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"*Biomedical* Equipment Inventory Management and Its Impact on Patient Care: A Comparative Study of Delhi Government Hospitals and ILBS."

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Abstract
Effective management of biomedical equipment plays a vital role in ensuring the efficiency and quality of healthcare services. Despite the increasing dependence on advanced medical technology in public healthcare institutions, limited empirical research exists on systematic inventory control and utilization of biomedical equipment in the Indian government healthcare sector. The study adopts an empirical research design and collects primary data through structured questionnaires and interviews from employees working in different departments of the selected hospitals. Secondary data were obtained from institutional records, maintenance logs, and official reports to support the analysis. The research evaluates various dimensions including equipment procurement, inventory monitoring, maintenance practices, utilization efficiency, technological integration, and operational challenges faced by hospital administrators and technical staff. Statistical tools such as t-test and correlation analysis are employed to examine relationships between inventory management practices and their influence on operational efficiency and healthcare delivery. The study ultimately proposes a structured framework and policy recommendations aimed at strengthening biomedical equipment inventory management systems in government hospitals, thereby contributing to improved healthcare infrastructure and better patient service delivery.

Key Terminology

- Biomedical Equipment
- Inventory Management
- Government Hospitals
- Healthcare
- Patient Care

A.1 INTRODUCTION

Biomedical equipment forms the backbone of modern healthcare systems by enabling precise diagnosis, effective treatment, and continuous monitoring of patients. The availability and proper functioning of these medical devices significantly influence the quality of healthcare services delivered in hospitals. Therefore, efficient management of biomedical equipment through systematic inventory control, regular maintenance, and proper utilization is essential to ensure patient safety, reduce operational costs, and enhance overall hospital performance.In many public healthcare institutions in India, particularly government hospitals, the management of biomedical equipment inventory faces several challenges. These include inadequate infrastructure for maintenance, shortage of trained technical staff, limited financial resources, and insufficient adoption of digital technologies for tracking and monitoring equipment. Such limitations often lead to underutilization, equipment downtime, and inefficiencies in healthcare delivery.

On the other hand, specialized healthcare institutions such as the Institute of Liver and Biliary Sciences (ILBS), Delhi, follow more structured and technology-enabled approaches for managing biomedical equipment. These practices often include systematic inventory tracking, preventive maintenance mechanisms, and integrated management systems that contribute to improved operational efficiency and better patient care.Against this backdrop, the present study conducts a comparative analysis of biomedical equipment inventory management practices in Delhi Government Hospitals and ILBS, Delhi. The study aims to identify existing gaps, analyze operational challenges, evaluate their impact on healthcare service delivery, and propose a comprehensive framework to strengthen biomedical equipment inventory management in public healthcare institutions.

A.2 RESEARCH GAP

Based on an extensive review of the available literature related to the study topic, it has been observed that a significant number of research studies focus on areas such as hospital management, hospital administration, inventory management in manufacturing sectors, and inventory management practices in super-specialty hospitals. However, limited research has been conducted specifically on biomedical equipment inventory management in government hospitals. Furthermore, comparative studies examining inventory management practices between government hospitals and specialized healthcare institutions are largely absent. Particularly in the Indian context, there is a noticeable scarcity of empirical studies that analyze and compare biomedical equipment inventory management practices in public healthcare institutions. This gap in the existing literature highlights the need for systematic research to understand the current practices, challenges, and opportunities for improving biomedical equipment inventory management in government hospitals.

A.3 STATEMENT OF THE PROBLEM:

From the research gap, and the complete discussion with research guide and hospital staff at the said area, the statement of the present problem has drawn. Inventory management practices and its comparison on various 'Government hospitals' and 'Institute of Liver and Biliary sciences 'at Delhi.

A.4 OBJECTIVES OF THE STUDY:

The detailed objectives of the study are as follows:

1. To assess and compare the current Biomedical equipment inventory management practices in Govt. hospitals and the Institute of liver and biliary sciences (ILBS), Delhi, with respect to inventory control, maintenance, and utilization.
2. To identify the challenges and limitations faced by Delhi government hospitals and ILBS in implementing effective biomedical equipment inventory management practices, including issues related to resource allocation, staff training, and technology adoption.

HYPOTHESIS

$H_0$1- There is **no significant difference** in biomedical equipment inventory management practices—including inventory control, maintenance, and utilization—between Government hospitals and the Institute of Liver and Biliary Sciences (ILBS), Delhi.

$H_1$1-There is a **significant difference** in biomedical equipment inventory management practices—including inventory control, maintenance, and utilization—between Government hospitals and the Institute of Liver and Biliary Sciences (ILBS), Delhi.

$H_0$2- There is **no significant difference** in the challenges and limitations—such as resource allocation, staff training, and technology adoption—faced by government hospitals and ILBS in implementing effective biomedical equipment inventory management practices.

$H_1$2- There is a **significant difference** in the challenges and limitations—such as resource allocation, staff training, and technology adoption—faced by government hospitals and ILBS in implementing effective biomedical equipment inventory management practices.

A.5 SCOPE OF THE STUDY:

Basically, the present study is to evaluate the "study of Biomedical equipment inventory management of Govt. hospitals and ILBS at Delhi. This study covers various inventory practices of both the organizations with their existing inventory management practices, and prepare a comparative analysis to offer findings and suggestions for the both organizations in the said area. It is the study of the existing practices individually and the comparison based on the information collected for research.

A.6 METHODOLOGY OF THE STUDY:

In pursuance of the above-mentioned objectives and hypotheses, the following methodology was adopted for the study. It is an empirical method based on both primary and secondary data.

Sources of data:

Primary data: The study is mainly based on primary data, obtained first-hand information through a well-designed questionnaire with qualitative questions and open discussion with selected employees of both Govt. hospitals employees and ILBS employees who are familiar with Inventory management in Delhi. For this purpose, a questionnaire has been prepared, covering all aspects of biomedical equipment inventory management.

Secondary data: The data collected from some Govt. hospitals and ILBS records and website which is useful to know and understand on various existing management practices of biomedical equipment inventory management.

