

Point-of-Care Testing in Prehospital Settings: Impact on Clinical Decision-Making and Patient Outcomes

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Abstract

Point-of-care testing (POCT) is a growing tool in emergency services, especially when it comes to prehospital care, allowing paramedics to quickly get the kind of diagnostic information they need to make decisions in real-time. This study, which combined both numbers and narratives, looked at how POCT impacts the decisions paramedics make and the outcomes for patients in emergency settings. On the quantitative side, we found that using POCT reduced the time it took to start treatment, shortened hospital stays, and even lowered mortality and complication rates. Qualitatively, paramedics talked about how POCT helped improve their decision-making and patient care but also mentioned some of the hurdles, like getting enough training, equipment challenges, and costs. This study highlights the real potential of POCT in prehospital care, while also noting the practical challenges that need to be addressed for broader use.

Keywords: Point-of-care testing, prehospital care, emergency medical services, decision-making, patient outcomes

Introduction

Point-of-care testing (POCT) is becoming more and more valuable in emergency medical services, particularly before the patient even reaches the hospital. It provides paramedics with rapid test results, allowing them to make quicker decisions that could be the difference between life and death. Imagine a scenario where every second counts: POCT gives paramedics information that allows them to take the right actions immediately, without waiting until they arrive at the hospital. This can be especially crucial for situations involving trauma, strokes, or sepsis (Claret et al., 2015; Drenck, 2001).

In emergency settings, time is of the essence, and POCT has proven to be valuable because it delivers immediate data—like glucose levels for diabetic emergencies, or blood lactate levels for trauma patients—that guides paramedics in providing the right care at the right time. It not only helps stabilize patients more effectively but also improves communication with the hospitals they are heading to, allowing those facilities to be better prepared (Goyder et al., 2020; Amaral et al., 2020).

That said, there are still challenges when it comes to making POCT a standard part of prehospital care, like ensuring accurate results, providing adequate training, and managing the cost of the equipment. Despite these hurdles, the potential for POCT to improve patient care is significant, and that's what makes this topic

worth exploring. The goal of this study is to see how POCT impacts decision-making by paramedics and how it affects patient outcomes.

Literature Review

The research out there shows that POCT can play a big role in improving emergency medical care, particularly before patients even reach the hospital. The ability to get diagnostic information quickly is critical in life-threatening situations. According to Claret et al. (2015), POCT helps emergency medical teams make faster decisions, especially in serious cases like sepsis, heart attacks, or trauma. When paramedics have these quick test results in hand, they can provide better care and pass on more useful information to the hospital, which often leads to better patient outcomes.

Goyder et al. (2020) analyzed a bunch of studies and found that using POCT in emergencies can significantly cut down the time it takes to start treatment—something that's particularly important for patients having heart attacks. In those situations, having instant access to markers like troponin allows paramedics to make better decisions about how to transport and treat the patient, which ultimately leads to fewer deaths and complications.

Another area where POCT shines is in trauma cases. Amaral et al. (2020) pointed out that by measuring blood lactate levels quickly, paramedics can assess how serious the shock is, which helps them prioritize care and allocate resources effectively. Similarly, in diabetic emergencies, Drenck (2001) found that checking blood sugar levels on the spot helped manage hypoglycemia better and reduced complications.

Still, making POCT a standard part of emergency services isn't without its issues. The cost of the equipment, potential accuracy problems, and variability in paramedic training have all been noted in the literature (Claret et al., 2015). Although POCT devices have gotten a lot better, some studies highlight that they're still not as accurate as lab tests, especially under tough conditions like extreme weather. Goyder et al. (2020) also pointed out that differences in how paramedics are trained can lead to inconsistent results, which suggests there's a need for standardized training.

The cost of POCT is also a challenge. Amaral et al. (2020) argued that while the initial costs can be high, the potential savings—like shorter hospital stays and better patient outcomes—might make it worth it. However, more research into the long-term cost benefits is needed to convince stakeholders.

All in all, the literature supports the idea that POCT can significantly improve prehospital emergency care by making it possible to act faster and more effectively. But issues like training, cost, and equipment reliability need to be addressed to make POCT work on a larger scale. This study aims to dig deeper into how POCT affects decision-making by paramedics and how it impacts patient outcomes in emergency settings.

Methodology

We took a mixed-methods approach for this study, which means we combined numbers (quantitative data) and stories (qualitative data) to evaluate how POCT impacts paramedics' decision-making and patient outcomes in emergency settings.

Study Design

The study ran over six months and used a prospective cohort design. We worked with EMS teams at a tertiary hospital and looked at two groups: one that used POCT and a control group that didn't. We collected data on patients who received POCT tests during emergency care, including tests for blood glucose, lactate, and cardiac markers.

Participants

We included 200 patients in this study—100 in the POCT group and 100 in the control group. All patients had conditions that could benefit from rapid diagnostics, like trauma, heart issues, sepsis, or diabetes. We excluded anyone under 18 or with a known terminal condition.

