Recipe for Early Recognition: Monitor Early Warning System MEWS

- Bellin Health
  - Presented by:
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      - Critical Care Clinical Nurse Specialist

Disclosures

- I have no conflicts of Interest
- I am not being sponsored by any commercial support other than the American Nurses Association
- I am not endorsed during my presentation by any product affiliation

Objectives

- Identify how data entered in the EMR can develop a recipe for an early warning tool identifying patient condition changes in real time.
- Develop key ingredients to design the MEWS to be automated and real time.
- Analyze the MEWS tool prevention data to provide decreasing code blues evens throughout the inpatient stay.
- Analyze the MEWS tool to effectively reduce sepsis mortality measures over a six month period.

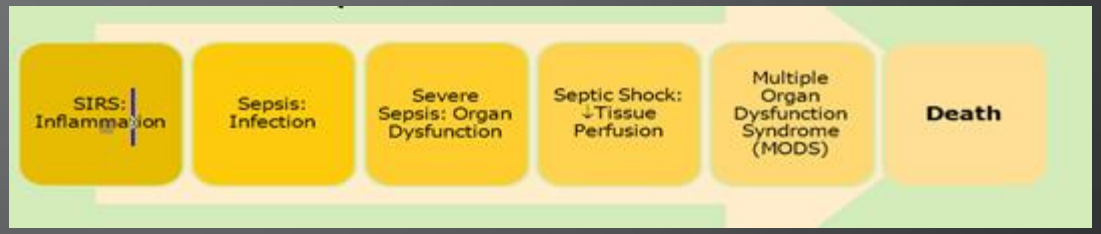
Clinical Nurse Specialist as change artist in EMR Implementation

1. *Credentialed Trainer of Physician Order Management (CPOM)*
2. *Zone Lead of Critical Care*
3. *Physician Redesign Team*
4. *Blazing the Trail*
5. *Clinical Informatics*

Background

What triggered this study?

- This year Leapfrog gave Bellin a "B" rating
- After reviewing our results we discovered:
  - Bellin has a higher risk adjusted death rate for surgical patients with "Severe Treatable" Conditions
  - We discovered that most of the patients died from severe sepsis
  - We decided to study these cases



Cascade can be insidious

What We Learned from the data?
Early recognition is a challenge

- Nursing
  - Rapid Response Team (SWAT) and Nursing Recognition
  - The time frame between 1st organ dysfunction and RRT notification was seen in 7 hours
  - Dysfunction of 3 organs occurred
  - No call was made to the Swat team on 2 patients
- Provider
  - The time frame between 1st organ dysfunction and Provider Notification was 5 hours
  - Patient deterioration could sneak up on a provider

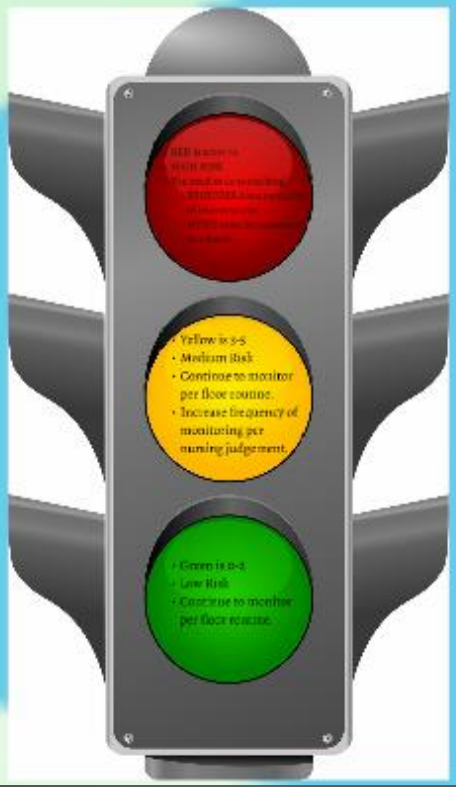
We needed HELP!!

- We searched for a tool to assist in:
  - Early recognition
  - Communicating Objective information to physicians.
- The decision support tool needed to meet the following characteristics
  - Automatically pulls in discrete data
  - Creates a severity of clinical illness score based on weighted discrete data
  - No duplication of data entry
  - Refreshes automatically
  - Provides a historical view
  - Alerts clinicians
  - Provides direction.

What is the MEWS

- Think of it as a Recipe to early recognition of patients potential to deteriorate.
  - There are 25 clinical triggers
  - The sicker the patient the higher the number added to the mix
  - The increase in comorbidities can increase the risks of mortality and the MEWS score
  - Real time configuration with interventions visible through a changing score.

