Clinical and Financial Successes at Advocate Health Care Utilizing our Tele-ICU Program

April 30, 2016

Michael Ries, MD, MBA, FCCM, FCCP, FACP
Medical Director Adult Critical Care and eICU
Advocate Health Care

Cindy Welsh, RN, MBA, FACHE
VP for Critical Care and Medical Professional Affairs
Advocate Health Care
Objectives

• It is important to state the goals and define metrics to track whether your use of the tele-ICU is delivering added quality.

• Identify potential clinical improvements and cost savings that can result from successful application of the above tools.

• Then step back and reassess how you can use tele-ICU to further improve the quality of Critical Care at your ICU(s).
Tele-ICU at Advocate

ICU-Telemedicine is care provided to critically ill patients by off-site clinicians using audio, video, and electronic links to leverage technical, informational, and clinical resources.
eICU Workstation
Advocate Critical Care

- 10 hospitals / Five Level One Trauma Centers
- 16 ICUs
- > 6000 physicians / > 100 Intensivists
- Total = 393 beds
  - 296 Critical Care beds (plus three Outreach programs = 97 additional beds)
  - eMobile carts in the ED (N = 7)
  - Critical Access Hospital with eMobile cart
- > 24,000 ICU Admissions in 2014
  - Ventilator days: 29,706 on 6,419 cases
  - Total direct costs for days while the patients were treated in the ICU (excluding ED and OR costs) were approximately $200M or 17% of direct costs for inpatients
- eIntensivist and eRN coverage 24/7/365 with board certified critical care physicians
Transformation to Integrated Care

Population Management and Evidence-Based Standardization

Patient Centric Focus

Information Technology

Collaborative and Integrated Workflows
Benefits/ROI/VOI

- **Clinical**
  - Reduced mortality
  - LOS
  - Reduce adverse events
  - DVT
  - Sepsis Mortality
  - Ventilator days/VAP’s
  - CLABSI’s
  - Reduce Transfusions
  - Improve nutrition
  - Increase mobility

- **Financial**
  - Leapfrog compliant
  - Reduced costs (“avoid harm”, fewer complications, VAPs, ADE’s, sepsis, cost of 24/7 onsite intensivists....)
  - Reduced LOS
  - Increased Capacity
  - Reduce unnecessary tests, xrays
  - Reduce transfers to higher level facility

- **Other**
  - Standardize the delivery of ICU care (workflows and protocols)
  - Leverage scarcity of board-certified intensivists
  - Facilitate Data Reporting
  - Process Flow Variability (Gap) Solutions
  - Avoid sleep deprivation
  - Housestaff training and satisfaction
  - Nurse satisfaction
  - Support of less experienced RN’s
  - Patient/family satisfaction
  - Decrease burnout of clinicians
  - Extend Intensivist and critical care nurse career (most experienced)
Variance in Practice of Tele-ICU

- Technology
- Types of ICU’s
- Bedside intensivist staff model
- Bedside documentation/CPOE availability
- Remote center staffing patterns
- Qualifications of providers
- Hours of Operation
- Buy-in by bedside clinicians
- Adherence to best practices
- Use of quality and safety information
- Intensivist handover of their patients
- Community v. Tertiary Facility
- Teaching v. Non-teaching
What Does Tele-ICU do to Improve Quality?

- Disease Management
  - Acute interventions
  - Patient surveillance for proactive intervention
- “Population Management” – Best Practices
- System Engineering
- Support Individual Unit Special Needs – Process flow variability through “gap analysis”
- Education
  - Resident eRounds
  - Nurse Mentoring
What Does Tele-ICU do to Improve Quality?

- Disease Management
  - Acute interventions
  - Patient surveillance for proactive intervention
- “Population Management” – Best Practices
- System Engineering
- Support Individual Unit Special Needs – Process flow variability through “gap analysis”
- Education
  - Resident eRounds
  - Nurse Mentoring
What Acute Issues Does Tele-ICU Deal With?

