

An analysis of 5-years of CPR and cardiac arrest report from CPR training center Ramathibodi hospital.

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Abstract

Background:

Cardiac arrest is one of the most common incidents found in the emergency department and there are many external factors that play a role in determining the survival rate of a patient, which is normally around "2%-10% for out-of-hospital patients and 7.4%-27.0% for in-hospital patients." ³ The purpose of this analysis is to evaluate the external and internal factors, which are individual characteristics and hospital factors to ensure better survival rates of patients at Ramathibodi Hospital in the future.

Methods:

A descriptive analysis of information from October 2015 to November 2020 was conducted from in-hospital CPR that have been reported to the CPR training center and Mann-Whitney U Test⁴ and one-way Anova⁵ were used to determine the significance of factors that affect the cardiac arrest.

Results:

In total there were 1,013 cardiac arrest cases throughout the 5 years period and the overall ROSC rate was at 58.9%. There was 1 significant external factor that plays a role in cardiac arrest, which is the gender of the patients, as males are more likely to have cardiac arrest than females shown by a statistical test of a one-tailed Mann-Whitney U Test. The high ROSC rate was contributed by factors such as the rapid response teams taking around 3 minutes to reach the patient, being able to perform a successful CPR in less than 30 minutes, and the use of adrenaline. Lastly, the most common type of electrocardiogram (EKG) found in cardiac arrest patients was pulseless electrical activity (PEA).

Conclusion:

Factors that affected sustained ROSC were genders, duration of CPR, the development of many programs, and the reduction in the rapid response team's time. In-hospital cardiac arrest tend to be reduced due to the development of a rapid response team

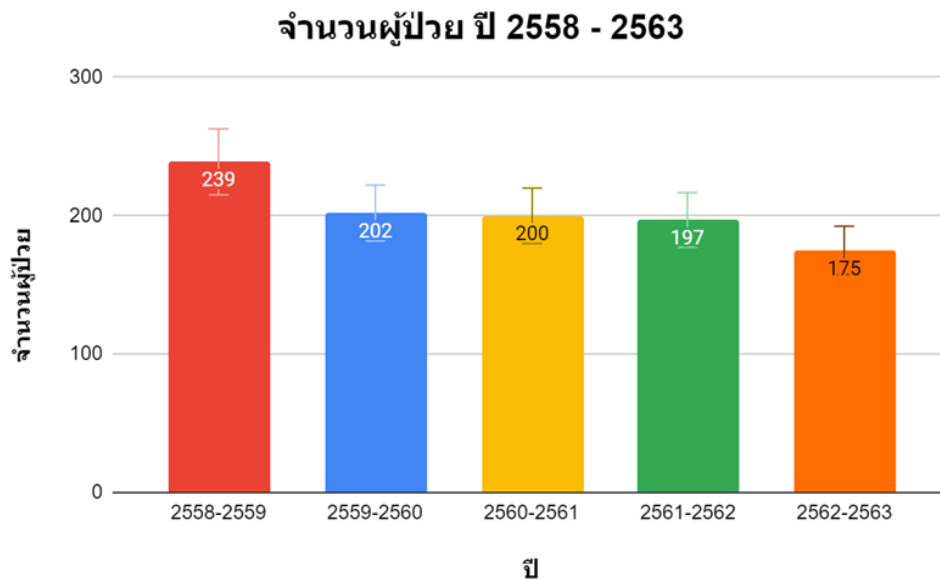
³Yuwares Sittichanbuncha, et al. A 6- year experience of CPR outcome in an emergency department in Thailand. Article from Therapeutics and Clinical Risk Management by Dove Medical Press Ltd.

⁴A non-parametric statistic test that is used to test on independent groups from population to find the differences and relationships.

⁵A statistic test that is used when there is only one factor contributed.

