

## Advancing Critical Care Nursing in Oman: Trends, Challenges, and Educational Innovations

Samir Al Nasser<sup>1</sup>, Mary Sheeba<sup>2</sup>, Sreedevi Appukuttan, Dr. Asyia Al Hassani<sup>2</sup>, Sultan Al Balushi<sup>1</sup>, Dr. Manal Al Zadjali<sup>3</sup>

<sup>1</sup> Adult Critical Nursing Program, Higher Institute of Health Specialties, Muscat, Oman

<sup>2</sup> Quality Assurance Section, Higher Institute of Health Specialties, Muscat, Oman

<sup>3</sup> Dean, Higher Institute of Health Specialties, Muscat, Oman

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### Abstract

**Objective:** This review critically examines the current state and challenges of adult critical care services in Oman, focusing on the need for skilled critical care nurses and their education.

**Sources and Methods:** A comprehensive review of existing literature and reports was conducted, including epidemiological studies, healthcare policy documents, and academic articles relevant to public health and critical care nursing in Oman. Data were compiled and interpreted to highlight key issues and propose recommendations.

**Findings:** Non-communicable diseases (NCDs) and trauma incidents, such as motor vehicle collisions, are major contributors to the demand for critical care services in Oman. The COVID-19 pandemic further strained the healthcare system, revealing critical shortages in both personnel and resources. The Adult Critical Care Nursing Program (ACCNP), established to address these needs, plays a crucial role in enhancing the competencies of critical care nurses. However, challenges such as a lack of senior faculty, limited clinical placement opportunities, insufficient advanced educational materials, and inadequate learning management systems hinder the program's effectiveness. Additionally, high nurse-to-patient ratios and the physical demands of ICU work contribute to stress and burnout among nurses.

**Conclusion:** To improve critical care services in Oman, it is essential to address the shortage of specialized faculty, expand clinical placement opportunities, invest in modern educational resources, and establish a comprehensive learning management system. Enhancing international collaboration and creating a robust regulatory framework will further support the development of a proficient and resilient critical care nursing workforce.

Adult Critical Care Nursing in Oman constitutes an essential element of the healthcare system, delivering care to patients with complex and frequently life-threatening diseases. Critical care, in contrast to other medical specialties, specifically focuses on the complex character of patients' situations, encompassing the extent of organ malfunction and the related mortality risks (Fu et al., 2022; Kayambankadzanja et al., 2022). Epidemiological research reveals that the prevalence of severe diseases is more extensive than previously acknowledged, a trend anticipated to continue as the population ages, especially given the rising incidence of non-communicable diseases (James et al., 2018; Lai et al., 2018). This acknowledgment highlighted the necessity for significant investments in sophisticated critical care facilities.

Nurses represent the largest cohort of healthcare professionals worldwide, significantly contributing to the provision of essential care (Brimblecombe, 2023). Critical care nurses function in specialized technical settings exhibit advanced knowledge, proficiency, and competence in providing care for patients and their families (Woo et al., 2017). In response to the complexity of critical illnesses, these nurses are assigned to diverse critical care environments, encompassing Adult Intensive Care Units (AICU), Coronary Care Units (CCU), Post Coronary Care Units (PCCU), Post Cardiac Surgery Units (PCSU), Cardio-Thoracic and Vascular Surgery Units (CTVSU), Neuro Intensive Care Units (NICU), Cardiac Catheterization Labs (CCL), and Burns Units (BU). Therefore, it is crucial for these professionals to have critical transferable abilities to operate effectively in these varied and challenging fields (Niu et al., 2023).

Ndirangu-Mugo et al. (2022) delineate the tasks of critical care nurses, highlighting their enhanced proficiency in critical thinking, problem-solving, decision-making, alertness, and prompt response. These qualities are crucial for managing high-intensity, clinically intricate situations. Critical care nurses are tasked with detecting, monitoring, and promptly addressing clinical deterioration using advanced body system evaluations and personalized therapy interventions based on priority needs. Moreover, they serve as essential members of multidisciplinary teams, especially in promoting patient-centered care and offering follow-up for terminally ill patients (Ndirangu-Mugo et al., 2022).