What is the Mews: Automated Data Points

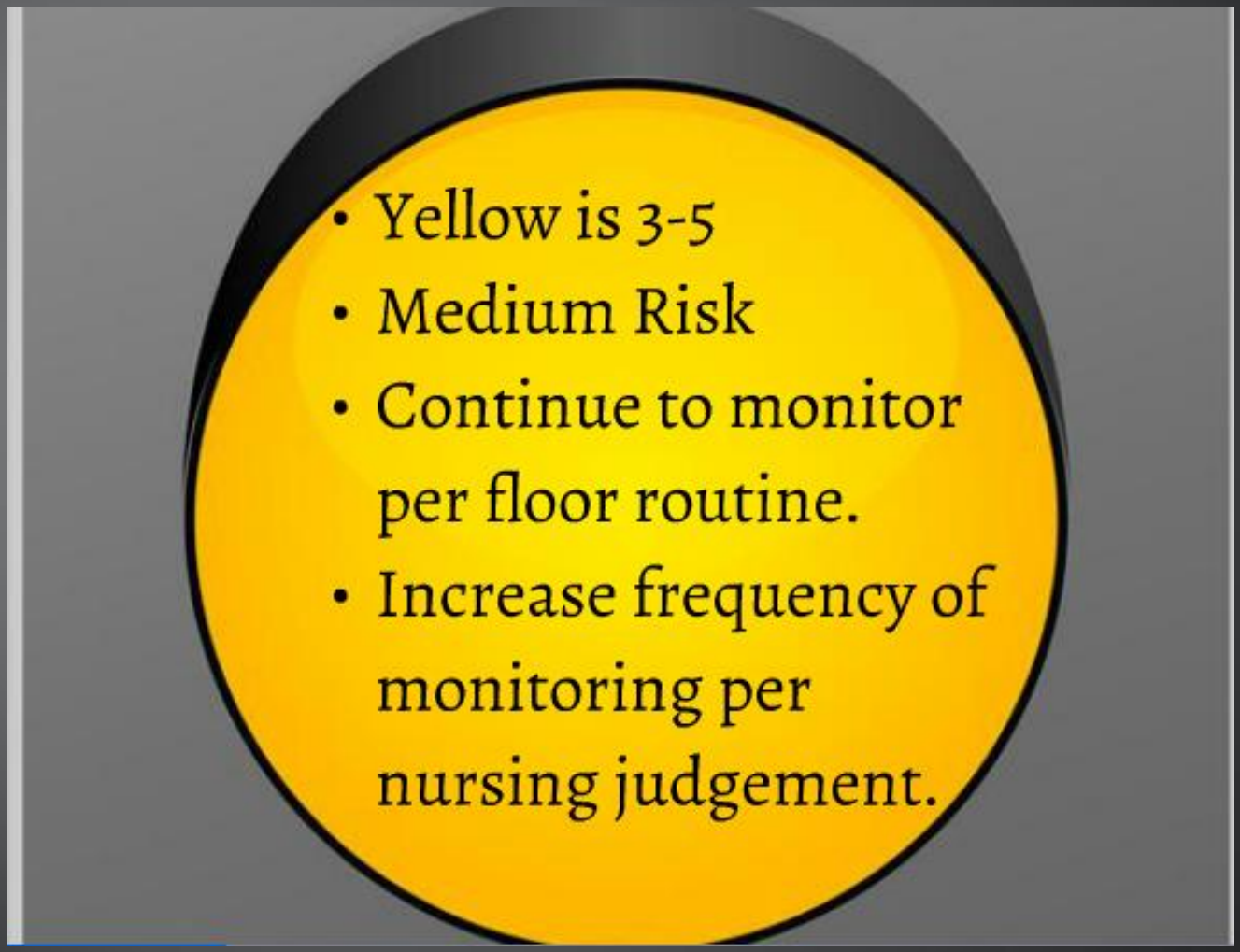


How it works...RISK SCORING

All the results (data) have points associated with each value and the values are totaled to produce a risk score.

