

Emergency Ambulance Services

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EXECUTIVE SUMMARY

1. This paper examines the quality of Emergency Ambulance Services (EAS) of Hong Kong and compares the EAS of different territories. Performance targets and the level of pre-hospital treatment are used as indicators of quality of EAS.
2. Most components of the overseas Emergency Medical Services are placed under one roof of the Ministry of Health. The segregate division of labour in the Hong Kong EAS might raise difficulties in the coordination, communication, accountability and monitoring of the performance of the different divisions.
3. Hong Kong Fire Services Department (HKFSD) adopts the 10 minutes travel time as the performance target for the EAS. Our findings indicate that most territories use response time targets as their performance targets though their performances differ.
4. The adoption of travel time target might mislead callers as to the true arrival time of ambulances. Since response time includes activation time and travel time, it can reflect the performance of the Fire Services Communication Centre (FSCC) and the Ambulance crew.
5. Notwithstanding the transfer of non-emergency services to the Hospital Authority and the current fleet size of 246 ambulances, the Ambulance Command fails to achieve the travel time target. The reasons given are long distance and traffic congestion.
6. The 1986 and 1995 Consultancy Studies had made a number of recommendations to improve the present performance target, yet, progress made so far falls short of the recommendations in both Studies.
7. The effectiveness of EAS depends on the level of training of the ambulancemen and the availability of appropriate equipment. Hong Kong ambulance crew received less training than their counterparts of London, California, Australia and British Columbia. Hong Kong's ambulance is less equipped than their European or North American counterparts in terms of the standard allocation of equipment of a front line ambulance. This is also evidenced by the findings on the defibrillation success rates.
8. The introduction of AAMC as "First Responders" and the deployment of EMA II ambulances show that there is a higher demand for more advanced treatment in a shorter time than is currently provided.

9. Quality Assurance built-in mechanisms are important in evaluating the quality of services and monitoring the performance of ambulance crew. Yet, little emphasis has been placed in quality assurance. Few statistics was available for quality analysis. Officer to Rank and File ratio is the lowest among the selected territories and within the Hong Kong Disciplined Forces. This is likely to affect the monitoring of performance of ambulance crews and operational activities.
10. EAS are dealing with life-threatening emergencies. People need help even before they make the phone call. This would involve preventive care education on a wider scale. It is envisaged that with the present standard of services provided by the HK EAS, additional resources will be required for its upgrading.

EMERGENCY AMBULANCE SERVICES

PART I - INTRODUCTION

1. Background

1.1 In April 1996, the Joint Panels Meeting on Health Services and Security Services discussed the performance target of the Hong Kong Emergency Ambulance Services (EAS) and the Panels later requested a research to be conducted to look into the quality of the overseas EAS.

2. Objective

2.1 This paper focuses on the response time target and the level of pre-hospital treatment as indicators of the quality of EAS. Part 2 of the paper gives a brief introduction of the Hong Kong Ambulance Services and compares its management structure with selected territories.

2.2 Part 3 addresses the performance targets and the effectiveness of hiving off of the non-emergency services to the Hospital Authority.

2.3 Part 4 looks into the pre-hospital treatment of EAS, the performance of the Ambulance-Aid Motorcycles (AAMC), the EMA II ambulances and the communication system of EAS.

2.4 Part 5 of this paper addresses the problem of quality assurance. This includes the supervision of staff and the adequacy of quality assurance built-in mechanisms.

3. Methodology

3.1 The study involves a combination of data collection, data analysis and consultation.

3.2 Data were collected from operations and control of Hong Kong Fire Services Department (HKFSD), Hong Kong Ambulance Command and the Health Ministry and EAS of different foreign territories.

3.3 Selection of foreign territories was based on population characteristics, economic activities, income per capita and state of development. Representative cities were chosen from North America, Europe and the Asian- Pacific region.

3.4 At of to date, a total of 18 Ambulance Services Agencies / Fire Departments / Health Departments of different foreign territories has responded to our enquiries by facsimiles, telephone interviews, electronic mails and post. Among the respondents, UK, USA and Canada have provided a more detailed response and therefore, their experiences and practices are widely quoted in this paper. Internet was also extensively used to search for overseas information.

3.5 Meetings had been held with the HKFSD and Ambulance Command staff to discuss the performance of the local EAS. One visit had been made to the Fire Services Communication Centre (FSCC) to understand its operation.

3.6 The data collected were analyzed and presented in the form of tables and charts. The validated data forms the basis of our analysis and position.

PART 2 - HONG KONG EMERGENCY AMBULANCE SERVICES

4. Introduction

4.1 There are a total of 88 officers and 1840 ambulancemen serving the Hong Kong Ambulance Command. Its ratio to the HK population is **1: 3220**. This is one third the ratio of British Columbia where the ratio of ambulance attendants to its population is *1: 1020*.

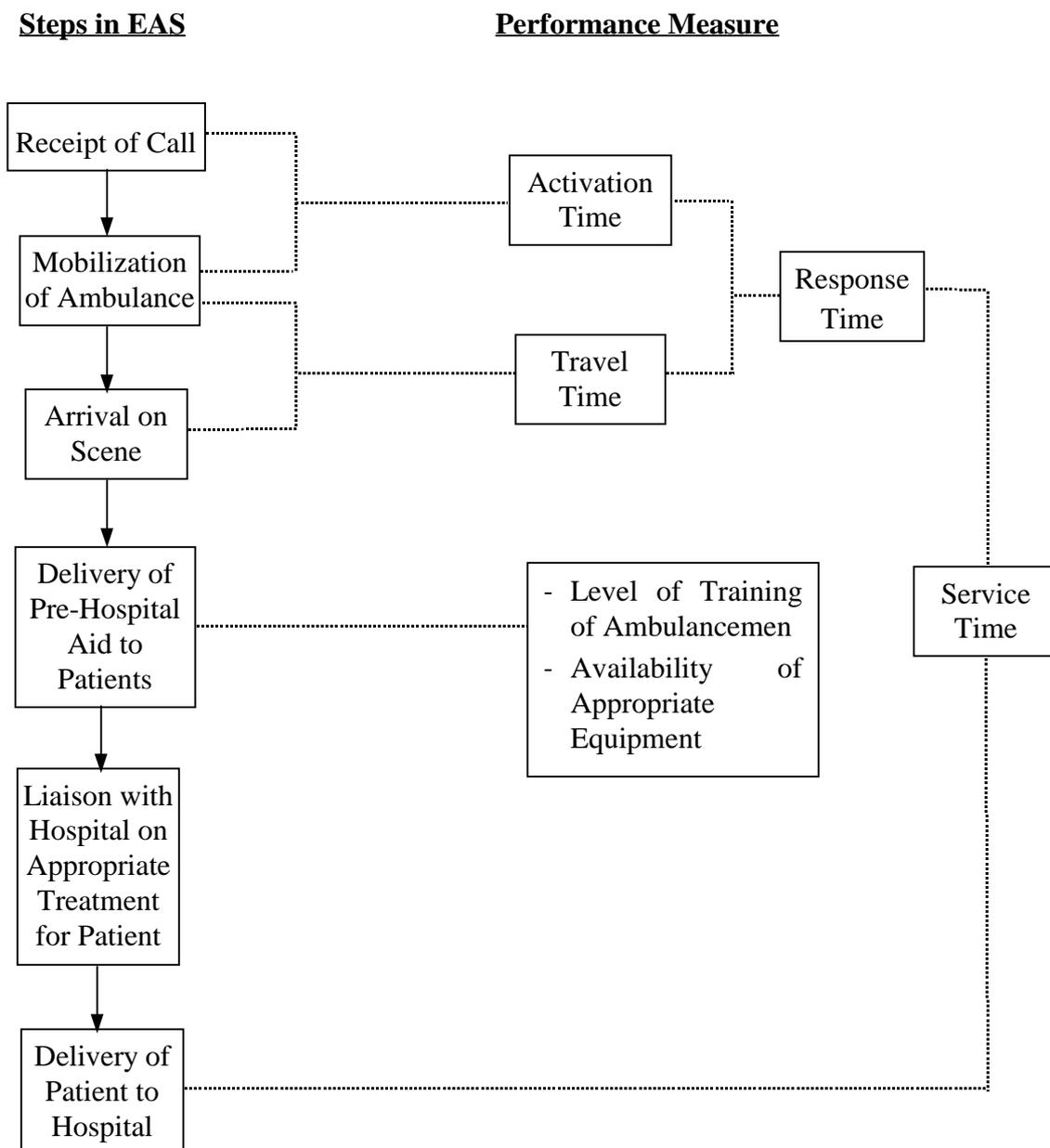
4.2 As at May 1996, we have 25 ambulance depots, 3 stations and 24 outstations. The Ambulance Fleet comprises 243 Town Ambulances (including 33 EMA II ambulances), 3 Village Ambulances, 15 Ambulance-aid Motorcycles and 1 Mobile Casualty Treatment Centre.