The Sultanate of Oman, located in the southeastern Arabian Peninsula, covers over 309,500 square kilometers and has a population surpassing 5.1 million, of which around 2.9 million are Omani nationals (National Centre for Statistics and Information (NCSI), 2023). The predominant segment of the population is aged between 15 and 60 years, and the country reports a life expectancy of 77.2 years. The epidemiological landscape of Oman is swiftly shifting towards non-communicable diseases, with a rising prevalence of comorbidities such as Diabetes Mellitus, Hypertension, Cancer and Cardiovascular Diseases. This transition is primarily due to alterations in lifestyle and health behaviors. Moreover, motor vehicle collisions and their consequent injuries impose a substantial strain on the healthcare system (Annual Health Report, 2023). This article seeks to examine the present condition of adult critical care nursing practice in Oman and to analyze the competencies and faced by critical care nurses in specialized units.

### **Healthcare Services in Oman**

The healthcare services in Oman have undergone significant developments in recent decades. In 1970, the country possessed merely two hospitals, each with 12 beds, alongside a total of 10 clinics. By 2022, the number of hospitals under the Ministry of Health (MoH) had markedly risen to 50. This expansion signifies the nation's endeavors to address the changing healthcare requirements of its population. In addressing these difficulties, the MoH has focused its five-year health plans on the idea that health is a collective responsibility (Ministry of Economy, Sultanate of Oman, 2021). Primary healthcare in Oman is provided by a network of health centers, polyclinics, extended health centers, and municipal hospitals. The MoH offers secondary and tertiary care services via hospitals that are adequately equipped with specialist beds. These services aim to respond to evolving illness trends and proficiently manage non-communicable diseases.

The 2023 Annual Health Report indicates that nurses constitute 60% of the overall healthcare workforce in Oman. Oman employs 22,130 nurses, with over 72% of them serving in hospitals affiliated with the MoH. Furthermore, 8% are worked at government hospitals not affiliated with the MoH, such as those under the Ministry of Defense and the Royal Oman Police, while the remaining 20% are engaged in private hospitals. Approximately 62% of the nurses at MOH institutes are Omani citizens. The nurse-to-population ratio is 42.8 per 10,000 individuals. The nursing workforce increased by 6.7% in 2022. This positively influences the beds-to-nurse ratio, which has diminished from 2.2 in 1975 to 0.3. The MoH currently manages 14 specialized

hospitals, with 124 Intensive Care Unit (ICU) beds, 51 Coronary Care Unit (CCU) beds, 15 beds in the Burns Unit, and 41 beds in specialized nursing wards. Currently, there are around 1,017 nurses engaged in critical care services in the Sultanate of Oman (Annual Health Report, 2023).

### **The Advancement of Nursing Education in Oman**

The nursing profession in the Gulf Cooperation Council (GCC) has its roots in the Islamic Era, during which women, spearheaded by Ms. Rufaida Al Aslamia, rendered care to the wounded in battle, as well as the ill and aged. The advancement of nursing in Oman commenced in the early 19<sup>th</sup> century under the guidance of the American Mission Association (Al Maqbali et al., 2019). Nonetheless, the most significant advancements in nursing in Oman occurred after 1971 when the Ministry of Health (MoH) was established. It took over hospitals and nursing education, formerly overseen by the American Missionary Association, to meet the growing demand for skilled and proficient nurses. Participants of these initial programs were designated as Nurse Assistants. The nursing profession attained increased significance in 1979 with the creation of the Directorate of Nursing as a distinct department within the MoH (Al Maqbali et al., 2019).

The 19<sup>th</sup> century witnessed the establishment of numerous healthcare institutions throughout Oman, encompassing both general and specialty hospitals. From 1982 to 1990, the MoH initiated a program to educate nurses in essential patient care and daily support (AL-Riyami et al., 2015). In 1991, the Ministry enhanced its educational infrastructure by founding five Nursing Institutes in Muscat, Salalah, Nizwa, Ibri, and Sur, subsequently adding institutes in Rustaq, Sohar, Ibra, and Buraimi, which provide a three-year diploma degree. The Oman Nursing Institute (ONI), previously referred to as Muscat Nursing Institute, educated an annual cohort of 200 nurses, culminating in a total of 599 students. The ONI additionally supplied curricula and teaching materials to various educational institutions (Al Maqbali et al., 2019).

The progression of nursing education in Oman demonstrates the country's dedication to cultivating a skilled and professional nursing staff. The creation of numerous nursing institutes and the Directorate of Nursing has greatly enhanced the education and professional development of nurses in Oman. As the nation advances its healthcare infrastructure, nursing education is essential for upholding high standards of patient care and addressing the increasing healthcare demands of the population.

