Quality Improvement in the ICU: A Way Forward

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Multidisciplinary Epidemiology and Translational Research in Intensive Care, Emergency and Perioperative Medicine (METRIC)

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Disclosure

- Research support from NIH, CMS, Philips Research North America and Mayo Clinic
- IP rights for critical care related software tools
  - Mayo Clinic and I have Financial Conflict of Interest related to research findings and methods presented
  - This research has been reviewed by the Mayo Clinic Conflict of Interest Review Board and is being conducted in compliance with Mayo Clinic Conflict of interest Policies
  - AWARE is licensed to Ambient Clinical Analytics
- No other financial relationships with commercial companies and no other relevant disclosures
Objectives

Contrast the “bottom up” bedside QI interventions with frequently flawed “top down” approaches

Review quality improvement methodology

Outline novel solutions to QI challenges in the ICU
Determinants of ICU Outcomes

Critical care delivery
- ICU structure and processes

Patient preferences
- Life-sustaining interventions
- Quality of life

Complex pathophysiological interactions
- Organ failure syndromes/patterns
Network of Critical Illness

Nurses, physicians, patient, family

Adapted from Barabasi et al NEJM 2009
CMS/Premier HQID Average Composite Quality Scores (CQS)

Average CQS improved significantly between the inception of the CMS/Premier HQID project and Year 2:

- From 87.5% to 94.4% for AMI (heart attack) patients.
- From 84.8% to 93.8% for coronary artery bypass graft patients.
- From 64.5% to 82.4% for heart failure patients.
- From 69.3% to 85.8% for pneumonia patients.
- From 84.6% to 93.4% for hip and knee replacement patients.
Administrative data...

• Definitions based on:
  • ICD-9-CM diagnosis and procedure codes
  • Often along with other measures (e.g., DRG, MDC, sex, age, procedure dates, admission type)

• Numerator = number of cases with the outcome of interest (e.g., cases with pneumonia)
• Denominator = population at risk (e.g., community population)
• Observed rate = numerator/denominator
• Some QIs measured as volume counts

ICD-9 for billing - not for quality

Performance Measure Name:
(PN-6) Initial Antibiotic Selection for Community-Acquired Pneumonia (CAP) in Immunocompetent Patients

Denominator Statement: Pneumonia patients (as specified under the Set Measure Identifier and description above) 18 years of age and older.

Included Populations: Discharges with:
- An ICD-9-CM Principal Diagnosis Code of pneumonia as defined in Appendix A, Table 3.1 OR ICD-9-CM Principal Diagnosis Code of septicemia or respiratory failure (acute or chronic) as defined in Appendix

Table 2
Agreement between the two external coders for the most frequently selected diagnoses

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number</th>
<th>Kappa</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>J960, acute respiratory failure</td>
<td>63</td>
<td>0.42</td>
<td>0.23–0.61</td>
</tr>
<tr>
<td>J159, bacterial pneumonia, unspecified</td>
<td>22</td>
<td>0.49</td>
<td>0.22–0.76</td>
</tr>
<tr>
<td>R402, coma, unspecified</td>
<td>21</td>
<td>0.82</td>
<td>0.63–1.00</td>
</tr>
<tr>
<td>I501, left ventricular failure</td>
<td>17</td>
<td>0.67</td>
<td>0.42–0.94</td>
</tr>
</tbody>
</table>

CI, confidence interval.

Available online http://jccforum.com/content/12/4/R05

Research
Reliability of diagnostic coding in intensive care patients
Benoît Misset¹, Didier Nakache², Aurélien Vesin³, Mickael Darmon⁴, Maïté Garrouste-Orgeas⁵,
Validity of administrative data

**Objective:** Investigators sought to measure the positive predictive value of a specific outcome that might be employed in studies of comparative effectiveness. In particular, we validated hospitalization for the composite outcome of sudden cardiac death and ventricular arrhythmia (SCD/VA) in an administrative dataset of 1999-2000 Medicaid and Medicare data using expert medical record review as the gold standard.

**Conclusion:** Overall, our outpatient-occurring composite SCD/VA outcome validated poorly (PPV = 18%). This may be improved by focusing on primary claims diagnoses only or utilizing, as true cases, only those that can be validated via medical record review.

Manual for defining hospital quality measures

Alphabetical Data Dictionary – 451 pages!
The market for analytics solutions — more than 100 vendors currently offer big data tools and products.
CMS/Premier HQID Average Composite Quality Scores (CQS)

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- From 64.5% to 82.4% for heart failure patients.
- From 69.3% to 85.8% for pneumonia patients.
- From 84.6% to 93.4% for hip and knee replacement patients.
What is quality?

The U.S Agency for Healthcare Research and Quality (AHRQ) defines quality healthcare as: "...doing the right thing at the right time in the right way for the right person, and having the best possible results."

The Institute of Medicine (IOM) defines quality of care as the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.

As you start thinking about enhancing quality and safety in the healthcare system, consider these principles (may be remembered by the acronym STEEEP) published by the IOM report on crossing the quality chasm.

Systems of care should be redesigned to make them more:

- Safe
- Timely
- Effective
- Equitable
- Efficient
- