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## Nurse Practitioner in Critical Care: A Systematic Review

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### ABSTRACT:

**Background:** The expanding role of Nurse Practitioners in critical care settings has been significant in addressing workforce demands and improving patient outcomes. This Systematic Review aims to generate existing evidence about the role, effectiveness or impact and outcomes of Nurse Practitioners in Critical Care. **Materials and Methods:** A comprehensive search was done in various databases like Google Scholar, Pubmed, MEDLINE, CINAHL and Cochrane Library till June 2024. The studies were included if they evaluated the role, effectiveness or impact and outcomes of the Nurse Practitioners in Critical Care. The data was extracted and carefully scrutinized for quality by two reviewers before its inclusion in the review. The quality of the included studies was assessed using Newcastle- Ottawa scale and RoB 2. **Results:** A total of seven studies were found eligible. The overall methodological quality of the studies ranged from fair to good. The studies were conducted in different critical care settings. The studies comprised of Randomized controlled trials, Cohort Study, Comparative designs, Comprehensive Reviews and Mixed Designs. **Conclusion:** Nurse Practitioners play a vital role in the Critical care settings significantly impacting patient outcomes and efficiency of health care delivery.

**Keywords:** Nurse Practitioner, Critical care, intensive care units, NP Role, NP Impact, effectiveness of NP.

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## 1. INTRODUCTION

Critical care units are environments which require high quality care to improve the clinical patient outcomes. Critical care units include Intensive care units, Cardiac care units and High dependency areas that require highly specialized knowledge and skills. The Critical care units face a severe staff crisis which impacts the overall efficiency of the health care delivered. After the introduction of Nurse Practitioner in Critical Care course in India since 2017, the inclusion of Nurse Practitioners in Critical care units has contributed to improve the overall quality of patient care. Nurse Practitioners are trained in focused initial assessment, diagnostics and management. Nurse practitioners are increasingly being employed in Intensive Care Units to offset physician shortages<sup>1,11</sup>.

However, the role and contribution of Nurse Practitioner in the critical care units are not clearly defined and appreciated. It is important to realize the contribution of Nurse Practitioners in Critical Care to make critical care decisions. As the demand for high quality and patient centered care continues to rise in the Critical care units, understanding the role of Nurse Practitioners in Critical care is crucial.

The primary objective of this Systematic Review is to highlight the role of the Nurse Practitioners in Critical care settings, identify the effectiveness of including them in the Critical care units, explore the impact caused or the outcomes brought by the Nurse Practitioners in the Critical Care units. This Systematic Review aims to provide a comprehensive review of the role, effectiveness or impact and outcomes of Nurse Practitioners in Critical Care.