4.3 In 1987, the government adopted recommendations made by the Health Operational Research Unit Consultancy on improvements to the ambulance services. In brief, a 95% 10-minute travel time target was adopted. The authority overseeing the provision of EAS was the Ambulance Services Steering Group (ASSG), which comprised representatives from the Security Branch, Health and Welfare Branch, Fire Services Department, Hospital Authority and Department of Health. In 1995, the ASSG ordered the same Consultant to conduct a review and update the 1986 Consultancy Study. The government has indicated that it would take steps to implement some of the Consultant's recommendations.

5. Measure of Quality of the Emergency Ambulance Services

5.1 Figure 1 summarizes the major steps and their respective performance measures in providing EAS in general.

Figure 1 - Major Steps and Performance Measures of EAS



5.2 In sum, there are several possible quantitative performance measures for EAS:

- **Activation Time** - the interval between receipt of a call and mobilization of an ambulance.

This measures vehicles availability and the effectiveness of mobilization procedures and efficiency of dispatchers.

- **Travel Time** - the interval between mobilization of an ambulance and its arrival at the scene of incident.

This measures vehicles availability and the effectiveness of emergency cover.

- **Response Time** - the interval between receipt of a call and the arrival of the ambulance at the scene of incident. In some territories, the response time refers to the interval between receipt of a call and the arrival of the ambulance at the patients / injured. However, in this study, response time refers to the first definition.

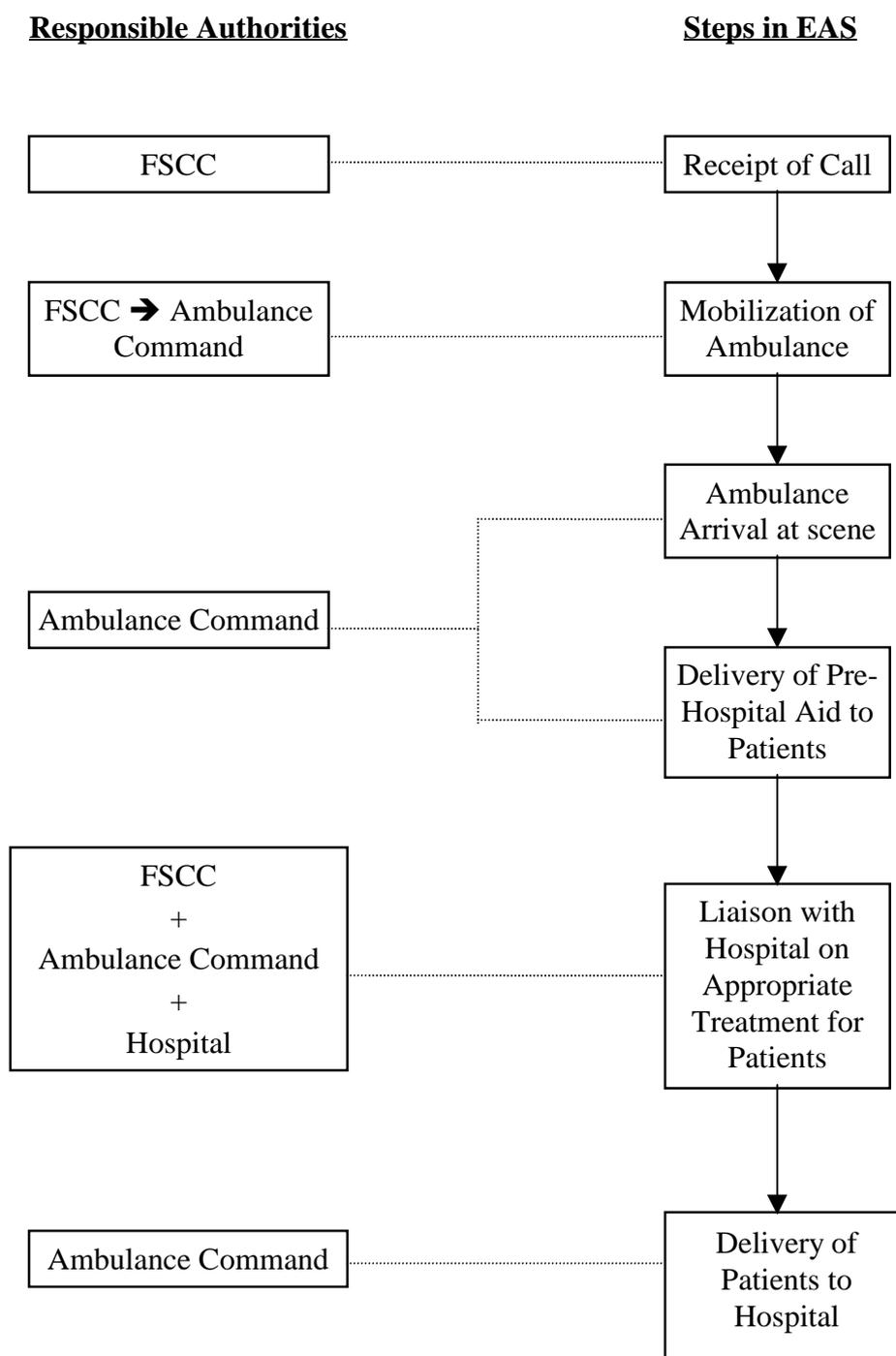
This measures the speed with which the ambulance service can provide assistance at an emergency incident.

