DEVELOPMENT OF QUALITY IMPROVEMENT CHECKLIST FOR NURSES IN CRITICAL CARE UNITS AT AIIMS, JODHPUR

A Thesis submitted to the

All India Institute of Medical Sciences, Jodhpur

In partial fulfillment of the requirement for the degree

Master of Science in Nursing

(Critical Care Nursing)

By

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[2021]

DECLARATION BY THE CANDIDATE

I declare that the thesis entitled “Development of quality improvement checklist for nurses in critical care units at AIIMS, Jodhpur” is a bonafide work carried out by me under the guidance of Dr. Ashok Kumar, Associate Professor, College of Nursing AIIMS, Jodhpur, Dr. Nikhil Kothari, Additional Professor, Department of Anesthesiology, AIIMS, Jodhpur and Mr. Nipin Kalal, Assistant Professor, College of Nursing AIIMS, Jodhpur. No part of this thesis has formed the basis for the award of any degree previously.

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This is to certify that the thesis entitled “Development of quality improvement checklist for nurses in critical care units at AIIMS, Jodhpur” is a bonafide work done by Ms. Ritika in partial fulfillment of requirement for the award of M.Sc. (Nursing) degree of the All India Institute of Medical Sciences, Jodhpur under the guidance of undersigned. She has carried out the work at College of Nursing, All India Institute of Medical Sciences, Jodhpur.

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“As we express our gratitude, we must never forget that the highest appreciation is not to utter words, but to live by them”.

-John Fitzgerald Kennedy

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LIST OF ABBREVIATION USED

AICU : Adult Intensive Care Unit

AIIMS : All India Institute of Medical Sciences

CAUTI : Catheter-Associated Urinary Tract Infection

CLABSI : Central Line-Associated Blood Stream Infections

CVP : Central Venous Pressure

FGD : Focus Group Discussion

HDU : High-Dependency Unit

ICUs : Intensive Care Units

NICU : Neonatal Intensive Care Unit

PCA : Principal Component Analysis

PICU : Pediatric Intensive Care Unit

PPE : Personal Protective Equipment

VAP : Ventilator-Associated Pneumonia

ABSTRACT

Introduction: Patient in critical care units are admitted with multiple clinical problems. So, the ICU staff needs high level of skills and knowledge. As busy environment with critical situations makes nurses more prone to commit mistakes. Thus, the checklist helps the staff in providing adequate, safe, and efficient client care and reducing the gaps in communication.

Objectives: To develop quality improvement checklist for nurses working in critical care units (AICU and HDU).

Methodology: A methodological design was used to develop quality improvement checklist for critical care units in five phases: Preliminary Phase, validation of checklist drafts, pilot study, final try out, and evaluation phase. The items for the quality improvement checklist were generated through extensive review of literature and FGDs and content validation was done through modified Delphi technique, which yielded the tool with 32 items in 6 different domains. The checklist validity was determined through assessment of face validity, content validity and construct validity using principal component analysis on the data provided by 190 nursing officers of AICU and HDU of All India Institute of Medical Sciences, Jodhpur. Reliability was calculated in term of internal consistency and equivalence of checklist.

Results: The result of the study suggest that quality improvement checklist is valid and reliable to improve the quality of critical care units. Cronbach's alpha

was used to measure the internal consistency of the checklist, which was 0.78. Content validity index was calculated and was found to be 0.98. In order to estimate equivalence Inter-rater reliability method was used and percentage of agreement between raters was 88%. Construct validity was analyzed by factor analysis. All items were loaded in 8 factors and accounted for 60.7% of variance.

Conclusion: Quality improvement checklist has high reliability and validity values and can be used to evaluate and improve the quality of critical care units.

Keywords: *Critical Care; Checklist; Factor Analysis; Intensive Care Units; Principal Component Analysis; Quality Improvement*

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CHAPTER – I

INTRODUCTION

INTRODUCTION

"The objectives of having standards is to raise them".

- ***Earnest Codman***

BACKGROUND OF THE STUDY

Critical Care Unit is a precisely staffed and equipped, distinct and self-contained area of a hospital allocated for the management and monitoring of patients with life threatening conditions. Thus it provides special expertise and the facilities for the support of vital functions and uses the competence of medical, nursing and other personnel experienced in the management of critically ill patient.[1]

In order to provide care to critically ill patients ICU performance is to be monitored precisely to upgrade the effectiveness and the quality of care delivered in ICU treatments. Systemic and consistent interventions are a part of Quality improvement that contribute towards measurable refinement in health-care facilities as well as targeted patient group's health status. The efficacy of any health-care unit is judged by its quality indicators. The Institute of Medicine (IOM) defines Quality as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge". The effect of Quality assurance majors in the ICU has been shown to minimize hospital acquired infections, enhance outcomes as well as decrease the cost.[2]

Human error is inescapable—especially during stressful circumstances. As stress and exhaustion levels rise, it has been shown that cognitive levels get

affected, as it is typical in many dynamic, highly critical field of work which may then lead to rise in judgment inaccuracy, diminished compliance with conventional protocols, and lowered competency. The checklist, a key tool in minimizing the likelihood of costly errors and improving overall outcome, is an effective instrument for solving the problem across all of these areas. A checklist is a manually organized list of action items that assure all items are accomplished.[3]

Hemodynamically unstable patients are overburden with disease and hence delivering care to them is complex.[4] Hospitals, chiefly their critical care units are not safe for high dependency patients due to an inflated chances of life – threatening mistakes to occur. Even if some mistakes produce slight difference to patient status, the risk for complications that bring harm to patients is clearly present. Errors can occur throughout the hospital, the intensive care unit (ICU) surely provides abundant opportunities for making them, as ICU patients are conceivably among those who are least able to withstand the consequences of a mistake.[5] Thus checklists have been put forward as an instrument to make certain that vital elements of care are not omitted.[6]

Human memory is liable to error, and acute stress can adversely affect performance and attention. Checklist make certain that all protocols are followed rather than depending solely on human memory.[7] Hence Checklists tremendously reduces errors, morbidity and mortality.[8]

As patient safety and outcome become a more grounded focal point of the

critical care units, the utilization of reliable instrument for error reduction such as checklists contributes to more effective practices, better patient outcomes and safety, more efficient use of allocated funds and resources.[3]

Frequent cause of harm for hospitalized patients are preventable medical errors. Recent evidence suggests that each year 200,000 to 400,000 deaths of patient occur due to errors. Lack of effective communication is a significant cause of these preventable errors and poor-quality transfers of patient care are accompained with adverse events. Literature suggests that clinician communication at intraoperative handoff of care and relay and retention of critical patient information is improved through electronic checklist.[9]

The complexity of medical conditions seems to be increased in intensive care unit, so checklist are particularly relevant to critical care. It was uncovered that more than one million injuries and nearly 100,000 deaths occur annually as a result of omissions in medical care.[10] As a result checklists have been put forward to avoid errors of omission, improve communication and prevent injuries.[11]

Study suggests that when withdrawal-of-life-support checklist was administered in two tertiary care medical surgical intensive care units (ICUs), 80% of nurses believed that the checklist led to improved withdrawal of life support and end-of-life care.[12]

There is an increased risk of an adverse event during intra-hospital transport as

critically ill patients are frequently transported between the ICU and other sections of the hospital for diagnostic and/or therapeutic interventions transport.[13] Thereupon checklists have also been demonstrated to improve safety.[14]

Checklist improves patient safety culture and handoff evaluation.[15] Checklist have been shown to prevent Ventilator associated pneumonia[16], maintenance and insertion of central line, and increase quality of medical information and proven to decrease morbidity and mortality with education and strict implementation.[17]

As considering that there exists only few data that encompasses all the domains that is desired to improve the quality of critical care units. So, this study aims to develop a quality improvement checklist for critical care units in order to minimize errors of omissions and increase quality of critical care units.

NEED OF THE STUDY

Patient in critical care units are admitted with multiple clinical problems. Thus, high level of skills and knowledge are required by ICU staff. In critical situations nurses are more prone to commit mistakes due to the complexity and busy environment of ICU. Hence, the checklist helps the staff in providing client care that is competent, efficient, safe and reduces the gaps in communication.[18]

According to World Health Organization (WHO) August 2019 report, indicates that while receiving hospital care one in 10 patients is harmed with nearly 50%

of them considered preventable. Worldwide, unsafe care is one of the 10th leading cause of death and disability. Globally, four out of 10 patients are harmed while receiving health care facility, with up to 80% of the harm considered to be preventable. Leading cause of avoidable harm in health care around the world is unsafe medication practices and errors – such as incorrect dosages or infusions, unclear instructions and use of abbreviations.[19]

Medical errors are common and dangerous threats to patient safety. Literature indicates that when data on errors and near errors were recorded in logbooks daily for 28 days, it was found that more than one third of registered nurses reported catching themselves making an error and over one quarter of them reported making an error. 224 errors and 350 near errors were reported. Various types of error were reported which includes procedural error and near errors, as well as transcription and charting errors yet medication administration was the most frequent type of error (56.7%). Study results suggests that these findings have significant implications for patient safety among seriously ill patients who have little natural resilience or ability to protect themselves from health-care mishaps.[20]

Adverse events and serious errors involving critically ill patients are common and often potentially life-threatening. During 1490 patient days 391 patients were studied which revealed 120 adverse events in 79 patients (20.2%), including 66 (55%) non preventable and 54 (45%) preventable adverse events among which 13% (16/120) were life-threatening or fata. There were 223 serious errors which were reported among which 11% (24/223) were potentially

life-threatening. Most serious medical errors occurred during the ordering or execution of treatments, especially medications (61%; 170/277). Performance level failures were most commonly slips and lapses (53%; 148/ 277), rather than rule-based or knowledge-based mistakes.[21]

Critically ill patient possess a notable risk of developing hospital acquired blood infections, majority of which originate due to intravascular devices. International Nosocomial Infection Control Consortium (INICC) states that in 1000 central line days in the INICC's Intensive care units the clustered rate of Central Line Associated Blood Stream Infection (CLABSI) is 4.9 which is nearly 5-fold higher when compared with US ICUs. Study done at medical ICU of Sanjay Gandhi Post – graduate Institute of Medical Sciences, Lucknow showed that overall rate of CLABSI was 17.04 per 1000 catheter-days and 14.21 per 1000 inpatient-days and thus CLABSIs have the highest mortality rate ranging from 12% to 25%. Study results concluded that there is a strict need for catheter insertion and maintenance checklist on nurses' chart.[22]

More recently, evidence-based practices have been targeted on checklists. As practices to improve patient outcomes are not certainly translated to the bedside, so when the checklist was used as a part of a multifaceted intervention for improving the overall care of mechanically ventilated patients, it led to a 66% improvement in the use of evidence-based best practices when compared with the period before the study.[23]

One of the major cause of hospital acquired infection in critically ill patients is

Ventilator – associated pneumonia (VAP). Mathai et al. carried out a study in northern India mixed medical surgical ICU where they found 95 (38%) patients who developed VAP were ventilated for more than 48 hour, with an incidence rate of 40.1 VAP infections per 1000 mechanical ventilation days and increased cost of treatment. Study highlighted the need to implement urgent measures to decrease the rate of infection in ICU.[24]

In ICU one of the major cause that lead to poor outcome is CLABSI. Application of catheter insertion and maintenance checklists has resulted in decrease incidence of CLABSI.[25] Another study concluded that the use of checklist increased compliance to standards of hygiene while insertion of central venous lines which reduced the frequency of infections significantly.[26]

Literature reflects the incidence of pressure ulcers to be 8.8–23% in the ICU. Wolverton et al. revealed incidence of pressure ulcer in general ICU as 13.7% of the 422 patients in University hospital at Indianapolis. So, there is a need of provision of some guidelines with ongoing nursing documentation for prevention of pressure ulcers.[27]

DuBose et al. demonstrated that introducing a daily Quality round checklist in a busy Level I trauma ICU improved adherence to clinically significant prophylactic measures. Results revealed that there was a significant improvement in patient outcome after the daily use of this checklist which takes just a few minutes per patient to complete.[28]

Study conducted by Byrnes et al. revealed that mandatory checklist use increased the rate of transfer out of patients from intensive care unit to telemetry (16% vs. 35%, $p < .0001$) with initiation of physiotherapy (28% vs.42%, $p < .0001$) when compared with baseline practice.[29]

Hence there is a need of quality improvement checklist for critical care unit that will help to improve patient outcome and quality of critical care units through standardization of procedures and treatment protocols.

AIM

To develop quality improvement checklist.

STATEMENT OF PROBLEM

Development of quality improvement checklist for nurses in critical care units at All India Institute of Medical Sciences Jodhpur, Rajasthan.

OBJECTIVE

To develop quality improvement checklist for nurses working in critical care units (AICU and HDU).

OPERATIONAL DEFINITION

1. **Critical Care Unit:** In context of this study, critical care units are units that cater hemodynamically unstable patients, which include AICU and HDU.
2. **Quality Improvement Checklist:** Quality improvement checklist is a tool used in ICU to standardize the process that lead to measurable improvement

in quality of targeted units which includes 6 domains namely: Infection control, patient care and safety, nutrition and elimination, inventory, recording and reporting, continuing nursing education.

3. **Nurses:** In context of this study, nurses who are working in critical care units (AICU and HDU) at All India Institute of Medical Sciences Jodhpur, Rajasthan.

DELIMITATION

Study was delimited to nurses of AICU and HDU at All India Institute of Medical Sciences Jodhpur, Rajasthan.

CHAPTER – II

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Review of literature is a written summary of evidence on a research problem. The review identifies, evaluates and organizes the concepts in relevant literature. It contextualizes the research and facilitate analyses and interpretation of results.