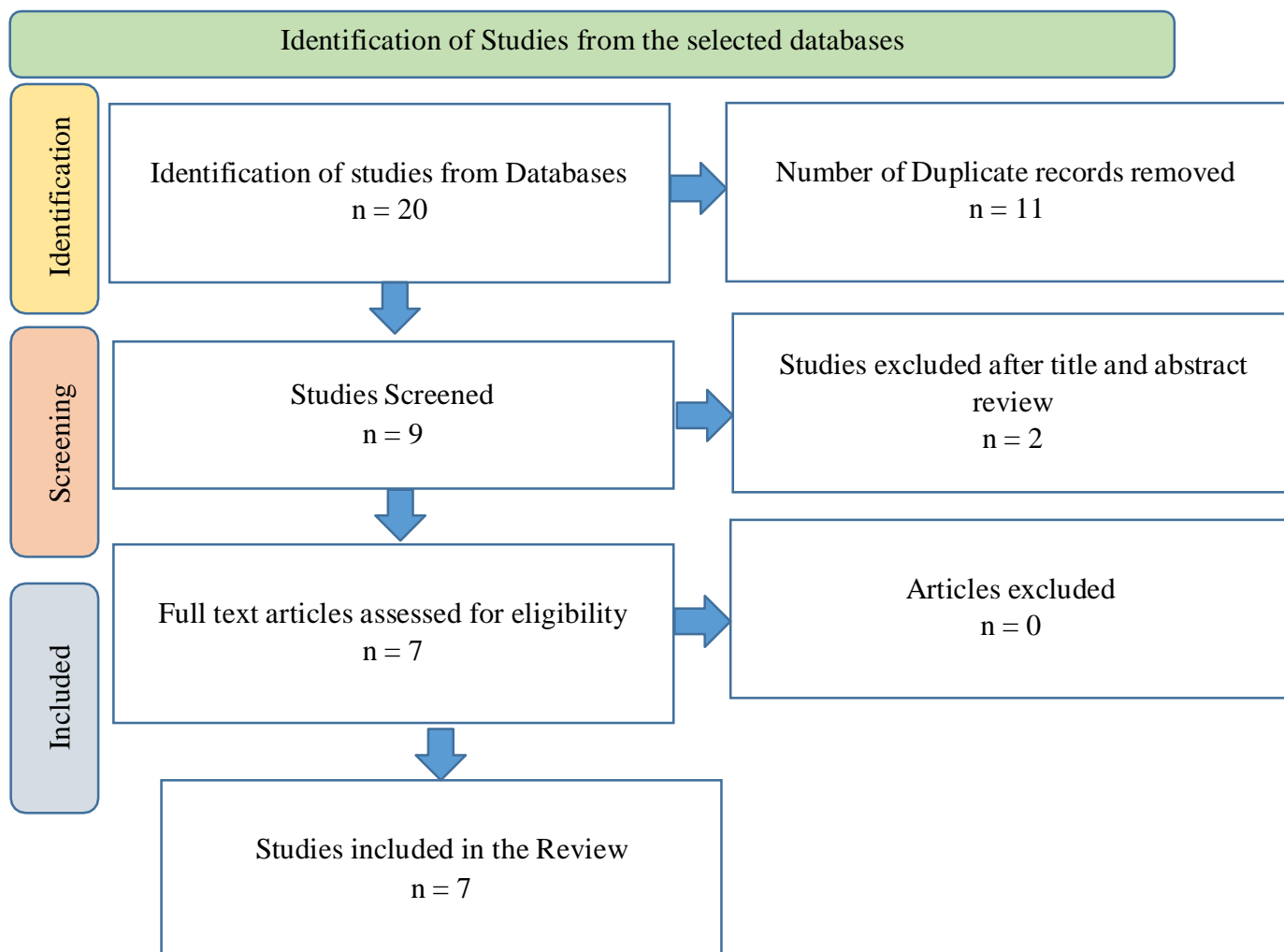
The review throws light on the importance of integration of Nurse Practitioners in Critical Care to meet the increasing demands and raise the standards of quality patient care delivered in the Critical Care Settings. It also emphasizes the impact of Nurse Practitioners in Critical care through decreased mortality rates, length of hospital stay, incidence of complications and Patient satisfaction. The Review will provide insights to future healthcare policy makers and administrators in Critical care decisions. The Review paper is organized into the following sections which include introduction, materials and methods, PRISMA flowchart, Table of the reviewed studies, results, discussion, conclusion and limitations.

## 2. MATERIALS AND METHODS

A Comprehensive search of data was conducted using the databases such as Google Scholar, Pubmed, MEDLINE, CINAHL and Cochrane Library. Data was extracted based on the preset inclusion and exclusion criteria. The studies were screened using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) protocol. Each study was scrutinized for objectives, results, methodology and included in the review.

**Table 1: Inclusion and Exclusion Criteria**

<b>Inclusion Criteria</b>	<b>Exclusion Criteria</b>
<b>Studies evaluating the role, effectiveness and impact or outcomes of Nurse Practitioner</b>	<b>Studies not specific to Critical Care</b>
<b>No limitation on time frame</b>	<b>Studies exploring barriers, factors affecting the role or role transition</b>

**Flowchart 1: PRISMA Flowchart****3. RESULT**

A total of 20 articles were identified and extracted through various databases. After removing the duplicates 9 articles were screened for title and abstract review. 2 articles that did not meet the inclusion criteria were excluded. After a full text review, 7 articles were selected for the review out of which no articles were removed later. A total of seven articles were included for the review which is represented in Table 2

The Review comprised of 7 articles which included a Mixed design study, a Comparative study, a Comprehensive review, a Descriptive study, a Prospective Cohort study, a Retrospective Cohort study and one Randomized Controlled trial. The quality assessment of the Randomized Controlled Trial was done using RoB 2 and found low risk for bias. The quality assessment of other studies was done using Newcastle Ottawa Scale and the quality ranged from fair to good.

