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Performance Assessment of Sri Lankan Pre-Hospital Ambulance Service

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Abstract

Ischemic heart disease is the leading cause of mortality that raised demand for pre-hospital emergency care in Sri Lanka. Understanding the performance of Sri Lanka's 1990 Suwa Seriya ambulance service is essential to improve its quality and to reduce morbidity and mortality associated with the disease. This study aims to describe socio-demographic characteristics and evaluate the clinical assessment and management process of patients presenting with acute chest pain of cardiac in origin. A descriptive study was conducted in Gampaha District of the Western Province of Sri Lanka. A total of 154 records of patients with acute chest pain who rang the 1990 call centre over a 3-month period were selected. Composite values for treatment and examinations as a percentage were plotted on run charts to assess the performance and its variations over the study period. About 47.4% of the study group were in 35–65 age group, 53.2% were males, and 81.8% had a typical presentation. The median for composite value for examination as a percentage was 89.5%, indicating substantial control and alignment with the reference package with normal cause variation. The median composite value for treatment as a percentage was 9.96%, a low value with normal cause variation. A good control of the processes of clinical examination and treatment is apparent. A higher median for composite value for examination as a percentage attributed to the formal training process of the ambulance staff. Although a low median was obtained for the composite value for treatment as a percentage, it was stable and pointed room for improvement.

Keywords: Ambulances; Chest pain; Ischemic heart disease; Pre-hospital emergency care; 1990 Suwa Seriya.

1. INTRODUCTION

The demand for pre-hospital urgent care has expanded over the past decade due to the trend of rising non-communicable disease (NCD) [1], changing demography of the diseases and increasing incidence of trauma. This trend is not limited to the developed world and is also seen in many middle-income countries [2]. The main goal of pre-hospital emergency care is to provide on-site medical treatment or emergency patient transport to the point of definitive care [3].

In Sri Lanka, NCD prevention and management policy aims annual reduction of 2% premature mortality (less than 65 years) over the next 10 years through expansion of evidence-based curative services and implementing individual and community-wide health promotion measures [4].

Ischemic heart disease is the main cause of mortality related to NCD in Sri Lanka. Wimalaratne *et al*. (2017) [5] has described an increase in the number of deaths due to circulatory diseases—including ischemic heart disease and stroke—a rise from 3 to 24% in the Island. The mortality rate for NCD in Sri Lanka remains 20-50% higher than that in the developed countries. This increasing trend of NCD catalyzed urgent care needs and hospitalization costs. Most patients with acute cardiac emergencies present with chest issues [6]. Breathing difficulty and unconsciousness can also be associated with symptoms. Patients presenting with acute chest pain could have many etiologies and it is very crucial to correctly identify and treat ischemic cardiac pathology. This emphasizes the requirement of efficient and effective service model change and more investment in pre-hospital and emergency care.

In cardiac care pathways, the time duration to reach the appropriate care such as percutaneous intervention (PCI) from the patient's door is directly related to the prognosis of the patient. This is further emphasized as "platinum ten minutes" and "golden hour." The importance of well-trained and skilful emergency medical technicians (EMTs) with the ability to assess, manage, and transfer the patient to the PCI lab safely and timely is critical to ensure effective cardiac care [7]. The primary aim of acute coronary syndrome (ACS) patient management is to reduce door to ballooning time for percutaneous coronary intervention. It should be kept below 90 minutes. For effective outcome, early accurate assessment and primary on-site management should be performed correctly by pre-hospital responders. Failing to perform effectively results in poor outcome and prognosis [8].

Even though emergency medical services are not fully established in Sri Lanka, the Emergency 1990 Suwa Seriya Ambulance Service has been initiated to provide pre-hospital emergency care for the public in 2016 with the financial aid

of the Indian Government. Indian authorities are in the process of training 250 EMTs to man the ambulances. The service provides emergency care for requested patients on-site and transports them to the appropriate secondary care hospital. Clinical assessment and management are provided by the EMT. The operational procedures and performance standard are maintained by the ambulance service authorities. External evaluation of the performance of the pre-hospital urgent care services has not been established.

The UK ambulance system has been rated as one of the most effective and efficient systems in the world. ACS due to ischemia is one of the main conditions attended by EMTs in the United Kingdom. The evidence-based approach for managing pre-hospital care of patients with ACS is stated in the ambulance clinical practice guideline (2016). They were the key guidelines used in this study [9].

Increasing cost of accident and emergency admission and hospital stay for medical and surgical emergencies justify the need for the effective pre-hospital system. Furthermore, delays in presentation and in the initiation of thrombolytic therapy and coronary interventions are key hurdles that need attention to optimize ischemic cardiac care in Sri Lanka [10]. Early and accurate assessment with pre-hospital stabilization by well-trained pre-hospital responders is a mandatory need.