Low Risk for Deterioration

Medium Risk for Deterioration



High Risk for Deterioration

Risk Assessment for early warning	No risk	Med risk	High risk	Extra Scoring Values
Pulse Brady Tachy	56-110 90-110	50-55 111-120	**<49** 121->	
Systolic BP Hypo hyper	90-154	85-89 155-169	<84- 170>	< 84 make score 4
MAP	**65-80**	**64**-55	<54	6
Respiratory rate	14-24	11-13 25-30	<10 >31	Both should score 4
Temp cool hot	97.4-99.9	**96.6**-97.3 99.9-101	<96.5 101.1>	<96.5 score 4
End Tidal	35-45	28-34 46-54	**<27** >55	
SPO2	92-100	**89-91**	**<88**	
O2 Device	Nasal cannula 2-4 liters	Nasal Cannula > 5L	Non rebreather, venti mask Hiflow, **Ventilator**	Score 6
Urine Output	>120 cc in four hours	100-120 in four hours	<100 in four hours	Score 4
Blood Glucose	70-150	69-55 **>150-250**	<54 251>	4
LOC	Alert all others	Lethargic, agitated, anxious, sleepy, confused	Obtunded, comatose, unresponsive, **Combative**	Score 6
Labs				
WBC	3.8-10.0	1.5-3.8 11.0-16.5	<1.4 16.6>	4
Bands			>10%	4
Creatinine	0.5-1.5	1.6-2.5	>2.5	4
Bilirubin	0-1.8	1.9-2.1	2.2>	4
Plt	150-450	100-149	<100	4
Lactate	0	**0.1**-2.0	>2.1	6
INR	**0-1.9**	2.0-3.0	>3.1	4
Potassium	**3.8-5.2**	**3.0-3.7**	<2.9	4
		5.3-5.7	>5.8	
HGB	>9.0	7.9-9.0	<7.9	4
Pain Score	0-5	5-8	>8	
RASS	+1, 0, -1	+2, -2	➢ +3, -3	
Aldrete	8-10	6-7	<5	

First Ingredient:

Vital Signs

Risk Assessment for early warning	No risk	Med risk	High risk	Extra Scoring Values
Pulse Brady Tachy	56-110 90-110	50-55 111-120	**<49** 121->	
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New Vital Sign Education:

MAP = Organ Perfusion

Monitors will calculate the Mean Arterial Pressure based on SBP and DBP.
Blood Pressure ALONE is not reliable to determine condition.

$$MAP = \frac{SBP + (2 \times DBP)}{3}$$

MAP = mean arterial pressure

SBP = systolic blood pressure

DBP = diastolic blood pressure

- MAP greater than 65 = Normal organ perfusion requirements
- MAP 64-55 = Organ not getting perfused enough.
- MAP 54 or less = Poor organ tissue perfusion.
  - Kidney not perfusing = decreased urine output
  - Brain not perfusing = Decreased LOC, anxiety.

Special Blend of Oxygen…

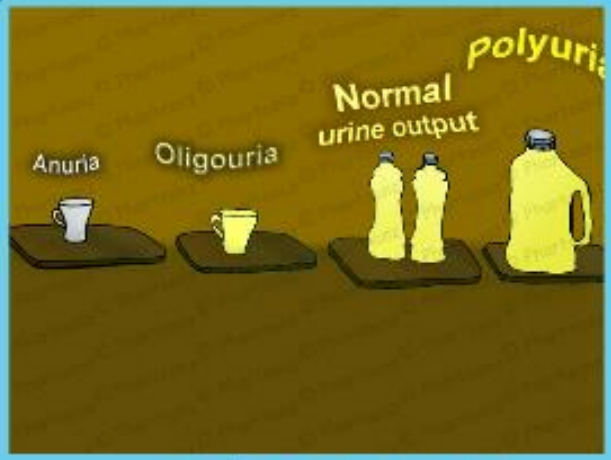
Oxygen Device

Green: Nasal Cannula 2-4 liters

Yellow: Nasal Cannula >5 liters

Red: Non-Rebreather Mask, Venti-mask,
Hi-Flow Nasal Cannula, or Ventilator

A dash of...



Urine Output

Green: >120 cc in 4 hours

Yellow: 100-120 cc in 4 hours

Red: <100 cc in 4 hours

Add a little sugar--just the right amount!

Blood Glucose

- Green 70-150
- Yellow 55-69

  >150-250
- Red <54

  >251

Mix in Level of Consciousness

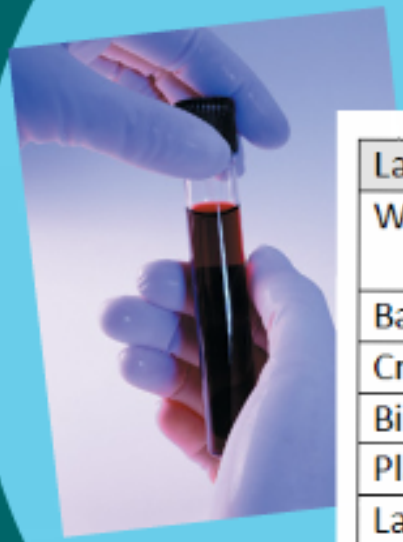
Green: Alert

Yellow: Lethargic
Agitated
Anxious
Sleepy
Confused

Red: Obtunded
Comatose
Unresponsive

LAB RESULTS

Pour in some lab results...



