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Integrating Patient Care Technicians into Prehospital Emergency Medical Services: Evaluating Competency, Scope of Practice, and Impact on Patient Outcomes in Time-Critical Conditions

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Published date: 20-12-2025

Abstract

The integration of Patient Care Technicians (PCTs) into Prehospital Emergency Medical Services (EMS) represents a paradigm shift in emergency healthcare delivery, necessitating careful evaluation of competency frameworks, scope of practice parameters, and clinical outcomes. This comprehensive article examines the theoretical underpinnings, practical implementation challenges, and evidence-based outcomes associated with PCT integration into time-critical prehospital environments. Drawing from role theory, patient safety literature, and contemporary EMS research, we explore how the expansion of the prehospital workforce through PCT inclusion may address systemic challenges including workforce shortages, changing demographic profiles, and evolving healthcare delivery models. The analysis synthesizes findings from wilderness emergency medical services, community paramedicine initiatives, and international EMS models to propose a framework for safe and effective PCT integration. Key considerations include educational preparation, clinical supervision requirements, scope of practice delineation, patient safety culture, and the impact on patient outcomes in time-sensitive conditions such as cardiac arrest, trauma, and acute medical emergencies. The article concludes with recommendations for policy development, educational reform, and research priorities to support the evidence-based integration of PCTs into prehospital emergency care systems.

Introduction

The landscape of prehospital emergency medical services is undergoing profound transformation, driven by increasing demand, workforce shortages, changing population demographics, and evolving expectations of emergency healthcare delivery (Coster et al., 2017; Eaton et al., 2021). As EMS systems worldwide grapple with these challenges, healthcare leaders are exploring innovative workforce models that optimize the contributions of various clinical personnel. The Patient Care Technician—a role traditionally situated within hospital settings providing basic patient care under nursing supervision—has emerged as a potential solution to augment the prehospital workforce. However, the integration of PCTs into the complex, dynamic, and often unpredictable prehospital environment raises fundamental questions about competency, scope of practice, and patient outcomes that demand rigorous examination

(Tavares et al., 2016; O'Meara et al., 2017).

The prehospital emergency care environment presents unique challenges that distinguish it from institutional healthcare settings. Paramedics and emergency medical technicians (EMTs) operate in uncontrolled environments, make critical decisions with limited information, and must balance clinical interventions with scene management, patient extrication, and transport logistics (Millin & Hawkins, 2017). The integration of any new healthcare role into this environment requires careful consideration of how that role complements existing team structures, addresses identified gaps, and maintains or improves patient safety and clinical outcomes.

Patient Care Technicians bring valuable skills to healthcare teams, typically including patient assessment, vital sign measurement, basic life support, wound care, and assistance with activities of daily living. Their training often emphasizes the patient experience, infection control, and collaborative care delivery (Utley et al., 2018). However, the translation of these competencies to the prehospital setting is not straightforward. The environmental context, clinical decision-making requirements, and scope of practice boundaries all differ substantially from the hospital-based settings where PCTs have traditionally been employed (Brookes et al., 2007; Hardy & Conway, 1988).

This study aims to provide a comprehensive evaluation of PCT integration into prehospital emergency medical services, examining the evidence base for competency requirements, appropriate scope of practice boundaries, and the potential impact on patient outcomes in time-critical conditions. Through systematic analysis of existing literature and theoretical frameworks, we identify key considerations for EMS leaders, educators, and policymakers considering PCT integration into their systems.

Theoretical Frameworks for Role Integration

Understanding the integration of Patient Care Technicians into prehospital emergency services requires examination through established theoretical lenses that illuminate role dynamics, professional boundaries, and organizational change processes. Role theory provides a particularly useful framework for analyzing how new healthcare roles are introduced, negotiated, and stabilized within existing healthcare systems (Hardy & Conway, 1988; Brookes et al., 2007).

Role Theory and Healthcare Integration

Role theory, as applied to healthcare settings, examines how individuals understand and perform their professional responsibilities, how roles are defined by organizational and social structures, and how conflicts or ambiguities arise when role expectations are unclear or contested (Utley et al., 2018). The introduction of PCTs into prehospital EMS creates potential for role ambiguity—uncertainty about what the role entails and how it relates to existing roles—and role conflict—situations where role expectations are incompatible or contradictory.

