

# Response times in paramedic ambulance service priority 1 and 2 emergencies

MANUEL LIRA VILLAVICENCIO

Graduate in Technology for Medical Emergencies and Disasters.  
Assisted Emergency Transport System STAE-ESSALUD, Lima, Peru.

---

**CORRESPONDENCE:**

Manuel Lira Villavicencio  
Av. Castro Iglesias, 574. Zona B  
San Juan de Miraflores  
Lima 29. Peru  
E-mail: pm4lira@hotmail.com

**RECEIVED:**

11-3-2008

**ACCEPTED:**

22-4-2008

**CONFLICT OF INTEREST:**

None

**Methods:** Prospective cross-sectional study of all paramedic-attended ambulance transfers to hospital in priority 1 and 2 emergencies in February and March 2003 in urban areas of the provinces of Lima and Callao, Peru.

**Results:** Data were collected on 258 level 1 and 2 emergency transfers. Response times averaged 24 minutes (SD, 14 minutes) in priority 1 cases; 13% of the priority 1 transfers were completed within 8 minutes. In priority 2 cases, response times averaged 27 minutes (SD, 13.4 minutes); 1% of these transfers were completed within 8 minutes. Delays were caused by long distances traveled to reach patients (29%), heavy traffic (24%), and inaccurate information (13%). The average return-trip speed (distance covered divided by duration of round trip) was 26 km/h (SD, 15 km/h) for priority 1 emergencies and 27 km/h (SD, 18 km/h) for priority 2 calls.

**Conclusion:** These transfer times show that there are still areas where improvements can be made if the service is to reach international standards. [Emergencias 2008;20:316-321]

**Key words:** Response time. Ambulances. Emergency Medical Services.

---

## Introduction

The Committee of Trauma of the American College of Surgeons established "Time Zero" as the first 60 minutes after an injury occurs during which time lethal injuries of traumatized patients may be reversed. The American Heart Association indicates that the main arrhythmia causing extra-hospital sudden death is ventricular fibrillation which may be reversed with immediate defibrillation in the first 10 minutes in 85% of the cases if the "first rescuers" have an external automatic defibrillator and arrive at the scene in 4 or 5 minutes<sup>1</sup>.

International organisms such as The National Center for Injury Prevention and Control, National AMBULANCE Advisory Council (NAAC), Data Elements for Emergency Department Systems (DEEDS), the Canadian Institute for Health Information, National Ambulatory Care Reporting System (NACRS), the Spanish Society of Emergency Care and Medicine (SEMES), the Clínica de la Universidad de las Américas in Mexico, the Fire Department of Miranda in Venezuela and the Ministry of Health of Argentina have established

indicators of quality specifying standards of response times which a medical transport unit should have, especially in cases determined as emergencies<sup>2-4</sup>.

The Ministry of Health has a project on the regulation of quality indicators in the prehospital area. In 1996 ESSALUD created the Department of STAE for prehospital emergency care. In their 2001 report on production, healthcare activity did not cover all the indicators of quality for services one hundred percent, particularly those of primary priority 1 and 2 calls<sup>5,6</sup>. The aim of this study was to measure response times, identify the factors of delay and establish the real average on the distance/time relationship of the primary calls with priorities 1 and 2 in the STAE primary emergency transportation service.

## Methods

The present investigation is descriptive, prospective and transversal. The time required for a medical unit to arrive to an emergency scene was measured. These units

are found in different districts which cover the urban area of the province of Lima and Callao (Figure 1).

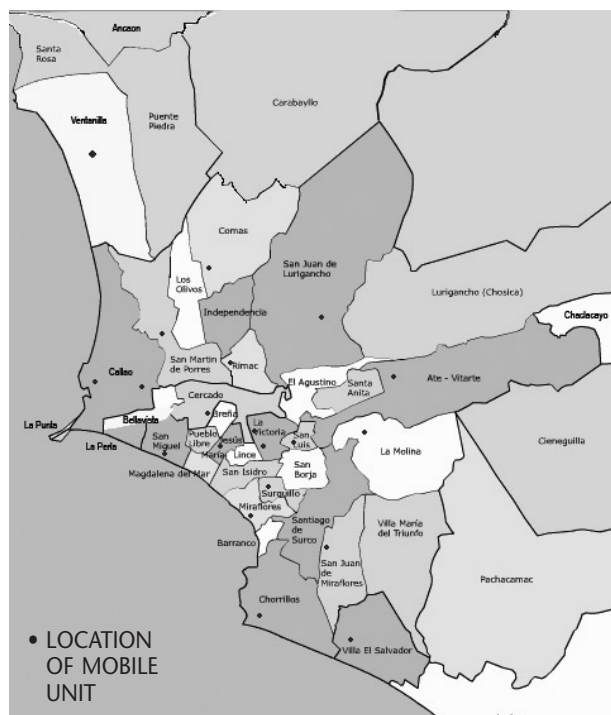
The STAE service has some medical units composed of Nissan 1996 Carivan lorries. According to the type of care needed the mobile units are divided into three groups: 5 Omega, 6 Alpha and 15 Beta.