Labs

Labs			
WBC	3.8-10.0	1.5-3.8 11.0-16.5	<1.4 16.6>
Bands			>10%
Creatinine	0.5-1.5	1.6-2.5	>2.5
Bilirubin	0-1.8	1.9-2.1	2.2>
Platelet	150-450	100-149	<100
Lactate	0	0.1-2.0	>2.1
INR	0-1.9	2.0-3.0	>3.1
Potassium	3.8-5.2	3.0-3.7 5.3-5.7	<2.9 >5.8
Hemoglobin	>9.0	7.9-9.0	<7.9

ROLL in some Pain and Agitation...

Pain Scale

- Green: 0-5
- Yellow: 5-8
- Red: > 8

+4 Combative = Combative, violent, immediate danger to staff
+3 Very agitated = Pulls or removes tube(s) or catheter(s); aggressive
+2 Agitated = Frequent nonpurposeful movement, fights ventilator
+1 Restless = Anxious, apprehensive but movements are not aggressive or vigorous
0 Alert & calm
-1 Drowsy = Not fully alert, but has sustained awakening to voice (eye opening & contact > 10 sec)
-2 Light sedation = Briefly awakens to voice (eye opening & contact < sec)
-3 Moderate sedation = Movement or eye opening to voice (but no eye contact)
-4 Deep sedation = No response to voice, but movement or eye opening to physical stimulation
-5 Unrousable = No response to voice or physical stimulation

Sedation Scale

- Green +1-0-1
- Yellow -2 or +2
- Red -3 or +3 and greater

Where to find the MEWS

- Individual Nurse's Patient list
- SWATCH list
- OVER VIEW
- STATUS Boards

The MEWS at work on Patient List

Room	MEWS	MEWS Score Changed	Code St	Problem	Admit Date	Allergies Last Reviewed	Hendrich Score Present?	PTA Meds Reviewed?	Adv Dir	Age
427	7	1 ↑	○	Cellulitis And Abscess Of Foot (Principal Prob)	5/30/14	05/30/14	●	●	Yes	86 year old
426	7	↓ 5		Sepsis	6/2/14	06/03/14	●	●	Yes	71 year old
264	7	=	○	Aortic Stenosis, Severe (Principal	6/3/14	06/02/14	●	●	Yes	90 year old

MEWS Score : 7 [Last reviewed: [redacted] at 06/09/14 1824] [Add/Edit comment]

6/6 started on ceftin po ep
6/8 recd 2uprbc for hgb 7.6
6/9 hgb improved, plan home health or hospice

La[redacted] on 06/09/14 at 1824

Systolic BP: 0 points (Down 4 points since last review) - [Last updated: 06/10/14 1423] [Add/Edit comment]

SPO2: 1 points - [Last updated: 06/10/14 1423] [Add/Edit comment]

WBC: 1 points (Up 1 points since last review) - [Last updated: 06/10/14 1423] [Add/Edit comment]

PLATELET: 0 points (Down 1 points since last review) - [Last updated: 06/10/14 1423] [Add/Edit comment]

INR: 4 points (Up 3 points since last review) - [Last updated: 06/10/14 1423] [Add/Edit comment]

Hemoglobin: 0 points (Down 1 points since last review) - [Last updated: 06/10/14 1423] [Add/Edit comment]

WBG: 1 points (Down 3 points since last review) - [Last updated: 06/10/14 1423] [Add/Edit comment]

Vital Signs

		12/18 0700 12/19 0659	12/19 0700 12/19 1407	Most Recent
Temp (°F)	97.9 96	97.6–97.9	96–96.6	96.6 (35.9)
Pulse	117 61	63–117	61–72	70
Resp	24 12	18–24	12–20	20
BP	154 115	115/66 –154/86	148/100	148/100
Arterial Line BP	150 133		133/70 –150/84	133/70
SpO2 (%)	97 90	90–97	93–96	96
MAP (mmHg)	119 83	83–114	119	119
ETCO2 (mm/Hg)	43 37		37–43	43