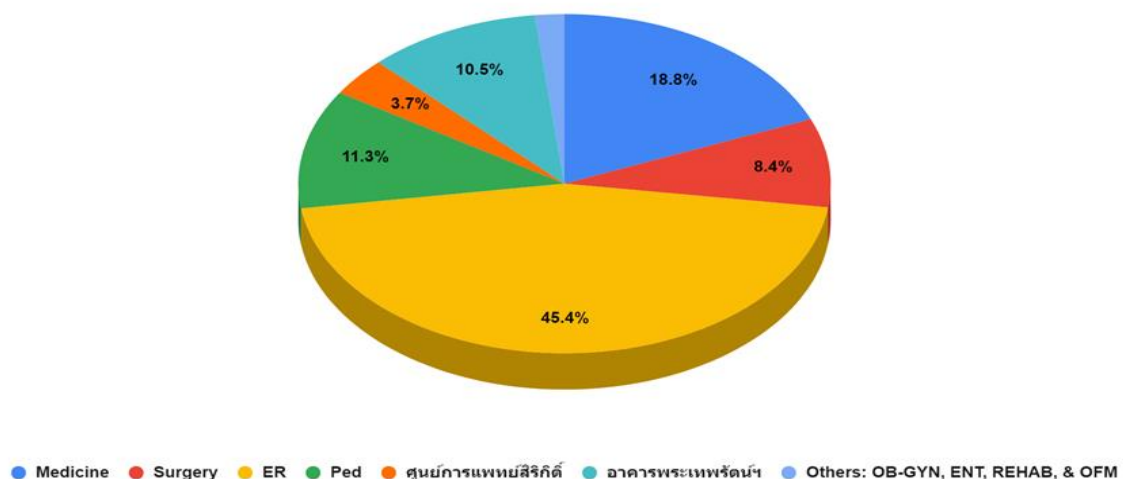
Keywords:

CPR (cardiopulmonary resuscitation); ROSC (Return of spontaneous circulation); ER (Emergency Room); Cardiac Arrest



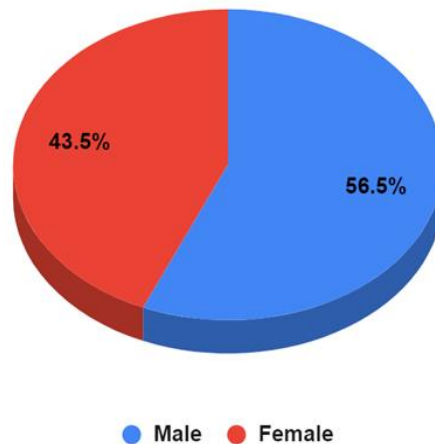
As seen from the bar chart, the in-hospital cardiac arrest has decreased in a trend from 239 patients to 175 patients in the years 2015-2020. This is because of the development of rapid response teams, “advanced cardiac life support” programs, and the increase in ROSC in the last 5 years.

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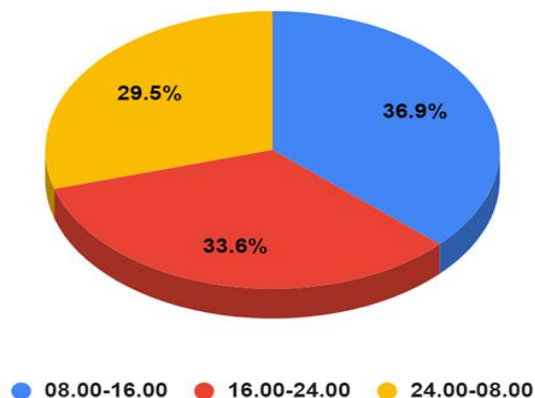
As seen from the pie chart, the Emergency Department (ER) has made up the majority of reports (45.4%) that were submitted by different departments in the last 5 years. This is because ER departments often dealt with patients who require urgent help, which may involve accidents like cardiac arrest; thus, the accident report rates would be the highest compared to other departments like OB-GYN for example.