- **Service Time** - the interval between receipt of a call and delivery of the patient to the hospital.

This measures the speed with which the ambulance service complete one emergency ambulance case.

5.3 Before we look into the comparison of the performance targets of different selected territories and the performance of Hong Kong EAS, we first study the management structure. Figure 2 identifies the different authorities responsible for the provision of the EAS in Hong Kong.

Figure 2 - Responsible Authorities in the Provision of EAS in HK



Note: FSCC = Fire Services Communciation Centre, HKFSD
 Ambulance Command = Ambulance Command, HKFSD
 Hospital = under Hospital Authority or Private Hospital

6. Management Structure

Ambulance Services

6.1 In Hong Kong, the Ambulance Command has been placed under the control of HKFSD due to the historical factor that the initial Ambulance Services (AS) were undertaken by firemen. However, in some territories, the AS are placed under the Health Department. Table 1 summarizes the findings.

Table 1 - Management Structure of the Ambulance Services

	AS under the purview of Fire Department	AS under the purview of Health Department
Hong Kong	✓	
Tokyo, Japan	✓	
London, UK		✓
British Columbia, Canada		✓
California, USA		✓
Hawaii, USA		✓
San Francisco, USA	For all public ambulances	For all private ambulances
New South Wales, Australia		✓
Queensland, Australia	*	

Remark: * refers to the Department of Emergency Services

Source: AS / Fire Services Department / Health Department of Hong Kong, Japan, UK, USA, Hawaii and Canada.

6.2 In some territories, the AS are perceived as one of the emergency services; therefore, they are put under the purview of Fire Department which normally handles emergencies. In some territories like Queensland, they have a Department of Emergency Services: the AS are one of the operational Divisions of this Department; other Divisions in this Department include the Fire Services, Counter Disaster Services, etc.

6.3 However, in other territories, since the AS render not just basic life support measures but also medical therapy or Advanced Life Support measures, the AS are put under the Health Department in order to have a closer monitoring of the services performed.

Dispatch System

6.4 In Hong Kong, the dispatch system is carried out by the FSCC but the operational services are carried out by the Ambulance Command. As pointed out in *the Study of Emergency Ambulance Cover in Hong Kong 1995* (the 1995 Consultancy Study), *the current separation between the management of ambulance control and ambulance crew within the Fire Services Department does not give firm accountability in relation to achieving performance targets and is not conducive to the cost-effective provision and development of emergency ambulance services in Hong Kong* (para. 4.5.9).

6.5 In fact, in some territories such as British Columbia, all components of the Emergency Medical System such as the Dispatch System, the Ambulance Services, the Accident & Emergency Department of Hospitals are all placed under one roof of the Ministry of Health. In this way, better coordination and communication is achieved and the efficiency among various division can easily be monitored.

PART 3 - PERFORMANCE TIME TARGETS

7. Comparison of Performance Targets in the Selected Territories

7.1 The Hong Kong Administration has adopted the recommendation in *the Review of Hong Kong Ambulance Services: Final Report 1986* (the 1986 Consultancy Study) that the performance time target of the EAS should be 10- minute travel time. However, there has been a growing feeling in the medical profession around the world that more clinically relevant standards are necessary in computing the performance time targets. For example, patients suffering from sudden cerebral anoxia, cerebral contusion or heart diseases should receive medical attention within a few minutes to avoid irrevocable damage.

7.2 In life-threatening cases, a shorter response time could save many lives. Our findings indicate that most territories use response time as their performance time target. Table 2 gives a list of performance time targets adopted by our selected territories.

Table 2 - Performance Time Targets of Different Territories

Territories			Performance Target	
			Response Time Target	Travel Time Target
Asia		Hong Kong		✓
	China	Beijing	✓	
		Shanghai	✓	
	Japan	Tokyo	✓	
	Singapore		✓	
Australia	Australia	Canberra	✓	
		New South Wales	✓	
Europe	UK		✓	
North America	Canada	British Columbia	✓	
	USA	California	✓	
		San Francisco	✓	
		Houston	✓	
		Honolulu	✓	

Source: Ambulance Services / Health Department / Fire Services Department of UK, Japan, Singapore, China, Australia, USA, Hawaii, Australia, Canada and Hong Kong.

Choice of Time Target

Hong Kong

7.3 There have been increasing calls for a different performance time target to be adopted in Hong Kong, namely, replacing the “travel time” target by the “response time” target. Nevertheless, the 1995 Consultancy Study recommended that the *ten-minute travel time target performance at 95% for emergency calls should remain the main target for Ambulance Command until appropriate action has been taken to ensure that it is consistently achieved.* (para. 4.1.2)

7.4 As discussed in the April Joint Panels meeting, Members learnt that using the travel time target neglected the time taken to mobilize an ambulance; hence, it might mislead callers as to the arrival time of the ambulance. A resolution was passed by the Panels requesting that the current travel time target be replaced by a response time target.

7.5 The HKFSD and the Security Branch remain of the view that only when the existing standard of 10-minute travel time is consistently achieved before they would consider adopting the response time as the target.

7.6 In fact, Hong Kong’s overall response time performance compares favorably with that of foreign territories. Table 3 shows that in a sample survey carried out in January 1996, Hong Kong had achieved a 75% within 10 minutes response time and 87.3% within 12 minutes response time.

Table 3 - Response Time of Emergency Ambulance Calls in January 1996

Response Time (Minute)	No. of Calls	Percent Share
< 10'	17,913	75.5
10'01"-10'59"	1,670	7.0
11-11'59"	1,140	4.8
12-12'59"	805	3.4
13-13'59"	486	2.0
14-14'59"	354	1.5
> 15'	1,357	5.7
Total	23,725	100

Remarks:

We were informed that the total sample size should be over 28,000, but data on 5,000 calls were missing out of unknown reasons. This might or might not affect the reliability and accuracy of the sample results for which we were unable to verify.

Source: Hong Kong Fire Services Department

7.7 Table 4 shows the attainment of the EAS in different selected territories. From the Table, it can be seen that not all territories are able to fulfill their performance targets.