1. Beta Units: These carry out the transfers of stable patients with priority IV (Table 1). They are equipped with a basic medication case, oxygen balloon, rigid boards, neck braces, straight jacket and 1 or 2 gurneys.

2. Alpha Units: These are Basic Support Units which transfer patients of priorities II and III (Table 1). They are equipped with all of the equipment of the Beta Unit as well as a pulsioxymeter and secretion aspirator.

3. Omega Units: These are Advanced Vital Support Units which evaluate and transfer patients with priorities 1 and II (Table 1). They are equipped with the same equipment as the Alpha Unit plus a defibrillator monitor, equipment for endotracheal intubation and infant deliveries and advanced medication and resuscitation cases.

To determine the sample size all the care classified as primary transport with priorities 1 and 2 presented during the months of February and March 2003 were considered.



**Figure 1.** Location of ESSALUD ambulance units in metropolitan Lima.

**Table 1.** Priorities according to the Decision of the General Council n° 069-CG-ESSALUD-2001<sup>6</sup>

1	Patients with sudden critical alteration in state of health with imminent risk of death requiring immediate medical care.	Emergency
2	Patients with sudden, acute picture with risk of death or serious complications requiring care within a period no greater than 10 minutes.	Emergency
3	Patients without risk of death or incapacitating sequelae.	Urgent
4	Patients in whom vital functions are not compromised and have no risk of immediate complication.	No emergency Not urgent

Data collection was carried out with the structuring of a formula in which the following variables were registered:

Primary or evaluation transportation, response time, division of the response time (decision time, waiting time, queue time, time on the road)7. Kilometres driven, priority 1, priority 2, reason for delay (delay of the unit, delay of the personnel, delay in communication, etc.).

The quantitative data were reported in the database and then refined and analysed using the SPSS version 9.0 statistical package for Windows. The results were compared with international standards (Table 2) to determine whether they were within the parameters established<sup>7</sup>.

**Results**

In the months of February and March 2003, 523 primary STAE transport services were used with 435 corresponding to priorities 1 and 2. It was estimated that 177 calls were within the exclusion criteria and thus, only 258 calls were included: 30 priority 1 calls (12%) and 228 priority 2 calls (88%).

Table 3 shows that the response time was less than 8 minutes in only 7 of the 258 primary calls. However, a greater percentage of priority 1 calls (13.3%) achieved this standard compared with priority 2 (1.3%; *p* = 0.004). Figure 2 provides a detailed distribution of the times.

With regard to the division of times for response time, Figure 3 demonstrates that the decision time for the primary calls was of less than 1 minute in 121 cases (47%) and for the remaining 137 (53%) this time was greater than or equal to 1 minute. The waiting time was less than 1 minute in 160 calls (62%), being greater than or equal to 1 minute in the remaining 98 (38%). The time on the road was less than 6 minutes for 11 cases (4%) and greater than or equal to 6

**Table 2.** Standards according to the Department of Transportation and the National Administration of Traffic Safety and Roads of the United States of North America<sup>12,13</sup>

Time Intervals	Ideal Time
<b>Response time*</b>	<b>&lt; 8 minutes 90%</b>
- Time of decision	30 seconds 90%
- Waiting time	0 seconds
- Time on the road 5 minutes 90%	
<b>Time for patient care</b>	
Time at scene	20 minutes
Transportation time	
- Urban	< 10 minutes
- Rural	< 30 minutes
Time from hospital	< 15 minutes
<b>Time by priorities</b>	
Response time for type I and II priorities (Annex 1)	8 minutes
Response times for type III and IV priorities (Annex 1)	15 minutes

\*Response time. The period from the time of the call until the Prehospital Emergency Team (PET) arrives to the scene of the patient. It is the sum of the decision time + queue time + arrival time.