- “First look” at all new admissions (seen within 30 minutes)
- Ventilator issues
- Arrhythmias, especially atrial fibrillation with rapid ventricular response
- Hypotension
- Electrolyte abnormalities
- X-ray checks requested by residents or nursing
- MD presence at code, RRT transfer, or before on-site MD arrival
- Adjustment of sedation
- Need for GI prophylaxis
- Ventilator liberation assistance
- Antibiotic stewardship
- Glucose management
What Does Tele-ICU do to Improve Quality?

• Disease Management
  - Acute interventions
  - Patient surveillance for proactive intervention
• “Population Management” – Best Practices
• System Engineering
• Support Individual Unit Special Needs – Process flow variability through “gap analysis”
• Education
  • - Resident eRounds
  • - Nurse Mentoring
“Population Management”

- VAPs prevention
- DVT prophylaxis
- CLABSI Prevention
- Sepsis screen
- Ventilator liberation
- Multidisciplinary Rounding Tool
- Sedation Management
- CPR Auditing
- eNutrition
- ePharmacy
- Palliative Care
- CAUTI Prevention
- Ventilator Induced Lung Injury (VILI)
## eICU Report Sheet

![eICU Report Sheet Image]

### 29 eNTerventions Logged in last 24hr, for Active Unit(s)

<table>
<thead>
<tr>
<th>Test</th>
<th>Patient Name</th>
<th>Age</th>
<th>Gender</th>
<th>Acuity</th>
<th>Admission Date</th>
<th>Admission Time</th>
<th>MRN</th>
<th>FIM</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST1</td>
<td>Test, David</td>
<td>78 M</td>
<td>M</td>
<td>65</td>
<td>08/03/13</td>
<td>12:01</td>
<td>123222</td>
<td>123211</td>
<td>Abdominal Pain, Hypotension, Shock, Heart Failure</td>
</tr>
<tr>
<td>TEST2</td>
<td>Test, Jim</td>
<td>64 M</td>
<td>M</td>
<td>65</td>
<td>08/03/13</td>
<td>12:04</td>
<td>333333</td>
<td>333333</td>
<td>Headache, Vomiting, Metastatic Breast Cancer</td>
</tr>
<tr>
<td>TEST3</td>
<td>Test, Mary</td>
<td>60 F</td>
<td>F</td>
<td>65</td>
<td>08/03/13</td>
<td>12:00</td>
<td>222222</td>
<td>222222</td>
<td>Respiratory Insufficiency, Hypertension</td>
</tr>
</tbody>
</table>

---

**Advocate Health Care**
Ventilator Associated Pneumonia (VAP) Bundle Assessment Screen
ICU VAP: Avoided Cost Trend

Cost (millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>VAP VDC</th>
<th>Avoided Cost</th>
<th>VAP Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>$2.8</td>
<td></td>
<td>101</td>
</tr>
<tr>
<td>2005</td>
<td>$0.7</td>
<td>$2.1</td>
<td>75</td>
</tr>
<tr>
<td>2006</td>
<td>$0.8</td>
<td>$2.0</td>
<td>30</td>
</tr>
<tr>
<td>2007</td>
<td>$0.4</td>
<td>$2.4</td>
<td>14</td>
</tr>
<tr>
<td>2008</td>
<td>$0.4</td>
<td>$2.4</td>
<td>13</td>
</tr>
<tr>
<td>2009</td>
<td>$0.2</td>
<td>$2.6</td>
<td>9</td>
</tr>
<tr>
<td>2010</td>
<td>$0.2</td>
<td>$2.6</td>
<td>8</td>
</tr>
<tr>
<td>2011</td>
<td>$0.3</td>
<td>$2.5</td>
<td>12</td>
</tr>
<tr>
<td>2012</td>
<td>$0.4</td>
<td>$2.4</td>
<td>14</td>
</tr>
<tr>
<td>2013</td>
<td>$0.5</td>
<td>$2.3</td>
<td>20</td>
</tr>
<tr>
<td>2014</td>
<td>$0.6</td>
<td>$2.2</td>
<td>22</td>
</tr>
</tbody>
</table>

