Chapter-6

Discussion
DISCUSSION

This was a prospective study of patients who sustained cardiac arrest inside the hospital from January 2011 to December 2011 (Period 1), and from October 2012 to May 2013 (Period 2) at Kasturba Hospital, Manipal. There were 1135 patients who sustained cardiac arrest in the year 2011 (Period 1) and there were 820 patients who sustained cardiac arrest from October 2012 to May 2013 (Period 2).

I. INCIDENCE

The incidence of In-hospital cardiac arrest prior to early warning score was 16 per 1000 hospital admissions. The incidence in the post early warning score period was 17 per 1000 hospital admissions. In a study by Sandroni and colleagues they found an incidence of in-hospital cardiac arrest (IHCA) as 1 -5 cardiac arrests in a total of 1000 patients admitted in the hospital and in other words it was 0.175 cardiac arrest events per hospital bed / year\(^1\). The incidence of In- hospital cardiac arrest was very high in the present study. This may be because the present study was conducted in a tertiary care hospital and end stage disease patients were also included in the study. In systematic reviews by Chan PS et al and Nadkarni VM et al the incidence of adult cardiac arrest was 6.65/1000.\(^9,10\)

In the Pre EWS there were 770 males and 365 females among the patients who had cardiac arrest. There were 557 male patients and 261 female patients in the post EWS.
The mean± SD age of the patients in the pre EWS was 52.47 ± 17.27 years and the mean ± SD age of the patients in the post EWS was 53.72 ±16.84 years. In the present study there was a significant association between gender and survival P= 0.001. Females were less in the population who sustained cardiac arrest.

In the present study age did not have significant difference between the patients who died or survived.

II. LOCATION OF THE CARDIAC ARREST

In the Pre EWS nine hundred and eleven patients had cardiac arrest in the ICU and two hundred and twenty four patients had cardiac arrest in the ward. In the post EWS period six hundred and seventy eight patients had cardiac arrest in the ICU and One twenty six patients had cardiac arrest in the ward.

Most of the studies report that there is a better outcome for patients who have cardiac arrests in the ICUs than in the wards. The reason for this irony may be that ICU patients are well monitored; there is an immediate availability of ACLS, the younger age of the patients and good selection of patients who needs to be resuscitated.78

Final Diagnosis

In the pre-EWS period, one hundred and ninety five patients had a final diagnosis of sepsis being the largest group of patients with same diagnosis, one hundred and ninety patients had cardiac diseases, one hundred and fifty five patients had hypertension, one hundred and forty two patients had multi-organ dysfunction syndrome, one hundred and thirty patients had pneumonia, sixty five patients had
Acute Respiratory Distress syndrome, forty seven patients had renal failure and twenty nine patients had carcinoma. Thirty five patients had chronic obstructive pulmonary disease, thirty one patients had stroke, nine patients had bronchial asthma and seven patients had thermal burns.

In the post EWS period there were one hundred and forty seven patients who had sepsis (18.2%), one hundred and thirty three patients who had cardiac problem (16.21%), one hundred and twenty patients who had hypertension (15.36%), one hundred and seven patients who had MODS (13.04%), one hundred and ten patients who had pneumonia (13.41%), twenty four patients who had ARDS (3.2%), sixty eight patients who had kidney disease (8.2%), thirty seven patients who had COPD (4.5), twenty two patients who had carcinoma (3.0%), nineteen patients who had burns (2.3%) and nineteen patients who had stroke (2.3%).

Dautzenberg PL et al found that comorbidities such as sepsis, kidney failure, cancer, stroke and house bound life style has significant relation to worsening of IHCA.64

**Apache II Score**

Pre EWS the APACHE II Score was 21.85 ± 6.67 and in the post EWS APACHE II Score was 18.15 ± 9.85. There was no statistical difference between APACHE II score of survived and died patients.
Muhammed Junail Patel *et al* in his study showed that patients with a lower APACHE II score, less than 20 had 4.6 times more chance of survival compared to patients with higher scores, scores >35.67

**III. TIME INTERVAL**

The Mean ± SD time interval between the time of collapse and time of initiation of Cardiopulmonary resuscitation was 3.80 ± 1.35 and the Mean ± SD time interval between the time of collapse and time of Code Blue team arrival was 5.00 ± 1.85. In the Post EWS the time for initiating CPR was 3.66 ± 1.8 and for the CPR team arrival was 2.1 ± 1.62. The time of initiation of CPR from Collapse onset has to be as short as possible. It is ideal to have this time interval as less than 3 min.