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As seen from the pie chart, males have a higher rate of cardiac arrests than females by the difference of 13%. To see if the rate of cardiac arrests is higher in males than females, a one-tail Mann-Whitney U Test was conducted at the significance level of 0.05 ($P \leq 0.05$). The calculated STAT value is 3 which is less than the critical value of 4 at $P \leq 0.05$. Therefore, rejecting the null hypothesis and accepting the alternative hypothesis that males have a higher chance of experiencing cardiac arrest. (See appendix A, B, & C) To resolve this, a study

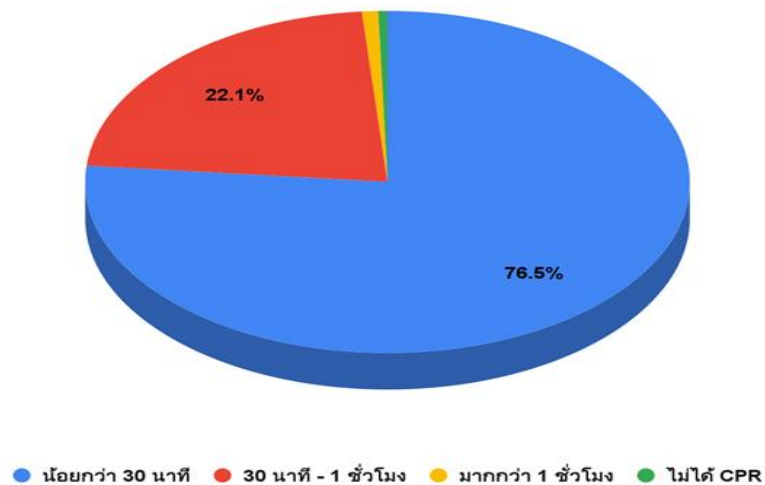
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of genders and cardiac arrest should be conducted.

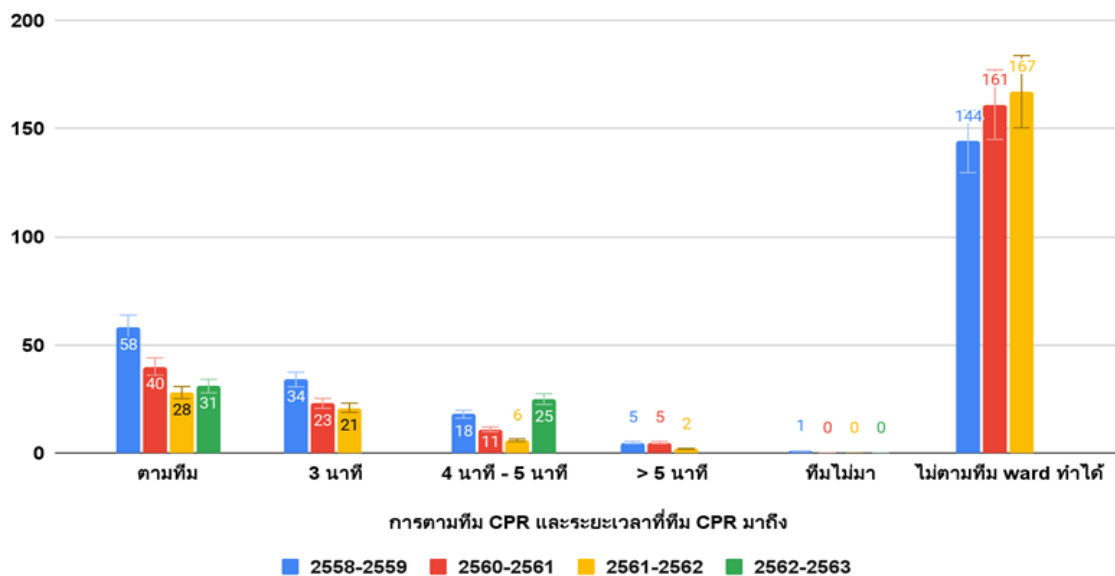
As seen from the pie chart, the time of day doesn't seem to play a role in cardiac arrest, as the percentages are very similar between the years 2015 to 2020. A one-way ANOVA test was conducted to see the relationship between time of the day (08.00-16.00, 16.00-24.00, & 24.00-08.00) and cardiac arrest at the significant level of 0.05 ($P \leq 0.05$) (See appendix A & D). The f-value is 2.41606, which shows that the result is not significant; thus, proving that the time of the day doesn't have a role in cardiac arrest

