.

- Confirm – Hospital number
- Converse
- Consent
- Cross-match report

The nursing staff was first supposed to confirm the identity of the patient with the Hospital number and not the name of the patient. The issue slip, blood bag, and the cross-match slip would be tallied only with the hospital number of the patient.

It was stressed that conversing with a conscious and oriented patient was very essential before beginning transfusion. The patient would definitely know whether the doctor has advised transfusion for him/her. Keeping the element of conversation in the checklist would also stress on the basic and essential yet easily missed component of patient involvement in treatment.

Consent of the patient is of utmost importance and any checklist should have this element as a necessity, for it is not only ethical but also a medico-legal requirement to check for consent. Checking of cross-match report will ensure that the patient is transfused the correct bag of blood. Thus, by having a checklist which was easy to remember and noncumbersome, the compliance in implementing the checklist among the nursing staff was ensured.

Specific work instructions were also issued to the nursing staff at the ward level to prevent any errors during labeling of the samples being sent for cross-match and blood grouping before BT. These were specific step-by-step instructions from checking the identity of the patient, drawing and labeling of the blood sample to sending the correct blood sample for investigation.

The work instructions would not only serve as a ready reckoner for the nursing staff but would also help in training of newly recruited staff.

The work instructions were as follows:

- Check the doctor's order and confirm that the patient requires BT.
- Check the grouping/cross-match requisition slip for the hospital number.
- Check for consent of the patient.
- Select the proper vacutainers (lavender for grouping, red for cross-match).
- Go to the bedside with the file, vacutainers, and requisition slip.
- Talk to the patient and confirm whether the doctor has advised bt or not.
- Draw the sample and label after drawing the blood.
- Send the blood sample for investigation to blood bank.

The above-mentioned "4C" checklist and work instructions for sending the sample for investigations were implemented in the tertiary care center at the end of phase 1 in the month of April and the outcome was measured in the next 4 months, i.e., phase 2 of the study.



**Table 2:** Phase 1

Total no. of safety incidents reported	34
Transfusion-related incidents	7
Transfusion-related incidents reported from blood banks	5
Transfusion-related incidents reported from wards	2
Near missed wrong BT	2
Wrong blood in tube	4
Wrong labeling of blood product	1
Safety reports initiated by nursing staff	2
Safety reports initiated by other staff	5
No. of blood components issued	9,873
No. of cross-match samples received	14,951

**Table 3:** Phase 2

Total no. of safety incidents reported	13
Transfusion-related incidents	2
Transfusion-related incidents reported from blood bank	2
Transfusion-related incidents reported from wards	0
Near missed wrong BT	0
Wrong blood in tube	2
Wrong labeling of blood product	0
Safety reports initiated by nursing staff	0
Safety reports initiated by other staff	2
No. of blood components issued	9,066
No. of cross-match samples received	15,399

## RESULTS

The results of phase 1 and phase 2 are tabulated in Tables 2 and 3 respectively.

The number of BT-related safety incidents reduced from seven in phase 1 to two in phase 2. There were two incidences of near missed events of wrong BT during phase 1 and none during phase 2. The incidences of wrong labeling of sample or blood bag came down from five during phase 1 to two after the interventions were implemented in phase 2. There was one incident of issue of product under incorrect label in phase 1 and none in phase 2.

There was not much difference in the number of cross-match samples received for testing by the blood bank during phase 1 (14,951) and phase 2 (15,399). The number of blood bags issued during the two phases was also comparable. It was 9,873 during phase 1 and 9,066 during phase 2.

Total number of safety incidents too had shown a decreasing trend from 34 in phase 1 to 13 in phase 2. The number of safety incident reporting from nursing staff from the wards decreased from two in phase 1 to nil in phase 2.

## CONCLUSION

Analysis of safety and sentinel incident reports demonstrated various reasons for WBIT and near missed

wrong BT. Therefore, focused interventions in the form of checklist and work instructions were carried out which proved to be effective in reducing the number of human errors that could lead to wrong BT. However, the reporting of incidents also decreased probably due to the repeated interviews of staff by the authors. Though the intervention could not reduce the numbers to zero, which is desirable, it is expected that continuation of the practices initiated would, in time, achieve the desired results.

It was demonstrated that improvement in quality of health care can be brought about by need based, focused intervention and that analysis and measurement of errors were pivotal in reducing human errors.

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# Use of CRABEL Scores to improve Quality of Medical Records Documentation in Hospitals

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## ABSTRACT

**Introduction:** This study is based on an approach employed by a medical college hospital for improving the adequacy of documentation in their medical records. The hospital utilized CRABEL scoring tool to screen and score their medical records and then used this information as a feedback to their clinical departments for encouraging them to improve their record documentation.

**Aim:** The study aims to determine whether the approach of the hospital resulted in any significant change in adequacy of their medical record documentation.

**Materials and methods:** Baseline sample of 250 current medical records (stratified random) from four clinical departments were scored using CRABEL scoring method to determine baseline average score and number of files with high scores (score >0.85). Feedbacks on scores were given to departments, along with the information on areas for improvement. Scoring and feedback were repeated every month for six consecutive months, with sample size of 230 to 271. Trends in average score and number of files with high scores were observed. Difference between average scores of baseline sample and sample at the end of 6 months was statistically tested. Number of files with high scores, in departments where approach was carried out was compared with number of files with high scores, in departments where approach was not carried out, to check statistically significant difference, if any

**Results:** The trend showed a continuous monthly improvement in both average scores and number of files with high scores. Improvement was found in files of all clinical departments with minor variations. The chi-square test and Student's t test showed a significant difference at  $p < 0.05$  ( $p$  for chi square – 0.001 and for t-test – 0.04).

**Conclusion:** The hospital's approach was found to be successful in improving the adequacy of documentation in medical records.

**Clinical significance:** Medical record constitutes the most important record in a clinical setting. Completeness of medical record is essential for proper patient care, but is a challenge in most organization. The approach has proven successful in this study and can be replicated in other settings for improvement.

**Keywords:** Case–control study, CRABEL, Documentation of records, Medical record, Scoring of medical record.

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## INTRODUCTION

Medical record is a written accounts of investigations, treatment, and health status of a patient.<sup>1</sup> Professional documentation by clinical staff is an integral part of practice to ensure safe and effective care.<sup>1</sup> The purposes served by documentation in medical record are communication, accountability, legislative requirement, quality improvement, and research.<sup>1</sup> Good record keeping has been mentioned as one of the fundamental requirement for clinical practice in any health care field.<sup>2</sup> Good quality and real-time documentation in medical record are described as important factors for preventing medical errors.<sup>3</sup> Health care accreditation bodies, such as Joint Commission International (JCI) and National Accreditation Board for Hospitals and Health care Providers (NABH) have specific standards on medical records documentation which are important for hospitals to comply with for accreditation.

However, concerns over the quality of documentation in medical records in hospitals have been often raised through various means. Inadequacies in medical record documentation have been reported as one of the most common nonconformities in NABH assessments findings.<sup>4</sup> Gross inadequacies in standards of medical record keeping have been found in several studies and audits.<sup>5-7</sup> Considerable room for improvement in medical record keeping has also been identified.<sup>5</sup> Substandard documentations in various categories that include regular update of notes, postoperative instructions, comments about postoperative recovery, the records of advice given to relatives, and incorrect consents have been found.<sup>7</sup> Need for legibility and use of approved abbreviation in medical records have been stressed upon.<sup>8</sup> Medical care documentation as an evolving area in the Health care industry of India that needs the attention of experts has also been expressed.<sup>8</sup> Spillover of problems in primary care with lack of information in records after discharge of patient from hospital has been identified in an audit study.<sup>7</sup>

Standard proformas are commonly used in medical record to aid in documentation, but it has been found that alone do not improve the quality of recording.<sup>9</sup> Another approach is electronic medical records that are being increasingly used and are considered to be a solution to missing entries. However, a large portion of hospitals in India still uses paper-based medical records. Besides, several studies have reported that the quality of recording where physicians are involved did not show improvement with electronic medical record.<sup>10-12</sup>

The CRABEL score as method for scoring the individual medical records on their quality of documentation was described by Crawford et al<sup>13</sup> in Annals of Royal College of Surgeons of England. The objective criteria used in the method were derived from the guidelines published by The Royal College of Surgeons.

Crawford et al<sup>13</sup> reported that by using CRABEL, scores of medical records typically increased over consecutive audits. As per the authors, CRABEL score is a quick, easy, and reproducible method of assessing and evaluating the quality of medical records. Different studies on CRABEL tool reported improved quality of medical records by using CRABEL as an audit tool.<sup>9,14,15</sup>

Use of CRABEL method has not been reported by any Indian hospital till the time of writing this paper.

## BACKGROUND OF THE STUDY

This study is based on an approach used by a large tertiary care teaching hospital in Gujarat, India, to address the problem of inadequacies and incompleteness of open medical record. The need was felt more as the hospital was trying to get accreditation by NABH and appropriate medical record keeping was one of their important standard requirements, which hospital was finding tough to meet. Quality team constituted by the hospital for accreditation preparation initiated screening open medical records to comply with this requirement. Initially, screening with randomly prepared checklist revealed numerous discrepancies and incompleteness in records. Based upon these, doctors and nurses were asked to improve their documentation on specific deficiency areas. However, no significant improvement was perceived despite several reminders and follow-ups. Few doctors also raised the issue with the screening checklist stating that it unduly stresses insignificant aspects of medical records. To counter these issues, it was decided to use an accepted standard method of screening and scoring medical record, CRABEL score, and systematically monitor the progress. Since the focus was on improving the real-time documentation quality, the screening and scoring was done only for open medical records.

## MATERIALS AND METHODS

The CRABEL score method was selectively used in four clinical departments (General Medicine [Med.], General Surgery [Sur], Obstetrics & Gynaecology [O&G] and Orthopaedics [Ortho]) as they comprised maximum workload of the hospital. The activity was carried out for a period of six months. For each department, medical records selected through stratified random sampling were screened using CRABEL scoring sheet. Each medical record was awarded a score as described by Crawford et. al, The score was related to initial clerking, subsequent entries, consent and discharge letter. From a starting score of 100, one point was deducted for each omissions (deficiency) to arrive at balance final score. However, if one or more points from CRABEL score was not applicable to a particular medical record, the percentage was calculated based on maximum possible score for that file and the score obtained by it. A proforma of CRABEL scoring sheet is given in Annexure 1.

Three members of quality team were trained in-house in the scoring method. The process of screening and scoring was done once per month (generally on middle of the month), for the consecutive 6 months in all the above-mentioned departments.

Only those open medical records were considered for which 24 hours duration has elapsed after patient's admission. This was the minimum time required to ensure that the record has all components of screening required for scoring. Data regarding all relevant admissions was obtained from the computerized hospital information system (HIS) from which records were selected using stratified randomization. The open records were screened to complete the section of 'Initial Clerking', 'Subsequent Entries' and 'Consent'. The section of 'Discharge notes' was completed after patient is discharged. The member screening a particular record keeps a track of his/her records, through HIS, to ensure that section of 'discharge notes' gets completed as soon as patient gets discharged. Once the form is completed for a record, the data was entered in a data sheet created on Microsoft excel, for analysis.

After screening and scoring, the findings were shared with the heads of the departments and with doctors and nurses of the concerned department. The scoring sheet of each medical record of a department was given back to them which shows its score and omissions. Corresponding deficient entries in the record were highlighted for their quick reference. They were asked to improve the score by reducing the number of omissions.

From scores of individual medical records, average score and number of medical records with high score were derived as measures for comparison. Taking reference from other similar studies a benchmark score of 85 (>84) was taken as the cut off to identify medical records with high score.<sup>13,16,17</sup>

<b>Annexure 1</b>		<b>THE CRABEL SCORE MARKING PROFORMA</b>	
Initials	[ ]	[ ]	patients
<b>INITIAL CLERKING</b>	[10]		
Patient name	<input type="checkbox"/>	<input type="checkbox"/>	
Patient hospital number	<input type="checkbox"/>	<input type="checkbox"/>	
Referral source	<input type="checkbox"/>	<input type="checkbox"/>	
Consultant	<input type="checkbox"/>	<input type="checkbox"/>	
Date/time	<input type="checkbox"/>	<input type="checkbox"/>	
Diagnosis	<input type="checkbox"/>	<input type="checkbox"/>	
Management plan	<input type="checkbox"/>	<input type="checkbox"/>	
Investigation result	<input type="checkbox"/>	<input type="checkbox"/>	
Clinician signature	<input type="checkbox"/>	<input type="checkbox"/>	
Clinician name/post	<input type="checkbox"/>	<input type="checkbox"/>	
<b>SUBSEQUENT ENTRIES</b>	[30]		
Patient name and number	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Date and time	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Headings	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Results	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Legibility	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Signature/name	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
<b>CONSENT</b>	[5]		
Patient name	<input type="checkbox"/>	<input type="checkbox"/>	
Hospital number	<input type="checkbox"/>	<input type="checkbox"/>	
Operation in full	<input type="checkbox"/>	<input type="checkbox"/>	
Risks/complications	<input type="checkbox"/>	<input type="checkbox"/>	
Signatures	<input type="checkbox"/>	<input type="checkbox"/>	
<b>DISCHARGE NOTES</b>	[5]		
Patient details	<input type="checkbox"/>	<input type="checkbox"/>	
Admission/discharge dates	<input type="checkbox"/>	<input type="checkbox"/>	
Diagnosis/management	<input type="checkbox"/>	<input type="checkbox"/>	
Drugs	<input type="checkbox"/>	<input type="checkbox"/>	
Follow-up	<input type="checkbox"/>	<input type="checkbox"/>	
<b>TOTAL DEDUCTIONS</b>	[ ]	+	[ ] = _____
<b>CRABEL SCORE (100 – Deductions) =</b>	_____ %		

These measures were calculated for each months separately and compared using line graph to observe changes. Based upon the observation a working hypothesis was created to test whether there is a significant change in scores of medical records in 1st month (that is baseline) and last month. The hypothesis was statistically tested using chi-square test and Student t-test.

Finally, the findings from observation and result of statistical testing were discussed in light of other contributory factors to identify limitations of the study and to make a valid conclusion.

## DATA AND FINDINGS

### Sampling

A total of 1,675 open medical records were screened and scored using CRABEL method for 6 months duration. Out

of this, scorings of 83 records were incompletely done and scorings of another 19 records had methodical inconsistency. The scores of these 102 records were removed and further calculations were based on remaining 1,573 effective scores. Month-wise and department-wise total medical records screened and the effective number of records for which a valid score were obtained and given in Table 1.

The incompleteness and inconsistencies in scoring method gradually reduced as the members doing the scoring improved their skills with practice. As a result, a gradual increase in proportion of effective to total numbers can be observed in Table 1.

### Measurement and Comparison

Using excel, average scores, standard deviation, and number of records with high scores were computed. The measures obtained for all records scored in a month are

**Table 1:** Total and effective number of open medical records screened and scored

Dept. Month	Med		Sur		O&G		Ortho		Total	
	T	E	T	E	T	E	T	E	T	E
1	83	74	71	64	66	59	62	53	282	250
2	89	82	74	69	65	61	64	57	292	269
3	78	73	67	64	62	60	57	52	264	249
4	83	79	71	68	65	63	60	56	279	266
5	79	77	70	68	64	61	61	55	274	261
6	85	83	74	73	64	64	61	58	284	278
Total	497	468	427	406	386	368	365	331	1,675	1,573

T: Total number of medical records screened and scored; E: Effective number of records whose scores were considered for further calculations

given in Table 2. As can be observed in the table, the average score has consistently improved every month and achieved a total increase of 11.83 at the end of 6th month. The number of records with high scores also increased by 13. As the sample size did not vary much in any of the month, absolute number of records with high score gives a fair idea of comparison and percentage comparison was not required.

Data of individual department's medical records also showed a similar trend in average score and high score records (HSRs), with minor fluctuations.

The department-wise and month-wise trend of change in average scores and HSR is presented in Graphs 1 and 2, which show generally improving trend

in both average score and number of records with high scores for all departments, with minor fluctuation.

**Statistical Testing**

Based on the observations in Table 2 and Graphs 1 and 2, it was hypothesized that CRABEL scoring clubbed with continuous feedback resulted in increase in average score and increase in number of records with high scores in open medical records, in 6 months time.

To test the hypothesis statistically, an independent statistical comparison was made between medical records of departments where the CRABEL scoring was carried out (study group) and in departments where it was not (control group).

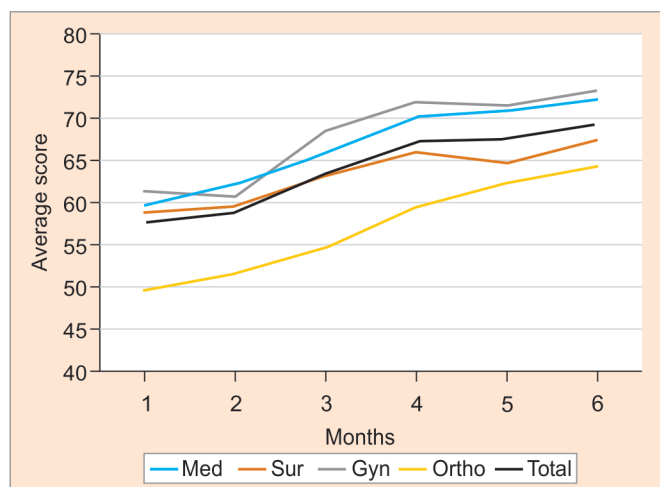
A sample of 100 open medical records from corresponding 6th month of the study was selected from control group using proportionate stratified simple random sampling and scored using CRABEL method. Criteria used for sample selection in study department were also used in this controlled sample. The data of scores achieved from this was compared with the data of scores of 278 files from study group (the 6th month scores).

Brief description of the sample of medical records selected and scored from control group is given in Table 3.