*Bethany Hospital excluded from January 2007 forward
*BroMenn Medical Center included starting in 2010
*Sherman Hospital included starting in 2013
*Data represents Adult ICU units only
Sepsis Screening Tool

Hospital: TEST  Unit: TEST1  Bed: test2
Name: test. 2  MRN: 2222

- Patient has been transferred (Unable to be Screened)
- Pt. Septic > 24hr with no signs of a new infection

Admit Source: ED

1. Is the patient already on the Sepsis Protocol?
   - No

2. Is the patient’s history suggestive of a new infection?
   - Patient does not meet any of the following criteria suggestive of a new infection
   - Pneumonia / Empyema
   - UTI
   - Acute abdominal infection
   - Unknown Source
   - Meningitis
   - Skin / soft tissue inflammation
   - Bone / joint infection
   - Catheter or device infection
   - Endocarditis

3. Are any two of the following signs and/or symptoms of infection both present and new to the patient?
   - Patient does not have any of the following signs or symptoms
   - Temp > 38.3°C (101°F)
   - Temp < 36°C (96.8°F)
   - PaCO2 < 32 mm/Hg
   - Heart Rate > 90 bpm
   - Resp. Rate > 20 bpm
   - WBC < 4 or > 12 or > 10 % bands
   - Sysolic Blood Pressure < 90 mm/Hg
   - Lactate > 2.2 mmol/L
   - Creatinine > 2.0 mg/dl
   - On Vasopressors
   - Bilirubin > 2 mg/dl (34.2 mmol/L)
   - Platelet count < 100,000

Submit  Cancel
Sepsis Screening Tool (cont’d)
### CMS Sepsis Bundle Guidelines summarized

<table>
<thead>
<tr>
<th>IF Severe Sepsis or Septic Shock is present:</th>
<th>ONLY IF Septic Shock is present:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Within 3 hours of presentation</strong> of severe sepsis</td>
<td><strong>Within 3 hours of presentation</strong> of septic shock:</td>
</tr>
<tr>
<td>• Measure lactate level</td>
<td>• Resuscitation with 30 ml/kg crystalloid fluids</td>
</tr>
<tr>
<td>• Administer broad spectrum antibiotics</td>
<td><strong>Within 6 hours of presentation</strong> of septic shock:</td>
</tr>
<tr>
<td>• Blood cultures prior to antibiotics</td>
<td><strong>ONLY IF</strong> hypotension persists <strong>after</strong> fluid administration:</td>
</tr>
<tr>
<td><strong>Within 6 hours of presentation</strong> of severe sepsis</td>
<td>• Vasopressors</td>
</tr>
<tr>
<td>• Repeat lactate level measurement only if initial lactate level is elevated</td>
<td>• Repeat volume status and tissue perfusion assessment consisting of either:</td>
</tr>
<tr>
<td></td>
<td>• Focused exam including:</td>
</tr>
</tbody>
</table>

**All of the following:**
- Vital signs, AND
- **Cardiopulmonary exam, AND**
- Capillary refill evaluation, AND
- Peripheral pulse evaluation, AND
- Skin examination

**Any two of the following:**
- Central venous pressure measurement
- Central venous oxygen measurement
- Bedside Cardiovascular Ultrasound
- Passive Leg Raise or Fluid Challenge

---

**These five require Physician/APN/PA documentation**

**Passive Leg Raise requires Physician/APN/PA documentation**

500 ml over 15 min or 1000 ml over 30 min
Sepsis Hospital Mortality Index

Data reflected is subject to rounding
Data Source: APACHE IV, 1Q2015, 2Q2015, 3Q2015, 4Q2015
Target Index not benchmarked by Philips

Data Source: APACHE IV, 1Q2015, 2Q2015, 3Q2015, 4Q2015
Target Index not benchmarked by Philips
What Does Tele-ICU do to Improve Quality?