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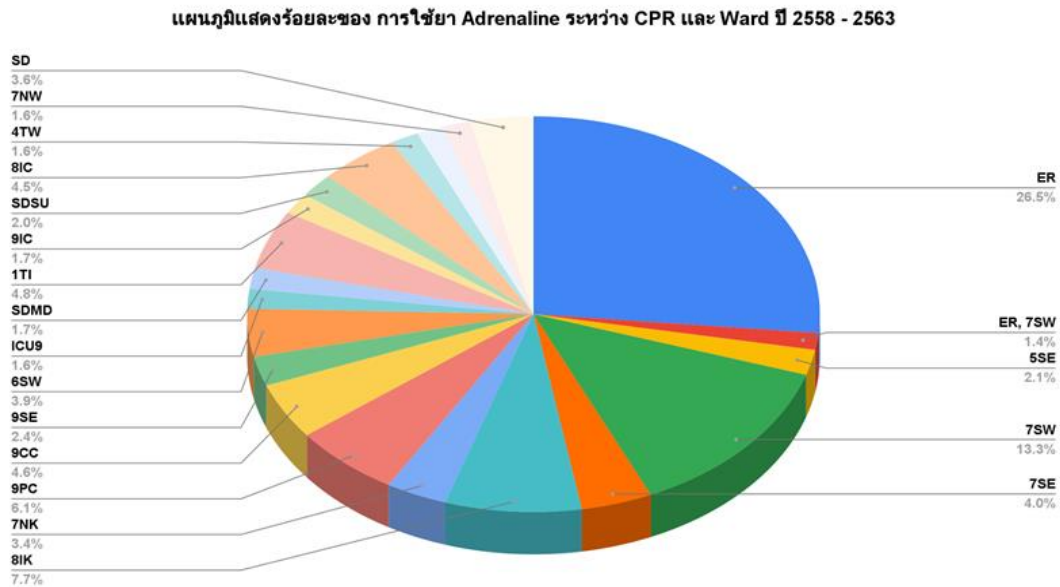


As seen from the pie chart, the majority take less than 30 minutes to perform a successful CPR (76.5%). This is because of the development of “advanced cardiac life support” programs and the CPR training throughout the 5 years period.

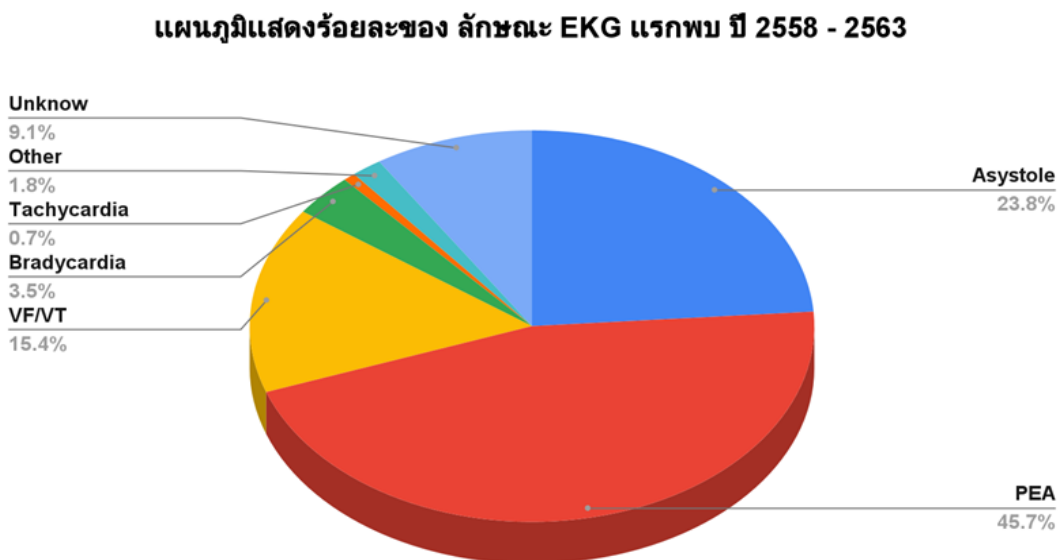
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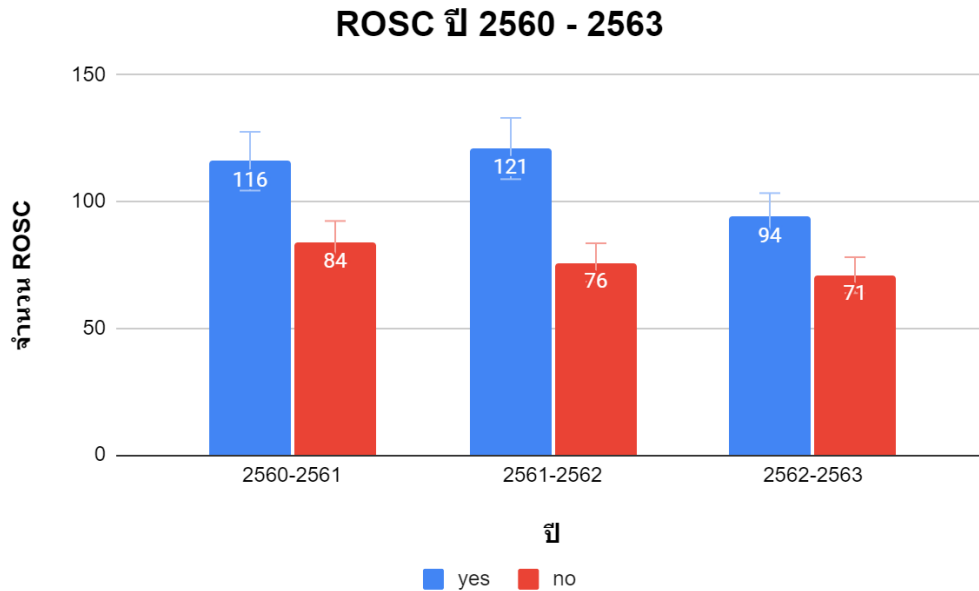
As seen from the bar chart, the majority of the response time for rapid response teams to reach the patient was 3 minutes, and the number of response teams that didn’t arrive decreased to 0 during the last 5 years due to the constant development and training.



