

ADHERENCE TO ASEPTIC TECHNIQUES DURING CLINICAL PROCEDURES AND THE IMPLEMENTATION OF STANDARD OPERATING PROCEDURES AMONG NURSING PROFESSIONALS IN SELECTED HOSPITAL/MEDICAL COLLEGE OF BARABANKI DISTRICT, UTTAR PRADESH

Dr. Muzammil Ali¹, Dr. Ravindra H.N.², Dr. Kinjal Mistry^{3*}

¹Assistant Professor, Community Health Nursing Department, Hind Institute of Medical Sciences, Safedabad, Barabanki, Uttar Pradesh, India

²Dean, Faculty of Nursing, Parul University, Vadodara, Gujarat, India; Executive Director, GINRA Foundation

³Professor, School of Nursing, P.P. Savani University, Surat, Gujarat, India

***Corresponding Author: Dr. Muzammil Ali**

Email: khanmuzammilali3@gmail.com

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ABSTRACT

Background: Aseptic technique is an essential component of safe nursing practice and infection prevention during clinical procedures. Despite the availability of infection-prevention guidelines and standard precautions, adherence to aseptic practices may vary because of workload, availability of resources, supervision and accessibility of standard operating procedures (SOPs). Direct observation provides an opportunity to identify actual clinical practice gaps that may not be evident through self-reported compliance.

Aim: To assess adherence to aseptic techniques among staff nurses during clinical procedures, identify practice gaps, explore factors influencing adherence, implement a standardized SOP-based intervention, and evaluate changes in adherence following implementation.

Methods: An observational interventional pre-post design was adopted among 100 staff nurses working in direct patient-care areas at Hind Institute of Medical Sciences, Barabanki, Uttar Pradesh. Participants were selected using stratified random sampling. A 17-item observational checklist was used to assess adherence to aseptic techniques before and after implementation of SOP AT/SN/2026/01. A 10-item gap assessment tool, a seven-component SOP compliance checklist and a semi-structured interview guide were also used. Quantitative data were analyzed using frequency, percentage, mean, standard deviation and paired *t*-test, with additional association and correlation analyses where appropriate. Qualitative responses were analyzed thematically.

Results: Before SOP implementation, 61% of nurses demonstrated moderate adherence, 34% demonstrated poor adherence and only 5% demonstrated good adherence. The mean pre-intervention adherence score was 10.38 ± 1.80 out of 17 (61.1%). Following SOP implementation, good adherence increased to 46%, moderate adherence was 53%, and poor adherence decreased to 1%. The mean post-intervention score increased to 13.35 ± 1.87 (78.5%), with a mean improvement of 2.97 ± 1.47 points. The improvement was statistically significant, $t(99) = 20.158$, $p < 0.001$, with a large paired effect size ($dz = 2.02$). All 17 observed practice items demonstrated improvement. The most frequent practice gap was failure to perform hand hygiene (34%), followed by non-availability/non-display of SOPs (32%) and improper PPE use (30%). Mean weekly SOP compliance increased from 74.1% in Week 1 to 89.3% in Week 4. Resource availability was significantly associated with post-assessment adherence ($p = 0.011$), while clinical experience showed a significant negative correlation with adherence ($r = -0.272$, $p = 0.006$).

Conclusion: Implementation of a structured SOP-based strategy was associated with a significant improvement in observed adherence to aseptic techniques among staff nurses. The findings indicate that improving aseptic practice requires not only education but also visible SOPs, adequate resources, supportive supervision, monitoring and periodic reinforcement.

Keywords: Aseptic technique; nursing professionals; infection prevention; standard operating procedure; SOP implementation; hand hygiene; patient safety; clinical practice; nursing compliance.

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INTRODUCTION

Healthcare-associated infections remain an important

patient-safety concern, particularly when invasive and

aseptic clinical procedures are performed without consistent adherence to recommended infection-prevention practices. Nurses are directly involved in procedures such as intravenous cannulation, wound dressing, urinary catheterization and injection administration, making their adherence to aseptic technique an important component of safe clinical care.

Aseptic practice is not limited to hand hygiene alone. It involves a sequence of behaviours, including preparation of equipment, appropriate use of personal protective equipment, maintenance of the sterile field, aseptic non-touch technique, safe handling of sterile instruments, prevention of cross-contamination, sharps safety and appropriate biomedical-waste management. The present study operationalized these behaviours through a structured 17-item observational checklist.

The study was designed around the premise that knowledge of infection prevention does not necessarily translate into consistent clinical behaviour. Direct observation can therefore identify specific points at which recommended practice is omitted or incorrectly performed. The study further recognized that adherence may be influenced by organizational conditions such as workload, availability of sterile supplies, supervision and accessibility of SOPs.