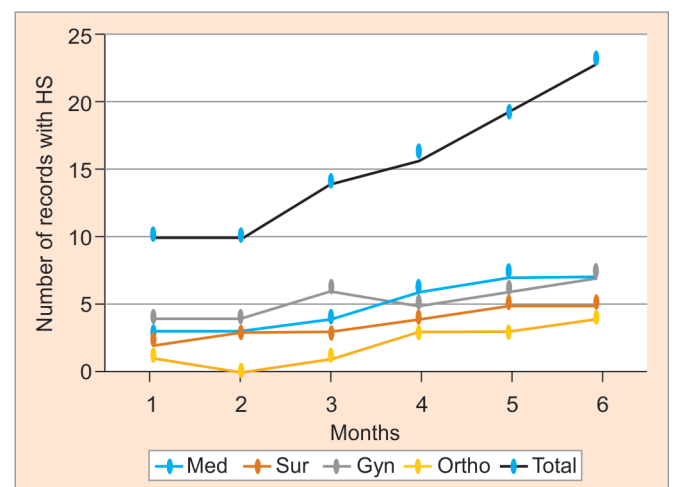
**Table 2:** Measures of comparison for all records scored (month-wise)

Month	n	Average score	Std. dev.	Min. score	Max. score	HS*
1	250	57.83	9.80	40	87	10
2	269	58.95	9.72	39	89	10
3	249	63.54	9.30	46	88	14
4	266	67.30	8.73	50	89	16
5	261	67.68	8.47	47	90	19
6	278	69.66	8.25	48	89	23

\*HS: Number of medical records with high score (i.e., 85 or more)



**Graph 1:** Trend of average CRABEL scores



**Graph 2:** Trend in number of records with high score (≥85)

**Table 3:** Sample and scoring from control group

Number of records in sample	100
Distribution	Pediatrics – 48, ENT – 04, Ophthalmology – 08, Dermatology – 03, Chest Medicine – 37
Average score	61.35
Standard deviation	11.40
Minimum score	37
Maximum score	87
No. of records with HS	3

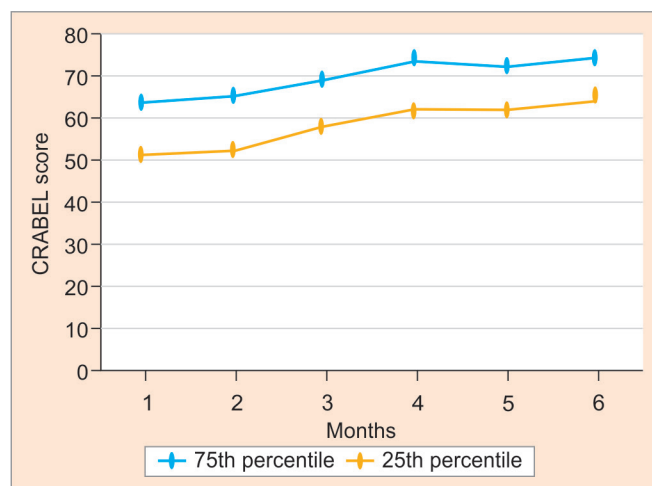
Student's t-test (two-tailed, homoscedastic) was performed, using excel statistics function to check if there is any significant difference between average score of control group and study group. The t-value was found to be 7.645 and p-value was less than 0.0001, which showed a highly significant difference between the average scores of control and study group records. The medical records of study group had a better average CRABEL scores as compared to control group.

Chi-square test was performed using excel statistic function to check if there is significant difference in the frequency of occurrence of records with high scores between control and study group. The chi-square value was found to be 4.6862 and p-value at 0.030405. Thus, at significance level of  $p < 0.05$ , it was found that number of medical records with high CRABEL scores are more frequent in study group records as compared to control group records.

## DISCUSSION

Although, the observation from data and findings from statistical analysis shows a significant improvement in documentation quality of medical records, there are some confounding factors that may have affected the result. Since the focus of the approach was to improve the documentation quality and not primarily to test effectiveness of CRABEL scores, adjusting for confounders were not desired at that time. Some of the factors that may have affected the result are: Increased focus on study group departments, individual differences of doctors and nurses in making entries in records, individual differences in type of disease and care being rendered to different patients, pressure on staff to be ready for accreditation assessment, subjective variation in scoring by different members of quality team, and other quality improvement measures indirectly affecting medical records documentation quality.

Certain other observations can also be made that conforms to the result. Along with an increase in average score, the score at 75th percentile and score at 25th percentile also increased over a period of 6 months, which shows that number of records achieving better score has increased while number of records achieving lower score has reduced. The trend of change in percentile score is given in Graph 3.

**Graph 3:** Change in percentile score (75th and 25th) during study period

Standard deviation of the scores also reduced from 9.8 in the 1st month to 8.25 in the last month, indicating better uniformity in documentation across different departments, doctors, and patients.

The trend of changes in scores of medical records from individual departments of the study group were found to be mostly similar to the trend of the total, which indicates the uniformity of result and generalizability to other departments of the hospital.

The study did had certain limitations, which include restriction of the study to one hospital organization, no formal training of team on CRABEL scoring method, and lack of references or benchmarking from similar studies in Indian hospitals.

Based on the above discussion, the conclusion of the study has been carefully presented.

## CONCLUSION

The study showed that the overall approach of CRABEL scoring and feedback was successfully used by the hospital in improving the quality of documentation in medical record. The improvement derived from this approach was statistically significant and hence, can be recommended to be used for the medical records of other departments. However, more studies need to be conducted to rule out the effect of confounding factors. The limitations of the study also need to be overcome for providing evidence of its use on a wider scale and for other hospitals.

## CLINICAL SIGNIFICANCE

Medical record constitutes the most important record in a clinical setting. Completeness of medical record is essential for proper patient care, but is a challenge in most organization. The approach has proven successful in this study and can be replicated in other settings for improvement.

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# Comparative Analysis of Cost of Biomedical Waste Management in Rural India

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## ABSTRACT

**Introduction:** The quantum of waste generated from medical care and activities is a global matter of concern. Improper management of biomedical waste (BMW) has a grave health impact on the community, health care professionals, and the environment.<sup>1</sup> It is mandatory by law that every medical organization that generates waste should have a system, process, and resources in place for segregating BMW within the organization for proper disposal. The present article deals with the understanding of various costs associated in BMW management process that will help the health care organization to prioritize their spending and focus on areas that require spending to achieve compliance in process of BMW management.

**Materials and methods:** Descriptive cross-sectional study was carried out, to study the compliance of BMW management at three different hospitals with respect to Bio-Medical Waste (Management and Handling) Rules, 2011. A retrospective study was conducted to analyze cost data for a 1-year time period. Cost involved in BMW management was analyzed and classified as capital and recurring costs. The study was undertaken in Udupi taluk, and the taluk comprises 11 hospitals (1 Government and 10 private hospitals). The hospitals were selected using convenient sampling as taking permission to conduct the study was difficult. Only three hospitals were permitted to carry out the study.

**Results and discussion:** Compliance was found to be better in accredited hospital than in nonaccredited hospital. This could be attributed to strict adherence to standard operating procedures and regular training of staff. Cost involved in BMW management was analyzed as capital and recurring costs. Since most of the hospital outsource final disposal, capital costs are significantly less compared to recurring costs. Among the recurring costs, maximum expenditure is on consumables like color-coded bags. Cost per bed per day for handling BMW was calculated and it was found to be higher in smaller hospitals.

**Keywords:** Biomedical waste, Cost analysis, Health care waste, Medical waste.

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## INTRODUCTION

Biomedical waste (BMW) means any waste which is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals, including categories mentioned in Schedule I.<sup>1,2</sup>

In India, it is estimated that there are more than 15,000 small medical institutions and laboratories which also generate significant amounts of BMW. It is estimated that our country generates around three million tons of medical waste every year and the amount is expected to grow at 8% annually.<sup>3</sup>

Biomedical waste may contain infectious, toxic chemicals causing risk of contamination to both people and the environment. Hospitals should be responsible for the waste they generate. They must ensure that the handling, treatment, and disposal of that waste will not have harmful consequences for community.

To effectively manage BMW at health care institutions, it is important to understand the various cost factors involved in the efficient management. According to WHO, the total cost of a waste management system includes initial capital investment, amortization over the effective life of plant or equipment, operating costs, such as labor and consumables, utility requirement, such as fuel electricity, water, and contractual and overhead costs.<sup>4</sup>

Hospitals can highly reduce the total costs for treatment and disposal of medical wastes by improving their classification method for medical wastes and then employing effective treatment or disposal methods based on the characteristics of their particular medical wastes.<sup>5</sup>

Failure for effectively handling BMW is because of lack of awareness about health hazard related to health care waste, inadequate training in waste management, absence of waste management, absence of disposal system, insufficient financial and human resource, and the low priority given to the topic.<sup>6</sup> Since the last 3 decades, unregulated BMW handling, treatment, and disposal have become a serious threat to the environment and community. Predictors include lack of awareness, knowledge, attitude of generators of health care waste, availability of resources, and improper disposal mechanism.<sup>7</sup>



The Ministry of Environment and Forests notified the "Bio-Medical Waste (Management and Handling) Rules, 1998" in July, 1998. In accordance with the rules (Rule 4), it is the duty of every "Occupier," i.e., a person who has the control over the institution and/or its premises, to take all steps to ensure that the waste generated is handled without any adverse effect to human health and environment.<sup>2</sup> Some of the factors like awareness about the health hazard of BMW, proper technique, and methods of handling the waste can go a long way toward the safe disposal of hazardous hospital waste and safeguard the community from various adverse effects of the hazardous waste.<sup>8</sup>

### Management of BMW within the Institution

It is statutory on part of every health care facility, from the smallest dispensary to the largest superspecialty hospital to manage BMW. Management of BMW starts from the time of segregation of waste at source, transport by hospital personnel to common disposal area within premises, and final collection by outsourced agency having common BMW treatment facility.

In general, BMW contains noninfectious waste and infectious waste. As regards to the category-wise percentage of waste generation, noninfectious waste is 80%, pathological and infectious waste 15%, sharps 1%, chemical or pharmaceutical waste 3%, and others 1%.<sup>9</sup>

The waste produced in the course of health care activities carries a higher potential for infection, injury, and pollution due to unscientific disposal and open burning, than any other type of waste. Whenever it is generated, safe and reliable methods for its handling are therefore essential. Inadequate and inappropriate handling of BMW may have serious public health consequences and a significant impact on the environment.<sup>9</sup>

Segregation of waste into different color-coded containers as stipulated under Schedule II of BMW (Management and Handling) Rules, 1998 (Amendment 2011) is one of the most important step in management of BMW. Adequate number of waste bins and color-coded bags have to be provided so that wastes are collected properly.

Wastes are generally collected from various areas of the hospital and transported within the hospital premises by closed designated trolleys. These trolleys are marked with Biohazard symbol.

Most of the hospitals have outsourced final disposal of BMW to common BMW treatment facility. These are licensed facilities which collect BMW from different hospital, transport waste in designated vehicles, and dispose BMW according to rules stipulated under BMW (Management and Handling) Rules, 1998 (Amendment 2011).

### Cost of Biomedical Waste Management

A significant portion of budget has to be earmarked for handling BMW management as per the laid rules.

The costs involved and that are required to be incurred by hospitals for BMW management can be classified as capital and recurring costs. Capital costs are one-time expenses or fixed costs. It includes procurement of plastic bins for discarding or disposing waste, transport trolleys used for transporting waste from source of generation to internal storage area, sharp containers for sharp disposal, personal protective equipment like rubber shoes worn by waste handlers during packaging and transportation. Recurring cost is a regular occurring cost over a period of time. This includes cost of consumables like color-coded bags, personal protective equipment like plastic apron, face masks, gloves, cost of training employees, salary for waste handlers, and cost of outsourcing.

Analyzing these costs and comparing the costs incurred under several cost heads will help an administrator prioritize spending to achieve compliance to BMW management.

### AIMS

To assess costs associated with BMW management in three different hospitals and identify priorities to improve compliance.

### OBJECTIVES

- To study and compare BMW management process at three different hospitals
- To understand the various costs involved in the BMW management process (internal and external) and determine focus area for spending to improve compliance to BMW management.

### MATERIALS AND METHODS

Descriptive cross-sectional study was carried out, to study the compliance of BMW management at three different hospitals with respect to Bio-Medical Waste (Management and Handling) Rules, 2011. A retrospective study was conducted to analyze cost data for a 1-year time period. Cost involved in BMW management was analyzed and classified as capital and recurring costs. The study was undertaken in Udupi taluk; the taluk comprises 11 hospitals (1 Government and 10 private hospitals). The hospitals were selected using convenient sampling, but taking permission to conduct the study was difficult. Only three hospitals were permitted to carry out the study.

The variables for assessing BMW management as per the compliance requirements of the protocol of BMW (REF).

The study was conducted at the following hospitals:

- A private accredited large tertiary care teaching hospital (2032 bedded): Hospital A
- A private nonaccredited nonteaching medium size hospital (268 bedded): Hospital B
- A private nonaccredited small hospital (112 bedded): Hospital C

Observation of workflow, process, and other activities related to BMW management:

- To study and compare process, workflow of handling BMW at different institutions.
- To observe support activities like training program, immunization schedules, and auditing.

Perusal of records in purchase department, finance department, and human resource department (where applicable) to obtain the information on costs.

Ascertaining costs under the following cost heads: Capital cost, recurring cost, cost per bed/day.

## RESULTS

The study was conducted in three hospitals in Udupi District of Karnataka. One was a large tertiary care teaching hospital. It was accredited by National Accreditation Board for Hospital and Health care (NABH) providers. The other two hospitals were nonaccredited nonteaching hospitals. Requisite permission to conduct the study was obtained from the administrators of the respective hospitals. Two observers (author and independent observer) were involved in the study.

Comparison of the hospital under study with respect to bed strength, accreditation status, and observation of BMW handling process has been tabulated in Table 1.

Segregation at source and sorting into color-coded bags is followed diligently in hospital A. In hospitals B and C, waste was not sorted according to Schedule II though color-coded bags were present. It appeared to be because of lack of awareness and training.

Internal transport within the hospital premises was found to be compliant in all three hospitals. It was transported in closed trolleys with Biohazard symbol marked on it. All waste handlers were provided personal protective equipment to handle waste. Immunization of employees was 100% in hospital A. In hospital B, immunization was provided by the hospital at discounted price; however, it was not documented. In hospital C, waste handlers were not aware of immunization and record of immunization provided by hospital was not available.

Common storage area within the premises where waste is collected before final disposal was present in all the three hospitals. However, the storage area in hospital C did not have doors and was close to underground water tank.

All the three hospitals have outsourced final disposal of waste to common BMW treatment facility. All wastes are weighed before transportation.

Regular training programs were conducted for housekeeping workers and nursing staff in hospital A. It consisted of lecture classes and onsite demonstration. Every new employee was provided training during the orientation program. Retraining for staff was provided once in 2 years. The hospitals B and C had informal training session. Nursing superintendent/Ward in-charge brief staff regarding segregation of waste. During our observation, we found that the sorting of waste into designated color-coded bags was not done as per Schedule II of BMW Rules. Compliance to BMW management is directly related to the knowledge and awareness about process and this attitude and knowledge is updated with the help of periodic training in the subject. It is evident from various studies that training should be an essential part of the hospital employee's daily activity so as to have proper and scientific management of the BMW generated in the hospital.<sup>4,10</sup>

**Table 1:** Comparison of hospital characteristics

	<i>Hospital A</i>	<i>Hospital B</i>	<i>Hospital C</i>
Type	Accredited teaching hospital	Nonaccredited nonteaching hospital	Nonaccredited nonteaching hospital
Bed strength	2,030	268	112
Segregation at source	Compliant	Partial compliance	Partial compliance
Color-coded bins/plastic bags	Present	Present	Present
Sharp containers	Present	Present	Present
Internal transport	Compliant	Compliant	Compliant
Common storage area	Present and compliant	Present and compliant	Present and noncompliant
Treatment within premises	Nil	Nil	Nil
Final disposal	Outsourced	Outsourced	Outsourced
Training of waste handlers	Yes	No	No
Immunization (Hep B)	Yes	No record maintained	No record maintained
Signage/IEC material	Present in all areas	Present in OT, ICU, OPD	Nil

## Cost of Handling BMW

Cost data was obtained after perusal of records maintained in hospital. Informal discussion with administrators and departmental in-charges was done for apportionment of cost. Since housekeeping staff perform functions apart from waste handling, it was found appropriate to apportion the cost. Cost for managing BMW was classified as capital cost and recurring cost. These costs are presented in Tables 2 and 3.

Total cost of managing BMW was calculated by adding capital cost and recurring cost as shown in Table 4. It was found that 70 to 80% of cost was incurred toward recurring expenses in all the three hospitals. Cost per bed/day is useful indicator to understand the cost of providing service. From Table 4, we can understand that, hospital A spent Rs 7.7 per bed/day, hospital B spent Rs 8.8 per bed/day, and hospital C spent 12.4 per bed/day. Hospital incurred higher recurring cost on procurement of consumables. Higher cost per bed/day at lower centers can be attributed to inability to bargain with vendors while procuring consumables which form a major part of recurring expenses.

**Table 2:** Capital cost incurred for the management of BMW in three hospitals

Capital cost	Hospital A	Hospital B	Hospital C
Sharps containers	846,388	48,534	11,760
Waste bins	113,823	9,800	3,760
PPE (shoes)	10,500	2,000	1,350
Trolleys	162,000	28,000	25,000
Transport bins	52,000	18,000	16,450
Signboards/IEC material	116,000		
Total capital cost (A) in rupee	1,300,711	106,334	58,320

**Table 3:** Recurring cost incurred for the management of BMW in three hospitals

Recurring cost	Hospital A	Hospital B	Hospital C
Plastic bags	2,057,973	391,280	102,200
PPE (apron, gloves, face mask)	150,100	51,533	25,417
Vaccination	35,615	2,700	
Training	135,642		
Salary	819,000	106,000	221,760
Outsourcing	1,195,232	199,205	99,603
Total recurring cost (B) in rupee	4,393,562	750,719	448,979

**Table 4:** Total cost incurred for the management of BMW and cost per bed/day

Total cost = cost (A) + cost (B) in rupee	5,694,273	857,053	507,299
Cost/bed/day in rupee	7.7	8.8	12.4

## DISCUSSION

Partial compliance in segregation of BMW was seen in hospitals B and C. In a study conducted by Sengodan,<sup>11</sup> it was shown that effective segregation significantly reduced BMW generation and reduction was achieved despite increase in inpatient numbers.

Training of waste handlers was not present in hospitals B and C but regular periodic training was provided to all the waste handlers in the hospital. In a study conducted by Mathur et al,<sup>8</sup> lack of proper and complete knowledge about BMW management impacts practices of appropriate waste disposal; therefore, it is essential to emphasize on training regarding proper management of BMW waste. It was also observed that ignorance of proper practices was more among sanitary level of waste handlers. Another study, conducted by Indian Council of Medical Research and INCLEN program evaluation network,<sup>7</sup> conducted across 25 districts of across 20 Indian states found during in-depth interviews, the gap in knowledge and practice in relation to availability of resources and processes in place was found and the need for organized training and structured supervision to bridge this gap. A study on tertiary care hospitals in India found that people with higher education, such as consultants, residents, and scientists had good knowledge of biomedical rules but was not reflected in their practices.<sup>12,13</sup>

United Nation Industrial Development Organization (UNIDO) reported that geographically diverse, large states of India (Andhra Pradesh, Maharashtra, and Uttar Pradesh) had shown that awareness among hospital staffs regarding segregation of BMW was slightly higher in urban areas compared to rural areas; and that employee training and awareness can be a major determinant of establishing optimal BMW.<sup>14</sup>

Presence of a common storage area was seen in all the three hospitals; however, compliance was deficient in hospital B. The WHO<sup>15</sup> suggests that waste, in bags or containers, should be stored in a separate area, room, or building of a size appropriate to the quantities of waste produced and the frequency of collection. The storage should not exceed the time limit in the following cases of climate:

- Temperate climate: 72 hours in winter and 48 hours in summer
- Warm climate: 48 hours during the cool season
- 24 hours during the hot season

Cost per bed for BMW disposal with outsourced agency was much lesser for hospital A when compared to the other respective hospitals as none of the hospitals had an in-house facility to treat. In a study, conducted by Jindal et al<sup>16</sup> on system analysis of BMW, it was suggested to explore outsourcing BMW for disposal as a viable option and cost effective, and also it was found

that waste generated in color-code yellow ranged from 64.25 to 27.345 gm/day/bed; in color-code red from 19.37 to 10.97 gm/day/bed; and in color-code blue from 3.295 to 3.82 gm/day/bed. Range of price quoted (Rs/day/bed) by various Health Care Establishments (HCEs) for outsourcing was between Rs 1.89 and Rs 8.60 with an average of approximately Rs 5.00 per day per bed. Cost variation was seen as per the location of the HCE.

## CONCLUSION

- Training was essential to ensure compliance to BMW (Handling and Management) rules. It is difficult for small health care organizations to conduct regular training of staff. Attrition among staff also discourages administrators to avoid training. Training session can be organized by Government at taluka level or district level to encourage small health care organization to enroll their staff.
- Common BMW treatment facility can supply color-coded bags at uniform prices to all health care facilities irrespective of their bed strength. This will reduce burden on small health care organizations.

## LIMITATION

There are limited studies related to costing of BMW management. Similar studies were conducted 20 years back but could not be used for comparison because of the factors like inflation, intercity variations in prices of consumables, outsourcing costs and all.

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# Lead Time in Drug Procurement: A Study of Tertiary Care Teaching Hospital of North India

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## ABSTRACT

Pharmaceutical procurement is a complex process that involves many steps, agencies, and manufacturers. Procurement lead time is defined as the time required to acquire the supplies and services and then placing them in the hands of the user. This study was done to study the lead time in drugs procurement at Government Medical College and Hospital, Chandigarh. It was aimed at calculating the average lead time in the procurement of drugs for year 2009–2010 in Pharmacy Department. Observational study along with retrospective record analysis was done to calculate the average internal and external lead time. Standardized format was used to retrieve data from the procurement records. Average lead time between the preparation of indent and receipt of drugs was observed to be 162 days, out of which 117 days (71%) accounted for internal lead time and external lead time was 47 days (29%). Internal lead time was approximately four times that of external lead time. Various reasons were noted for longer duration of internal lead time and every effort should be made to bring it down to the minimum, so as to ensure the availability of the right medicine in the right quantity, in the right time at the right place.

**Keywords:** Drug Procurement, Lead time, Pharmacy.

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## INTRODUCTION

The goal of procurement is to deliver the best cost-effective product to the ultimate user on a timely basis.<sup>1</sup>

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An effective procurement process ensures the availability of the right medicines in the right quantities, at reasonable prices, at recognized standards of quality and, above all, at the right time.<sup>2</sup> Pharmacy forms one of the essential and critical support services for any hospital; therefore, effective drug management becomes necessary. Pharmaceutical procurement is a complex process that involves many steps, agencies, and manufacturers.<sup>3</sup>

Delays in procurement can be unfortunate and the effects of nonavailability of the right drug at times can be disastrous in terms of morbidity and mortality. Proper drug management, therefore, can save money, which can be used for other health care needs, as it decreases maintenance, ordering, and other indirect costs associated with procurement.

Procurement lead time is defined as the average duration of time between the placing of the order and receipt of material. It may be divided into internal lead time (time required for organizational formalities to be completed for placing the order) and external lead time (time interval in placement of order and receipt of drugs).<sup>4</sup> Lead time is one of the most important factors that drive procurement cycle and buffer stock, and tremendous gains can be realized by focusing on reducing lead times. Variability in lead time performance can lead to either excess or shortage of inventories, and sometimes both.<sup>5</sup> Long procurement lead times result in capital being locked in the inventory to meet any unforeseen demand that could occur during the time, when supplies/items are being ordered, procured, and delivered.<sup>6</sup> In materials management, this represents the one time plus the continued cost of holding and managing the inventory. The time, it takes to replenish the supplies directly determines the size of the inventory the health care organization must hold.<sup>1</sup> A reduction in the inventory replenishment lead time allows reducing safety stock requirements and improving delivery of health care.<sup>5</sup> It is easier to reduce internal lead time as factors affecting the same are under the control of the health care organization, and it can be reduced by 40% by streamlining the processes. External lead time cannot be avoided, but it may be minimized by timely reminders, judicious use, penalty for delayed supplies, etc.<sup>4</sup>

As there is little or no scientific literature on the lead times of procurement in Indian setting, this study was

conducted to calculate lead time in drug procurement at a teaching tertiary care government hospital of north India.

## MATERIALS AND METHODS

This study was descriptive, observational in nature and was carried out in the Pharmacy Department of Government Medical College and Hospital (GMCH), Chandigarh, for a period of 1 month (June 2010). All the drugs received during the financial year 2009–2010 were included in the study. A retrospective record analysis and unstructured interview of the assistant dispensing superintendent and other staff members were carried out to study the procurement process and identify various steps involved. A standardized format for data retrieval from the procurement files of various drugs was prepared, was validated by technical experts from Department of Hospital Administration and Pharmacy.

Thereafter, time spent at each step of procurement process was calculated, which was collated to arrive at average lead time, that is, both average internal and external lead times. The data were analyzed using Microsoft Excel software.

## RESULTS

The GMCH, Chandigarh, is a 674-bedded multispecialty tertiary care hospital providing comprehensive health care, including preventive, curative, and rehabilitative health care. Pharmacy of the hospital has a modern set up and is responsible for the procurement of drugs and dressing material for the hospital. Pharmacy is divided into the following areas/section:

- OPD drug distribution center (OPD pharmacy)
- OPD counters for chest and TB as well as leprosy patients
- OPD injection room
- Drugs receipt section
- Drugs verification section and inspection area
- Bulk stores for:
  - Dressing material
  - I.V. fluids
- Main centralized drug stores
- Main centralized drug store for hospital issue and supplies
- Hospital issue counter
- Dispensing services area
- Emergency stocks/night dispensary area
- Record room
- Office of superintendent dispensary
- Office of Asstt. Superintendent Dispensary
- General office

In case of procurement of items between INR 1 and 10 lakhs, an agenda is prepared by the procurement

branch under the guidance of the medical superintendent. The agenda is submitted for approval to the lower purchase committee and director principal, GMCH, who is the final approving authority. After approval, a purchase order is issued to the L1 (lowest quoting firm/company). For procurement exceeding rupees 10 lakh and up to rupees 25 lakh, approval by the standing purchasing committee is required.

The time period of various steps involved, between raising of demand and receipt of drugs, was documented. Both internal lead time and external lead time were calculated for all the drugs received in the year 2009–2010. The procurement process of total 123 drugs was studied.

## Internal Lead Time

Various steps were identified by reviewing the office records and then the time consumed at each step was calculated to arrive at an internal lead time. The steps are detailed as follows:

- Time interval between demand preparation and verification.
- Time interval between demand verification and submission.
- Time interval between demand approval by medical superintendent and receipt of approved demand in pharmacy.
- Time interval between publishing of advertisement and opening of quotations.
- Time interval between quotation opening and comparative preparation.
- Time interval between comparative preparation and approval by lower purchase committee.
- Time interval between approval by lower purchase committee and issue of purchase order.

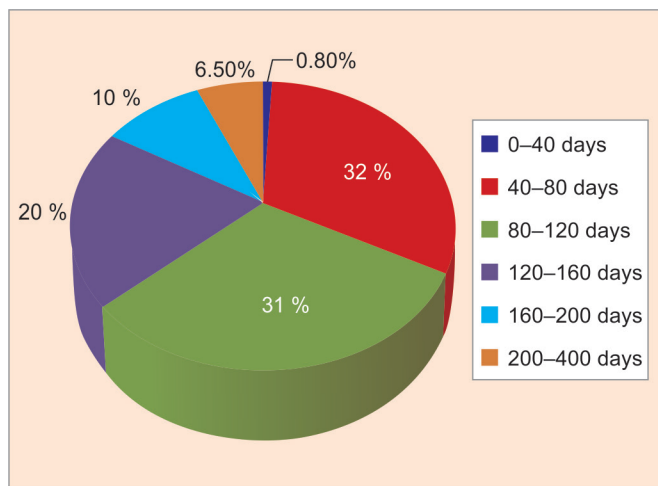
The following table provides the time taken at different steps contributing to internal lead time (Table 1).

Analysis of data on internal lead time revealed that in about 32% of drugs, the time interval between the preparation of demand and issue of purchase order was 40 to 80 days.

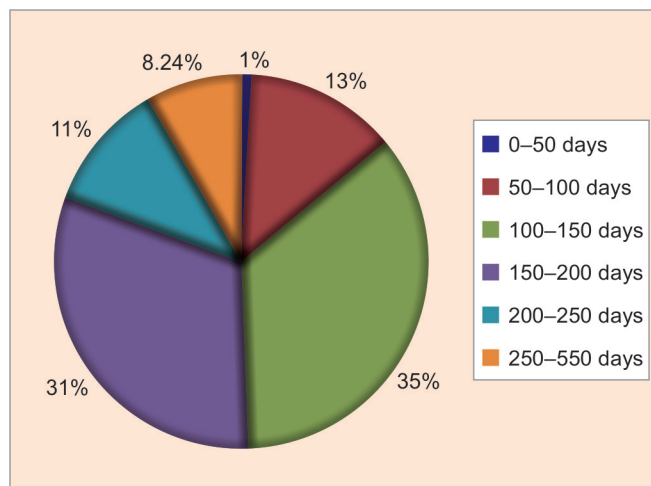
In 31% of drugs, the internal lead time was between 80 and 120 days. In about 20% of the drugs the internal lead time was 120 to 160 days. In 10% of drugs, the internal

**Table 1:** Average time taken in various steps of internal lead time

Process	Average time (days)
Indent preparation and quotation opening	70
Quotation opening and comparative preparation	3
Comparative preparation and issue of purchase order	41
Total internal lead time (Demand preparation and issue of purchase order)	114



Graph 1: Internal lead time (percentage of drugs)



Graph 2: Time taken for receipt of various drugs received during the year 2009-2010

Table 2: External lead time

No. of days	Percentage of drugs received
0-20	16
20-40	42
40-60	27
60-360	14.65

Table 3: Percentage of total time taken in various steps

Process	Percentage of time taken
Indent preparation and quotation opening	43.2
Opening of quotation and making of comparative	1.9
Making of comparative and Issue of purchase order	26
Issue of purchase order and receipt of drug	29

lead time was 160 to 200 days and in the remaining (6.5%) was between 200 and 400 days (Graph 1).

**External Lead Time**

In order to calculate the external lead time, the time interval between the issue of purchase order and the receipt of drugs in the hospital pharmacy was observed. The average external lead time was observed to be 47 days.

More than half (58%) of the drugs were received within 20 to 40 days and 27% were received within 40 to 60 days. Only 5% of drugs took 60 to 80 days (Table 2).

**Total Lead Time**

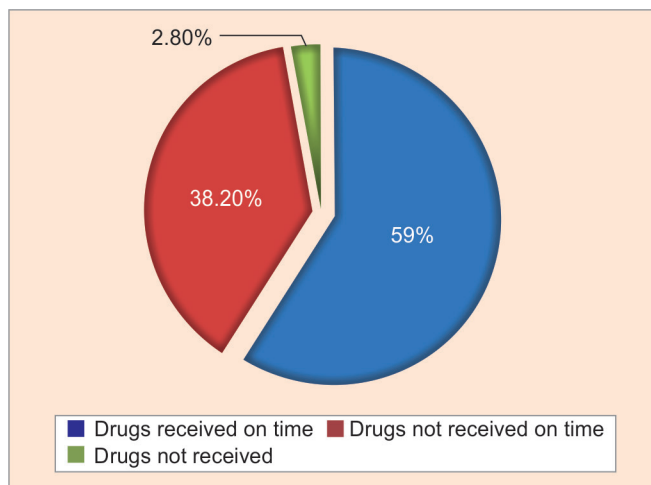
Analysis of data revealed that 80% of the drugs were received within 200 days and 92% of the drugs were received within 250 days. Remaining 8% of the drugs were received within 550 days (Graph 2).

The following table gives the time consumed at various steps of drug procurement (Table 3).

Average lead time between the preparation of indent and receipt of drugs in the hospital pharmacy is 161 days (Table 4). The average internal lead time is 114 days and the average external lead time is 47 days. Only 59% of the drugs were received in time (Graph 3).

Table 4: Lead time in drugs procurement

No. of days	Drugs received	Percentage of drugs received	Cumulative %
0-50	1	0.81	0.81
50-100	16	13	13.81
100-150	42	35.20	49.01
150-200	37	31	80.01
200-250	13	11	91.01
250-300	4	3.36	94.37
300-350	2	1.70	96.07
> 350	4	3.20	99.27



Graph 3: Timely receipt of drugs

**CONCLUSION**

It was found that procurement of drugs is taking significant lead time in which internal lead time was identified to be four times that of external lead time. It is prudent to

streamline the various procurement processes to bring down the inventory cost and bring efficiency into the procurement system. As it is well known that the right



quality of drug should be available in the right quantity at the right time at the right cost is the reflection of efficient and effective procurement system. Therefore, efforts should be made by the hospital to reduce it to as minimum as possible.

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# How Prepared are Hospital Employees for Internal Fire Disasters? A Study of an Indian Hospital

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## ABSTRACT

**Introduction:** In case of internal disasters, such as fire in hospitals, health services to the community are severely hampered with the additional morbidity of victims, such as employees and visitors present when the disaster strikes. Risk assessment and fire preparedness are most crucial proactive measures to prevent fire disasters and minimize the loss in a hospital; however, scanty studies are available on this topic.

**Materials and methods:** This cross-sectional study was conducted at a multispecialty hospital in Mumbai, Maharashtra (India), during March–April 2014. Fire-Safety Preparedness Framework (FSPF) was designed with four domains (risk and vulnerability assessment, response mechanisms and strategies, preparedness plan and information management) for evaluation of fire safety preparedness of hospital employees. Baseline variables were summarized; instrument was tested for reliability using Cronbach's alpha and content validity through review by experts. The number of correct responses for each question was further analyzed across the type of employee.

**Results:** The instrument showed high reliability (Cronbach's alpha=0.89, p-value≤0.01) and content validity. A total of 207 employees (mean age 32±8.3 years, 63% females) consented and participated in the study. Out of 20 questions, awareness was high (≥90%) only for three questions from "Response mechanism and strategies" domain. For the remaining questions, awareness was moderate to low. The awareness varied highly with the type of employee.

**Conclusion:** The FSPF is a reliable tool for application in the Indian context for hospital employees. Disaster preparedness training and drill need to involve employees from all departments as awareness levels varied highly with type of employee.

**Keywords:** Disaster preparedness, Fire safety, Hospital.

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## INTRODUCTION

One of the criteria used by the Pan American Health Organization (PAHO) and the World Health Organization (WHO) to define a Safe Hospital is one that "is organized, with contingency plans in place and health workforce trained to keep the network operational."<sup>1</sup> A hospital is prone to three types of disasters, namely, community affected – hospital unaffected, community unaffected – hospital affected, and community affected – hospital affected. The second category of "community unaffected – hospital affected" is also known as an internal disaster, such as fire and terrorist attack. In case of hospitals being affected by disasters, the health services to the community are severely hampered with the additional morbidity load of the disaster victims, such as employees and visitors present when disaster struck.

However, the situation can be controlled relatively sooner if employees are well versed with the necessary actions to be taken in terms of response mechanisms and strategies, preparedness plan, and information management for quick evacuation and triage. The components of a disaster response cycle include risk assessment and preparedness, response, rescue, recovery, mitigation, risk reduction, out of which the most important component is being proactive with a contingency plan to deal with the disaster.<sup>2</sup> In hospitals, preparedness includes preparation and circulation of a disaster manual that addresses the action plan. However, there have been only a few studies examining the level of preparedness of hospitals for an urgent evacuation, and Indian studies are hard to find.<sup>3</sup> The present study has been conducted to assess the level of fire safety preparedness of employees of an Indian hospital.

## MATERIALS AND METHODS

### Study Design and Setting

This cross-sectional study was conducted on employees of a multispecialty hospital in Mumbai, Maharashtra (India), from March to April 2014, after obtaining permission from the hospital authorities and written consent from employees.

### Study Procedure, Instrument, and Scoring

All employees of the hospital under the following categories were provided a questionnaire: Doctors, nurses,

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administrative staff, engineers and maintenance (E&M), and security personnel. Those who consented to participate in the study and completed the questionnaire were included.

The safety manual of the hospital that was being followed for fire safety preparedness in the hospital was studied in detail. In addition to this, the disaster preparedness training program of International Federation of Red Cross<sup>4</sup> was referred to design the Fire-Safety Preparedness Framework (FSPF) for evaluation of fire safety preparedness of hospital employees. The FSPF questionnaire comprised 20 questions pertaining to four domains, namely, risk and vulnerability assessments (Q. 1,2,4), response mechanisms and strategies (Q. 8, 9, 14, 19), preparedness plan (Q. 3, 5, 7, 10, 15, 16, 20), and information management (Q. 6, 11, 12, 13, 17, 18). Questions 1 to 3 are evaluated on Yes/No/Can't say scale. The remaining questions had four options, out of which one was the correct answer.

### Data Analysis

The baseline variables were summarized using an appropriate measure of central tendency. The reliability of the questionnaire was tested using Cronbach's alpha. For qualitative content validity, a group of experts was interviewed for suitability and comprehensiveness of questions. The scores were computed based on the scoring guidelines mentioned before. The number of correct responses for each question was further analyzed across the type of employee.

## RESULTS

The questionnaire was preliminarily validated and approved by a team consisting of the medical superintendent, quality officer, hospital administrator, facility director, and safety committee of the hospital. All the experts approved the comprehensiveness and suitability of questions, thus, indicating high content validity. The questionnaire was then distributed to 230 hospital employees to assess their fire safety preparedness. A total of 207 employees (90%) who provided consent were included in the study.

Of these 207 employees, 130 (63%) were females and mean age of the sample was  $32 \pm 8.3$  years. Mean work experience of the employees in the hospital was  $4 \pm 0.54$  years and the mean time since last training attended by the employees for fire safety was  $1.6 \pm 1.5$  years. Included in the sample were 40 doctors (19%), 82 nurses (40%), 31 administrative staff (15%), 20 E&M staff (9.6%), and 34 security personnel (16.4%).

Results of reliability analysis of the instrument are shown in Table 1. The reliability of the questionnaire was tested with overall Cronbach's alpha of 0.89 ( $p$ -value  $\leq 0.01$ ) revealing high internal consistency. However, for the questions 1, 2, and 4 in the Risk and Vulnerability Assessment domain, the "corrected item-total correlations" were low. When, the reliability test was repeated by dropping these questions and the negatively scored items, the Cronbach's alpha of the instrument increased from 0.89 to 0.92. Hence, these were identified as weak questions.

