Benchmarking for Rapid Response Systems:

Two Novel Systems to Measure Outcomes

Chris Subbe, Wrexham, Wales

Q J Med 2001; **94**:521–526

Original papers

QJM

Validation of a modified Early Warning Score in medical admissions

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Table 1 Modified Early Warning Score

	3	2	1	0	1	2	3
Systolic Blood pressure (mmHg)	<70	71–80	81–100	101–199		⩾200	
Heart rate (bpm)		<40	41–50	51–100	101–110	111–129	⩾130
Respiratory rate (bpm)		<9		9–14	15–20	21–29	⩾30
Temperature (°C)		<35		35–38.4		⩾38.5	
AVPU score				**A**lert	Reacting to **V**oice	Reacting to **P**ain	**U**nresponsive

Benchmarking of Rapid Response Systems ...

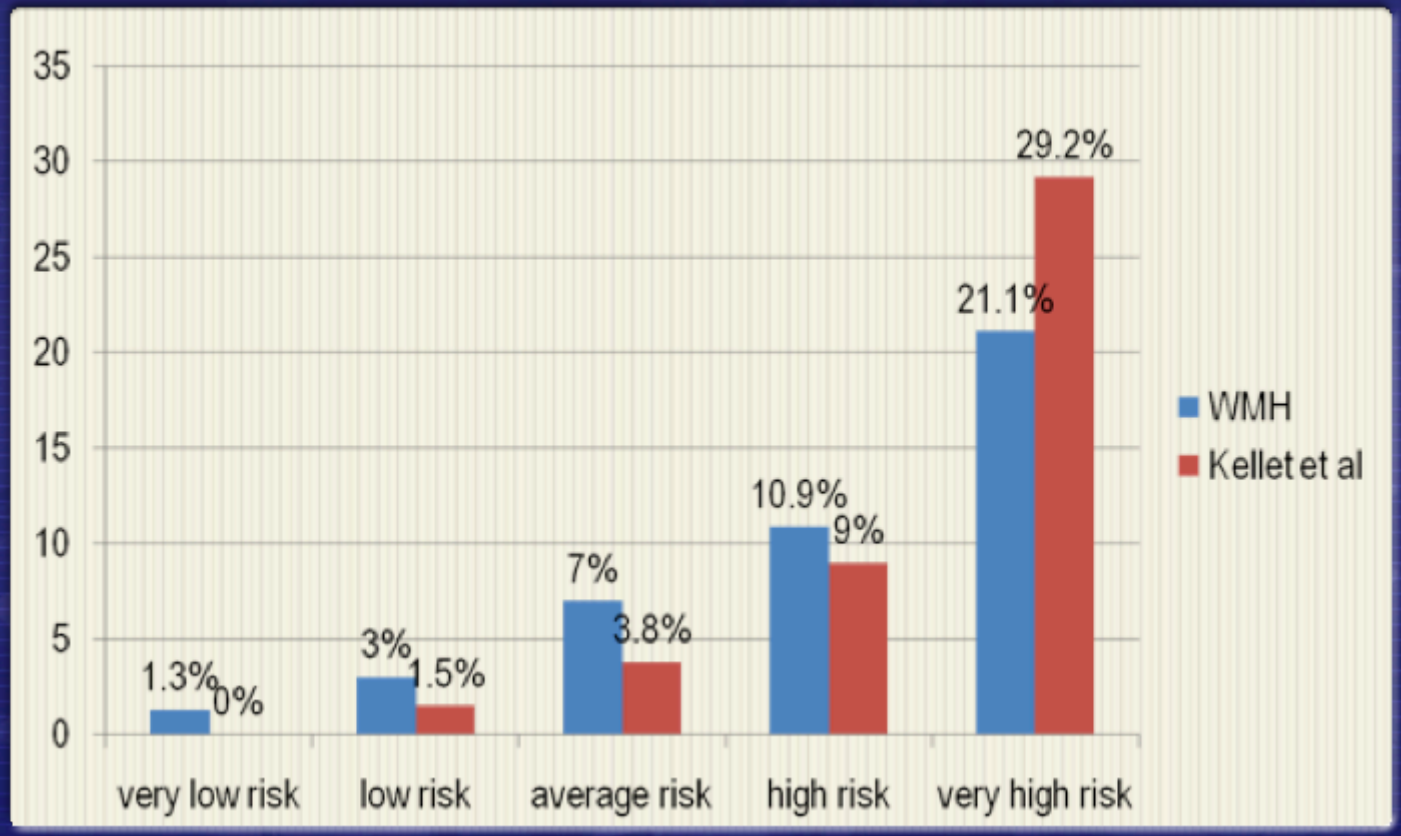
- Why compare?
- Seeing same patients?
- Doing same things?
- RRS: Are they rapid & Do they respond?

Benchmarking: Does it matter?

Simple Clinical Score

		Independent Predictors	*Points*
A'	**Age**	>75	4
		>=50 men and >=55 for women and <=75	2
A	**Airway**	Coma (responds only to pain or unresponsive)	4
		Oxygen saturation <90%	2
		Oxygen saturation >=90% and <95%	1
B	**Breathing**	Respiratory rate >30/min	2
		Respiratory rate >20/min and <=30/min	1
		Breathlessness – complaining of	1
C	**Circulation**	Systolic blood pressure <=70 mmHg	4
		Systolic blood pressure >70 mmHg and <=80 mmHg	3
		Systolic blood pressure >80 mmHg and <=100 mmHg	2
		Pulse > systolic blood pressure	2
D	**Disability**	Stroke – new presentation	3
		Altered mental status >=50 (not intoxicated) *	2
		Unable to stand unaided or Nursing Home resident	2
		Prior illness – some part of daytime in bed	2
		Diabetes (Type I or II)	1
E	**ECG**	Abnormal ECG (does not include brady or tachycardia)	2
F	**Fever**	Temperature <35°C or >= 39°C	2

