



# Medical Emergency Team (M.E.T.) The South Infirmary-Victoria University Hospital, Cork



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# Background

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“The most sophisticated intensive care often becomes unnecessarily expensive terminal care when the pre-ICU system fails”

**Peter Safar 1974**

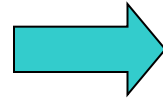
**80% of patients who experience an in-hospital cardiac arrest have changes in vital signs eight hours prior to the event**

**Schein RMH. Chest 1990; 98:1388-1392**

# Pre-introduction of MET



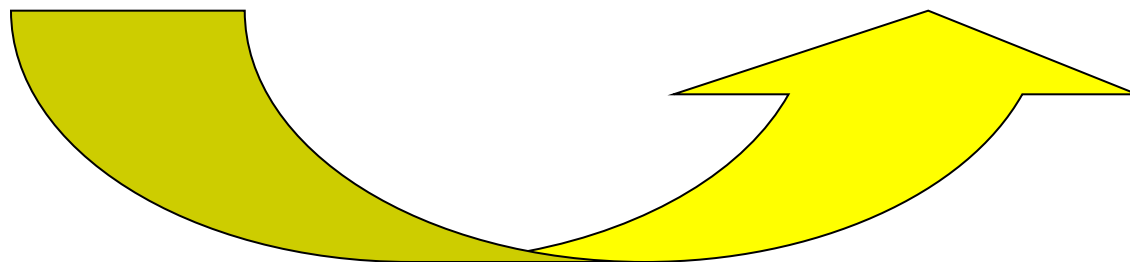
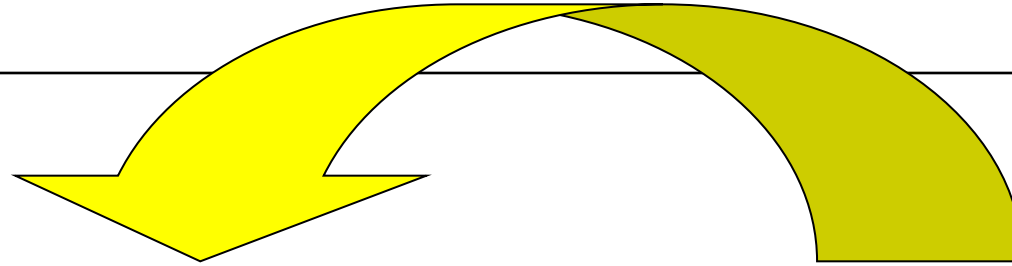
Patient deteriorates



Nurse bleeps  
Junior Doctor



Junior Doctor  
Arrives to assess



# Pre-MET

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- Junior Doctors inexperienced
- Novice nurses (poor skill mix)
- Lack of clinical judgment
- Interns have no ICU admission privileges

IF A JUNIOR DOCTOR or NURSE CANNOT IDENTIFY SUBTLE CHANGES IN PATIENTS CONDITION – DETERIORATION MAY BE OVERLOOKED

Time to senior medical assistance is delayed

END POINT FURTHER DETERIORATION

# Avoidable Deterioration

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- Confidential inquiry into the quality of care of 100 patients prior to ICU admission
  - 39% of patients were admitted late to ICU
  - 54% of patients received suboptimal care prior to ICU

*McQuillan et al 1998*

# Examples of Sub-optimal Care

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- UK Study examining 78 cardiac arrests
  - All received inadequate care prior to arrest
  - 58% cases there was a failure to respond to abnormal lab findings
  - 58% diagnostic error
  - In 45% of cases the SHO was most senior physician top have reviewed 24hrs prior to cardiac arrest
  - Failure of nurses to inform doctors of deterioration in 25% of cases

*Hodgetts et al 2002*



# Studies Recommendations

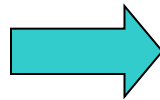
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- Implementation of M.E.T's
- Development of early warning scoring (EWS) tools to assist in early identification of deteriorating patients
- Education of nurses and doctors on how to deal with critically ill patients at ward level

# Medical Emergency Team Picture



Patient deteriorates,  
Nurse assesses vital  
Signs and scores them

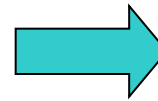


Severity Score for Activation of the Medical Emergency Team

NEW Symptoms	1	2	3	4	5	6	7	8
Conscious	100-100							
Heart Rate (b/min)	120-120							
SpO2 (%)	100-100							
Temp (°C)	36-36							
Respiratory								
SpO2 (%)	94-94	92-94	90-92	88-90	86-88	84-86	82-84	80-82
Resp Rate (b/min)	12-20	20-25	25-30	30-35	35-40	40-45	45-50	50-60
Systemic BP (mmHg)	90-90	90-90	90-90	90-90	90-90	90-90	90-90	90-90
Level of Consciousness	A	V	P	U				
Glucose (mg/dl)	70-70	70-70	70-70	70-70	70-70	70-70	70-70	70-70
ECG	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9

Score	Instructions
5-7	Call with Nurse in Charge Call: 462-XXXX or Registrar of patient's speciality Fast Resp: Dial 462 - "Sleep No." - "Ext. No."
8 or more	Activate M.E.T. Dial 7777

A = Alert + oriented  
 V = Responds to verbal commands  
 P = Responds to painful stimuli  
 U = Unresponsive  
 EFFECTIVE DATE: \_\_\_\_\_  
 WRITTEN BY: \_\_\_\_\_  
 APPROVED BY: \_\_\_\_\_  
 DATE OF REVISION: \_\_\_\_\_