Table 2 represents the frequency of optionwise response for each of the questions. The correct response

**Table 1:** Reliability results of the questionnaire

Questions/items	Corrected item-total correlation	Alpha value
<i>Domain 1: Risk and vulnerability assessment</i>		
1 Did the hospital face any fire disaster in the past?	0.43	0.57
2 Does your hospital have a disaster plan?	0.31	0.59
4 Does the hospital have a Safety Committee?	0.39	0.54
<i>Domain 1 Cronbach's alpha = 0.52 (p-value &lt; 0.001)</i>		
<i>Domain 2: Response mechanisms and strategies</i>		
8 Means of going down in case of fire breakout on 3rd floor of hospital	0.77	0.65
9 Means used to find way in dark in case of emergency	0.75	0.64
14 Action to be taken on discovering fire	0.7	0.68
19 What is the first step while using fire extinguisher?	0.7	0.69
<i>Domain 2 Cronbach's alpha = 0.68 (p-value &lt; 0.001)</i>		
<i>Domain 3: Preparedness plan</i>		
3 Have you attended any workshops/training related to disasters/emergencies?	0.86	0.8
5 What is the correct position while firefighting in a closed area	0.75	0.81
7 Type of fire extinguisher used in case of short circuit	0.77	0.79
10 Location of the grab kit in conjunction with the employee work station	0.52	0.83
15 What is the location of the assembly point?	0.69	0.81
16 Location of the nearest fire exit in conjunction with the work station	0.71	0.82
20 Type ABC fire extinguishers are safe to use on which type/s of fire?	0.8	0.8
<i>Domain 3 Cronbach's alpha = 0.83 (p-value &lt; 0.001)</i>		

(Cont'd...)

(Cont'd...)

Questions/items	Corrected item– total correlation	Alpha value
<b>Domain 4: Information management</b>		
6 What is the code to be announced in case of fire emergency at the hospital?	0.88	0.87
11 Which sections'/departments' number should be dialed first for internal reporting in case of fire?	0.91	0.89
12 When do the sprinklers get activated?	0.85	0.8
13 Where is the Fire Control Panel located in the hospital?	0.82	0.85
17 What color tag must be provided to triage patients who require URGENT care?	0.8	0.86
18 Who is evacuated FIRST in case of a fire disaster from site of incident to assembly area?	0.75	0.87
<i>Domain 4 Cronbach's alpha = 0.88 (p-value &lt; 0.001)</i>		
<i>Overall Cronbach's alpha = 0.89 (p-value &lt; 0.01)</i>		

**Table 2:** Domain-wise frequency (n, %) of responses (n=207)

Q. no.	Question	Response n (%)			
<b>Domain 1: Risk and vulnerability assessment</b>					
1	Did the hospital face any fire disaster in the past?	Yes 5 (3)	No 184 (89)	Can't say 6 (3)	No response 10 (5)
2	Does your hospital have a disaster plan?	Yes 199 (96)	No 0 (0)	Can't say 4 (2)	No response 4 (2)
4	Aware about the presence of safety committee of the hospital	<u>Yes 193 (93)</u>	No 8 (4)	Can't say 4 (2)	No response 2 (1)
<b>Domain 2: Response mechanisms and strategies</b>					
8	Means of going down in case of fire breakout on 3rd floor of hospital	<u>Stairs 195 (94)</u>	Lift 0 (0)	Both 10 (5)	No response 2 (1)
9	Means used to find way in dark in case of emergency	Nearest switch board 7 (3)	Your cell phone 4 (2)	<u>Floro-luminous indicators 186 (90)</u>	No response 10 (5)
14	Action to be taken on discovering fire	Inform the manager 2 (1)	Wait for detector to activate alarm 2 (1)	<u>Raise alarm 199 (96)</u>	No response 4 (2)
19	What is the first step while using fire extinguisher	Aim toward extinguisher 27 (13)	<u>Pull the pin 153 (74)</u>	Check if extinguisher is full 25 (12)	No response 2 (1)
<b>Domain 3: Preparedness plan</b>					
3	Training attended for any disaster/emergency	Yes 197 (95)	No 8 (4)	Can't say 2 (1)	No response 0 (0)
5	What is the correct position while fire-fighting in a closed area	<u>Exit 157 (76)</u>	Along wind 15 (7)	Away from wind 35 (17)	No response 0 (0)
7	Type of fire extinguisher used in case of short circuit	<u>CO<sub>2</sub>, DCP, ABC powder 176 (85)</u>	Water, ABC, Foam 10 (5)	Both 6 (3)	No response 15 (7)
10	Location of the grab kit in conjunction with the employee work station	<u>Correct 72 (35)</u>	Wrong 104 (50)	No response 31 (15)	
15	What is the location of the assembly point	<u>Correct 147 (71)</u>	Wrong 25 (12)	No response 35 (17)	
16	Location of the nearest fire exit in conjunction with the work station	<u>Correct 153 (74)</u>	Wrong 29 (14)	No response 25 (12)	
20	For which type of fire is the ABC fire extinguisher used?	Ordinary combustibles 31 (15)	Flammable liquids 35 (17)	<u>All types 122 (59)</u>	No response 19 (9)
<b>Domain 4: Information management</b>					
6	Code to be announced in case of fire emergency in hospital	Code Pink 75 (36)	Code Purple 2 (1)	<u>Code Red 118 (57)</u>	No response 12 (6)
11	Which sections/departments number should be dialed first for internal reporting in case of fire?	Operator 39 (19)	<u>Public address system 135 (65)</u>	Security 15 (7)	No response 18 (9)
12	When do the sprinklers get activated?	Smoke in an area 59 (28)	Activation of a pull station 72 (35)	<u>Heat from fire 64 (31)</u>	No response 12 (6)
13	Location of the fire control panel in the hospital	<u>Building Management System (BMS) 77 (37)</u>	Security 88 (42)	IT 21 (10)	No response 21 (10)
17	Triage color code for Urgent care patients	Yellow 37 (18)	<u>Red 151 (73)</u>	Green 2 (1)	No response 17 (8)
18	Color tag of the patient to be evacuated first from disaster site to assembly area	Green tag 43 (21)	Yellow tag 10 (5)	<u>Red tag 135 (65)</u>	No response 19 (9)

The correct responses are underlined. No response means that the question was left blank

for each question is underlined. For question 1, 89% respondents were correct in saying that the hospital has not faced any fire disasters in past. Similarly, in question 2, 96% respondents correctly responded that the hospital has a well-defined disaster plan pertaining to fire safety. Out of 20 questions, awareness was high ( $\geq 90\%$ ), only for three questions from domain 2 “response mechanism and strategies”. For domain 2, range (in %) of correct responses was 74 to 96% showing highest awareness for this domain. The proportion of correct responses for domain 3 “Preparedness Plan” was low for two questions – location of grab kit (35%) and type of fire for which ABC extinguisher is used (59%). Range of correct responses was 71 to 85% for remaining questions under domain 3. The proportion of correct responses for domain 4 “Information Management” was low to moderate for almost all questions ranging from 18 to 65%, except for one question on triage color code for urgent care with 73% correct responses. Hence, the awareness level was usually moderate to poor among hospital employees.

Graph 1 shows the proportion of correct responses across various types of employees interviewed, such as doctors, nurses, engineering and maintenance (E&M), administration, and security. Questions 1 to 3 are not included in the graph as there are no correct answers for these questions.

The staff members from E&M and administration were observed to be most aware about the fire safety guidelines. This may be largely because they are involved in purchasing and/or installation of the equipment. Security staff was aware about the guidelines for the areas pertaining to their functioning, but their awareness was low. Nursing staff was better aware regarding the questions on triage and those pertaining to their work stations and day-to-day activities. Doctors, many of whom are visiting consultants, had marginal knowledge regarding

fire safety issues. However, they had sound knowledge about the questions on triage and emergency situation.

## DISCUSSION

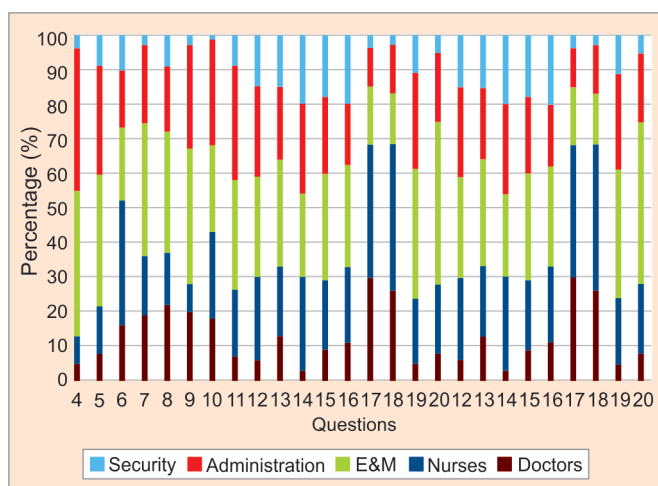
The present study was conducted with the objective of evaluating fire safety preparedness among the employees of an Indian hospital. The Fire-Safety Preparedness Framework (FSPF) questionnaire was found to be reliable for application in the Indian context for hospital employees. Questions 1, 2, and 4 in the risk and vulnerability assessment domain were identified as weak questions and should be dropped for future studies.

The overall preparedness score regarding the various factors on fire safety was low to moderate. Highest awareness was observed for domain 2 “response mechanism and strategies” with awareness level  $>90\%$  except for one question. As much as 95% employees had attended fire safety training. However, as the mean time since last training attended was 1.6 years, the time gap is high. Previous studies have shown that training develops skills and knowledge to handle the disaster.<sup>5</sup> Refresher courses must be carried out every 4 to 6 months to refresh the memory of employees. To increase the performance and participation in the training programs, the awareness levels about fire safety preparedness may be linked to the performance appraisal of the employees. However, staff must be made more aware about the issues covered in “Information Management” and “Preparedness Plan” domains.

Doctors were found to have sound knowledge about the questions on triage and emergency situation. Administration and E&M staff was better aware about the installation and location aspects. However, we could not find any study in literature regarding variation of preparedness awareness across type of staff to compare our results with.

It is recommended that disaster management committee should include staff from all cadres. Initiative should be taken by this committee to educate and inform all staff members regarding safety preparedness guidelines. Further, mock drills with all staff members should be conducted regularly, preferably on rotation basis to cover all employees.

The hospital should also have some tie ups with other nearby health facilities that can be contacted in case of an internal disaster in hospitals.<sup>6</sup> The employees must be aware about these health facilities where the critical patients can be shifted in case of an internal disaster. Further, services of these facilities can be immediately availed to transfer critical patients of the affected hospital. The employees and other visitors of the affected hospital can also be treated at these facilities.



**Graph 1:** Graphical representation of distribution of correct responses (in %) across category of staff

The strength of our study is that we validated the questionnaire on 207 employees of a multispecialty Indian hospital. To the best of our knowledge, we could not find any similar studies that analyze the safety preparedness of hospital employees across different cadres. The probable weakness of the study is that the analysis was done at a basic level. The second phase of the study is planned for high fire-prone areas for analysis of preparedness of the staff posted there.

## CONCLUSION

The Fire-Safety Preparedness Framework (FSPF) is reliable for application in an Indian context for hospital employees. Disaster preparedness training and drill need to involve employees from all departments as awareness levels varied highly with type of employee. Internal disaster may strike any time and employees need to be vigilant and aware to handle such situations. Training and refresher programs should be conducted more frequently and may be linked with annual performance appraisal for better participation and receptivity.

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# Does Health Insurance give Us an Assurance? A Study on the Extent of Coverage of Health Insurance at a Tertiary Care Hospital in North India

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## ABSTRACT

**Introduction:** Health insurance is emerging fast as an important mechanism to finance health care needs of the people. Complexity of the health insurance industry has been much talked about and less understood in the Indian scenario. Hence, it is imperative to assess the level of awareness that the population has with respect to health insurance policies.

**Materials and methods:** Cross-sectional prospective study conducted over a period of 6 months, at the third-party administrator (TPA) desk of the hospital. The data was collected using a preformed close-ended questionnaire after obtaining consent from all the participants. Only patients admitted in the hospital availing cashless hospitalization were included in the study. The study was undertaken with the objective to determine the level of awareness about insurance policies and procedures among those insured and identify the problems faced by those insured when availing cashless treatment. Responses to the variables in the questionnaire were compiled and tabulated using Excel 2010.

**Results:** Response rate of 76% was observed. 56% of the study population were planned admissions and 44% were admitted through emergency department. The study showed that about 56% of the principal policy holders were between 30 and 50 years of age. The awareness regarding the terms and conditions of the health care insurance policy and the servicing TPA was found to be 70%. However, on interacting with patients it came to light that despite being appraised by their insurance agent, they faced challenges while availing health care benefits under health care insurance and were ignorant about the procedure involved.

For the current admission, in 78% of the cases, the TPA responded within 24 hours of intimation; however, in 22% cases there were delays in response from the TPA mostly attributed to communication gap between the Insurance Company and the TPA. Preexisting disease was not covered in 14% cases. 82% cases had to wait for more than 2 hours for the final clearance from the TPA. Over the years, as ascertained in 2016 also, the scenario of insurance has not undergone significant change.

**Conclusion:** Strategies to optimize claims by bringing about a uniformity in the rates being charged by the hospitals for different procedures are needed to increase coverage.

**Keywords:** Awareness, Health insurance, Third-party administrators.

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## INTRODUCTION

Health, like education, should be essential and should be freely available to all the citizens of a country. With rising health care costs, it has become imperative to make quality health care affordable for all the citizens irrespective of their income. Unlike many developed countries who spend 6 to 8% of their GDP on health, India barely spends 4% of its GDP on health.<sup>1</sup> This low priority accorded to health has resulted in poor infrastructure and lack of advanced therapeutic and diagnostic facilities in public sector hospitals. Hence, the public has to look toward the private hospitals for such treatments. At present, as many as 135 million Indians do not have access to health services.<sup>2</sup>

The World Health Report of 2010, entitled *Health Systems Financing: The Path to Universal Coverage*, showed that over a billion people are unable to use the health services they need, while a 100 million people are pushed into poverty and 150 million people face financial hardship because they have to pay directly for the health services they use at the point of delivery.<sup>3</sup> Advancement of medical technology and the increase in cost have necessitated the exploration of better health financing options to manage problems arising out of increasing health care costs. Health insurance is emerging fast as an important mechanism to finance health care needs of the people. However, the complexity of the health insurance industry has been much talked about and less understood, especially in the Indian scenario. Only a small section

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of the society have their health care covered.<sup>4</sup> The lower socio-economic group sometimes falls out of the coverage because of nonaffordability.

Health insurance is a protection scheme to take care of health of a person and one can avail the benefit by buying a policy from an insurance company or an insurance agent. Health insurance schemes are particularly important for such people, especially from the lower income group so as to provide them with adequate cover in event of any mishap or illness.<sup>5</sup> Health insurance not only promises payment to the insured in the event of sickness or injury, but also ensures that no compromises are made in the treatment for wants of funds.<sup>6</sup> Currently, the trend of some of the reputable companies is to build in a health insurance policy as a benefit to their employees. At present, there is no universal health insurance in India and is limited to industrial workers and their families or to people who can afford to purchase such a scheme.<sup>7</sup>

The country has a number of public health insurance schemes, such as the Employees State Insurance Scheme, Central Government Health Scheme (CGHS), ECHS for the defense services personnel, and health care schemes for employees working in the railways or any public sector undertakings.<sup>4</sup> Besides the public health insurance schemes, there are a number of private players in the country which provide health insurance to a number of people based on the premium paid by the insured to the company. The Insurance Regulatory Development Authority (IRDA) is the agency responsible for recognizing the various health insurance companies in India. There were 29 nonlife insurers in India in 2013 which covered health.<sup>8</sup> Despite this, health care insurance market in India is yet to make a dent in the sector, with only 3.4 to 3.5 million members covered.<sup>9</sup>

The third-party administrators (TPA – Health Services) were introduced into the insurance industry through a notification of IRDA (TPA – Health Services). The IRDA defines TPA as “an insurance intermediary licensed by the Authority who either directly or indirectly, solicits or effects coverage of, underwrite, collect, charge premium from an insured, or adjust or settle claims in connection with health insurance, except as an agent or broker or an insurer.”<sup>10</sup> The basic role of a TPA is to function as an intermediary between the insurer and the insured by providing administrative functions. The IRDA has granted license to 30 TPAs till June 2014.<sup>10</sup> The introduction of these intermediaries in the sector has benefitted both the insured and the insurer. While the insurers are benefitted by reduction in their administrative costs, the insured is benefitted by better service.<sup>10</sup>

An insurance company may also use a TPA to manage its claims processing, provider networks, utilization

review, or membership functions. While some TPAs may operate as units of insurance companies, they are often independent. Given the demand and supply complexities in health insurance and health care markets, the TPAs provide an important link between insurance companies, health care providers, and policy holders. The core product or service of a TPA is ensuring cashless hospitalization to the policy holders.<sup>3,11,12</sup> The TPAs require skills to develop networks, manage finance, and for delivery of appropriate health care services to its clients. The TPAs have a wider role to play in ensuring standardization of charges and managing cashless services in health insurance. However, their actual roles and responsibilities have remained less understood, less clear, and much debated.<sup>11</sup>

The backbone of TPA is information management system. Analysis of data regarding hospital admissions across the network, analysis of treatment, tracking documents pertaining to each case, and tracking shortfalls in claims are essentials of claim management.<sup>12</sup>

The study was conducted at a 650 bedded, multispecialty, tertiary care, not for profit trust hospital in Delhi with the objective to determine the level of awareness about insurance policies among the inpatients availing cashless hospitalization. Further, the study aimed at identifying the problems faced by those insured while availing the said facility.

## MATERIALS AND METHODS

This cross-sectional prospective study was conducted over a period of 6 months from July to December 2011 in a 650 bedded, tertiary care charitable trust hospital situated in Delhi. The existing process of cashless hospitalization in the hospital was studied and thereby close-ended questionnaire was designed, which was pilot tested before using the study. The data was collected after obtaining consent from all the participants. Confidentiality of the participants was ensured at every stage of the study and anonymized data was used for analysis.

The questionnaire had 31 items and was divided into three sections: Demographic profile, awareness about the health care insurance, and insurance process for current admission. The study sample was decided by taking the 10% of the total inpatients admission in a week availing health care insurance. Randomly selected 100 patients were studied. Questionnaires distributed were more than the study sample to achieve the requisite sample size. Sample included all patients who had an insurance cover and went through the procedure of applying to avail the cashless hospitalization. The study population included emergency cases for which insurance authorization request was sent after admission and planned inpatient

admission which had necessary TPA-related processing done prior to admission.

Any patient suffering from any cardiovascular, nervous, mental, or physical pathology were excluded from the study. Responses to the variables in the questionnaire were compiled and tabulated.

A short study was again conducted using the same questionnaire in June, 2016 to assess the current situation. In this study, questionnaires were administered to 20 patients fulfilling the inclusion criteria mentioned above.

## OBSERVATIONS AND RESULTS

The health care organization is a leading 650 bedded, multispecialty, tertiary care, not for profit trust hospital, successfully run by a highly competent and strong team of consultants specialized in their respective fields providing comprehensive medical care on its over 800 beds. The hospital is also a leading Academic Centre and is recognized as a Research Institute by the Department of Scientific and Industrial Research, Government of India. The hospital has produced numerous collaborative research programs, which have been recognized nationally and internationally. Annually, the hospital registers more than 4 lakh outpatients and 50,000 inpatients with more than 90% occupancy at all times. Over 24,000 surgeries take place in 24 seamless and world-class stainless steel modular operation theatres.