**Table no: 2 Findings of all studies included in the Review**

S.no	Author	Title	Objectives	Method	Outcome Measures & Results	Conclusion
1	enny Carryer et.al (2007) <sup>3</sup>	The core role of the Nurse Practitioner: Practice, Professionalism and Clinical leadership	Draw on empirical evidence to illustrate the core role of Nurse Practitioners	Mixed Method. This interpretive study used multiple data sources, including published and grey literature, policy documents and interviews with 15 nurse practitioners	The core role of the Nurse Practitioner was identified as having three components: dynamic practice, professional efficacy and clinical leadership.	The nurse practitioner demonstrates professional efficacy, enhanced by an extended range of autonomy that includes legislated privileges. The nurse practitioner is a clinical leader with a readiness and an obligation to advocate for their client base and their profession at the systems level of health care.
2	son Merret (2008) <sup>4</sup>	The role and effectiveness of a Nurse Practitioner led critical care outreach service	Describe the role and effectiveness of a Nurse Practitioner led critical care outreach service (CCORS).	Comparative Study design. The study compared data collected 12 months prior to, and 12 months following the implementation of the Nurse Practitioner led CCORS (July 2005– June 2007 inclusive)	Data was also collected on length of stay and APACHE II scores of ICU readmissions <72 h, ICU patient acuity, readmission mortality, and ward medical emergency team (MET) and cardiac arrest calls.	NP led CCORS has a positive effect on patient outcomes and supports development of further NP positions.

3	Margaret Fry (2011) <sup>5</sup>	Impact of Nurse Practitioners in critical care services	Examine the impact of Critical Care Nurse Practitioner models, roles, activities and outcomes.	Comprehensive Review identified 1048 articles out of which 47 studies were considered relevant.	The role focused on direct patient management, assessment, diagnosis, monitoring and procedural activities. Critical Care Nurse Practitioners improved patient flow and clinical outcomes by reducing patient complication, morbidity and mortality rates.	Internationally, Critical Care Nurse Practitioners are demonstrating substantial positive patient, service and nursing outcomes
4	Janna Landspurger et.al (2016) <sup>6</sup>	Outcomes of Nurse Practitioner-Delivered Critical Care	Compare the primary end point of 90-day survival between patients cared for by Acute Care Nurse Practitioner and resident teams	Prospective Cohort study The primary endpoint of 90-day survival was compared between patients cared for by ACNP and resident teams. Secondary endpoints included ICU and hospital mortality and ICU and hospital length of stay.	Patients cared for by ACNPs had lower ICU mortality (6.3%) than resident team, length of stay was shorter for patients cared for by ACNPs (7.9 ± 11.2 days) than for resident patients	Outcomes are comparable for critically ill patients cared for by Acute Care Nurse Practitioner and resident teams. Low ICU Mortality and Shorter Length of ICU stay was noted for patients cared by Nurse Practitioners.

Table no: 2 Cont...d						
S.no	Author	Title	Objectives	Method	Outcome Measures & Results	Conclusion
5	Audrey Jackson et.al (2014) <sup>7</sup>	The advance Nurse Practitioner in critical care: workload evaluation	To report on specific activities and workload	Descriptive study. A data collection form was designed to capture clinically and patient-related activities of these post-holders. Data from 1 week were recorded on one post-holder and subsequently analysed.	The Nurse Practitioners contributed to the majority of interventions. Independent patient assessment was highlighted as a significant part of that workload (12%). The evaluation also highlighted the broad nature required of nurse practitioner prescribing and thus reinforced the strategic decision not to introduce a restricted formulary.	The workload of Nurse Practitioners in Critical Care Units mainly consisted of patient assessments and prescribing. Advanced nurse practitioners in critical care effectively carried out the traditional medical tasks in which they were trained. As already experienced nurses with new enhanced skills they successfully contributed to and enhanced the delivery of care to the critically ill.
6	Min-Hsin Huang et.al (2018) <sup>8</sup>	The impact of the addition of nurse practitioners to surgical intensive care units	To compare the outcomes of critically ill surgical patients before and after the addition of NPs to the ICU team.	Retrospective Cohort study compared the outcomes of patients admitted to ICU during the 2-year period before and after the addition of NPs to the ICU team. The primary endpoint was ICU mortality. Secondary endpoints included ICU length of stay	A total of 8747 patients were included in the study. ICU mortality was significantly lower after the addition of NPs (2.2% before vs. 1.1% after addition of NPs, $p = 0.014$ ). In the multivariate analysis, admission after the addition of NPs was associated with significantly	Incorporating NPs in the ICU team was associated with improved outcomes in scheduled admissions to surgical ICU when compared with a traditional, resident-based team.