**M.E.T.**  
 Medical Registrar  
 Medical Intern  
 Resuscitation Officer

If  $\geq 8$  activates a  
M.E.T. call 7777

# Initial Early Warning Score (EWS) tool used by Nurses in SIVUH

## Severity Score for Activation of the Medical Emergency Team

NEW Symptoms	4	3	2	1	0	1	2	3	4
Concern			NEW						
Acute Chest Pain		NEW							
Acute SOB		NEW							
<b>Physiology</b>									
Pulse ( <b>manual</b> )	< 45	45 – 49	50 – 54	55 – 60		90 – 99	100 - 119	120 - 139	> 139
Core Temp (c)	< 34	34.0 - 34.5	34.6 - 35.0	35.1 - 35.9			38.5 - 39.9	40.0 - 40.4	> 40.4
Resp Rate (bpm)	< 8	8 – 9	10 – 11			20 – 25	26 – 30	31 – 36	> 36
SpO2 ( <b>O2</b> )	< 88	88 – 91	92 – 95						
SpO2 ( <b>Air</b> )	< 85	86 – 89	90 – 93						
Systolic BP (mmHg)	IS < 90	90 – 99 Falls by 31 – 40	100 – 110 Falls by 20 - 30			Rises by 20 – 29	Rises by 30 – 40	Rises by > 40	
Or	Falls > 40								
Level of Consciousness	GCS < 13		GCS 13/ 14				Confused or agitated		
Urine Output	<10mls/ hr for 2 hrs	<20mls/ hr for 2 hrs					>250mls/ hr		
<b>Biochemistry</b>									
K		<2.5	2.5 – 3.0				5.6 – 5.9	6.0 – 6.2	>6.2
Na	< 120	120 – 125	126 – 129			146 – 147	148 – 152	153 – 160	> 160
Hb	< 8.0	8.0 – 8.9	9.0 – 10.0						
pH	< 7.21	7.21 – 7.25	7.26 – 7.30	7.31 – 7.34		7.46 – 7.48	7.49 – 7.50	7.51 – 7.60	> 7.60
PCO2 changes		< 3.5	3.5 – 3.9	4.0 – 4.4				6.1 – 6.9	> 6.9
PO2 changes	< 9.0	9.0 – 9.4	9.5 – 9.9	10 - 11					
BE	< -5.9	-4.9 - -5.8	-3.8 - -4.8	-3.0 - -3.7					

A SCORE  $\geq 8$  WARRANTS ACTIVATION OF THE MEDICAL EMERGENCY TEAM – DIAL 7777

*Hodgetts et al (2002)*



# Medical Emergency Team Objectives

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- **Deliver critical care outside the boundaries of ICU**
- **Reduce the number of cardiac arrests**
- **Detect and react to patient deterioration earlier**
- **Reduce the number of unplanned admissions to  
ICU**

# Implementation of the M.E.T.

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Resuscitation Committee (early 2006)



Executive Management Board (May 2006)



Consultants (June 2006)



Nursing, Paramedical, and NCHD's (June 2006)



**Implementation Date 16<sup>th</sup> July 2006**

# Study Method

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Study period: 12 months

- Jan – June 2006: Pre MET introduction
  - Unplanned ICU patients only
  - All cardiac arrests
- July – Dec 2006: MET audit
  - **All** patients requiring a MET call
  - All cardiac arrests

# Study Objectives

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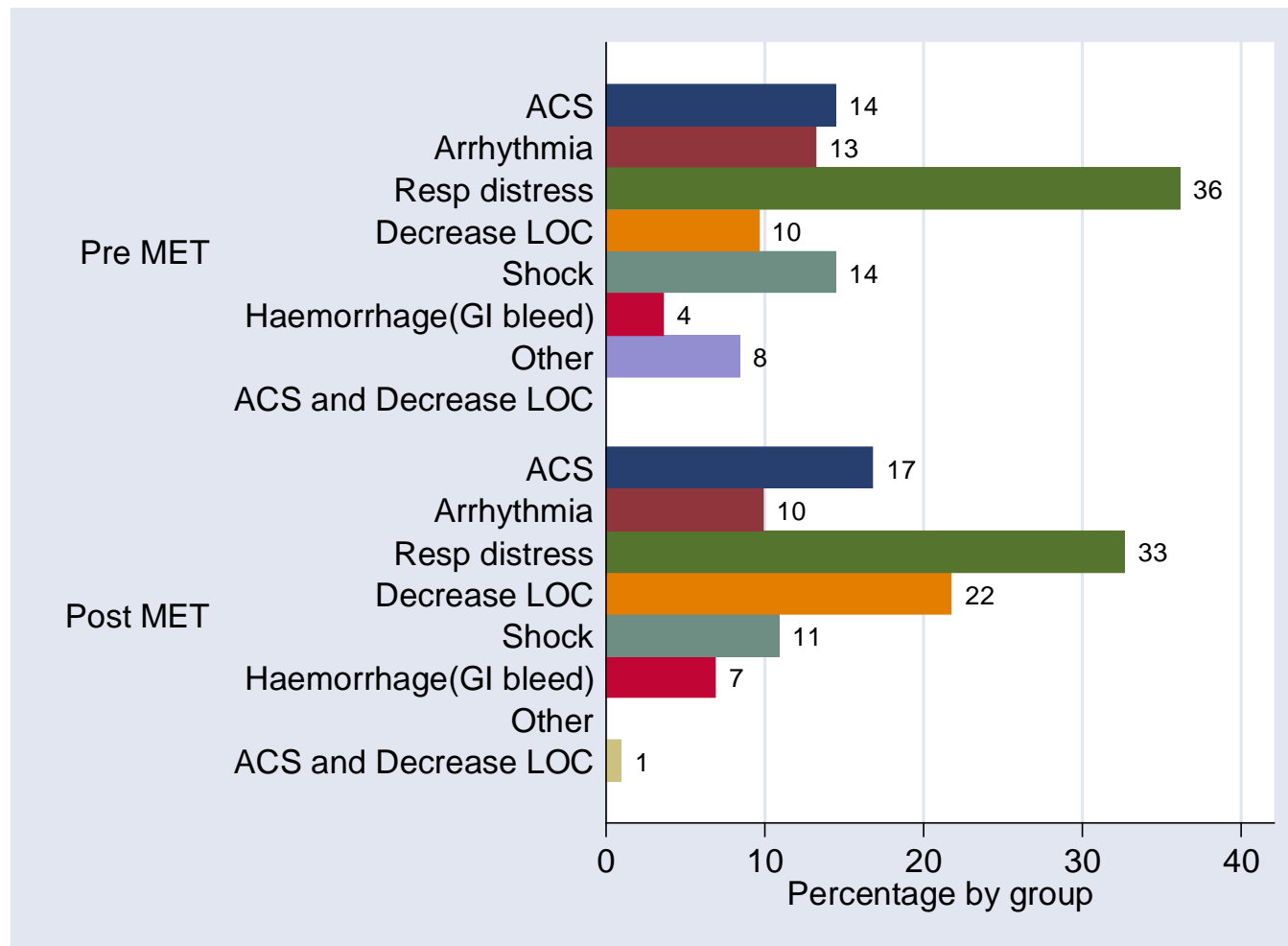
- To examine the effect an MET has on:
  - length of hospital stay
  - Length of ICU stay
  - Hospital mortality
  - In-patient cardiac arrests
- The ability of the early warning score (EWS) tool in identifying those patients most at risk of death