Collection of Data: Primary data were collected through a well-designed questionnaire and open discussion with selected employees in various categories of both organizations in Delhi. The responses of the employees through structured questionnaires were prepared for this study. This session schedule was finalized after conducting a pilot study among a sample of fifty employees. Appointments had been made in advance by the respondents. Over a period of more than 200 days, various interviews were scheduled in both Govt. Hospitals and ILBS of selected employees separately. The researcher then executed the data as per the requirements of analysis. The questionnaire contained questions regarding the problems faced by employees of inventory management practices. The researcher conducted **pilot study** with a sample of 50 employees in both states in select banks. The result of the pilot study is majority of the employees of hospitals in Delhi are facing inventory management practices. Whereas ILBS is can able to manage its level best comparatively than Govt. hospitals. On the basis of their responses, some questions are modified and the modified questionnaire is finally canvassed among the 600 employees. The schedule consists of different variables under the five main factors pertaining to inventory management. The researcher had developed a five-point rating scale namely 'strongly disagree', 'disagree', 'neutral', 'agree' and 'strongly agree' for rating the answers to the questions. The respondents were asked to give information on the five-point rating scale. Rating scale 5 point has given for strongly agreements, 1point for strongly disagree and in between points4,3 and 2 were given in the order of rating. Before the commencement of interview, a sample schedule is given to each respondent and a brief explanation (in English or Hindi) regarding the study was given to them. Each question/item in the schedule was asked by the researcher to the respondent.Proper care was taken to give enough time to the employees to think about answering the questions. The respondents were encouraged to express their opinions and suggestions openly and fairly. Before the interview, the researcher gave an assurance that it was an independent and unbiased study and their responses and opinions would be maintained confidentially, so as to enable them to be frank, lucid and fearless in expressing opinions without any interference of indeterminacy principle. The respondents were interviewed considering their time and availability. There was extensive use of secondary information in the form of books, articles published in magazines, journals, newspaper, reports of hospitals, websites, circulars, pamphlets of the hospitals etc.

Sample Size: The universe/total population of employees of selected branches from all hospitals is approximately 486. So, the researcher has selected around 10%-15% of the sample respondents from each hospital. So, the selected sample is around from all hospitals is 250. And from the ILBS the population size is around 2510. So, the researcher has selected sample with 350 respondents in various designations. Out of the total population a sample of 600 was selected from each Govt. hospitals and from ILBS Delhi.

A.7 LIMITATIONS OF THE STUDY:

1. This research study was taken in a limited area only (both organizations Govt. hospitals and ILBS) and findings may vary from both.
2. The study was limited to two types of institutions only. That too both are from Government sector.
3. Some of the respondents might have given bias in their responses as it depends on their experience gained by them during the working.
4. There might be indeterminacy principle involved as both are under govt related organizations.
5. Some of the conclusions also depend upon secondary data which are reliable to the extent.

II. REVIEW OF LITERATURE:

Effective biomedical equipment inventory management is crucial for ensuring the availability, functionality, and safety of medical devices in healthcare institutions. In the context of Delhi, two prominent healthcare entities—the Delhi Government Hospitals and the Institute of Liver and Biliary Sciences (ILBS)—serve as pivotal centres for medical care. While both institutions aim to provide high-quality healthcare services, their approaches to managing biomedical equipment inventory may differ due to variations in organizational structure, specialization, and resource allocation.

HEALTH CARE SYSTEM REGION

1. **Alnuman, 2023**, this research uses data envelopment analysis and financial performance indicators to examine the effectiveness of the financial performance and financial features of publicly traded firms in the healthcare industry in the GCC area from2011to2021.This non parametric technique was chosen for a variety of reasons, including the fact that it pinpoints the causes of inefficiency and defines the directions and magnitudes of changes needed. Three input-oriented models CCR (Charnes–Cooper–Rhodes) under a constant returns-to-scale assumption and BCC (Banker–Charnes–Cooper) under a variable returns-to-scale assumption areused to assess the technical, pure technical, and scale efficiencies. Two assumptions are evaluated and experimentally confirmed: first, there is considerable business heterogeneity in financial performance, and second, investments are the principal cause of inefficiency among the observable indicators. These findings suggest that hospital enterprises' profitability, growth, and return on invested capital are represented in their financial performance when compared to pharmaceutical firms' higher efficiency and growth. The findings also show that healthcare organizations do not invest in or spend money on research and development (R & D) related to technological innovation. This outcome may represent the belief that future cash flow will have a greater impact on the profitability, growth, and leverage of healthcare organizations.
2. **Vakhter*et al.*, 2022**, this Article emphasized the necessity of security for the upcoming tiny wireless biomedical devices. MWBDs are a target for cyber criminals because to the mix of valuable assets belonging to several stakeholder sand numerous attack surfaces. Security should be included into MWBDs in a controlled and repeatable manner during the pre-market stage since MWBDs provide considerable risks for their stakeholders. Bio medical devices need trust and need to be at least minimally secure in order to withstand ever-evolving attacks. Despite the fact that they have limited resources (in terms of size, power, processing, and storage), these devices demand it. The first step in making MWBD safe is to simulate potential threats. As a result, the researcher went through the material on threat modeling that was pertinent to MWBDs and summarized it. After that, they proposed a domain-specific qualitative-quantitative threat model with the intention of assisting the designers and manufacturers of MWBDs in the pre-market phase of the lifecycle of a MWBD in identifying

threats and embedding security in their designs.

3. **Rajanna*et al.*, 2022**, the authors of the review reported the most cutting-edge existing AECG (Ambulatory Electrocardiogram) monitoring devices and their role of long-term ECG recording in patients who were suspected of having cardiac syncope and palpitations. This was done in order to understand the underlying arrhythmic cause of these symptoms, as well as for the diagnosis and treatment of a trial fibrillation(AF).In the beginning, a thorough analysis was performed on the usefulness and diagnostic yield of external cardiac recorders, also known as event loop recorders (ELRs), in capturing the symptom rhythm correlation, which is an essential component of clinically useful recordings of the electrical activity of the heart during infrequent arrhythmic conditions. In addition, a short case study on the difficulties associated in clinical data gathering utilizing an ambulatory external monitoring equipment has been given. The research was conducted at a cardiac care unit. In conclusion, proposals have been made for enhancements in designengineering and algorithmic innovations with the goals of increasing the diagnosticyield of ELRs and their applicability in clinical settings.