Simple Clinical Score



Score-2-Door time©

- Is your RRS “rapid” -

Door to Needle

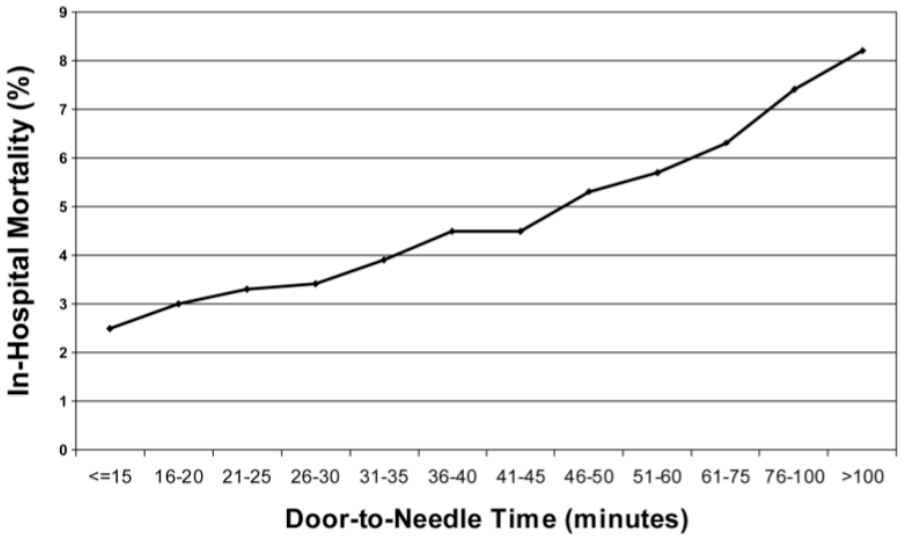


Figure 2.
Door-to-needle time and in-hospital mortality for the entire cohort, p <0.001 for trend.

Door to Balloon

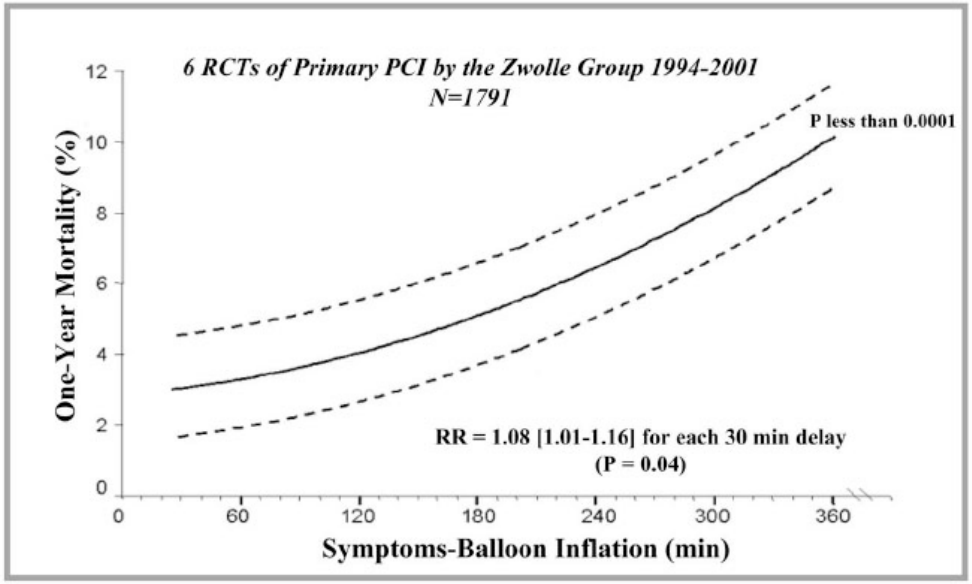
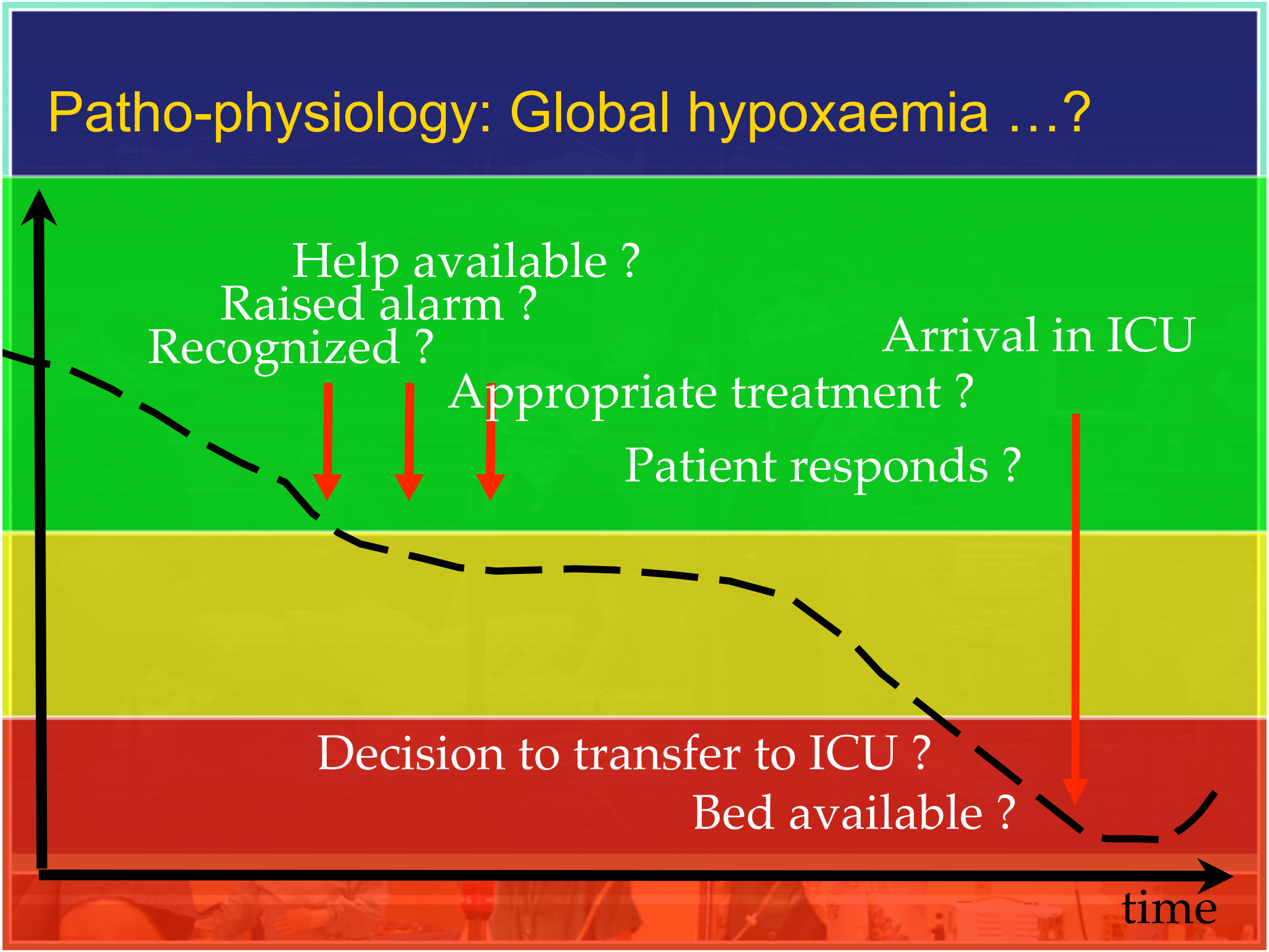
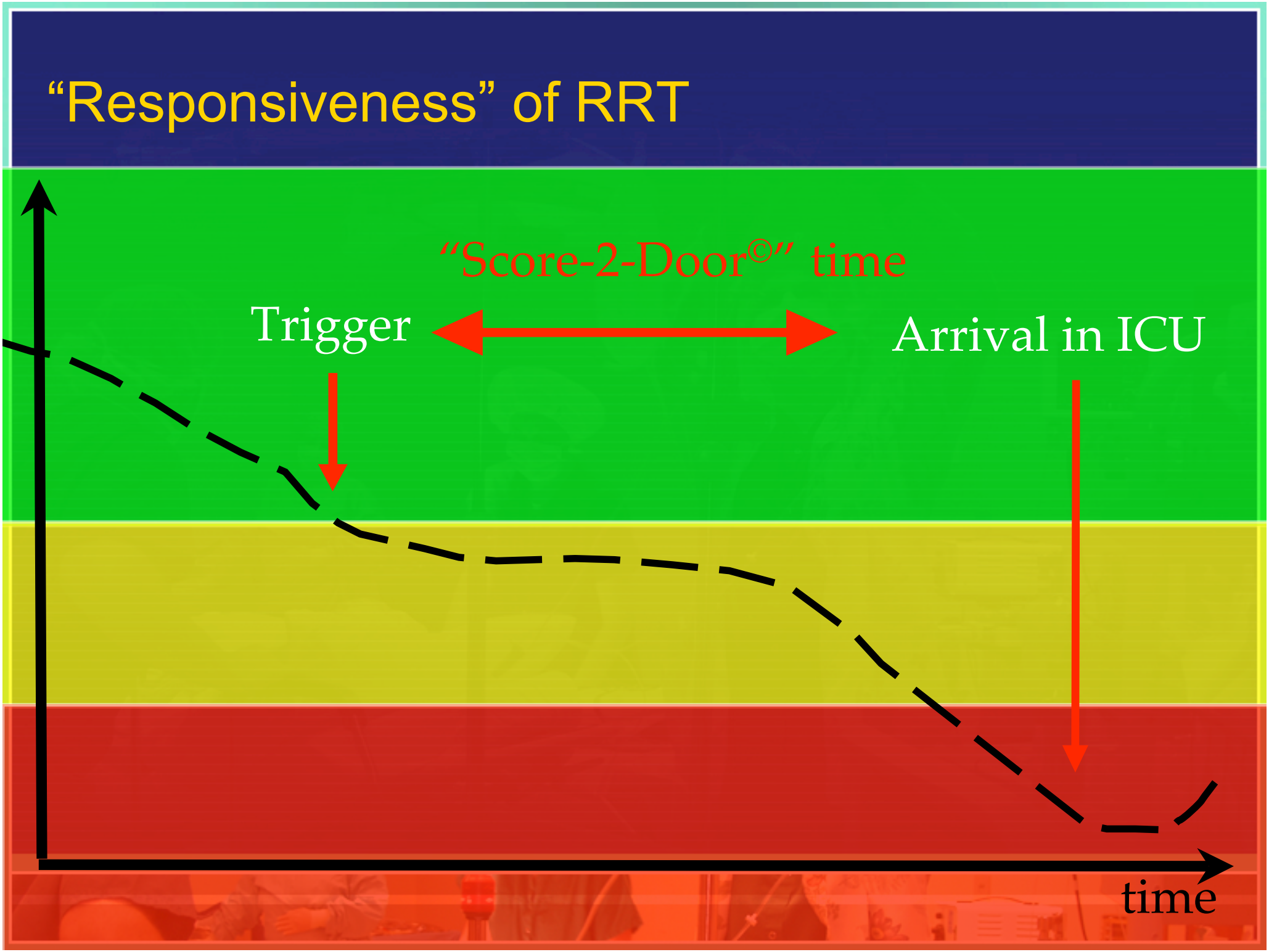