# Study Population

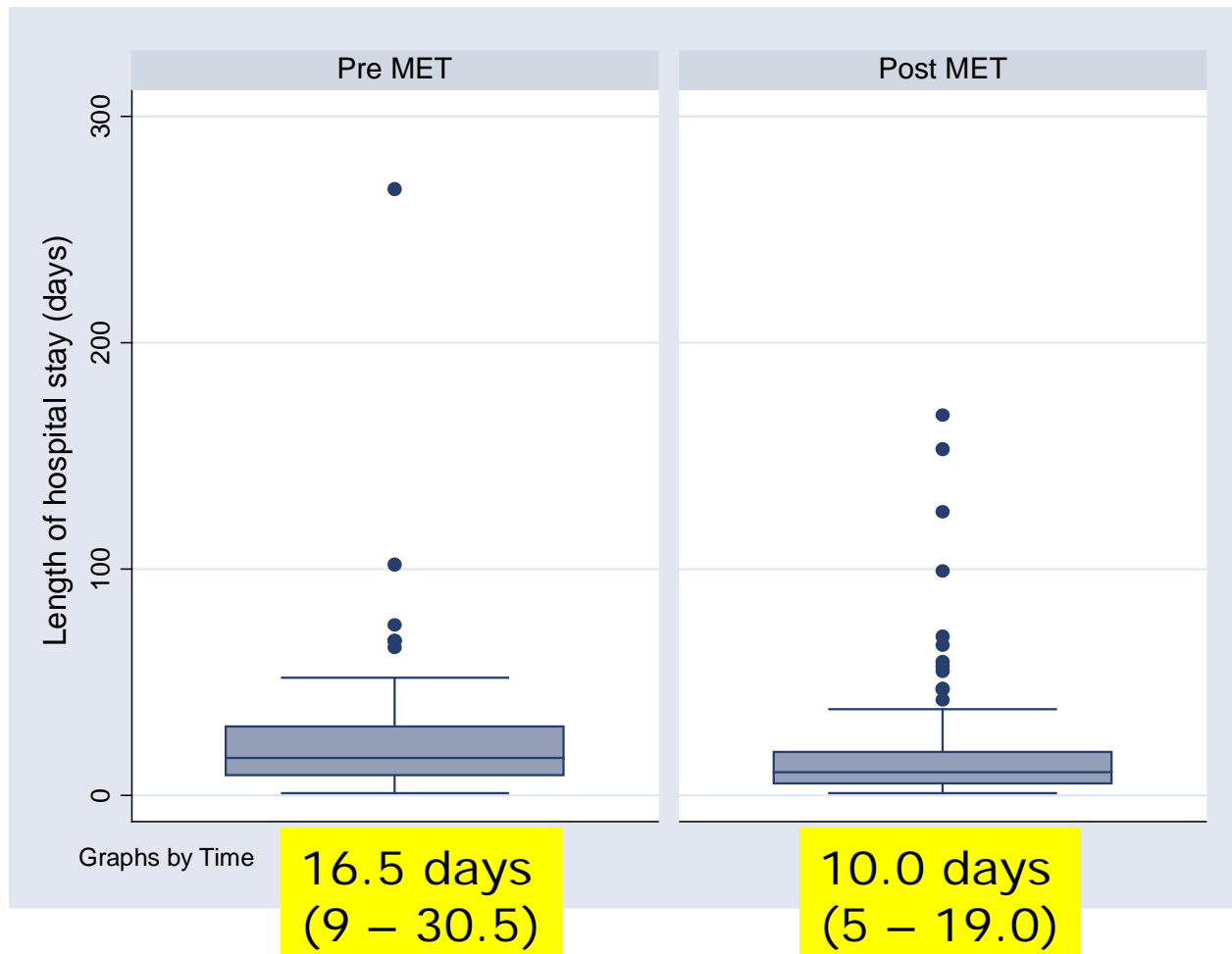
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	Pre MET Introduction	MET Study Period
No. of Subjects	83 M=43/F=40	101 M=47/F=54
Age (Median)	73yrs	75yrs