Review of literature was done to assess in-depth information regarding quality improvement protocol or policy in critical care units and various checklist used in critical care units.

The review had been conducted from various journals, articles and other previous studies using the electronic databases PubMed, MEDLINE, CINHAL, and Google Scholar. The BOOLEAN Operators, AND/ OR was used for the review, using the following:

- Quality Improvement AND Critical care unit
- Critical care unit AND Checklist
- Quality Improvement AND Checklist OR Critical care unit
- Quality Improvement Checklist AND Critical care unit
- Quality Improvement AND ICU checklist

The review focused mainly on the studies containing information related to quality improvement checklist in critical care units. The studies which suggested about impact of quality improvement checklist on outcomes in ICU, the various tools used to assess the quality and outcome of critical care were included.

Hallam et al. carried out a qualitative study to understand perception of health care professionals working in ICU and develop improved framework for rounding checklist implementation. Daily rounds were directly observed and semi structured interviews were conducted with ICU clinicians. Themes were identified using inductive and deductive approach through observation and interviews. Results reflected that checklist were daily reminder and sometimes perceived as not helpful when checklist was not in accordance with the ICU's need.[30]

Kumar et al. conducted an observational study to assess outcome in a surgical Intensive care unit using Quality Improvement checklist. In order to examine the compliance to checklist sample of 170 patients were prospectively analyzed in comparison with 170 patients who underwent similar surgeries in the previous 3 months. Result concluded that in the prospective samples there was a significant improvement in the documentation of quality indicators (98% vs. 32%) with the use of checklist. However no difference was found in rate of mortality, length of ICU stay or nosocomial infection rates. Authors concluded that with implementation of quality improvement surgical checklist there was improvement in documentation of parameters related to quality control yet there was no difference in infection rates when compared with control sample. [31]

Taylor et al. conducted a study with quasi – experimental research design in a period of 24 months, to evaluate the impact of checklist on central line associated infections. Insertion, daily maintenance and procedural access based on the existing clinical guideline were evaluated using a checklist. Results

depicted that rates of CLABSI declined to 41%. Compliance for central line insertion was 70%, and overall mean for daily maintenance was 66% which depicted significant reduction of CLABSI in neonatal unit.[20]

McConnell et al. carried out an observational study to assess the effect of post – intubation checklist and time out on process-related outcomes. Result shows that compliance with checklist is 71% with ICU intubations and 27% for intubations performed outside the ICU. Checklist use was negatively impacted while transfer from referring institutions (23% checklist initiation rate, P .006). Checklist adherence was higher with ICU intubations (71%) on random sample of mechanically ventilated adults**.** Results concluded that mechanical ventilation monitoring was improved with the use of post-intubation checklist and time out.[32]

Li et al. conducted a prospective observational cohort study to develop a quality improvement bundle for safety of tracheal intubation. Opinion of 1715 children undergoing tracheal intubation at 15 PICUs were taken to reach the consensus. National Emergency Airway Registry was used for collecting information regarding baseline process and outcomes in tracheal intubation. A multidisciplinary quality improvement committee was formed. Airway Bundle Checklist was developed through workflow analysis and pilot testing in 4 parts which can help to improve the safety in airway management at various PICUs.[33]

Al Ashry et al. conducted a retrospective analysis of data with utilization of nurse led checklist. The comparison was made among hospital, ICU and ventilator stay. Results showed after implementation of nurse-led ICU checklist,

there was decrease in hospital, ICU and ventilator stay.[34]

Kaushal et al. conducted a methodological study to develop a patient receiving checklist for nurses in ICUs of tertiary health care facility. Checklist was developed in 5 phases. There were 12 main steps with 105 items in the final draft of checklist. Study reported that nursing checklist was valid and reliable and it can be administered in context of research and daily practice.[21]

Carlos et al. carried out a prospective analysis on physician for improving adherence to use of checklist by attending physician during ICU rounds. From April 2013 to March 2014 five thousand eight hundred twelve patients days of ICU care were assessed. Results showed adherence to use of checklist during ICU rounds with decrease in use of assisted devices.[35]

Kowitlawakul et al. conducted a cross-sectional study to observe nurses and doctors during handover of patients in and out of the intensive care unit through use of checklist. Implementation of checklist provided the data for improving the handover process during the transfer of patients in and out of the intensive care unit.[36]

Just et al. conducted a prospective single-center randomized trial to determine the effectiveness of checklists for emergency procedures. Two ICU nurses and one ICU residents of intensive care unit in a tertiary care health facility at Germany were randomized to use the checklist and outcome measurement was done. Result concluded that study subjects commenced items faster and more

completely in accordance with treatment guidelines (9 vs 7 items with and without checklists, P b .05) with the use of checklist. It has been found that checklist was beneficial in type 2 scenarios than in type 1 scenarios (2 vs 1 additional item. Use of checklist lead to completion of items faster in type 2 scenario. Study concluded that checklist can help in accomplishment of treatment steps.[8]

Ceballos et al. carried out a study for quality improvement in which nurse leaders audited neonatal educational module, CLABSI and VAP bundle checklist which revealed decrease in CLABSI that evoked 84 fewer hospital days which resulted in reduction in cost of $348,000 and pre intervention to post intervention 92% reduction in CLABSI. It was reported that there was 27% reduction in central line days. Decrease in VAP elicited 72 fewer hospital days, reduction in cost of $300,000 and pre intervention to post intervention 71% reduction in VAP. It was found that there was 31% reduction in vent days. Result indicated that bundled interventions provided the nurses with a structure to successfully implement a systematic process for improvement.[27]

Rod et al conducted a study to evaluate the effectiveness of a daily safety checklist on reductions in invasive device use and care costs in PICU. During a 21-month period, the checklist was used to prompt the care team to address quality and safety items during rounds in the pediatric ICU at Children's Hospitals and Clinics of Minnesota. Result concluded that after successful implementation of daily safety checklist there was improved quality and safety measures which includes use of invasive device, cost of medication, use of

laboratory tests and antibiotic, and adherence to care standards. For safety, communication and collaboration staff satisfaction rates were greater than 80%.[38]

Anja et al carried out a study in which a tool was developed for critically ill patients to increase safety of intra-hospital transport. Checklist was developed in three steps. In first step, review of literature was done to assess the published guidelines and available checklists. In second step, incident was collected from ICU regarding intra – hospital transport. In the next phase, discussion with ICU physicians and ICU nurses were done regarding the incidents which concluded that there was a need for development of standard checklist and inter – department communication. In final phase of the study intra – hospital checklist was developed. To evaluate the checklist, nurses feedback was taken which was found to be positive and average time taken for filling the checklist was 4.5 minutes.[13]

Dubose et al conducted a study to assess the efficacy of Quality Rounds checklist in fostering adherence to 16 prophylactic measures for VAP, DVT or pulmonary embolism, central line infection and other ICU complications. Before administering Quality Rounds checklist compliance to 16 prophylactic measures was assessed for 1 month. For three months, multidisciplinary team assessed the compliance which was then compared with compliance rate of pre Quality Rounds checklist. Result depicted that after introduction of a daily quality round checklist in a busy Level I trauma ICU, there was improvement in compliance rates for 16 clinically significant prophylactic measures.[28]

CHAPTER – III

METHODOLOGY

RESEARCH METHODOLOGY

This chapter deals with research methodology which includes research approach, research design, phases of tool development, validity and reliability of checklist.

RESEARCH APPROACH

Quantitative research approach has been used in the current study. Quantitative approach is defined as a systematic investigation of phenomena by gathering quantifiable data and performing statistical, mathematical or computational techniques.

RESEARCH DESIGN

In present study Methodological research design has been used. Methodological research design is a process used to develop the validity and reliability of instrument to measure constructs used as variable in research.

STUDY SETTING

Setting of this study is selected as Critical care units that include AICU and HDU of All India Institute of Medical Sciences, Jodhpur, Rajasthan as these are the units that cater adult critically ill patients who are hemodynamically unstable. Quality of these units should be maintained in order to have efficient patient outcome.

RESEARCH METHODOLOGY

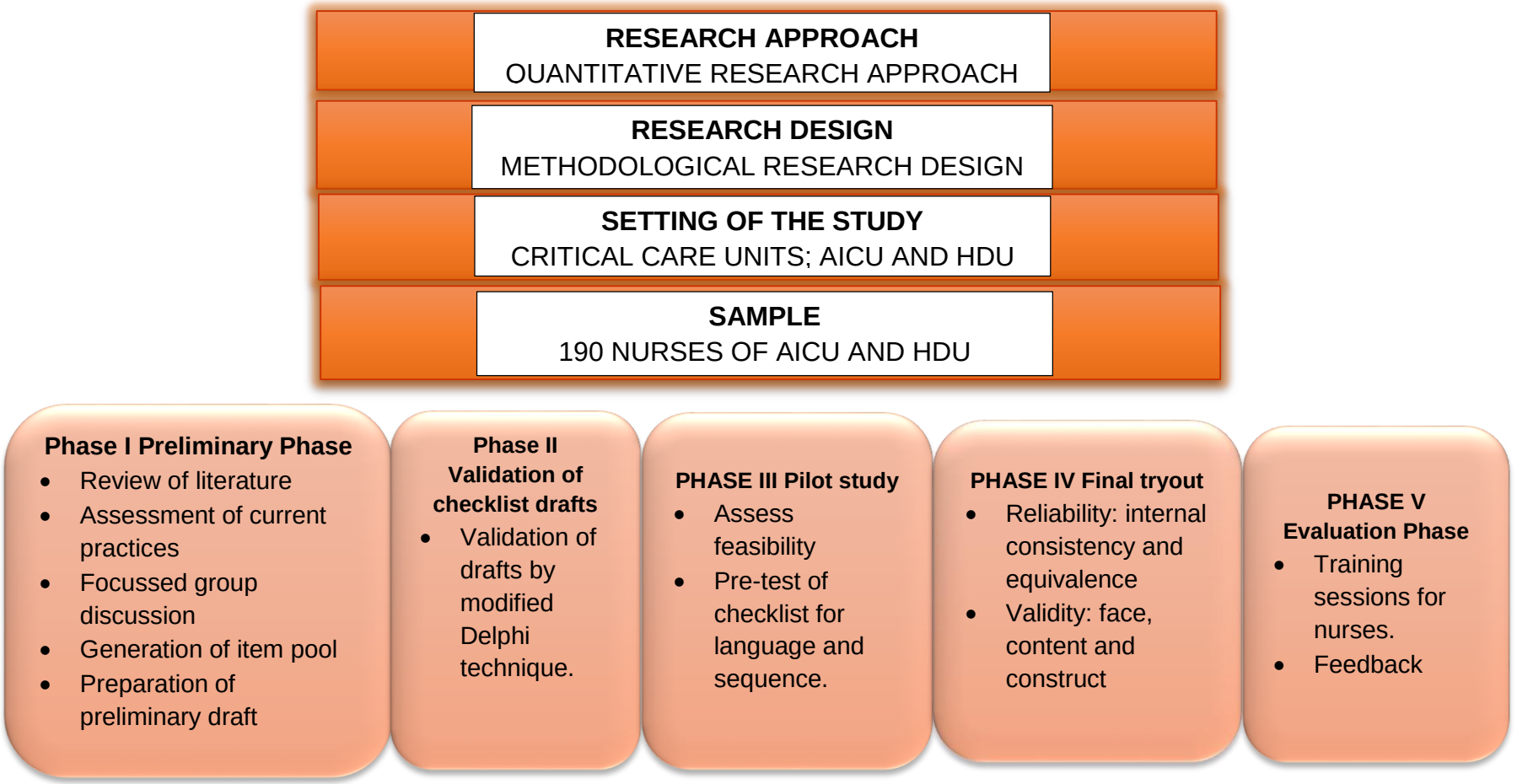

Figure 1: Schematic representation of research methodology

ETHICAL CONSIDERATION

Ethical clearance certificate has been obtained from the Institutional Ethical Committee, AIIMS Jodhpur, Rajasthan. (Appendix – I)

- Written Informed consent was obtained from the nurses involved in the study after providing a complete explanation of the research information. (Appendix – II & III)
- Confidentiality of the subjects was maintained and the study subject was given full autonomy to withdraw from the study at any time.

PHASES OF TOOL DEVELOPMENT

The Quality Improvement checklist was developed under five phases:

Phase I: Preliminary Phase

1. Review of literature
2. Assessment of current practices
3. Focussed group discussion (FGD)
4. Generation of item pool
5. Preparation of preliminary draft

Phase II: Validation of drafts of quality improvement checklist for critical care units (By Modified Delphi technique)

1. Preparation and validation of subsequent drafts

Phase III: Pilot Study

Phase IV: Final try out

1. Reliability: Internal consistency and equivalence of checklist
2. Validity: Face, Content and Construct validity

Phase V: Evaluation Phase

PHASE I – PRELIMINARY PHASE

This is the first phase of tool development in which preliminary draft of quality improvement checklist for critical care units has been prepared on the basis of review of literature, assessment of current practices, focussed group discussion, and previously available tools.

1. **Review of Literature:**

   Literature was reviewed related to various guidelines and/or protocols practiced in critical care units through national and international journals, books, manuals and web search like PubMed, Google scholar, CINHAL and Cochrane library etc.

2. **Assessment of Current practices:**

   Current practices to improve the quality of critical care units was assessed by asking about the various checklist that were being followed in the designated unit. Information was collected from senior nursing officers of the respective units. As conclusion there were checklist followed for prevention of CLABSI, CAUTI, VAP, pressure ulcer risk assessment checklist, and also a quality assurance checklist consisting of various criteria for assessing the practice of nursing staff, hospital attendants and housekeeping staff was followed in critical care units.