For paramedics and EMTs, the integration of PCTs may challenge established professional identities and raise concerns about role erosion or deprofessionalization (Givati et al., 2018; Mausz et al., 2022). Research on paramedic professional identity has demonstrated that paramedics derive significant meaning from their autonomous clinical decision-making, their ability to manage complex and unpredictable situations, and their status as the senior clinical provider in the prehospital setting (Mausz et al., 2022). The introduction of another clinical role, particularly one with a broader scope than traditional EMTs but perhaps with less educational depth than paramedics, may provoke professional tensions that must be carefully managed.

Conversely, role theory also suggests that role expansion and the strategic delegation of certain tasks can enhance role satisfaction by allowing practitioners to focus on higher-level clinical activities for which they are uniquely qualified (Tavares et al., 2016). From this perspective, PCT integration may allow paramedics to concentrate on complex clinical decision-making, advanced interventions, and team leadership, while PCTs handle more routine aspects of patient care and scene management.

Educational Frameworks and Competency Development

The educational preparation of PCTs for prehospital practice must be grounded in established competency frameworks that address the unique demands of the emergency environment. O'Meara and colleagues (2017) advocate for a holistic approach to paramedic education that emphasizes not only clinical and technical skills but also critical thinking, communication, professional behavior, and adaptability. Similar principles should inform PCT education, with appropriate adaptation for the level of responsibility and scope of practice assigned to the role.

The competency domains identified by Tavares and colleagues (2016) in developing a Canadian paramedic profile provide a useful starting point for considering PCT competencies. These include clinical assessment and decision-making, technical and procedural skills, communication and interpersonal abilities, professional behavior and accountability, safety and risk management, and health promotion and illness prevention. For PCTs in prehospital settings, these domains would require adaptation to reflect the specific tasks and responsibilities assigned to the role, while ensuring alignment with the competencies required of more advanced providers with whom they will collaborate. Chan and

colleagues (2019) emphasize the importance of standardized, evidence-based training programs for community paramedicine roles, noting wide variation in training approaches across jurisdictions. This finding has direct relevance to PCT integration, suggesting that meaningful competency assessment requires clear standards that are consistently applied.

Current Evidence on Prehospital Workforce Integration

The existing literature provides limited direct evidence on PCT integration into prehospital EMS, but several related areas of inquiry offer valuable insights. Community paramedicine programs, telehealth integration, and international approaches to EMS staffing all inform our understanding of how new roles and technologies can be successfully incorporated into prehospital care.

Lessons from Community Paramedicine

Community paramedicine represents the expansion of paramedic practice into preventive, chronic disease management, and primary care domains outside the traditional emergency response context (Chan et al., 2019; Eaton et al., 2021). While community paramedics typically have more extensive education and experience than PCTs, the integration of community paramedicine into EMS systems offers transferable lessons about role expansion, stakeholder engagement, and outcome evaluation.

Chan and colleagues (2019) found that community paramedicine programs vary considerably in their structure, funding, and scope, with common program types including scheduled home visits, postdischarge follow-up, and support for frequent 911 users. These programs have demonstrated potential benefits including reduced emergency department visits and improved patient satisfaction. However, their systematic review noted that rigorous outcome evaluation remains limited, and most program descriptions lack standardized training requirements.

The community paramedicine experience suggests that successful integration of new roles into EMS requires clear articulation of how the role addresses identified system needs, strong stakeholder engagement including physician oversight and hospital partnerships, and robust outcome evaluation. These principles apply equally to PCT integration.

International Perspectives on EMS Staffing

International EMS systems employ diverse workforce models that may inform PCT integration. Several systems utilize multi-tiered response models with different provider levels responding based on call type or patient acuity. For example, some European systems employ emergency medical dispatchers to triage calls and deploy appropriately skilled personnel, with basic life support providers attending lower-acuity calls while advanced providers are reserved for time-critical emergencies (Vicente et al., 2014). The role of ambulance nurses in some Scandinavian countries offers an interesting comparison point. Backman and colleagues (2019) explored ambulance nurses' experiences of deciding that a patient does not require ambulance transport to hospital, finding that these decisions require significant clinical experience, comfort with uncertainty, and strong communication skills. This research highlights the sophisticated clinical reasoning required even for relatively routine EMS decisions, suggesting that PCTs would require careful supervision and clear decision-making protocols if involved in similar determinations.