• Disease Management
  - Acute interventions
  - Patient surveillance for proactive intervention
• “Population Management” – Best Practices
• System Engineering
• Support Individual Unit Special Needs – Process flow variability through “gap analysis”
• Education
  • Resident eRounds
  • Nurse Mentoring
Final Target State Guiding Principles

• Improve Communication/Coordination
• Achieve System Standardization of Care but with site innovation
• Creating a Critical Care Team with a strong leader
• Documentation/Technology
• Integrate Services (e.g. Pharmacy, PT, Resp Therapy…)
• Enable the Clinical Staff to care for the patient
## KRA Target Overview and Weights

<table>
<thead>
<tr>
<th>Measure</th>
<th>Min</th>
<th>Target</th>
<th>Max</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU Ventilator Days Index</td>
<td>Baseline</td>
<td>Mid of Min/Max</td>
<td>90th</td>
<td>19.0%</td>
</tr>
<tr>
<td>CLABSI (ICU) SIR</td>
<td>50th</td>
<td>75th</td>
<td>90th</td>
<td>9.5%</td>
</tr>
<tr>
<td>CLABSI (non-ICU) SIR</td>
<td>50th</td>
<td>75th</td>
<td>90th</td>
<td>9.5%</td>
</tr>
<tr>
<td>Unassisted Fall Percentile Rank</td>
<td>50th</td>
<td>75th</td>
<td>90th</td>
<td>19.0%</td>
</tr>
<tr>
<td>Culture of Safety Survey Percentile</td>
<td>50th</td>
<td>75th</td>
<td>90th</td>
<td>10.0%</td>
</tr>
<tr>
<td>LOS</td>
<td>Moderate</td>
<td>Mid of Min/Max</td>
<td>Well</td>
<td>11.0%</td>
</tr>
<tr>
<td>CI PHO Score</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>11.0%</td>
</tr>
<tr>
<td>Readmissions Rate</td>
<td>50th</td>
<td>63rd</td>
<td>75th</td>
<td>11.0%</td>
</tr>
</tbody>
</table>

- Lower weight on duplicative measures
  - LOS and readmissions appear in both CI and AdvocateCare index
ICU Ventilator Days Ratio

APACHE® IVa Ventilator Days Ratio
2015 Q4 - ADVOCATE HEALTH CARE

(Hosp DC Yr & Qtr)

Advocate Health Care
ICU/Hospital LOS Ratio

APACHE® IVa ICU LOS Ratio
2015 Q4 - ADVOCATE HEALTH CARE

APACHE® IVa Hospital LOS Ratio
2015 Q4 - ADVOCATE HEALTH CARE
## 2015 Safety & Quality Accomplishments

<table>
<thead>
<tr>
<th>Area of Focus</th>
<th>Initiative</th>
<th>Financial Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>eICU®</td>
<td>Improvements in quality of patient care</td>
<td>23 ICU lives saved Decrease of 352 ICU days, resulting in savings of $305,382 Decrease of 331 ICU vent days, resulting in savings of $430,251</td>
</tr>
</tbody>
</table>
Multidisciplinary Round Checklist

MDR Sheet for Doe, J #563253 ICU Admission: 12/31/2014 01:00 PM

MDR - 12/31/2014

- Central Line: N/A
  - Type: (Blank)
  - Necessity: Yes/No
  - Insertion Date: 99 days
  - Indication: (Blank)

- Foley: N/A
  - Insertion Date: 99 days
  - Indication: (Blank)

- Glucose
  - Second value > 180
  - Value: (Blank)
  - Date/Time: (Blank)

- DVT: Prophylaxis in Place

- Vented: N/A
  - Analgesia receiving: Yes/No
  - Tidal Volume
  - GCS
  - ABGs
  - PEEP

- Nutrition
  - Fed within 48 hours of admission: Yes/No
  - NPO: Yes/No
  - TPN: (Blank)
  - Enteral Nutrition: (Blank)

- LET: Addressed

Advocate Health Care
ICU CLABSI: Avoided Cost Trend

- Bethany Hospital excluded from January 2007 forward
- BroMenn Medical Center included starting in 2010
- Sherman Hospital included starting in 2013
- Data represents Adult ICU units only

*CL VDC  Avoided Cost  Added Cost  CL Cases

Advocate Health Care
What Does Tele-ICU do to Improve Quality?

