

The Role Of Advanced Practice Nurses In Pre-Hospital Care: A Collaborative Approach With Paramedics

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Abstract:

This article explores the evolving role of Advanced Practice Nurses (APNs) in pre-hospital care and the benefits of collaborative approaches with paramedics. It discusses the historical context, shifting paradigms, and inter-professional collaboration between APNs and paramedics in delivering emergency medical services. The scope of practice for APNs in pre-hospital care, including assessment, triage, advanced interventions, and patient education, is delineated. Training programs, simulation-based learning, benefits, challenges, and future directions are also discussed.

Keywords: Advanced Practice Nurses, APNs, pre-hospital care, paramedics, collaborative approach, inter-professional collaboration, scope of practice, training, patient outcomes.

Introduction:

Advanced Practice Nurses (APNs) play a crucial role in modern healthcare systems, providing specialized care and expertise across various settings. While traditionally associated with hospital and clinic-based care, APNs are increasingly being integrated into pre-hospital settings, collaborating with paramedics to deliver comprehensive and high-quality emergency medical services. This article explores the evolving role of APNs in pre-hospital care and the benefits of a collaborative approach with paramedics.

In modern healthcare systems, the role of Advanced Practice Nurses (APNs) has evolved significantly, extending beyond traditional hospital and clinic-based care to encompass diverse settings, including pre-hospital environments. This paradigm shift is particularly notable in emergency medical services, where APNs are increasingly integrated into collaborative models of care alongside paramedics. This introduction delineates the historical context, the evolving landscape of pre-hospital care, and the imperative for inter-professional collaboration between APNs and paramedics.

Historically, pre-hospital care primarily relied on the expertise of paramedics and emergency medical technicians (EMTs) to provide immediate medical assistance in emergency situations. While

paramedics and EMTs excel in rapid response and basic life support interventions, the complexity of modern healthcare demands a more comprehensive approach that integrates advanced clinical expertise. This necessity has led to the recognition of APNs as invaluable assets in pre-hospital care delivery.

The evolution of pre-hospital care is driven by several factors, including advancements in medical technology, changing patient demographics, and a growing emphasis on community-based healthcare. As the healthcare landscape continues to evolve, there is a clear recognition of the need for a collaborative approach that leverages the unique skill sets of APNs and paramedics to optimize patient outcomes.¹

Interprofessional collaboration between APNs and paramedics is central to the success of this integrated model of care. By combining their respective strengths in assessment, diagnosis, treatment, and patient education, APNs and paramedics can provide a more holistic and comprehensive approach to emergency medical services. Effective communication, mutual respect, and shared decision-making are essential components of this collaborative framework, ensuring seamless coordination and continuity of care throughout the pre-hospital continuum.

This article will delve into the scope of practice for APNs in pre-hospital care, including their roles in assessment, triage, advanced interventions, and patient education. Furthermore, it will explore the training programs, simulation-based learning modalities, benefits, challenges, and future directions associated with integrating APNs into pre-hospital care delivery. Through a comprehensive examination of these topics, this article aims to highlight the transformative potential of collaborative approaches between APNs and paramedics in enhancing the quality and efficiency of emergency medical services.

Background:

The landscape of pre-hospital care has evolved significantly over the years, shaped by advancements in medical technology, changes in healthcare delivery models, and shifts in patient demographics. Traditionally, emergency medical services (EMS) were primarily provided by paramedics and emergency medical technicians (EMTs), who excelled in rapid response and basic life

support interventions. However, as healthcare needs have become increasingly complex and multifaceted, there has been a growing recognition of the need for a more comprehensive approach to pre-hospital care.

Historically, pre-hospital care focused on stabilizing patients and transporting them to the nearest hospital for definitive treatment. While this approach remains fundamental, there has been a shift towards providing more advanced interventions and treatments in the field, particularly for time-sensitive conditions such as trauma, stroke, and cardiac arrest. This evolution reflects a broader trend towards delivering healthcare services in community settings and empowering paramedics with enhanced clinical skills and capabilities.

