

# ePOD (early Predictor Of Deterioration)

January 25, 2016

# Thank You to Our Industry Partners

This Patient Safety Seminar is offered at no charge thanks to funding from our National Coalition for Alarm Management Safety industry partners. The AAMI Foundation and its co-convening organizations appreciate their generosity. The AAMI Foundation is managing all costs for the series. The seminar does not contain commercial content.

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# Speaker Introductions

- Kathy J. Simpson, BSN, RN – Director, Medical Emergency Team, Intermountain Medical Center
- Kathryn G. Kuttler, PhD - Director of Clinical, Quality and Research Medical Informatics, Homer Warner Center, Intermountain Healthcare
- R. Scott Evans, MS, PhD - Medical Informatics Director, Intermountain Healthcare; Professor of Biomedical Informatics, University of Utah

# Disclosures

- Kathy Simpson: None
- Kathryn Kuttler: None
- Scott Evans: None

# Initial Collaborators/Developers

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- Alden Tanner, RN
- Chelbi Wilde, RN
- Jeff Moore
- James Lloyd

# ePOD Objectives

- Why we need help with early recognition
  - IHI Mortality Diagnostic
- How failure/delays in “rescue” of acute care patients affects their outcomes
- Why hospitals, as rapid response systems, need two limbs to be effective:
  - Afferent (recognition)
  - Efferent (response/treatment)
- ePOD algorithm and methods
- ePOD evaluation and conclusion

# IHI Mortality Diagnostic

“People die unnecessarily every single day in our hospitals. The goal is to respond to a “spark” before it becomes a forest fire.”

*2005 Institute for Healthcare Improvement*

	ICU Admission	No ICU Admission
Comfort Care	1 86/3175 3% (0-14%)	2 402/3175 13% (0-40%)
Non Comfort Care	3 1161/3175 37% (10-72%)	4 1526/3175 48% (18-76%)

*Aggregate Results for 64 US Hospitals*

# Box four should further be analyzed by asking if there were any...

- Failures in planning
  - Includes assessments, treatments, goals
- Failure to communicate
  - Patient-to-staff, staff-to-staff, staff-to-physician, etc.
- Failure to recognize a deteriorating patient

These three problems often lead to *Failure to Rescue*

(IHI 2005)



# Failure/Delays in Rescue

## what we know...

- Risk of death from in-hospital cardiac arrest is 50-90%
- “Unexpected” cardiac arrests usually preceded by 6-8 hours of instability (deterioration time)  
*Chest 1990; 98: 1388-92*
- Patients who are attended to within 30-60 minutes of physiologic deterioration have significantly lower mortality rates

*Crit Care Med 2008;36:634–6,  
2006;34:1589–96, N Engl J Med 2008;358:9–17*

# Delays in Rescue

*Mike Young et al*

Identified simple clinical predictors of rapid deterioration in patients on acute care units who may have benefited from prompt ICU admission