Figure 21. Symptom onset-balloon time and mortality in primary PCI for ST-elevation myocardial infarction. RCT = randomized controlled trial; PCI = percutaneous coronary intervention. The relationship between time-to-treatment and 1-year mortality, as continuous functions, was assessed using a quadratic regression model. The dotted lines represent 95% confidence intervals of the predicted mortality. Modified with permission from De Luca. Circulation 2004;109:1223-25 (275).

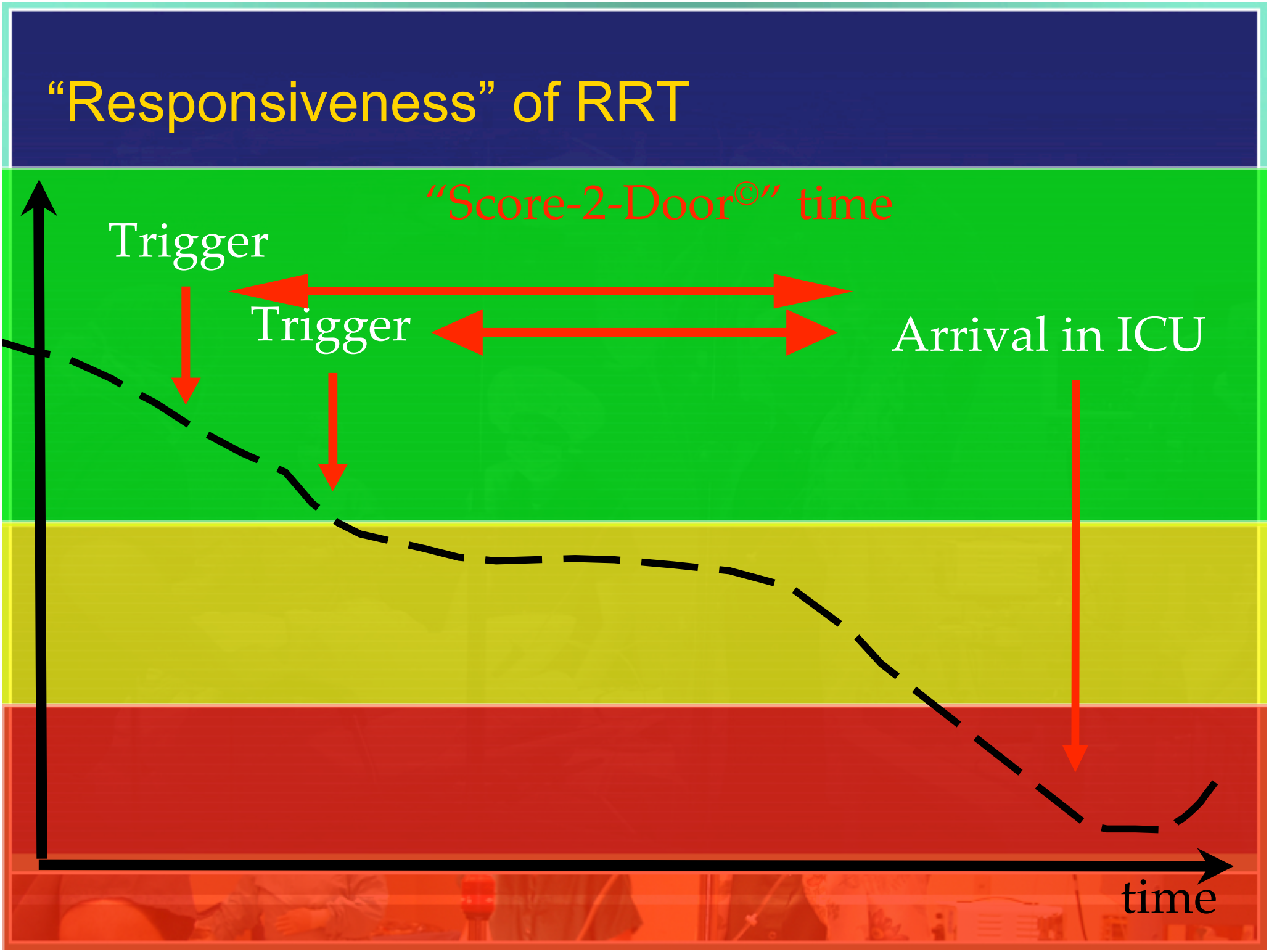
Patho-physiology: Global hypoxaemia …?