- Decision time. The period from the time the operator receives the call until the arrival of the ambulance. Here the dispatcher uses triage to determine the most appropriate ambulance for the service taking into account the location, distance, priority, and available.
- Waiting or queue time. The period from the time of the call to the ambulance until the ambulance goes to the scene. This period depends on the availability of the ambulance, if it is operative and available the time is 0.
- Time on the road. The period from the time the ambulance leaves the base or indicates its availability until the arrival at the scene. This time depends on the distance, ease of access, priority, etc.

minutes for 247 (96%) calls. Significant differences were only observed in the decision time in which a greater percentage of response of 1 minute was observed in priority 1 calls ( $p = 0.004$ ).

The mean response time for primary calls was 26 minutes (SD: 13) with a median of 24 minutes, ranging from 1 to 108. The mean response time for priority 1 calls was 24 minutes (SD:14) with a median of 22 minutes and a range from 1 to 54 minutes. For priority 2 calls, the mean was of 27 minutes (SD: 18), and the median was 20 minutes ranging from 4 to 108 minutes.

The mean of the average vehicle speed for primary calls was 26 Km/h (SD: 18), with a median

**Table 3.** Priorities 1 and 2 response times

Priority	Total calls n (%)	Response time < 8 minutes n (%)	Response time ≥ 8 minutes n (%)
1	30 (12%)	4 (13.3%)	26 (86.7%)
2	228 (88%)	3 (1.3%)	225 (98.7%)
<b>Total</b>	<b>258 (100%)</b>	<b>7 (2.7%)</b>	<b>251 (97.3%)</b>

\* $p = 0.004$  for comparison between priorities 1 and 2.

of 20 Km/h, ranging from 2 to 150. The mean of the average speed for the primary priority 1 calls was of 26 Km/h (SD:15) with a median of 23 Km/h and a range of 2 to 150 Km/h.

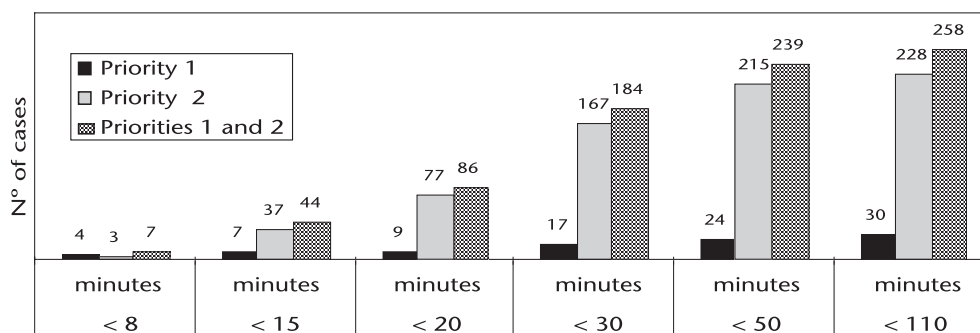
### Discussion

One of the major advances in emergency medicine is providing assistance to a request for emergency medical care where this is produced<sup>8</sup>. Therefore, the indicator of response time may control the quality of care provided by prehospital services.

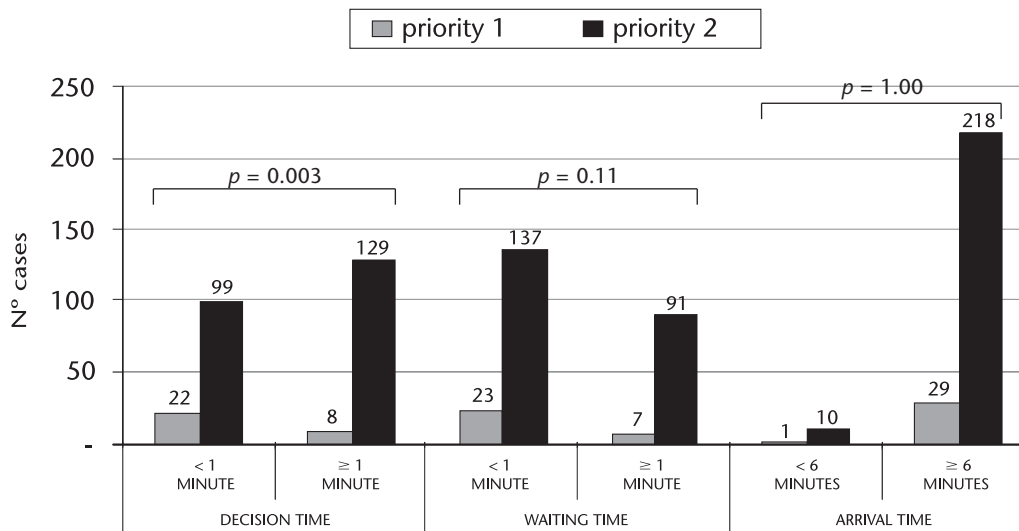
From February to March 2008, 523 primary calls or evaluations were reported, with 50.7% of the total number of evaluations being excluded from the study and half of these exclusions corresponded to saturated service and thus, posterior sending of the unit.

