Telemedicine Enhanced Neuro-ICU

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Telemedicine

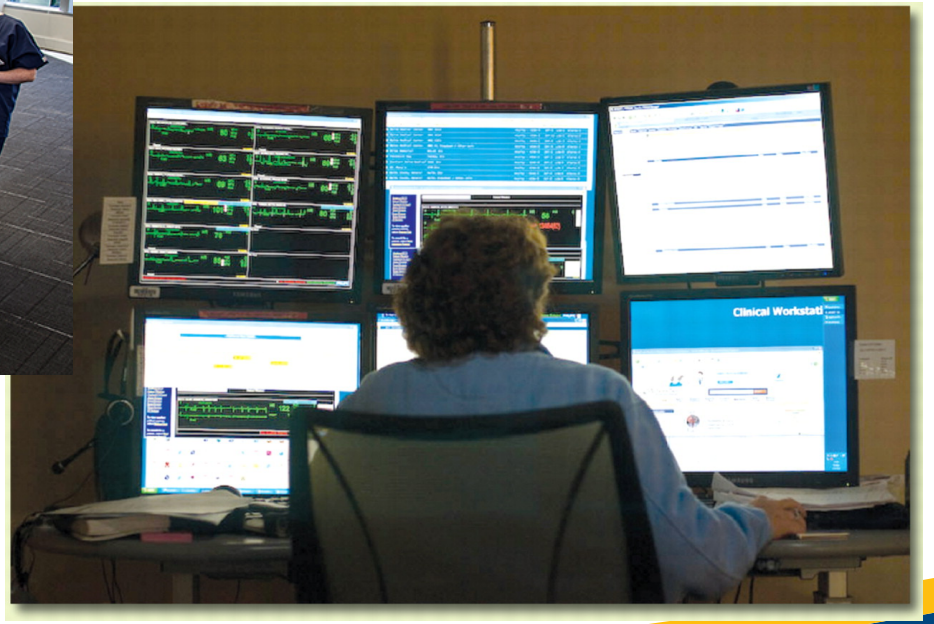
- “Two or more geographically separated health care providers collaborating via information technology to provide value added health care delivery”
- In Neurology most commonly used in assessment of acute stroke

Paul et al. Int J Health Tech Mgt 2000.

What is a Tele-ICU?

- Continuous monitoring of ICU patients
- Assess patients via video and access EHR
- Make management recommendations
- Tele-providers may be physicians, nurses or both

Paul et al. Int J Health Tech Mgt 2000.
Hoonaker et al. J Crit Care 2017



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sence Robotic

making it possible to be, in effect, in two places at once. From
d a Wi-Fi connection, the operator can use the robot to hear, talk, see
d a workplace far away. Early adopters include doctors, technology
robots range in size, features and price. Here is a sampling.

ions)	Tilr (RoboDynamics)	Texai (Willow Garage)	RP-7i (InTouch Health)	QB (Anybots)
	3'8" or 4'2"	5'2"	5'5"	2'6" to 6'0"
	2.4 m.p.h.	1.5 m.p.h.	2 m.p.h.	3.5 m.p.h.
	8" (touchscreen)	15"	15"	3.5"
	55 degrees	140 degrees	360 degrees	130 degrees
	500 kbps	500 kbps	600 kbps	500 kbps
	$10,000	Not available	Not available	$15,000

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Why Consider Tele-ICU?

- Shortage of intensivists
- Lack of nighttime in-house coverage
- Lack of specialty and sub-specialty care
- Difficulty staffing ICUs outside of urban/suburban areas
- Many patients can get proper care locally by intensivists using tele-tools

Paul et al. Int J Health Tech Mgt 2000. Hoonaker et al. J Crit Care 2017 . Fortis et al. Chest 2018.

Potential Tele-ICU Benefits

- Continuous, proactive monitoring leads to:
  - Improved patient safety and mortality
  - Increase rate of adherence to best practices
  - Improved timeliness of care
- Decreased length of stay
- Decreased hospital acquired conditions
- Improved resource utilization & decreased cost
- Improved patient, family and staff satisfaction

Becker et al. Curr Op Anaesth 2019.
Zawada et al. Postgrad Med. 2009.

Potential Pitfalls & Barriers to Implementation

- Decrease individual commitment and autonomy
- Create role ambiguity
- Concerns about impact on workload
- Create communication problems and conflicts
- Decrease trust
  - Apprehension about intrusiveness
  - Nursing perception about being spied upon
  - Difficult to build trust in the absence of face-to-face interactions

Becker et al. Curr Op Anaesth 2019. Zawada et al. Postgrad Med. 2009. Fortis et al. Chest 2018

Trust is a Major Factor

- In surveys of nurses in monitored ICUs:
  - 79% said it was important to be familiar with the tele-ICU physician
  - 61% were more likely to communicate with the tele-ICU physician if they personally knew them
  - 46% had never contacted the tele-ICU service with patient concerns
  - Only 44% routinely incorporated suggestions from the tele-ICU service