# Category of symptoms associated with study groups

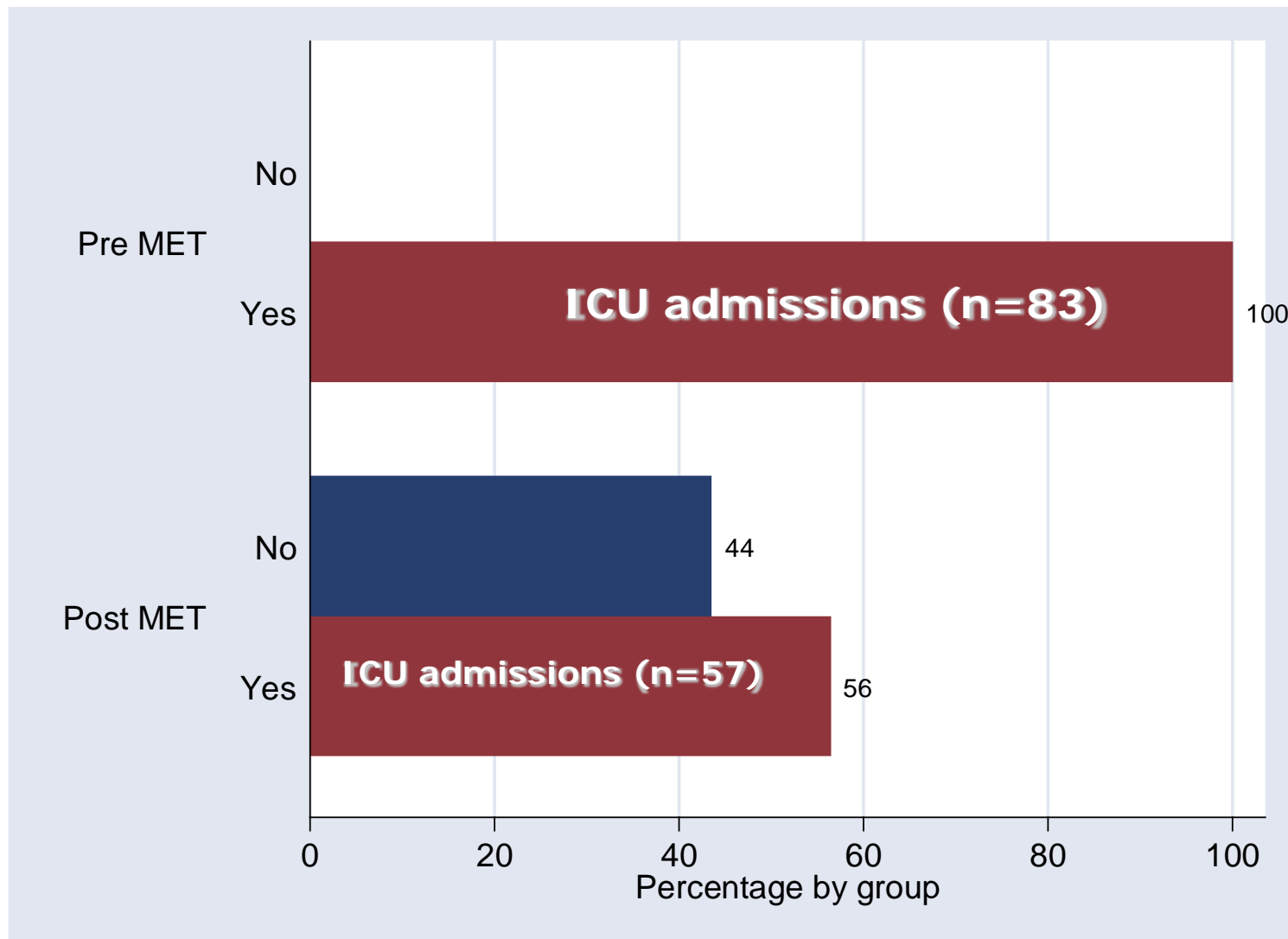


# Effect of MET on length of hospital stay

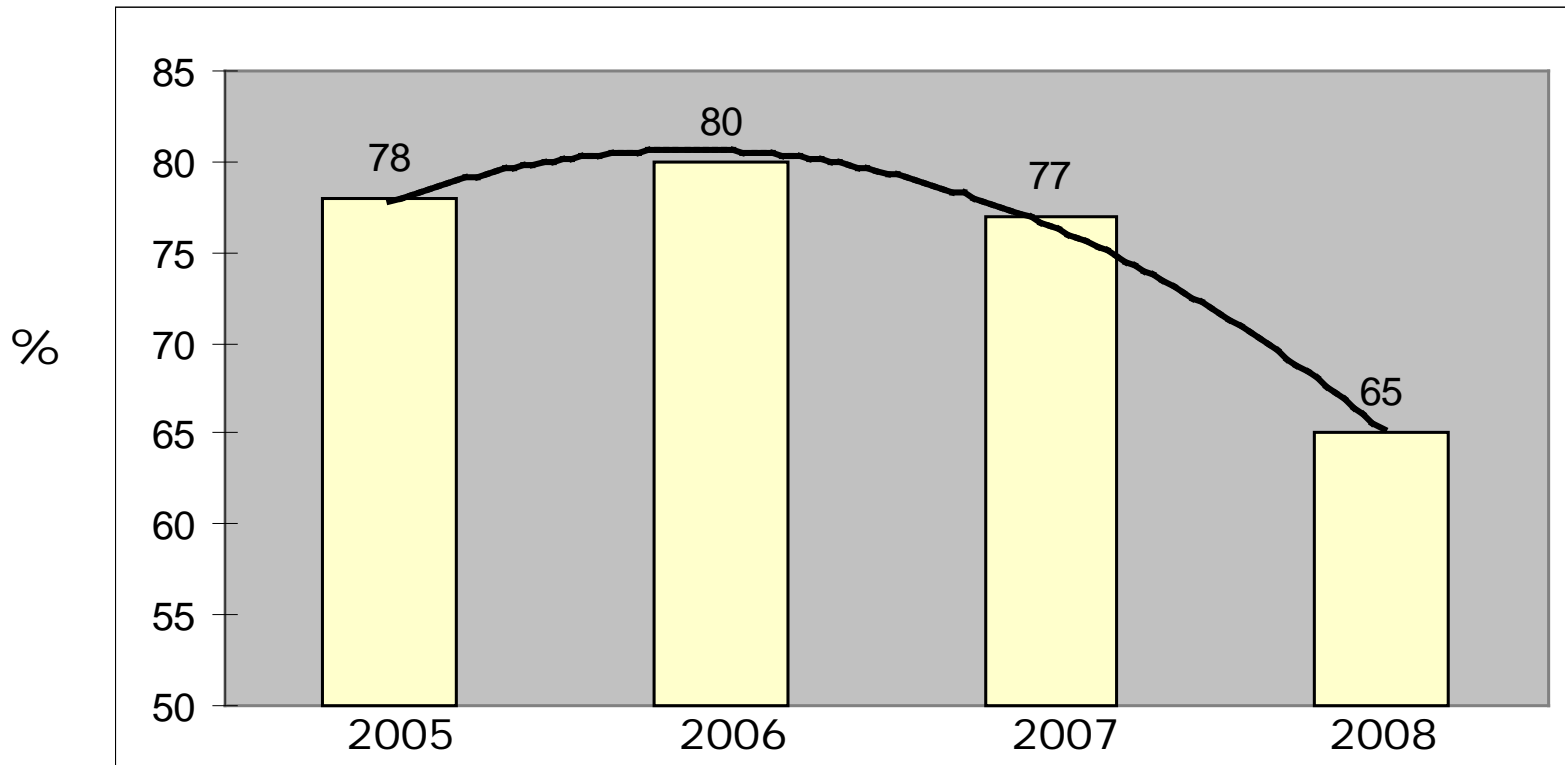


**$p=0.002$**

# Unplanned ICU admissions pre and post