“Responsiveness” of RRT



“Responsiveness” of RRT



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REVIEW PAPER

Review and performance evaluation of aggregate weighted 'track and trigger' systems☆

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Table 5 Area under the receiver operator cu
CI) for the 31 track and trigger systems used
(with the outcome as hospital mortality) using
comes from 9987 medical assessment unit adm

No.	AWTTS	AUROC	95% CI
21	Bakir[73]	0.782	0.767–0
4	Subbe[79]	0.761	0.745–0
29	Subbe[22]	0.728	0.711–0
8	Subbe[70]	0.722	0.705–0
28	Duckitt[4]	0.721	0.701–0
17	Goldhill[35]	0.711	0.692–0
33	Von Lilienfeld-Toal[82]	0.702	0.683–0

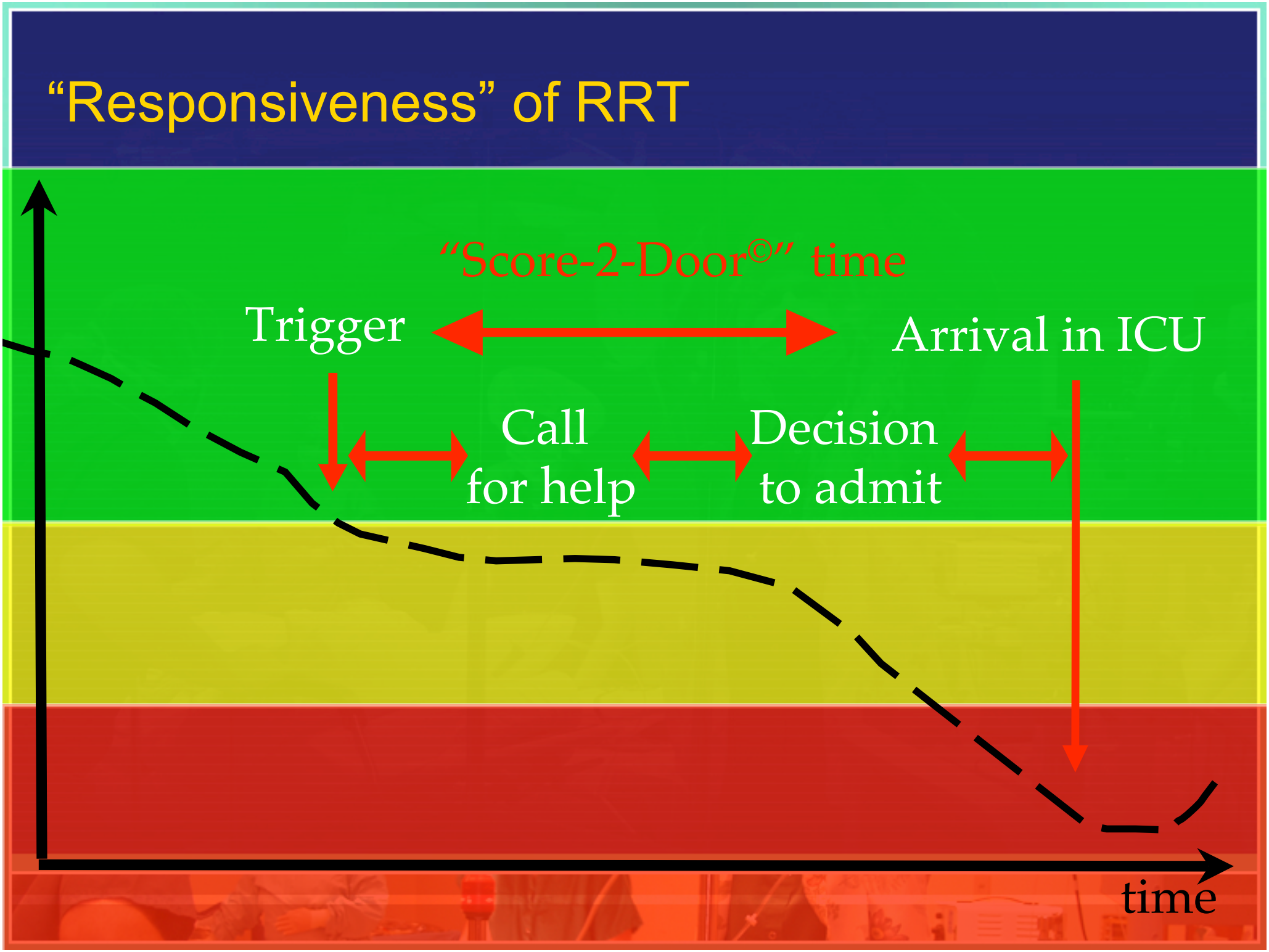
Towards a National Early Warning Score

	3	2	1	0	1	2	3
Pulse rate (bpm)	≤40		41-50	51-90	91-110	111-130	≥131
Breathing rate (bpm)	≤8		9-11	12-20		21-24	≥25
Temp °C	≤35.0		35.1-36.0	36.1-38.0	38.1-39.0	≥39.1	
Systolic BP mmHg	≤90	91-100	101-110	111-219			≥220
SaO_2 %	≤91	92-93	94-95	≥96			
Inspired O_2				Air		Any O_2	
CNS (use AVPU scale)				Alert (A)			Voice (V) Pain (P) Unresponsive (U)
[1]Confusion should not be charted in patients with previously documented dementia							