*JGIM 2003;18:77-83*

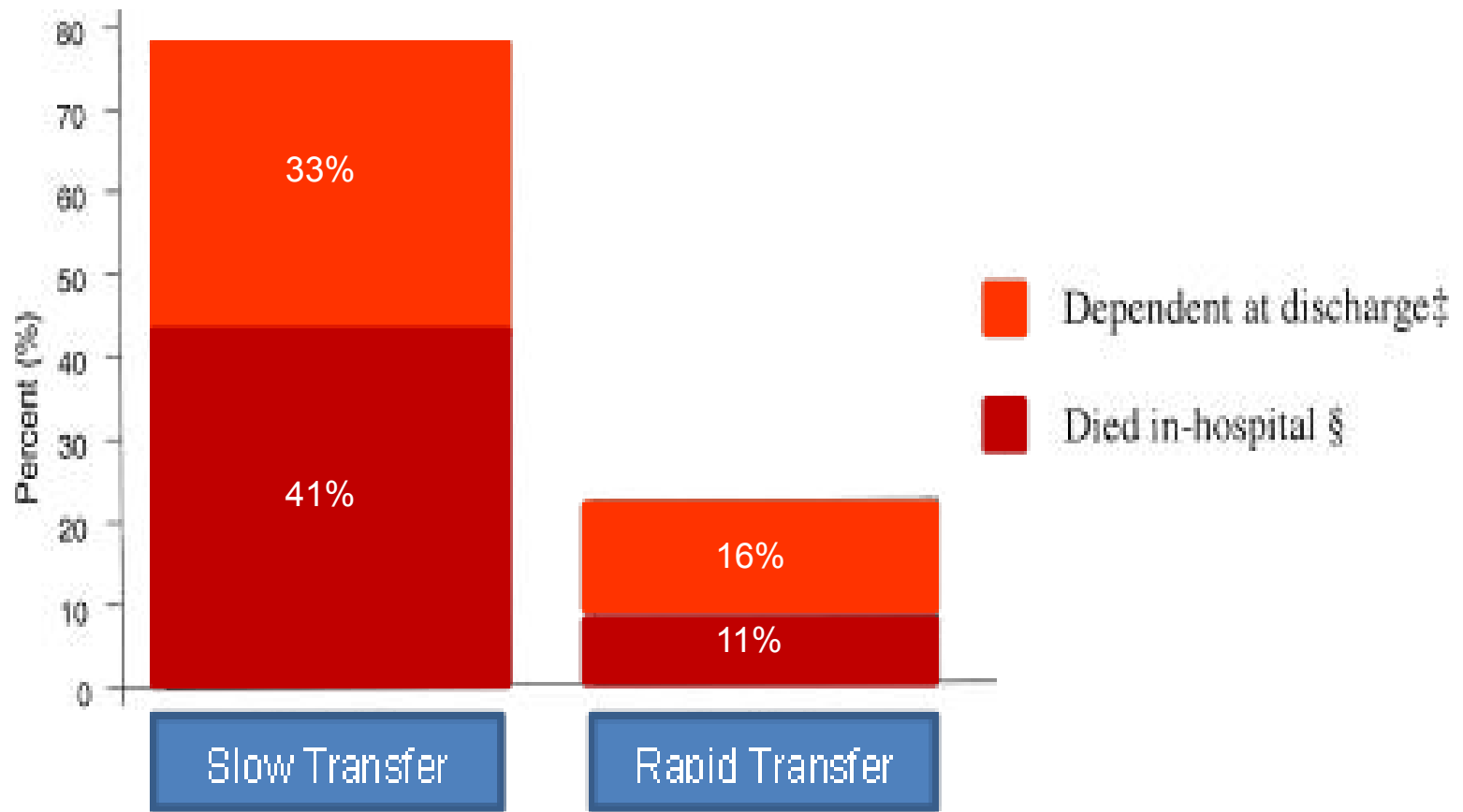
# Delays in Rescue (cont.)

- 91 consecutive non-cardiac inpatients
- Determined the time each patient first met a physiologic criterion (deterioration time)
- Categorized patients into “rapid” transfers ( $\leq 4$  hrs) and “slow” transfers ( $> 4$  hrs)
- At the time the first physiologic criterion was met on the acute care unit, groups were similar in terms of demographics, diagnosis, severity of illness and APACHE II scores

# Delays in Rescue (cont.)

- By the time they were admitted to the ICU, slow-transfer patients were far sicker than the rapid-transfer patients:
  - Significantly higher APACHE II scores (21.7 vs 16.2)
  - Four-fold higher risk of hospital mortality (41% vs 11%)
  - 60% higher total hospital costs (\$34k vs \$21k)

# Delays in Rescue affects ability to function independently at discharge



# Addressing Failure to Rescue

## Recognition and Treatment

To be effective, **hospitals**, as rapid response systems, must have two limbs:

- Afferent (recognition) **ePOD**
- Efferent (medical response/treatment) **RRT**

# Addressing Failure to Rescue (cont.)

## Recognition

The success of a Healthcare System's ability to prevent acute care codes and keep their patient's safe is directly tied to any given bedside clinician's:

- experience
- clinical judgment
- work environment
- ability to recognize deterioration

# Addressing Failure to Rescue (cont.)

## Recognition

- Because **we know** that half of patients who die on acute care units do so unexpectedly; many of them after prolonged deterioration
- Support bedside clinicians with a clinical algorithm that helps them recognize their patient's deterioration sooner...