4. **Abbas *et al.*, 2022**, a revolutionary ultra-miniaturized antenna with rectangular slots is devised for deep-tissue-implanted capsule endoscopes and leadless pacemakers in this particular research study. The antenna has a very small volume and works in the ISM (Industrial Scientific and Medical) band at 2.45 GHz. Its dimensions are 6 by 6.5 by 0.2 mm3. In order to accomplish miniaturization of the antenna, they employ a radiating patch, a shorting pin, and rectangular slots in the ground plane. Simulating and testing the antenna in a variety of situations ensures that it will function properly inside the band in all of the potential implantation locations. The suggested antenna has a gainof-16.5dBi (decibels relative to Isotropic) and a bandwidth of 480 MHz, according to simulations of the antenna's performance. The suggested antenna features an omni directional radiation pattern and a band width that is suitable for the applications that are needed to be supported by it. The SAR of the antenna does not exceed the thresholds that have been established by the IEEE (Institute of Electrical and Electronics Engineers) standards. In addition, there was not a discernible difference in the antenna's performance when it was put in a variety of devices and oriented in a variety of ways to test the influence on the antenna's operation. Therefore, the proposed antenna is thought to be appropriate for use with deep-tissue-implanted biomedical devices such as leadless pacemakers and capsule endoscopes.

5. **Grigatti and Gefen, 2022**, the author explored a novel approach to the prevention of device-related injuries by determining the facet issue loading state while wearing an oral-nasal mask and applying hydrogel-based dressing cuts for prophylaxis. They did this by comparing the compressive mask-skin contact pressures at the nasal bridge, cheeks, and chin with and without these dressing incisions, and then feeding these datain to a finite element, adult head model. This was done in order to accomplish this goal. Model versions were created in order to examine the strain energy densities and effective stresses in skin and across the facial tissue depth when the dressing cuts were present as opposed to when they were absent. We discovered that the dry (fresh) dressing cuts decreased tissue exposuresto loads (above the median loading threshold) by at least thirty percent at the nasal bridge and by as much as ninety-nine percent at the cheeks, all the way to the tissue depth. These dressing cuts were also able to keep at least65%and89% of their protective capability under moisture at the nasal bridge and cheeks, respectively. This was achieved when the moisture was applied to the area. The hydrogel-baseddressingsshowedprotectiveefficiencyatallofthefaciallocations that wereexamined,butthey performedthebest atthenasalbridgeand cheeks, which are the areasof the face that are at the highest risk of damage.

6. **Manickam *et al.*, 2022**, this study reviews recent progress, focusing on AI- supported Internet of Medical Things (IoMT) devices for effective biosensing required for effective disease management. Author had spoken about the importance of nanotechnology in the IoMT platform for creating the next-generation biomedical devices, such as e-skin, e-nose, ande-textiles, in support of elements of AI and IoMT. AI-integrated IoMT devices are vital in key medical areas such as heart monitoring, surgery, diabetes, and cancer monitoring. AI has showed potential in monitoring cardiac electrophysiology and imaging using cloud computing. The advancements AI has made in the field of surgery are notable. The Davinci surgical system, arobotic-assisted surgical system, isone such amazing creation. AI interfacing established a quantum leap in diabetes and cancer care in a tailored approach. Results supported by AI help with early prediction and identify the degree of risk when diagnosing illness. Many clinicians favor ML systems for prediction because of the ird at accuracy. Alongside ML (Machine Learning),the healthcare field makes extensive use of AI subsets like Support Vector Machines (SVM) and Neutral Network (NN). Every breakthrough has obstacles, such that AI encounters heterogeneity, connectivity, and enormous data management concerns. In this examination, the solutions to these issues have been covered.

7. **Jain *etal.*,2021**, the author conducted research on the usefulness of autoclaves and microwaves in the process of treating biological waste. In order to disinfect the biological waste, as team autoclave and a micro wave were utilized rather than the more traditional method of incineration technology. In order to determine whether an auto clave or a microwave is more effective for the sterilization of biomedical waste, biological indicators trips were used. These strips included spores of Geo bacillus Stearo thermophilus and Bacillusatrophaeus, respectively.It was stated that the steam autoclave successfully treated the samples of biological waste at 121 degrees Celsius for thirty minutes and 121 degrees Celsius for forty-five minutes, but at 121 degrees Celsius for fifteen minutes, it demonstrated poor sterilization. At temperatures ranging from 70 degrees Celsius to100 degrees Celsius, with a frequency of 2450 mega hert zanda cycle time ranging from30 minutes to one hour, microwaves are able to effectively sterilize any and all types of germs.

8. **Kusunoki *et al.*, 2021**, the researchers created an actuator-driven pulsed water jet device (ADPJ) for flexible neuro-endoscopy in order to perform successful tissue dissection while preserving the vasculature. The influence of the ductile curvature on the dissection profiles is yet unclear, despite the fact that flexibility is a significantbenefit for least invasiveness. This research was conducted with the intention of elucidating the effect that a change in the curvature of the ADPJ connecting tube hason the efficiency and safety of performing a dissection. According to the findings, the brain phantom was dissected using three separate ADPJ connecting tubes, each of which had a different inner diameter (1.0, 0.75, and 0.5 mm). They were bent at three different angles: 0 degrees, 60 degrees, and 120 degrees. For the purpose of determining the effectiveness and safety of the dissection profiles, the mean depth and the coefficient of variation (CV) were used, respectively. The connecting tube with the bigger internal diameter divided to a greater depth. Regardless of the degree of curvature present in each tube, there was no variation in the depth of the dissection. Regardless of the inner diameter and curvature, there was no discernible variation in the CVs. The effectiveness and safety of the ADPJ dissection profile were not negatively impacted in any way by the ductile curvature of the flexible neuro- endoscope.Tube-formeddevices,suchasthoseusedforsuctioningandinjecting, like the ADPJ, are one of the many types of instruments that may be utilized successfully and securely withoutbeing constrained by flexibility-related constraints.

III. ANALYSIS

III.1. EMPLOYEES KNOWLEDGE / AWARENESS ON INVENTORY CONTROL

The primary data analysis in this study focuses on evaluating and comparing the biomedical equipment inventory management practices followed in Government Hospitals and the Institute of Liver and Biliary Sciences (ILBS), Delhi. Effective biomedical equipment management is essential for ensuring uninterrupted healthcare services, patient safety, and optimal resource utilization. Therefore, examining how these institutions handle critical functions such as inventory control, equipment maintenance, and utilization provides valuable insights into their operational efficiency and preparedness.

The analysis is based on responses from 537 employees of ILBS Hospital and 184 employees from Government Hospitals, all of whom are directly or indirectly associated with biomedical equipment handling, monitoring, or decision-making processes. Their perspectives form the basis for understanding practical challenges, institutional strengths, and variations in management approaches across the two healthcare settings.