VitalPAC™ Early Warning Score

G Smith, personal communication

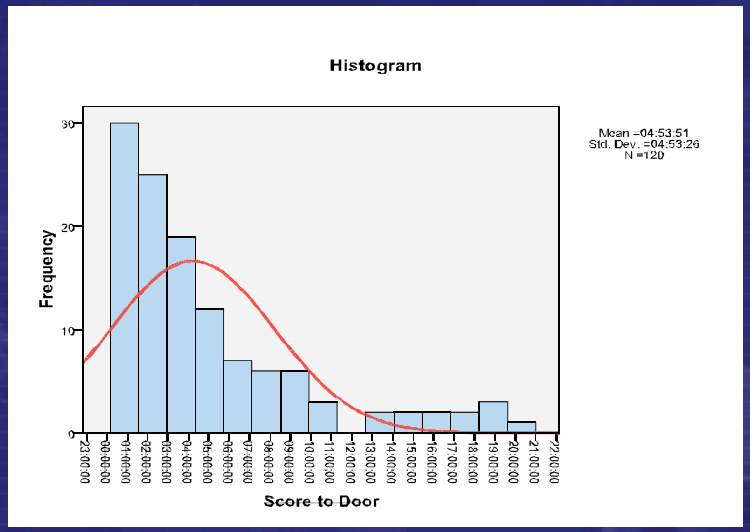
“Responsiveness” of RRT

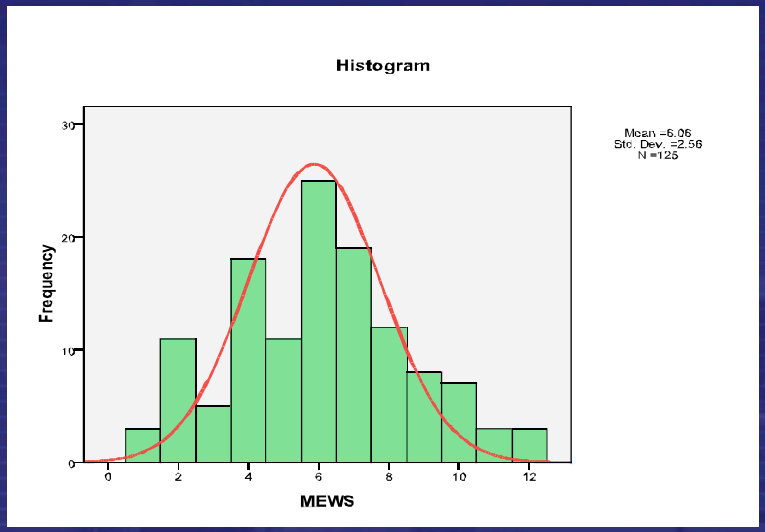


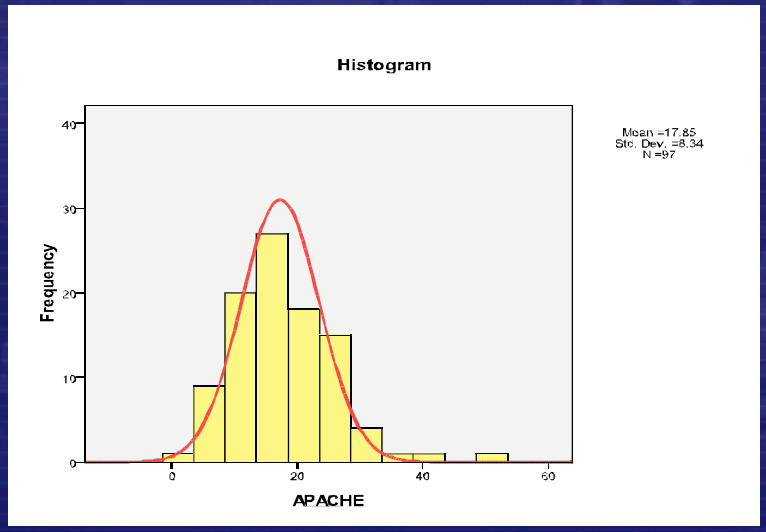
Score-2-Door © - A multicentre pilot

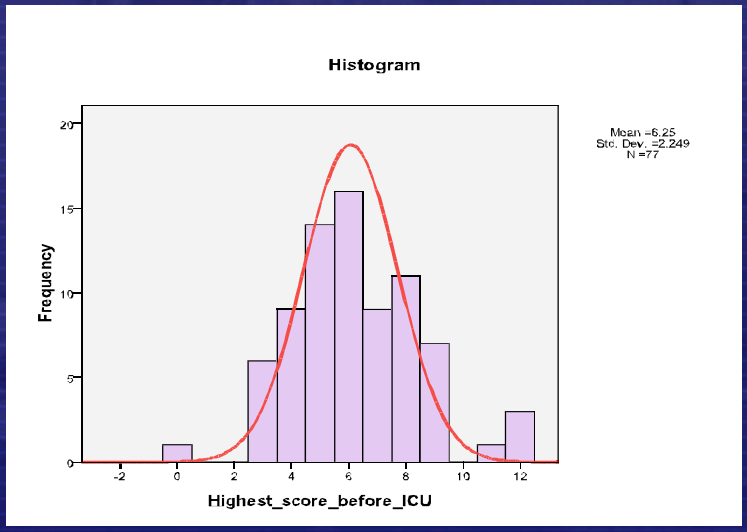
- Trigger
  - 1 set of observations
  - Date & time
- ICU admission
  - APACHE II & diagnosis
  - Date & time
- Others
  - Reasons for delay
  - Time of call to outreach
  - Worst score prior to admission