It can be seen that the total of priority 1 calls is 12% versus 88% of priority 2 indicating that the type of severity of the patients using this service in the evaluations is not very severe and rapid, effective care was able to reverse their state of health.

International standards (Table 2) suggest that 90% of the response times of primary calls in the services considered as an emergency (priorities 1 and 2) should be carried out in less than 8 minutes. The present study shows that arrival within this exiguous margin was achieved in only 3% of



**Figure 2.** Speed of response.



**Figure 3.** Speed of the different components of response time.

the cases, although with a significantly better response for priority 1 calls (13%).

According to the values suggested by the international standards, the ideal time in the division of response times establishes that 90% of the decision times should be carried out in less than 1 minute. This was achieved with the STAE service in 47% of the cases and if this is examined by priorities, priority 1 achieved a high value of 73%, being 43% in priority 2, with the differences being statistically significant. With regard to waiting times, the international standards suggest that this should be a time of 0 minutes. This was achieved in STAE in more than half of the cases (62%) and with respect to case priority this was achieved in 77% of the cases of priority 1 and in 60% for priority 2 (not statistically significant). Finally, the international standards suggest that the arrival time should be made in no more than 5

minutes. This was achieved with the STAE service in only 3% of the cases, with no differences according to priorities. It can be seen that all the parameters suggested by the international standards of emergency services in developed countries are not far from being achieved by the STAE service, although some parameters must be improved.

The mean response time registered by the STAE service in the present study was 3-fold greater in all the cases (in general and for each priority) than the other Medical Services of International Emergency (MSIE). With regard to the divisions of response times, the averages were not far from the other MSIE, with the mean decision and waiting times for priority 1 being 1 minute in both cases and 2 minutes for priority 2. However, a notable difference was observed in the mean time on the road of the STAE service, which

**Table 4.** Reasons for delay

Main reason	Quantity	%	Specific reason	Quantity	%
1. The unit	34	13	1.1. Vehicle accident	1	0
			1.2. Mechanical failure	8	3
			1.3. Unit supply	25	10
2. Communication	55	21	2.1. Transmission not understood	6	2
			2.2. Communication cut off	13	5
			2.3. Imprecise address	36	14
3. Personnel	27	11	3.1. Sick leave	4	2
			3.2. Absenteeism	4	2
			3.3. Not available	19	7
4. Geography	143	55	4.1. Traffic	65	25
			4.2. Distance	78	30
<b>Total</b>	<b>259*</b>	<b>100</b>		<b>259</b>	<b>100</b>

\*There was no delay in some cases and in others there was more than one reason explaining why this number does not coincide with the total of 259 calls studied.

quadrupled the times established in this category for the MSIE.

Another aspect of the study was the possible causes of delay of the care unit, with 30% being due to the distance of the location of the patient. The geographical area covered by each STAE unit is of approximately 15 Km<sup>2</sup> which could be solved with more units to reduce the geographical area designated to each unit<sup>5</sup>. The second cause of delay was vehicular traffic, with 25% due to the lack of civil consciousness of the population with regard to preference for emergency medical vehicles on the road, despite the use of the siren and emergency lights. In the present study only 7 calls were attended with no delay, coinciding with the 7 calls in which the response time was achieved in less than 8 minutes.

A new variable in this study was the mean speed of response (result of dividing the distance travelled by the medical unit from the sub-base or the site where call was taken to the scene of the patient and the speed to do the same). Although no standards or parameters have been established for this category and neither are there previous studies with which comparisons may be made, in the present study the mean average speed for priorities 1 and 2 was 26 Km/h and 27 Km/h, respectively. If we relate these data obtained with the 15 Km<sup>2</sup> of geographical area covered by each medical unit, it can be stated that the ambulances of the STAE service have a mean speed of 34 minutes in the case of a patient being located at the limit of the area of action.