### **The Development of Specialized Nursing Education**

Despite the MoH's institutions endeavoring to cultivate direct care nurses, the demand for highly skilled nurses in Oman remained unfulfilled. Consequently, the Muscat Nursing Institute established a specialized post-basic diploma program in Midwifery in 1995 (Al Maqbali et al., 2019). The success of this program, coupled with the growing demand for skilled nurses in many fields, resulted in the establishment of the Nephrology Nursing Program in 1997 and the Critical Care Nursing in Pediatric and Neonatology Program in 1999. Nonetheless, an increase was imperative due to demand exceeding three specialization programs. Therefore, the MoH (MOH) founded the Oman Specialized Nursing Institute (OSNI) in November 2001. The Institute's objective was to match with global innovations in nursing care by consistently developing and providing new programs that meet the essential needs of Oman's healthcare institutions (Al-Riyami et al., 2015). Subsequent to its official introduction, a partnership was established with Villanova University in the United States to initiate a new nursing management program in the academic year 2003/2004.

In 2004, recognizing the necessity for trained nurses, the OSNI entered into a Memorandum of Agreement with the University of Central Lancashire (UCLan), UK, to establish a Post Basic Diploma in Adult Critical Care Nursing Program (PGD-ACCNP). This curriculum encompassed four unique subspecialties: Medical, Neuro and Coronary Intensive Care, and Accident & Emergency (White, 2012). Table 1 indicates that nine cohorts of Post Basic Diploma students have successfully completed and graduated from this program. A total of 233

individuals graduated from the Post Basic - Adult Critical Care Nursing Program between 2004 and 2013 in Oman. Majority of graduates were from Muscat, with substantial representations from North and South Batinah, Al Dhakhiliya, and Dhofar. Several hospitals had merely one or two graduates, indicating an inequitable distribution of critical care specialized staff nationwide. In 2015, a notable enhancement took place when all programs were elevated to Post Graduate Diploma status following a comprehensive curriculum assessment performed by OSNI and externally reviewed by Cardiff University, UK. In that year, due to the elevated frequency of Motor Vehicle Collisions and the increasing demand for nursing staff in Emergency rooms, the Emergency Nursing specialization was created as an independent program. Since the establishment of the Higher Institute of Health Specialties (HIHS) in 2018, eight cohorts of students (Table 2) have graduated and obtained postgraduate certificates from the Adult Critical Care Nursing Program, currently employed in various critical care units nationwide. Approximately 118 graduates completed the Post Graduate Diploma in Adult Critical Care Nursing (PGD-ACCN) from various hospitals in Oman. Khoula Hospital in Muscat produced the most graduates, totaling 26, followed by the Royal Hospital with 14 graduates and Sohar Hospital with 12 graduates. Certain institutions, including Al Nahdha, Sur, and Buraimi, produced fewer graduates, reflecting a concentrated yet uneven distribution of critical care nursing proficiency nationwide according to demand. The advancement of specialized nursing education in Oman reflects a robust dedication to improve the skills and capabilities of nurses. The creation of specialized institutes and programs guarantees that nurses are adequately prepared to address the intricate requirements of the healthcare system. This emphasis on specialized education enhances patient care and promotes the advancement of the nursing profession in Oman (Al Awaisi et al., 2015).

**Table 1**

*Post Basic - Adult Critical Care Nursing Program from 2004 to 2013*

Region / Hospitals	Graduates 2004 - 2013 (09 Batches)				Total
Muscat - Royal Hospital	13	7		13	33
Muscat - Khoula Hospital	12		5	17	34
Muscat - Al Nahdha Hospital				5	5
Muscat - SQUH	3	1			4
Muscat - Quriyat Hospital				3	3
N. Batinah - Sohar Hospital	9	3		10	22
N. Batinah - Sohar Polyclinic				1	1
N. Batinah - Saham Hospital				3	3
N. Batinah - Shinas EHCentre				1	1
N. Batinah - Suwaiq Polyclinic				1	1
S. Batinah - Rustaq Hospital	9			5	14
S. Batinah - Musanah EHC				1	1
N. Sharqiya - Ibra Hospital	7			6	13
N. Sharqiya - Samad Alshaan Hos.				1	1
N. Sharqiya - Sinaw Hospital				3	3
S. Sharqiya - Sur Hospital	5			2	7
S. Sharqiya - Jalan BB Hassan Hos.				1	1
S. Sharqiya - Jalan BB Ali Hospital	1			2	3