- Disease Management
  - Acute interventions
  - Patient surveillance for proactive intervention
- “Population Management” – Best Practices
- System Engineering
- Support Individual Unit Special Needs – Process flow variability through “gap analysis”
- Education
  - Resident eRounds
  - Nurse Mentoring
Collaboration with Individual Sites on Certain Processes

- Pneumonia Screening
- CPR Audit
- Central Line insertion bundle compliance
- DVT Intensity of Prophylaxis
- Foley catheter assessment
- Sedation Withdrawal
- Multidisciplinary Rounds
- ED Sepsis Management
- Resident Coverage/Nurse Mentoring
- eNutrition
- ED Boarders
An elderly patient arrived to the ED with severe shortness of breath and O2 sats in the 70’s. She refused intubation and was placed on BiPap. The decision was made to admit the patient and an ICU bed was requested. The ED was informed there were no beds available.

While the patient was boarding in the ED, she was not tolerating BiPap and was having runs of V-Tach. The ED physician intubated the patient. The intensivist discussed the case several times with the ED physician, but did not come down to see the patient.

Four hours later, the patient was still waiting for an ICU bed. She had continued runs of V-Tach and was given Mag and Amiodarone.
Patient Safety Story

- The patient continued to receive care in the ED, including an EKG. Sixteen hours after the initial bed request, the patient was assigned a bed and report called to the MICCU. A repeat EKG identified a possible STEMI. Serial troponins identified STEMI.

- Three hours later the patient was taken to the Cath Lab and clinically progressed and was then considered a poor candidate for a CABG. The patient was returned to the ICU. Care was withdrawn and the patient expired.
Corrective Action

Collaborate with eICU team to identify potential solutions

- 4 eICU carts
- Create workflow process
- Hand off process with ED physician, ED resident, ED RN, Intensivist and eICU MD
- First eICU service in an ED with a continuous workflow process
CMC ED eCareMobile Cart Data

Monthly eMobile Cart Count by Discharge to ICU vs Downgrade
CMC ED eCareMobile Cart Data
Cumulative February 2015 thru February 2016

ECC eMobile Cart Percent by Unit Discharge Location

- ICU, 66%
- Floor, 23%
- Step-Down Unit (SDU), 10%
- Other Hospital, 0%
- Home, 1%
- Death, 1%
What Does Tele-ICU do to Improve Quality?

- Disease Management
  - Acute interventions
  - Patient surveillance for proactive intervention
- “Population Management” – Best Practices
- System Engineering
- Support Individual Unit Special Needs – Process flow variability through “gap analysis”
- Education
  - Resident eRounds
  - Nurse Mentoring
Advocate eICU Mentorship Program

Need:

• Our sites identified that new RNs often feel under supported at the bedside and this program was developed to bridge the gap from novice to advanced beginner ICU RN

Results:

• To date (from 2012), 80 RNs have completed the program; 8 currently enrolled and 10 in pipeline
• Will be expanded to outreach partners and to two additional Advocate sites
• This program is utilized as part of the recruitment/retention strategy by our ICUs

Lessons Learned:

• Adapt the program based on feedback from each participant
• eRN staff requested additional education on mentor/precepting principles
• Adjust eRN schedule, for consistency in mentor, based on number of participants
• Instituted support pods in CORE to provide support to mentor/coach
Objectives

• It is important to state the goals and define metrics to track whether your use of the tele-ICU is delivering added quality.

• Identify potential clinical improvements and cost savings that can result from successful application of the above tools.

• Then step back and reassess how you can use tele-ICU to further improve the quality of Critical Care at your ICU(s).
Thank You!

Contact: Michael.Ries@Advocatehealth.com
Cindy.Welsh@Advocatehealth.com