Response rate of 76% was observed. 56% of the study population were planned admissions and 44% were admitted through emergency department. The study showed that about 56% of the principal policy holders were between 30 and 50 years of age. Only 6% of study population composed of retired individuals. 42% of the respondents had their parents, spouses, and children covered under the insurance. 86% of the policy holders

were income tax payers, thus meaning that the insurance is majorly availed by the people employed in organized sectors (public and private). Approximately 52% of the respondents were in service and 42% were self-employed. It shows that awareness about the insurance is fairly similar in both the groups. Of these 52% were salaried, 40% were insured under the corporate insurance policies, and 60% had purchased the health care insurance policies on their own (Table 1).

The awareness regarding the terms and conditions of the health care insurance policy and the servicing TPA was found to be 70%. However, on interacting with patients it came to light that despite being appraised by their insurance agent, they faced challenges while availing health care benefits under health care insurance and were ignorant about the procedure involved. Few of them were even not aware about the diseases covered under the health care insurance. It was also found that the change in the servicing TPA was not being communicated to them and became aware once they applied for a claim under health care insurance.

Table 2 depicts the details of the health care insurance policy subscribed by the study participants. For the current admission, approximately 40% of the insurance cases were decided in the first instance itself, while for remaining additional information requests were received. In 78% of the cases the TPA responded within 24 hours of intimation, however in 22% cases there were delays in response from the TPA mostly attributed to communication gap between the Insurance Company and the TPA, either regarding the renewal or with regards to the change in TPA. In 44% of the cases no conditions were attached to the grant of approval for the claim made under health care insurance (Graph 1). In the rest of the cases some limitations to the extent of coverage were flagged. In 26% cases there was a capping on the room rent being

**Table 1:** Demographic profile of the patients

Questions					Total
Age of the principal policy holder	Below 30 years	30–40 years	40–50 years	Above 50 years	
	18	34	22	26	100
Level of education	Matric	Undergraduate	Graduate	Postgraduate	
	4	8	44	44	100
No. of dependent members	None	Spouse	Spouse, children	Spouse, children, parents	
	2	22	34	42	100
Age of the elder most member covered	Below 40 years	40–60 years	60–70 years	above 70 years	
	22	46	26	6	100
Whether self-employed or in service	Self-employed	Salaried	Retired		
	42	52	6		100
Total annual income (in Rs.)	Up to 2 lacs	2–5 lacs	5–10 lacs	More than 10 lacs	
	14	36	30	20	100
Whether income tax payer	Yes	No			
	86	14			100



**Table 2:** About the insurance policy details

Questions					Total
If insurance cover provided by employer or enrolled by self	Corporate insurance 40	Personal insurance 60			100
Educated about policy terms and conditions by the company/insurance agent?	Yes 72	No 28			100
Awareness about servicing TPA at the time of admission	Yes 70	No 30			100
Insured for how long	1st year 12	2nd year 18	3–5 years 34	<5 years 36	100
Sum (in Rs.) for which insured	Less than 50,000/- 2	Up to 1 lac 10	Up to 3 lacs 68	More than 3 lacs 20	100

sanctioned. In another 14% of the cases a preexisting disease was not covered. In 54% of the cases an enhancement of the sum approved was required and this caused a delay in the patient being discharged from the hospital. 51% cases had to wait for more than 2 hours for the final clearance from the TPA, in 31% cases this wait extended beyond 4 hours (Graph 2).

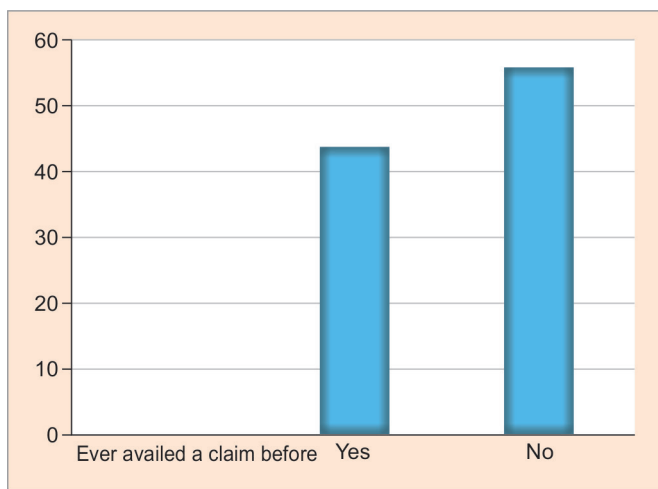
Of the 44 respondents who had availed insurance benefits earlier, only 26 were approved for cashless hospitalization while others were asked to get the reimbursement done. Of these, in 10 cases the total amount was reimbursed and in 8 cases partial deductions were made (Graph 3). The enquiry into the kind of deductions made was beyond the scope of the study. Of the total, 12 cases were settled within 45 days of filing for reimbursement while rest were settled within 3 months of filing for claim. The previous claim history of the study participants is given in Table 3.

In the short study, 55% admissions were planned admissions with about 60% of the principal policy holders between 30 and 50 years of age. Half the respondents were in service and the other half were self-employed.

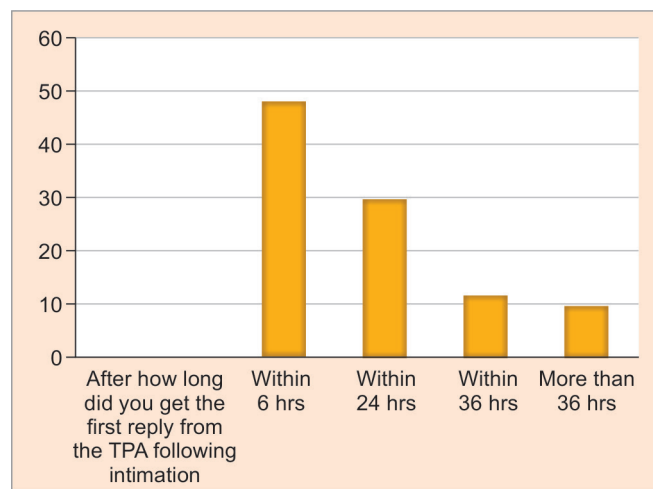
Awareness across all respondents was similar to the results observed in the study conducted in 2011. However, in the current study it was found that the hours taken to process the claim has reduced from 6 hours in the earlier studies to less than 4 hours in over 80% cases (Table 4, Graph 4). In addition, the respondents also stated that they had a wider choice of hospitals to go to and they were also getting cashless benefits for certain outpatient benefits. In addition, claims for reimbursements have reduced in consonance with the increase in the number of hospitals being empaneled by individual insurance companies.

**DISCUSSION**

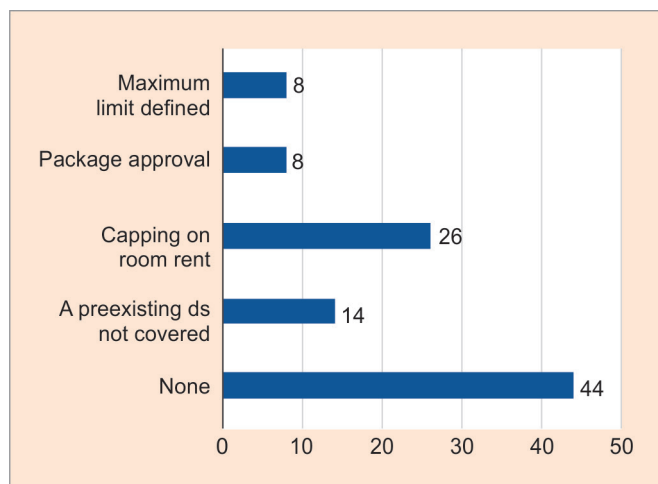
In the current study, it was deduced that most of the principal policy holders belonged to the productive age group (30–50 years) which is line with the conclusions drawn in a number of studies conducted earlier on the subject.<sup>13-15</sup> Similarly, earlier studies have come to the conclusion that income was one of the most important determinant to purchase insurance, which also holds true in this study.<sup>16-18</sup>



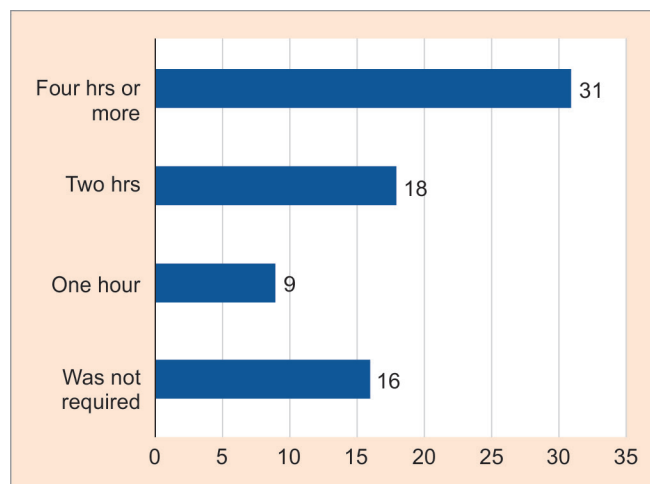
**Graph 1:** Previous claim status



**Graph 2:** Time taken by the TPA to give initial response



Graph 3: Conditional approvals



Graph 4: Time taken by TPA for final clearance at the time of discharge

In a study done by Bhatt et al<sup>10</sup> in the Indian subcontinent revealed that the policy holders have very little knowledge and awareness about the empaneled hospitals for cashless hospitalization services and the existence of TPA, which is the reason why they rely heavily on insurance agents. Health care providers experience substantial delay in settling of their claims by the TPAs. The authors of this study observed similar

experience despite greater penetration of insurance in an increasingly privatized health care environment over the decade.

Though the need for insurance is highest in the lower strata of the society, only 14% were nonincome tax payers, thus meaning that the insurance is majorly availed by the organized sector of the society. Though the aging population has increased with clear needs for greater

Table 3: Previous claim history

Questions	Once	2-5 times	More than 5 times	Total
How many times have you availed of the insurance benefit in single financial year	26	18		44
If more than once was it for the same beneficiary and illness	Yes but not for the same illness 3	Yes but not for the same beneficiary 4	Yes for same beneficiary and same illness 11	18
Has there been any refusal for coverage for repeat hospitalizations	Yes 4	No 40		44
Have you increased the sum for which you were insured at the time of registering the policy?	Yes 10	No 34		44
Is there any preexisting disease that the company has identified as not covered	Yes 6	No 38		44

Table 4: Current admission

Questions	Within 6 hours	Within 24 hours	Within 36 hours	More than 36 hours	Total	
After how long did you get the first reply from the TPA following intimation	48	30	12	10	100	
How many queries were raised by the TPA before the final decision	None 40	One 30	two 18	More than two 12	100	
Were there any conditions applied on the approval that was granted to you	None 44	A preexisting ds. not covered 14	Capping on room rent 26	Package approval 8	Maximum limit defined 8	100
Was there a need for enhancement of the limit approved	Yes 54	No 26			80	

coverage, a mere 6% coverage may also reflect the higher premiums that older clientele would need to pay.

Based on the observations above, the following recommendations can be deduced from the study. The communication between the Parent Insurance Company and the TPA needs to be improved in order to make the claim processing smooth and hurdle-free. This can be achieved through the cross-linking of the databases of the various TPAs of an insurance company in order to solve the renewal-related issues which are responsible for a considerable portion of delays and confusions.

The package rates for all common cases requiring hospitalization should be determined by discussions with the provider hospitals considering their requirements and constraints. We can also think in terms of promoting day care procedures as these cut the costs to a large extent.

Working in the direction of preventive and promotive aspects of health will decrease the health care costs in the long term due to timely diagnosis and timely intervention. This can be achieved by providing a free periodic health checkup to the beneficiaries.

The study was conducted within a limited timeframe and few assumptions were made during the course of the study. Since the data was collected from the TPA desk, it is possible that those who have been denied a cashless hospitalization might have been missed out.

## CONCLUSION

Although the awareness and utilization of the insurance benefit is fairly satisfactory in the people working in the organized sector, but a lot needs to be done to bring the people working in the unorganized sector under the umbrella of the health care insurance. The process of availing cashless hospitalization has to be made less cumbersome as the beneficiary has to run from pillar to post to avail the benefit when a family member is already sick and needs attention. In order to increase coverage, innovative solutions are needed in terms of optimizing the claims by bringing about a similarity of the rates charged by the hospitals.

## ACKNOWLEDGMENT

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# A Small Nudge can make a Difference: Impact of Passive Feedback on Prescription Behavior

<sup>1</sup>VK Tadia, <sup>2</sup>R Ahlawat, <sup>3</sup>SK Arya, <sup>4</sup>DK Sharma

## ABSTRACT

It is generally believed that big changes can be brought about by big interventions. Sometimes, small interventions also can show spectacular results. This case describes the impact of simple intervention, audit and feedback on change in the behavior of clinicians. In this case, the impact of simple intervention in the form of passive feedback has been documented. All the prescriptions received in pharmacy during the period of study were scrutinized for specific prescription errors. An overall error rate of 0.12% was observed in phase 1 of the study, which was reduced to 0.04% during phase 2 of the study after implementation of the intervention, which further dropped to zero during phase 3. It was concluded that a simple audit and feedback nudged the recipients of the feedback to modify their behavior.

**Keywords:** Audit, Feedback, Nudge, Passive feedback, Prescription behaviour.

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**Conflict of interest:** None

## INTRODUCTION

The All India Institute of Medical Sciences, New Delhi, runs an Employee's Health Service (EHS) scheme to provide medical/health facilities to all its employees and members on a contributory basis. The facilities admissible under the scheme are available to all central/state government employees on deputation and their families. All the beneficiaries under the scheme are issued with identity cum EHS card and are allotted an EHS number. This EHS number needs to be quoted on all papers and documents pertaining to medical care of the employees and their dependents.

Many prescriptions are received in the EHS pharmacy daily, sometimes with errors in a few of them. The EHS

pharmacists had raised a complaint against this and had asked for a solution to this problem so that they could dispense the medicines at EHS counters without any confusion. Considering this problem, a meeting was held in which it was decided to quantify the problem and look for possible solutions. This study was undertaken at EHS pharmacy subsequent to the above developments. Further, it was decided that it should not merely be a fault-finding exercise, and the results of the audit would be shared with the in-charge Chief Medical Officer, EHS and its impact would be evaluated. All the stakeholders were involved as a team in this study. All of them participated with a sense of belonging and in the end, the results led to the mutual satisfaction of all the stakeholders.

During the course of study, it was found that the errors that generally occur could be clubbed into 6 groups, the details of which are provided later in the article. An informal feedback was shared after an audit of phase 1 findings. This feedback was well taken and appreciated by the in-charge Chief Medical Officer, EHS. Motivated by this, the feedback of phase 2 was shared formally.

The audit and feedback process involves retrospective reporting of information to individuals or organizations about their actions. The information is collected from actual practice in order to increase insight into particular actions. Data can be collected through either internal audit, where clinicians are involved in data collection, or external audit where others collect and collate the information. The feedback can be on outcomes of care, costs, or other elements of clinical performance and it may be comparative among peers or noncomparative.<sup>1</sup>

## MATERIALS AND METHODS

### Study Design

A prospective interventional study was carried out to assess the impact of passive feedback on clinicians' behavior in health care settings.

### Study Period

The study was conducted in three phases, i.e., phase 1 (preintervention) and phase 2 (postintervention) and phase 3 (follow up). In phase 1, the study was carried out from October 28, 2015 to December 16, 2015 and the

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phase 2 of the study was carried out from December 28, 2015 to February 16, 2016. Both the phases of the study were of 50 days each. In between these two phases, the intervention was instituted. A follow-up study for another 50 days was undertaken from February 28, 2016 to April 17, 2016 to evaluate the number of errors observed after giving feedback of phase 2 to the Chief Medical Officer, EHS. The total duration of the study was 111 days.

## Intervention

The intervention was conducted in the form of passive informational feedback, which was provided to the in-charge Chief Medical Officer, EHS outpatient department (OPD) after auditing and analyzing the data obtained in phase 1 of the study.

## Data Collection

Data was collected through pharmacists posted at EHS pharmacy. All the prescriptions in the mentioned duration were studied and errors were notified separately. The commonly occurring errors were classified under following heads and analyzed statistically:

- Number of times available drugs were prescribed under local purchase\*
- Number of times wrong quantity was mentioned
- Number of times blank prescription was signed
- Number of times wrong drug/dose was prescribed
- Same drug was prescribed twice
- Doses were not mentioned

\*When the drug prescribed or the substitute is not available in the pharmacy, the medicine is purchased through the hospital store and is issued to the patient through local purchase counter of the pharmacy.<sup>2</sup>

## RESULTS

The present study was carried out at EHS pharmacy at the All India Institute of Medical Sciences, New Delhi. A total of 85,238 prescriptions were studied in three phases of the study. In phase 1, total 27,988 EHS patient prescriptions were studied, whereas in phase 2, a total of 29,017 prescriptions were studied over a period of 50 days. On an average, 559 prescriptions were studied per day in phase 1 (preintervention) and 580 prescriptions were evaluated in phase 2 (postintervention) of the present study. The follow-up phase 3 included 28,233 EHS patient prescriptions.

## SUMMARY

Phase 1 errors:  $33/27,988 = 0.12\%$

Phase 2 errors:  $11/29,017 = 0.04\%$

Phase 3 errors:  $0/28,233 = 0\%$

A total of 33 errors were identified in phase 1 of the study, which constitutes 0.12% of the total prescriptions studied in phase 1 (Table 1).

Maximum number of errors noticed were 15 (45.4%), i.e., the number of times wrong quantity was mentioned, followed by 8 (24.2%) prescriptions wherein drugs available in the hospital pharmacy were asked to be procured through local purchase. Least number of errors i.e., 1 (3%), were noticed as "dosage not mentioned" and "same drug prescribed twice."

A total 11 of errors were identified in phase 2 of the study, which constitutes 0.04% of the total prescriptions studied in phase 2 (Table 2).

The maximum number of errors noticed in the post-intervention period were 5 (45.5%), i.e., number of times drugs available in the hospital pharmacy were asked to be procured through local purchase, whereas in 3 (27.2%) wrong quantity was mentioned. No drug was prescribed twice in the postintervention period and no errors were made in prescribing appropriate dosage.

In follow-up phase 3, no errors were observed, which points to the fact that impact of the intervention was sustainable over a period of time.

The errors were significantly lower in phase 2, with p-value of 0.001 (Table 3).

There was no significant difference in the frequency of the distribution of errors (Table 4).