3. **Focussed group discussion (FGD):**

Focussed group discussion is a qualitative approach to gain an in-depth understanding of social issues. The aim of this method is to obtain data from a purposely selected group of individuals rather than from a statistically representative sample of a broader population.[39]

The focus group discussion is a method which brings together a small homogenous group, usually six to twelve persons to discuss topics on a study agenda.[40]

The following research methodology was followed for conducting focus group discussion.

Setting: Critical care units including AICU, NICU, PICU and HDU at All India Institute of Medical Sciences.

Population: Nurses working in AICU, NICU, PICU and HDU.

Sampling technique: Non probability convenient sampling.

Sample and sample size: 8 nurses working in critical care units (AICU, NICU, PICU, HDU).

Focussed group discussion guide:

Contain few semi-structured open ended questions to conduct FGD. These are as follows:

a. What are the current standard practices are you following for quality improvement?

b. According to you, in what areas there is a need to improve the quality of critical care units?
c. According to you how can you improve the outcome of patient care?
d. What evaluation criteria are you using to measure the outcome of care?

Results: After reviewing the content of group discussion major findings identified are:

- The FGD (Annexure VIII) revealed that, in the area of patient care current standard practices that were being followed were oral care, back care, tracheostomy care, bed bath, eye care, positioning, catheter care, central line care and chest tube care. But there was a need of improvement in the area concerning to infection control to prevent mishandling and mislabelling of invasive lines and medicine bottles respectively. To measure the outcome of care certain checklist like CLABSI, CAUTI, PICC line, Artery line, IV cannula, pressure ulcer risk assessment checklist were used. However in order to improve quality care of critical care units there was a need to develop and follow the institutional protocols.

4. Generation of item pool:

An initial pool of items were generated through deductive and inductive method via literature review, FGDs and through researcher's personal experience of the critical care unit. Identified items categorized in some

domains like infection control, patient care and safety, nutrition and elimination, inventory, recording and reporting, handover evaluation and pooled these all together.

5. Preparation of preliminary draft:

The preliminary draft of quality improvement checklist was prepared by relevant literature, consultation with guide and co-guide, incorporating the results of assessment of current practices and valuable suggestions of nurses gathered in FGDs.

The blue print of preliminary draft (Appendix – IX) of quality improvement checklist has been prepared with 55 items under following domains:

1. Infection control (25 items)
2. Patient care and safety (10 items)
3. Nutrition and elimination (4 items)
4. Inventory (5 items)
5. Recording and Reporting (8 items)
6. Handover evaluation (3 items)

Scoring of quality improvement checklist was done as 1 and 0. Score of 1 was given for yes, score of 0 was given for no and no score was given for not applicable. Maximum score was 55 and minimum score was 0.

PHASE II - VALIDATION OF DRAFTS OF QUALITY IMPROVEMENT CHECKLIST

The Delphi is a unique iterative process designed to combine expert opinion into group consensus. According to Dalkey and Helmer (1963) Delphi technique is defined as a method used to obtain the most reliable consensus of opinion of a group of experts by a series of intensive questionnaires interspersed with controlled feedback.[41]

The goal is to reduce the range of responses and arrive at something closer to expert consensus.[42]

The modified Delphi technique is homogenous to the Delphi with regard to the procedure (i.e., a series of rounds with panel of experts) and intent (i.e., to foresee future events and to reach at consensus) and is selected to obtain expert input from individuals who were widely dispersed geographically through mail, post, etc.[43,44]

The proper accomplishment of Delphi process depends mainly on the expert panel. Therefore careful selection of experts should be made. An expert is considered as a person who possess expertise and knowledge in field under study, who has time and willingness to participate in the study. Willingness and commitment are essential factors since the process involves multiple rounds before attaining consensus.[44]

In the present study, Modified Delphi technique was used with a large, geographically diverse sample of Anesthesiologists in Critical Care unit, Associate Professor and Assistant Professor from Department of Medical Surgical Nursing and Assistant Nursing Superintendent of Critical care unit to develop a valid and reliable checklist consisting of items crucial for quality improvement of critical care units. The selection of experts was done through purposive sampling technique as they were selected for a purpose of application of their knowledge and expertise towards the subject matter under study.

The Delphi method involves seeking opinion from the experts who are qualified to answer a clinical question. Since the panel members were present over different parts of India, the main means of invitation was via email, even though personal contact was also used as a means of communication. The initial contact with the selected experts were made through mail in which a request letter (Appendix – VII) was sent inviting them for the Delphi method along with the study title. In August 2020, request letter was sent to 20 experts from the field of medicine as well as nursing inviting their participation as an expert in the study. A panel of 10 experts (Appendix – VI) provided their consent for participation and agreed to provide expert guidance in order to reach the final consensus.

The blue print of preliminary draft of the checklist was circulated among 10 experts for the content validation of the quality improvement checklist. They were requested to go through the items and give their suggestions regarding the checklist in terms that items are relevant, need modification or omitted for

assessment of the content validity of the checklist. Modifications in the checklist were made in accordance with the expert's opinion. Three subsequent rounds of modified Delphi technique were conducted to reach final consensus.

First round of modified Delphi:

In the first round, a preliminary draft/first draft of quality improvement checklist was sent to 20 experts from different institutions of India but 10 experts replied. First draft (Appendix – IX) has been prepared with 55 items under 6 domains: infection control (contain 25 items), patient care and safety (contain 10 items), nutrition and elimination (contain 4 items), inventory (contain 5 items), recording and reporting (contain 8 items), handover evaluation (contain 3 items). Scoring of 1 will be given for 'YES', 0 will be given for 'NO' and no score will be given for 'N.A' (not applicable).

Modification done after first modified Delphi:

a. Domain modifications

As per the expert's suggestions and the domain statements that were overlapping/duplicating, those domains were modified. In the first draft of quality improvement checklist 6 domains were formulated: infection control, patient care and safety, nutrition and elimination, inventory, recording and reporting, handover evaluation but in the second draft one domain handover evaluation was removed and one domain continuing nursing education was added.

b. Statement modifications

There are some statements in the domains of the checklist, those meaning was overlapping with another domain statement were modified and merged in the

more suitable domain and some new statements added in second draft. Items from the handover evaluation domain were more concerned with documentation, those were deleted and suitable items were added in suitable domain as inventory and recording and reporting.

After compiling the correction and suggestion from experts under modified Delphi rounds, modifications made and second draft prepared (Appendix – X), which was again sent to all 10 experts that were present in first round among them 9 experts replied in second round.

Item number decreased from 55 items to 45 items in second draft with six domains infection control (22 items), patient care and safety (10 items), nutrition and elimination (3 items), inventory (5 items), recording and reporting (4 items), continuing nursing education (1 item).

Modifications done after second modified Delphi round:

a. Instruction note modification:

Instruction note modified with little change in the third draft of quality improvement checklist as: Please read each statement carefully and put a tick mark on appropriate place which will indicate the quality of critical care units. Scoring of 1 will be given for ‘YES’, 0 will be given for ‘NO’ and no score will be given for ‘N.A’ (not applicable). Anonymity and confidentiality of your responses will be maintained. Observation, Record review and Staff Interview can be used as a method of assessment by the assessor for assessing the following items.

b. Statement modifications:

Some items from the second draft were deleted in the third draft as they were overlapping with other items and meaning were same in some items. As per expert's suggestion some items were reframed.

After compiling the correction and suggestion from experts under modified Delphi rounds, modifications made and third draft prepared along with the content validity Performa (Appendix XI & XII), which is again sent along with the content validity Performa to all 10 experts among them 9 experts replied with the content validity Performa. Total of 35 items were retained in third draft with six domains: infection control (contain 16 items), patient care and safety (contain 9 items), nutrition and elimination (contain 2 items), inventory (contain 3 items), recording and reporting (contain 4 items), continuing nursing education (contain 1 items).

Modification done after third Delphi round:

a. Statement modifications:

Items in some of the domain were overlapping with other items and were not feasible for the assessment were deleted from the checklist. Two items (Item 1.13 & Item 1.14) from infection control domain were deleted and one item (Item 5.1) from recording and reporting domain was merged with other suitable item of same domain. Total of 32 items were retained in the final draft of quality improvement checklist for critical care units.

b. Scoring key modification:

In the third draft, scoring keys were as: Score for 1 was given for Yes and 0 was given for No and no score was given for not applicable but now in final draft the scoring keys modified as: Yes (1) and No (0).

Final Draft of Quality Improvement Checklist:

After three rounds of the modified Delphi technique, the final draft of quality improvement checklist for critical care units (Appendix – XIII) was prepared as well as circulated among experts and final consensus was achieved.

The final draft of quality improvement checklist for critical care units contains six domains namely: infection control (14 items), patient care and safety (9 items), nutrition and elimination (2 items), inventory (3 items), recording and reporting (3 items), continuing nursing education (1 items). Total of 32 items are retained in the final draft of quality improvement checklist for critical care units. The minimum score of the checklist is 0 and maximum score of checklist is 32. Higher scores reflect efficient quality of critical care units.

PHASE III – PILOT STUDY

The pilot study was conducted to assess the feasibility of the checklist, to examine the composition and sequence of items, to determine the time required to complete the checklist, to pre-test the checklist for understanding and language clarity of checklist.

Study setting: Setting of pilot study was AICU and HDU.

Population: Nurses working in AICU and HDU.

Sampling Technique: Non – probability convenient sampling

Sample and sample size: 20 nurses working in AICU and HDU.

Sample selection criteria: Nurses who are available and willing to participate in study.

Data collection tool: Final draft of Quality Improvement checklist for critical care units.

Duration of data collection: The data was collected in the month of November 2020.

Result of pilot study: Pilot study revealed that the checklist was comprehensible and easy to understand. The average completion time for quality improvement checklist for critical care units was 8 - 10 minutes. The tool was found to be feasible with adequate composition and sequence of items in the checklist. No problem was found during pilot study. No modification were done after pilot study.

PHASE IV – FINAL TRYOUT

Final draft of tool was tried out on large sample.

Study Setting: Setting of final tryout was critical care units including AICU and HDU of All India Institute of Medical Sciences, Jodhpur.

Population: Nurses working in AICU and HDU.

Sampling Technique: Non probability convenient sampling technique.

Sample and Sample size: 190 nurses working in AICU and HDU.

Sample selection criteria: Nurses who are available and willing to participate in the study.

Data collection tool: Quality Improvement checklist for critical care units.

Data collection procedure:

The data collection was done in December 2020. The average completion time to complete the checklist was 8 – 10 minutes.

- Formal permission was taken from the institute ethical committee to conduct the study.
- Data was collected after taking the informed consent from the nurses working in critical care units (AICU and HDU) of AIIMS Jodhpur.
- Nurses who were included in the study were explained regarding the purpose of study and were ensured that confidentiality of the information will be maintained.
- Data was collected by providing Quality Improvement checklist to the nurses those who were willing to participate in the study.

RELIABILITY OF QUALITY IMPROVEMENT CHECKLIST

Internal Consistency:

Data was analysed by SPSS (version 20.0). There were a total of 32 items in quality improvement checklist and overall Cronbach's alpha of quality improvement checklist was found to be 0.78 which indicates good internal consistency.

Cronbach's alpha if item deleted:

To ensure the reliability of each item, each item was deleted one by one to see the changes in the value of Cronbach's alpha in order to examine the individual contribution of items. When the individual item was deleted the value of Cronbach's alpha either remained same or decreased for 31 items which indicated that all 31 items are contributing to the reliability of the checklist. But for 1 item the value of Cronbach's alpha was increased when the individual item was deleted. (Table – 1)

As the item has significant contribution in the checklist despite the increased value of Cronbach's alpha after their deletion. Hence, all the 32 items were retained in the checklist with guide and expert's permission.

Average checklist mean score was 30.73. When checklist mean if item deleted was calculated for 32 items in checklist, the checklist mean if item deleted was in the range of 29.73–29.88 and none of the item showed an increase in the value of average checklist mean rather it remained same or decreased. It implies checklist is internally consistent by taking all the items. (Table – 1)

Corrected item to total correlation:

Corrected item to total correlation was applied on 32 items of checklist, 25 items in the checklist had item score to total correlation between 0.2 – 0.7 whereas 7 items in the checklist had item score to total correlation less than 0.2 indicating their inconsistency with the overall checklist. Despite of the low score to a total correlation, all 7 items were retained in the checklist as all the items in the checklist measures different phenomenon, therefore item to total correlation shows low correlation. (Table – 1)

Table – 1: Reliability analysis of checklist by Cronbach's alpha

Items	Checklist Mean if Item deleted	Corrected Item – Total Correlation	Cronbach's Alpha if Item Deleted
1	29.74	.43	.77
2	29.75	.20	.77
3	29.74	.31	.77
4	29.73	.29	.77
5	29.88	.22	.78
6	29.78	.33	.77
7	29.73	.42	.77
8	29.77	.56	.76
9	29.75	.14*	.78
10	29.77	.37	.77
11	29.77	.27	.77
12	29.74	.04*	.78
13	29.81	.27	.77
14	29.84	.04*	.79
15	29.74	.06*	.78
16	29.77	.49	.76
17	29.77	.52	.76
18	29.77	.47	.76
19	29.76	.30	.77
20	29.76	.19*	.78
21	29.74	.51	.77
22	29.77	.65	.75
23	29.77	.25	.77
24	29.79	.26	.77
25	29.74	.39	.77
26	29.77	.33	.77
27	29.74	.27	.77
28	29.73	.02*	.78
29	29.77	.12*	.78
30	29.78	.25	.77
31	29.77	.25	.77
32	29.76	.31	.77

**Items in the checklist which shows item to total Correlation <0.2*

Interrater Reliability:

Equivalence is a measure for interrater reliability which involves assessing the congruence of ratings or classifications of two or more independent observers. When observers make classifications, interrater agreement is usually assessed using the kappa statistic, which is an index of chance – adjusted proportion in agreement. In the present study cohen's kappa was calculated which is a measure of interrater reliability and was found to be 0.88 for the quality improvement checklist that implies 88% as a percentage of agreement.