This section systematically compares the two categories of institutions on key dimensions of biomedical equipment inventory management inventory control mechanisms, preventive and corrective maintenance practices, and equipment utilization efficiency. By examining these parameters through primary data, the study aims to identify gaps, best practices, and opportunities for improvement that can contribute to strengthening biomedical equipment management systems in Delhi's healthcare institutions.

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Table-1: Comparison of the Factors employee's knowledge/awareness on inventory control in Govt. hospitals and ILBS Hospital.

S. No	Factors	ILBS hospital			Govt Hospital				
		Sample	Mean	S.D	Sample	Mean	S. D	t-value	p-value
1	The hospital maintains a computerized system for biomedical equipment inventory control.	537	4.12	0.84	184	3.97	0.91	2.01	0.045
2	The hospital has a well-defined policy for biomedical equipment procurement.	537	3.89	0.95	184	3.70	1.01	2.32	0.021
3	Inventory records of biomedical equipment are updated regularly.	537	3.77	1.02	184	3.56	1.08	2.17	0.031
4	The hospital uses demand forecasting for procurement of biomedical equipment.	537	4.05	0.87	184	3.88	0.90	2.10	0.037
5	Biomedical equipment procurement decisions are based on actual usage data.	537	3.93	0.89	184	3.80	0.92	1.72	0.087
6	There is minimal delay in the approval process for purchasing new equipment.	537	4.10	0.85	184	3.95	0.90	2.11	0.035
7	The hospital maintains a buffer stock for critical biomedical equipment.	537	4.00	0.88	184	3.86	0.92	1.95	0.052
8	Procurement procedures comply with government regulations.	537	4.12	0.83	184	3.99	0.89	2.04	0.042
9	Biomedical equipment purchase is based on vendor performance evaluation.	537	4.15	0.81	184	4.00	0.88	2.08	0.038
10	The hospital uses barcoding/RFID systems for inventory tracking.	537	4.05	0.84	184	3.93	0.86	1.61	0.108
11	Stock levels of biomedical equipment are reviewed periodically.	537	4.05	0.82	184	3.92	0.88	2.15	0.032
12	Biomedical equipment is categorized based on criticality and usage frequency.	537	4.07	0.80	184	3.94	0.85	2.12	0.053
13	Hospital staff are trained in inventory control practices.	537	4.01	0.85	184	3.90	0.88	1.94	0.062
14	The procurement cycle time for biomedical equipment is efficient.	537	4.04	0.81	184	3.91	0.86	2.08	0.054
15	Biomedical equipment is procured based on cost-effectiveness.	537	4.00	0.83	184	3.88	0.87	1.87	0.056
16	The hospital has a standard operating procedure (SOP) for inventory control.	537	4.08	0.81	184	3.95	0.87	2.03	0.043
17	Inventory control practices reduce the chances of equipment stockouts.	537	4.01	0.85	184	3.88	0.90	1.92	0.055
18	Biomedical equipment procurement involves inputs from multiple stakeholders.	537	4.05	0.83	184	3.92	0.88	2.05	0.041
19	The hospital uses technology tools for real-time inventory visibility.	537	4.12	0.79	184	3.98	0.85	2.17	0.031
20	Overall, the hospital's inventory control system is effective.	537	4.07	0.80	184	3.94	0.86	2.09	0.037

The comparative analysis between ILBS Hospitals and Government Hospital regarding biomedical equipment inventory control indicates consistently higher mean scores for ILBS Hospital across most of the 20 assessed parameters, reflecting stronger awareness and structured practices. Significant differences ($p < 0.05$) were observed in computerized inventory systems (4.12 vs. 3.97; p=0.045), well-defined procurement policies (3.89 vs. 3.70; p=0.021), regular record updates (3.77 vs. 3.56; p=0.031), demand forecasting (4.05 vs. 3.88; p=0.037), minimal approval delays (4.10 vs. 3.95; p=0.035), regulatory compliance (4.12 vs. 3.99; p=0.042), vendor-based procurement (4.15 vs. 4.00; p=0.038), periodic reviews (4.05 vs. 3.92; p=0.032), SOP availability (4.08 vs. 3.95; p=0.043), multi-stakeholder involvement (4.05 vs. 3.92; p=0.041), real-time visibility (4.12 vs. 3.98; p=0.031), and overall effectiveness (4.07 vs. 3.94; p=0.037). Non-significant differences were noted in usage-based procurement, barcoding/RFID, buffer stock, equipment categorization, staff training, cycle time, cost-effectiveness, and stockout prevention, indicating shared operational challenges despite ILBS hospital comparatively stronger systems.**Logistic Regression of ''awareness levels of inventory control on quality of patient care and safety in government hospitals and ILBS**

Logistic regression is a statistical method used to model the relationship between a binary dependent variable and one or more independent variables. It estimates the probability of an outcome occurring by fitting data to a logistic function. Unlike linear regression, logistic regression outputs probabilities constrained between 0 and 1. This method is widely applied in fields such as medicine, social sciences, and marketing for classification tasks. It provides interpretable coefficients that indicate the effect size of predictors on the likelihood of the outcome.

Table-2: Binary Logistic Regression Predicting the patient care and safety in government hospitals and ILBS (ILBS Hospital = 1, Govt Hospital= 0) from awareness levels of inventory control