Telehealth and Technology-Enabled Care

The growing integration of telehealth into prehospital emergency care (Janerka et al., 2023) offers opportunities and challenges for PCT integration. Telehealth can support clinical decision-making by connecting field providers with remote physicians or advanced practitioners, potentially enabling PCTs to perform assessments and interventions under real-time remote supervision. This model may allow for expanded PCT scope of practice while maintaining appropriate clinical oversight.

Janerka and colleagues (2023) identified several applications of prehospital telehealth, including stroke assessment, trauma triage, and remote physician consultation. The evidence base for prehospital telehealth is emerging, with studies demonstrating feasibility and potential benefits, though further research is needed to establish definitive clinical outcome improvements.

Scope of Practice Considerations

Defining the appropriate scope of practice for PCTs in prehospital emergency services is a critical task that requires balancing several considerations: the competencies of the PCT workforce, the capabilities of the broader EMS system, patient safety requirements, and regulatory and legal frameworks.

Core Competencies and Skills

Based on the role of PCTs in hospital settings and the identified needs of EMS systems, the following core competencies may be appropriate for PCTs in the prehospital environment:

Basic assessment skills including vital sign measurement, history taking, and focused physical examination. These skills would support data collection for paramedics and enable PCTs to identify changes in patient condition requiring advanced intervention.
Basic life support including cardiopulmonary resuscitation, automated external defibrillator use, and airway management with basic adjuncts (oral and nasal airways, bag-valve-mask ventilation). These skills are critical for time-sensitive conditions and represent core competencies that should be maintained through regular training and competency verification.
Patient care and comfort including moving and handling, personal care, and psychosocial support. The patient experience in prehospital care is increasingly recognized as important, and PCTs may contribute meaningfully to patient comfort and dignity (Blackmore, 2022).
Scene support including equipment setup, preparation of medications and supplies, and assistance with advanced procedures. This role function could enhance team efficiency, allowing paramedics to focus on advanced clinical tasks.
Documentation and communication including accurate patient care reporting and effective communication with patients, families, and healthcare facilities.
Procedures such as intravenous cannulation, medication administration, and advanced airway management would typically be excluded from the PCT scope, reserved for paramedics with advanced training, unless specific additional training and competency verification are provided.

Decision-Making Authority and Clinical Judgment

One of the most challenging aspects of defining PCT scope involves the degree of independent clinical decision-making that would be permitted. The prehospital environment frequently demands clinical judgment in situations with significant uncertainty (Bury et al., 2019; Thorvaldsen et al., 2022). A safe scope of practice for PCTs must recognize this uncertainty and include mechanisms for appropriate clinical supervision and decision support.
A progressive model might permit PCTs to make certain routine decisions—for example, determining that a patient with a minor complaint and stable vital signs can wait for paramedic assessment while the PCT attends to equipment preparation. However, decisions about treatment interventions, transport destination, and escalation of care should typically remain with paramedics or other advanced providers.

Protocol-Driven Care and Standing Orders

Many EMS systems utilize protocols or standing orders that allow providers to initiate certain treatments without direct physician consultation. These protocols are typically tiered, with more advanced interventions requiring higher levels of certification. For PCTs, protocol-driven care might include basic interventions such as oxygen administration, glucose checks, and splinting, with clearly defined parameters for seeking paramedic or physician guidance.

Patient Safety Considerations

Patient safety is paramount in any healthcare delivery, and the integration of new roles into prehospital care must be evaluated through a patient safety lens. The prehospital environment presents unique safety challenges including time pressure, environmental hazards, limited information, and the absence of the safety systems present in hospital settings (Fisher et al., 2015; O'Connor et al., 2021).

Safety Culture and Systems Thinking

Bigham and colleagues (2021) emphasize that patient safety in EMS requires attention to both clinical practice and systems oversight. A strong safety culture—characterized by open communication about errors, a learning rather than blaming orientation, and commitment to continuous improvement—is essential for any EMS organization. The integration of PCTs provides an opportunity to reinforce safety culture by establishing clear expectations for safety behaviors and reporting.
Shepard and colleagues (2022) explored paramedic perceptions of patient safety in NHS ambulance services, finding that cultural factors including leadership, teamwork, and communication were viewed as central to patient safety. Other factors influencing safety included workload, staffing levels, and equipment availability. These findings suggest that PCT integration could positively influence safety if it addresses workload and staffing challenges, but could undermine safety if it introduces communication or teamwork problems.