MET introduction

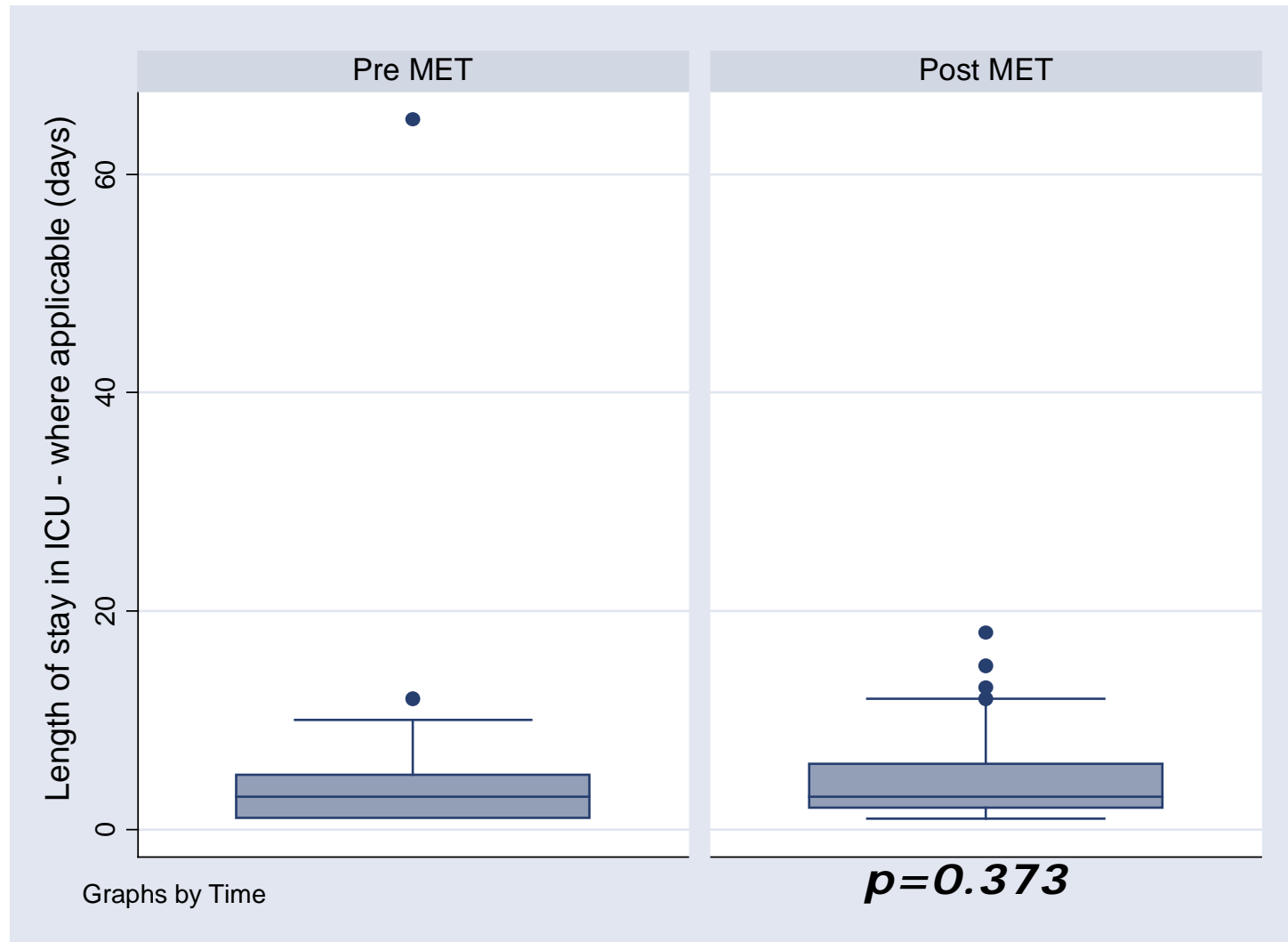


# ICU bed Occupancy Pre and Post MET

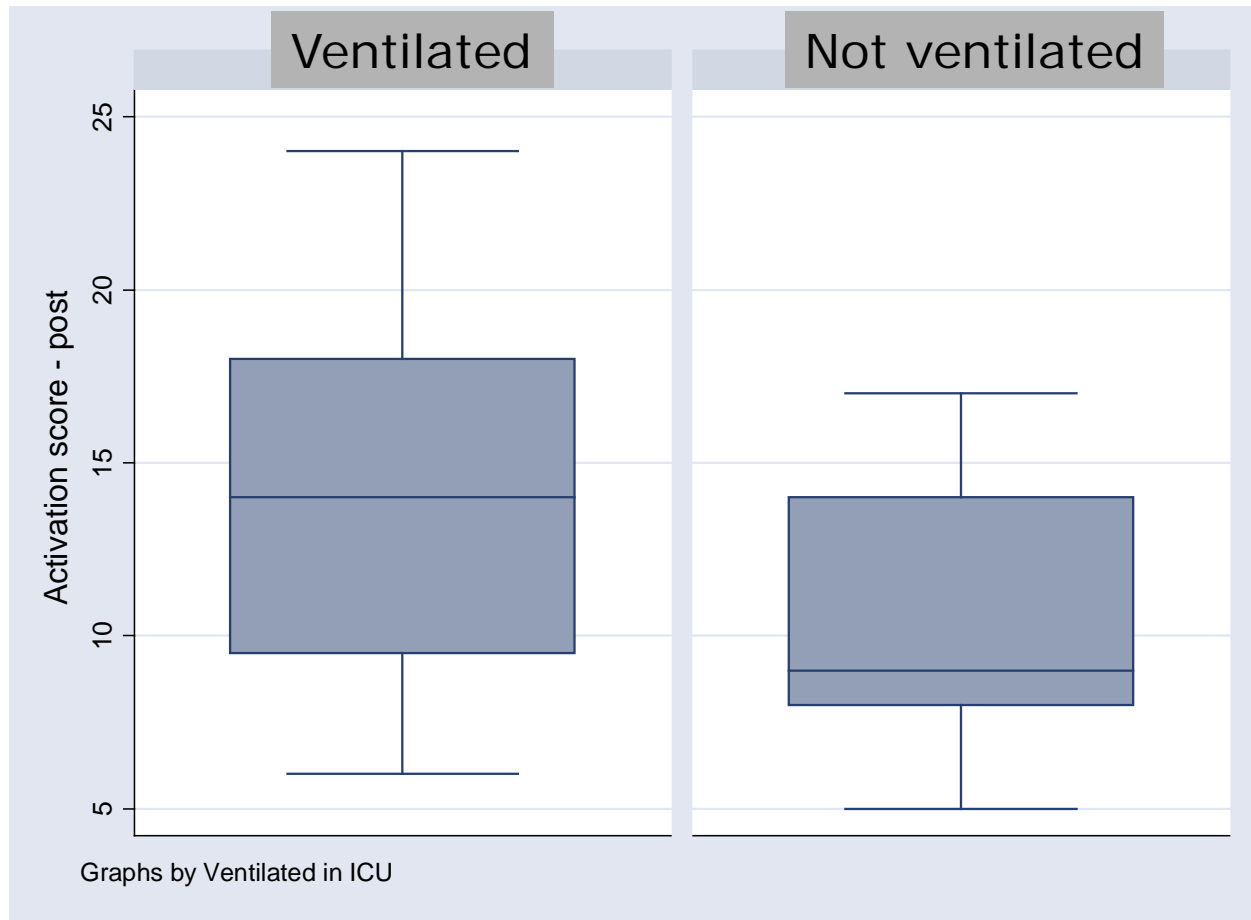


M.E.T. commenced July '06

# ICU length of stay



# Relationship between activation scores