Score-2-Door ©: the first 125 patients …



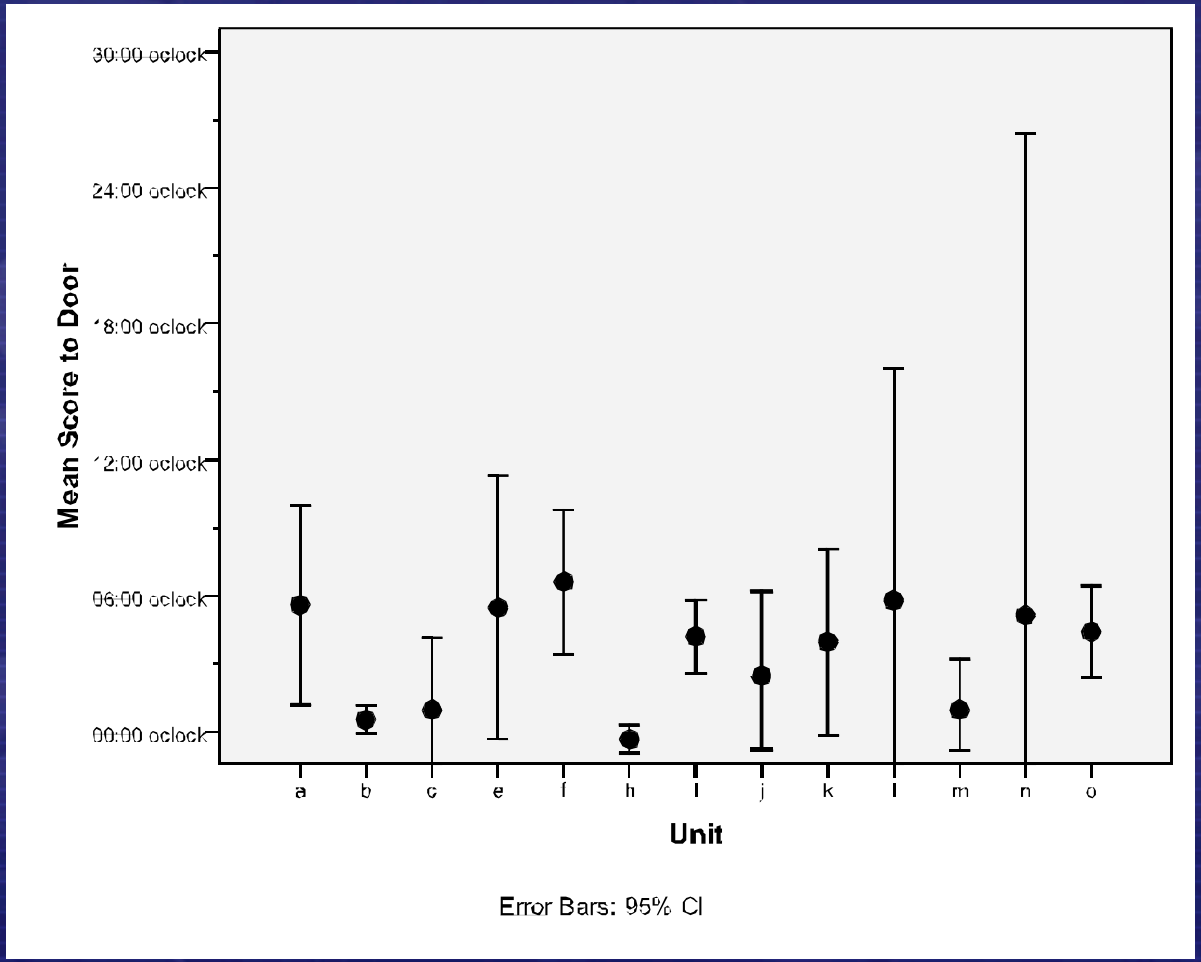




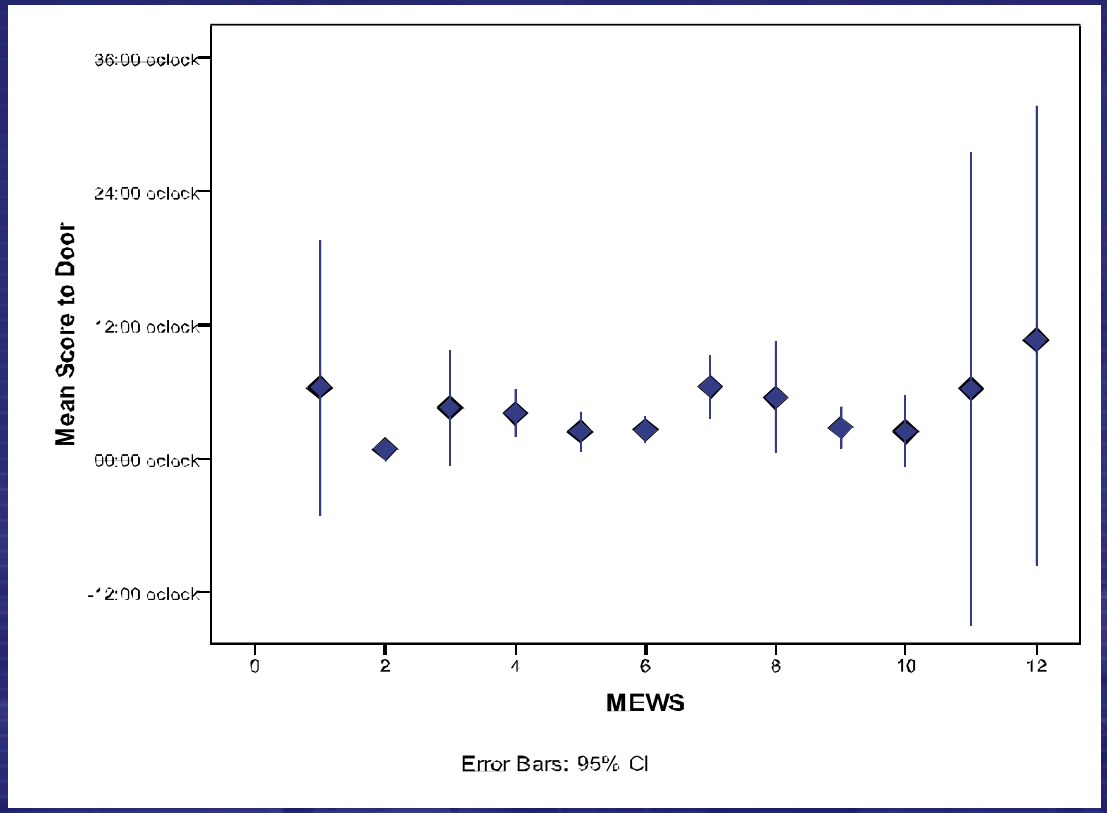


Multi-centre audit: Score-2-Door©

- UCL
- Barnet & Chase Farm
- North Cumbria University Hospital
- North-East CCNW
- Melbourne
- Sydney
- Copenhagen
- Paolo Alto
- Cardiff
- Merthyr Tydfil
- Rhyl
- Bangor
- Wrexham



MEWS vs Score-2-Door©



- Higher MEWS ≠ Lower S2D© !!