				and incidence of unplanned extubation.	reduced ICU mortality.	
7	Alba Mitchell-DiCenso et.al (1996) <sup>9</sup>	A Controlled Trial of Nurse Practitioners in Neonatal Intensive Care	Compare a Neonatal practitioner (NP) team with a pediatric resident team in the delivery of neonatal intensive care.	Randomized, controlled trial. of 821 neonatal infants admitted to the neonatal intensive care unit between September 1991 and September 1992, 414 were randomized to care by the NP team, and 407 were randomized to care by the pediatric resident team.	There were 19 (4.6%) deaths in the NP group and 24 (5.9%) in the resident group. In the NP group, 230 (55.6%) neonates had complications, in comparison with 220 (54.1%) in the resident group. Mean lengths of stay were 12.5 days in the NP group and 11.7 days in the resident group.	NP and resident teams are similar with respect to all tested measures of performance. These results support the use of NPs as an alternative to pediatric residents in delivering care to critically ill neonates.

#### 4. DISCUSSION

Nurse practitioner practice is dynamic and involves the application of high level clinical knowledge and skills in a wide range of contexts. The nurse practitioner demonstrates professional efficacy, enhanced by an extended range of autonomy that includes legislated privileges. The nurse practitioner is a clinical leader with a readiness and an obligation to advocate for their client base and their profession at the systems level of health care<sup>2,12</sup>.

The core role of the Nurse Practitioner Jenny Carryer et.al (2007) used multiple data sources, including published and grey literature, policy documents, nurse practitioner program curricula and interviews with 15 nurse practitioners from the two countries (New Zealand and Australia). The data were aggregated thematically according to patterns within and across the interview and material data. The core role of the nurse practitioner was identified as having three components: dynamic practice, professional efficacy and clinical leadership. These

research findings provide new perspectives to inform the international debate about this extended level of nursing practice<sup>3</sup>.

Margaret Fry (2011) performed a comprehensive review to examine the impact of Critical Care Nurse Practitioner models, roles, activities and outcomes. The MEDLINE, CINAHL; PubMed; PROQUEST; Science

Direct; and the Cochrane database were accessed for the review. From the identified 1048 articles 47 studies were considered relevant. The role focused on direct patient management, assessment, diagnosis, monitoring and procedural activities. Critical Care Nurse Practitioners improved patient flow and clinical outcomes by reducing patient complication, morbidity and mortality rates<sup>5</sup>.

Audrey Jackson et.al (2014) did an evaluation of the specific activities, workload and patterns of prescribing of advanced nursing practice posts within a critical care setting. A data collection form was designed to capture clinically and patient-related activities of these post-holders. The intensive care and high dependency unit ward round attributed to 46% of the nurse practitioner's weekly activity and mainly consisted of patient assessments and prescribing. The rest of the time was mainly split between documentation and unsupervised patient assessments. The nurse practitioners contributed to the majority of interventions. Independent patient assessment was highlighted as a significant part of that workload (12%). The evaluation also highlighted the broad nature required of nurse practitioner prescribing and thus reinforced the strategic decision not to introduce a restricted formulary<sup>7</sup>.

The effectiveness, impact or outcomes of Nurse Practitioners in Critical Care Alison M Pirret (2008) described the role and effectiveness of a nurse practitioner (NP) led critical care outreach service (CCORS). Using a comparative study design, data on the number of intensive care unit (ICU) readmissions <72h were analysed 12 months prior to, and 12 months following implementation of the service. Data was also collected on length of stay and APACHE II scores of ICU readmissions <72h, ICU patient acuity, ICU readmission mortality, and ward medical emergency team (MET) and cardiac arrest calls. Data on NP referrals were collected to identify NP activities. Data analysis was completed using descriptive statistics and run and control charts. The most common interventions completed by the NP during visits included requesting of diagnostic tests and prescribing. Following introduction of the NP CCORS, there was a sustained reduction in ICU readmissions <72h<sup>4</sup>.