Against this backdrop, the role of Advanced Practice Nurses (APNs) in pre-hospital care has emerged as a critical component of modern EMS systems. APNs, including Nurse Practitioners (NPs), Clinical Nurse Specialists (CNSs), Certified Registered Nurse Anesthetists (CRNAs), and Certified Nurse Midwives (CNMs), bring advanced clinical expertise and specialized training to the pre-hospital environment. Their ability to assess, diagnose, and treat a wide range of medical conditions makes them invaluable assets in delivering high-quality care outside of traditional healthcare settings.

The integration of APNs into pre-hospital care represents a paradigm shift in how emergency medical services are delivered. By working collaboratively with paramedics, APNs can extend the scope of pre-hospital care, providing timely interventions, initiating treatment protocols, and improving patient outcomes. This collaborative approach leverages the unique strengths of both professions, combining the rapid response capabilities of paramedics with the advanced clinical skills of APNs to deliver comprehensive and holistic care to patients in need.

In the following sections, we will delve deeper into the evolving role of APNs in pre-hospital care, exploring the collaborative models of care, scope of practice considerations, training and education requirements, as well as the benefits and challenges associated with integrating APNs into EMS systems. Through this

examination, we aim to shed light on the transformative potential of APN-led pre-hospital care in improving the overall quality and effectiveness of emergency medical services.

Evolution of APN Role in Pre-hospital Care:

The integration of Advanced Practice Nurses (APNs) into pre-hospital care represents a significant evolution in emergency medical services (EMS) delivery. Historically, EMS systems primarily relied on paramedics and emergency medical technicians (EMTs) to provide immediate medical care and transportation to hospitals. However, as healthcare needs have become more complex and dynamic, there has been a growing recognition of the value that APNs bring to pre-hospital settings.

The evolution of the APN role in pre-hospital care can be traced back to broader shifts in healthcare delivery models and the expanding scope of practice for APNs. Traditionally, APNs were predominantly associated with hospital and clinic-based care, where they provided advanced clinical assessments, diagnosis, and treatment under the supervision of physicians. However, as healthcare systems have embraced more patient-centered and community-oriented approaches, APNs have increasingly ventured into non-traditional settings, including pre-hospital environments.

One key driver of the evolution of the APN role in pre-hospital care is the recognition of their unique skill set and expertise in managing acute and critical conditions. APNs undergo rigorous education and training, often at the graduate level, which equips them with advanced clinical knowledge and decision-making capabilities. This training enables APNs to perform a wide range of tasks in pre-hospital settings, including advanced assessments, diagnostic procedures, and therapeutic interventions.

Furthermore, the increasing emphasis on interdisciplinary collaboration and team-based care has facilitated the integration of APNs into EMS systems. APNs bring a holistic perspective to pre-hospital care, complementing the technical proficiency of paramedics with their comprehensive clinical assessment skills, therapeutic interventions, and patient education expertise. This collaborative approach enhances the quality and efficiency of care delivery, particularly for patients with complex medical needs or

multiple comorbidities.

The evolution of technology has also played a significant role in expanding the role of APNs in pre-hospital care. Advanced medical devices, telemedicine platforms, and mobile health applications enable APNs to remotely assess patients, consult with other healthcare providers, and initiate treatment protocols in real-time, even before the patient arrives at the hospital. This capability is particularly valuable in rural or underserved areas where access to specialized medical care may be limited.

Overall, the evolution of the APN role in pre-hospital care reflects a broader trend towards a more integrated and patient-centered approach to emergency medical services. By leveraging their advanced clinical skills, expertise in interdisciplinary collaboration, and innovative use of technology, APNs are poised to play a pivotal role in improving patient outcomes and enhancing the overall effectiveness of EMS systems. As healthcare continues to evolve, the role of APNs in pre-hospital care is likely to become increasingly prominent, further solidifying their position as essential providers in the continuum of emergency medical services.