**Table 1:** Frequency and type of errors identified in phase 1 of the study

Error	Phase 1
Number of times wrong quantity was mentioned	15
Number of times available drugs were prescribed under local purchase	8
Number of times wrong drug/dose was prescribed	5
Number of times blank prescription/without OPD card prescription was signed	3
Same drug was prescribed twice	1
Doses were not mentioned	1
Total	33

**Table 2:** Frequency and type of errors identified in phase 2 of the study

Error	Phase 2
Number of times available drugs were prescribed under local purchase	5
Number of times wrong quantity was mentioned	3
Number of times wrong drug/dose was prescribed	2
Number of times blank prescription/without OPD card prescription was signed	1
Same drug was prescribed twice	0
Doses were not mentioned	0
Total	11

**Table 3:** Chi-square test for comparison of the errors

Error		Count	Phase		Total
			Phase 1	Phase 2	
Error positive	Count	33	11	44	
	% within phase	0.1%	0.0%	0.1%	
No errors	Count	27,955	29,006	56,961	
	% within phase	99.9%	100.0%	99.9%	
Total	Count	27,988	29,017	57,005	
	% within phase	100.0%	100.0%	100.0%	

Chi-square value 11.822, p-value 0.001

**Table 4:** Chi-square tests of the phase types of error difference

Error		Count	Phase		Total
			Phase 1	Phase 2	
Doses not mentioned	Count	1	0	1	
	% within phase	3.0%	0.0%	2.3%	
Number of times available drugs were prescribed under local purchase	Count	8	5	13	
	% within phase	24.2%	45.5%	29.5%	
Number of times blank prescription/without OPD card prescription was signed	Count	3	1	4	
	% within phase	9.1%	9.1%	9.1%	
Number of times wrong drug/dose was prescribed	Count	5	2	7	
	% within phase	15.2%	18.2%	15.9%	
Number of times wrong quantity was mentioned	Count	15	3	18	
	% within phase	45.5%	27.3%	40.9%	
Same drug was prescribed twice	Count	1	0	1	
	% within phase	3.0%	0.0%	2.3%	
Total	Count	33	11	44	
	% within phase	100.0%	100.0%	100.0%	

Fisher's exact test 3.108, p-value 0.766

## DISCUSSION

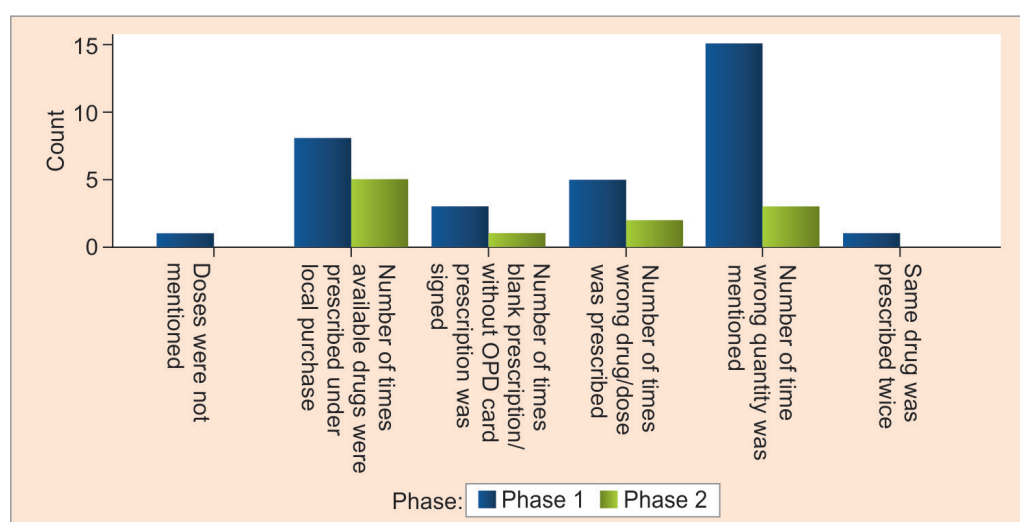
Errors in health care settings constitute a serious problem across the globe. It is generally noticed that junior doctors are likely to make more errors during their early medical practice.

The findings suggest that the errors were significantly lower in phase 2 of the study, i.e., from 0.12 to 0.04%. There was a 66.6% reduction in the frequency of errors from phase 1 to phase 2 (Figure 1). The findings positively support that intervention had some impact and suggest that there has been a change in clinicians' behavior after provision of feedback. Further, no errors were observed during follow-up phase 3, which points that the impact of the intervention was sustainable over a period of time. All the stakeholders were satisfied with the outcome in the end. This shows that even small interventions can sometimes lead to bigger results.

Further, the findings of the study suggest that audit and feedback are important tools to change the behavior of clinicians. Based on the findings, it was recommended that periodic audit and feedback should be given for better resource utilization, as well as better patient care services.

In a review paper published by Robertson and Jochelson,<sup>3</sup> "Interventions that change clinician behaviour: Mapping the literature," different interventions have been mapped that can be used to change health professionals' behavior. This article suggests that audit and feedback are one of the modalities that can be used to modify the behavior of the clinicians in health care settings.

A Cochrane systematic review of audit and feedback studies found that there was no empirical basis for deciding how audit and feedback should be provided and recommends that the format should be based on pragmatic factors and local circumstances.<sup>4</sup>

**Fig. 1:** Comparison of Errors in Phase 1 (Pre-Intervention) and Phase 2 (Post-Intervention)

In spite of this, a number of reviews mention characteristics that have an impact on the effectiveness of feedback interventions. A review suggests that the effects of feedback might be larger if clinicians are actively involved, although lack of evidence makes this difficult to assess.<sup>4</sup> Another review suggests that small group meetings with peers to discuss the data might increase the effectiveness of the audit, and that individual-level feedback may be more effective than that reported at group level. Feedback may be more effective if used in situations where individuals do not realize that their practice deviates from what is required.<sup>1</sup>

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# Emergency and Essential Surgical Care Capacity across Primary, Secondary, and Tertiary Institutions in Meghalaya, India: A Cross-sectional Study

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<sup>6</sup>Paul P Francis, <sup>7</sup>Natela Menabde

## ABSTRACT

**Aim:** This study aims to evaluate surgical care systems across tertiary, secondary, and primary health institutions in the state of Meghalaya, India.

**Materials and methods:** The government of Meghalaya conducted the first comprehensive assessment of surgical capacity at three levels of care: Tertiary hospitals, community health centers (CHCs), and primary health centers (PHCs).

This cross-sectional survey utilized World Health Organization (WHO) tool for situational analysis to assess emergency and essential surgical care (EESC) to capture health facilities' capacity to perform life-saving and disability-preventing surgical interventions, such as resuscitation, surgical, trauma, obstetric, and anesthetic care. Data were collected across four categories: Infrastructure, human resources, surgical procedures, and equipment.

**Results:** The 55 facilities surveyed comprised 8 tertiary hospitals, 26 CHCs, and 21 PHCs. A total of 107,962 surgical presentations were reported across all facilities per year, with the greatest number presenting to PHC. No specialist doctors worked at PHC level; there were 1 anesthesiologist and 2 obstetricians at the CHC level. All of the PHCs or CHCs referred do not provide key emergency and essential surgical procedures, including resuscitation, cesarean section, general anesthesia, laparotomy, and closed and open treatment of fractures. At the tertiary level, only 50% provide cesarean section and laparotomy procedures.

**Conclusion:** The results of this WHO state survey demonstrate significant gaps, notably in resuscitation, at all lower level health

facilities and the absence of obstetric procedures at some tertiary hospitals, in essential and emergency surgical capacity, including human resources, equipment, and infrastructure, across all levels of health institutions in Meghalaya.

**Clinical significance:** This study is an effort to identify the strengths and limitations of surgical capacity in the state of Meghalaya. The method of the study are simple and results can be extrapolated to other states of the country or any third world state which can translate into enhancement and redirection of resources for an optimum outcome.

## Strengths of the study

- This study is driven by the motivation of the government of Meghalaya to address the issue of surgical care capacity.
- The study identifies concrete areas of need in surgical care capacity in a collaborative effort with the government of Meghalaya.
- Given the wealth of information on different levels of care centers provided by the government, specific recommendations for improvement can be made.

## Limitations of the study

- Although detailed, the situation analysis survey tool is not fully comprehensive and cannot be used exclusively for program planning.
- Not all care centers were able to be surveyed; thus, the results may be representative of only those surveyed.

**Keywords:** India, Meghalaya, Surgical capacity, World Health Organization study.

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**Conflict of interest:** The authors include WHO staff. The views expressed in this publication reflect their views and not necessarily that of WHO.

## INTRODUCTION

Essential surgical care has the potential to address an estimated 11% of the global burden of disease.<sup>1</sup> Surgical services at the first-referral level are an essential component of comprehensive health care and achieving universal coverage of health services. However, global public initiatives and in-country ministries of health have yet to prioritize surgical care systems, which encompass emergency medicine and surgery, anesthesia, trauma,

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and obstetrics and gynecology, in national health plans.<sup>2</sup> Poor access to timely surgical services, particularly in rural regions of low- and middle-income countries, contributes to unnecessary morbidity and mortality from various treatable surgical conditions, including injuries, pregnancy complications, congenital anomalies, infections, and acute abdominal cases.<sup>3</sup>

Meghalaya is a state in northeast India, bound by the state of Assam in the north and Bangladesh to the west and south (Map 1). Its geography is marked by rugged and mountainous terrain that has impeded health service extension to remote villages across the seven districts.<sup>4</sup> According to the 2011 census, the state population was approximately 2.96 million, of whom a majority, an estimated 2.37 million, live in rural areas.<sup>5</sup> Meghalaya's health structure comprises district and civil hospitals at the tertiary level of care, community health centers (CHCs) at the secondary level, and primary health centers (PHCs) at the primary level. As of 2010, there were 11 functional hospitals, 28 functional CHCs, and 108 functional PHCs.<sup>6</sup> Primary health centers are intended as the "cornerstone" of rural health service delivery, designed to be the first point of access to qualified doctors and as referral centers to both CHCs and tertiary hospitals.<sup>6</sup> Community health centers are designed to provide a referral to tertiary hospitals, as well as specialist health care to the rural population. District or civil hospitals are providers of specialist tertiary services, including curative and preventative health care. Meghalaya faces significant health workforce shortages, with approximately 2.5 allopathic doctors per 10,000 people, compared with national estimates of

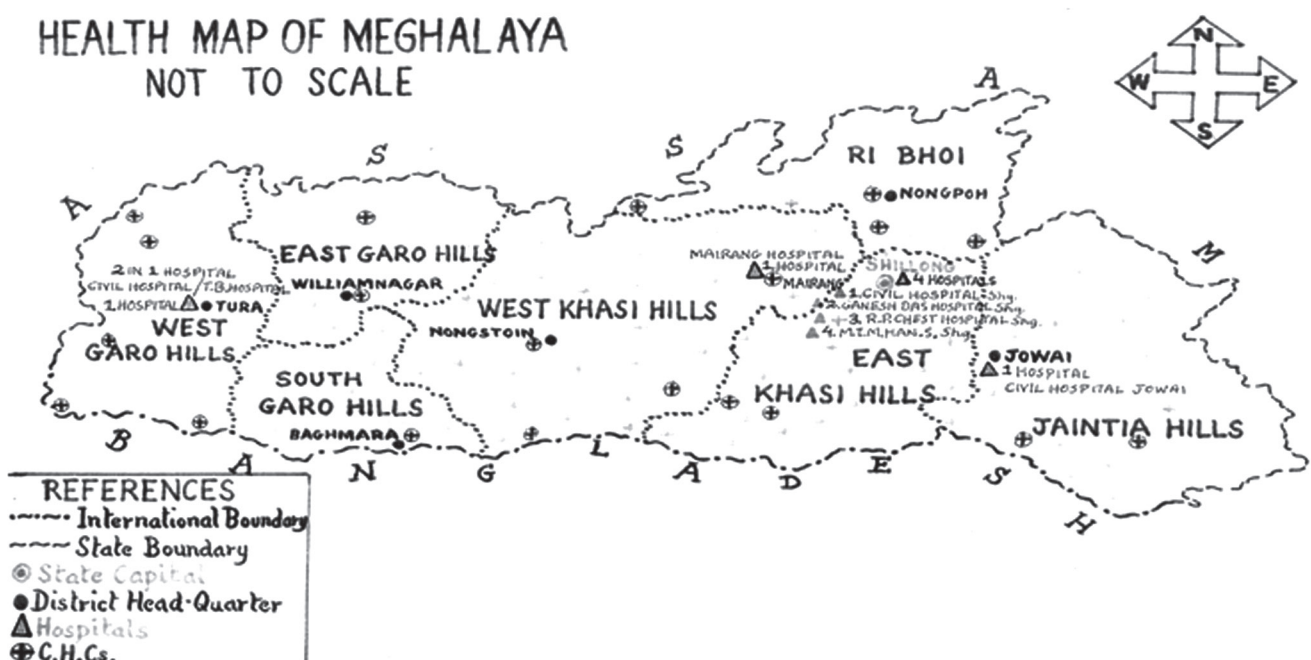
13.3 and 3.8 per 10,000, in urban and rural areas respectively. The 25.4 per 10,000 benchmarks were established by the World Health Organization (WHO).<sup>6,7</sup>

The Department of Health and Family Welfare, government of Meghalaya, has been following an action plan to promote essential and emergency surgical care (EESC). In 2011, it established a technical working group on EESC in order to strengthen surgical care systems. A top-down gap assessment was identified as the first step in formulating an evidence-based response to surgical care system needs. To date, there have been no comprehensive studies performed to assess the surgical capacity and needs of health facilities in Meghalaya.

### MATERIALS AND METHODS

This is the first study of its kind, undertaken by the government of Meghalaya in collaboration with the WHO, in utilizing the WHO Situational Analysis Tool (SAT) across primary, secondary, and tertiary institutions (Map 1). The SAT was developed as a comprehensive questionnaire with which to quantify a facility's surgical capacity across four categories: Infrastructure, human resources, surgical procedures, and equipment.<sup>8</sup> A total of 110 data points queried the availability of 8 types of health care personnel, 35 surgical procedures, and 67 items of equipment.

This survey was administered to 8 tertiary and all secondary health facilities and a sample of 21 of the 108 functional PHCs (Table 1). Of the 11 tertiary institutions in Meghalaya, three were excluded from the study because their mission does not include surgical services or they are not under the jurisdiction of the state; one



Map 1: Health map of Meghalaya

## Emergency and Essential Surgical Care Capacity across Primary, Secondary, and Tertiary Institutions in Meghalaya, India

**Table 1:** Primary health centers, community health centers, and tertiary hospitals by district that completed the WHO SAT in the state of Meghalaya, India

District	PHCs	CHCs
West Garo Hills	PHC Bhaitbari	Ampati CHC
	PHC Jeldupara	Phulbari CHC
	PHC Kherapara	Dadinggre CHC
East Garo Hills		Dalu CHC
		Mahendraganj CHC
		Selsella CHC
		Resubelpara CHC
South Garo Hills	PHC Sibbari	Rongjeng CHC
	PHC Chokpot	
	PHC Moheshkola	Baghmara CHC
East Khasi Hills	PHC Laitlyngkot	Sohra CHC
	PHC Shella	Ishamati CHC
	PHC Smit	Pynursla CHC
West Khasi Hills		Mawiong CHC
		Mawsynram CHC
	PHC Kynshi	Riangdo CHC
	PHC Markasa	Mawkyrwat CHC
	PHC Rambrai	Ranikor CHC
Jaintia		Nongkhlaw CHC
	PHC Wapung	Khliehriat CHC
	PHC Barato	Ummulong CHC
	PHC Mynso	Nongtalang CHC
Ri Bhoi		Sutnga CHC
		Laskein CHC
	PHC Kyrдем	Umsning CHC
	PHC Mawhati	Patharkhmah CHC
	PHC Mawlasnai	Bhoi Rymbong CHC
	n=21	n=26

PHC: Primary health centers; CHC: Community health centers

is a psychiatric institution, the second is a dedicated tuberculosis hospital, and the third is a private mission hospital. Based on the in-country expertise of the technical working group, three PHCs were chosen from each of the seven districts to provide an overview of their surgical capacity and activities.

The WHO SAT was administered by the members of the government's technical working group to each of the health facilities and the survey was completed either by the member of the working group (KI Singh) with the health provider in charge of the hospital or in some cases, survey forms were filled only by the health provider directly. Data collection took place between September 2011 and April 2012. Data were collated and analyzed through the WHO Global DataCol Database for Emergency and Essential Surgical Care.

Where data were reported as a range on the survey, the average of the range values was utilized. Where a figure was reported as greater than a single value (i.e., >5,000), then the value itself (5,000) was utilized. The number of hospitals reporting positively for performing or

**Table 2:** Demographic data across the three levels of health institutions

Facility type	PHCs (n=21)	CHCs (n=26)
Average population served (range)	27,770 (8,000–150,000)	30,437 (9,700–61,550)
Average number of beds (range)	8 (5–50)	32 (11–50)
Total number of functioning operating rooms (major and minor) across all facilities	9	29
Average total admissions in 1 year (range)	428 (0 to >5,000)	1,875 (101 to >5,000)
Average number of patients requiring minor and major surgical (including Gyn/Obs) procedures per year (range)	3,474 (21 to >5,000)	700 (11 to 5,000)
Average number of children (<15 years) requiring surgical procedures per year	2,195 (10 to >5,000)	538 (5 to >5,000)
Average number of patients referred for surgical intervention to a higher level facility per year (range)	1,580 (21 to >5,000)	476 (10 to 5,000)
Weighted mean of distance (km) to health facility	42	53

referring the procedure was divided by the total number of hospitals to determine the percentage. To determine the availability of equipment and supplies, the number of hospitals that had consistent, intermittent, or no access to a particular item of equipment was divided by the total number of hospitals. In order to better reflect the distances traveled by the average patient, the distance traveled prior to admission was expressed as a weighted mean. This was calculated by summing the products of annual admissions and average distance traveled for each facility, and then dividing by the sum of annual admissions for all facilities.

## RESULTS

The WHO SAT was completed by 55 facilities across all 7 districts of Meghalaya, which comprised 8 tertiary facilities, 26 of the 28 functional CHCs, and 21 PHCs (Table 1).

The demographic details of the populations served by these facilities are expressed in Table 2. Of particular note is the high number of surgical patients presenting to PHCs, at an average of 3,474 per year. Per year, a total of 107,962 of patients across all levels of care for surgical procedures were children (<15 years of age), comprising 67% of total surgical presentations. However, the range was large, some facilities handled 5 to 10 pediatric cases, while others handled more than 5,000 per year.

A total of 1,107 health workers were employed across the 55 facilities, the majority of whom (78%) were

**Table 3:** Total personnel across the three different types of health facilities

Facility type	PHCs (n = 21)	CHCs (n = 26)
Surgeons (qualified)	0	0
Anesthesiologist physicians (qualified)	0	1
Obstetricians/gynecologists (qualified)	0	2
General doctors providing surgery	29	88
General doctors providing anesthesia	0	0
Nurse/clinical/assistant medical officers providing anesthesia	0	0
Clinical/assistant medical officers providing surgery	0	0
Paramedics/midwives	109	342

paramedics or midwives (Table 3). A total of 193 general doctors provided surgery across all facilities, and every facility had at least one such full-time general doctor. Primary health centers did not have any specialists (qualified surgeons, anesthesiologists, or obstetricians/gynecologists). There was only one anesthesiologist and two obstetricians in the 26 CHCs. At the tertiary level, 44 specialist medical staff were reported, but the majority of the medical workforce still comprised general doctors. Across all facilities, anesthesia was performed by qualified anesthesiologists, consistent with the provision context in India.<sup>9</sup> As such, only one CHC with an anesthesiologist reported providing any form of anesthesia (Ketamine intravenous [IV] anesthesia), while all other CHCs referred. Table 4 presents the percentages at which PHCs, CHCs, and tertiary facilities provide and refer surgical procedures.