VALIDITY OF QUALITY IMPROVEMENT CHECKLIST

Face Validity:

Face validity refers to whether the instrument looks like it is measuring the target construct.[45] Face validity was assessed through consultation with several sets of experts who suggested that quality improvement checklist was systematic and organized. Hence, the face validity of the checklist was considered good.

Content Validity:

Content validity is defined as the extent to which an instrument's content adequately captures the construct that is, whether an instrument has an appropriate sample of items for the construct being measured.

Content validity of the checklist was calculated by evaluation of the quality improvement checklist by panel of experts. Evaluation of checklist was done through Content Validity Performa which was developed by Davis in 1992 under the 4 relevancy criteria for each item in checklist: highly relevant (4), quite relevant (3), somewhat relevant (1), and not relevant (0). Scoring was done by

dichotomizing these four criteria in relevant which includes highly relevant and quite relevant; and not relevant includes somewhat relevant and not relevant.[46] On the basis of 8 expert's evaluation content validity index (CVI) was calculated for the items (I-CVI) and for the checklist (S-CVI). The I-CVI ranges from 0.8 to 1 and S-CVI/Ave is 0.98.

Construct Validity:

Construct validity of quality improvement checklist is calculated by factor analysis.

Factor analysis is a useful tool for investigating variable relationships for complex concepts such as socioeconomic status, dietary patterns, or psychological scales. It allows researchers to investigate concepts that are not easily measured directly by collapsing a large number of variables into a few interpretable underlying factors.

The starting point of factor analysis is a correlation matrix, in which the inter correlations between the studied variables are presented. The dimensionality of this matrix can be reduced by "looking for variables that correlate highly with a group of other variables, but correlate very badly with variables outside of that group.[47]

Suitability of data for factor analysis:

Before factor extraction, to ensure the checklist meets the eligibility criteria for factor analysis KMO value and Bartlett's test of sphericity were calculated. (Table – 2)

Table 2: KMO and Bartlett's Test of Sphericity

Test applied		Value
Kaiser-Meyer-Olkin Measure Sampling Adequacy.		.671
Bartlett's Test of Sphericity	Approx. Chi-Square	2638.01
	df	496
	p value	.000

The KMO value in this study was 0.671 which was calculated by SPSS (version 20) (The KMO value of data should be 0.50 for proceeding for factor analysis.) whereas p value of Bartlett's test of sphericity was 0.000 which was found significant (Value of Bartlett's test of sphericity must be <0.05). It indicates that the data was suitable for factor analysis.

Extraction communality of items:

Principal Component analysis extraction method was applied to find out the extraction communality value of each item of checklist. Initial communality is assumed as 1(100%) for each item. Extraction communality of items was in the range of 0.32-0.83. Average communality extraction was 0.60 (Average communality extraction should be >0.5). It means data is suitable to carry out factor analysis. (Table – 3)

Table 3: Extraction Communality of each item

Item	Initial	Extraction
1	1.00	.65
2	1.00	.81
3	1.00	.55
4	1.00	.80
5	1.00	.56
6	1.00	.54
7	1.00	.82
8	1.00	.71
9	1.00	.72
10	1.00	.49
11	1.00	.51
12	1.00	.61
13	1.00	.51
14	1.00	.38
15	1.00	.73
16	1.00	.64
17	1.00	.71
18	1.00	.61
19	1.00	.47
20	1.00	.39
21	1.00	.83
22	1.00	.80
23	1.00	.39
24	1.00	.63
25	1.00	.78
26	1.00	.53
27	1.00	.68
28	1.00	.68
29	1.00	.54
30	1.00	.32
31	1.00	.33
32	1.00	.58

Extraction Method: Principal Component Analysis.

Factor extraction:

Factor extraction condenses items into a smaller number of factors and is used to identify the number of underlying dimensions. The goal is to extract clusters of highly interrelated items from a correlation matrix. For factor analysis of items of quality improvement checklist principal components analysis was applied. Checklist had generated 8 factors/components 1, 2, 3, 4, 5,6,7,8. All the items had loaded (>.30) on factor 1 to 8 so all the items were retained in the checklist. (Table – 4)

Table 4: Total Variance Explained by items

Item	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.82	18.20	18.20	5.82	18.20	18.20	4.92	15.38	15.38
2	3.69	11.54	29.73	3.69	11.54	29.73	3.31	10.34	25.72
3	2.15	6.74	36.48	2.15	6.74	36.48	2.51	7.84	33.57
4	1.91	5.97	42.45	1.91	5.97	42.45	1.94	6.07	39.64
5	1.75	5.48	47.94	1.75	5.48	47.94	1.93	6.05	45.70
6	1.46	4.57	52.51	1.46	4.57	52.51	1.68	5.26	50.97
7	1.36	4.25	56.77	1.36	4.25	56.77	1.61	5.05	56.02
8	1.26	3.95	60.73	1.26	3.95	60.73	1.50	4.70	60.73
9	1.09	3.41	64.14						
10	1.02	3.19	67.34						
11	.99	3.11	70.45						
12	.92	2.89	73.34						

Item	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
13	.89	2.80	76.14						
14	.82	2.57	78.72						
15	.76	2.39	81.12						
16	.67	2.09	83.21						
17	.65	2.04	85.26						
18	.60	1.90	87.16						
19	.59	1.85	89.01						
20	.53	1.68	90.70						
21	.46	1.46	92.16						
22	.38	1.20	93.36						
23	.31	.99	94.36						
24	.30	.95	95.31						
25	.26	.82	96.13						
26	.24	.75	96.89						
27	.22	.69	97.58						
28	.20	.63	98.22						
29	.18	.57	98.79						
30	.16	.52	99.31						
31	.12	.39	99.71						
32	.09	.28	100.00						

Rotated component matrix:

For analyzing rotated component matrix, principal component analysis applied along with varimax. Principal component analysis (PCA) with varimax rotation had yielded total of 8 factors with eigenvalues more than 1. The eigenvalues of 8 factors ranges between 1.26 to 5.82. (Table – 5)

Table 5: Rotated Component Matrix

S.No.	Items	Component							
		1	2	3	4	5	6	7	8
1.	Maintaining professional attire.	.70			.32				
2.	Hand-rub antiseptic solution is available at patient bedside for practicing hand hygiene whenever required.						.83		
3.	Wearing appropriate PPE as per institutional guidelines.				.52	.39			
4.	Contaminated instruments are cleaned and disinfected.			.80					.30
5.	Three bucket system is followed for mopping of floor.								.65
6.	Housekeeping staff and hospital attendants are trained in infection control and waste management.		.32	.33					.53
7.	Patient bedsheet is changed daily or whenever required as per institutional policy.		.84						
8.	Bio medical waste management protocol are being followed as per guideline.	.70		.37					
9.	Suction bottle jar is cleaned with 1% hypochlorite and not filled more than 2/3rd.					.83			
10.	Changing the ventilator tubing circuit and filter if visibly soiled.	.58		.34					
11.	Cleaning/changing of feeding bag and syringe with Pressure monitoring line for infusion pump routinely or as indicated.		.55					.37	

S.No.	Items	Component							
		1	2	3	4	5	6	7	8
12.	Labelling of multi dose vials, medicine bottles and prepared injectable with dose, date and time.					.44			-.53
13.	Number of visitors and visits of patient's relatives are limited.			.41		.39	.35		
14.	Culture swab of environment (air, surfaces, selected sites), health personnel (hand culture) is taken regularly.							.50	
15.	Personal hygiene is provided routinely (bed bath, eye care, hair care and perineal care, etc.) or as required.							.83	
16.	Oral care is performed regularly or whenever required.	.69							
17.	Assessing the risk of pressure ulcer and initiating preventive measures (repositioning & back care every 2 hourly)	.77	.31						
18.	Assessing the surgical site/cannulation site/ CVP line site for signs of infiltration and infection and changing the dressing for any soiling whenever required.	.44	.30		.53				
19.	Tracheostomy dressing is clean and changed every day.			.60					
20.	Chest physiotherapy and limb physiotherapy is provided in every shift or whenever required.		.59						
21.	Invasive lines, feeding tube, and catheters are labelled with date and secured to prevent dislodgement.		.50		.67				
22.	Senior nursing officer and nursing officer attends daily patient rounds.	.81							
23.	Patient safety is maintained (use of bed rails, pillows and keeping distance between patient and warmer etc).	.41							

S.No.	Items	Component							
		1	2	3	4	5	6	7	8
24.	Recording weight and height of patient as per requirement.		.36			.67			
25.	Dietary recommendation is followed for the patient with proper documentation (type of diet, calorie count, route of administration)		.86						
26.	Stock registers and inventories are maintained.	.70							
27.	Indent and buffer stock of consumable items are maintained.	.54						.55	
28.	Inventory of schedule H drugs are kept under lock and key.						.81		
29.	Patient file is maintained in order with documentation of complete records and reports like vital signs, intake and output chart, informed consent, shifting notes, procedures done, treatment and nursing care given etc.				.71				
30.	Census is maintained and submitted on time.	.52							
31.	Specific incident report is maintained and informed to concerned authority.	.41							
32.	CNE, training sessions and demonstration are being organized periodically.			.68					

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Table 5 indicates that factor rotation generated eight components, factor 1 loaded with 12 items from the checklist from which 10 items retained in factor 1 as remaining item had higher loading value in the remaining factors. Factors 2 loaded 9 items from which 4 items retained in factor 2; remaining items had more loading value in other factors. Factor 3 loaded with 7 items among that 5 items retained in factor 3 remaining items had high loading values in remaining factors. 5 items were loaded in factor 4 from which 4 items were retained and remaining items had high loading values in remaining factors. Factor 5 loaded with 5 items from the checklist from which 2 items retained in factor 5 as

remaining items had higher loading value in the remaining factors. Factor 6 loaded 3 items from which 2 items were retained as remaining 1 item had high loading value in other factors. Factor 7 loaded with 4 items from the checklist from which 3 items retained in factor 7 as remaining items had higher loading value in the remaining factors. Factor 8 loaded 4 items from which 2 items were retained as remaining items had high loading value in other factors. All 8 factors accounted for 60.7% variance.

Scree Plot:

A scree plot is a graphical method used in the selection of the number of relevant components or factors to be considered in a principal components analysis or a factor analysis. Conceptually, the scree plot is a way of visualizing the magnitude of the variability associated with each one of the components extracted in a principal component analysis.[48]

Figure 2 depicts that initial 8 factors had a major contribution to the total variance (point of first inflection). Factor 1 had eigenvalue 5.82, factor 2 had the eigenvalue 3.69, factor 3 had eigenvalue 2.15, factor 4 had eigenvalue 1.91, factor 5 had eigenvalue 1.75, factor 6 had eigenvalue 1.46, factor 7 had eigenvalue 1.36, factor 8 had eigenvalue 1.26. Successive to first 8 factors, the scree plot curve does not have any further deflection and is smoother.

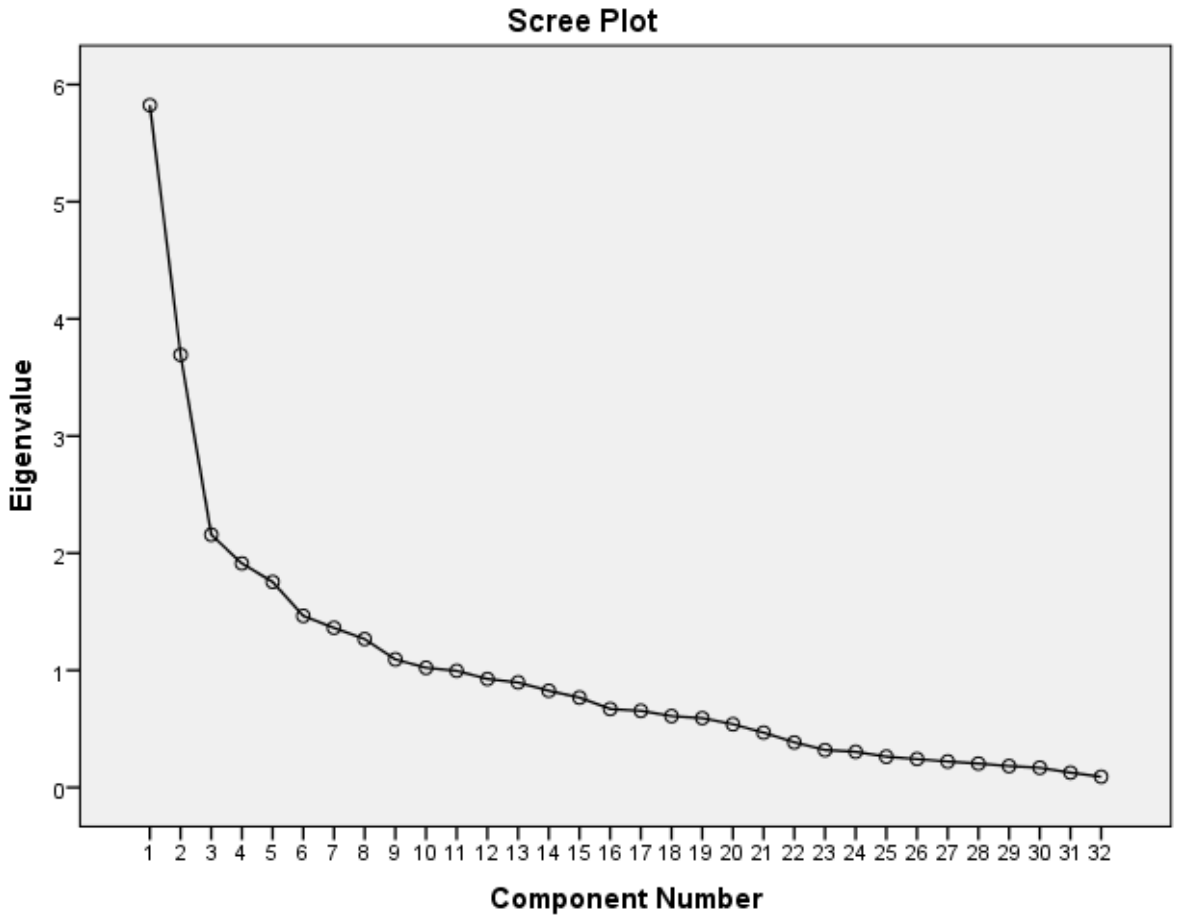

Figure 2: Scree plot of factor analysis

PHASE V – EVALUATION PHASE

After completing four phases of tool development, Quality improvement checklist has been developed. The quality improvement checklist have good reliability and validity. Training session was conducted for nursing staff to explain how to use the checklist and how to do scoring as well interpretation of the quality improvement checklist (Appendix – XIV).