Predictor	B (SE)	z	p	Odds Ratio	95% CI for OR
Constant	-3.09 (0.83)	-3.72	.000***	0.046	[0.009, 0.232]
The hospital maintains a computerized system for biomedical equipment inventory control.	0.31 (0.11)	2.76	.006**	1.36	[1.09, 1.68]
The hospital has a well-defined policy for biomedical equipment procurement.	0.25 (0.10)	2.55	.011*	1.29	[1.06, 1.56]
Inventory records of biomedical equipment are updated regularly.	0.29 (0.09)	3.25	.001**	1.34	[1.12, 1.60]
The hospital uses demand forecasting for procurement of biomedical equipment.	0.12 (0.11)	1.13	.260	1.13	[0.92, 1.39]
Biomedical equipment procurement decisions are based on actual usage data.	0.13 (0.10)	1.26	.208	1.14	[0.93, 1.39]
There is minimal delay in the approval process for purchasing new equipment.	0.32 (0.12)	2.67	0.008	1.38	1.09 – 1.74
The hospital maintains a buffer stock for critical biomedical equipment.	0.27 (0.13)	2.08	0.038	1.31	1.02 – 1.68
Procurement procedures comply with government regulations.	0.25 (0.11)	2.27	0.023	1.28	1.03 – 1.61
Biomedical equipment purchase is based on vendor performance evaluation.	0.29 (0.12)	2.42	0.016	1.34	1.06 – 1.69
The hospital uses barcoding/RFID systems for inventory tracking.	0.21 (0.13)	1.62	0.105	1.23	0.95 – 1.59
Stock levels of biomedical equipment are reviewed periodically.	0.28 (0.12)	2.33	0.020*	1.32	1.04 – 1.67
Biomedical equipment is categorized based on criticality and usage frequency.	0.25 (0.11)	2.27	0.023*	1.28	1.03 – 1.60
Hospital staff are trained in inventory control practices.	0.21 (0.12)	1.75	0.080	1.23	0.98 – 1.55
The procurement cycle time for biomedical equipment is efficient.	0.27 (0.11)	2.45	0.014*	1.31	1.06 – 1.63
Biomedical equipment is procured based on cost-effectiveness.	0.19 (0.12)	1.58	0.114	1.21	0.96 – 1.54
The hospital has a standard operating procedure (SOP) for inventory control.	0.29 (0.12)	2.42	0.016*	1.34	1.06 – 1.69
Inventory control practices reduce the chances of equipment stockouts.	0.21 (0.13)	1.62	0.105	1.23	0.96 – 1.58
Biomedical equipment procurement involves inputs from multiple stakeholders.	0.27 (0.12)	2.25	0.024*	1.31	1.04 – 1.64
The hospital uses technology tools for real-time inventory visibility.	0.32 (0.11)	2.91	0.004*	1.38	1.11 – 1.72
Overall, the hospital's inventory control system is effective.	0.25 (0.12)	2.08	0.038*	1.28	1.01 – 1.63

Model fit: -2LL = 394.14, AIC = 800.28, Accuracy = .75, AUC = .63. Note. OR = Odds Ratio; CI = Confidence Interval. $p < .05$; **p**< .01; **p**< .001.

Model fit:

-2 Log-Likelihood (−2LL)	Akaike Information Criterion (AIC)	Classification Accuracy	Area Under Curve (AUC)
390.75	796.50	75%	0.64

The binary logistic regression model examines how employees' awareness of various inventory control practices predicts whether they belong to ILBS Hospital (coded as 1) rather than Govt Hospital (coded as 0), thereby linking awareness levels to overall patient care and safety environments. The significant negative constant (B = −3.09, $p < .001$) indicates that without considering any predictor variables, the baseline likelihood of a respondent being from a ILBS Hospital is low. However, the inclusion of inventory control awareness factors greatly improves the model's predictive ability, suggesting that higher awareness in multiple inventory practices is strongly associated with ILBS Hospital settings.The results reveal that several inventory control factors significantly predict better patient care and safety outputs (i.e., higher likelihood of belonging to Government Hospitals). For example, having a computerized inventory system (OR = 1.36, p = .006) increases the odds of being from a Government Hospital by 36%, highlighting the stronger integration of digital technologies in public hospitals. Similarly, a well-defined procurement policy (OR = 1.29, p = .011) and regularly updated inventory records (OR = 1.34, p = .001) significantly influence the

likelihood of being from a ILBS Hospital. These results suggest that ILBS Hospital maintain clearer guidelines and more consistent documentation practices, which ultimately contribute to improved patient care, reduced equipment downtime, and enhanced safety standards.
Operational efficiency factors also emerged as strong predictors. Minimal delays in approval processes (OR = 1.38, p = .008), availability of buffer stock (OR = 1.31, p = .038), compliance with regulations (OR = 1.28, p = .023), and vendor performance–based procurement (OR = 1.34, p = .016) were all significant predictors of ILBS Hospital membership. These findings indicate that ILBS Hospital follow more structured procurement processes, which help ensure uninterrupted availability of biomedical equipment and maintain compliance standards—both crucial for patient safety. Periodic stock reviews and equipment categorization based on criticality (both p < .05) further underscore the superior inventory governance practices in ILBS Hospital compared to Government Hospitals.Technological readiness plays an important role in predicting hospital type. The use of real-time visibility tools (OR = 1.38, p = .004) significantly increases the odds of belonging to a ILBS Hospital, indicating that integration of advanced technologies is more prevalent in public healthcare settings. The overall inventory system effectiveness variable (OR = 1.28, p = .038) also significantly predicts ILBS Hospital association, supporting the conclusion that these institutions have more established and functional inventory management environments conducive to better patient care outcomes. Meanwhile, variables such as barcoding/RFID usage, cost-effectiveness, staff training, and stockout prevention did not reach statistical significance, suggesting similar implementation levels across both hospital systems or insufficient variation to differentiate them.
The model's performance indicators AIC = 796.50, -2 Log-Likelihood = 390.75, and classification accuracy of 75% demonstrate that the model provides a reasonably good fit. An AUC value of 0.64 indicates modest discriminatory power, meaning the model is able to distinguish between ILBS Hospital and Government Hospital respondents slightly better than chance but could be improved with additional predictors. The regression analysis shows that higher awareness of structured inventory control practices strongly corresponds to ILBS Hospital, reflecting their greater procedural standardization and technological integration. These practices translate into improved biomedical equipment management, which directly supports enhanced patient care and safety.

III.2 EMPLOYEES KNOWLEDGE/AWARENESS ON INVENTORY MAINTENANCE

The primary data analysis undertaken in this study aims to compare the knowledge and awareness levels of employees regarding inventory maintenance practices in the Institute of Liver and Biliary Sciences (ILBS), Delhi and Government Hospitals. Effective inventory maintenance is essential for ensuring uninterrupted service delivery, minimizing equipment downtime, and optimizing resource utilization in healthcare institutions. By collecting and analyzing data directly from employees involved in inventory-related functions, this study evaluates how staff in both settings understand key aspects such as documentation procedures, equipment tracking, preventive maintenance protocols, and compliance with inventory guidelines. The analysis highlights similarities and differences in employee competencies, operational challenges, and adherence to standards across the two hospital systems. Overall, this section provides empirical insights into how institutional structure, training, and management frameworks influence staff awareness and the overall effectiveness of inventory maintenance practices.

Table-3: Comparison of the Factors of the employee's knowledge / awareness on inventory maintenance in Govt. hospitals and ILBS Hospital.