Data Collection

We gathered data from patient records, paramedic reports, and hospital follow-ups. We measured things like the time to treatment, hospital stay length, and patient outcomes (mortality and morbidity rates). We also talked to paramedics through semi-structured interviews to get their perspectives on using POCT and how it influenced their patient care.

Procedure

Before the study began, paramedics received training on using POCT devices. During the study, they used POCT on eligible patients either at the scene or on the way to the hospital. They then used those results to make decisions, like whether to administer glucose for hypoglycemia or rush a patient to a cardiac center. The control group received the usual prehospital care without POCT, and we tracked all patients through their hospital stays.

Data Analysis

Quantitative data were analyzed using statistical software to compare outcomes between the POCT and control groups. Qualitative data from interviews were analyzed for themes that showed up repeatedly, which gave us a better understanding of the real-world experiences of paramedics using POCT.

Ethical Considerations

Ethical approval was obtained, and all participants gave informed consent. We kept patient data anonymous, and everyone could choose to leave the study at any time.

Quantitative Findings

Here's what we found on the numbers side of things:

| Variable | POCT Group (n=100) | Control Group (n=100) | p-value |
|---------------------------|-----------------------|--------------------------|---------|
| Average Time to Treatment | 25 minutes | 45 minutes | < 0.01 |

| | | | |
|-------------------------|----------|----------|------|
| Length of Hospital Stay | 3.2 days | 4.5 days | 0.03 |
| Mortality Rate | 5% | 10% | 0.05 |
| Morbidity Rate | 15% | 25% | 0.04 |

The POCT group experienced faster treatment times (25 minutes versus 45 minutes, $p < 0.01$), shorter hospital stays (3.2 days versus 4.5 days, $p = 0.03$), and lower rates of both mortality and complications compared to the control group.

Qualitative Findings

The interviews with paramedics provided some rich insights into their experiences using POCT. Here are some of the themes that came up:

Theme 1: Improved Decision-Making

- **Timeliness of Information:** Many paramedics talked about how having test results right away helped them make quicker decisions. One participant said, “Having the test results right there on the scene allowed us to decide much faster on the treatment plan.”
- **Confidence in Treatment:** POCT boosted confidence in treatment decisions, with one paramedic noting, “It made me more confident in deciding whether the patient needed immediate transport to a cardiac center.”

Theme 2: Enhanced Patient Care

- **Targeted Interventions:** Paramedics felt they were able to provide more focused care. For example, “We were able to administer glucose immediately without having to wait for confirmation at the hospital.”
- **Communication with Receiving Hospitals:** Better communication with hospitals also came up a lot. “The hospital staff were better prepared when we called in with POCT results. They knew what to expect,” said one participant.

Theme 3: Challenges in Implementation

- **Training and Familiarity:** There were some challenges related to training. “Initially, there was a learning curve. Not everyone was comfortable using the devices,” noted one paramedic.
- **Equipment Reliability:** Another issue was reliability. “Sometimes the devices didn’t work as expected, especially in extreme weather conditions,” said a participant.

Theme 4: Cost and Resource Allocation

- **Equipment Costs:** Cost was a big concern for many. “The cost of the POCT devices is high, and we need to justify that with improved outcomes,” one paramedic observed.
- **Resource Management:** Managing these devices also required effort. “We had to ensure the devices were available and in working condition, which required careful planning,” another participant said.

Discussion

The results of this study clearly show the significant impact of POCT on paramedic decision-making and patient outcomes. On the numbers side, patients in the POCT group had shorter times to treatment, shorter hospital stays, and lower rates of both mortality and complications. This tells us that having access to quick test results really helps paramedics take appropriate actions faster—actions that ultimately lead to better outcomes.

Paramedics also reported feeling more confident in their decisions, particularly in urgent situations. This confidence translated into improved communication with hospital teams, which made a real difference for patients arriving at the hospital in critical condition. Essentially, by knowing more and knowing it faster, paramedics were able to give hospitals a heads-up, allowing for better preparation.

But, of course, it wasn't all smooth sailing. We found that training and equipment were real hurdles. Not every paramedic was comfortable using the POCT devices initially, and a lot of them felt that more extensive training could make a difference. The cost and reliability of the devices, particularly under extreme conditions, also stood out as barriers. These issues need to be addressed before POCT can become a standard part of emergency medical services. There's a need for more investment in training and making the devices more resilient and reliable in a range of environments.

Ultimately, this study highlights the promise of POCT in prehospital emergency care. The faster treatment times and improved patient outcomes observed in this study suggest that POCT has the potential to change the way we deliver emergency care. However, the practical challenges—such as cost, training, and device reliability—must be addressed. Future studies should focus on validating these findings in larger populations, conducting cost-benefit analyses, and developing training programs to prepare paramedics for using POCT effectively.

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