The literature reviewed for the study indicates that multimodal interventions incorporating education, reminders, monitoring, feedback, leadership and organizational support can improve infection-prevention practices. However, the thesis identified a local research gap concerning the integration of direct observation of multiple aseptic behaviours with gap assessment, SOP implementation, follow-up monitoring and exploration of barriers among staff nurses in Barabanki District.

Therefore, the present study assessed actual adherence to aseptic techniques, identified practice gaps, implemented a standardized SOP and evaluated the change in adherence following implementation.

AIM OF THE STUDY

To assess adherence to aseptic techniques among staff nurses during clinical procedures, identify gaps in practice, and implement SOP-based measures to strengthen infection-prevention practices in selected hospital/medical college settings of Barabanki District, Uttar Pradesh.

Objectives

1. To observe and assess adherence to aseptic techniques among staff nurses during selected clinical procedures.
2. To identify gaps or lacunae in aseptic

practices.

3. To determine factors influencing adherence, including workload, supervision and availability of resources.
4. To develop and implement standardized SOPs/checklists for aseptic clinical practice.
5. To evaluate the effectiveness of SOP implementation on adherence to aseptic techniques.

Conceptual Framework:

The study was guided by the Donabedian Structure–Process–Outcome model, which conceptualizes quality of nursing care through three interrelated components. The structure component included the availability of essential resources, equipment, and standard operating procedures; the process component focused on nurses' adherence to aseptic techniques during clinical procedures and compliance with SOPs; and the outcome component reflected improvement in adherence and consistency of safe clinical practices following the intervention. The framework provided a systematic basis for assessing practice gaps, implementing SOP-based interventions, and evaluating changes in aseptic practice among nursing professionals.

MATERIALS AND METHODS

Research Design

An observational interventional research design with a pre- and post-assessment approach was used. The design followed the sequence:

$O_1 \rightarrow X \rightarrow O_2$

where O_1 represented baseline assessment, X represented SOP implementation with orientation, demonstration, reinforcement and supportive monitoring, and O_2 represented post-intervention assessment. As the study did not include a randomized control group, changes were interpreted as pre–post changes associated with the intervention rather than definitive proof of causality.

Study Setting

The study was conducted at Hind Institute of Medical Sciences, Barabanki District, Uttar Pradesh, India.

Participants and Sampling

The study included 100 staff nurses involved in direct patient care. Staff nurses with at least six months of clinical experience who were willing to participate and provided informed consent were eligible. Nursing students, interns, trainees, administrative nursing personnel, non-clinical staff and nurses unavailable or unwilling during the data-collection period were excluded.

Stratified random sampling was used to select the participants.

Study Instruments

Four principal tools were used:

Tool 1: A 17-item pre- and post-observational

checklist assessing aseptic practices before, during and after clinical procedures.

Tool 2: A 10-item gap/lacuna assessment tool identifying specific deficiencies such as hand-hygiene omission, improper PPE use, sterile-field breach, resource shortages, workload and supervision issues.

Tool 3: A seven-component SOP follow-up compliance checklist.

Tool 4: A semi-structured interview guide for exploring contextual barriers and nurses' perceptions.

The principal observational checklist used a binary scoring system: correctly performed = 1 and not performed/incorrectly performed = 0. Scores of 80–100% indicated good adherence, 60–79% moderate adherence and below 60% poor adherence.

Intervention

The intervention consisted of implementation of SOP AT/SN/2026/01. The SOP addressed hand hygiene, equipment preparation, PPE, patient preparation, sterile-field maintenance, aseptic non-touch technique, instrument handling, prevention of cross-contamination, biomedical-waste disposal, PPE removal, hand hygiene and documentation.

Implementation incorporated orientation, demonstration, discussion, accessibility/display of the SOP, supportive supervision and follow-up monitoring.

Data Analysis

Participant characteristics were summarized using frequency and percentage. Mean and standard deviation were calculated for adherence scores. The paired *t*-test was used to compare pre- and post-assessment scores. Chi-square analysis was used for selected categorical associations, Pearson correlation for selected continuous variables, and qualitative responses were analyzed thematically.

Ethical Considerations

The dissertation materials include administrative permission, ethical clearance, participant information, informed consent and other research appendices.

RESULTS

Participant Characteristics

The study included 100 staff nurses. The mean age was 29.43 ± 4.56 years. The largest age group was 26–30 years (40%), followed by 31–35 years (31%), 22–25 years (20%) and 36–40 years (9%).

Female nurses constituted 68% of the sample and male nurses 32%. Regarding professional qualification, 41% were B.Sc. Nursing graduates, 24% were GNM nurses, 21% had Post Basic B.Sc. Nursing qualifications and 14% had M.Sc. Nursing qualifications.