RASS Sedation Score

	Most Recent Value
RASS	-4

Link to Complex Hemodynamics

Link to Complex Hemodynamics

MEWS (>6 is high risk) See Side bar for Swat comments

ED to Hosp-Admission (Current) from 12/17/2015 in Bellin Hospital-Intensive Care

MEWS Score	**16**
Action Taken	**Continue to Monitor, Nursing interventions/medications**
SWAT Assessment Status	**Follow up**
SWAT Visit Reason	-- [respiratory status]
Outcome	**Patient remained on nursing unit**

Endocrine - Glucose (Up to last 8 results from past 24 hours)

Report

None

Endocrine (last 8 hours)

None

Diet Orders

First Filed Weight & Height (Admission)

	First Filed Value
Weight	**325 lb (147.419 kg)** Filed At 12/17/2015 0945
Weight Device	**Stated** Filed At 12/17/2015 0945

Intake/Output

	12/17 0700 12/18 0659	12/18 0700 12/19 0659	12/19 0700 12/20 0659
P.O.	690	920	
I.V. (mL/kg)	725 (4.8)		900 (5.9)
Blood	500	550	
Other			30
Total Intake (mL/kg)	**1915 (12.7)**	**1470 (9.7)**	**930 (6.1)**
Urine (mL/kg/hr)	1150	2075 (0.6)	265 (0.2)
Drains			85 (0.1)
Other			25 (0)
Total Output	**1150**	**2075**	**375**
Net	**+765**	**-605**	**+555**

Respiratory

Report

Blood Gases (Last 24 hours)

	12/19 1108
PH TEMP CORRECTED	7.31
PCO2 TEMP CORRECTED	48
PO2 TEMP CORRECTED	81
BICARBONATE, ARTERIAL	25
BASE EXCESS, ARTERIAL	-3
O2 SATURATION	95

Respiratory Data

	12/19 1100	Most Recent
FiO2 (%)	70	70
SpO2 (%)	93	96
Peep (cm H2O) (cm)		10
Resp Rate (Set)		20
Vt (Set, mL) (mL)		400
O2 Device	Ventilator	Ventilator

Most Recent Weight & Height

	Most Recent Value
Weight	**334 lb (151.5 kg)** Filed At 12/19/2015 0356
Weight Device	**Standing** Filed At 12/19/2015 0356

Selected Labs (Up to last 2 results from past 72 hours)

	12/18 0254	12/18 1304	12/19 0407
SODIUM	138		
POTASSIUM	4.4		
CHLORIDE	106		
HEMATOCRIT	51.4		
HEMOGLOBIN	16.7		
CREATININE	1.05		
PROTIME INR		1.50	1.42
PLATELET COUNT	176		
	12/17 1003		
SODIUM	141		
POTASSIUM	4.7		
CHLORIDE	107		
HEMATOCRIT	56.5		
HEMOGLOBIN	18.0		
CREATININE	1.23		
PROTIME INR			
PLATELET COUNT	184		

Viral Screening

	Most Recent Value
In the last 21 days, has the patient been to an area high risk for Ebola?	**No**
Has the patient been near live or dead persons with Ebola?	**No**

Infectious Disease

Temp/WBC Trend (Since Date of Admission)

	12/17 0700 12/19 1407	24h Max
Temp (°F)	98 96	97.9 (36.6) 12/19 0300

Communicating the patients at high risk

MEWS (>6 is high risk) See Side bar for Swat comments

	Most Recent Value
MEWS Score	9
Action Taken	Continue to Monitor
SWAT Assessment Status	Follow up
SWAT Visit Reason	Heart rate < 40, SBP < 85, Uncontrolled pain, LOC change
Interventions	Suction, O2 per mask/nasal cannula, Place on telemetry
Outcome	Unplanned visit to ICU, Unplanned return to ICU, Patient transferred to OR

Status Boards

Real-time view of change in patient status.

Includes only necessary information.

- **Room Numbers**
- **Provider**
- **Assigned Staff**
- **MEWS**
- **Change in Score**
- **Code Status**
- ***Isolation Status**
- ***Fall Risk**
- ***Unacknowledged Orders**
- ***Transfer Status**
- ***Discharge Med Rec Complete?**

status board (43 Patients) Last refreshed: 1431 Search All My Lists

Location/Status	MD	Midleve Provide	RN	CNA Initials	Code St	MEWS	MEWS Score Change	Isolation Status	Fall Risk	Transfe Med Rec Status	Unackn Orders	Discharge Med Rec Complete?
422-1	Al-Khali M			MELISS N		9	8	Droplet/Contact	Yes			
423-1	Mortara K			MELISS N		3	3		Yes			
424-1	Danowit H			MELISS N		9	1	Droplet/Contact	Yes			
425-1	Mortara K			HEATHI B		5	5		Yes			
426-1	Danowit H					3	7	Contact Transmission	Yes			
427-1	Al-Khali M	TANYA J				9	1	Droplet Transmission	Yes			
NEURO TEAM-BMH	Swift, M			HEATHI B		11	3		Yes			