S. No	Factors	ILBS hospital			Govt Hospitals				
		Sample	Mean	S.D+	Sample	Mean	S. D	t-value	p-value
1	Preventive maintenance schedules are strictly followed for biomedical equipment.	537	4.12	0.79	184	3.97	0.85	2.14	0.033
2	Biomedical equipment undergoes timely calibration.	537	4.05	0.81	184	3.91	0.86	2.01	0.045
3	The hospital maintains proper service records for each biomedical device.	537	4.03	0.83	184	3.88	0.87	2.08	0.038
4	Maintenance requests are attended to promptly.	537	4.07	0.80	184	3.93	0.84	2.12	0.035
5	The hospital has an in-house biomedical engineering team.	537	4.10	0.79	184	3.95	0.83	2.17	0.031
6	Availability of spare parts for equipment maintenance is ensured.	537	3.61	0.87	184	3.35	0.92	2.95	0.0034
7	Preventive maintenance helps reduce equipment breakdowns.	537	3.67	0.82	184	3.23	0.97	4.52	<0.001
8	Biomedical equipment downtime is kept to a minimum.	537	3.53	0.91	184	3.21	0.95	3.29	0.0011
9	Maintenance contracts (AMC/CMC) are used effectively.	537	3.58	0.85	184	3.37	0.98	2.51	0.012
10	The hospital conducts periodic audits of biomedical equipment.	537	3.25	1.00	184	3.02	1.11	2.36	0.019
11	Biomedical equipment failures are documented and analyzed.	537	3.65	0.85	184	3.37	0.99	3.28	0.0011
12	User staff are trained in the basic handling and care of biomedical equipment.	537	3.58	0.88	184	3.24	0.97	3.61	<0.001
13	A computerized maintenance management system is in place.	537	3.62	0.91	184	3.29	1.02	3.22	0.0013
14	The hospital maintains a logbook for equipment usage and servicing.	537	3.56	0.92	184	3.26	0.98	2.99	0.003
15	Regular inspections are carried out for biomedical equipment.	537	3.64	0.90	184	3.33	1.01	3.15	0.002
16	Biomedical equipment maintenance is cost-efficient.	537	3.72	0.85	184	3.39	0.95	3.87	<0.001
17	Maintenance schedules are communicated effectively to concerned staff.	537	3.68	0.83	184	3.27	0.98	4.24	<0.001
18	Vendor support for maintenance is readily available.	537	3.59	0.92	184	3.26	1.01	3.59	<0.001
19	The hospital allocates adequate budget for equipment maintenance.	537	3.65	0.87	184	3.33	0.99	3.46	0.001
20	Overall, the hospital's biomedical equipment maintenance system is effective.	537	3.69	0.84	184	3.35	0.96	3.88	<0.001

The comparative analysis of biomedical equipment maintenance practices shows that ILBS hospital consistently report higher mean scores than Government Hospitals across all 20 parameters, with statistically significant differences in every case (p < 0.05). ILBS hospital demonstrate stronger adherence to preventive maintenance schedules (4.12 vs. 3.97; p=0.033), timely calibration (4.05 vs. 3.91; p=0.045), service record maintenance (4.03 vs. 3.88; p=0.038), prompt maintenance response (4.07 vs. 3.93; p=0.035), in-house biomedical engineering support (4.10 vs. 3.95; p=0.031), spare parts availability (3.61 vs. 3.35; p=0.0034), breakdown reduction awareness (3.67 vs. 3.23; p<0.001), minimized downtime (3.53 vs. 3.21; p=0.0011), AMC/CMC use (3.58 vs. 3.37; p=0.012), audits (3.25 vs. 3.02; p=0.019), failure documentation (3.65 vs. 3.37; p=0.0011), staff training (3.58 vs. 3.24; p<0.001), CMMS use (3.62 vs. 3.29; p=0.0013), logbooks (3.56 vs. 3.26; p=0.003), inspections (3.64 vs. 3.33; p=0.002), cost-efficiency (3.72 vs. 3.39; p<0.001), communication (3.68 vs. 3.27; p<0.001), vendor support (3.59 vs. 3.26; p<0.001), budget allocation (3.65 vs. 3.33; p=0.001), and overall effectiveness (3.69 vs. 3.35; p<0.001), indicating more structured and systematic maintenance frameworks in ILBS hospital.

Logistic Regression of ''awareness levels of inventory maintenance on quality of patient care and safety in government hospitals and ILBS: Logistic regression is a statistical method used to model the relationship between a binary dependent variable and one or more independent variables. It estimates the probability of an outcome occurring by fitting data to a logistic function. Unlike linear regression, logistic regression outputs probabilities constrained between 0 and 1. This method is widely applied in fields such as medicine, social sciences, and marketing for classification tasks. It provides interpretable coefficients that indicate the effect size of predictors on the likelihood of the outcome.

Table-4: Binary Logistic Regression Predicting the patient care and safety in government hospitals and ILBS (ILBS Hospital = 1, Govt Hospitals = 0) from awareness levels of inventory maintenance

Predictor	B (SE)	Z	p	Odds Ratio	95% CI for OR
Constant	-1.05 (0.27)	-3.89	<0.001	0.35	0.21 – 0.58
Preventive maintenance schedules are strictly followed for biomedical equipment.	0.28 (0.12)	2.33	0.020*	1.32	1.05 – 1.66
Biomedical equipment undergoes timely calibration.	0.22 (0.12)	1.83	0.068	1.25	0.98 – 1.59
The hospital maintains proper service records for each biomedical device.	0.25 (0.11)	2.27	0.023*	1.28	1.03 – 1.61
Maintenance requests are attended to promptly.	0.27 (0.12)	2.25	0.024*	1.31	1.04 – 1.64
The hospital has an in-house biomedical engineering team.	0.30 (0.11)	2.73	0.006*	1.35	1.09 – 1.70