Current status of 1990 Suwa Seriya ambulance service utilization and performance relevant to patients with chest pain is not fully understood. The study findings will be useful for future development and in the service expansion for other areas of the country.

The aim of the study is to describe socio-demographic characteristics and to evaluate the clinical assessment and management process of patients presenting with acute chest pain and related cardiac symptoms, identified as cardiac in origin by 1990 Suwa Seriya ambulance staff of Sri Lanka.

2. METHOD(S)

This is a descriptive study conducted in Gampaha District of Sri Lanka from November 2017 to November 2018, collecting data from patients transferred by 1990 Suwa Seriya ambulance service in the first 3 months of 2018. All patients presenting with acute chest pain and related cardiac symptoms, identified as cardiac in origin according to the clinical record, and who utilized 1990 Suwa Seriya telephone line to seek the urgent ambulance care during the study period were included in the study. A data collection spreadsheet was developed by doctors with clinical as well as healthcare management experience studying the patient clinical record maintained by the ambulance staff based on the clinical guideline of the ambulance clinical practice guideline (2016) of the United Kingdom. Before starting data collection, each component in the spreadsheet was assessed by the clinical experts (consultant cardiologist and anesthetist) and adapted for the local setting. Data were extracted by a team of experts involving emergency medicine consultant, an expert in pre-hospital care, and a general physician. One hundred and fifty-four patients were included for the study by this team. Demographic data and performance data for ambulance EMTs, including clinical assessment and management details, were taken from these patient records.

In the data extraction and analysis process, history taking and examination were considered as a single component (examination parameters). Medicinal administration and investigations were considered separately (treatment parameters).

2.1. Examination Parameters
Recording of presenting complaints with time of onset, associated symptoms and past medical history, examination and recording of pulse, blood pressure (BP), level of consciousness, oxygen saturation (SpO_2) and respiratory rate (RR) were included in examination parameters.

2.2. Treatment Parameters
Measurement of random blood sugar (RBS), electrocardiogram (ECG), sublingual administration of glyceryl trinitrate (GTN), aspirin, and O_2 were considered as treatment parameters.

We used run charts, a well-recognized and accepted tool to identify variations in performance, for calculated composite value as percentages on y-axis against time in weeks on x-axis.

A composite value for treatment as a percentage: this value was calculated by giving a score of either "1" (yes) or "0" (no) depending on getting RBS, ECG, administering GTN, aspirin, and O_2.

A composite value for examinations as a percentage: this value was calculated by giving a score of either "1" (yes) or "0" (no) for recording of presenting complaints with time of onset, associated symptoms, past medical history, and examination of pulse, BP, level of consciousness, SpO_2, and RR.

Ethical clearance for the study was obtained from the National Hospital of Sri Lanka. Administrative permission was obtained by the Regional Director of Health Services, Gampaha. The consent for accesses to the clinical information was obtained from the ambulance management authority.

3. RESULTS AND DISCUSSION

A descriptive study was conducted in Gampaha District of the Western Province of Sri Lanka to describe socio-demographic characteristics and evaluate the clinical assessment and management process of patients presenting with acute chest pain of

cardiac in origin. A total of 154 records of patients with acute chest pain who rang the 1990 Suwa Seriya call centre over a 3-month period were selected.

Harris has mentioned that single dimensions are not suitable for performance assessment in a dynamic group of staff such as ambulance paramedics [11]. Similarly, Mehmood also suggested output and goal-based multipronged method for performance assessment [12]. In this study, the authors used multi-dimensions within the assessment of composite values for examination and treatment. As the authors performed in this study, indicators should be developed on the basis of common acute conditions presenting to ambulance services based on published frameworks [13].

Table 1 shows important descriptive values revealed in the study.

From the patients included in the study, 47.4% were in the 35–64 age group. About 53.2% of cases were males. This study revealed that nearly half of the patients were between the ages 35 and 65, the economically productive group, closely resembling national NCD data [18]. The fact that a substantial fraction of patients (18%) having atypical presentations emphasize the need for specific skills to initiate specific treatment. In 81.8% of patients, the presentation was typical while 18.2% presented atypically. This finding indirectly expresses the need of paying attention in order to implement strategies to detect atypical presentation of cardiac patients in pre-hospital setting as atypical presentations may lead to significant number of morbidity and mortality [14]. Of the total study sample, 77.3% had satisfactory analysis of the symptoms by the EMTs. Symptom analysis is a very important task in care process in management of cardiac patients in pre-hospital setting, which guilds the clinician toward correct diagnosis and treatment. Although 77.3% indicate satisfactory level of symptom analysis, there was scope for improvement. In developed setting, EMTs are assisted by the automated decision support system to ensure effective symptom analysis and reaching correct diagnosis [15-17]. Percentage of patients who received CPR and expert advice for further management was 5.8% and 3.9%, respectively. This number indicated that the newly established 1990 Suwa Seriya ambulance service has addressed a very important requirement for pre-hospital cardiac patient management. Every minute counts for the survival of cardiac arrest patients and the patients must be assisted with CPR for better outcome at the earliest. The effectiveness of CPR processes needs to be evaluated periodically and staff must be continuously trained [18].

