

Our Experience with 782 Patients Over a Period of 4 Years with India's First Coronary Care Ambulance

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ABSTRACT

The operation, methodology and facilities of India's first coronary care ambulance is elaborated. Overall 761 (97.3%) patients out of 782 were benefited due to early access to medical treatment over the period of 4 years from 1969-1973. The statistical data pertaining to various calls received and disease diagnosed are documented subsequently. Two deaths occurred during transit which was documented as hospital deaths due to technical reasons. Of the total calls received 19 (2.4%) died at home. Major calls were for cardiac cause 63.7 % (499). Transit time varied between 15 minutes to one hour. This mobile unit with telemetry helped in providing improved health care during transit and lead to considerable decrease in mortality which could have occurred otherwise.

Key Words: Coronary Care, Telemetry, VHF, Modulator – Demodulator System

Introduction

In our country cardiac emergencies are major life threatening disorder which needs immediate management to minimize morbidity and mortality. The incidences of cardiac emergencies are on the rise due to lifestyle and dietary changes. About 60 percent of world's coronary artery disease patients live in India according to study by T. A. Gaziano in 2005. The growth of heart diseases is dependent on a number of factors such as ageing, changing lifestyles, bad eating habits and rapidly evolving socio-economic determinants like access to healthcare. Demographic trends show increase in cardiovascular disease mortality as life expectancy increases. Another fact of concern is that cardiac diseases remain silent till they become worse. Newer advances have led to remarkable improvement in treatment and diagnosis of cardiac emergencies once the patient reaches a specialty centre. This situation however doesn't hold good for primary health care centre or a district hospital. Diagnosis and management of cardiac

emergencies in first phase unit is still in initial stages. Furthermore transport of patients to a higher centre has its practical difficulties and there is often delay in transit which leads to delay in treatment. The transient changes in cardiac activity also could not be documented due to delay in transit. The number of deaths at home and first phase centers lead to concept of mobile ambulance. The numbers of cases of cardiac emergencies are rapidly on the rise with early age of onset and high fatality rate. The key challenges in cardiac care include inadequate facilities and poor accessibility.

Materials & Methods

In our early experience with home pick-up before the use of coronary care ambulance we found many of them died at home in spite of CPR, five of them during transport. The reason for the increased mortality is mainly due to lack of advanced resuscitation facilities and expertise within the reach of the professionals handling the patient at the initial stage. So we felt there is a real necessity to start all measures at home as well as during transit to the centre. With this background we designed, constructed the first mobile coronary care ambulance with two way telemetry which could transfer the ECG of the patient to the center for expert opinion as well as guidance for management of the patient during transit. Hence the delay in treatment initiation is avoided as much as possible.

The vehicle chosen was Volkswagen mini bus with rear

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Fig.1: Mobile Intensive Coronary Care Unit

engine fitted with a red beacon atop and a powerful siren. The mobile coronary care unit is designed with facilities for transmitting the ECG signals to the center through the VHF and voice calls to and from the center.

A outboard motor coupled to power generator is attached to the front of the unit in the chassis which is used as power source for respirator, cardiac monitor, defibrillator, pace maker, suction unit, water supply unit, internal illumination and air conditioning. The telemetry unit is connected through a VHF or wireless transmission unit which sends and receives audio signals through



Fig. 2 : Two way voice communication system



Fig. 3 : Interior of the mobile coronary care unit with cardioscope and other instruments



Fig. 4: Inside MICCU - Oxygen cylinder with mask

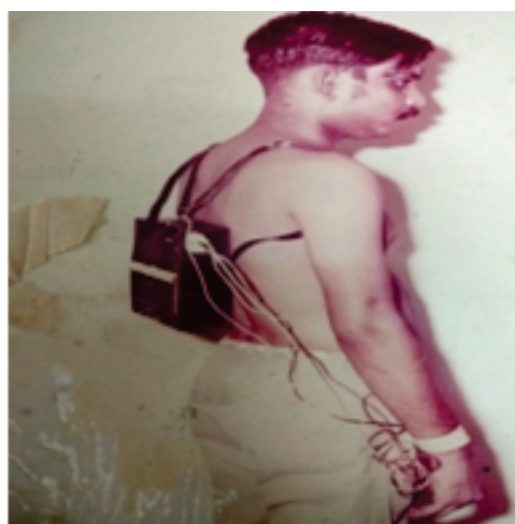


Fig. 5: Walkie cardie is connected

modulator-demodulator system. The unit is staffed by a medical resident and nursing staff or paramedical worker trained in intensive care. The installed equipments include cardioscope, pace maker, defibrillator and respirator facilities for intravenous fluid therapy, suction apparatus, oxygen cylinders and emergency drugs.

As soon as the patient is shifted to the mobile unit blood pressure and general condition checked, intravenous line started. Patient connected to compact cardiac monitoring unit (Electrodyn). These ECG signals are transmitted from ambulance to the centre through radio communication (VHF or landline telephone). An alert is send to the receiver and message transmitted by paging system. The ECG signals can be recorded if needed with the help of walkie cardie. The first of its kind equipment with a portable cassette recorder which records electrical activities of heart. The cassette recorder can be used to record any transient changes of heart during transit. The transmitting system consists of three slave units and 1 master unit. First slave unit is installed in rural health centre, second in mobile coronary ambulance, third in car

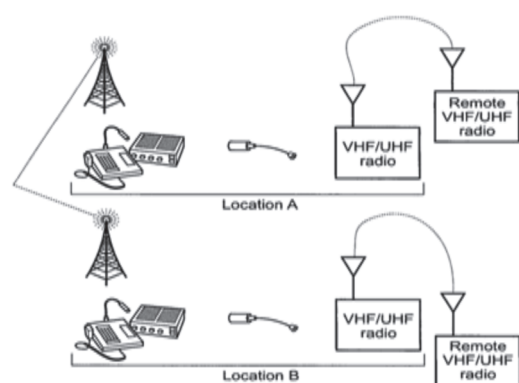


Fig. 6: Diagrammatic representation of principle of telemetry

and master unit in KJ Hospital. It can be used to communicate in both ways.