Feedback regarding checklist was taken from adult intensive care unit (AICU) Assistant Nursing superintendent (ANS), Senior Nursing officer (SNO) and nurses which revealed that the:

- Checklist is systematic and easy to use.
- Checklist is useful in assessing critical care unit as a whole.
- Checklist will help in finding the shortcoming in critical care units.
- Checklist is useful in improving the overall quality of critical care units as it helps in reducing chances of errors in patient care and safety and prevents omission in documentation.

MAJOR FINDINGS:

- A Quality improvement checklist for critical care units was developed in five phases; preliminary phase, validation of preliminary draft and subsequent draft of quality improvement checklist, pilot study, final tryout, and evaluation phase to evaluate the quality of critical care units.
- Internal consistency of the checklist was analyzed by Cronbach's alpha which was found 0.78 which indicate good internal consistency of the present checklist.

- Corrected item to total correlation score for 25 items ranged between 0.2 – 0.7 showing consistency with overall checklist whereas 7 items in the checklist had item score to total correlation less than 0.2.
- For equivalence interrater reliability was calculated by cohen's kappa and was found to be 0.88 for the quality improvement checklist signified that percentage of agreement was 88%.
- Content validity index was calculated for content validity which was 0.98, indicates good content validity of the checklist.
- For calculation of construct validity of checklist principal component factor analysis was applied which generated 8 factors. Thus all the items were having loading value >.30 on factors which shows the quality improvement checklist was having good construct validity.
- Total 32 items is in the checklist. Maximum score is 32 and minimum score is 0. The scoring was done dichotomously; score of 1 for yes and score of 0 for no. Higher the score, higher will be the quality of critical care units.

CHAPTER – IV

DISCUSSION

DISCUSSION

The critical care unit is a complex and high risk clinical area where attention to detail is essential in achieving optimal patient outcomes.[49] Instrument like standard CCU checklist have enhanced adherence to the protocols, reduced medical errors and subsequently improved the outcome in patient care.[50]

The present study was conducted to develop quality improvement checklist for nurses working in critical care units. The study was carried out at All India Institute of Medical Sciences. The Quality improvement checklist for critical care unit was developed under six domains namely: Infection control, patient care and safety, nutrition and elimination, inventory, recording and reporting and continuing nursing education. Similarly Chang et al developed quality improvement rounding checklist for trauma intensive care unit which consisted of following domains namely: infection control, delirium monitoring, endotracheal tube and respiration, removal of catheter, pressure sore prevention, glucose control, stress ulcer prevention, head elevation, thromboembolic prophylaxis, sedation, analgesia and feeding in order to reduce errors of omission without overburdening nurses.[51] Similar study was conducted among nurse managers to help in planning adequate quality assurance programme in which safe nursing care assessment tool was developed with four domains: patient's psychological need assessment, patient's physical needs assessment, evaluation of nursing skills and nurse's teamwork assessment.[52]

Reliability of quality improvement checklist was analyzed in term of internal consistency which was found 0.78 by Cronbach's alpha. Cohen's kappa is a measure for inter – rater reliability which was 0.88 for the quality improvement checklist signified that percentage of agreement was 88%. Macedo and bohomol conducted a study at Patient Safety Centers in health care institutions to validate an instrument for the self - assessment for which cronbach's alpha was 0.857 and percentage of agreement was 70%.[53] Similar study in which a risk assessment tool was developed for the prediction of fall examined percentage of agreement between raters which was found to be 84% and cronbach's alpha was 0.75.[54]

Face validity was assessed by the panel of experts which revealed that checklist is organized and structured. Content validity index was calculated as 0.98, which indicates good content validity of the checklist. Polit and beck concluded that for the scale to have excellent content validity SCI/Ave should be 0.90 or higher.[46]

For calculation of construct validity of quality improvement checklist principle component factor analysis was applied which yielded 8 factors according to the components. Thus all the items were having loading value >.30 on factors which shows the quality improvement checklist was having good construct validity. Rashvand et al developed a tool for safe nursing care assessment for which construct validity was calculated using principal component analysis which extracted four factors with overall variance of 63.54%.[52]

As there is no clinically applicable instrument in the literature which is specific and included multiple domains that can aid in quality improvement of critical care units as a whole, this study was aimed at developing the quality improvement checklist for critical care units. And the findings suggests that quality improvement checklist for critical care units is valid and highly reliable checklist to improve the quality of critical care units.

CHAPTER – V
SUMMARY, CONCLUSION & RECOMMENDATIONS

SUMMARY, CONCLUSION & RECOMMENDATION

This chapter provides a brief account about the present study consisting of brief description of the study methodology, strengths and limitations, implication of the study in nursing and recommendations for future research.

The present study aimed at development of quality improvement checklist for nurses in critical care units. Statement of the problem of the present study was "Development of quality improvement checklist for nurses in critical care units at All India institute of medical sciences Jodhpur, Rajasthan."

Objective of the study was to develop quality improvement checklist for nurses working in critical care units (AICU and HDU). Major findings of study are as follows:

- There were total 32 items in the checklist categorized into six domains namely infection control (14 items), patient care and safety (9 items), nutrition and elimination (2 items), inventory (3 items), recording and reporting (3 items), continuing nursing education (1 items).
- The Quality improvement checklist for critical care units was developed in five phases: preliminary phase, validation of preliminary draft and subsequent draft of quality improvement checklist, pilot study, final tryout, and evaluation phase.
- Internal consistency of the checklist was analyzed by Cronbach's alpha which was found 0.78 which indicate good internal consistency of the present checklist.

- For equivalence interrater reliability was calculated by cohen's kappa and was found to be 0.88 for the quality improvement checklist signified that percentage of agreement was 88%.
- Content validity index was calculated for content validity which was 0.98, indicating good content validity of the checklist.
- For calculation of construct validity of checklist principal component factor analysis was applied which yielded 8 factors. Thus all the items were having loading value >.30 on factors which shows the quality improvement checklist was having good construct validity.
- The scoring was done dichotomously; score of 1 was given for yes and score of 0 was given for no. Higher the score, higher will be the quality assuredness of critical care units.

Strength of the study

- This checklist is one of its own kind that is particularly meant for evaluating and improving the quality of critical care units.
- The quality improvement checklist was found to have good practicability in critical care units.

IMPLICATION

The findings of the present study have several implications for nursing practice, nursing education, nursing administration, and nursing research.

Nursing Practice:

Nursing practice is an important part of the nursing profession where the nursing officers are directly providing care to the patient. The checklist can be used in critical care units to reduce errors, increase adherence with evidence – based practice and improving the outcome of critically ill patients.

Nursing Education:

Nursing education is directly related to the nursing practice and gaining the knowledge and applying in nursing practice. Through in-service education programme all nurses can be trained to use quality improvement checklist that will aid in process of care. The present study would generate scientific literature for trained as well as student nurses and serve as a baseline in developing more valid quality improvement checklist for various settings.

Nursing Administration:

Nursing administration is a managerial part of the nursing profession which can modify and introduce the new policies, rules-regulation and guideline for the nursing department. The nursing administrators can make effort to involve the quality improvement checklist with the treatment chart of the patients. Training should be provided according to developed quality improvement checklist to nursing staff for favourable outcomes.

Nursing Research:

To develop the body of knowledge, to test the strategies and to bring new finding in current education, nursing research is essential. This study can help establish

comparison in patient outcome by using present quality improvement checklist vs. checklist implemented in critical care areas.

RECOMMENDATIONS

- The study can be replicated on a large sample and in multi centres to validate the findings of present study.
- A study can be replicated to assess the impact and measurable outcome of quality improvement checklist.
- A comparative study can be conducted to establish comparison in patient outcome by using present quality improvement checklist vs. checklist implemented in critical care areas.
- An observational study can be conducted to assess the effect of quality improvement checklist on process of care.
- A qualitative study can be conducted to assess the perception towards quality improvement checklist in critical care units.

CONCLUSION

On the basis of finding of the present study conclusion can be drawn that quality improvement checklist is feasible, highly reliable and valid checklist that can be used to evaluate and improve the quality of critical care units.

REFERENCES

REFERENCES

1. Marshall JC, Bosco L, Adhikari NK, Connolly B, Diaz JV, Dorman T, et al. What is an intensive care unit? A report of the task force of the World Federation of Societies of Intensive and Critical Care Medicine. Journal of Critical Care. 2017 Feb;37:270–6.
2. Chelluri LP. Quality and performance improvement in critical care. Indian Journal of Critical Care Medicine : Peer-reviewed, Official Publication of Indian Society of Critical Care Medicine. 2008 Jun;12(2):67.
3. Hales BM, Pronovost PJ. The checklist--a tool for error management and performance improvement. J Crit Care. 2006 Sep;21(3):231–5.
4. Chrusch CA, Martin CM, Care Project TQI in C. Quality Improvement in Critical Care: Selection and Development of Quality Indicators. Canadian Respiratory Journal. 2016;2016:1–11.
5. Simpson SQ, Peterson DA, O'Brien-Ladner AR. Development and implementation of an ICU quality improvement checklist. AACN Adv Crit Care. 2007 Jun;18(2):183–9.
6. Writing Group for the CHECKLIST-ICU Investigators and the Brazilian Research in Intensive Care Network (BRICNet), Cavalcanti AB, Bozza FA, Machado FR, Salluh JIF, Campagnucci VP, et al. Effect of a Quality Improvement Intervention With Daily Round Checklists, Goal Setting, and Clinician Prompting on Mortality of Critically Ill Patients: A Randomized Clinical Trial. JAMA. 2016 Apr 12;315(14):1480.
7. Hart EM, Owen H. Errors and Omissions in Anesthesia: A Pilot Study Using a Pilot???s Checklist: Anesthesia & Analgesia. 2005

Jul;101(1):246–50.

8. Just KS, Hubrich S, Schmidtke D, Scheifes A, Gerbershagen MU, Wappler F, et al. The effectiveness of an intensive care quick reference checklist manual--a randomized simulation-based trial. J Crit Care. 2015 Apr;30(2):255–60.
9. Agarwala AV, Firth PG, Albrecht MA, Warren L, Musch G. An electronic checklist improves transfer and retention of critical information at intraoperative handoff of care. Anesth Analg. 2015 Jan;120(1):96–104.
10. Occurrence of Dispensing Errors and Efforts to Reduce Medication Errors at the Central Arkansas Veteran's Healthcare System - PubMed [Internet]. [cited 2020 Jan 14]. Available from: https://pubmed.ncbi.nlm.nih.gov/15003037-occurrence-of-dispensing-errors-and-efforts-to-reduce-medication-errors-at-the-central-arkansas-veterans-healthcare-system/
11. Cavalcanti AB. A cluster randomized trial of a multifaceted quality improvement intervention in Brazilian intensive care units: study protocol. Implement Sci [Internet]. 2015 Jan 13 [cited 2020 Jan 12];10. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4342101/
12. Ri H, Gm R, D M. Simple changes can improve conduct of end-of-life care in the intensive care unit [Internet]. Vol. 51, Canadian journal of anaesthesia = Journal canadien d'anesthesie. Can J Anaesth; 2004 [cited 2021 Jan 7]. Available from: https://pubmed.ncbi.nlm.nih.gov/15197128/
13. Brunsveld-Reinders AH, Arbous MS, Kuiper SG, de Jonge E. A comprehensive method to develop a checklist to increase safety of intra-

hospital transport of critically ill patients. Crit Care. 2015 May 7;19:214.

14. Arriaga AF, Bader AM, Wong JM, Lipsitz SR, Berry WR, Ziewacz JE, et al. Simulation-based trial of surgical-crisis checklists. N Engl J Med. 2013 Jan 17;368(3):246–53.
15. Salzwedel C, Mai V, Punke MA, Kluge S, Reuter DA. The effect of a checklist on the quality of patient handover from the operating room to the intensive care unit: A randomized controlled trial. Journal of Critical Care. 2016 Apr;32:170–4.
16. Duclos G, Zieleskiewicz L, Antonini F, Mokart D, Paone V, Po MH, et al. Implementation of an electronic checklist in the ICU: Association with improved outcomes. Anaesthesia Critical Care & Pain Medicine. 2018 Feb 1;37(1):25–33.
17. Taylor JE, McDonald SJ, Earnest A, Buttery J, Fusinato B, Hovenden S, et al. A quality improvement initiative to reduce central line infection in neonates using checklists. Eur J Pediatr. 2017 May;176(5):639–46.
18. Kaushal RK, Kapoor S, Kaur S, Bhagat H. A Methodological study to develop a “Nursing Checklist” for receiving patients in ICUs. 2015;11(1):11.
19. WHO | Patient safety [Internet]. [cited 2020 Jan 15]. Available from: https://www.who.int/patientsafety/en/
20. Balas MC, Scott LD, Rogers AE. Frequency and type of errors and near errors reported by critical care nurses. Can J Nurs Res. 2006 Jun;38(2):24–41.
21. Rothschild JM, Landrigan CP, Cronin JW, Kaushal R, Lockley SW, Burdick E, et al. The Critical Care Safety Study: The incidence and nature

of adverse events and serious medical errors in intensive care*: Critical Care Medicine. 2005 Aug;33(8):1694–700.

22. Mishra SB, Misra R, Azim A, Baronia AK, Prasad KN, Dhole TN, et al. Incidence, risk factors and associated mortality of central line-associated bloodstream infections at an intensive care unit in northern India. Int J Qual Health Care. 2016 Dec 8;intqhc;mzw144v1.
23. Sm B, S M, A F, Dt P, K E, P L, et al. Improving care for the ventilated patient [Internet]. Vol. 30, Joint Commission journal on quality and safety. Jt Comm J Qual Saf; 2004 [cited 2021 Jan 7]. Available from: https://pubmed.ncbi.nlm.nih.gov/15085785/
24. Mathai AS, Phillips A, Kaur P, Isaac R. Incidence and attributable costs of ventilator-associated pneumonia (VAP) in a tertiary-level intensive care unit (ICU) in northern India. Journal of Infection and Public Health. 2015 Mar;8(2):127–35.
25. Berenholtz SM, Pronovost PJ, Lipsett PA, Hobson D, Earsing K, Farley JE, et al. Eliminating catheter-related bloodstream infections in the intensive care unit. Crit Care Med. 2004 Oct;32(10):2014–20.
26. Wichmann D, Belmar Campos CE, Ehrhardt S, Kock T, Weber C, Rohde H, et al. Efficacy of introducing a checklist to reduce central venous line associated bloodstream infections in the ICU caring for adult patients. BMC Infect Dis. 2018 Dec;18(1):267.
27. Li D. The relationship among pressure ulcer risk factors, incidence and nursing documentation in hospital-acquired pressure ulcer patients in intensive care units. J Clin Nurs. 2016 Aug;25(15–16):2336–47.
28. DuBose JJ, Inaba K, Shiflett A, Trankiem C, Teixeira PGR, Salim A, et

al. Measurable outcomes of quality improvement in the trauma intensive care unit: the impact of a daily quality rounding checklist. J Trauma. 2008 Jan;64(1):22–7; discussion 27-29.

29. Byrnes MC, Schuerer DJE, Schallom ME, Sona CS, Mazuski JE, Taylor BE, et al. Implementation of a mandatory checklist of protocols and objectives improves compliance with a wide range of evidence-based intensive care unit practices. Crit Care Med. 2009 Oct;37(10):2775–81.
30. Hallam BD, Kuza CC, Rak K, Fleck JC, Heuston MM, Saha D, et al. Perceptions of rounding checklists in the intensive care unit: a qualitative study. BMJ Qual Saf. 2018;27(10):836–43.
31. Kumar L, Dominic M, Rajan S, Singh S. Impact of modified quality control checklist on protocol adherence and outcomes in a post-surgical Intensive Care Unit. Indian Journal of Anaesthesia. 2017 Jan 1;61(1):29.
32. McConnell RA, Kerlin MP, Schweickert WD, Ahmad F, Patel MS, Fuchs BD. Using a Post-Intubation Checklist and Time Out to Expedite Mechanical Ventilation Monitoring: Observational Study of a Quality Improvement Intervention. Respir Care. 2016 Jul;61(7):902–12.
33. Li S, Rehder KJ, Giuliano JS, Apkon M, Kamat P, Nadkarni VM, et al. Development of a Quality Improvement Bundle to Reduce Tracheal Intubation-Associated Events in Pediatric ICUs. Am J Med Qual. 2016 Feb;31(1):47–55.
34. Al Ashry HS, Abuzaid AS, Walters RW, Modrykamien AM. Effect of Compliance With a Nurse-Led Intensive Care Unit Checklist on Clinical Outcomes in Mechanically and Nonmechanically Ventilated Patients. J Intensive Care Med. 2016 May;31(4):252–7.

35. Carlos WG, Patel DG, Vannostrand KM, Gupta S, Cucci AR, Bosslet GT. Intensive care unit rounding checklist implementation. Effect of accountability measures on physician compliance. Ann Am Thorac Soc. 2015 Apr;12(4):533–8.
36. Kowitlawakul Y, Leong BSH, Lua A, Aroos R, Wong JJ, Koh N, et al. Observation of handover process in an intensive care unit (ICU): barriers and quality improvement strategy. Int J Qual Health Care. 2015 Apr;27(2):99–104.
37. Ceballos K, Waterman K, Hulett T, Makic MBF. Nurse-driven quality improvement interventions to reduce hospital-acquired infection in the NICU. Adv Neonatal Care. 2013 Jun;13(3):154–63; quiz 164–5.
38. Tarrago R, Nowak JE, Leonard CS, Payne NR. Reductions in invasive device use and care costs after institution of a daily safety checklist in a pediatric critical care unit. Jt Comm J Qual Patient Saf. 2014 Jun;40(6):270–8.
39. O.Nyumba T, Wilson K, Derrick CJ, Mukherjee N. The use of focus group discussion methodology: Insights from two decades of application in conservation. Methods in Ecology and Evolution. 2018;9(1):20–32.
40. Lakshman M, Charles M, Biswas M, Sinha L, Arora NK. Focus group discussions in medical research. Indian J Pediatr. 2000 May 1;67(5):358–62.
41. Keeney S, Hasson F, McKenna HP. A critical review of the Delphi technique as a research methodology for nursing. International Journal of Nursing Studies. 2001 Apr;38(2):195–200.
42. Monica 1776 Main Street Santa, California 90401-3208. Delphi Method

[Internet]. [cited 2021 Jan 6]. Available from: https://www.rand.org/topics/delphi-method.html

43. Custer RL, Scarcella JA, Stewart BR. The Modified Delphi Technique--A Rotational Modification. Journal of Vocational and Technical Education. 1999;15(2):50–8.
44. Humphrey-Murto S, Varpio L, Wood TJ, Gonsalves C, Ufholz L-A, Mascioli K, et al. The Use of the Delphi and Other Consensus Group Methods in Medical Education Research: A Review. Academic Medicine. 2017 Oct;92(10):1491–8.
45. Johnson E. Face Validity. In: Volkmar FR, editor. Encyclopedia of Autism Spectrum Disorders [Internet]. New York, NY: Springer; 2013 [cited 2021 Jan 10]. p. 1226–7. Available from: https://doi.org/10.1007/978-1-4419-1698-3_308
46. Polit DF, Beck CT. The content validity index: Are you sure you know what's being reported? critique and recommendations. Res Nurs Health. 2006 Oct;29(5):489–97.
47. Yong AG, Pearce S. A Beginner's Guide to Factor Analysis: Focusing on Exploratory Factor Analysis. TQMP. 2013 Oct 1;9(2):79–94.
48. Ledesma RD, Valero-Mora P, Macbeth G. The Scree Test and the Number of Factors: a Dynamic Graphics Approach. Span J Psychol. 2015;18:E11.
49. Hewson KM, Burrell AR. A pilot study to test the use of a checklist in a tertiary intensive care unit as a method of ensuring quality processes of care. Anaesth Intensive Care. 2006 Jun;34(3):322–8.
50. Maitra S. Checklist & prompting in intensive care unit: quality of care is

improved but long way to go for better outcome. J Thorac Dis. 2017 Feb;9(2):228–9.

51. Chang YR, Chang SW, Kim DH, Yun J, Yun JH, Lee SW, et al. Quality Improvement in the Trauma Intensive Care Unit Using a Rounding Checklist: The Implementation Results. Journal of Trauma and Injury. 2017 Dec 30;30(4):113–9.
52. Rashvand F, Ebadi A, Vaismoradi M, Salsali M, Yekaninejad MS, Griffiths P, et al. The assessment of safe nursing care: development and psychometric evaluation. J Nurs Manag. 2017 Jan;25(1):22–36.
53. Macedo R, Bohomol E. Validation of self-assessment instrument for the Patient Safety Center. Revista Brasileira de Enfermagem. 2019 Feb 1;72:259–65.
54. Saini P, Kumar A. Risk Assessment Tool for the Prediction of fall. IOSR Journal of Nursing and Health Science. 2013 Oct 1;2:36–41.

APPENDICES

APPENDIX – I

अखिल भारतीय आयुर्विज्ञान संस्थान, जोधपुर
All India Institute of Medical Sciences, Jodhpur
संस्थागत नैतिकता समिति
Institutional Ethics Committee

No. AIIMS/IEC/2020/3077 **Date: 01/06/2020**

ETHICAL CLEARANCE CERTIFICATE

Certificate Reference Number: **AIIMS/IEC/2020-21/**2096

Project title: **"Development of quality improvement check list for nurses in critical care units at AIIMS Jodhpur"**

Nature of Project:	**Research Project Submitted for Expedited Review**
Submitted as:	**Student Research Project, as a part of Academic Programme**
Investigator:	**Ritika**
Supervisor:	**Dr. Ashok Kumar**
Co-Supervisor:	**Dr. Nikhil Kothari & Mr. Nipin Kalal**

Institutional Ethics Committee after thorough consideration accorded its approval on above project.

The investigator may therefore commence the research from the date of this certificate, using the reference number indicated above.

Please note that the AIIMS IEC must be informed immediately of:

- Any material change in the conditions or undertakings mentioned in the document.
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research.

The Principal Investigator must report to the AIIMS IEC in the prescribed format, where applicable, bi-annually, and at the end of the project, in respect of ethical compliance.

AIIMS IEC retains the right to withdraw or amend this if:

- Any unethical principle or practices are revealed or suspected
- Relevant information has been withheld or misrepresented

AIIMS IEC shall have an access to any information or data at any time during the course or after completion of the project.

Please Note that this approval will be rectified whenever it is possible to hold a meeting in person of the Institutional Ethics Committee. It is possible that the PI may be asked to give more clarifications or the Institutional Ethics Committee may withhold the project. The Institutional Ethics Committee is adopting this procedure due to COVID-19 (Corona Virus) situation.

If the Institutional Ethics Committee does not get back to you, this means your project has been cleared by the IEC.

On behalf of Ethics Committee, I wish you success in your research.

Dr. Praveen Sharma
Member Secretary

Member secretary
Institutional Ethics Committee
AIIMS,Jodhpur

Basni Phase-2, Jodhpur, Rajasthan-342005, **Website:** www.aiimsjodhpur.edu.in, **Phone:** 0291-2740741 Extn. 3109
Email: ethicscommittee@aiimsjodhpur.edu.in

APPENDIX – II

Informed Consent Form

Title of the research study: "Development of quality improvement checklist for nurses in critical care units"

Name of the Investigator: Ritika (M.Sc. Nursing)

Subject Identification No:

I, _____S/o__or W/o _____R/o _____ give my full, free, voluntary consent to be a part of the study **"**Development of quality improvement checklist for nurses in critical care units"**,** the procedure and nature of which has been explained to me in my own language to my full satisfaction. I confirm that I have had the opportunity to ask questions.

I understand that my participation is voluntary and am aware of my right to opt out of the study at any time without giving any reason.

I understand that the information collected about me may be looked at by responsible individual from All India Institute of Medical Sciences Jodhpur, Rajasthan. I give permission for these individuals to have access to my records.

Date: _____

Place: _____ Signature

This is to certify that the above consent has been obtained in my presence.