The largest proportion of observations came from the Operation Theatre (31%), followed by the Medical Ward and ICU (21% each), Surgical Ward (18%) and Emergency Department (9%). IV cannulation was the

most frequently observed procedure (33%), followed by catheterization (21%), wound dressing (20%) and injection administration (15%).

Baseline Adherence

Before SOP implementation, 61% of nurses demonstrated moderate adherence, 34% demonstrated poor adherence and only 5% demonstrated good adherence.

The mean baseline adherence score was:

10.38 ± 1.80 out of 17 (61.1%)

This indicated that although many nurses performed several aseptic steps correctly, consistency across the complete clinical sequence required improvement.

Post-Intervention Adherence

Following SOP implementation, 46% of nurses achieved good adherence, 53% demonstrated moderate adherence and only 1% remained in the poor-adherence category.

The mean post-intervention score was:

13.35 ± 1.87 out of 17 (78.5%)

The mean improvement was:

2.97 ± 1.47 points

Thus, mean adherence increased from 61.1% to 78.5% of the maximum possible score.

Effectiveness of SOP Implementation

The paired *t*-test demonstrated a statistically significant improvement in adherence:

$t(99) = 20.158$, $p < 0.001$

The paired effect size was:

$d_z = 2.02$

indicating a large within-participant change.

All 17 observational items showed improvement after implementation. The largest improvement was 30 percentage points, while the smallest improvement was 9 percentage points.

Identified Practice Gaps

The most frequently identified gap was failure to perform hand hygiene (34%). Other identified deficiencies included:

- SOP not available/displayed at point of care – 32%
- Improper PPE use – 30%
- Improper biomedical-waste segregation – 26%
- Work overload affecting practice – 26%
- Inadequate supervision – 26%
- Breach of sterile field – 21%
- Improper handling of sterile instruments – 21%
- Lack of sterile supplies – 14%
- Needle recapping – 13%

These findings demonstrate that non-adherence involved both individual clinical behaviours and organizational/environmental factors.

SOP Follow-Up Compliance

During the four-week follow-up period, mean weekly SOP compliance increased progressively:

Follow-up period	Mean compliance
Week 1	74.1%
Week 2	79.1%
Week 3	85.7%
Week 4	89.3%

By Week 3, all seven monitored SOP components had reached the high-compliance category. During Week 4, aseptic non-touch technique achieved the highest compliance at 94%, while hand hygiene reached 90%.

Factors Associated with Adherence

Resource availability demonstrated a statistically significant association with post-assessment adherence ($p = 0.011$).

Clinical experience demonstrated a significant negative correlation with adherence ($r = -0.272$, $p = 0.006$). Age was not significantly correlated with adherence ($r = -0.033$, $p = 0.747$).

The findings suggest that aseptic adherence should be understood within the broader clinical environment rather than being considered solely an individual nursing characteristic.

Qualitative Findings

Interview responses indicated several practical barriers to consistent aseptic practice. Nurses identified workload, occasional shortages of supplies, variable supervision, the need for refresher training and limited visibility of SOPs as important challenges. Participants also emphasized that adherence becomes easier when sterile supplies and PPE are readily available, SOPs are displayed at the point of care, training is periodically repeated and supervision is regular and supportive.

DISCUSSION

The present study demonstrated a substantial improvement in observed adherence to aseptic techniques following implementation of a structured SOP-based intervention. The mean adherence score increased from 10.38 to 13.35 out of 17, representing an increase from 61.1% to 78.5% of the maximum possible score.

The change was statistically significant and associated with a large paired effect size. Importantly, improvement was observed across all 17 checklist items rather than being restricted to a single practice component. This supports the value of combining standardization with demonstration, monitoring, supervision and feedback.

The baseline finding that only 5% of nurses demonstrated good adherence highlights the difference that may exist between awareness of infection-prevention principles and consistent execution of each step during routine clinical work. Direct observation was particularly useful because it allowed the study to identify specific deficiencies,

including missed hand hygiene, inappropriate PPE use, sterile-field breaches and unsafe waste or sharps practices.

Hand hygiene was the most frequently identified gap. This finding is consistent with the broader literature reviewed in the thesis, which demonstrates that hand-hygiene adherence is influenced by clinical workload, accessibility, organizational support, reminders and monitoring. The study therefore supports the use of multimodal strategies rather than education alone.

The significant association between resource availability and adherence further emphasizes that infection prevention is an organizational responsibility. Nurses cannot consistently follow aseptic standards if essential sterile supplies, PPE or other necessary materials are unavailable.