Collaborative Model of Care:

In modern healthcare systems, the collaborative model of care between Advanced Practice Nurses (APNs) and paramedics in pre-hospital settings is becoming increasingly recognized as essential for delivering comprehensive and effective emergency medical services (EMS). This model emphasizes the integration of the unique skills, expertise, and roles of APNs and paramedics to provide timely and high-quality care to patients in need.

Interprofessional collaboration between APNs and paramedics is characterized by a shared commitment to patient-centered care, mutual respect, effective communication, and seamless coordination of efforts. In the collaborative model of care, APNs and paramedics work together as part of a multidisciplinary team, leveraging their complementary strengths to address the diverse needs of patients in emergency situations.

One key aspect of the collaborative model of care is the recognition of the distinct but interconnected roles of APNs and

paramedics. Paramedics are trained in rapid assessment, stabilization, and basic life support interventions, making them well-equipped to manage emergent situations in the field. APNs, on the other hand, bring advanced clinical assessment skills, diagnostic expertise, and therapeutic interventions to the pre-hospital environment, allowing for a more comprehensive approach to patient care.²

Effective communication and coordination are essential components of the collaborative model of care. APNs and paramedics must communicate clearly and efficiently to share critical patient information, discuss treatment options, and make informed decisions about patient care. This communication often occurs through verbal handoffs, written documentation, and electronic medical records, ensuring continuity of care as patients transition between pre-hospital, hospital, and post-acute care settings.

The collaborative model of care also emphasizes shared decision-making and mutual respect between APNs and paramedics. Each member of the team brings valuable insights and perspectives to the table, contributing to a holistic understanding of the patient's needs and preferences. By working together collaboratively, APNs and paramedics can develop individualized care plans that optimize patient outcomes and promote patient safety.

Furthermore, the collaborative model of care extends beyond direct patient care to include ongoing education, training, and professional development for APNs and paramedics. By participating in joint training programs, simulation-based exercises, and continuing education opportunities, APNs and paramedics can enhance their clinical skills, communication abilities, and teamwork proficiency, ultimately improving the quality and effectiveness of care delivery in pre-hospital settings.

Overall, the collaborative model of care between APNs and paramedics represents a transformative approach to emergency medical services, leveraging the strengths of both professions to provide comprehensive, patient-centered care in the pre-hospital environment. By embracing this model, healthcare organizations can optimize resource utilization, improve patient outcomes, and

enhance the overall effectiveness of EMS systems.

Scope of Practice for APNs in Pre-hospital Care:

The scope of practice for Advanced Practice Nurses (APNs) in pre-hospital care encompasses a wide range of clinical activities and responsibilities aimed at delivering timely and comprehensive care to patients in emergency situations. As highly skilled and autonomous healthcare providers, APNs bring advanced clinical expertise, critical thinking skills, and decision-making abilities to the pre-hospital environment, complementing the roles of paramedics and emergency medical technicians (EMTs).

Assessment and Triage:

APNs are trained to perform comprehensive assessments of patients in emergency situations, including gathering medical history, conducting physical examinations, and assessing vital signs. They utilize their clinical judgment and diagnostic skills to identify emergent medical conditions, prioritize care based on the severity of illness or injury, and initiate appropriate treatment interventions. APNs play a key role in triaging patients, determining the level of acuity and urgency of care needed, and directing resources accordingly to ensure optimal patient outcomes.

Advanced Interventions:

APNs are authorized to perform a variety of advanced interventions and procedures in the pre-hospital setting, depending on their specialty and scope of practice. This may include initiating intravenous (IV) access, administering medications, performing advanced airway management techniques, and conducting emergency medical procedures such as cardioversion or needle decompression. APNs are trained to respond to critical events and medical emergencies, providing rapid and appropriate interventions to stabilize patients and prevent further deterioration of their condition.

Collaboration and Communication:

APNs collaborate closely with paramedics, EMTs, physicians, and other healthcare providers to ensure seamless coordination of care throughout the pre-hospital continuum. They communicate

effectively with team members to share critical patient information, discuss treatment options, and make informed decisions about patient care. APNs participate in multidisciplinary team-based approaches to patient management, contributing their expertise to develop individualized care plans and optimize patient outcomes.