S. Sharqiya - Masirah Hospital				1	1
Al Dhakhiliya - Nizwa Hospital	11	4		9	24
Al Dhakhiliya - Adam Hospital				1	1
Al Dhakhiliya - Bahla Hospital				1	1
Al Dhakhiliya - Jabal Akhdar Hos.				1	1
Al Dhakhiliya - Samail Hospital				2	2
Dhofar - Sultan Qaboos Hospital	8	3		5	16
Al Dhahira - Ibri Hospital	10			6	16
Al Dhahira - Yankul Hospital				1	1
Al Dhahira - Buraimi Hospital	8			2	10
Musandam -Khasab Hospital	1			2	3
Musandam - Dibba Hospital				1	1
Royal Flight Oman				1	1
Royal Court Affairs				1	1
Defence Force - Bahrain	2			1	3
Diwan				1	1
<b>Total</b>	<b>99</b>	<b>18</b>	<b>5</b>	<b>111</b>	<b>233</b>

**Table 2**

*Post Graduate Diploma in Adult Critical Care Nursing - (PGD-ACCN)*

<b>Region / Hospitals</b>	<b>2015 to 2016</b>	<b>2016 to 2017</b>	<b>2017 to 2018</b>	<b>2018 to 2019</b>	<b>2020 to 2021</b>	<b>2021 to 2022</b>	<b>2022 to 2023</b>	<b>2023 to 2024</b>	<b>Total</b>
Muscat - Royal Hospital	3	2	3	1			1	4	14
Muscat - Khoula Hospital	4	4	5	2	2	2	2	5	26
Muscat - Al Nahdha Hospital		2	1			1			4
Muscat - SQUH	2							1	3
Muscat - Armed Force Hospital			1		2	3	3	1	10
N. Batinah - Sohar Hospital		1	1	1	5		2	2	12
S. Batinah - Rustaq Hospital				2			1	1	4
N. Sharqiya - Ibra Hospital						1			1
S. Sharqiya - Sur Hospital				2	2			1	5
S. Sharqiya - Jalan BB Ali Hospital			1		1		2		4
Al Dhakhiliya - Nizwa Hospital	1	2	1		1	2	2	3	12

Dhofar - Sultan Qaboos Hospital			2		1		2		5
Al Dhahira - Ibri Hospital				1	1	1	4	4	11
Al Dhahira - Buraimi Hospital							1	1	2
Royal Court Affairs	1								1
DGHS - ROP			1						1
King Hamed University Hospital - Bahrain							2		2
Defence Force - Bahrain							1		1
<b>Total</b>	11	11	16	9	15	10	23	23	118

*Note.* There were six graduates from GCC counties.

### Adult Critical Care Services in Oman

The Sultanate of Oman as any other country requires critical care services for multiple reasons, including the management of acute medical emergencies, cardiac, medical and surgical intensive care, and severe trauma incidents such as Motor Vehicle Collisions (Al-Shaqsi et al., 2013). Adult critical care nursing is essential in facilitating diverse services inside acute hospitals, encompassing emergency and elective procedures, acute admissions, and emergency departments. Non-communicable diseases (NCDs), including cardiovascular diseases, Diabetes Mellitus, cancer, and chronic respiratory diseases, constitute the four principal disease categories responsible for 80% of all NCD fatalities, with their incidence consistently rising (Fadhil et al., 2022). This development underscores the increasing need for skilled healthcare personnel, especially critical care nurses, to address the rising healthcare demands in Oman.

Throughout the COVID-19 pandemic, the healthcare system in Oman, similar to other global healthcare systems, faced substantial difficulties in sustaining critical care bed capacity because of deficiency in personnel and material resources (Al Harthi et al., 2020). Notwithstanding the contingency measures devised by hospitals nationwide, numerous facilities were compelled to augment their ICU capacity and convert standard rooms into COVID-19 and ICU units. The Royal Hospital, being the nation's primary referral facility, allocated a whole building for COVID-19 patients. Khoulia Hospital designated 13 beds in their Intensive Care Unit (ICU) exclusively for COVID-19 patients and created a distinct ward for those diagnosed with this virus. In September 2020, a field hospital with general and high-dependency beds was created to provide medical care to patients from the adjacent Governorates of Muscat (Khamis et al., 2020). The main problem encountered was the mobilization of human resources to address the crisis needs. A significant quantity of nurses was reassigned from primary and secondary healthcare institutions to referral hospitals to address the situation efficiently. Throughout this period, elective and non-essential services were halted, leaving only emergency, cancer, and heart care services operational. Such occurrences underscore the necessity of proficient nurses to provide comprehensive treatment in Oman's critical care units.