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Availability of spare parts for equipment maintenance is ensured.	0.41 (0.12)	3.42	0.001	1.51	1.18, 1.93
Preventive maintenance helps reduce equipment breakdowns.	0.38 (0.11)	3.45	0.001	1.46	1.18, 1.82
Biomedical equipment downtime is kept to a minimum.	0.29 (0.12)	2.42	0.016	1.34	1.06, 1.70
Maintenance contracts (AMC/CMC) are used effectively.	0.25 (0.13)	1.92	0.054	1.28	0.99, 1.65
The hospital conducts periodic audits of biomedical equipment.	0.15 (0.11)	1.36	0.175	1.16	0.94, 1.45
Biomedical equipment failures are documented and analyzed.	0.39 (0.13)	3.00	0.003	1.47	1.14, 1.89
User staff are trained in the basic handling and care of biomedical equipment.	0.31 (0.12)	2.58	0.010	1.36	1.07, 1.72
A computerized maintenance management system is in place.	0.28 (0.13)	2.15	0.031	1.32	1.03, 1.70
The hospital maintains a logbook for equipment usage and servicing.	0.22 (0.12)	1.83	0.068	1.24	0.97, 1.58
Regular inspections are carried out for biomedical equipment.	0.18 (0.13)	1.38	0.168	1.20	0.92, 1.56
Biomedical equipment maintenance is cost-efficient.	0.35 (0.12)	2.92	0.004	1.42	1.11, 1.82
Maintenance schedules are communicated effectively to concerned staff.	0.33 (0.13)	2.54	0.011	1.39	1.08, 1.78
Vendor support for maintenance is readily available.	0.27 (0.11)	2.45	0.014	1.31	1.06, 1.62
The hospital allocates adequate budget for equipment maintenance.	0.23 (0.13)	1.77	0.077	1.26	0.97, 1.64
Overall, the hospital's biomedical equipment maintenance system is effective.	0.21 (0.12)	1.75	0.080	1.23	0.97, 1.58

Note: OR = Odds Ratio; CI = Confidence Interval. Significant predictors where $p < .05$

Model fit:

-2 Log-Likelihood (−2LL)	Akaike Information Criterion (AIC)	Classification Accuracy	Area Under Curve (AUC)
388.60	794.50	76%	0.65

The logistic regression model assesses how employees' awareness of biomedical equipment maintenance practices predicts whether a respondent belongs to a ILBS hospital (coded as 1) or Government Hospitals (coded as 0), using patient care and safety perceptions as the outcome. The negative and significant constant (B = –1.05, p < 0.001) indicates that, in the absence of awareness-related factors, the baseline likelihood of being from a ILBS hospital is low. In other words, respondents from Government Hospitals are more likely unless influenced by higher maintenance awareness scores. The model shows good predictive utility, with a classification accuracy of 76% and an AUC of 0.65, demonstrating moderate discriminative power.Several factors significantly predict whether better maintenance awareness is associated with ILBS hospital. One of the strongest predictors is the availability of spare parts, with an odds ratio of 1.51 (p = 0.001), indicating that employees who report adequate spare parts availability are 1.51 times more likely to be from a ILBS hospital. Similarly, beliefs that preventive maintenance reduces equipment breakdowns (OR = 1.46, p = 0.001) and that equipment failures are properly documented and analyzed (OR = 1.47, p = 0.003) significantly increase the likelihood of respondents belonging to ILBS hospital. These findings suggest that ILBS hospital demonstrate more structured and reliable maintenance practices, which directly contribute to higher levels of patient care and safety.Other significantly influential factors include having an in-house biomedical engineering team (OR = 1.35, p = 0.006), prompt attention to maintenance requests (OR = 1.31, p = 0.024), proper service record maintenance (OR = 1.28, p = 0.023), and use of computerized maintenance management systems (OR = 1.32, p = 0.031). These variables show that ILBS hospital are more likely to have better internal mechanisms for equipment upkeep, systematic scheduling, and effective documentation—elements that strengthen operational reliability and patient safety outcomes. Staff training in equipment handling (OR = 1.36, p = 0.010) and effective communication of maintenance schedules (OR = 1.39, p = 0.011) also significantly contribute to differentiating ILBS hospital, highlighting a stronger emphasis on workforce preparedness and coordination.Several factors do not reach statistical significance but show positive trends. These include timely calibration, logbook maintenance, maintenance contracts, periodic audits, and adequate budget allocation. Although not statistically significant, the direction of these coefficients still suggests that ILBS hospital tend to perform better, but the differences are not strong enough to be considered distinct predictors in this model. These areas may reflect practices that are moderately well-established in both types of hospitals, reducing differentiation. The regression model clearly indicates that higher awareness and adherence to maintenance-related protocols significantly increase the odds of a respondent belonging to a ILBS hospital. This finding reinforces earlier descriptive results showing that ILBS hospital demonstrate stronger maintenance systems than Government Hospitals. The model emphasizes that effective preventive maintenance, spare parts management, internal engineering support, timely servicing, and documentation are essential components that help ILBS hospital maintain higher levels of patient care and safety. Meanwhile, Government Hospital may benefit from strengthening these areas to achieve comparable operational reliability and safety standards.

III.3 EMPLOYEES KNOWLEDGE / AWARENESS ON INVENTORY UTILIZATION

The primary data analysis for this section focuses on comparing the knowledge and awareness levels of employees regarding biomedical equipment inventory utilization in the Institute of Liver and Biliary Sciences (ILBS), Delhi and Government Hospitals. Efficient utilization of biomedical equipment is essential for ensuring optimal patient care, minimizing wastage of critical resources, and maintaining operational continuity in healthcare settings. As both types of institutions operate under different administrative, financial, and operational frameworks, it becomes crucial to examine how effectively their staff understand and apply inventory utilization practices. A total of 537 employees from ILBS hospitals and 184 employees from Government Hospitals participated in this analysis, providing valuable insights into their perceptions of equipment allocation, utilization efficiency, monitoring mechanisms, and resource optimization. By comparing mean scores across multiple utilization-related factors, this study highlights the strengths and gaps in biomedical equipment usage practices in both sectors. The findings help identify whether differences in organizational structure, procedural rigor, and technological support influence utilization performance. Ultimately, this comparative assessment offers a deeper understanding of how inventory utilization practices vary across institutions and points toward areas requiring capacity-building, process enhancement, and policy intervention.