Clinical Supervision and Backup

The presence of adequate clinical supervision is a critical patient safety consideration for PCT integration. In many proposed models, PCTs would work as part of a team including at least one paramedic, ensuring that a more qualified provider is available for complex or deteriorating patients. This team-based

approach aligns with the growing emphasis on crew resource management and teamwork in EMS (Hansen et al., 2020).

Systems must also ensure that PCTs have clear protocols for seeking assistance and that paramedics are not so overloaded with other responsibilities that they cannot provide adequate supervision. The "twoperson crew" model common in many EMS systems, with at least one paramedic and one EMT, provides a natural structure for PCT integration, with the PCT potentially substituting for the EMT role in some situations while a paramedic provides clinical leadership.

Competency Assurance and Continuing Education

Patient safety requires that PCTs demonstrate and maintain appropriate competencies through initial education, competency verification, and ongoing professional development. Competency verification should include both written and practical assessments, and should be repeated at regular intervals to ensure skill retention. Continuing education should address both clinical topics and non-technical skills including communication, teamwork, and situational awareness.

The concept of "sustainable resilience" introduced by Alburaidi and colleagues (2023) highlights the importance of organizational capacity to maintain safety during crises and periods of high demand. PCT integration should enhance, not diminish, this resilience by providing additional workforce capacity and supporting the flexibility needed to respond to fluctuating demand.

Impact on Patient Outcomes in Time-Critical Conditions

The ultimate measure of PCT integration success is its impact on patient outcomes, particularly in timecritical conditions where minutes matter. While direct research on PCT outcomes in prehospital care is limited, evidence from related interventions can inform understanding of how PCT integration might influence outcomes.

Cardiac Arrest

Cardiac arrest is the quintessential time-critical emergency, where immediate bystander CPR and early defibrillation are essential to survival. The presence of additional personnel on scene could potentially improve outcomes by enabling more efficient resuscitation—assigning a PCT to perform quality chest compressions while the paramedic manages airway, vascular access, and rhythm interpretation. Studies have demonstrated that high-quality CPR is associated with improved survival, and that fatigue reduces CPR quality over time. Additional personnel may enable more frequent rotation of compressors, maintaining CPR quality.

However, the integration of PCTs into cardiac arrest response must ensure that they are adequately trained and regularly practiced in their resuscitation roles. Programs such as the Transport PLUS intervention described by Munjal and colleagues (2022) demonstrate the feasibility of enhanced transitions of care that may reduce delays in definitive treatment, though these specific findings relate to post-transport interventions rather than the time-critical resuscitation phase.

Trauma

Time-critical trauma care requires rapid assessment, hemorrhage control, airway management, and timely transport to definitive care. PCTs could contribute to trauma care by assisting with spinal immobilization, controlling external hemorrhage, preparing equipment for paramedic interventions, and ensuring rapid and safe transport.

The wilderness EMS literature (Millin & Hawkins, 2017) provides insights into the challenges of providing care in austere environments, where resource limitations and extended transport times are common. PCT integration may be particularly valuable in rural or wilderness settings where paramedic resources are scarce, though these settings also require careful consideration of the supervision and support available to PCTs.

Acute Medical Emergencies

For conditions such as stroke, acute coronary syndrome, and respiratory distress, the prehospital phase of care directly influences downstream outcomes. Quick identification of stroke symptoms, timely 12lead ECG acquisition, and appropriate oxygen therapy all depend on the clinical assessment and intervention capabilities of the prehospital team.

Research on the role of paramedics in primary care (Eaton et al., 2021) and palliative care (Blackmore, 2022) emphasizes the importance of holistic assessment and appropriate referral. PCTs may support these aspects by collecting comprehensive patient information, attending to comfort needs, and facilitating communication with patients and families.

Implementation Considerations

Successful PCT integration requires careful attention to implementation factors including education and training, scope of practice definition, clinical supervision, and outcome evaluation.

Educational Requirements

Initial education for prehospital PCTs should build on the existing training curriculum for hospital-based PCTs, with additional content addressing the unique prehospital environment. Essential curriculum elements include:

- Prehospital scene management and safety
- EMS systems and operations
- Principles of patient assessment in the prehospital setting
- Basic life support with emphasis on high-quality CPR
- Use of basic equipment including oxygen delivery devices, suction, and immobilization equipment
- Communication and teamwork in the prehospital setting
- Professional behavior and ethical considerations

A structured clinical orientation with experienced paramedics should follow formal education, allowing PCTs to develop competence and confidence in the prehospital environment. The orientation period should include both supervised field shifts and simulation experiences, with competency verification before independent practice within their defined scope.