**ePOD early Predictor Of Deterioration**



# ePOD

- Applies to acute care patients  $\geq 13$  years
- Exclusions: ED, ICU, OR/PACU, L&D, hospice/comfort care patients
- Six patient parameters analyzed and assigned a “score” each time new vitals are entered in the computer (EMR)
  - SBP, HR, RR, temp, change in oxygen requirements and neurological data
- When cumulative score is  $\geq 4$ , an alert is sent via text to a designated clinician on the unit (charge nurse), who further assess the patient with the bedside nurse
  - Emails or pages can be sent to other recipients as well (e.g. manager, educator, nursing supervisor, LIP)

# ePOD

	4	3	2	1	0	1	2	3	4
SBP	≤ 50	51 - 70	71 - 81	82 - 90	91 - 199		≥ 200		
HR	≤ 34	35 - 40		41 - 51	52 - 114	115 - 124	125 - 129	130 - 200	≥ 201
Temp					≤ 38.0	38.1 - 38.9	≥ 39.0		
RR	≤ 7	8 - 9			10 - 23	24 - 25	26 - 29	≥ 30	
O2						O2 increase by ≥ 3 LPM	Change from NC to mask		
Neuro AVPU:	Unresponsive	Responds to Pain		Responds to Voice	Alert		New agitation/confusion		
NAMDU							Moderate sedation	Deep sedation	unconscious