and requirement for ventilation in ICU

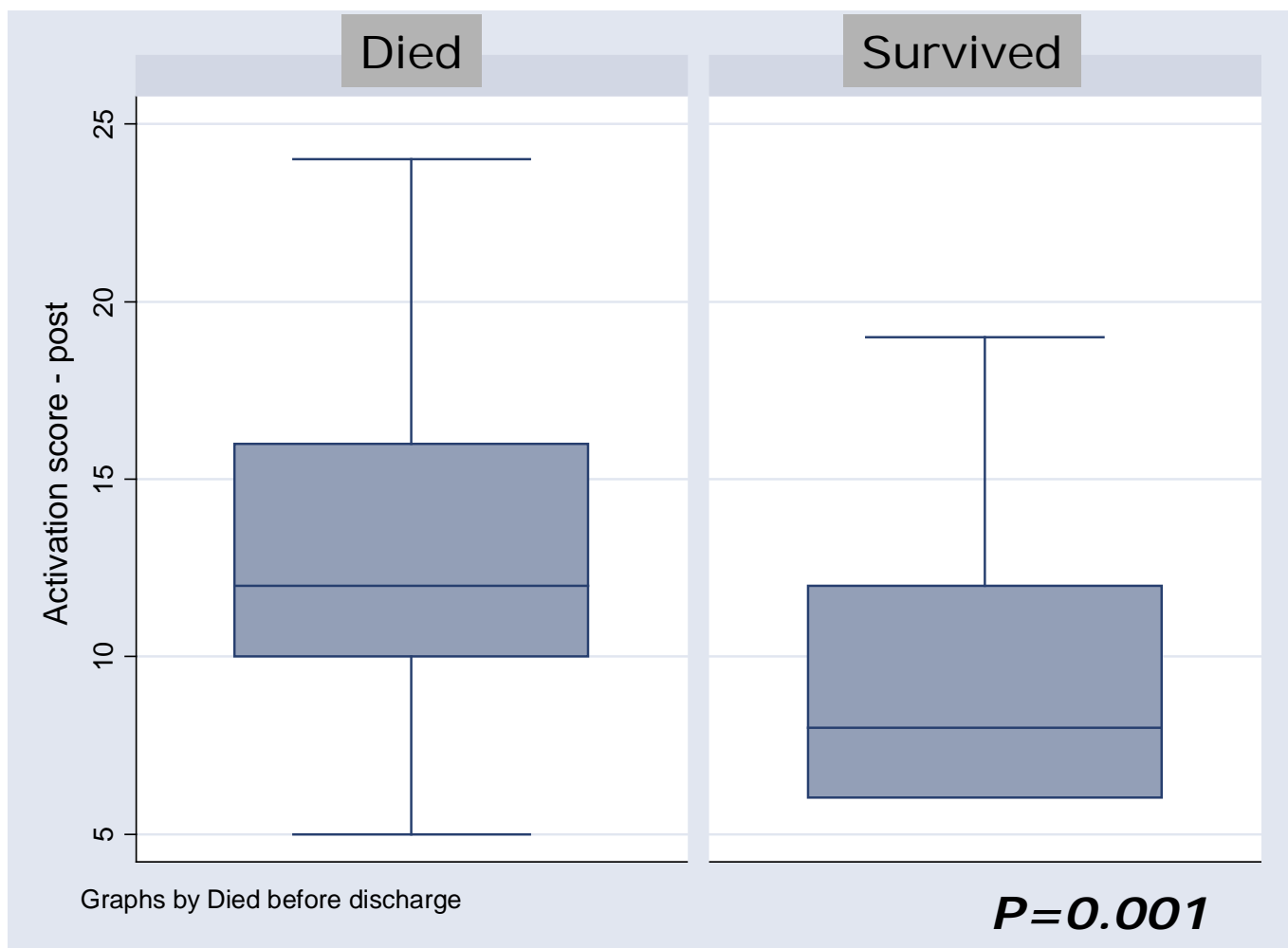


Median EWS score for  
Non-ventilated pts  
= 9.0

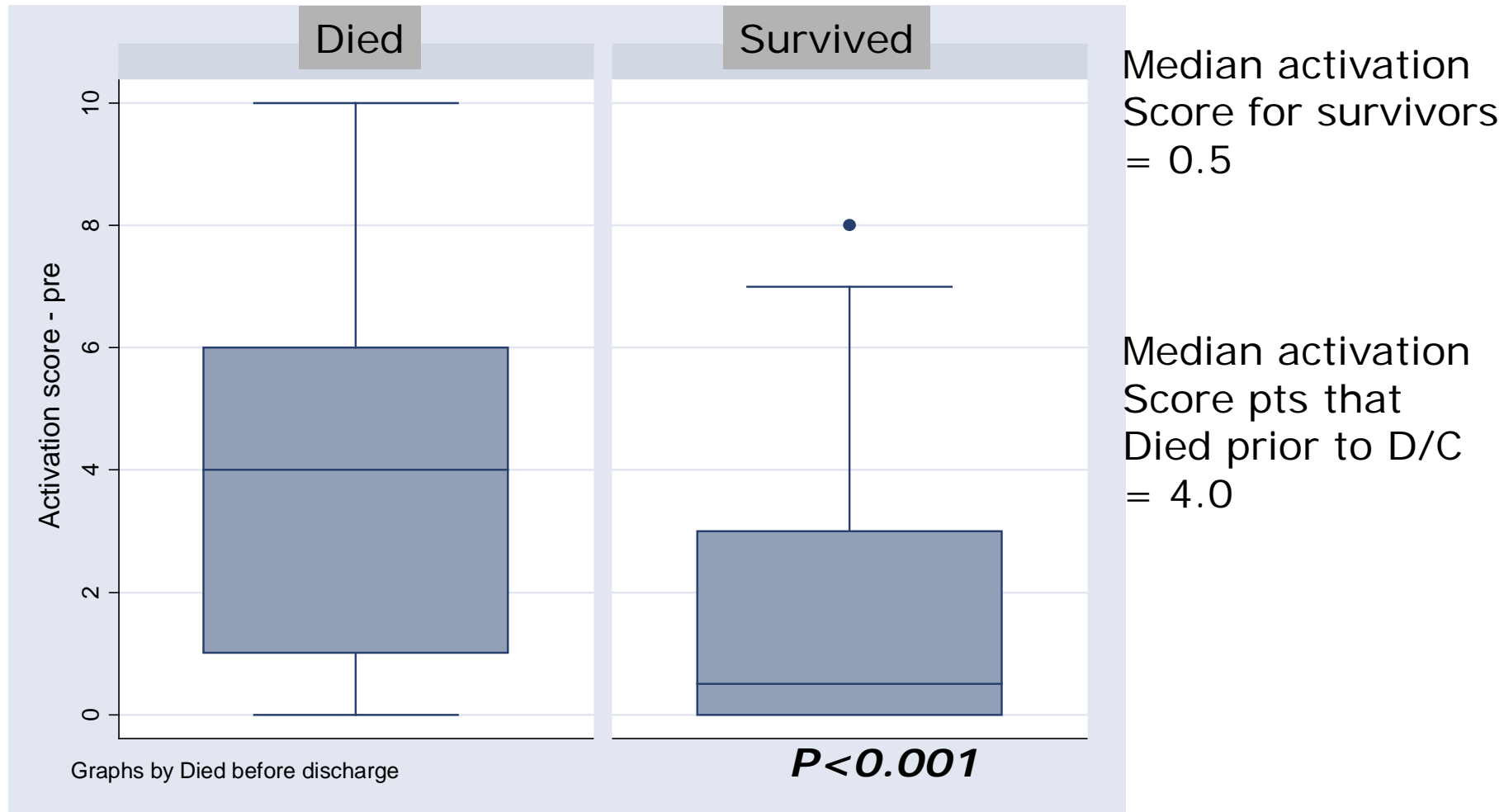
Median EWS score for  
Pts requiring  
Ventilation  
= 14.0

**$p=0.004$**

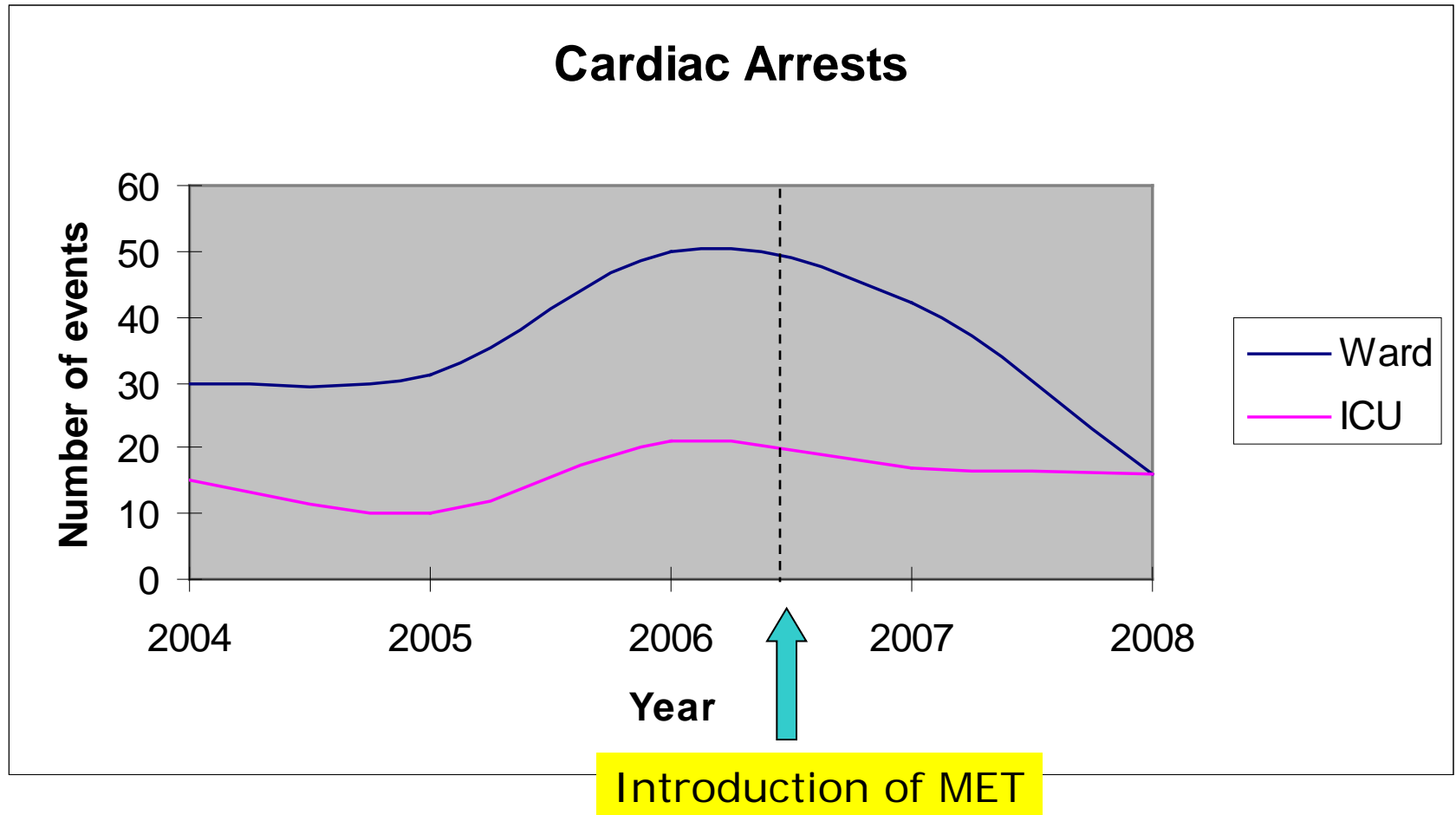
# Identifying those patients most at risk of death (EWS score at time of MET call)