In Figure 1, the number of runs indicated in the chart is within the random variation of the process. The median value for the composite value for the treatment is 9.96%. There were no shifts, trends, or any astronomical values. Number of runs indicated in the chart is within the random variation of the process. Early initiation of medication for cardiac emergency is an important requirement to prevent further damage of cardiac tissue. In this study, the composite value for treatment as a percentage showed significant gap in this area with regard to the treatment of cardiac patients in pre-hospital setting. This result demands early initiation of exploratory study to identify root cause and solution for this issue. Also, a run chart displaying

Table 1: Descriptive statistics.

Category	Frequency (*n* = 154)	%
Age category (years)		
18–34	24	15.5
35–64	73	47.4
65 and above	51	33.1
Not documented	6	3.9
Gender category		
Male	82	53.2
Female	64	41.6
Not documented	8	5.2
Hospital category		
Secondary/tertiary care	91	59
Primary care	63	41
Type of presentation		
Typical	126	81.8
Atypical	28	18.2
Appropriateness of symptom analysis		
Satisfactory	119	77.3
Unsatisfactory	35	22.7
Percentage of patients who had CPR and got an expert advice		
Percentage of patients who had CPR	9	5.8
Percentage of patients who got an expert advice	6	3.9

Figure 1: Composite value for treatment as a percentage for patients with chest pain diagnosed as cardiac in origin in the pre-hospital setting. Percentage CT1: composite value for treatment as a percentage in *y*-axis. Timescale in weeks in the *x*-axis.
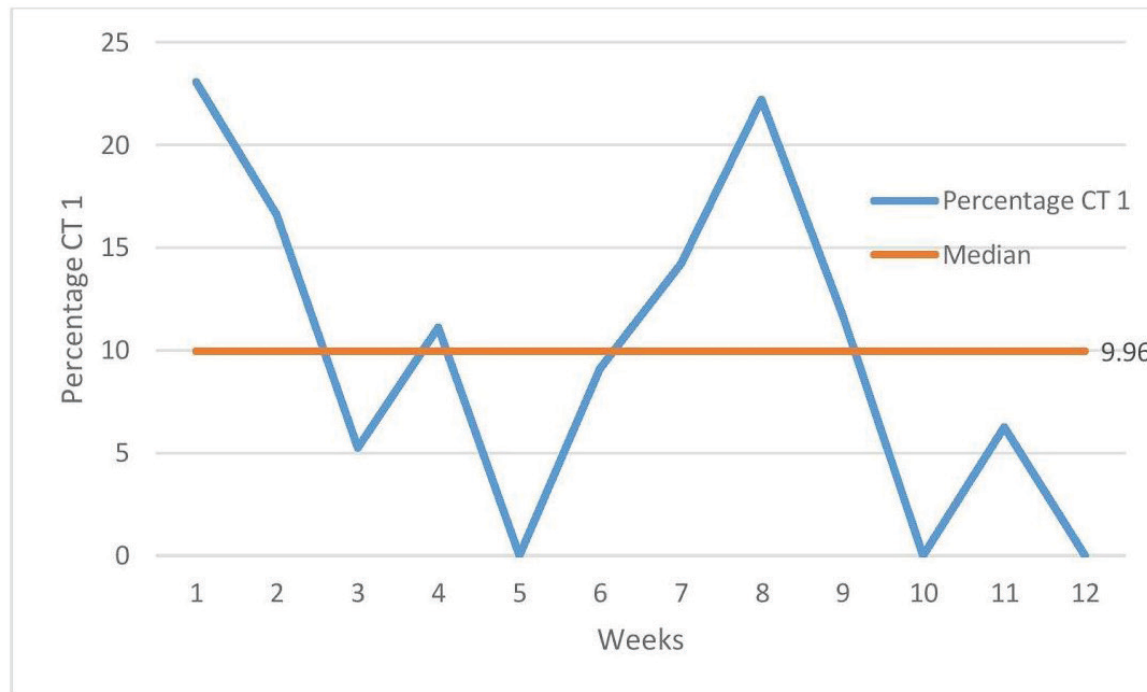
a low median value (9.96%) can be attributed to a lack of proper authority and legal coverage to give emergency drugs. The composite value for treatment as a percentage has not varied over the study period. Absence of trends and shifts, as well as astronomical values, exhibits a common cause variation of the context in this clinical situation [11]. This means the elements related to context and human resources were managed within control to maintain a stable process; a potential room for improvement.