Herlitz *et al* in their study showed that resuscitation in 1 minute after the collapse there was significantly higher outcome also it was statistically significant - 33% Vs 14%, *p* = 0.008.74

Peberdy *et al* stated recovery from cardiac arrest to be 38% Vs 21% once the initial defibrillation for VF/VT provided in 3 minutes or > 3 min. The chance of survival was more when the defibrillation was given within 3 minutes and the difference was statistically significant.75 Similar results have been reported by other authors like Skrifvars MB *et al* in their studies.79

In the Pre EWS there were seven hundred and seventeen patients who had cardiac arrest in the night duty shift (8 PM to 8 AM) and there were four hundred and eighteen patients who had cardiac arrest during day duty shift (8 AM to 8 PM). There was a significant association between the duty time and the survival *P* = 0.02.
In the post EWS there were 343 patients who had cardiac arrests in the day duty shift (8 AM to 8 PM) and 477 patients who had cardiac arrest in the night duty shift (8 PM to 8 AM).

One study conducted by Herlitz et al showed the cardiac arrest during the day has better survival than night. The reported survival of cardiac arrest occurring in the night is half of the survival that occurs in the day. The study also showed that the incidence of unwitnessed cardiac arrest was considerably greater at the night hours. In the night hours reduced survival rates are seen due to the decreased proficient emergency system in the hospital.\(^{74}\)

The study conducted by Dumot et al showed that there were a high proportion of cardiac arrests occurring in the night.\(^{76}\)

**IV. INITIAL RHYTHM**

The rhythms noted during cardiac arrest were Ventricular Fibrillation/ Ventricular Tachycardia, Non VF/ VT rhythms such as Pulseless electrical activity and Asystole. There were forty four patients who had Ventricular Tachycardia and Fifty three patients had Ventricular Fibrillation. The total number of patients who had VF/VT rhythms was ninety seven which was 8.5 % of all the cardiac arrests. There were two hundred and eighty four patients who were having Pulseless electrical activity. There were eight hundred and eighty four patients who were in asystole.
In the post EWS period, 194 patients had VF/VT rhythms, which was 23% of all the patients. Three hundred and twenty patients were in Pulseless electrical activity and three hundred and six patients were in Asystole. The increase in the percentage of VF/VT may be because the patients were attended sooner than the pre EWS patients and this result is similar to the result of Girotra. S et al.

There are two major reasons for the better outcome reported in VF/VT rhythms. First, VF/VT rhythms can be treated promptly and successfully with defibrillation. Second, since VF/VT rhythms deteriorate to asystole if not treated promptly, the presence of a VF/VT implies a recent onset of cardiac arrest. There was a significant association between Initial rhythm and survival. When the initial rhythm was VF/VT the survival was better ($P = 0.001$).

Girotra. S et al in their study showed that 79.3% of the patient’s initial rhythm was asystole or pulseless electrical activity and 20.7% patients had VF/VT. When the two rhythms were compared outcome was not different in both the groups of patients and this improvement was owed to both ROSC and also the presence of life after post resuscitation care.\(^8\)

V. SUCCESSFUL RESUSCITATION

There were 228 out of 1135 patients who had successful resuscitation in the pre EWS. This is 20% of the patients who had cardiac arrest. Out of the 228 patients who had Return Of Spontaneous Circulation 78 patients had Return Of Spontaneous Circulation (ROSC) for less than 20 min, 81 patients had Return Of Spontaneous
Circulation for more than 20 minutes and 69 patients had Return Of Spontaneous Circulation for more than 24 hours.

R.C. Peatfield, *et al* in their ten years of treating patients with arrest in a general hospital set-up, conducted a study on 1063 patients. Among 1063 patients 718 (67%) patients, ROSC did not happen. 252 patients had death in the hospital later and 93 patients were discharged alive. The mortality was 7% for the first five years but after that no patients died.\(^52\)

In the post EWS there were two hundred and two (202) patients who survived. That is 24.63 % of all the patients who had cardiac arrest. This result is similar to the results of the study by R.C Peterfield *et al* (23.7%).

Out of these 202 patients 31 patients had Return of Spontaneous Circulation (ROSC) for less than 20 min, 45 patients had Return of Spontaneous Circulation for more than 20 minutes and 144 patients had Return of Spontaneous Circulation for more than 24 hours.

Nauman Naeem *et al* concluded in his study that introduction of MEWS resulted in a better survival to hospital discharge and it was statistically significant – (5.2% Vs 16.8 %).\(^95\)

Bellomo et al reports a reduction in death after cardiac arrest (56%) and overall in-hospital mortality (88%).\(^96\)
VI. SURVIVAL TO HOSPITAL DISCHARGE

In the pre EWS patients 59 patients out of 228 had Return Of Spontaneous Circulation till hospital discharge, which is 25.8%. Out of the 1135 patients 59 patients survived to discharge which is 5.1% of all cardiac arrests. In the post EWS, out of the 202 patients who had Return Of Spontaneous Circulation (ROSC) 138 patients were discharged alive, which is 68.3% of the patients who had ROSC and 16.82% of all the patients who had cardiac arrest.