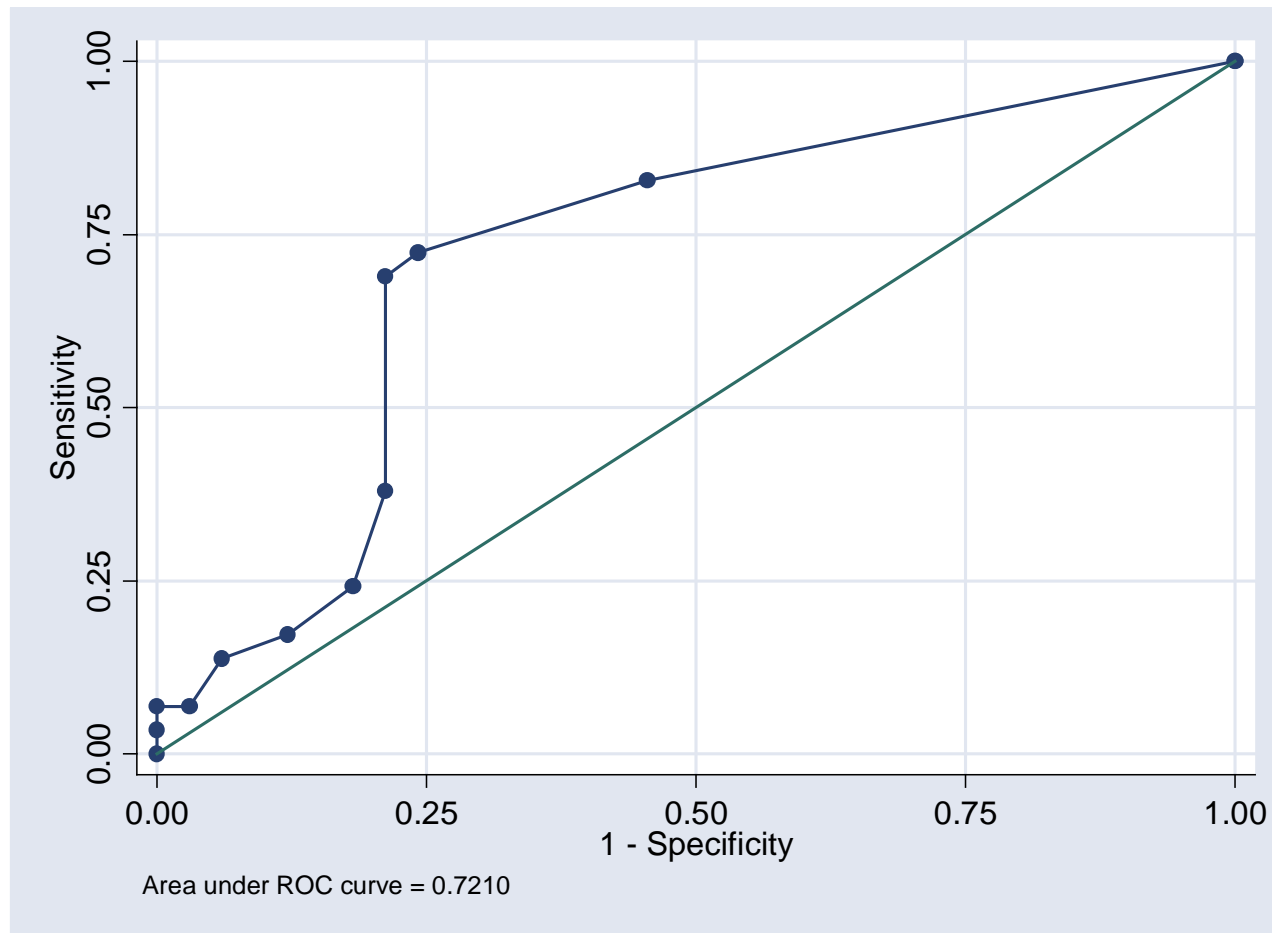
# EWS score 4 hours prior to MET call



# Number of Cardiac Arrests

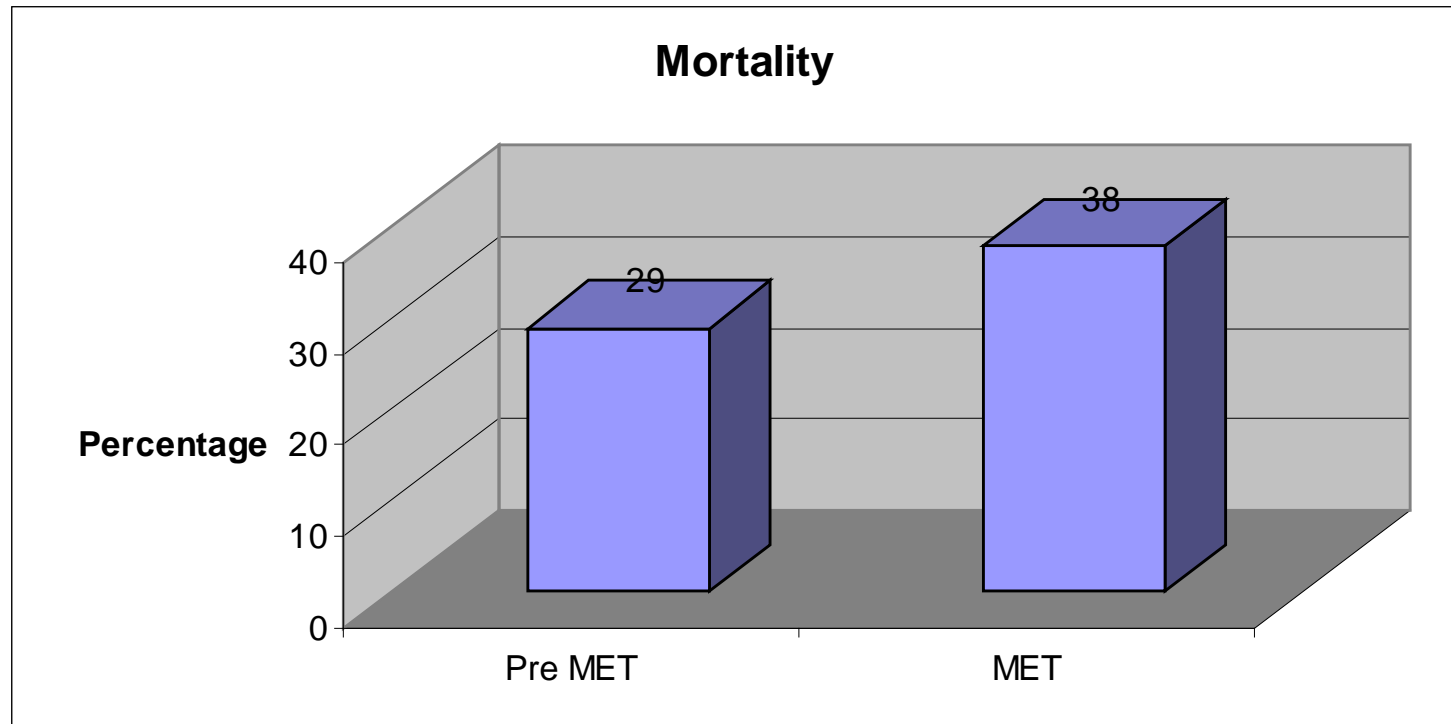


# Accuracy of EWS tool in determining patients most at risk



**0.72 (95% CI: 0.59 to 0.85)**

# Overall mortality



***p=0.214***



# Summary

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- Length of hospital stay - improved
- Length of ICU stay – remains the same
- In-patient cardiac arrests - reduction
- Hospital mortality – remains the same
- EWS successful in identifying those patient at risk



# Sustainability of Project

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- The M.E.T. project utilises existing resources
- No additional staff requirements
  - However -desirable: MET co-ordinator
- No additional infrastructural costs



## Other Benefits

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- Nurses, NCHD's, paramedical staff and consultants have all welcomed the project
- Junior NCHD's as well as nurses learn from their peers on how to deal with emergencies
- Patients are cared for in a safer environment
- Much more efficient use of ICU beds



# Thankyou

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## Early Warning Score for Activation of the Medical Emergency Team

### Vital Signs

1. Concern
2. SOB
3. RR 28
4. Sats 89%

NEW Symptoms	4	3	2	1	0	1	2	3
Concern			NEW					
Acute Chest Pain		NEW						
Acute SOB		NEW						
Seizure (new)	7777							
G.I. Bleed	7777							
Physiology								
Pulse ( <b>manual</b> )	< 45	45 – 49	50 – 54	55 – 60			100 – 119	120 – 139
Resp Rate (bpm)	< 10					20 – 25	26 – 30	31 – 38
Oxygen Saturation	< 88	88 – 90	91 – 95					> 139
Systolic BP (mmHg)	IS < 90	90 – 99	100 – 110			Rises by 20 – 29	Rises by 30 – 40	Rises by > 40
Or	Falls > 40	Falls by 31 – 40	Falls by 20 – 30					
Level of Consciousness					A		V	P
Core Temp (c)	< 34	34.0 – 35						40.0 – 40.4
								> 40.4

Score	Instructions
5 – 7	Confirm with Nurse in-charge then <u>Fast bleep</u> SHO or Registrar of patient's speciality  Fast Bleep: Dial 462 – 'bleep No.' + 'Ext. No.'
8 or more	Activate M.E.T. Dial 7777

A = Alert + orientated  
 V = Responds to verbal commands  
 P = Responds to painful stimuli  
 U = Unresponsive

EFFECTIVE DATE:	24 – 10 – 2007
WRITTEN BY	Gerard Allen RO
APPROVED BY	Resuscitation Committee
DATE OF REVISION	Oct-2008

Early Warning Score 2 + 3 + 2 + 3 = 10