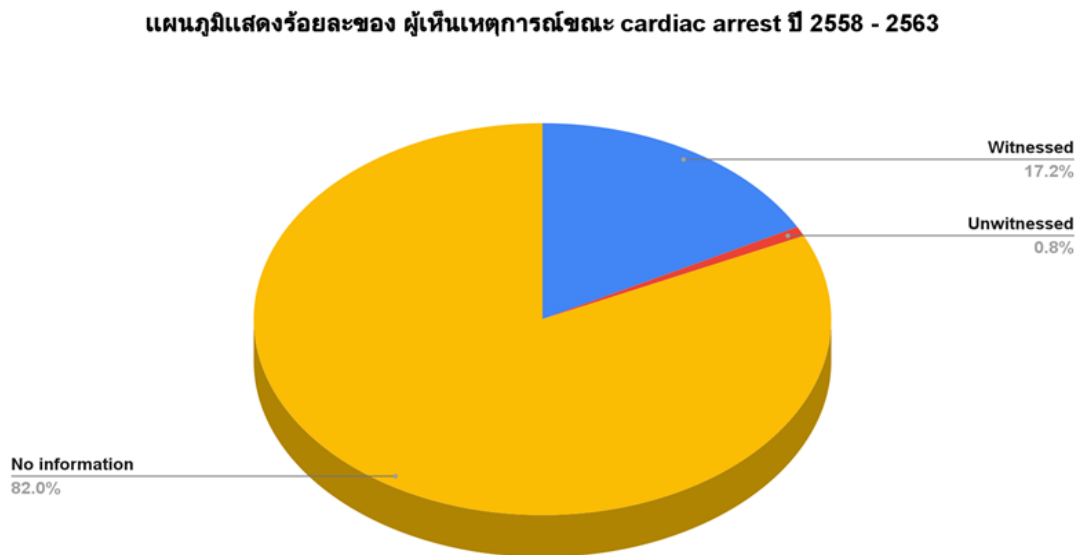
As seen from the pie chart, ER Ward used the most adrenaline during CPR, as seen by the percentage of 26.5% during the years 2015 to 2020. This is because ER often deals with a severe case of cardiac arrest; thus, it is often required to use more adrenaline to ensure the survival of patients.