Table 4 - Performance Time Targets of Different Foreign Territories

Territories		Performance Target	Achievement
Hong Kong		95% <10-min. T.T.	89.53%
Asia			
China	Beijing	N.A.	R.T. <=10 min. : 27.66% 10-15 min.: 24.14% 15-20 min. : 24.05% 20-30 min. : 17.11% >30 min. : 7.04%
	Shanghai	8 min. R.T. (urban) 30 min. R.T. (rural)	N.A.
Japan	Tokyo	N.A.	42% < 5 min. R.T.
Singapore		within 11 min. R.T.	“unable to achieve”
Taiwan		N.A.	Activation Time: 6 minutes Travel Time: 10.1 minutes
Australia			
Canberra		90% < 8 min. R.T.	50% < 8 min. R.T. 90% < 14.5 min. R.T.
New South Wales		95% 14 min. R.T.(urban) 95% 19 min. R.T.(rural)	Activation Time: 95% ≤ 3 min. R.T.: 50% ≤ 7 min. (metropolitan) 50% ≤ 8 min. (urban) 50% ≤ 9 min. (rural)
Europe			
UK		95% <14min. R.T.(urban) 95% <19 min. R.T.(rural)	84.1% (urban) 96.2% (rural)
North America			
Canada	British Columbia	8 min. R.T.	50% 6.91 min. R.T. 90% 12 min. R.T.
USA	Honolulu	8-10 min. R.T.(city) 10-15 min. R.T.(suburbs) 15-20 min. R.T.(rural)	80% (city) 75-80% (neighbor islands)
	California	<u>Basic Life Support:</u> 90% <5 min. R.T. (urban) 90% <15min. R.T. (rural) <u>Early Defibrillation:</u> 90% <5 min. R.T. (urban) as quickly as possible (rural) <u>Advanced Life Support:</u> 90% <8 min. R.T. (urban) 90% <20 min. R.T.(rural)	N.A.
	Houston	6 min. R.T.	N.A.
	San Francisco	90% 8-10 min. R.T.	92% < 10 min.

Remarks: R.T. - Response Time, T.T. - Travel Time, N. A. - Not Available

Source: Ambulance Services / Health Department / Fire Services Department of UK, Japan, Taiwan, Singapore, China, Australia, USA, Hawaii, Australia, Canada and Hong Kong.

8. Performance of Hong Kong Ambulance Services

Transfer of Non-Emergency Services to Hospital Authority

8.1 Since 1991, the responsibility of non-emergency services was gradually transferred from Ambulance Command to the Hospital Authority for more cost-effective deployment of AS. It was estimated that 297 posts and 70 ambulances would be released from the Ambulance Command to serve emergencies, other urgent purposes, and replacement of staff and vehicles. Because of these savings, the Ambulance Command was not able to increase its establishment since then.

8.2 The 1986 Consultancy Study estimated that in the post hiving-off period, the Ambulance Command would retain 144 operational ambulances, which was the fleet size recommended for the year when hiving-off was agreed in principle. A total of 175 ambulances would be required toward achieving the 95% performance target. With the present fleet size of more than 175 ambulances (para. 4.2), it was assumed that the Ambulance Command should have been able to attain the performance time target.

8.3 At present, notwithstanding the transfer of non-emergency cases and the current fleet size of 246 ambulances (para. 4.2), the Ambulance Command fails to achieve the performance target. Table 5 shows the attainment of the performance targets by region in the last 3 years. Except for the New Territories, the ambulance performance for Hong Kong Island and Kowloon deteriorated and dragged down the overall performance. All regions failed to achieve a 95% 10-minute travel time target.

Table 5 - Performance of the Hong Kong AS 1993-1996

Region	Division	1993 (%)	1994 (%)	1995 (%)	1996 (1st Quarter) (%)
HK	East	96.94	93.77	90.97	90.93
	West	97.51	96.02	93.01	91.80
Regional Performance		96.93	94.47	91.61	91.22
Kowloon	East	93.22	92.87	88.46	88.24
	West	94.18	93.30	89.80	89.28
Regional Performance		93.76	93.11	89.21	88.81
N.T.	East	83.45	93.39	86.11	88.34
	West	93.31	93.05	90.79	92.35
Regional Performance		88.75	88.67	88.72	90.64
Overall Performance		92.48	91.68	89.53	90.03
Overall Performance Including AAMC		N.A.	N.A.	N.A.	90.21

Remark: N.A. - Not Applicable

Source: Hong Kong Fire Services Department

8.4 Table 6 shows that there was an 18% increase in emergency calls from 1993-1995. Projected from the figure for the first quarter of 1996, the number of emergency calls at the end of the year would be over 350,000. This would impose tremendous pressure on the present resources and might further affect the performance of the EAS.

Table 6 - Demand for the EAS in the Year 1993-1996

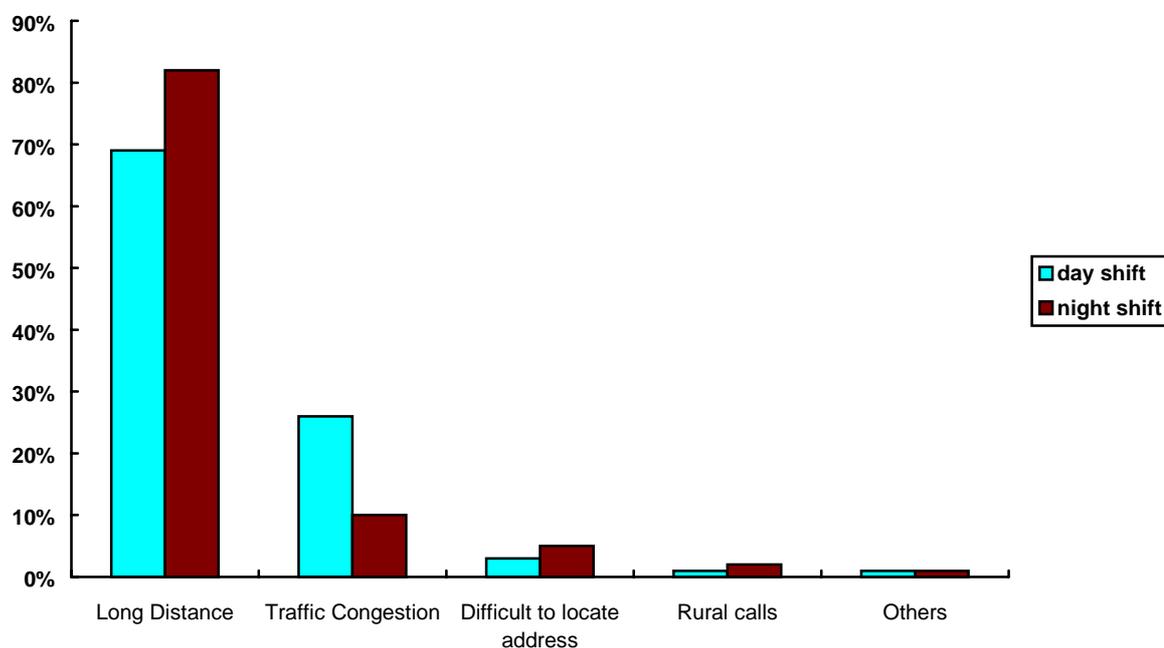
Year	Calls			Patients		
	Emergency	Urgent	Routine	Emergency	Urgent	Routine
1993	268,943	60,815	112,546	252,666	76,637	232,408
1994	289,289	62,581	73,465	270,901	74,737	147,505
1995	317,749	63,873	43,721	289,422	77,228	84,838
Change in % from 93 - 95	+18.10%	+5.02%	-61.15%	+14.55%	+0.77%	-63.50%
1996 (1st Quarter)	88,274	16,220	2,673	79,223	19,562	2,826

Source: Fire Services Department

Reasons for Not Achieving the Performance Target

8.5 Figure 3 shows the reasons identified in the 1995 Consultancy Study for exceeding the 10-minute travel time for 1994/1995. The predominant reasons are long distance and traffic congestion for both day and night shift.