The progressive increase in SOP compliance over four weeks also suggests that repeated reinforcement and monitoring may be important in translating written standards into routine clinical behaviour. However, because follow-up was limited to four weeks and there was no randomized control group, longer-term sustainability and causal effects should be interpreted cautiously.

The conceptual interpretation of the findings is consistent with the Donabedian Structure–Process–Outcome model. Structural conditions such as resources, supervision, workload and SOP accessibility influence the clinical process, while improved adherence represents an immediate quality-related outcome.

IMPLICATIONS FOR NURSING

The findings support the integration of standardized aseptic technique protocols and clearly accessible standard operating procedures (SOPs) into routine nursing practice. Regular competency-based training, demonstration and return-demonstration, supportive supervision, and periodic monitoring may strengthen nurses adherence to aseptic practices. Nursing administrators should ensure the availability of essential infection-prevention resources and reinforce compliance through continuous education and clinical audit. Incorporating SOP-based practice into staff orientation and ongoing professional development may contribute to safer and more consistent clinical

care.

STRENGTHS OF THE STUDY

The study has several methodological strengths:

1. Direct observation was used to assess actual clinical behaviour.
2. A structured 17-item checklist allowed identification of specific practice deficiencies.
3. The pre-post design permitted assessment of change following SOP implementation.
4. The gap assessment incorporated organizational factors.
5. SOP compliance was monitored over four weeks.
6. Qualitative interviews provided contextual understanding of barriers.
7. The study integrated quantitative and qualitative information.
8. The Donabedian model provided a coherent conceptual framework.

LIMITATIONS

The study was conducted in a selected institutional setting, which may limit generalizability to other hospitals or nursing populations. The pre-post design did not include a separate randomized control group; therefore, the observed improvement cannot be attributed exclusively to the SOP with certainty.

Direct observation may have temporarily influenced participant behaviour. Workload and resource availability may also have varied during observation. Interview responses may have been affected by social desirability. Furthermore, follow-up was limited to four weeks, preventing conclusions about long-term sustainability of improvement.

CONCLUSION

The study demonstrated that adherence to aseptic techniques among staff nurses improved significantly following implementation of a structured SOP-based intervention.

At baseline, most nurses demonstrated moderate adherence and approximately one-third demonstrated poor adherence. Following implementation, good adherence increased from 5% to 46%, while poor adherence declined from 34% to 1%. The mean adherence score increased from 10.38 ± 1.80 to 13.35 ± 1.87 , with a statistically significant paired difference.

The findings indicate that improvement in aseptic nursing practice is achievable through a combination of standardized procedures, practical demonstration, accessible guidelines, supportive supervision, monitoring and adequate resources. The study also demonstrates that infection prevention should be approached as a shared organizational responsibility rather than solely as an individual nursing responsibility.

Importantly, the study assessed adherence to aseptic processes rather than directly measuring healthcare-associated infection rates. Therefore, the findings support improvement in an important infection-prevention process but should not be interpreted as direct evidence of a reduction in HAI incidence.

RECOMMENDATIONS

1. Aseptic-technique SOPs should be clearly displayed and easily accessible at points of care.
2. Regular refresher training should be conducted for nursing professionals.
3. Training should include practical demonstrations and return demonstrations.
4. Particular emphasis should be placed on hand hygiene, PPE, sterile-field maintenance, sterile-instrument handling and biomedical-waste segregation.
5. Periodic direct observation and audit should be continued.
6. Feedback should be provided in a supportive and non-punitive manner.
7. Adequate sterile supplies, PPE and sharps-disposal facilities should be maintained.
8. Nursing supervisors and infection-control personnel should conduct regular monitoring.
9. Workload-related barriers should be reviewed by nursing administration.
10. Future studies should use larger multicentre samples, control/comparison groups and longer follow-up periods to assess sustainability.

DECLARATIONS

Ethics Approval and Consent

Ethical approval was obtained from the appropriate Institutional Ethical Committee before commencement of the study. Administrative permission was obtained from the concerned Medical College authorities. The study methodology incorporated informed consent, confidentiality safeguards and institutional permission procedures.

Conflict of Interest

The authors declared they don't have any actual conflict of interest.

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Author Contributions

Dr. Muzammil Ali: Conceptualization, methodology, data collection, data analysis, interpretation, manuscript preparation and correspondence.

Dr. Ravindra H.N.: Guidance and supervision, methodological review, academic oversight and critical revision of the manuscript.

Dr. Kinjal Mistry: Co-supervision, methodological input, academic review and critical revision of the manuscript.

DATA AVAILABILITY

The datasets generated and analyzed during the study is available according to institutional policy, subject to appropriate confidentiality safeguards.

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