Reasons for delay of admission

- Procedures
  - “CT scan prior to transfer”
  - “Had to be intubated and stabilised on the ward first”
- Capacity
  - “No beds on ICU”
  - “Bed had to be freed up first on ICU”
- Senior supervision
  - “Senior review awaited”
  - “Consultant to consultant referral”

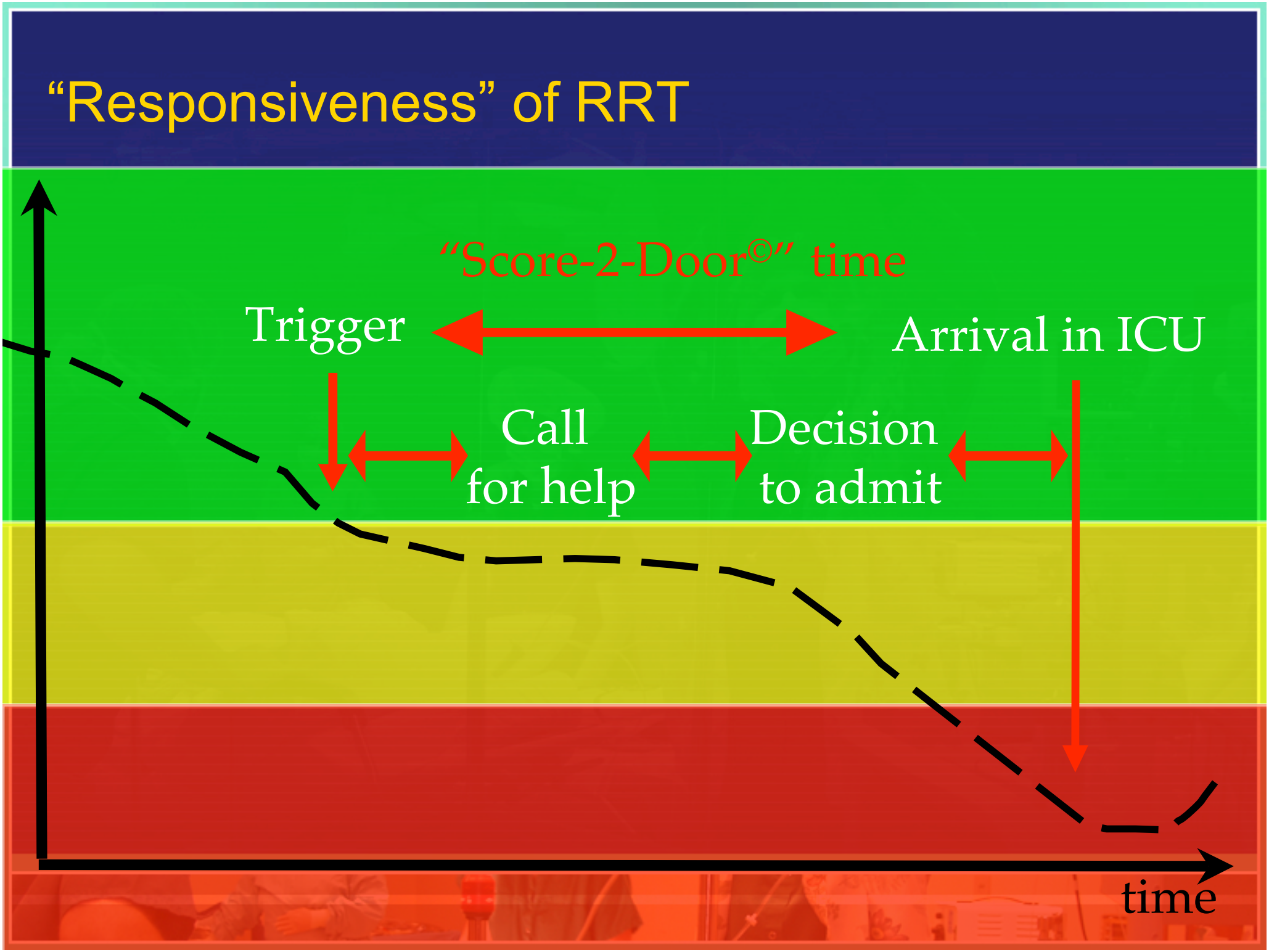
Reasons for delay of admission

- Rapid transfer 32
- Improved 4
- Treated on ward 9
- Procedure 12
- CPR 2
- No bed 11
- Senior review 14
- Others 15
- No data 26

Score-2-Door© time

- Responsiveness of whole system
- Comparison
  - over time?
  - with hospitals with similar calling criteria