Janna S. Landsperger et.al (2016) conducted a Prospective cohort study of all admissions to an adult medical ICU in an academic, tertiary-care center between January 1, 2011, and December 31, 2013. The primary end point of 90-day survival was compared between patients cared for by ACNP and resident teams using Cox proportional hazards regression. Secondary end points included ICU and hospital mortality and ICU and hospital length of stay. The patients cared for by ACNPs had lower ICU mortality (6.3%) than resident team patients (11.6%; adjusted OR, 0.77; 95% CI, 0.63-0.94; P = .01), hospital mortality was not different (10.0% vs 15.9%; adjusted OR, 0.87; 95% CI, 0.73-1.03; P = .11). ICU length of stay was similar between the ACNP and resident teams ( $3.4 \pm 3.5$  days vs  $3.7 \pm 3.9$  days [adjusted OR, 1.01; 95% CI, 0.93-1.1; P = .81]), but hospital length of stay was shorter for patients cared for by ACNPs ( $7.9 \pm 11.2$  days) than for resident patients ( $9.1 \pm 11.2$  days) (adjusted OR, 0.87; 95% CI, 0.80-0.95; P = .001)<sup>6</sup>.

Min-Hsin Huang et.al (2018) compared the outcomes of critically ill surgical patients before and after the addition of NPs to the ICU team conducting a retrospective cohort study in a Taiwanese surgical ICU. The outcomes of patients admitted to ICU during the 2-year period before and after the addition of NPs to the ICU team. The primary endpoint was ICU mortality. Secondary endpoints included ICU length of stay and incidence of unplanned extubation. A total of 8747 patients were included in the study. For scheduled ICU admissions, ICU mortality was significantly lower after the addition of NPs (2.2% before vs.



1.1% after addition of NPs,  $p = 0.014$ ). In the multivariate analysis, admission after the addition of NPs was associated with significantly reduced ICU mortality (odds ratio = 0.481; 95% confidence interval = 0.263-0.865;  $p = 0.015$ ) among scheduled admissions<sup>8</sup>.

Alba Mitchell-DiCenso et.al (1996) compared a Neonatal practitioner team with a pediatric resident team in the delivery of neonatal intensive care. A Randomized, controlled trial of 821 infants admitted to the neonatal intensive care unit between September 1991 and September 1992, 414 were randomized to care by the NP team, and 407 were randomized to care by the pediatric resident team. There were 19 (4.6%) deaths in the NP group and 24 (5.9%) in the resident group (relative risk [RR], 0.78; confidence interval [CI], 0.43 to 1.40). In the NP group, 230 (55.6%) neonates had complications, in comparison with 220 (54.1%) in the resident group (RR, 1.03; CI 0.91 to 1.16). Mean lengths of stay were 12.5 days in the NP group and 11.7 days in the resident group (difference in means, days; CI, -1.1 to 2.7). Mean scores on the Neonatal Index of Parent Satisfaction were 140 in the NP group and 139 in the resident group (difference in means, 1.0; CI, -3.6 to 5.6). In the NP group, 6 (2.6%) infants performed 30% or more below their age level in the Minnesota Infant Development Inventory, in comparison with 2 (0.9%) in the resident group (RR, 2.87; CI, 0.59 to 14.06)<sup>9</sup>.

## 5. CONCLUSION

Nurse Practitioners play an inevitable role in contributing to the Clinical outcomes of the Critical care units. Their role is remarkably highlighted for promoting wellness of the Critically ill patients. Appropriate utilization of Nurse Practitioners in the Critical Care units can meet the increasing workforce demands. The need for acute care nurse practitioners (ACNPs) in the intensive care unit (ICU) has steadily increased over the years. This is in part because of an increase in hospital admissions from an aging population that is living longer from advances in health care, especially in the critical care arena. Another factor involves recommendations by the Leapfrog Group that include fundamental critical care support be readily available to the patient's bedside within 5 minutes. However, the largest driving force is the human resources shortage in critical care medicine. More and more patients are requiring critical care services, whereas physician numbers are not keeping pace with the growth. The addition of Nurse Practitioners into the Critical care arenas has positive effects.<sup>10,13,14</sup>

**Limitations:** The Study is limited to its heterogeneous nature of including only Nurse Practitioners in Critical care and potential publication bias

**Conflicts of Interest:** There is no conflict of interest between the authors

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