### Educating Critical Care Nurses in Oman

There is an increasing necessity to augment the skills and competencies of critical care nurses to improve the overall quality of care they provide worldwide. A significant difficulty encountered by critical care nurses is

insufficient knowledge, frequently resulting from inadequate training and little clinical experience during their foundational education. The problem is exacerbated by a lack of specialized training programs, unpreparedness for the critical care setting, insufficient regulation of critical care nurses' competencies, and constrained resources (Kiwanuka et al., 2019). The absence of thorough training may lead to reduced confidence and a pessimistic outlook on nursing and critical care, ultimately obstructing the provision of high-quality and safe treatment to critically ill patients (Liu et al., 2020). Healthcare institutions must prioritize investment in the continuing professional development of their personnel to enhance their competence and preparedness for critical care obligations. To address these requirements in Oman, the Adult Critical Care Program (ACCNP) was initiated in 2004 in partnership with the Nursing College of Uclan University (UK). The curriculum, originally covering four academic years, was subsequently administered by the faculty of the Higher Institute of Health Specialties (HIHS), previously referred to as OSNI. The program comprises a 40-credit hour curriculum spanning three semesters, with each cohort consisting of 30 candidates. Candidates are chosen from nurses employed in critical care units throughout Oman, with selection criteria aimed at meeting service requirements and ensuring a fair distribution of ACCNP graduates throughout.

The ACCNP corresponds with the philosophy, mission, and vision of the MoH, demonstrating His Majesty's dedication to uphold superior healthcare standards in Oman and guarantee public access to comprehensive medical services. The program prioritizes comprehensive care for patients and their families in critical care environments. It emphasizes the enhancement of critical care nurses' competencies, the significance of collaboration, and the critical care setting, all based on the most recent data. Program learning outcomes are intended to delineate the academic, intellectual, attitudinal, and skill skills that students must attain and exhibit during their education and in their future professional positions within critical care environments. Students are instructed to perform thorough physical examinations of critically ill patients, swiftly recognize anomalies, and treat appropriately. The curriculum cultivates essential skills in evaluating and managing acute and chronic pain, alongside the swift and precise interpretation of both fatal and non-fatal arrhythmias.

Comprehensive training is offered in the surveillance of critically ill patients utilizing technologies such as Cardiac Pacing, Intra-Cardiac Devices (ICDs), Extra-Corporeal Membranous Oxygenation (ECMO), Intracranial Pressure (ICP) Monitoring, and Extra Ventricular Drain (EVD). The curriculum also cultivates advanced therapeutic communication skills to address the needs of patients and family including the grief process, managing ICU delirium, conveying painful news, and delivering end-of-life care. Emphasis is placed on ethical and professional assistance, particularly in providing complete treatment, including palliative care, for patients with diverse malignant illnesses. The curriculum also provides students with essential skills for 'Major Incident Planning' and preparing critical care units for disasters, emphasizing multidisciplinary collaboration. The competences acquired via the ACCNP equip graduates to provide comprehensive, evidence-based care to critically ill patients in varied and demanding circumstances, with particular emphasis on Patient and Family Centered Care (PFCC).

In Oman, critical care nurses work in conjunction with physicians to devise and implement the prescribed treatment plan tailored to the individual requirements of each patient. The healthcare workers consistently monitor the patient's hemodynamic status, meticulously analyze and manage the patient's conditions, evaluate the efficacy of nursing interventions and patient outcomes, and furnish reports to physicians as required. They cooperate with interdisciplinary teams to streamline the admission, management, and release of patients. The nurses' clinical responsibilities include doing a comprehensive nursing assessment utilizing suitable assessment instruments grounded in evidence-based practice. They are tasked for ensuring precise documentation of observations, nursing interventions provided, and patients' progress. In emergencies and other scenarios that

threaten patient safety, they implement appropriate nursing interventions. Furthermore, they should demonstrate expertise in managing patients on ventilators and other sophisticated treatment modalities, operate and analyze the results, collaborate with other health team members, and aid patients in making informed decisions about their treatment and care.