Supervision Models

The supervision requirements for PCTs depend on the scope of practice assigned to them. Most models would involve PCTs working as part of a team including at least one paramedic, who serves as the clinical lead. This paramedic-PCT team model provides immediate supervision while allowing the paramedic to focus on advanced clinical interventions.

In systems where a paramedic and PCT respond as a two-person ambulance crew, the paramedic would be responsible for clinical decision-making, advanced interventions, and overall patient care. The PCT would assist with patient assessment, perform basic interventions under protocol, and support the paramedic with equipment and documentation. This model aligns with the existing paramedic-EMT crew model common in many jurisdictions.

For systems considering PCTs responding as part of multi-provider units, such as in mass casualty events or with physician-staffed units, supervision structures may vary but should still provide clear clinical leadership and accountability.

Legal and Regulatory Considerations

The legal and regulatory framework for PCT practice in prehospital settings must be carefully developed to ensure both patient safety and provider protection. Key considerations include:

- Authorization for PCT practice within the EMS system
- Scope of practice limits based on education and competency verification
- Clinical protocols and standing orders
- Malpractice insurance and liability considerations
- Documentation requirements

Bury and colleagues (2019) highlight the potential for unintended effects of legislation on emergency care decision-making, emphasizing the need for careful consideration of how legal frameworks may influence clinical behavior. This is relevant to PCT integration, as legislation regarding scope of practice and decision-making authority could affect PCTs' willingness to perform certain interventions or seek appropriate supervision.

Evaluation and Quality Improvement

Quality improvement should be integral to PCT integration, with systematic evaluation of patient outcomes, provider performance, and system function. Key evaluation domains include:

- Clinical outcomes including survival, morbidity, and functional status
- Process measures including response times, on-scene times, and protocol compliance
- Safety indicators including adverse events and near misses
- Patient and provider satisfaction
- Workforce retention and role satisfaction

Implementation of PCT integration should include a pre-implementation baseline data collection period to allow for before-after comparisons. Controlled designs, such as staggered implementation or matched jurisdictions, would strengthen the evidence base for PCT integration effectiveness.

Challenges and Future Directions

The integration of PCTs into prehospital emergency services presents several challenges that require ongoing attention and research.

Professional Boundaries and Interprofessional Relationships

As previously discussed, the introduction of new roles into healthcare systems can create professional tensions. Paramedics may perceive PCTs as encroaching on their professional territory or may be concerned about the quality of care provided by less qualified personnel. Conversely, PCTs may feel undervalued or may experience role ambiguity when working with paramedics who have different expectations.

Addressing these challenges requires clear role definition, collaborative training, and open communication between team members. Regular multidisciplinary meetings and debriefings can help address concerns and build team cohesion.

Skills Decay and Maintenance

Maintaining clinical competencies presents challenges for all healthcare providers, but is particularly important for PCTs who may perform certain skills less frequently than paramedics. Skills decay can occur with limited use, potentially affecting patient safety. Simulation-based training and periodic skills verification should be built into regular professional development activities.

Research Priorities

The evidence base for PCT integration in prehospital EMS requires significant development. Research priorities include:

- Outcome studies comparing PCT-inclusive teams to traditional paramedic-EMT teams
- Qualitative research exploring provider and patient experiences with PCT integration
- Cost-effectiveness analysis of PCT workforce models
- Studies of optimal supervision models and workload distribution
- Investigation of PCT training requirements and competency maintenance

Conclusion

The integration of Patient Care Technicians into prehospital emergency medical services represents a promising approach to addressing workforce challenges and optimizing emergency care delivery. Drawing from role theory, the evidence base on EMS workforce integration, and consideration of patient safety principles, we have developed a framework for PCT integration that emphasizes clear role definition, appropriate scope of practice, robust supervision, and systematic outcome evaluation.

Successful PCT integration requires careful attention to educational preparation, clinical supervision, legal and regulatory frameworks, and ongoing quality improvement. The potential benefits include improved team efficiency, enhanced patient care capacity, and more sustainable EMS workforce models. However, these benefits must be balanced against potential risks including scope of practice issues, professional tensions, and patient safety concerns.

Moving forward, research is needed to establish the clinical and cost-effectiveness of PCT integration across diverse EMS settings and patient populations. Pilot programs with rigorous evaluation should precede widespread implementation, and findings should inform iterative refinement of PCT roles and integration strategies.

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