Scenarios

- Discharge patient with a score of 19 and Swat approach provider of potential for readmission
- Admission of 4 patients with two greater than 6 SWAT new how to prioritize the patients
- Admission on medical floor with MEWS at 20 and Nurses due diligence to care for her patient
- Earlier transfers in the ICU
- OPTIME directing patient care and staffing mix
  - GI lab ERCP
  - CSS
- Right care needs for the right expertise of the nurse

Closing GAPS

- Epic Tools
  - MEWS automated for SWAT March 1,2014
- Education Opportunities
  - MEWS educated to all staff starting April 1, 2014
- Goal Directed Order Sets
  - GO live April 1, 2014
  - ASAp and Stork Go Live October 2014
- Trial Patient Status boards
  - OB October, 2014
  - ER November, 2014
  - ICU Feb, 2015
- Add to OPTIME Status Boards
  - April 2015
- Build Historical View
  - Go live May 9, 2015

Multidisciplinary Team

Charge Nurses

1. Admission/Transfer/Discharge:
   - *Is this patient appropriate for admission to floor vs ICU?*
   - *Is patient appropriate for discharge?*
2. Staff assignments.
   - *Assign a balanced load.*
   - *Assign patients of high acuity to the right expertise of skills in nursing.*
3. Trend

Respiratory therapy:

1. Prioritizing patient assignments
2. Managing respiratory clinical triggers increasing mews
3. Awareness of patient progressive change

PT, OT, Speech Therapies

1. Awareness of a patient condition when compiling daily schedule
2. Quick reference on patient readiness for discharge

Discharge planning team

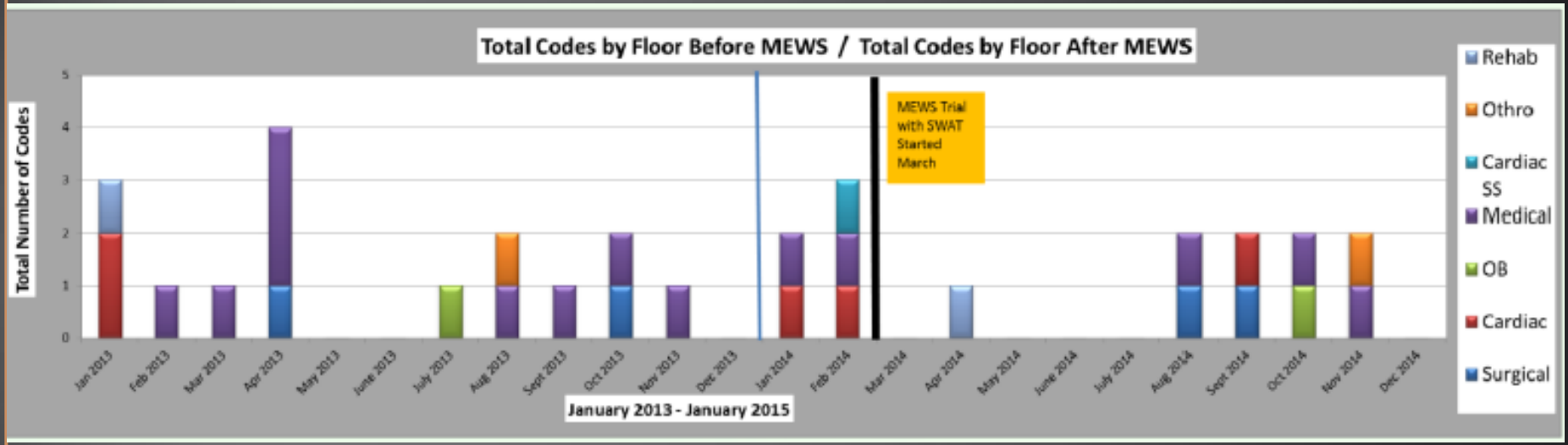
1. Evaluate readiness for transfer out of ICU or Discharge.
2. Planning awareness of patient decline or improvement in progress

Physicians-Providers

MEWS score assists:

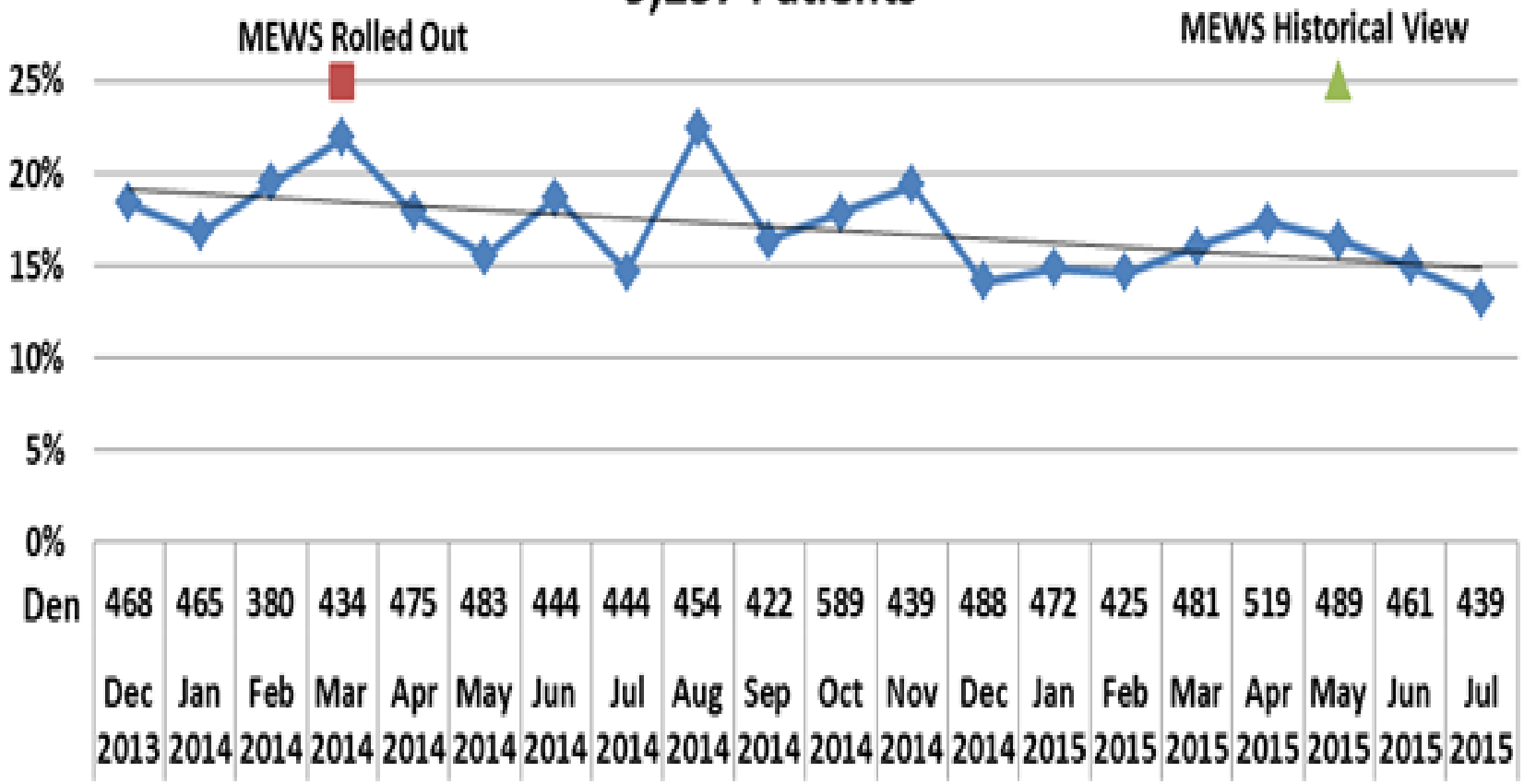
- **Prioritizing** patient's according to score.
- **Identify** components driving patient score (improve or decline).
- **Trending** patient score.