Figure 3 - Reasons for Failure of Attainment of the 10-minute Travel Time Target



Source: 1995 Consultancy Study

8.6 The range of cover and response times are a function of incident distribution, hospital configuration, station configuration and crew deployment. Table 7 shows crew levels, number of depots and demand by shift.

Table 7 - Crew Level, Number of Depots and Demand by Shift

Day	Weekday		Saturday		Sunday		Target	
	Day	Night	Day	Night	Day	Night	Day	Night
Ave. Crew	177.20	93.00	165.00	93.00	153.70	93.00	183.00	93.00
Total Calls per hour	66.60	27.80	59.50	28.10	55.00	26.30	x	x
Day/Night of Ave. Crew	1.91	1.00	1.77	1.00	1.65	1.00	1.97	1.00
No. of Depots	47	40	47	40	47	40	x	x

Remarks:

1. Day Shift = 0830 hours to 2030 hours
Night Shift = 2030 hours to 0830 hours
2. x = estimate post hiving-off
3. Ave. Crew = Average Crew
4. A crew is usually a team of 2 to 3 ambulancemen, with or without officer

Source: 1995 Consultancy Study

8.7 Long Distance and traffic congestion reflected the unsatisfactory performance of the emergency cover. It can be seen that at night, only 40 depots work whereas 47 work at day time. The area covered by each depot at night becomes larger, implying a longer distance for the ambulance to travel in response to emergency calls. This is a likely factor that can explain the reason of “long distance” for failure to attain the 10-minute travel time at night.

8.8 As pointed out in the 1995 Consultancy Study, the use and development of additional locations are critical to achieving the performance target. This could be done by extending standby cover at fire stations and building additional ambulance depots at strategic locations. Yet, the number of ambulance depots has not exactly matched the requirement identified in the 1986 Consultancy Study, with fewer new depots being realized partly due to scarcity of land, time consumption in site searches and queueing in the Public Works Programme. The Administration has indicated that steps would be taken to implement recommendations contained in the two Consultancy Studies.

8.9 Crew deployment is another factor which affects the range of cover and response time. It can be seen that the target ratio of day: night crew is 1.97:1.00. However, the actual ratio ranges from 1.65 to 1.91 for the day shift. This is likely to hamper the overall attainment of the 10-minute travel time.

8.10 The other factor that might affect the ambulance performance but is not reflected in the chart is the proportion of the Service Not Required Calls (SNRC) or Aborted Calls (AC)¹ and the Cancelled Calls (CC)² to the total number of calls. These calls might absorb substantial resources and affect the response to more serious emergencies. Overseas experience had indicated a serious wastage here³. Unfortunately, in Hong Kong, these calls are not reflected in any of the official statistics and hence, the damage they bring to the resources allocation cannot be evaluated.

¹ SNRC or AC refers to calls in which the ambulance is ordered to go to the scene of incident but is not required to go to hospitals. The FSCC might order more ambulances than necessary to the scene of incident due to inadequate information, precaution or misjudgment. There is no formal official statistics showing the number of SNRC or AC but in a sample study carried out by the Consultant last year, about 12% of the sample calls (around 20,000 calls) were Aborted Calls.

² CC refers to calls cancelled by the FSCC when the ambulance has been mobilized and is on the way to the scene. It happens when a more suitable ambulance is found. By the same sample study, about 1% of the calls belongs to this category.

³ For example, in British Columbia and Taiwan, the SNRC comprised 31% and 37% of total calls received respectively.

PART 4 - PRE-HOSPITAL TREATMENT

9. Comparison of Pre-Hospital Treatment with the Selected Territories

9.1 The principal role of the EAS is to transport the patients / injured to hospital as quickly and safely as possible and permissible. However, in some cases such as the immediately life-threatening emergencies, the fate of the patients / injured cannot be influenced by the saving of a few minutes in the response time but rather could be changed if some definitive treatment could be given within a few minutes of the patient's collapse. For example, individuals suffering sudden cardiac arrest could be saved if defibrillation could be applied within a few minutes after the occurrence of the cardiac arrest.

9.2 In general, the pre-hospital treatment includes the following: patient assessment, prompt and effective treatment, safe and efficient transport and proper transfer of responsibility to the hospital staff.

9.3 The effectiveness of such services depends on the level of training of the ambulancemen and the availability of appropriate equipment. Appendices 1 and 2 summarize the major differences in qualification and skills of ambulance staff and provision of equipment of ambulances in different territories.

9.4 Appendices 1 and 2 show that the standard of service provided by the Hong Kong Ambulance Command is below that in the advanced territories with respect to the skills and the training of ambulance crew and allocation of equipment of front line ambulances. In Beijing and Shanghai, they employ *Medical Doctors* to receive calls (act as dispatchers) and attend the ambulances (act as general ambulance attendants). In Germany, they *normally* send a physician (by car or by helicopter) to the emergencies and their ambulances are equipped with electro-cardiogram, infusion-pumps and most of all other equipment which is found in the Emergency Department of hospital.

10. Performance of Hong Kong Ambulance Services

Defibrillation

10.1 Cardiac diseases are one of the top three killers in Hong Kong. At present, almost half of the ambulance fleet (47%) are equipped with defibrillators (which aims at treating patients with cardiac diseases). Only the Senior or Principal Ambulancemen had received training on defibrillation. The adequacy of defibrillators and the performance of the defibrillation service are critical to those affected patients.

10.2 Table 8 and 9 show the performance of defibrillation service in Hong Kong and different foreign territories. From Table 8, it is noted that with an increase in the number of ambulances equipped with defibrillators in 1995, more patients in Hong Kong could be attended, but the success rate is still below that of USA and UK. This could be attributed to the failure to attain the 10-minute travel time target, in particular, when defibrillation is normally administered within 8 minutes (in the UK) or 5 minutes (in the USA) in response time.