Date: _____

Place:

_____ _____

Signature of Investigator

APPENDIX - III

<u>सूचित सहमति प्रपत्र</u>

परियोजना का शीर्षक : "डेवलपमेंट एंड वेलिडेशन ऑफ़ क्वालिटी इम्प्रूवमेंट चेकलिस्ट फॉर नर्सेज इन क्रिटिकल केयर यूनिट्स" |

अन्वेषक का नाम : रितिका

पहचान संख्या :_____

मैं_____पुत्र/पत्नी_____निवासी "महत्वपूर्ण देखभाल इकाइयों में नर्सों के लिए गुणवत्ता सुधार चेकलिस्ट का विकास" नामक अध्ययन जिसकी प्रक्रिया और प्रकृति मुझे मेरी अपनी भाषा में पूर्ण संतुष्टि के साथ समझा दीगयी है, मैं भाग लेने के लिए अपनी पूर्ण, स्वतंत्र एवं स्वेच्छिक सहमति देता /देती हूँ मैंपुष्टि करता /करती हूँ | किमुझे सवाल पूछने का अवसर दिया गया है | मैं समझता /समझती हूँ कि मेरी भागीदारी स्वैच्छिक है और मैं अपने इस अधिकार से अवगत हूँ की मैं किसी भी समय बिना कोई कारण दिए इस अध्ययन से अपना नाम वापस ले सकता/ सकती हूँ |

मैं समझता / समझती हूँ कि मेरे बारे में एकत्र जानकारी <u>एम्स जोधपुर</u> के किसी भी जिम्मेदार व्यक्ति द्वारा या नियामक अधिकारियो द्वारा देखी जा सकती है | मैं उपरोक्त व्यक्तियों को मेरे द्वारा दी गई जानकारी देखने की अनुमति देता/ देती हूँ |

दिनांक: _____

स्थान: _____

अन्वेषक का हस्ताक्षर

यह प्रमाणित है कि उपरोक्त सहमति मेरी उपस्थिति में प्राप्त की गयी है |

दिनांक: _____

स्थान: _____

हस्ताक्षर

APPENDIX - IV

Participant Information Sheet

Part-I

1. Purpose of the research study: Development of quality improvement checklist for nurses in critical care units at All India Institute of Medical Sciences Jodhpur, Rajasthan.
2. Study procedure to be followed: After development of quality improvement checklist data will be collected from nurses of critical care units at AIIMS, Jodhpur.
3. Benefits from the study: The study will help in improving the quality of critical care units by development of quality improvement checklist.
4. Risk of the study: None
5. Complication of the study: None
6. Confidentiality: Data collected from the participants shall not be allowed shared with anyone except the study investigator.
7. Rights of the participants: Participants would have the freedom to share their data and to continue or leave the study if they desire so at any point of time.

Participant Signature:
Participant Name:
Date:

Part- II

Investigator's word
I have explained the purpose, procedure, benefits, and harms of the study in details to the participants. All the information regarding study has been disclosed and enough opportunity for asking questions regarding the study was given to study participant.

Principal Investigator Signature	Witness signature
Name:	Name:
Date:	Date:

APPENDIX – V

प्रतिभागी सूचना पत्र

भाग- I

1. अनुसंधान अध्ययन का उद्देश्य: डेवलपमेंट एंड वेलिडेशन ऑफ़ क्वालिटी इम्प्रूवमेंट चेकलिस्ट फॉर नर्सेज इन क्रिटिकल केयर यूनिट्स, आल इंडिया इन्स्टिटूट ऑफ़ मेडिकल साइंसेज, जोधपुर, राजस्थान।
2. अध्ययन प्रक्रिया का पालन किया जाना चाहिए: गुणवत्ता सुधार के बाद चेकलिस्ट डेटा एम्स, जोधपुर में महत्वपूर्ण देखभाल इकाइयों की नर्सों से एकत्र किया जाएगा।
3. अध्ययन से लाभ: अध्ययन में गुणवत्ता सुधार चेकलिस्ट के विकास द्वारा महत्वपूर्ण देखभाल इकाइयों की गुणवत्ता में सुधार करने में मदद मिलेगी।
4. अध्ययन का जोखिम: कोई नहीं
5. अध्ययन की जटिलता: कोई नहीं
6. गोपनीयता: प्रतिभागियों से एकत्र किए गए डेटा को अध्ययन अन्वेषक को छोड़कर किसी के साथ साझा करने की अनुमति नहीं दी जाएगी।
7. प्रतिभागियों के अधिकार: प्रतिभागियों को अपने डेटा को साझा करने और अध्ययन जारी रखने या छोड़ने की स्वतंत्रता होगी यदि वे किसी भी समय ऐसा चाहते हैं।

प्रतिभागी हस्ताक्षर:
भाग लेने वाले का नाम:
दिनांक:

भाग- II

अन्वेषक का शब्द

मैंने प्रतिभागियों को विवरण में अध्ययन के उद्देश्य, प्रक्रिया, लाभ और हानि के बारे में बताया है। अध्ययन के बारे में सभी जानकारी का खुलासा किया गया है और अध्ययन के बारे में सवाल पूछने के लिए पर्याप्त अवसर अध्ययन प्रतिभागी को दिया गया था।

प्रधान अन्वेषक हस्ताक्षर	गवाह हस्ताक्षर
नाम:	नाम:
दिनांक:	

APPENDIX – VI

LIST OF EXPERTS FOR CONTENT VALIDITY

Dr. Pradeep Bhatia
Professor & Head
Dept. of Anaesthesiology & Critical care
AIIMS Jodhpur

Dr. Rakesh Sharma
Assistant Professor
College of Nursing
AIIMS Rishikesh

Dr.Sadik Mohammed
Associate Professor
Dept. of Anaesthesiology & Critical care
AIIMS Jodhpur

Mrs. Rakhi
Assistant Professor
College of Nursing
AIIMS Rishikesh

Dr. Bharat Paliwal
Associate Professor
Dept. of Anaesthesiology & Critical care
AIIMS Jodhpur

Mrs. Vandna Pandey
Assistant Professor
College of Nursing
AIIMS Rishikesh

Dr. Vasantha Kalyani
Associate Professor
College of Nursing
AIIMS Rishikesh

Mr. Natwar Patidar
Asst. Nsg Suptd, ICU
AIIMS Jodhpur

Dr. Himanshu Vyas
Associate Professor
College of Nursing
AIIMS Jodhpur

Mrs. Nimarta
Assistant Professor
College of Nursing
AIIMS Jodhpur

APPENDIX – VII

Expert Opinion on Validity of preliminary draft of Quality Improvement Checklist for nurses in critical care units under modified Delphi rounds

From
Ritika
M.Sc. Nursing (Batch 2019)
College of Nursing, AIIMS Jodhpur

To

_____

_____

Subject: Expert Opinion on Validity of preliminary draft of Quality Improvement Checklist for nurses in critical care units under modified Delphi rounds

Respected Sir/Madam,

I "Ritika", M.Sc. Nursing (Batch-2019) student at College of Nursing, AIIMS Jodhpur, have undertaken the following topic for research project: "Development of quality improvement checklist for nurses in critical care units at All India Institute of Medical Sciences Jodhpur, Rajasthan." under the supervision of Dr. Ashok Kumar, Associate Professor, College of Nursing, AIIMS Jodhpur.

Objective of the study is:

1. To develop quality improvement checklist for nurses working in critical care units (AICU and HDU).

I request you to kindly validate my research tool for appropriateness and relevancy. Your esteemed opinion and critical comments will provide the required direction and contribute immensely to the quality and content of my research.
Looking forward to your expert guidance and suggestions.
Thanking you in anticipation
Yours Sincerely

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Enclosure:

- Brief Methodology
- Preliminary draft
- Evaluation criteria checklist for validation of tools
- Certificate for validation

APPENDIX – VIII

FOCUS GROUP DISCUSSION (FGD)

APPENDIX – IX

PRELIMINARY DRAFT OF QUALITY IMPROVEMENT

CHECKLIST

Instruction: Please read each statement carefully and put a tick mark on appropriate place which will indicate the quality assuredness of critical care units. Scoring of 1 will be given for 'YES', 0 will be given for 'NO' and no score will be given for 'N.A' (not applicable). Anonymity and confidentiality of your responses will be maintained.

Name of Clinical Area:

Name of Assessor:

S.NO.	CRITERIA	YES/NO/N.A
1.	**INFECTION CONTROL**	
1.1	Maintaining professionalism by wearing tidy uniform with name.	
1.2	Removing jewellery, wrist watch, nail polish, cutting long nail and keeping phone out before entering the ICU.	
1.3	Practicing hand hygiene / hand rub as per protocol.	
1.4	Wearing appropriate PPE.	
1.5	Cleaning and disinfecting the contaminated instrument.	
1.6	Three bucket system is followed for mopping of floor every 2hrly.	
1.7	Supervising housekeeping staff and hospital attendants in surface cleaning of furniture, equipment, trolley, OT tables as per guideline.	
1.8	Supervising housekeeping staff in disinfection of liquid waste (blood, drain, mucus, sputum) with 1% sodium hypochlorite solution for 15-30min before discarding it.	
1.9	Supervising housekeeping staff segregation and storing soiled and dry linen separately.	
1.10	Patient bedsheet is changed daily as per color code or whenever required.	
1.11	Ensuring the disinfection of the soiled linen with hypochlorite solution as per guideline before sending it to laundry.	
1.12	Bio medical waste management is followed as per guideline.	
1.13	Discarding IV injections, fluids bottles with drip set after use.	

1.14	Ensuring the emptying and cleaning of the suction bottle when 2/3rd filled with hypochlorite.	
1.15	Changing ventilator tubing circuit if grossly contaminated.	
1.16	Changing HME filter every 48hr or if grossly contaminated.	
1.17	Changing feeding bag every 24hr.	
1.18	Labelling multi dose vials and medicine bottles, prepared injectables with dose, date and time and all the invasive lines and catheters with date.	
1.19	All the procedures are done as per protocol following strict aseptic technique.	
1.20	Ensuring not to keep the diluted medication more than 24hr.	
1.21	Scrubbing the ports for 5 – 15sec before and after accessing the catheter site.	
1.22	Ensuring closed medication and drainage system.	
1.23	Heparinizing invasive lines.	
1.24	Limiting the number of visitors and no. of visits while educating visitors regarding infection prevention practices.	
1.25	Ensuring that culture of environment (air, surfaces, selected sites), health personnel, and blood is taken by microbiologist at equal intervals.	
2.	**PATIENT CARE AND SAFETY**	
2.1	Routinely providing body wash, eye care and perineal care.	
2.2	Oral care is performed every 4hrly or when required.	
2.3	Repositioning and providing back care to patient every 2hrly and checking the status of pressure sore.	
2.4	Changing and assessing the dressing for any soiling.	
2.5	Changing tracheostomy dressing every day.	
2.6	Chest physiotherapy and limb physiotherapy is provided in every shift or when required.	
2.7	Securing and maintaining patency of invasive lines, feeding tube, and catheters to prevent dislodgement.	
2.8	Attending daily patient rounds.	
2.9	Ensuring patient safety through use of bed rails, pillows and keeping distance between patient and warmer.	
2.10	Surgical site/cannulation site/ CVP line site is checked for any signs of infiltration or infection.	
3.	**NUTRITION AND ELIMINATION**	
3.1	Recording weight and height of patient.	
3.2	Documenting the type of diet, calorie count and route of administration.	
3.3	Recording intake and output chart hourly or as per order.	
3.4	Restricting food and beverages from outside the hospital and following dietary recommendation.	
4.	**INVENTORY**	

4.1	Maintaining stock registers and inventories.	
4.2	Checking bedside articles like ventilator, bag and mask, ET tube, suction catheter, laryngoscope with blade, measuring tape, stethoscope, bedside medicines.	
4.3	Ensuring availability of sterile instrument sets and keeping procedure room, store and utility room stocked.	
4.4	Maintaining indent and keeping buffer stock of consumable items.	
4.5	Maintaining the inventory of the narcotics that is kept in lock and key with physician sign.	
5.	**RECORDING AND REPORTING**	
5.1	Informed consent is taken from patient or relative whenever indicated.	
5.2	Documenting date and time of receiving and transferring the patient.	
5.3	Documenting vitals, medication and care given.	
5.4	Documenting blood transfusion details with starting and ending date and time and maintain blood transfusion monitoring form.	
5.5	Maintaining record of checklist for all the procedures.	
5.6	Patient file is in order with complete records and reports.	
5.7	ICU census is maintained and submitted on time.	
5.8	Recording and reporting the specific incidence.	
6.	**HANDOVER EVALUATION**	
6.1	Ensuring proper receiving of patient to ICU through prior preparation of equipments.	
6.2	Ensuring proper shifting / transferring of patient for diagnostic procedure or to ward.	
6.3	Properly handing over and taking over patient records and reports at the change of the shift.	

APPENDIX – X

IInd DRAFT OF QUALITY IMPROVEMENT CHECKLIST

Instruction: Please read each statement carefully and put a tick mark on appropriate place which will indicate the quality assuredness of critical care units. Scoring of 1 will be given for 'YES', 0 will be given for 'NO' and no score will be given for 'N.A' (not applicable). Anonymity and confidentiality of your responses will be maintained.

Name of Clinical Area:

Name of Assessor:

S.NO	ITEM	YES	NO	N.A
1.	**INFECTION CONTROL**			
1.1	Maintaining professionalism by wearing neat and clean uniform.			
1.2	HCWs have removed all accessories like jewellery, wrist watch before entering the ICU.			
1.3	Practicing hand hygiene / hand rub as per protocol.			
1.4	Wearing appropriate PPE as per institutional guideline.			
1.5	Contaminated instrument are cleaned and disinfected.			
1.6	Three bucket system is followed for mopping of floor every 2hrly.			
1.7	Housekeeping staff and hospital attendants are trained in surface cleaning of furniture, equipment, trolley as per guideline.			
1.8	Housekeeping staff are trained in disinfection of liquid waste (blood, drain, mucus, sputum) with 1% sodium hypochlorite solution for 15-30min before discarding it.			
1.9	Soiled and dry linen are segregated, disinfected and stored separately.			
1.10	Patient bedsheet is changed daily as per institutional policy or whenever required.			
1.11	Bio medical waste management is followed as			

	per guideline.			
1.12	Discarding IV injections, fluids bottles with drip set after use in proper bin.			
1.13	Suction bottle jar is emptied and cleaned with hypochlorite whenever 2/3rd filled.			
1.14	Changing the ventilator tubing circuit and HME filter every 48hr or if grossly contaminated.			
1.15	Changing feeding bag and syringe with PMO line for infusion pump every 24hr.			
1.16	Labelling multi dose vials and medicine bottles, prepared injectables with dose, date and time and all the invasive lines and catheters with date.			
1.17	Procedures are done as per protocol following strict aseptic technique.			
1.18	Diluted medication are not kept more than 24hr.			
1.19	Scrubbing the ports for 5 – 15sec with alcohol swab before and after accessing the catheter site.			
1.20	Heparinizing invasive lines when indicated or required.			
1.21	Number of visitors and visits of patient's relatives are limited.			
1.22	Culture of environment (air, surfaces, selected sites), health personnel, and blood is taken regularly.			
2.	**PATIENT CARE AND SAFETY**			
2.1	Personal hygiene is provided routinely (body wash, eye care, hair care and perineal care, etc.)			
2.2	Oral care is performed every 4hrly or when required.			
2.3	Patient is repositioned and back care is provided every 2hrly and status of pressure sore is assessed.			
2.4	Assessing and changing the dressing for any soiling.			
2.5	Changing tracheostomy dressing every day.			
2.6	Chest physiotherapy and limb physiotherapy is provided in every shift or when required.			
2.7	Invasive lines, feeding tube, and catheters are secured to prevent dislodgement.			
2.8	Nursing staff attend daily patient's rounds.			