Mullin-Fortino et al, Am J Crit Care 2012

Tele-ICU in Severe Sepsis

- 2 large observational studies of 150,000+ patients with severe sepsis or septic shock
  - Local tele-ICU decreased inter-hospital transfer by ~40%
  - No change 30 day mortality of non-transferred
  - Increase in 30 day mortality of transferred patients
  - ED telemedicine increased transfers
- Up to 19% Neuro-ICU patients have severe sepsis

Colorado et al, Crit Care 2007
Ilko et al. Crit Care Med 2019
Fortis et al. Chest 2018

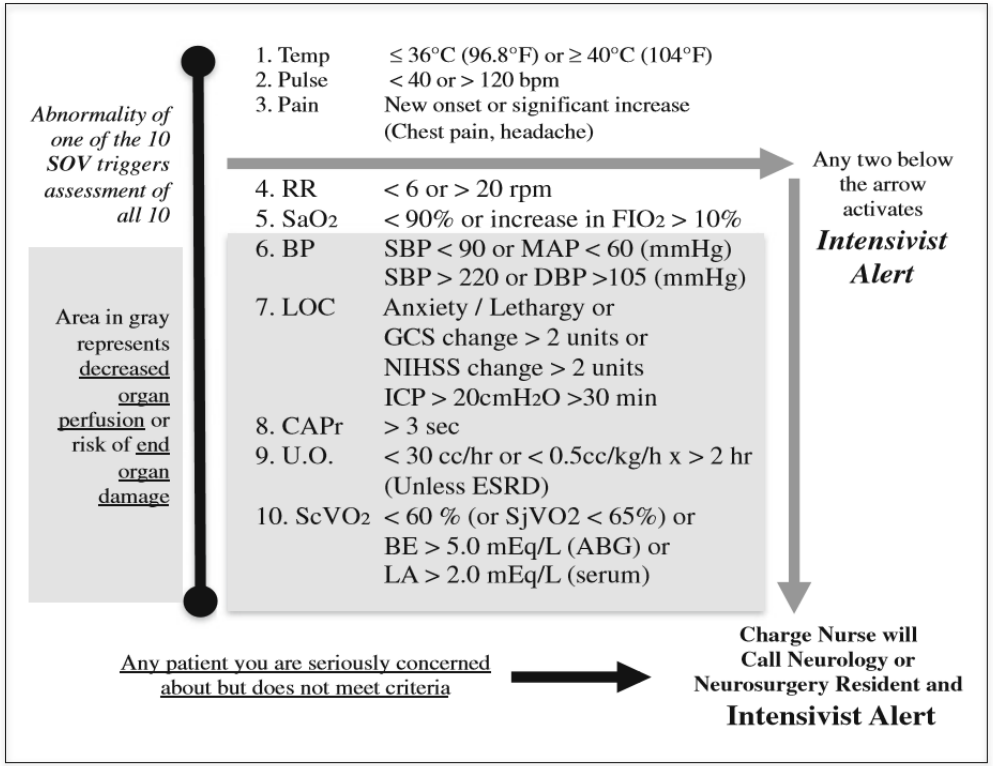
Tele-Neuro-ICU

- Implementation of a RTP (robotic tele-presence) Jefferson Hospital for Neurosciences 26 bed unit
- Prior to RTP: Neurointensivist in-house 7a-7p
  - CCRNs, Neurology and Neurosurgery residents in place 24/7
- With RTP: attending rounds daily and night
  - Also called for “Intensivist Alerts”

Rincon et al, NeuroCrit Care 2012

Activation Criteria / Intensivist Alert

10 Signs of Vitality (SOV)



Question	Disagree	Agree	No opinion	*p* value
Are the ICU physicians are sufficiently available to the ICU team?				
AM shift				
Pre-RTP protocol (%), *n* = 34	26	38	35	
Post-RTP protocol (%), *n* = 40	13	55	33	
Difference in proportion (%)	*14*	*17*	*3*	*0.089*
PM shift				
Pre-RTP protocol (%), *n* = 34	74	6	21	
Post-RTP protocol (%), *n* = 40	50	20	30	
Difference in proportion (%)	*24*	*14*	*9*	*0.008**
During patient care emergencies, is adequate physician involvement and support?				
AM shift				
Pre-RTP protocol (%), *n* = 34	21	44	35	
Post-RTP protocol (%), *n* = 40	5	65	30	
Difference in proportion (%)	*16*	*21*	*5*	*0.007**
PM shift				
Pre-RTP protocol (%), *n* = 34	62	24	15	
Post-RTP protocol (%), *n* = 40	35	35	30	
Difference in proportion (%)	*27*	*12*	*15*	*0.005**

What we've learned

- Tele-ICU decreases inter-hospital transfers
- Tele-ICU may improve timeliness and appropriateness of care
- Tele-ICU may improve cost of care
- Tele-ICU can lead to communication problems, conflict and lack of trust

Where are we going?

- RTP devices to better staff units 24/7
- Tele-ICU services to allow smaller hospitals to keep lower acuity neuro-ICU patients
  - ie. Post-tPA and smaller ICHs
- Potential to keep mid acuity patients at their local hospitals in some circumstances
- What amount of tele-health is reasonable?