As seen from the pie chart, the most common type of EKG (electrocardiogram) found during the time period of 2015 to 2020 was PEA (Pulseless electrical activity). With PEA being the most common type of cardiac arrest found in the last 5 years, this would allow us to conduct more research on PEA regarding etiology and proper intervention to improve survival of cardiac arrest from PEA.



As seen from the bar chart, there were more patients who experienced ROSC (Return of spontaneous circulation) from CPR throughout 2017 to 2020. This is due to “advanced cardiac life support” programs and CPR training. However, in the year 2020, the number of patients who experienced ROSC was similar to those who didn't by the difference of 23 patients. With that, CPR techniques should be revised from the years 2018 and 2019, as it has the greatest amount of ROSC compared to other years.



As seen from the pie chart, the majority of witnesses provided no information regarding the cardiac arrest throughout the 5 years period. With that, a program that aims to help to raise awareness about cardiac arrests and how to identify if a person is having a cardiac arrest should be developed.

Appendix A: Raw data

Year:	Number of Male Cardiac Arrest Patients	Number of Female Cardiac Arrest Patients
2558-2559	125	114
2559-2560	111	91
2560-2561	116	84
2561-2562	112	85
2562-2563	108	67

Time of the day	Number of Cardiac Arrest Patients
08.00-16.00	372
16.00-24.00	339
24.00-08.00	298

Appendix B: One-tailed Mann-Whitney U Test (Genders and Cardiac Arrest)

Males	Initial Ranking	Final Ranking	Female	Initial Ranking	Final Ranking
125	10	10	114	8	8
111	6	6	91	4	4
116	9	9	84	2	2
112	7	7	85	3	3
108	5	5	67	1	1
	R1:	37		R2:	18
	U1:	22		U2:	3
	N1:	5		N2:	5
Ustat	3				
Critical Value	4				
	3<4	Reject H0			

Appendix C: One-tailed Mann-Whitney U Test's Critical Value Table

n_1 \Rightarrow $n_2 \downarrow$	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3	0																		
4	1 3																		
5	1 2 4 5																		
6	1 3 5 7 9																		
7	1 4 6 9 11 13																		
8	2 5 7 10 13 16 19																		
9	2 5 8 12 15 18 21 25																		
10	3 6 10 13 17 21 24 28 32																		
11	3 7 11 15 19 23 27 31 36 40																		
12	4 8 12 17 21 26 30 35 39 44 49																		
13	4 9 14 18 23 28 33 38 43 48 53 58																		
14	5 9 15 20 25 30 36 42 47 52 57 64 69																		
15	5 10 16 22 27 33 39 45 51 57 63 68 74 81																		
16	5 11 17 23 29 35 42 48 54 61 67 74 80 86 92																		
17	5 12 18 25 32 38 45 52 58 65 72 79 85 92 99 105																		
18	6 13 20 27 34 41 48 55 63 69 76 84 91 98 105 113 120																		
19	6 14 21 28 36 43 50 59 65 74 81 89 96 104 112 120 128 120																		
20	7 15 22 30 38 46 54 62 70 78 85 94 102 110 119 127 135 128 152																		

Source: The entries in this table were computed by Pat Dugard, a freelance statistician.

<https://onlinelibrary.wiley.com/doi/pdf/10.1002/9780470776124.app1>

Appendix D: One-Way ANOVA Test for Time of the Day and Cardiac Arrest

<https://www.socscistatistics.com/tests/anova/default2.aspx>

Summary of Data						
	1	2	3	4	5	Total
N	5	5	5	N/A	N/A	15
$\sum X$	372	339	298	N/A	N/A	1009
Mean	74.4	67.8	59.6	N/A	N/A	67.267
$\sum X^2$	27962	23917	17908	N/A	N/A	69787
Std.Dev.	8.4439	15.2709	6.0663	N/A	N/A	11.6953
Result Details						
Source	SS	df	MS			
Between-treatments	549.7333	2	274.8667	$F = 2.41606$		
Within-treatments	1365.2	12	113.7667			
Total	1914.9333	14				

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