2.9	Patient safety is maintained (use of bed rails, pillows and keeping distance between patient and warmer etc).			
2.10	Surgical site/cannulation site/ CVP line site is assessed for any signs of infiltration or infection.			
3.	**NUTRITION AND ELIMINATION**			
3.1	Recording weight and height of patient as per requirement.			
3.2	Documenting the type of diet, calorie count and route of administration.			
3.3	Dietary recommendation is followed by the patient.			
4.	**INVENTORY**			
4.1	Stock registers and inventories are maintained.			
4.2	Bedside articles should be kept ready to use (like ventilator, bag and mask, ET tube, suction catheter, laryngoscope with blade, measuring tape, stethoscope)			
4.3	Sterile instrument sets, store and utility room are stocked.			
4.4	Indent and buffer stock of consumable items are maintained.			
4.5	Inventory of schedule H drugs should be kept in lock and key with physician sign.			
5.	**RECORDING AND REPORTING**			
5.1	Document vitals, intake and output, treatment and nursing care given.			
5.2	Patient file is maintained in order with documentation of complete records and reports like informed consent, shifting notes, procedures done and etc.			
5.3	ICU census is maintained and submitted on time.			
5.4	Specific incident report is maintained and informed to concern authority.			
6.	**CONTINUING NURSING EDUCATION**			
6.1	CNE, training sessions and demonstration are observed and learned.			

APPENDIX – XI

III[rd] DRAFT OF QUALITY IMPROVEMENT CHECKLIST FOR CRITICAL CARE UNITS

Instruction: Please read each statement carefully and put a tick mark on appropriate place which will indicate the quality assuredness of critical care units. Scoring of 1 will be given for 'YES', 0 will be given for 'NO' and no score will be given for 'N.A' (not applicable). Anonymity and confidentiality of your responses will be maintained. Observation, Record review and Staff Interview can be used as a method of assessment by the assessor for assessing the following items.

Name of Unit:

Name of Assessor:

S.NO.	ITEM	YES	NO	N.A
1.	**INFECTION CONTROL**			
1.1	Maintaining professional attire.			
1.2	Handrub antiseptic solution is available at patient bedside for practicing hand hygiene when required.			
1.3	Wearing appropriate PPE as per institutional guidelines.			
1.4	Contaminated instruments are cleaned and disinfected.			
1.5	Three bucket system is followed for mopping of floor every 2hrly.			
1.6	Housekeeping staff and hospital attendants are trained in surface cleaning and disinfection of liquid waste as per guideline.			
1.7	Patient bedsheet is changed daily as per institutional policy or whenever required.			
1.8	Bio medical waste management protocol are being followed as per guideline.			
1.9	Suction bottle jar is emptied and cleaned with 1% hypochlorite whenever 2/3[rd] filled.			

1.10	Changing the ventilator tubing circuit and filter every 48hr or if visibly soiled.			
1.11	Changing feeding bag and syringe with Pressure monitoring line for infusion pump every 24hr.			
1.12	Labelling of multi dose vials, medicine bottles and prepared injectables with dose, date and time.			
1.13	Scrubbing the ports for 5 – 15sec with alcohol swab before and after accessing the catheter site.			
1.14	Heparinizing invasive lines when indicated or required.			
1.15	Number of visitors and visits of patient's relatives are limited.			
1.16	Culture swab of environment (air, surfaces, selected sites), health personnel (hand culture) is taken regularly.			
2.	**PATIENT CARE AND SAFETY**			
2.1	Personal hygiene is provided routinely (bed bath, eye care, hair care and perineal care, etc.) or as required.			
2.2	Oral care is performed every 4hrly or when required.			
2.3	Assessing the status of pressure sore and initiating preventive measures (repositioning & back care every 2hrly)			
2.4	Assessing the surgical site/cannulation site/ CVP line site for signs of infiltration and infection and changing the dressing for any soiling in every shift.			
2.5	Changing tracheostomy dressing every day.			
2.6	Chest physiotherapy and limb physiotherapy is provided in every shift or when required.			
2.7	Invasive lines, feeding tube, and catheters are labelled with date and secured to prevent dislodgement.			
2.8	Senior nursing officer and nursing officer attends daily patient rounds.			
2.9	Patient safety is maintained (use of bed rails, pillows and keeping distance between patient and warmer etc).			
3.	**NUTRITION AND ELIMINATION**			
3.1	Recording weight and height of patient as per requirement.			
3.2	Dietary recommendation is followed for the patient with proper documentation (type of diet, calorie			

	count, route of administration)			
4.	**INVENTORY**			
4.1	Stock registers and inventories are maintained.			
4.2	Indent and buffer stock of consumable items are maintained.			
4.3	Inventory of schedule H drugs should be kept in lock and key.			
5.	**RECORDING AND REPORTING**			
5.1	Document vitals, intake and output, treatment and nursing care given.			
5.2	Patient file is maintained in order with documentation of complete records and reports like informed consent, shifting notes, procedures done etc.			
5.3	CCU census is maintained and submitted on time.			
5.4	Specific incident report is maintained and informed to concern authority.			
6.	**CONTINUING NURSING EDUCATION (CNE)**			
6.1	CNE, training sessions and demonstration are being organized at regular intervals.			

APPENDIX – XII

CONTENT VALIDITY PERFORMA

Instruction: The expert is requested to go through the following criteria checklist prepared for validation of Quality improvement nurse checklist. There are four columns given for response and a column for remarks. Kindly tick marks at the appropriate column and facilitate your remarks in the remarks column.

S.no	Item	Highly relevant	Quite relevant	Somewhat relevant	Not relevant	Remark
1.	**INFECTION CONTROL**					
1.1	Maintaining professional attire.					
1.2	Handrub antiseptic solution is available at patient bedside for practicing hand hygiene when required.					
1.3	Wearing appropriate PPE as per institutional guidelines.					
1.4	Contaminated instruments are cleaned and disinfected.					
1.5	Three bucket system is followed for mopping of floor every 2hrly.					
1.6	Housekeeping staff and hospital attendants are trained in surface cleaning and disinfection of liquid waste as per guideline.					
1.7	Patient bedsheet is changed daily as per institutional policy or whenever required.					
1.8	Bio medical waste management protocol are being followed as per guideline.					
1.9	Suction bottle jar is emptied and cleaned with 1% hypochlorite whenever 2/3rd filled.					
1.10	Changing the ventilator tubing circuit and filter every 48hr or if visibly soiled.					

1.11	Changing feeding bag and syringe with Pressure monitoring line for infusion pump every 24hr.					
1.12	Labelling of multi dose vials, medicine bottles and prepared injectables with dose, date and time.					
2.	**PATIENT CARE AND SAFETY**					
2.1	Personal hygiene is provided routinely (bed bath, eye care, hair care and perineal care, etc.) or as required.					
2.2	Oral care is performed every 4hrly or when required.					
2.3	Assessing the status of pressure sore and initiating preventive measures (repositioning & back care every 2hrly)					
2.4	Assessing the surgical site/cannulation site/ CVP line site for signs of infiltration and infection and changing the dressing for any soiling in every shift.					
2.5	Changing tracheostomy dressing every day.					
2.6	Chest physiotherapy and limb physiotherapy is provided in every shift or when required.					
2.7	Invasive lines, feeding tube, and catheters are labelled with date and secured to prevent dislodgement.					
2.8	Senior nursing officer and nursing officer attends daily patient rounds.					
2.9	Patient safety is maintained (use of bed rails, pillows and keeping distance between patient and warmer etc).					
3.	**NUTRITION AND ELIMINATION**					
3.1	Recording weight and height of patient as per requirement.					

3.2	Dietary recommendation is followed for the patient with proper documentation (type of diet, calorie count, route of administration)					
4.	**INVENTORY**					
4.1	Stock registers and inventories are maintained.					
4.2	Indent and buffer stock of consumable items are maintained.					
4.3	Inventory of schedule H drugs should be kept in lock and key.					
5.	**RECORDING AND REPORTING**					
5.1	Document vitals, intake and output, treatment and nursing care given.					
5.2	Patient file is maintained in order with documentation of complete records and reports like informed consent, shifting notes, procedures done etc.					
5.3	CCU census is maintained and submitted on time.					
5.4	Specific incident report is maintained and informed to concern authority.					
6.	**CONTINUING NURSING EDUCATION (CNE)**					
6.1	CNE, training sessions and demonstration are being organized at regular intervals.					

Any other comments/ suggestion regarding:

a. Overall organization of scale

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b. Language of tool:

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c. Practicability of tool:

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Signature of the Expert

APPENDIX – XIII

FINAL DRAFT OF QUALITY IMPROVEMENT CHECKLIST FOR CRITICAL CARE UNITS

Instruction: Please read each statement carefully and put a tick mark on appropriate place which will indicate the quality assuredness of critical care units. Scoring of 1 will be given for 'YES', 0 will be given for 'NO' and no score will be given for 'N.A' (not applicable). Anonymity and confidentiality of your responses will be maintained. Observation, Record review and Staff Interview can be used as a method of assessment by the assessor for assessing the following items.

Name of Unit:

Name of Assessor:

S.NO.	ITEM	YES	NO
1.	**INFECTION CONTROL**		
1.1	Maintaining professional attire.		
1.2	Hand-rub antiseptic solution is available at patient bedside for practicing hand hygiene whenever required.		
1.3	Wearing appropriate PPE as per institutional guidelines.		
1.4	Contaminated instruments are cleaned and disinfected.		
1.5	Three bucket system is followed for mopping of floor.		
1.6	Housekeeping staff and hospital attendants are trained in infection control and waste management.		
1.7	Patient bedsheet is changed daily or whenever required as per institutional policy.		
1.8	Bio medical waste management protocol are being followed as per guideline.		
1.9	Suction bottle jar is cleaned with 1% hypochlorite and not filled more than 2/3rd.		
1.10	Changing the ventilator tubing circuit and filter if visibly soiled.		
1.11	Cleaning/changing of feeding bag and syringe with Pressure monitoring line for infusion pump routinely or as indicated.		
1.12	Labelling of multi dose vials, medicine bottles and prepared injectable with dose, date and time.		
1.13	Number of visitors and visits of patient's relatives are limited.		

1.14	Culture swab of environment (air, surfaces, selected sites), health personnel (hand culture) is taken regularly.		
2.	**PATIENT CARE AND SAFETY**		
2.1	Personal hygiene is provided routinely (bed bath, eye care, hair care and perineal care, etc.) or as required.		
2.2	Oral care is performed regularly or whenever required.		
2.3	Assessing the risk of pressure ulcer and initiating preventive measures (repositioning & back care every 2 hourly)		
2.4	Assessing the surgical site/cannulation site/ CVP line site for signs of infiltration and infection and changing the dressing for any soiling whenever required.		
2.5	Tracheostomy dressing is clean and changed every day.		
2.6	Chest physiotherapy and limb physiotherapy is provided in every shift or whenever required.		
2.7	Invasive lines, feeding tube, and catheters are labelled with date and secured to prevent dislodgement.		
2.8	Senior nursing officer and nursing officer attends daily patient rounds.		
2.9	Patient safety is maintained (use of bed rails, pillows and keeping distance between patient and warmer etc).		
3.	**NUTRITION AND ELIMINATION**		
3.1	Recording weight and height of patient as per requirement.		
3.2	Dietary recommendation is followed for the patient with proper documentation (type of diet, calorie count, route of administration)		
4.	**INVENTORY**		
4.1	Stock registers and inventories are maintained.		
4.2	Indent and buffer stock of consumable items are maintained.		
4.3	Inventory of schedule H drugs are kept under lock and key.		
5.	**RECORDING AND REPORTING**		
5.1	Patient file is maintained in order with documentation of complete records and reports like vital signs, intake and output chart, informed consent, shifting notes, procedures done, treatment and nursing care given etc.		
5.2	Census is maintained and submitted on time.		
5.3	Specific incident report is maintained and informed to concerned authority.		
6.	**CONTINUING NURSING EDUCATION (CNE)**		
6.1	CNE, training sessions and demonstration are being organized periodically.		

*PPE- Personal protective equipment, CVP – Central venous pressure.

Remarks (if any):

APPENDIX – XIV

TRAINING SESSION

APPENDIX - XV

MASTER DATA SHEET

Subject	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	Item 14	Item 15	Item 16	Item 17	Item 18	Item 19	Item 20	Item 21	Item 22	Item 23	Item 24	Item 25	Item 26	Item 27	Item 28	Item 29	Item 30	Item 31	Item 32
1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
9	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
19	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
21	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
22	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
23	1	1	0	1	0	0	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1
24	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
26	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
27	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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