In Figure 2, the median value is 89.5% with no shifts, trends, or astronomical values. Run chart displaying no shifts, trends, or astronomical values indicates that the process is under substantial control and closely follows the reference package value [11]. Number of runs recorded in the chart is not outside the random variation of the process. This higher number for composite value for examinations as a percentage showed higher standard of clinical assessment ability of the EMTs in pre-hospital setting. In developed settings, staff abilities and competencies were continuously assessed and improved by applying various techniques such as annual appraisal processes and in-service training [12]. The existing gap between the value obtained in the study and the reference package can be filled by applying modern training techniques, close monitoring of the performance, and introducing clinical guidelines, protocols, and routine skill appraisals. Largely, examination and description of the symptom by ambulance staff was satisfactory with scope for improvement. Composite percentage of examinations maintained at a higher value could be attributed to the formal training process the ambulance staff received. A high composite value for examinations as a percentage (89.5%) indicates the positive potential of the EMT staff toward the patient's clinical assessment.

The pain management was one of the main components of the reference package. We excluded it in this study because the administration of opioids was not legally permitted for the EMTs. Although we considered administration of GTN and aspirin, a very limited number of patients received them only if these were prescribed in the patients' own clinical notes. These causes are attributed to the low median percentage value for the treatment. Reason for this lower, unsatisfactory performance needs to be investigated further. If there are needs for capacity development as suggested by Zakaria *et al*. [13], it should be addressed favorably for the development of the service.

The gaps in treatment, higher composite value for examinations, performing CPR in pre-hospital setting, and variation of performance over the study period without any shift or trends show the potential ability of the 1990 Suwa Seriya organization to maintain good control over the clinical processes and show the opportunity for effective changes in services. This study had certain limitations, essentially, limited time period.

Figure 2: Composite value for examinations as a percentage for the patients with chest pain diagnosed as cardiac in origin in the pre-hospital setting. Percentage CE1: composite percentage value for examinations in *y*-axis. Timescale in weeks in the *x*-axis.
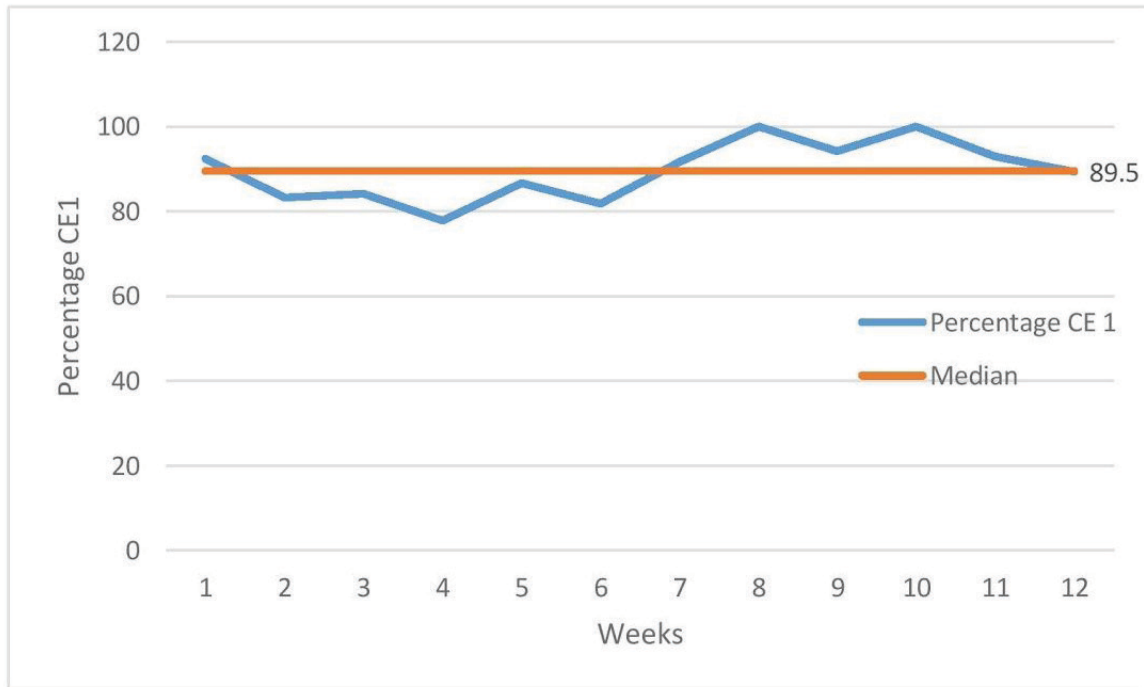
Author Contributions
All authors conceptualized the study, read, and improved the manuscript. PSA and CL collected data. RP and PR analyzed data.

Conflict of Interest
There is no conflict of interest.

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