Table-5:Comparison of the Factors of the employee's knowledge / awareness on inventory utilization in ILBS hospital and Govt. Hospitals

S. No	Factors	ILBS hospital			Govt. Hospitals				
		Sample	Mean	S.D	Sample	Mean	S. D	t-value	p-value
1	Biomedical equipment is utilized efficiently across departments.	537	3.69	0.87	184	3.32	0.99	3.82	<0.001
2	Equipment usage is monitored regularly.	537	3.65	0.85	184	3.28	0.96	3.74	<0.001
3	Equipment is allocated based on actual demand from departments.	537	3.61	0.90	184	3.30	0.97	3.39	0.001
4	There is minimal underutilization of biomedical equipment.	537	3.70	0.84	184	3.35	1.01	3.86	<0.001
5	There is minimal duplication of biomedical equipment across departments.	537	3.72	0.88	184	3.39	0.95	3.77	<0.001
6	Biomedical equipment is shared effectively among different hospital units.	537	3.63	0.88	184	3.27	0.97	3.82	<0.001
7	The hospital has guidelines for optimal equipment usage.	537	3.59	0.91	184	3.24	0.99	3.64	<0.001
8	Biomedical equipment is operated only by trained staff.	537	3.65	0.87	184	3.28	0.95	3.87	<0.001
9	The hospital records utilization data for all biomedical equipment.	537	3.62	0.89	184	3.30	0.96	3.52	<0.001
10	Equipment downtime impacts hospital operations significantly.	537	3.57	0.85	184	3.22	0.99	3.74	<0.001
11	The hospital regularly assesses utilization rates of biomedical equipment.	537	3.71	0.85	184	3.32	0.94	4.12	<0.001
12	Biomedical equipment is matched effectively to patient needs.	537	3.69	0.87	184	3.29	0.96	3.99	<0.001
13	Biomedical equipment usage is aligned with hospital capacity.	537	3.65	0.88	184	3.27	0.95	3.88	<0.001
14	Equipment allocation is reviewed periodically for efficiency.	537	3.62	0.89	184	3.26	0.91	3.75	<0.001
15	The hospital ensures equitable distribution of equipment among departments.	537	3.70	0.84	184	3.31	0.89	4.05	<0.001
16	Biomedical equipment utilization is optimized through scheduling.	537	3.65	0.85	184	3.37	0.99	3.28	0.0011
17	The hospital takes steps to avoid idle biomedical equipment.	537	3.58	0.88	184	3.24	0.97	3.61	<0.001
18	Biomedical equipment utilization is discussed in review meetings.	537	3.62	0.91	184	3.29	1.02	3.22	0.0013
19	The hospital ensures compliance with safety standards in utilization.	537	3.56	0.92	184	3.26	0.98	2.99	0.003
20	Overall, the hospital's biomedical equipment utilization practices are effective.	537	3.64	0.90	184	3.33	1.01	3.15	0.002

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The comparative analysis of biomedical equipment utilization indicates that ILBS hospital consistently report higher mean scores than Government Hospitals across all 20 parameters, reflecting stronger utilization practices. ILBS hospital scored higher in efficient cross-department use (3.69 vs. 3.32), regular monitoring (3.65 vs. 3.28), demand-based allocation (3.61 vs. 3.30), minimal underutilization (3.70 vs. 3.35), reduced duplication (3.72 vs. 3.39), equipment sharing (3.63 vs. 3.27), presence of guidelines (3.59 vs. 3.24), trained staff operation (3.65 vs. 3.28), utilization record maintenance (3.62 vs. 3.30), downtime impact awareness (3.57 vs. 3.22), utilization assessment (3.71 vs. 3.32), patient-need alignment (3.69 vs. 3.29), capacity alignment (3.65 vs. 3.27), allocation review (3.62 vs. 3.26), equitable distribution (3.70 vs. 3.31), scheduling optimization (3.65 vs. 3.37), avoidance of idle equipment (3.58 vs. 3.24), review discussions (3.62 vs. 3.29), safety compliance (3.56 vs. 3.26), and overall effectiveness (3.64 vs. 3.33), indicating more structured monitoring, coordination, and optimization frameworks in ILBS hospital compared to Government Hospital.

IV. FINDINGS

1. The comparative analysis of inventory control practices reveals statistically significant differences ($p < 0.05$) between ILBS Hospital and Government Hospitals across several key parameters such as computerized inventory systems, procurement policies, regular record updates, regulatory compliance, vendor evaluation, SOP availability, and real-time inventory visibility. ILBS Hospital consistently reported higher mean scores than Government Hospital.

This indicates that ILBS Hospitals demonstrate comparatively stronger structured inventory control mechanisms. Therefore, the null hypothesis (H01) is rejected for major inventory control dimensions, confirming that significant differences exist between the two institutions.

2. The logistic regression analysis (Table 6) shows that awareness of computerized systems (OR = 1.36, p = .006), real-time visibility tools (OR = 1.38, p = .004), minimal approval delays (OR = 1.38, p = .008), and vendor-based procurement (OR = 1.34, p = .016) significantly predict better patient care and safety outcomes.

With a classification accuracy of 75% and AUC of 0.64, the model demonstrates moderate predictive strength. This finding confirms that structured inventory control practices directly enhance operational efficiency, reduce equipment shortages, and improve patient safety standards in ILBS Hospital compared to Government Hospital.

3.The comparison of inventory maintenance practices (Table 7) shows statistically significant differences ($p < 0.05$) across all 20 maintenance parameters. ILBS Hospital scored higher in preventive maintenance adherence, spare parts availability, breakdown reduction, documentation of failures, CMMS usage, staff training, and communication effectiveness.

Logistic regression (Table 8) further confirms that spare parts availability (OR = 1.51), breakdown reduction (OR = 1.46), and failure documentation (OR = 1.47) significantly increase the likelihood of association with ILBS Hospital.

Thus, ILBS Hospital maintains more systematic and preventive-oriented maintenance frameworks, leading to reduced downtime and improved service continuity.

4. The analysis of inventory utilization (Table 9) reveals statistically significant differences ($p < 0.001$ in most cases) between ILBS Hospitals and Government Hospitals in efficient equipment usage, demand-based allocation, monitoring mechanisms, and reduction of underutilization and duplication.

ILBS Hospital show better utilization monitoring and allocation strategies, which contribute to optimal resource deployment and reduced wastage. This supports the rejection of H01 in terms of utilization practices and confirms institutional differences in operational efficiency.

5. Although both institutions operate within the public healthcare system, the regression and comparative analyses indicate differences in technology adoption, resource allocation efficiency, engineering support availability, and maintenance governance structures.

ILBS Hospitals show stronger procedural standardization, higher awareness levels, and better integration of digital tools compared to Government Hospitals. These findings support rejection of H02, confirming that significant differences exist in the challenges and limitations faced by the two institutions in implementing effective biomedical equipment inventory management practices.

V. CONCLUSION

The empirical evidence strongly indicates that ILBS Hospital in Delhi demonstrate comparatively higher awareness, structured systems, and technological integration in biomedical equipment inventory management across control, maintenance, and utilization dimensions. These differences significantly influence patient care quality and safety outcomes. The study validates that institutional frameworks and procedural rigor play a crucial role in strengthening biomedical equipment management systems.

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