Another variable which may be a reason for discussion is that referring to the time on the road. The time which the unit takes to arrive to the home or the location of the scene of the patient was considered but not the time of real contact from when the medical personnel leave the unit in the determined address and have physical contact with the victim (talk to or examine the patient) which is 1 to 5 minutes in some cases because the patient is in a building, shared complex and in other cases, human settlements to which the medical unit cannot arrive and it is

necessary for the medical personnel to walk a certain distance before arriving to the home of the patient.

In addition, studies undertaken by Sunat, the superintendence of the EPS and the Sub-administration of Evaluation and Labour Risk have estimated that the number of persons insured by ES-SALUD in the province of Lima and Callao has ascended to 3,146,653 inhabitants. Moreover, according to the 2001 data of annual production for the STAE service, 84,000 calls were received with an average of 6,646 care services being made per month, 605 of which were primary calls. Considering that there should be one ambulance for assisted transportation for every 200,000 inhabitants and STAE only has a total number of 25 ambulances, there is one mobile medical unit for every 125,000 persons insured and 1 unit exclusively for emergencies for every 390,000 persons insured with a consequent overcrowding and impossibility to attend all the requests for medical care.

## References

- 1 Sanders M. Ambulance Operations. Editor. Paramedic Textbook, Missouri, Mosby's 2000;1345-72.
- 2 Arnold JL. International Emergency Medicine and the Recent Development of Emergency Medicine Worldwide. *Ann Emerg Med* 1999;33:97-103.
- 3 Innes G, Murray M, Grafstein E. A Consensus - Based Process To Define Standard National Data elements for a Canadian Emergency Department Information System. *Can J Emerg Med* 2001;3:277-84.
- 4 Grupo de Trabajo SEMES - Insalud. Calidad en los Servicios de Urgencias. Indicadores de Calidad. *Emergencias* 2001;13:60-5.
- 5 Essalud - Sistema de Transporte Asistido de Emergencia (STAE): Producción Anual 2001. Gerencia departamental de Lima. 2002.
- 6 Essalud: Protocolos de Triage, Daños de Emergencia por Prioridad de Atención, GDLIMA - GSS - OGH. Lima 2001.
- 7 Swor R. Quality assurance in suburban EMS systems. Editor. *Quality Management in Prehospital Care*. Missouri: Mosby, 1993;140-8.
- 8 Pell JP, Sirel JM, Marsden AK, Ford I, Cobbe SM. Effect of reducing ambulance response times on deaths from out of hospital cardiac arrest cohort study. *BMJ* 2001;322:1385-8.

## Tiempo de respuesta en el transporte primario de prioridades I y II en el servicio de sistema de transporte asistido de emergencia STAE-ESSALUD

Lira Villavicencio M

**Objetivo:** Evaluar el tiempo de respuesta en sistema de transporte asistido de emergencia STAE-ESSALUD.

**Método:** Descriptivo, prospectivo y transversal, del total de transportes primarios considerados emergencias prioridad 1 y 2, recibidos en el Servicio de STAE durante febrero y marzo de 2003 en la zona urbana de las Provincias de Lima y Callao.

**Resultado:** Se seleccionaron 258 transportes primarios de prioridad 1 y 2. Los tiempos de respuesta para la prioridad 1 tuvieron una media de 24 minutos (DE: 14); el 13%, de los casos se efectuaron en menos de 8 minutos. En la prioridad 2, el tiempo fue de 27 minutos (DE: 13,4); el 1%, de los casos se efectuaron en menos de 8 minutos. Los motivos de demora de la unidad mayoritariamente son causados por la lejanía de la localización del paciente (29%), seguida por el tráfico vehicular (24%) y los derroteros inexactos (13%). La velocidad media (distancia recorrida/tiempo rodado) fue de 26 Km/h (DE: 15) para la prioridad 1 y de 27 Km/h (DE: 18) para la prioridad 2.

**Conclusión:** Estos tiempos muestran que todavía tenemos una oportunidad de mejora para acercar este servicio al tiempo ideal sugerido por los estándares internacionales. [Emergencias 2008;20:316-321]

**Palabras clave:** Tiempo de respuesta. Ambulancia. Transporte primario.