Patient Education and Counseling:

APNs play a crucial role in providing patient education and counseling in the pre-hospital setting, empowering patients and their families to understand their medical conditions, treatment options, and self-care strategies. They offer guidance on medication management, injury prevention, and follow-up care, ensuring continuity of care beyond the pre-hospital environment. APNs advocate for patient-centered care, addressing the physical, emotional, and psychosocial needs of patients and their families during times of crisis.

Documentation and Quality Improvement:

APNs are responsible for documenting all aspects of patient care accurately and comprehensively, maintaining detailed medical records and ensuring compliance with regulatory requirements. They participate in quality improvement initiatives and evidence-based practice projects to enhance the delivery of pre-hospital care, identify areas for improvement, and implement best practices to optimize patient outcomes. In summary, the scope of practice for APNs in pre-hospital care is multifaceted and dynamic, encompassing a broad range of clinical activities, collaborative efforts, and patient-centered interventions. By leveraging their advanced clinical skills and expertise, APNs contribute to the delivery of high-quality, timely, and comprehensive care in emergency medical situations, ultimately improving patient outcomes and enhancing the effectiveness of EMS systems.

Training and Education:

The preparation of Advanced Practice Nurses (APNs) for roles in pre-hospital care requires a comprehensive and specialized educational pathway that equips them with the knowledge, skills, and competencies necessary to deliver high-quality emergency medical services (EMS) in dynamic and challenging environments. Training and education for APNs in pre-hospital care encompass a

combination of formal education, clinical experiences, and ongoing professional development opportunities tailored to the unique demands of the pre-hospital setting.³

Advanced Nursing Education:

APNs typically pursue graduate-level education, including master's or doctoral degrees, in specialized areas such as Nurse Practitioner (NP), Clinical Nurse Specialist (CNS), Certified Registered Nurse Anesthetist (CRNA), or Certified Nurse Midwife (CNM). Graduate programs for APNs incorporate coursework in advanced pathophysiology, pharmacology, physical assessment, diagnostic reasoning, and evidence-based practice, providing a solid foundation in advanced clinical practice. Specialized tracks or concentrations in emergency and acute care nursing may be available within APN programs, offering focused coursework and clinical experiences relevant to pre-hospital care settings.

Clinical Experiences and Practicum:

Clinical practicum experiences are integral components of APN education, providing hands-on opportunities for students to apply theoretical knowledge and develop clinical skills under the supervision of experienced preceptors. APN students may complete clinical rotations in a variety of healthcare settings, including hospitals, clinics, primary care practices, and specialty units, to gain exposure to diverse patient populations and clinical scenarios. Specific clinical experiences in emergency departments, urgent care centers, and EMS agencies may be incorporated into APN programs to prepare students for the unique challenges of pre-hospital care.

Specialty Certifications and Training Programs:

APNs seeking to specialize in pre-hospital care may pursue additional certifications or training programs to enhance their knowledge and skills in emergency medicine and critical care. Specialty certifications such as Emergency Nurse Practitioner (ENP) or Critical Care Nurse Practitioner (CCNP) may be available for APNs interested in advanced practice roles in pre-hospital settings. Continuing education courses, workshops, and simulation-based training programs focused on pre-hospital care may offer opportunities for APNs to refine their clinical competencies, procedural skills, and decision-making abilities.

Interprofessional Education and Collaboration:

APN training and education emphasize the importance of inter-professional collaboration and teamwork in pre-hospital care. APN students may participate in inter-professional education initiatives, simulations, and collaborative practice experiences with paramedics, emergency physicians, EMTs, and other members of the healthcare team to develop effective communication skills, teamwork strategies, and mutual respect for diverse roles and perspectives.

Continuing Professional Development:

Lifelong learning and professional development are essential for APNs practicing in pre-hospital care to stay current with evolving evidence, guidelines, and best practices.