Of the 35 essential surgical interventions listed on the survey, 8 were performed at the PHC level; over 85% of PHCs provided care for acute burn management, incision and drainage of abscess, suturing, airway foreign body removal, resuscitation, and wound debridement; 9.5% of PHCs could provide male circumcision, and 33.3% could perform dilatation and curettage. Remarkably, over 90% of PHCs referred for all procedures, including resuscitation. Referrals were due to either lack of skills or lack of drugs or supplies. No PHCs referred due to nonfunctional equipment.

There was little difference between the procedures reported at CHCs and PHCs; the vast majority of CHCs provided only the same eight procedures. A further four procedures were provided at varying numbers of CHCs. These were tubal ligation/vasectomy (7.7%), ketamine IV anesthesia (3.8%), management of closed fractures (38.5%), and joint dislocation reduction (7.7%). However,

with the exception of two procedures, management of abscess and dilatation and curettage, over 92% of CHCs referred for all procedures. Over 85% of CHCs made referrals due to lack of skills, up to 15% due to nonfunctional equipment, and up to 12% due to lack of drugs and supplies.

All the PHCs and CHCs referred for resuscitation, cesarean section, laparotomy, general anesthesia, and closed treatment of fractures.

All tertiary hospitals provided resuscitation, and 75% provided all four anesthetic procedures (general inhalational anesthesia, ketamine IV anesthesia, and regional and spinal anesthesia). Only 50% of the tertiary hospitals performed cesarean sections, laparotomy, chest tube insertion, or cricothyroidotomy, while less than 40% provided general surgical procedures (including appendectomy, hernia repair, and hydrocelectomy) or pediatric procedures (including neonatal surgery, cleft lip, and club foot repair).

Even at the tertiary level, the majority of procedures, even in the instances where they were reported as provided, were still referred, with the exception of procedures that could also be provided at the PHC level (incision and drainage of abscess, suturing, anesthetic procedures, wound debridement, and dilatation and curettage). In particular, 37% of tertiary hospitals reported referring for resuscitation. Among the different reasons for referral, lack of skills constituted the primary reason for referral for the majority of procedures. None of the hospitals provided cataract repair.

The availability and consistency of access to infrastructure are depicted in Table 5. Notably, 75% of tertiary hospitals, 96% of CHCs, and 100% of PHCs reported no access to a blood bank.

A third of PHCs did not have access to an oxygen source and 52% reported having no access to running water or resuscitation equipment. No surgical, anesthetic, or pain management guidelines were reported, though 67% had access to emergency guidelines.

More than 92% of CHCs reported no access to emergency, anesthesia, surgery, or pain management guidelines. A total of 96% had no anesthesia machine, 85% had no postoperative room.

Even at the tertiary level, access to guidelines was poor; 63% reported no access to emergency and 75% reported no access to surgical guidelines. All tertiary institutions had full access to electricity, running water, and medical records; and 88% reported the constant availability of oxygen.

All facilities had at least intermittent access to face masks, but all PHCs and 54% of CHCs had no access to eye protection.

## Emergency and Essential Surgical Care Capacity across Primary, Secondary, and Tertiary Institutions in Meghalaya, India

**Table 4:** Procedures offered, referral for procedures, and reasons for referral at PHCs, CHCs, and tertiary facilities

Key PHCs (n = 21) CHCs (n = 26) Tertiary (n = 8)	Percent that provide procedure	Percent that refer	Percent that refer due to lack of skills/license	Percent that refer due to nonfunctional equipment
<i>Anesthesiology and airway management</i>				
Resuscitation (airway, hemorrhage, peripheral percutaneous intravenous access, peripheral venous cutdown)	95.2	100.0	9.5	0
	92.3	100.0	92.3	15.4
	100.0	37.5	25.0	25.0
Removal of foreign body (throat/eye/ear/nose)	100.0	100.0	95.2	0
	100.0	100.0	92.3	19.2
	100.0	50.0	50.0	0
Cricothyroidotomy/tracheostomy	0	100.0	95.2	0
	0	100.0	96.2	3.8
	50.0	62.5	50.0	37.5
General anesthesia inhalational	0	90.5	95.2	0
	0	100.0	96.2	3.8
	75.0	37.5	25.0	12.5
Ketamine IV anesthesia	0	100.0	95.2	0
	3.8	96.2	96.2	0
	75.0	37.5	25.0	12.5
Regional anesthesia blocks	0	100	95.2	0
	0	100	100	3.8
	75.0	37.5	25.0	12.5
Spinal anesthesia	0	100	95.2	0
	0	100.0	100.0	3.8
	75.0	37.5	25.0	12.5
<i>General and congenital</i>				
Biopsy (lymph node, mass, other)	0	100.0	100.0	0
	0	100.0	100.0	3.8
	50.0	50.0	37.5	0
Appendectomy	0	100.0	95.2	0
	0	100.0	96.2	7.7
	37.5	62.5	50.0	12.5
Laparotomy (uterine rupture, ectopic pregnancy, acute abdomen, intestinal obstruction, perforation, injuries)	0	100.0	95.2	0
	0	100.0	96.2	7.7
	50.0	75.0	50.0	12.5
Suturing (for wounds, episiotomy, critical, and vaginal lacerations)	90.5	100.0	100.0	0
	96.2	92.3	69.2	11.5
	87.5	37.5	12.5	12.5
Incision and drainage of abscess	85.7	95.2	90.5	0
	96.2	19.2	7.7	11.5
	100.0	0	0	0
Acute burn management	100.0	100.0	95.2	0
	92.3	96.2	46.2	15.4
	100.0	50.0	25.0	12.5
Hernia repair (strangulated, elective)	0	100.0	95.2	0
	0	100.0	96.2	7.7
	37.5	62.5	50.0	12.5
Hydrocele	0	100.0	95.2	0
	0	100.0	96.2	7.7
	37.5	62.5	50.0	12.5
Cystostomy	0	100.0	95.2	0
	0	100.0	96.2	7.7
	37.5	62.5	50.0	12.5

(Contd...)

(Contd...)

Key PHCs (n = 21) CHCs (n = 26) Tertiary (n = 8)	Percent that provide procedure	Percent that refer	Percent that refer due to lack of skills/license	Percent that refer due to nonfunctional equipment
Cleft lip repair	0	100.0	95.2	0
	0	100.0	100.0	0
	12.5	87.5	87.5	0
Congenital hernia repair	0	100.0	95.2	0
	0	100.0	92.3	7.7
	37.5	62.5	50.0	12.5
Neonatal surgery: Abdominal wall defect, colostomy imperforate anus, intussusceptions	0	100.0	95.2	0
	0	100.0	92.3	7.7
	37.5	62.5	50.0	12.5
Cataract surgery	0	100.0	95.2	0
	0	100.0	100.0	3.8
	0	87.5	87.5	0
Acute burn management	100.0	100.0	95.2	0
	92.3	96.2	46.2	15.4
	100.0	50.0	25.0	12.5
<i>Reproductive health</i>				
Cesarean section	0	100.0	100.0	0
	0	100.0	84.6	15.4
	50.0	50.0	50.0	0
Dilatation and curettage	33.3	95.2	71.4	0
	69.2	26.9	23.1	7.7
	62.5	37.5	12.5	0
Tubal ligation/vasectomy	4.8	100.0	95.2	0
	7.7	100.0	96.2	3.8
	75.0	75.0	75.0	0
Obstetric fistula repair	0	100.0	100.0	0
	0	100.0	88.5	7.7
	50.0	50.0	50.0	12.5
Male circumcision	9.5	90.5	85.7	0
	0	100.0	92.3	7.7
	37.5	62.5	50.0	12.5
<i>Orthopedics and traumatology</i>				
Chest tube insertion	0	100.0	95.2	0
	0	100.0	96.2	3.8
	50.0	50.0	50.0	25.0
Closed treatment of fracture	0	100.0	95.2	0
	38.5	100.0	100.0	3.8
	87.5	62.5	62.5	0
Open treatment of fracture	0	100.0	95.2	0
	0	100.0	100.0	3.8
	37.5	62.5	62.5	0
Drainage of osteomyelitis/septic arthritis	0	100.0	95.2	0
	0	100.0	100.0	3.8
	50.0	62.5	50.0	0
Limb amputation	0	100.0	95.2	0
	0	100.0	100.0	3.8
	37.5	62.5	62.5	0
Wound debridement	85.7	100	95.2	0
	100.0	92.3	7.7	11.5
	100.0	12.5	0	0
Clubfoot repair	0	100.0	95.2	0
	0	100.0	100.0	3.8
	37.5	62.5	62.5	0

## Emergency and Essential Surgical Care Capacity across Primary, Secondary, and Tertiary Institutions in Meghalaya, India

Table 5: Equipment and infrastructure at PHCs, CHCs, and tertiary hospitals

Key PHCs (n=21) CHCs (n=26) Tertiary (n=8)	Percent of facilities with consistent access	Percent of facilities with intermittent access	Key PHCs (n=21) CHCs (n=26) Tertiary (n=8)	Percent of facilities with consistent access	Percent of facilities with intermittent access
Blood bank	0	0	Suture	95.2	4.8
	3.8	0		80.8	15.4
	12.5	12.5		100.0	0
Electricity	76.2	23.8	Nasogastric tube	95.2	4.8
	76.9	23.1		61.5	26.9
	100.0	0		75.0	0
Generator	28.6	42.9	Retractor	95.2	0
	65.4	11.5		80.8	15.4
	87.5	0		85.7	0
Running water	28.6	19.0	Sterilizer	95.2	4.8
	50.0	38.5		80.8	19.2
	100.0	0		100.0	0
Medical records	81.0	9.5	Sterile gauze dressing	95.2	4.8
	96.2	3.8		84.6	11.5
	100.0	0		100.0	0
Surgical guidelines	0	0	Syringes	95.2	0
	0	3.8		92.3	7.7
	25.0	0		100.0	0
Emergency guidelines	33.3	0	Anesthesia machine	0	0
	3.8	3.8		3.8	0
	25.0	12.5		75.0	0
Pain management guidelines	0	0	Cricothyroidotomy set	0	0
	3.8	3.8		0	0
	50.0	0		37.5	12.5
Anesthetic guidelines	0	0	IV cannula	95.2	4.8
	3.8	0		84.6	15.4
	75.0	0		100.0	0
Emergency room	19.0	14.3	IV infusion set	95.2	4.8
	65.4	23.1		96.2	3.8
	87.5	0		100.0	0
Hemoglobin and urine analysis	76.2	9.5	IV infusor bags	0	0
	73.1	15.4		26.9	11.5
	100.0	0		62.5	0
Face masks	85.7	0	Endotracheal tubes cuffed	0	0
	73.1	26.9		11.5	38.5
	100.0	0		62.5	25.0
Eye protection	0	0	Endotracheal tubes uncuffed	0	0
	0	46.2		15.4	34.6
	37.5	25.0		62.5	25.0
Forceps (artery)	100.0	0	Urinary catheter	100.0	0
	80.8	19.2		73.1	23.1
	100.0	0		100.0	0
Gloves (sterile)	100.0	0	Blood pressure measuring equipment	100.0	0
	88.5	11.5		96.2	3.8
	100.0	0		100.0	0
Gloves (nonsterile)	100.0	0	Laryngoscope (adult)	0	28.6
	88.5	11.5		7.7	42.3
	100.0	0		62.5	25.0
Scalpel handle with blade	100.0	0	Laryngoscope (pediatric)	0	19.0
	84.6	15.4		7.7	46.2
	87.5	12.5		62.5	25.0

(Contd...)

(Contd...)

Key PHCs (n = 21) CHCs (n = 26) Tertiary (n = 8)	Percent of facilities with consistent access	Percent of facilities with intermittent access	Key PHCs (n = 21) CHCs (n = 26) Tertiary (n = 8)	Percent of facilities with consistent access	Percent of facilities with intermittent access
Magill forceps (adult)	0	0	Scalp vein infusion set	95.2	4.8
	0	34.6		84.6	15.4
	50.0	25.0		100.0	0
Magill forceps (pediatric)	0	0	Stethoscope	95.2	4.8
	0	34.6		100.0	0
	50.0	25.0		100.0	0
Mask and tubing to connect to oxygen supply	38.1	33.3	Radiography	0	0
	73.1	11.5		26.9	30.8
	75.0	25.0		100.0	0
Oropharyngeal airway (adult)	95.2	0	Chest tube insertion equipment	0	0
	53.8	30.8		3.8	7.7
	75.0	0		50.0	0
Oropharyngeal airway (pediatric)	95.2	0	Splints for arms, legs	100.0	0
	46.2	38.5		65.4	23.4
	75.0	0		87.5	12.5
Oxygen concentrator	4.8	0	Tourniquet	95.2	0
	11.5	23.1		88.5	11.5
	87.5	0		87.5	12.5
Oxygen cylinder	47.6	9.5	Vaginal speculum	95.2	4.8
	65.4	23.6		92.3	7.7
	87.5	12.5		100.0	0
Postoperative recovery room	0	0	Suction catheter	95.2	0
	7.7	7.7		61.5	34.6
	50.0	12.5		75.0	25.0
Resuscitation bag, valve, and mask (adult)	9.5	38.1	Disposable needles	100.0	0
	30.8	61.5		76.9	15.4
	62.5	37.5		100.0	0
Resuscitation bag, valve, and mask (pediatric)	14.3	71.4	Light source	95.2	0
	34.6	53.8		84.6	11.5
	50.0	50.0		100.0	0

## DISCUSSION

This study demonstrated little difference between the surgical capacity of PHCs and CHCs, despite their different mandates. The large average number of surgical patients (3,474) presenting to PHCs compared with other levels suggests that PHCs are serving their role as the first point of care for the rural population. However, the high number of referrals from PHCs (on average 1,580) and their inability to undertake surgical procedures due to lack of skills or resources is concerning. Although it is unrealistic to expect PHCs to undertake complex surgical procedures, given they are staffed by only one general doctor and no specialists, resuscitation and stabilization of surgical patients are vital to safe transfer for a referral to CHCs or tertiary hospitals. To date, over 90% of PHCs referred for all surgical procedures including resuscitation. This is particularly important given the significant distances to tertiary referral hospitals

(weighted mean distance 118 km), difficult terrain, limited private vehicle ownership, and developing road infrastructure in Meghalaya.<sup>10</sup> Thus, it is paramount to develop the capacity and self-sufficiency of the PHCs and first referral facilities, such as CHCs that are relatively more accessible for the rural population.

In spite of their role as referral centers, our results found that CHCs are minimally more developed than PHCs. Across the 26 CHCs surveyed, there were no qualified surgeons, with only one anesthesiologist and two obstetricians/gynecologists. Nationally, only 10% of CHCs have anesthetists, and, according to Mavalankar and Siram,<sup>9</sup> "adequate training is not included in the MBBS curriculum" and as such, "general doctors are unable to perform anaesthesia services, thereby increasing the number of referrals to specialists." Quality anesthetic care, including the capacity for resuscitation, are vital to effective emergency obstetric care and the management of life-threatening complications.<sup>11</sup> This

is compounded by the significant national shortage of obstetricians capable of performing comprehensive emergency obstetric care, including cesarean deliveries.<sup>12,13</sup> Nationally, this contributes to the high maternal death ratio, with an estimated total of 117,000 maternal deaths per year.<sup>14</sup> In Meghalaya, this specialized workforce shortage is bridged by general doctors providing surgery, but none of the CHCs and only 50% of tertiary hospitals provide cesarean section. It is crucial then to enhance the skills of general doctors at all health care levels to provide basic emergency surgical care. The WHO Primary Surgical Care Package defines these basic surgical procedures and those requiring advanced skills, which can be integrated into national and local plans to address in-country needs.<sup>8</sup>

The significant number of referrals made from tertiary hospitals, on average 888 per year, is of similar concern. Some tertiary hospitals did not have staff across all specializations and most have an overwhelmingly large patient pool, which includes patients referred from other facilities. In addition, different tertiary hospitals have different provision of specialized services. For instance, in Shillong, a city of over 200,000 people, the Civil Hospital does not provide maternal and child health care or cesarean section; such services are instead provided at the Ganesh Das Hospital.<sup>15</sup> Tertiary facilities also refer out-of-state, with some expenses borne by the government.

Optimizing the capacity of general doctors, at both the PHC and CHC level, through training in basic surgical skills, and ensuring consistent access to guidelines (in emergency care, pain management, surgery, and anesthesia), equipment, and drugs has the potential to reduce the burden on higher level facilities and address workforce shortages without compromising the quality of care. However, particularly in terms of surgery and anesthesia, this demands ongoing provision of training, supervision, monitoring, and evaluation in order to ensure that adequate standards are maintained.<sup>16</sup>

Short-term training courses have been demonstrably effective in extending the capacity of general doctors. Medical officers can be effectively trained in basic emergency obstetric care. An emergency obstetrics training program performed in the Indian states of Gujarat and Rajasthan demonstrated that selecting trainees with some prior surgical training and who had access to equipped facilities were far more likely to be performing cesarean deliveries after training and to become more successful providers of comprehensive emergency obstetric care.<sup>13</sup> Similarly, a two-day trauma course conducted at a teaching hospital in Bangalore, India, involving general practitioners (GPs), local surgeons, and residents in training

found that although GPs began with a significantly lower precourse test score than surgeons, their postcourse test score was just as high as the surgeons'.<sup>17</sup> In Meghalaya, with a workforce skewed toward general doctors rather than surgeons at all levels of health facilities, such short-term training courses may be a feasible approach to improving surgical care knowledge and skills. As general doctors often have compulsory rural service bonds in exchange for subsidized, government-provided medical education, the medical education should include adequate preparation for surgical care in rural settings.<sup>18</sup> Given the Meghalaya government's documentation that only four medical officers have received training in emergency obstetric care, increasing access to training for health personnel should be prioritized and an appropriate training forum should be explored.<sup>6</sup>

Meghalaya is also included in the National Rural Health Mission (NRHM) launched by the government of India to increase availability and access to health care by the people, especially those residing in rural areas.<sup>19</sup> The objectives for the NRHM include optimization of health manpower through training to address the shortages in rural facilities, particularly strengthening CHCs through establishing standards for infrastructure, staff, equipment, and to create multiskilled providers at remote posts that lack specialists. The NRHM could make substantial progress through coordination with the Department of Health and Family Welfare, government of Meghalaya. Furthermore, by working cohesively at both national and state levels to address the unmet demand for essential surgical care services, it will strengthen existing health systems.<sup>20</sup>

There are several limitations to this study. First, due to the limitations of the situation analysis tool, it cannot be used for detailed program planning. For example, the survey only accounts for certain reasons that facilities refer procedures, belying the complexity of whether "lack of skills" relates to insufficient numbers of personnel (quantity) or whether current personnel may not have sufficient training (quality). Additionally, the selection of PHCs sampled was undertaken by experts within the state Ministry of Health and, although geographically distributed, does not capture data from every first-referral facility in the state.