Study by Bloom HL et al compared the survival after IHCA in terms of short term and long term. They found 6.6% patients to survive at the time of moving out from hospital. Sandroni C et al to summarise: reported survival to hospital discharge varies from 0% to 42%, the most common range being between 15% and 20%.

In the present study the survival to hospital discharge improved significantly from 5% to 16.82% and it is similar to the results of Nauman Naeem et al where introduction of MEWS resulted in a better survival to hospital discharge and it was statistically significant - (5.2% Vs 16.8%).

Long term Survival

Out of the fifty nine patients (5.1%) in the pre EWS, 5 patients died after discharging from the hospital, due to worsening of the disease condition. Three of the patients had Ischemic heart disease and two of them had Chronic renal failure six patients were bed ridden and forty five patients were able to do their activities of daily living. At six months only 26 patients were alive. In the Post EWS, out of 138 patients,
ten patients died, eleven patients are bedridden and one hundred and seventeen patients are able to do their activities of daily living. At six months 18 more patients died. At 6 months the survival rate was 99 out of 820 patients (12 %).

Moretti MA et al in their study found that ROSC was present in 96 patients which come to 84% and 64 patients survived more than 24 hours. There were 37 patients which accounts for 32% survived to hospital discharge. There were 24 patients who survived at 6 months to 1 year and it accounted to 23%. After 12 months of the cardiac event, twenty one of them survived and they had better recovery or moderate disability which comes in CPC 1-2. 5 had severe disability or persistent vegetative state with CPC 3-4. 51

Out of the eleven patients who are bedridden six patients are able to recognize people and communicate by words. Hearing is impaired in three of these six patients. Rest of the five patients does not recognize people, has irrelevant speech, tolerates semiliquid food, passes urine and motion in the bedpan and needs the care of a person at all times.

This is the first study that evaluated CPC and ADL pre and post introduction of MEWS.

VII. ACTIVITIES OF DAILY LIVING

In the pre EWS group Among the 26 (44.1 %) of them who are independent in their activities of daily living, 19 (32.2%) were able to take bath on their own; they do not have any bladder and bowel disturbances. Movement disorders are there in nine
patients (Resting and postural tremors, Myoclonus and Limb rigidity), these people
dress up on their own, can cook their meal and eat by themselves, can do grooming,
oral care, toileting and walking. These patients attend physiotherapy clinics. 18
(39.5%) of them needs no reminders for medications, talks on phone, 8 (13%) of
them have no difficulty to wash clothes, 11 (18.6 %) drive vehicles frequently, 16
(27.1 %) of them manage finance, 26 (44.1 %) of them go for shopping with family
members and do small jobs at home and outside.

Among the 99 patients who are independent in their activities of daily living,
seventy two (72, 72.7%) people are able to take bath on their own; they do not have
any bladder and bowel disturbances. Movement disorders are there in thirty nine
patients (39, 39.4%) (resting and postural tremors, myoclonus and limb rigidity),
these people dress up on their own, can cook their meal and eat by themselves,
grooming, oral care, toileting, walking.59 (59.6%) of them are able to walk, 44
(44.4%) of them needs no reminders for medications, talks on phone, 30 (30.3%) of
them to wash clothes, 35 (35.4%) of them drive vehicles frequently, 51 (52.1%) of
them manage finance without difficulty, 69 (70 %) of them go for shopping with family
members and do small jobs at home.

Girotra et al in their study found that the survival and neurological outcome of
the victims who sustained IHCA have improved over the years.68

There are very few studies that has evaluated ADL of patients who survived
cardiac arrest.
Wachelder EM et al concluded in their study that when there was a person available for CPR who was not a member of the family, then the survival and neurological status was better. Long term survival in elderly in OHCA was depended on the bystander CPR and 1 month survival had a relation with the CPR done by the person who was available at the site of CPR. In our present study the setting was In- hospital and in the post MEWS period there was an improvement in the time of first compression and the survival rate and activities of daily living was better.

In our study there was no significant difference in the CPC but there was a change in the ADL in the post MEWS period which shows that when the patients were resuscitated earlier, the outcome both in terms of survival and neurological status in the long term. This study suggest that MEWS could be widely used in the hospitals to detect the deterioration of in- patients by the ward nurse and the patients could be resuscitated effectively and quite earlier so that the neurological status is regained in a better way.