Table 8 - Performance of Defibrillation Service in Hong Kong 1993-1996

	Patients *		
	Attended	Regained Heart beat	Success Rate (%)
1993	1 078	35	3.25
1994	1 878	82	4.37
1995	4 102	118	2.88
1996 (Q1)	1 470	43	2.93

Remarks:

- * refers to patients who had history of heart disease or were having cardiac arrest.
- Source: Hong Kong Fire Services Department

Table 9 - Defibrillation Services in Different Territories in 1994

Territories		Patients Attended ¹	Successful Cases	Success Rate (%)
UK	England	14,038	2,760 ²	19.7
	Scotland	1,715	371 ²	21.6
	Wales	1,141	150 ²	13.2
	N. Ireland	283	52 ²	18.4
USA	Los Angeles County	387	33 ³	8.5
	San Diego	225	31 ³	13.8
	Riverside County	53	3 ³	5.7

Remarks:

- ¹ refers to patients who had been defibrillated.
- ² refers to "a patient who is admitted to hospital with a spontaneous circulation and a measurable blood pressure, with or without vasopressors. Patients may or may not be breathing spontaneously, and may or may not be intubated. Note, the need for continuing CPR or mechanical CPR devices implies the absence of spontaneous circulation and therefore such patients should be excluded."
- ³ refers to patients who survived to be discharged from the hospital

Sources:

- Northumbria Ambulance Service of Britain, *National Clinical Audit 1993/1994*.
- EMS Agency of Riverside County, San Diego and Los Angeles County, California.

AAMC Performance

Observation

10.3 Table 10 shows the frequency of mobilization of the AAMC. The AAMC acts as “First Responders” and supplements the EAS. They serve to provide quick and initial treatment to patients / injured. Overseas experience shows that for efficient and effective response, the number, type and availability of “First Responders” and other emergency vehicles are indicated in a computer dispatch program on which dispatchers rely heavily to mobilize the most appropriate vehicle. Unfortunately, it can be seen from Table 10 that the mobilization frequency of AAMC in Hong Kong had been declining since 1993.

Official Response

10.4 The response given by the Administration is that with the increase in the number of ambulances equipped with automatic defibrillators, this might reduce the need to mobilize the AAMC.

Table 10 - Mobilization Frequency of AAMC 1993-1996

Year	Hong Kong	Kowloon	New Territories	Total
1993	3 919	6 964	7 435	18 318
1994	2 777	5 686	5 269	13 732
1995	2 373	4 768	4 676	11 817
1996 (Q1)	676	1 091	1 086	2 853

Source: Hong Kong Fire Services Department

Analysis

10.5 The decision to mobilize AAMC is made by the FSCC dispatchers who have been given attendance criteria of the AAMC (Appendix 3). However, those instructions are not embedded in the computer program on which the dispatchers rely heavily to make decisions. *If the dispatchers were not aware of the traffic conditions at the time of call or the availability of AAMC, they would not mobilize AAMC.* As the AAMC acts as “First Responder” to emergencies, its efficient and effective mobilization probably affects the quality and promptness of the pre-hospital treatment received by the patients.

Performance of EMA II Ambulances

10.6 Table 11 shows the frequency of mobilization of EMA II ambulance. At the moment, we have 33 EMA II ambulance, an increase of 8 when compared with 1995. EMA II ambulances provide more advanced medical care and are served by officers with higher level of medical training. Appendix 4 gives the attendance criteria of the EMA II ambulances.

Table 11 - Frequency of Mobilization of EMA II and Ordinary Ambulance, 1995-1996

	Number	E Calls	Patients	Average Monthly E calls served by each ambulance	Average Monthly Patients served by each ambulance
1995					
EMA II Ambulance	25	57,438	49,746	191.5	165.8
Ordinary Ambulance	163	260,311	239,676	133.1	122.5
1996 (1st Quarter)					
EMA II Ambulance	33	18,034	15,764	182.2	159.2
Ordinary Ambulance	152	70,240	63,459	154.0	139.2

E Calls - Emergency Calls

Source : Hong Kong Fire Services Department

Observation

10.7 It can be seen from Table 11 that in the period covered, each EMA II ambulance responded to an average range of 191.5 to 182.2 emergency calls and 165.8 to 159.2 patients each month. If we look at the response rate for the rest of the ambulance fleet (excluding the AAMC), each ambulance responded to an average range of 133 to 154 emergency calls and 122.5 to 139.2 patients per month only. This reflects that the demand for more advanced treatments, i.e., EMA II ambulances, has been greater than that for ordinary ambulances.

Official Response

10.8 The HKFSD did not give response to the question of whether the current fleet of EMA II ambulance is sufficient to meet the demand. They reported that they were planning to conduct a review of the services provided by the EMA II ambulance. The review would look into the adequacy of the EMA II ambulances in serving the demand.

Analysis

10.9 Since there is no official statistics showing the types of emergency calls, we are unable to evaluate the adequacy of the EMA II ambulances in serving the demand. There might also exist a situation where ordinary ambulances would be sent to respond to EMA II emergencies when no EMA II ambulance was available. In this regard, the patients / injured might or might not have received proper medical aid.

Communication

10.10 Since each emergency might involve a large number of resources and rescue agents, an efficient coordination and communication system is essential. An efficient communication system contains two components: a dispatch system and an ambulance-to-hospital system.

10.11 A dispatch system receives calls for help, categorizes them according to priority and sends the most appropriate response vehicles to the scene. It also allows the ambulancemen at the scene to call for additional resources, such as more rescue personnel. An ambulance-to-hospital system allows the ambulancemen in the field to communicate with the physicians at the hospital. The extra few minutes provided by this advance warning allows the hospital to set up an operation team or to have specialized equipment and personnel standing by.

Observation

10.12 At the moment, all ambulances in HK are equipped with radio telephone which is directly connected to the FSCC. However, the ambulance crew could only communicate through the FSCC to the physicians at hospitals. They are not equipped with any communication equipment which allows them to talk directly to hospitals. Moreover, since the ambulance crew are not provided with mobile phones, if they are out in the field, they could not communicate with the FSCC.

10.13 An efficient communication system is particularly vital in some multi-casualties and trauma cases. Take the Pat Sin Leng hillfire as an example. Since no ambulance had installed an ambulance-to-hospital system, any messages had to first go through the FSCC before they could be passed along to the hospitals. As the ambulancemen were not equipped with any mobile communication equipment, they were not able to report to the FSCC at once when they were not near to the ambulance. In fact, requests for further assistance had to go through a four-step chain⁴. According to the Pat Sin Leng Hillfire inquest, emergency doctors were never told how many victims they would have to treat because the rescuers failed to contact them. The information that was made available was conflicting and confusing. The most useful information was actually taken from the first two ambulance drivers when they arrived at the hospital⁵.

Official Response

10.14 The HKFSD denies the ambulance crew direct access to the hospitals or to FSCC when they are out in the field because they fear that this might jam all the airways. They are of the opinion that if too many people are given direct access, there might be confusion of information. Efforts would have to be made to clarify the information and decisions might be delayed.

Overseas Experience

10.15 However, in California State, San Francisco City and Queensland, all emergency medical transport vehicles and non-transporting advanced life support responders (i.e. vehicles which transport advanced life support equipment but not patients) are equipped with two-way radio communications equipment which provides for dispatch and ambulance-to-hospital communication. In certain counties of California and Germany, each ambulanceman is provided with a cellular phone to enhance communication.

