

# Implementation of Novel Nursing Techniques to Prevent Catheter-Related Bloodstream Infections (CLABSI) in a Liver Transplant Intensive Care Unit

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**Abstract:** *Central Line Associated Bloodstream Infections (CLABSI) remain a major preventable cause of morbidity and mortality in intensive care units, particularly among post-liver transplant patients who are highly immunosuppressed. Recurrent CLABSI cases were observed in the Liver Transplant Intensive Care Unit (ICU), prompting the need for a structured, nurse-led infection prevention strategy. This prospective quality improvement project implemented novel nursing techniques including dedicated sterile medication preparation by a trained nurse using a laminar airflow hood, continuous monitoring, and daily staff education. Following the intervention, CLABSI rates reduced from 4.2 per 1000 catheter days to zero cases during the final quarter of observation. Compliance with aseptic practices improved from 72% to 98%. The findings demonstrate that standardized, nurse-driven sterile medication preparation and monitoring significantly enhance patient safety and effectively prevent CLABSI.*

**Keywords:** CLABSI, infection prevention, nursing leadership, liver transplant ICU, quality improvement

## 1. Introduction

Central venous catheters are essential for medication administration, hemodynamic monitoring, and critical care management in post-liver transplant patients. However, their use is associated with a high risk of Catheter-Related Bloodstream Infections (CLABSI), especially in immunocompromised populations [1]. CLABSI contributes to increased morbidity, mortality, prolonged ICU stay, and higher healthcare costs [2].

Despite adherence to standard catheter care bundles, variations in aseptic medication preparation and frequent line manipulation continue to pose challenges in infection control. Nurses play a pivotal role in catheter care and medication administration, positioning them as key agents in infection prevention initiatives [3].

## 2. Problem Statement

Recurrent CLABSI cases were identified in the Liver Transplant ICU. Infection control audits revealed inconsistencies in sterile medication preparation practices and multiple handling of central lines as potential contributing factors. A structured and standardized nursing intervention was required to address these gaps.

## 3. Aim and Objectives

### 3.1 Aim

To eliminate and prevent CLABSI among post-liver transplant patients through standardized sterile medication preparation and continuous nurse-led monitoring.

### 3.2 Objectives

- To assign one dedicated nurse per shift for medication preparation
- To ensure sterile preparation using a laminar airflow hood
- To provide daily education and training to nursing staff
- To monitor compliance with aseptic techniques
- To evaluate reduction in CLABSI incidence

## 4. Methodology

### 4.1 Study Design

Prospective quality improvement project with pre- and post-intervention comparison.

### 4.2 Setting

Liver Transplant Intensive Care Unit of a Apollo hospital, New Delhi.

### 4.3 Intervention

#### Phase 1: Dedicated Medication Preparation Nurse

One trained nurse per shift prepared all intravenous medications for liver transplant patients using strict aseptic techniques under a laminar airflow hood.

#### Education and Training

Daily briefings, demonstrations, and competency-based assessments were conducted to reinforce infection prevention and aseptic practices.

#### Phase 2: Monitoring and Supervision

The same dedicated nurse functioned as a monitor, remaining near the laminar airflow hood to supervise medication preparation and administration, ensuring immediate correction of any breach in sterile technique.

## 5. Data Collection and Outcome Measures

### 5.1 Data Collection

- Number of CLABSI cases
- Total catheter days
- Compliance audit scores
- Infection control surveillance findings

### 5.2 Outcome Measures

The primary outcome was reduction in CLABSI rates. Secondary outcomes included improved compliance with aseptic practices and enhanced patient safety.

## 6. Results

**Table 1: CLABSI Rates Before and After Intervention**

CLABSI RATES Before and After Intervention		
Parameter	Pre-Intervention (SEP-2025-NOV2025)	Post- Intervention (DEC 2025-FEB 2026)
Total Number of Central Line Days	1147	1040
Number of CLABSI CASES	2	0
Clabsi Rate (Per 1000 Central Line Days)	1.74	0

**Table 2: Compliance with Aseptic Medication Preparation**

Indicator	Pre-Intervention (%)	Post-Intervention (%)
Hand hygiene adherence	78	95
Sterile medication preparation	70	98
Hub disinfection	68	97
Overall compliance	72	96

**Table 3: Impact of the Intervention**

Outcome	Observation
CLABSI occurrence	Eliminated
Patient safety	Improved
ICU length of stay	Reduced
Nursing workflow	Streamlined
Infection control audit results	Improved

## 7. Discussion

The implementation of a nurse-led sterile medication preparation and monitoring system resulted in complete elimination of CLABSI during the final quarter of the study. Centralizing medication preparation reduced variability in practice and minimized unnecessary catheter manipulation. Continuous supervision and real-time feedback ensured sustained compliance.

These findings are consistent with previous studies demonstrating the effectiveness of nurse-driven infection prevention strategies in reducing CLABSI in critical care settings [4], [5].

## 8. Conclusion

A structured, nurse-led sterile medication preparation system combined with continuous monitoring effectively prevented CLABSI in a high-risk Liver Transplant ICU. This low-cost, sustainable intervention highlights the critical role of nursing leadership in infection prevention and quality improvement.

## 9. Recommendations

- Continue the dedicated nurse preparation model
- Conduct regular infection surveillance and compliance audits
- Sustain ongoing education and competency validation
- Expand the intervention to other ICUs

## References

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## Author Profile

**Capt. (Dr) Usha Banerjee** is a seasoned nursing professional with Bachelor's Degree from the prestigious Armed Forces Medical College, MBA in HR & Industrial Relations, Diploma in Hospital Administration, Diploma in Training and Development and PhD in management from esteemed institutions. She was fortunate enough to hold executive positions in some of the greatest companies. She is currently employed at the Apollo Hospitals Group in India as a Group Director of Nursing. She has over 30 years of noteworthy professional experience in Corporate Hospitals (Manipal, Max Healthcare, and currently Apollo), Academic Nursing, and Military Nursing Services. She has a broad and varied background in healthcare. As a recipient of numerous national and international honours, including the President's Award, she feels that it is her duty to significantly improve the nation's health system and owes this to her profession.

**Mr. Dipin P. Nair** is a Senior Nurse Executive at Indraprastha Apollo Hospital, New Delhi, with nearly two decades of experience in emergency and critical care nursing. He specializes in liver transplant intensive care now, with key expertise in infection control, patient safety, and clinical workflow optimization. An MBA graduate in Healthcare Services.

**Ms. Reena Ligin** is Working as a Lead Nursing Administrator in Infection Control Department since 17 yrs in Apollo Hospitals, New Delhi. After she passed her Graduation, She Started her journey as an ICU Nurse in Cardio Thoracic Unit, Under world renowned Surgeon. Dr. Naresh Trehan. and switched to speciality Nursing as Infection Control Nurse worked Under Founder of Hospital Infection society India (HISI) \*Dr. Raman Sardana\* Hon. secretary of HISI and now currently leading the unit as Lead Nursing administrator.

## Annexures:



**Figure 1:** Trained nurse Preparing all medication in Laminar hood



**Figure 2:** Daily briefings, demonstrations to reinforce infection prevention and aseptic practices.