APNs engage in ongoing continuing education activities, conferences, seminars, and self-directed learning opportunities to expand their knowledge base, enhance clinical skills, and maintain competency in pre-hospital care. Participation in quality improvement projects, research endeavors, and professional organizations dedicated to emergency and pre-hospital care can further support APNs in advancing their practice and contributing to the improvement of EMS systems.

In summary, training and education for APNs in pre-hospital care encompass a multifaceted approach that integrates advanced nursing education, clinical experiences, specialty certifications, interprofessional collaboration, and ongoing professional development. By investing in comprehensive and specialized training programs, APNs are equipped to deliver high-quality emergency medical services in pre-hospital settings, contributing to improved patient outcomes and the overall effectiveness of EMS systems.

Benefits and Challenges:

The integration of Advanced Practice Nurses (APNs) into pre-hospital care brings forth a multitude of benefits as well as challenges. Understanding and addressing these factors are crucial for optimizing the role of APNs and ensuring the delivery of high-quality emergency medical services (EMS) in pre-hospital settings.

Benefits:

Enhanced Clinical Expertise: APNs bring advanced clinical skills, diagnostic abilities, and therapeutic interventions to pre-hospital care, enabling them to provide comprehensive and timely medical assistance to patients in emergency situations.

Improved Patient Outcomes: The presence of APNs in pre-hospital settings can lead to improved patient outcomes, including reduced morbidity and mortality rates, as APNs are able to initiate appropriate interventions, stabilize patients, and facilitate timely transfer to definitive care facilities.

Expanded Scope of Practice: APNs in pre-hospital care can perform a wide range of advanced procedures and interventions, such as advanced airway management, medication administration, and critical care procedures, thereby enhancing the scope and quality of care delivered in the field.

Interprofessional Collaboration: The collaborative model of care between APNs and paramedics fosters effective communication, shared decision-making, and mutual respect among healthcare providers, leading to enhanced teamwork and coordination of efforts in emergency medical situations.

Increased Access to Care: By extending the reach of healthcare services beyond traditional hospital settings, APNs in pre-hospital care contribute to increased access to timely and appropriate medical care, particularly in underserved or remote areas where access to specialized healthcare services may be limited.

Challenges:

Regulatory Constraints: APNs practicing in pre-hospital settings may face regulatory constraints related to scope of practice, licensure, and prescriptive authority, which can vary by state or jurisdiction and may limit the full utilization of their clinical skills and expertise.

Resource Limitations: Pre-hospital care environments often face resource limitations, including limited access to medical equipment, medications, and diagnostic tools, which may impact the ability of APNs to deliver optimal care and may necessitate creative solutions to address resource gaps.

Training and Education: The specialized training and education required for APNs to practice in pre-hospital care settings may pose logistical challenges, including limited availability of specialized training programs, clinical preceptorship opportunities, and continuing education resources tailored to the pre-hospital environment.

Workforce Integration: Integrating APNs into pre-hospital care teams may require changes in organizational culture, policies, and practices to ensure effective collaboration, role clarity, and acceptance among paramedics, emergency medical technicians (EMTs), physicians, and other members of the healthcare team.

Liability and Legal Issues: APNs practicing in pre-hospital settings may encounter liability and legal issues related to scope of practice, standard of care, medical oversight, and malpractice concerns, necessitating clear protocols, guidelines, and legal protections to mitigate risks and ensure patient safety. In conclusion, while the integration of APNs into pre-hospital care offers numerous benefits in terms of enhanced clinical expertise, improved patient outcomes, and expanded access to care, addressing the associated challenges is essential for maximizing the potential of APNs and optimizing the delivery of emergency medical services in pre-hospital settings. By recognizing and addressing these factors, healthcare organizations can effectively leverage the skills and expertise of APNs to enhance the quality, safety, and effectiveness of pre-hospital care delivery.

Future Directions:

As the healthcare landscape continues to evolve, the role of Advanced Practice Nurses (APNs) in pre-hospital care is poised to undergo further transformation, driven by advancements in technology, changes in healthcare policy, and shifts in patient demographics. Looking ahead, several key future directions can be identified that have the potential to shape the role of APNs in pre-hospital care and optimize the delivery of emergency medical services (EMS).