Data Results: Code Blue



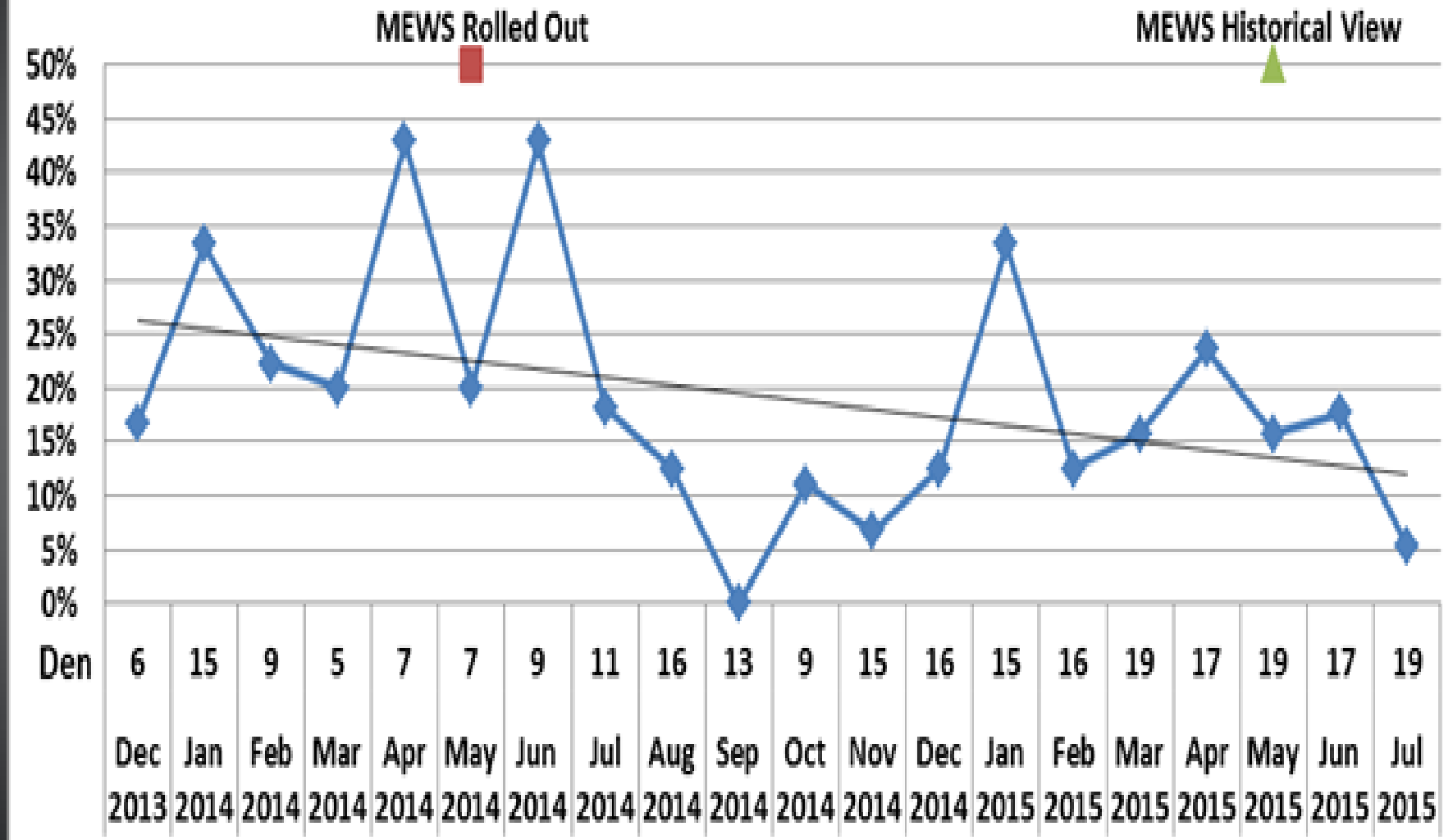
Rate of Unplanned ICU Visits

9,237 Patients



	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	Jun 2014	Jul 2014	Aug 2014	Sep 2014	Oct 2014	Nov 2014	Dec 2014	Jan 2015	Feb 2015	Mar 2015	Apr 2015	May 2015	Jun 2015	Jul 2015
Den	468	465	380	434	475	483	444	444	454	422	589	439	488	472	425	481	519	489	461	439

Severe Sepsis Hospital Mortality



Pediatric (PEWS)
Maternity (MEOWS)
Preoperative Risk Tool
Discharge Readiness Tool
Acuity System
Palliative-Terminally Ill

Summary

- ✔ Pulls in discrete data automatically
- ✔ Creates a severity of illness score based on weighted discrete data
- ✔ No duplication of data entry
- ✔ Refreshes automatically
- ✔ Provides direction
- ✔ Provides a historic view
- ✔ Alerts clinicians
- ✔ EMR Clinical Program

Disclaimer: MEWS is only a TOOL

- May not trigger a SCORE in some patients who are or becoming acutely ill
  1. Health-care professionals must remember this tool will not always identify when the patient is deteriorating
  2. Use MEWS to guide best practice
  3. Must use clinical judgment in conjunction
  4. MEWS TOOL is only as good as the data entered