⁴ The ambulanceman had to contact a senior officer on the hill. Then he radioed field command, which in turn called the FSCC. The FSCC then alerted the hospital.

⁵ *South China Morning Post*, May 14 to May 25, 1996.

PART 5 - QUALITY ASSURANCE OF HONG KONG EAS

11. Quality Assurance Built-In Mechanisms

Official Statistics

11.1 Quality Assurance built-in mechanisms are important in evaluating the quality of services and monitoring the performance of ambulance crew. Yet, little emphasis had been placed in this regard. In the course of researching into the quality of EAS, it is found that very little official statistics can be deployed for quality analysis. A lot of data which are useful in monitoring the performance of the crew and indicating the demand for services have not been categorized or analysed. Examples include the number of SNRC, the types of emergency calls and the average activation time.

Supervision of Staff Performance

Overseas Experience

11.2 In general, supervision of staff performance and guidance on the delivery of quality AS depend on the officer strength. Most overseas EAS employ Paramedic officers to carry out operational activities; hence, they do not need a lot of supervision or guidance.

11.3 In Queensland, the ratio of classified officers to base grade ambulance officers is 1:4. Since more than half of these classified officers perform a dual responsibility of management and operations, the effective ratio of non-operational classified officers to operational officers becomes 1:7.

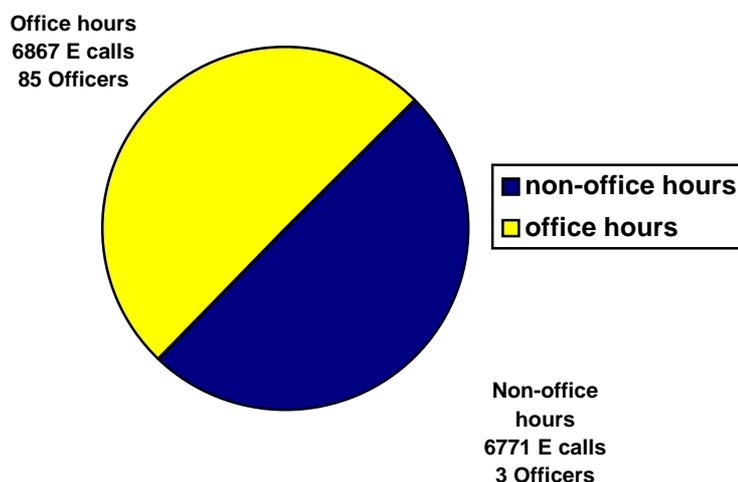
Hong Kong

11.4 As pointed out in the 1986 Consultancy Study, the number of Officers in the Ambulance Command is small in relation to both the number of Ambulancemen and the volume of operational activity. The ratio of Officers to Ambulancemen in operational divisions is around 1:32.

11.5 Despite the recommendations made by the Consultant to strengthen the existing establishment of the Hong Kong Officer grade, the ratio of Officers to rank and file in the Ambulance Command is still the lowest of any of the disciplined services. The reason given by the Administration is that with the transfer of the non-emergency services to the Hospital Authority since 1991, the Ambulance Command has not been able to increase any establishment.

11.6 Only the three divisional depots (HK Island, Kowloon and New Territories) are commanded by officers round the clock. For the other depots, officers are only present during normal office hours⁶. As the EAS are provided on a 24-hour basis, the scarcity of officers at night suggests an inadequate officer strength in non-office hours. Figure 4 shows that the ratio of emergency calls received during non-office hours and office hours is 1:1.01⁷. However, 85 officers are present in office hours but only 3 officers are present during non-office hours. This translates into a very low officer strength in the non-office hours. This could very likely lead to inadequate monitoring of performance of ambulance crews and operational activities during non-office hours.

Figure 4 - Emergency Demand During Office Hours and Non-Office Hours During the Period January 7 - 22, 1995.



Source: 1995 Consultancy Study

Complaints Handling

11.7 All complaints of the Ambulance Command and the FSCC are handled by the HKFSD. An investigation team comprised of senior staff of the Department will be formed on receipt of a complaint. The investigation team will then carry out an investigation and will draft a report to the Director of Fire Services whose decision will be final. No public body is engaged in the investigation team nor in the final decision. This complaint handling procedure is not transparent although so far no complaint has been made as to the handling procedure.

⁶ Office hours refer to 0830 to 1700 hours and non-office hours refer to 1701 to 0829 hours.
⁷ Since the data were presented on an hourly basis, the office hours were slightly changed to 0900 to 1700 and non-office hours became 1701 to 0859.

Abbreviations

1986 Consultancy Study	Review of Hong Kong Ambulance Services: Final Report 1986
1995 Consultancy Study	Study of Emergency Ambulance Cover in Hong Kong 1995
AAMC	Ambulance-Aid Motorcycles
AC	Aborted Calls
AS	Ambulance Services
ASSG	Ambulance Services Steering Group
BC	British Columbia
BCAS	British Columbia Ambulance Services
CC	Cancelled Calls
CPR	Cardiopulmonary Resuscitation
EAS	Emergency Ambulance Services
EMA II	Emergency Medical Assistant II
EMT-I	Emergency Medical Technician - I
EMT-P	Emergency Medical Technician - Paramedic
FSCC	Fire Services Communication Centre
HKFSD	Hong Kong Fire Services Department
SNRC	Services Not Required Calls

Appendix 1 - Major Differences in Qualification of Ambulance Staff and Provision of Equipment of Ambulances in Different Territories

Territories	Qualification of ambulance attendants	Qualification of Dispatchers	All ambulances are served by at least one Paramedic	All ambulance crews had received automatic external defibrillation course	All ambulances are equipped with automatic defibrillator
Hong Kong	All ambulancemen underwent 24 weeks initial training and some had attained the level of Paramedic II	All dispatchers are provided with procedural guidelines on the type of emergency services to be provided and have to sit for professional examination	No	No. But all ambulance supervisors are now required to receive the training.	No (Only some of the ambulances, EMA II ambulances and AAMC are equipped with automatic defibrillator)
Singapore	Registered Nurses with Midwifery qualification	N.A.	No	Yes	Yes
British Columbia	Paramedic I, II, III	Paramedic level who must be working in the field for not less than 3 years	Yes for major cities. In most cases, served by at least one Paramedic II	Yes	Yes
London	Qualified Ambulance Technicians and Paramedics	N.A.	To be achieved by the end of 1996	Yes	Yes
California	First Responders: administered first aid and CPR within the previous 3 years. All ambulancemen: at least EMT-I Advanced Life Support Ambulance: at least EMT-II or EMT-P	All dispatchers receive training in accordance with the EMS Authority's Emergency Medical Dispatch Guidelines	Yes	Yes	Yes
San Francisco	First Responders: administered first aid and CPR within the previous 3 years. All ambulancemen: at least EMT-I Advanced Life Support Ambulance: at least EMT-II or EMT-P	EMT level	Yes. Most are paramedic ambulances at the Advanced Life Support Level	Yes	Yes
Australia	Paramedics	N.A.	Yes. There is a minimum one qualified Paramedic with either a Student Officer or another Paramedic	Yes	Yes

N.A. - Not Available

Source: AS / Fire Services Department / Health Department of Hong Kong, UK, Canada, USA, Australia and Singapore.