## **Challenges and Recommendations**

### ***Deficiency of Senior and Specialized Faculty and Researchers***

When delivering such an important program, it is imperative to have senior and specialized faculty and researchers. This deficiency restricts student-instructor interaction and may impact the quality of education provided. The scarcity of experienced professors deprives students of essential mentorship and advanced knowledge, both are vital for their professional development. Confronting this challenge necessitates the purposeful recruitment and retention of talented educators and researchers to guarantee that students receive a thorough and high-caliber education and the organizations to have high quality of research projects to improve their services.

### ***Deficiency of Clinical Placement Opportunities***

A notable difficulty is the scarcity of clinical placement opportunities. Ensuring adequate placements and proficient preceptors is crucial for the skill development of ACCNP students. Insufficient clinical experience may hinder students' ability to apply theoretical information in practical environments, which is essential for their development into proficient practitioners. Augmenting collaborations with healthcare institutions and increasing the availability of placements are essential measures to improve clinical training.

### ***Insufficiency of Advanced Educational Materials***

To run a successful ACCNP, it is important to have some modern educational materials, including high-fidelity simulation. These resources are essential for delivering practical experience and equipping students for the intricacies of critical care. The lack of such tools restricts students' capacity to practice and enhance their skills in a controlled setting, potentially jeopardizing their preparedness for real-world situations. Investing in cutting-edge simulation technology is essential to enhance educational outcomes.

### ***Requirement for a Comprehensive Learning Management System***

An efficient learning management system is crucial for the delivery of education and the engagement of students. Having a complete software tool that allows to create, deliver, and report on training programs such as learning management system (LMS) would improve resource management, promote communication between teachers and students, and offer a platform for ongoing assessment and feedback. This technology enhancement is essential for updating education and guaranteeing students access to optimal learning experiences.

### ***Shortage in Specialized Nurses***

Nurses in critical care units have numerous obstacles, primarily the scarcity of proficient personnel and elevated turnover rates. Internationally, the optimal nurse-to-patient ratio in critical care is 1:1 for ventilated patients and 1:2 for non-ventilated patients (ANA, 2016); nevertheless, in Oman, these ratios frequently escalate to 1:2 or greater for ventilated patients and 1:3 for non-ventilated patients. This divergence from optimal staffing standards can negatively impact patient outcomes, as evidenced by studies in Australia and New Zealand

advocating a 1:1 ratio for ventilated patients to guarantee safety (Rose et al., 2008), whereas Italian ICUs associate higher ratios with elevated complications and prolonged ICU stays (Confalonieri et al., 2001). The staffing ratios in Oman may compromise patient safety, highlighting the necessity for the healthcare system to reevaluate these norms to mitigate the risks of bad outcomes, such as ventilator-associated infections and mortality (Jansson et al., 2019).

### ***Lack of Proficiency among the Intensive Care Nurses***

Improving the proficiency of intensive care nurses is essential for delivering quality patient care, and tackling organizational problems is imperative for enhancing safety (Ndirangu-Mugo et al., 2022). International research indicates that ICU nurses encounter substantial physical demands and heavy workload adversely affecting their health, safety, and quality of work, considerably damaging their well-being (Mohammadi et al., 2016; Al Ma'mari et al., 2020). Furthermore, numerous ICU nurses are inadequately trained in stress management techniques, rendering them susceptible to worry, especially when under pressure to deliver prompt care, and they frequently fail to practice good coping strategies and thus exacerbate their stress levels (Isa et al., 2019).

In conclusion, addressing the shortage of skilled personnel and enhancing faculty recruitment, broadening clinical placement opportunities, investing on modern educational resources, establishing a comprehensive learning management system, and promoting international collaboration are essential measures for establishing and implementing an efficient ACCNP. Addressing these challenges would enable any institution to cultivate a proficient and resilient staff, skillful in delivering outstanding critical care to enhance patient outcome and progress in the healthcare delivery system.

### **Conclusion**

The epidemiological profile is swiftly transitioning towards non-communicable diseases and their consequences. Road traffic accidents and their associated injuries impose a significant strain on the nation. The ACCNP is a vital nursing specialization designed to equip nurses with the updated knowledge competence necessary to care for patients in critical care environments across various healthcare settings. To assist these nurses and uphold the quality of care they deliver, it is essential to create a regulatory framework that delineates the standard of practice by establishing regulations that specify the obligations of critical care nurses.

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