The principle involved is converting electrical waves into sound waves with help of modulator apparatus which in turn converts it again to electrical waves through demodulation. The sound waves are passed through

Total No. cases 782	No. of cases	%
Chest pain	499	63.81
Respiratory	126	16.11
Pain abdomen	53	6.77
Poison	47	6.01
Trauma	26	3.32
Mortality	21	2.7
CPR	9	1.15
Burns	2	0.25
Functional	1	0.12
CVA	18	2.30
Renal	13	1.66
Pediatric emergency	2	0.25
Head injury	13	1.66

*due to technical reasons we have included 2 deaths in institutional death

Age distribution of 499 cases with chest pain

Age group	No.	%
30-39	54	10.8
40-49	94	18.8
50-59	132	26.4
60-69	168	33.6
>70	51	10.2

Sex distribution of cases of chest pain

	No.	%
Male	348	69.74
Female	151	30.26

Initial cardiac rhythm of cases of chest pain

	No.	%
Sinus rhythm	287	57
Sinus bradycardia	129	26
Atrial tachycardia	36	7.3
Atrial fibrillation	16	3.2
Ventricular tachycardia	11	2.5
Left ventricular failure	18	3.6
Complete heart block	2	0.4

either wireless or through telephone system to the centre. The medical professional in the ambulance may be given moment to moment guidance on transit. The results on the basis of application of mobile coronary care unit are discussed in 782 patients during a period of 4 year 1969-1973 and data have been analyzed. This forms the basis of experience of the report.

During this four year study the mobile unit was called for 782 times. There were 19 deaths before arrival of coronary care ambulance presumably due to cardiac arrest. Two deaths occurred during transit which has been included under hospital death due to technical reasons. The distribution of calls attended has been tabulated. Most cases documented were due to cardiac cause. The initial cardiac rhythm before transit has been tabulated. Out of the total 782 calls 499 for patient with chest pain with symptoms of myocardial infarction. Out of 499 cases 287 were in sinus rhythm, atrial tachycardia seen in 36 patients. 129 had sinus bradycardia, 16 atrial fibrillation and 11 ventricular tachycardia. There were 18 cases with symptoms of heart failure. Treatment modalities were initiated as per instruction from hospital through the telemetry unit. The age and sex wise distribution of cases of chest pain has been tabulated. Most cases of chest pain occurred in age group of 50-69 with male preponderance. All patients received intensive care within 1 hour. The average transit time was 30 minutes (Transit time includes the time taken between the receipt of the call and arrival of the patient at the center). Other non cardiac causes were respiratory diseases, neurological disorders, poison cases, gastrointestinal problems.

Discussion

Cardiovascular causes continue to be major cause of mortality in India. There is high prevalence of coronary artery disease in younger age group[1]. Majority of calls to mobile coronary care unit were invariably due to cardiac cause. Death due to cardiac cause occurs early and the need for early intervention is considered more important. Majority of cardiac death occurred outside hospital emphasizing the need for improved outreach [2]. Death occurs immediately after an attack which could otherwise be reversed if the transit time is minimized. Majority of cardiac deaths occur even before patient is brought to hospital. This can be prevented by shortening the pre admission transit time and bringing patient to intensive care setup at the earliest [2]. The various delay factors include time taken for patient to notify doctor, time for hospital admission, ambulance transit duration [2]. Time for mobile unit to reach the hospital varies on traffic, delay in casualty department should be minimized at all cost. Pantridge in the year 1967 was the first to develop

this concept of mobile cardiac unit [3]. The major cause of death in myocardial infarction was cardiac asystole followed by cardiogenic shock and secondary asystole [2]. The time of onset of symptom and call to alert system was a major delay factor [2]. This delay could be minimized by proper patient education about symptoms and facilities available to them. The percentage of patients receiving early CPR is less than 1% [4]. The incidence of cardiac arrest is increasing in younger age group [4], also the pre hospital transport remains poor [4]. The use of telemetry along with mobile coronary care unit has served this purpose for early management of cardiac cases. The early initiation of intensive care outside hospital may prevent ventricular irregularities. A properly organized mobile coronary care unit reduces the risk of death during transit. The early initiation of intensive care and correction and prevention of dysrhythmia and associated hypotension diminish the incidence of shock and circulatory failure. With the advent of technology it is possible to extend the benefits of advances in the field of medicine even to remote, inaccessible areas. Telemetry has made it possible to provide superior medical aid to everyone. Increasing need for more convenient care along with unavailability of specialists to meet the demands of growing population has led to rise of telemedicine. Telemedicine expands access to quality patient care. It has also cut down on patient's expenditure towards healthcare. It can be even used to monitor patients for chronic conditions like diabetes. Telemedicine has the power to break down geographical barriers and if used properly has the potential to change the healthcare delivery system in a better way.

Conclusion

Early transportation, effective resuscitation measures play a key role in proper management of cardiac emergencies. The use of mobile coronary care unit with telemetry, the delay in treatment was considerably reduced which led to the reduction of mortality. Telemetry was the most effective tool in guiding the personal for better management of patients during transit.

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