Appendix 2 - Scope of Practice of Ambulance Attendants in Different Regions

Scope of Practice / Protocols / Drugs	Hong Kong Ambulancemen	B. C. EMA-II	USA EMT-I	USA EMT-P	UK Paramedic	Australia Paramedic
Length of training course (hours)	702 *	240 **	110 **	1,032**	N.A.	N.A.
Patient Assessment	✓	✓	✓	✓	✓	✓
Basic Life Support, Rescue and First Aid	✓	✓	✓	✓	✓	✓
Obtain Diagnostic Signs	✓	✓	✓	✓	✓	✓
Cardiopulmonary Resuscitation	✓	✓	✓	✓	✓	✓
Oxygen therapy by resuscitators	✓	✓	✓	✓	✓	✓
Arrest of Haemorrhage	✓	✓	✓	✓	✓	✓
Management of Fracture	✓	✓	✓	✓	✓	✓
Treatment of Shocks and Burns	✓	✓	✓	✓	✓	✓
Entonox	✓	✓	✓	✓	✓	✓
Airway Management	✓	✓	✓	✓	✓	✓
Suction	✓	✓	✓	✓	✓	✓
Management of Spinal Injuries	✓	✓	✓	✓	✓	✓
Use of Lifting and Handling Equipment	✓	✓	✓	✓	✓	✓
Defibrillation	✓	✓	Opt.	✓	✓	✓
Monitor Flow of Intravenous Fluid		✓	✓	✓	✓	✓
Extricate Entrapped Persons		✓	✓	✓		
Inflate Antishock Trousers			✓	✓		
Endotracheal Intubation			Opt.	✓		✓
Intravenous Procedures	EMA	✓		✓	✓	✓
Synchronized Cardioversion				✓		
Pulmonary Ventilation				✓		✓
Obtain Venous Blood Samples				✓		✓
Valsalva's Maneuver				✓		
Needle Thoracostomy				✓		
Nasogastric Intubation and Gastric Suction				✓	✓	✓
Activated Charcoal				✓		
Aerosolized or Nebulized β_2 Specific Bronchodilators				✓		
Atropine Sulfate				✓	✓	✓
Bretylium Tosylate				✓		
Calcium Chloride				✓		✓
Administer Oral Glucose or Sugar Solutions			✓	✓		✓
Nitroglycerin	EMA	✓		✓		
Sager Splint	EMA	✓				
Chlopheniramine		✓				
Dopamine Hydrochloride				✓		
Diphenhydramine Hydrochloride				✓		
Diazepam				✓	✓	✓

Appendix 2 (Con'd)

Scope of Practice / Protocols / Drugs	Hong Kong Ambulancemen	B. C. EMA-II	USA EMT-I	USA EMT-P	UK Paramedic	Australia Paramedic
Furosemide				✓		✓
Heparin				✓	✓	
Isoproterenol				✓		
Morphine Sulfate				✓		✓
Oxytocin				✓		
Sodium Bicarbonate				✓		
Syrup of Ipecac				✓		
Terbutaline Sulfate				✓		
Lidocaine Hydrochloride				✓		
Dextrose 10% in Water	EMA***	✓		✓	✓	✓
Epinephrine Hydrochloride (Adrenalin, "EPI")		✓		✓	✓	✓
Naloxone Hydrochloride (Narcan)		✓		✓	✓	✓
Salbutamol; Albuterol (Ventolin)	EMA	✓				✓
Thiamine (Bataxin)	EMA	✓				
Lignocaine					✓	✓
Metoclopramide						✓
Acetylsalicylic Acid						✓
Frusemide						✓
Glyceryl Trinitrate						✓
Haemaccel					✓	✓
Hartmann's						✓
Nalbuphine Hydrochloride (Nubain)					✓	
Gelofusine					✓	
Ergometrine					✓	
Heplok / Hepsal					✓	
Normal Saline	EMA	✓			✓	
Blood Glucose Test	EMA	✓				✓

Remarks:

* training includes ambulance-aid, procedural and organization introduction, etc.

** only includes ambulance-aid / medical therapy training

*** refers to dextrose 5% in water

EMA means the protocols or drugs could only be administered by EMA II officers

N.A. stands for not available

Opt. stands for Optional Skills

Source:

Hong Kong Fire Services Department

California Code of Regulations - EMT-I

California Code of Regulations - EMT-P

Field Operations Policy and Procedure Manual Vol. III, Provincial AS, Ministry of Health, BC

Health Service Guidelines, NHS Management Executive, UK

Ambulance Service of New South Wales, Australia

Appendix 3 - Attendance Criteria of AAMC

The AAMC will respond to the following emergency cases:

1. Unconscious cases
2. Patient with known heart disease
3. Emergency at location where the travel time of the responding ambulance is likely to exceed the 10 minutes target
4. Traffic accident cases
5. Emergency at location where traffic congestion is known
6. Emergency at location where responding ambulance is obstructed by traffic congestion. The ambulance supervisor of the responding ambulance will have to request FSCC through radio telephone for the attendance of the AAMC if he considers it necessary
7. Emergency which cannot be readily responded to by ambulance due to non-availability in the area where the emergency originates. Emergency at location where access by a standard ambulance is prohibited by road configuration, e.g. remote villages and country parks, etc. The ambulance supervisor of the responding ambulance will have to request FSCC through radio telephone of the situation which requires the attendance of the AAMC
8. Any emergency as directed by FSCC

Source: Hong Kong Fire Services Department

Appendix 4 - Attendance Criteria of EMA II Ambulance

1. Major trauma - e.g. severe traffic accident, shooting and stabbing cases, trauma to chest or neck, person fall from height of more than 15 feet, severed limbs and severe burns etc.
2. Chronic Obstructive Airway Disease (COAD) - patients suffering from shortness of breath with history of COAD, asthma (bronchitis or emphysema)
3. Diabetes Mellitus - patients suffering from dizziness and headache with history of Diabetes Mellitus
4. Cardiac Disease - patients suffering from shortness of breath, chest pain, epigastric pain with history of cardiac disease
5. All unconscious patients - patients who do not respond to verbal stimulation
6. Any other emergency cases which cannot be readily responded to by a standard ambulance

Remark:

EMA II ambulance will not normally be dispatched to attend removal and urgent cases. However, a request for an urgent case may be exceptional by entertained when the medical officer of the hospital / clinic considers that the patient's condition requires the care of an EMA II ambulance.

Source: Hong Kong Fire Services Department

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