This article provides the first snapshot of surgical care systems throughout Meghalaya. The government of Meghalaya's support and commitment to collecting data on various facilities and identifying areas of shortage embody the core process of establishing surgical care in the national health agenda. The greatest barrier to universal surgical care is the lack of skills in current medical personnel at primary, secondary, and tertiary



levels of care, making a coordinated emergency and essential surgical care program particularly relevant and important. As policy and initiatives are undertaken to address these identified gaps, ongoing monitoring and evaluation of progress is vital. With dedicated support from the government, improvements to surgical care systems instituted into policy can move toward creating a universal coverage reality.

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# A Study of Cost incurred in providing Emergency Care Services in an Apex Tertiary Care Hospital

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## ABSTRACT

**Introduction:** An emergency department (ED), also known as accident and emergency (A&E), emergency room (ER), or casualty department, is a medical treatment facility specializing for acute care of patients who present without prior appointment, either by their own means or by ambulance. In spite of the emergency beds forming only a fraction of the hospital beds, they consume a relatively large proportion of the hospitals resources. There is a requirement to ascertain the cost incurred in providing emergency care treatment to the patients coming to an apex tertiary care center, whose principal mandate is to provide tertiary care treatment. The study will not only help in allocating funds to the ED in an apex tertiary care facility but will also be useful if the hospital authorities decide to outsource the emergency services to a third party.

**Aims and objectives:** To study the cost incurred in providing emergency care services in an apex tertiary care hospital. To identify the various cost centers pertaining to patient care in the emergency care department and to estimate the cost of rendering patient care in ED and the cost of running the emergency per day.

**Materials and methods:** Six months' retrospective data were collected from the ED, accounts section, engineering section, stores department, radiology department, emergency lab, computer facility, etc. The cost was apportioned to per patient as well per hour in rendering emergency care services.

**Observations:** The total cost incurred in providing emergency care services in the hospital under study was Rs 2034 per patient, while Rs 31,000 are spent per hour in running the emergency care facility.

**Discussion:** Almost 40 to 50% of the total cost incurred on providing emergency care services goes to the salary head of the staff working in the ED. The next major sources of expenditure are the radiology and lab investigations.

**Conclusion:** The study suggests that a considerable amount of hospital funds are spent on providing emergency care services in the apex tertiary care facility, whose primary mandate

is to provide tertiary care services. The possibility of complete outsourcing or partial outsourcing in the form of radiology investigations and hiring humanpower on a contract basis can be a viable solution, to reduce the cost on providing emergency care, which can better be utilized in providing high-end tertiary care facilities.

**Keywords:** Accident and emergency, Tertiary care hospital, Unit cost.

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## INTRODUCTION

An emergency department (ED), also known as accident and emergency (A&E), emergency room (ER), or casualty department, is a medical treatment facility specializing in acute care of patients who present without prior appointment, either by their own means or by ambulance. The ED is usually found in a hospital or other primary care center.

The ED of most hospitals operate 24 hours a day, although staffing levels may be varied in an attempt to mirror patient volume.

Due to the unplanned nature of patient attendance, the department must provide initial treatment for a broad spectrum of illnesses and injuries, some of which may be life threatening and require immediate attention. In some countries, emergency departments have become important entry points for those without other means of access to medical care.

In the hospital where this study has been undertaken, there are three emergencies, i.e., medical, surgical, and pediatrics. The annual attendance to the emergency is around 1,35,000, with approximately 330 to 350 patients coming to the ED. There are 88 beds in total divided in three wards, for inpatients admitted through emergency, and total 53 beds for observation of patients in all the three emergencies. There is further a provision to accommodate patients on trolleys during exigencies.

The health expenditure in India was less than 1% of the GDP in the eleventh plan period. It has since been increased to 1.3% during the year 2015–16 and is slated to rise both as a proportion of the GDP and in absolute

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numbers. This has led to the government looking toward the private sector to augment the health care delivery system through suitable models of partnership. Health care resources are sparse and the need for the same is unmet to a large extent. The out-of-pocket expenditure incurred by a patient in India at present is estimated at about 70 to 80%.

Emergency services are provided free of cost in government hospitals and as such have no budgetary allocation or control. In a resource-poor setting, the need for a costing study cannot be overemphasized. Provision of health care costs money to the government and individuals. Hospital care incurs considerable costs. Emergency care costs many times more than general hospital beds. In spite of the emergency beds forming only a fraction of the hospital beds, they consume a relatively large proportion of the hospitals resources. Numerous studies point to the fact that hospital emergencies cost 10 to 40% out of the total hospital costs. The need for reimbursing the private players in this circumstance becomes an issue in the light of lack of reliable costing data for care. It is obvious that the basic assessment and knowledge of economics is essential to increase the economic efficiency, and costing studies are one useful way of understanding these.

Such studies will help hospital (ED) planners, administrators, and health department in

- Allocating resources for current operations of ED
- Planning of new ED or expansion of existing ED services
- Calculating/setting charges for Emergency care
- Reimbursement/insurance
- Budget projections

### Approaches of Costing

With regard to costing methodologies, there are four methods that one can use to allocate costs to a patient.<sup>1</sup>

1. First, an investigator can use surrogates for cost, such as charges or prices, either unadjusted or adjusted for a cost-to-charge ratio, linking these to each patient. In the other three methods, investigators directly measure costs rather than using surrogate measures, such as charges.
2. In the second method (called process or “top down” costing), investigators measure all the relevant costs in each cost center and divide this total by either the number of service units (e.g., patient days) or the weighted service units (e.g., TISS units, or the Therapeutic Intervention Scoring system) to obtain a cost per (weighted) unit. Total per-patient costs are equal to cost per (weighted) service times the number of (weighted) services.

3. In the third method (called job, bottom-up, or micro-costing), the investigator traces each resource (e.g., nursing time) to each patient, provides a cost for the resource, and adds up the cost for each patient.
4. In the fourth method (called activity-based costing), the investigator develops a comprehensive list of activities (e.g., providing ventilation services), develops a standard unit cost for each, and then develops a cost for each patient according to the activities that were used in the care of each patient.

### Activity-based Costing

Activity-based costing (ABC) is an economic model that identifies the cost pools or activity centers in an organization and assigns costs to cost drivers based on the number of each activity used. Since the cost drivers are related to the activities, they occur on several levels:<sup>2,3</sup>

- Unit-level drivers, which assume the increase in the inputs for every unit that is being produced.
- Batch-level drivers, which assume the variation of the inputs for every batch that is being produced.
- Product-level drivers, which assume the necessity of the inputs to support the production of each different type of product.
- Facility-level drivers, which are related to the facility’s manufacturing process.<sup>4</sup>

Users of the ABC system will need to identify the activities that generate cost and then match the activities to the level bases used to assign the products. While using the ABC system, the activities that generate cost must be determined and then should be matched to the level drivers used to assign costs to the products.

Information generated by ABC significantly contribute to hospital management in planning and managerial control, as they enable organizational behavioral changes by enhancing the attention focus for activities due to volumes. Application of the ABC in health care institution entails a number of predictable benefits, especially the ability to quantify the actual costs of activities, to identify the relationship between the costs and means of carrying out these activities, to identify capacity influences on the overall costs of the organization, and to assess legislative issues regarding the reimbursement of particular performances to also measure the “profitability” of provided operations.<sup>2</sup>

An alternative approach for estimating an ABC model is called “time-driven activity-based costing.” It is simpler, less costly, and faster to implement, and allows cost driver rates to be based on the practical capacity of the resources supplied. The essence of ABC and activity-based management is the measurement and management of the organization’s capacity. For this purpose, ABC systems require two estimates:<sup>5</sup>

1. The unit cost of supplying capacity, and
2. The consumption of capacity (unit times) by the activities the organization performs for products, services, and customers.

The traditional ABC system overestimates the costs of performing activities because of its distribution of effort survey. By specifying the unit times to perform each instance of the activity, the organization gets both a more valid signal about the cost and the underlying efficiency of each activity as well as the quantity and cost of the unused capacity in the resources supplied to perform the activity. Another benefit of implementing a time-driven ABC model is the knowledge it generates about the efficiencies – unit cost and unit times – of critical business processes. Managers are often surprised by how much time it takes to process a special order or to set up a new customer or the costs of performing a quality assurance check. Companies have enjoyed immediate benefits from their models by focusing their improvement efforts on high-cost and inefficient processes.

As per a study done by Dr Michael Lee, assistant professor of emergency medicine in the Warren Alpert Medical School of Brown University and a physician at Rhode Island Hospital and the Miriam Hospital, on the cost of EMS services in U.S. Hospitals, ED costs are between 4.9 and 5.8% of the total healthcare spending. Across four major studies over the last three decades, the average cost per patient of an ED visit in 2010 ranged from only \$134 to more than \$1000, as found by Lee and colleagues.<sup>6</sup>

## Elements of Costing

### Manpower

- Direct manpower also known as process labor, productive labor, etc., is one that actively or directly takes part in the production of a commodity.
- Indirect manpower is the labor employed for carrying of tasks incidental to the goods produced or services provided.

### Material/Resources

- Direct material is one that becomes an integral part of a finished product and can be conveniently assigned to a specific physical unit.
- Indirect material is one that cannot be conveniently and wholly allocated to a specific cost center. The material that is used for purposes ancillary to the business and that cannot be conveniently assigned to specific physical units is termed as indirect material. Consumable stores, oil and waste, printing and stationery material, etc., are some of the examples of indirect material.

## Expenses

- Direct expenses are those that can be wholly and directly allocated to the goods produced or to the service rendered. For example, the cost of buying the equipment or the gases for the cylinders.
- Indirect expenses, for example, water or electricity charges, which cannot be directly allocated to the expenses incurred. Overhead costing is a term used to refer to the indirect elements of costing.

The guidelines of the internal revenue service (Washington, D.C.: U.S. Govt. Printing Office 1963) estimates the life of office furniture, fixtures, machines, and equipment at 10 years and they would depreciate at the rate of 10% per annum.<sup>2</sup>

## MATERIALS AND METHODS

*Study design:* Descriptive, cross sectional, retrospective, record-based study

*Study period:* Six months' retrospective data was studied.

*Data collection:* Data were collected respectively from the ED, accounts section, engineering section, stores department, radiology department, emergency lab, computer facility, etc.

*Data analysis:* Data analysis was done using Microsoft Excel 2010.

*Cost ascertainment process:* The cost centers (cost heads) were identified and data pertaining to each were collected under the following heads. Traditional method of costing was used for cost estimates as follows.

### Cost Centers (Cost Heads)

#### Estates

This included

- *Capital cost of the building:* The replacement cost of the building was calculated based on the historical value, and the Cost Inflation Index (CII)<sup>7</sup> correction was applied. Annualization factor was applied to evaluate the cost of the facility for the financial year 2012 to 2013 (the study period) as per the WHO costing manual.<sup>4</sup>
- *Annualization:* The annualization of the costs was used as the standard methodology to arrive at the current capital costs. This involved the following steps as elaborated in the WHO Manual for Hospital Costs-A Manual for Managers by Shepard et al.<sup>4</sup>
- The cost of building was ascertained as per CPWD manual rates for 2014, based on the rates per square meter.<sup>8</sup> The total area of emergency as per the drawings of the Engineering Department is 1950 sq m.
  - The cost of building in 2007 was multiplied by the inflation factor obtained by the ratio of the common inflation index of the present financial

year (FY) to the inflation index of year 2007 to arrive at or calculate the replacement cost of the present FY.

- The current capital cost was divided by 100, considering the life of building as 100 years as per WHO manual, to get the annualization value.
- The cost of electrical installations and water and sewerage work was calculated as above.
- The cost of heating ventilation air conditioning (HVAC) was calculated by taking the basic cost, maintenance cost, operational cost, and cost of electricity incurred on running the HVAC. The capital cost of the plant and the air handling units (AHUs) were noted from records and the replacement cost was calculated by multiplying with CII. Annualization value was obtained by dividing with 10, considering the average working life as 10 years. Maintenance cost was apportioned based on the tonnage used in emergency. Operational cost was derived from the salaries of the AHU operators who are dedicated for emergency. And the cost of electricity consumed for running was ascertained based on the hours of operation daily and the tonnage of plant and AHUs.
- *Cost of maintenance:* The actual maintenance cost for the financial year 2012 to 2013 was obtained. The emergency area proportionate to the total area of the main hospital was used as the apportioning criteria. The maintenance cost was calculated for the emergency as a proportion of the total maintenance cost.
- *Cost of electricity:* The cost of electricity consumption was ascertained by calculating the total number of electrical appliances and multiplying with the wattage and daily running.

### Manpower

- Doctors
- Nurses
- Technicians
- Security staff
- Housekeeping staff

Midpoint salary based on the revised pay scales as per the Sixth Pay Commission was taken for calculating the cost of the manpower to the emergency. The faculty cost was apportioned depending on the hour spent in the emergency. The indirect manpower for various support services is covered under the respective support services cost.

### Support Services, Clinical

- Laboratory and blood bank – the laboratory cost per test of the emergency as well the cost of one unit of blood/blood component bag was assumed based

on the cost provided by a previous study conducted in year 2012 by Dr Sunil Verma. The total number of hematology and biochemistry tests conducted for patients in emergency were obtained from the emergency lab, and accordingly the cost incurred on lab investigation from emergency was calculated. Similarly, the total number of blood products transfused to emergency patients were obtained from the records of the ED, and accordingly the cost was obtained by multiplying the number of blood products transfused with the cost of each component.

- Radiology cost has been estimated as per the cost of similar investigations being charged from private ward patients, who pay for the investigation. The number of tests conducted on patients sent from emergency was obtained from the radiology department and accordingly cost incurred on radiological investigation was ascertained.
- Manifold cost is taken from the previous costing study of manifold services conducted by Dr P Kumar in the year 2010. The per-point cost is multiplied with the total number of points after doing cost inflation index adjustment.

### Support Services, Nonclinical

- Central sterile supply department (CSSD) and laundry – the cost of the CSSD and laundry has been ascertained from the previous study conducted by Dr Shilpi Verma in the year 2012, and the same has been used for computing the cost of CSSD and laundry for the emergency.
- Housekeeping staff dedicated to the emergency has been included in the manpower cost and the consumable has been included in the stores valuation. The cost has been brought down to per-patient cost.
- Security – the cost of the security personnel has been included in the manpower cost of the emergency.
- Ambulance – the cost of the three ambulances used was taken from the ambulance section. Daily petrol/diesel consumption and the cost of maintenance was also obtained from the records of ambulance section. Drivers' salary was also considered before deriving the per-patient cost on ambulance services.
- Cost of bio medical waste management (BMW) is ascertained by dividing the total contract value/year with no of collection points. The per-point collection rate is multiplied with the number of points in emergency.
- Medical social service officer (MSSO) – salaries of three MSSO, dedicated for casualty, were considered for deriving the cost incurred on MSSO services.

### Consumables

- Drugs and surgical consumables
- General stores
- Stationary
- Linen

The consumption for a 6-month period was taken into account and the rates for the same were fixed as per the rate contracts from the store section. Further, the cost of consumables per patient was calculated. Consumable items were on rate contract and therefore, there was no fluctuation of values during the study period.

### OBSERVATIONS

Summary of cost under major heads:

Sl. no.	Cost head	Cost per patient
1	Estate	144.5
2	Manpower	957
3	Medical equipment and consumables	301.7
4	Support services clinical	583.81
5	Support services nonclinical	46.9
	Total	2034.11

Total cost/year = Rs 27,15,53,685.

Twenty-seven crore fifteen lac fifty-three thousand six hundred eighty-five rupees are spend annually on running all the three casualties. And Rs 2034.11 is spent in providing emergency treatment per patient.

### SUMMARY

Summary of all cost centers is given under Table 1.

Total cost/year = RS 27,15,53,685

Total cost/day = Rs 7,43,982.7

Total cost/hour = Rs 30,999.27

Total cost/patient = Rs 2034.11

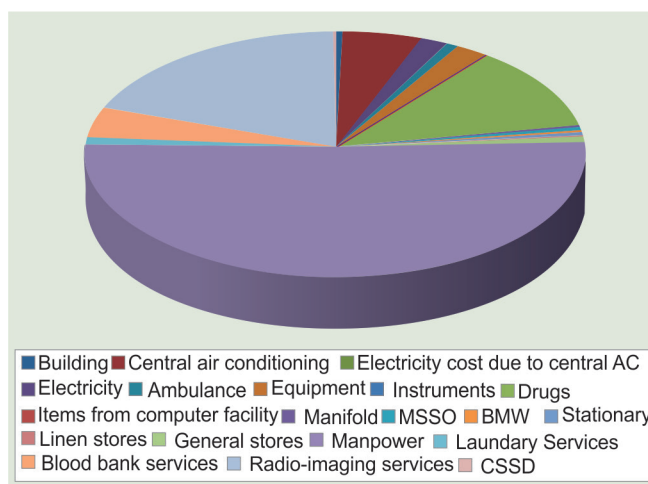
### DISCUSSION

The distribution of expenditure under various cost head is reflected in Pie Chart 1. As per the study done by Dr Michael Lee, Assistant Professor of Emergency Medicine in the Warren Alpert Medical School of Brown University and a physician at Rhode Island Hospital and the Miriam Hospital, on the cost of EMS services in U.S. Hospitals, ED costs are between 4.9 and 5.8% of total healthcare spending.<sup>6</sup>

In our study, the total cost/year came to around 27 crore rupees. The total fund allocated to the hospital under study in that particular year was 426 crore rupees. Thus, 6.35% of the total expenditure of the hospital goes in providing emergency care services. Almost 40 to 50% of the total cost incurred on providing emergency care services

**Table 1:** Summary of all cost centers

Sl. no.	Summary of the total cost per patient	Cost (Rs)	Percentage
1	Building	8.6	0.4
2	Central air conditioning	101.9	5
3	Laboratory	136.5	6.7
4	Electricity	34	1.6
5	Ambulance	15	0.7
6	Equipment	63	3.1
7	Instruments	0.6	0.03
8	Items from computer facility	1.9	0.1
9	Drugs	212	10.4
10	Manifold	3.85	0.2
11	MSSO	9	0.4
12	BMW	4.2	0.2
13	Stationary	9.4	0.4
14	Linen Stores	3.8	0.2
15	General Stores	12.9	0.6
16	Manpower	957	47
17	Laundry Services	13	0.6
18	Blood Bank Services	77.3	3.8
19	Radio-imaging services	366.16	18
20	CSSD	4	0.2
	Total	2034.11	100



**Pie Chart 1:** Distribution of expenditure

goes to the salary head of the staff working in the ED. The next major source of expenditure are the radiology and lab investigations.

### CONCLUSION

The study suggests that a considerable amount of hospital funds are spent on providing emergency care services in the apex tertiary care facility, whose primary mandate is to provide tertiary care services. The possibility of complete outsourcing or partial outsourcing in the form of radiology investigations and hiring manpower on a contract basis can be a viable solution, to reduce the cost on providing emergency care, which can better be utilized in providing high-end tertiary care facilities.

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