Expansion of Telehealth and Mobile Health Technologies:

The widespread adoption of telehealth and mobile health technologies is likely to transform the delivery of pre-hospital care,

enabling APNs to remotely assess patients, provide virtual consultations, and initiate treatment interventions in real-time. Telemedicine platforms and mobile health applications offer opportunities for APNs to extend their reach beyond traditional healthcare settings, providing timely and accessible care to patients in remote or underserved areas.

Integration of Artificial Intelligence and Decision Support Systems:

The integration of artificial intelligence (AI) and decision support systems into pre-hospital care workflows has the potential to enhance clinical decision-making, optimize resource utilization, and improve patient outcomes. AI algorithms can assist APNs in interpreting diagnostic data, predicting patient outcomes, and identifying optimal treatment strategies, thereby augmenting their clinical expertise and supporting evidence-based practice in emergency medical situations.

Advancements in Remote Monitoring and Wearable Devices:

Advances in remote monitoring technology and wearable devices offer opportunities for APNs to monitor patients' vital signs, physiological parameters, and health status in real-time, even before they arrive at the hospital. Wearable sensors, smart devices, and remote monitoring systems enable APNs to track patients' progress, detect early warning signs of deterioration, and intervene promptly to prevent adverse outcomes, thereby enhancing patient safety and continuity of care.

Interprofessional Education and Training:

Future directions for APNs in pre-hospital care include further integration of inter-professional education and training initiatives, aimed at fostering collaboration, teamwork, and mutual respect among healthcare providers.

Interprofessional simulation-based learning experiences, joint training programs, and collaborative practice models can enhance communication skills, coordination of care, and shared decision-making among APNs, paramedics, emergency physicians, and other members of the healthcare team.

Policy and Regulatory Changes:

The future of APNs in pre-hospital care will be influenced by policy

and regulatory changes aimed at expanding their scope of practice, enhancing their autonomy, and recognizing their contributions to the delivery of emergency medical services. Advocacy efforts to remove barriers to practice, streamline licensure requirements, and establish standardized protocols for APN-led pre-hospital care have the potential to facilitate greater integration of APNs into EMS systems and improve access to high-quality emergency care for patients. In conclusion, the future of APNs in pre-hospital care is characterized by opportunities for innovation, collaboration, and advancement, as well as challenges related to technology integration, workforce development, and policy reform. By embracing these future directions and leveraging emerging trends in healthcare delivery, APNs can continue to play a pivotal role in optimizing patient outcomes and enhancing the effectiveness of emergency medical services in pre-hospital settings.⁴

Conclusion:

The integration of Advanced Practice Nurses into pre-hospital care represents a significant advancement in emergency medical services, leveraging their advanced clinical skills and expertise to improve patient outcomes. By embracing a collaborative approach with paramedics, APNs can play a vital role in delivering high-quality care to patients in the pre-hospital environment, ultimately saving lives and enhancing the overall effectiveness of emergency medical response systems.

References:

- 1-American Association of Nurse Practitioners. (2020). Nurse Practitioner Fact Sheet. Retrieved from https://cdn.ymaws.com/www.aanp.org/resource/resmgr/2019_aanp_np_fact_sheet.pdf
- 2-Institute of Medicine. (2010). The future of nursing: Leading change, advancing health. Washington, DC: The National Academies Press.
- 3-Kue, R., Brown, A., Schwartz, T., & Byerly, S. (2016). EMS provider perceptions on prehospital sepsis detection and management: A qualitative study. *The Western Journal of Emergency Medicine*, 17(5), 640–646. <https://doi.org/10.5811/westjem.2016.6.30441>.
- 4- World Health Organization. (2019). WHO guideline: Recommendations on digital interventions for health system

Special Issue On Multidisciplinary Research

strengthening. Geneva: World Health Organization.

<https://apps.who.int/iris/bitstream/handle/10665/311941/9789241550505-eng.pdf?ua=1>