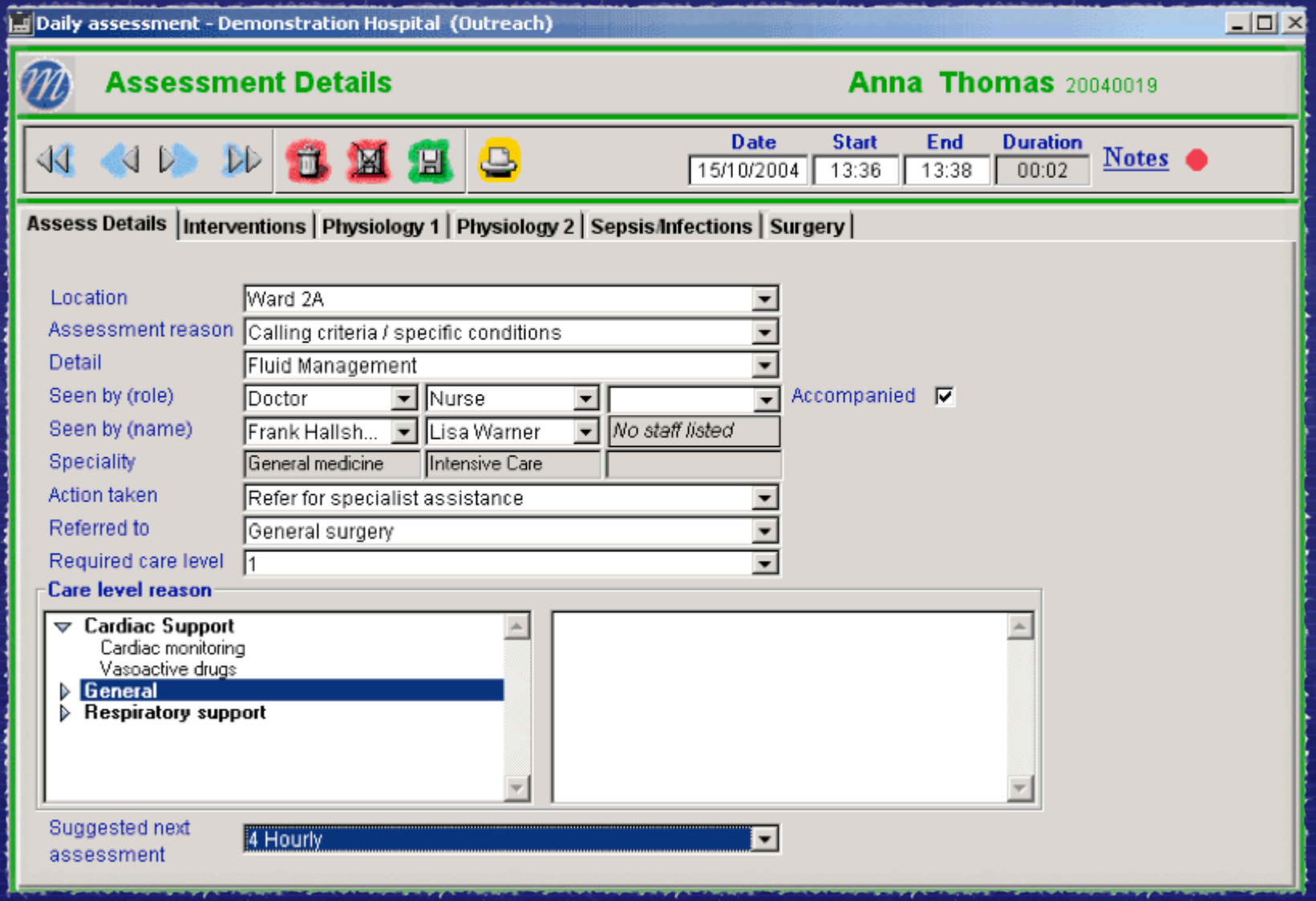
“Responsiveness” of RRT



Multidisciplinary Audit EvaLuating Outcomes of Rapid response (MAELOR)

- Is your RRT responding? -

Background


Daily assessment - Demonstration Hospital (Outreach)
Assessment Details
Anna Thomas 20040019
Date
Start
End
Duration
15/10/2004
13:36
13:38
00:02
Notes
Assess Details
Interventions
Physiology 1
Physiology 2
Sepsis/Infections
Surgery
Location
Ward 2A
Assessment reason
Calling criteria / specific conditions
Detail
Fluid Management
Seen by (role)
Doctor
Nurse
Accompanied
Seen by (name)
Frank Hallsh...
Lisa Warner
No staff listed
Speciality
General medicine
Intensive Care
Action taken
Refer for specialist assistance
Referred to
General surgery
Required care level
1
Care level reason
Cardiac Support
Cardiac monitoring
Vasoactive drugs
General
Respiratory support
Suggested next assessment
4 Hourly

Aim

- Development of tool for Clinical Outcomes
- Minimum time expense
- Best point in time for collection

- Potential problems: differences in …
  - Resources
  - Interventions

Methods

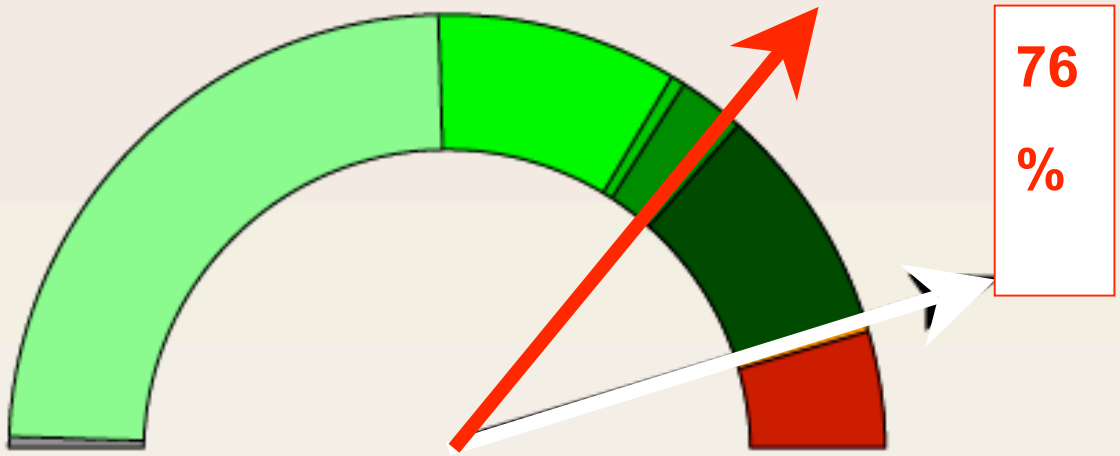
- Focus-Group
- Outcomes
  - collectively exhaustive &
  - mutually exclusive

- Pilot application
- Prospective data collection 10/52
- Pragmatic Follow-up for 7 days

Results: Outcomes

Outcomes	Positive	Negative
ICU admission	Timely admission S2D© < 4 hours	Delayed admission S2D© > 4 hours
Alive on Ward	No longer triggering	Still triggering
Deceased	Terminal Care & DNAR order	Cardio-Pulmonary Arrest
Others	Terminal Care & DNAR order New Pathology	Lost to Follow up

24 hour outcomes (n=146)



- Alive (no longer triggering)
- Alive and DNAR
- Died without cardiac arrest
- Admitted to ICU/HDU/theatre no more than 4 hours after PAR score recorded
- Alive (still triggering)
- Died with cardiac arrest
- Admitted to ICU/HDU/theatre more than 4 hours after PAR score A recorded
- Others: New trigger for unrelated problem or triggering due to chronic condition, but clinically stable or discharged
- Not known, lost to follow up

Results: Lessons learnt

- Collection during clinical duties

- Too many delayed admissions
- Prolonged triggering / adverse event small number
- Focus in one clinical area

Summary ...

Benchmarking Rapid Response Systems

- Do we need to compare our systems?
  - R&D: Risk stratified populations
- Back to the Roots: TIME DOES MATTER!
  - Score-2-Door©
  - ViEWS™ will facilitate comparison in the UK
- The Bottom line?
  - MAELOR© - tool
  - As simple as possible: targeting problem areas

Interested in collaborative Audit & Research?

Would you be happy to share and compare data?

E-mail: csubbe@hotmail.com

Thanks to Lesley Durham, John Welch & Liz Smith
for help in developing this talk