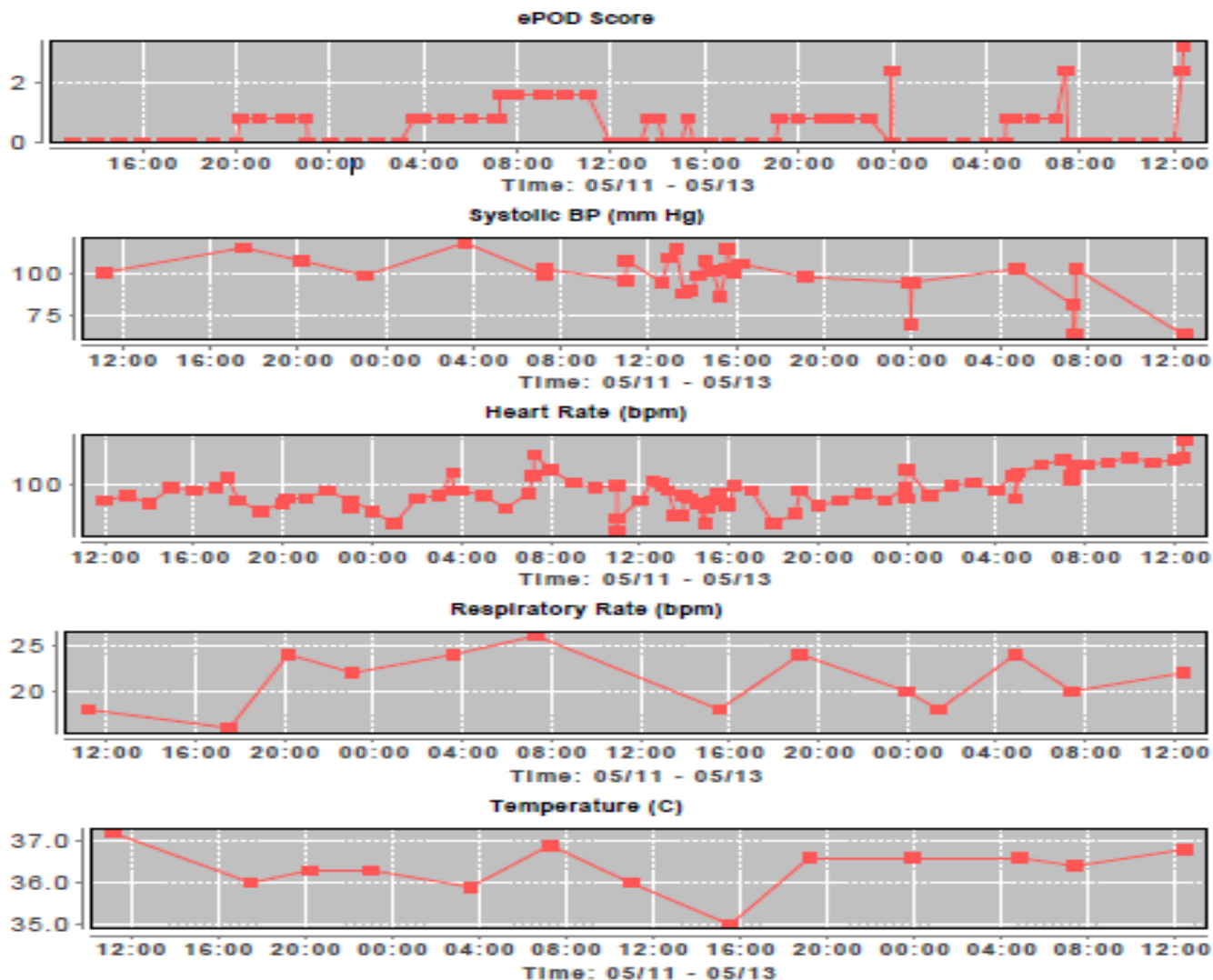
# EMR Graphs

- When the ePOD score reaches  $\geq 4$ , an alert is sent to bedside clinician who takes appropriate action:
  - Clinical interventions
  - May notify LIP/MD
  - Problem charting
- An icon in the EMR can be accessed to display 24 hours' worth of vital sign data in graphical form, assisting the clinician in identifying trends and deterioration

ePOD Alert: 4 Triggered at: 05/13/2015 12:25

SBP: 63, 05/13/2015 12:25, points: 3  
HR: 118, 05/13/2015 12:25, points: 1  
RR: 22, 05/13/2015 12:25, points: 0  
Temp: 36.8, 05/13/2015 12:25, points: 0  
O2 LPM: . . , points: 0  
LOC: . . , points: 0

# EMR Graphs (HELP2)



# ePOD alerting methods

- Pager
- Cell Phone
- email
- Vocera – Audio & Text alert
- Spectralink

# Vocera/pager/cell alerts

Mar 12, 7:33 AM

(ePOD Alert) Room: T1307

Patient: 123456789

Advanced Directive found. POLST found.

SBP: 57

HR: 128

- Date and time is that of the page/text, not alert
- Only displays values with points
- Vocera only says/texts “ePOD alert” and room #

# ePOD email alert

Room: T111 Patient: 098765432 Name: XTEST, SAM H  
Age: 79Y Gender: M Admit Diagnosis: PYELONEPHRITIS  
Height: 160 cm Weight: 72 kg BSA: 1.83 sqm BMI: 24.9  
Advance Directive found: 02/07/15 00:31

## ePOD Alert

ePOD (early Predictor Of Deterioration): 7 Triggered at: 02/09/15 15:51

SBP: 51, 02/09/2015 15:39, Points: 3

HR: 119, 02/09/2015 14:10, Points: 0

RR: 14, 02/09/2015 14:05, Points: 0

Temp: 0, --/--/----- --:-- , Points: 0

O2 LPM: --/--/----- --:-- , Points: 0

LOC (unresponsive): 02/09/2015 15:51, Points: 4

# ePOD Study

After a two year prospective study of ePOD, we found:

- Positive predictive value between 91-98%
- Significant increase in appropriate MET calls (60 vs 29,  $p = 0.0004$ )
- MD notified 44-90% of the time after receiving an alert
- Interventions occurred 52-72% of the time
- Significantly fewer patients died [84 (2.6%) vs 125 (3.7%),  $p = 0.022$ ] (MET deterioration time affected)

*Automated detection of physiologic deterioration in hospitalized patients Evans, Kuttler, Simpson et al*



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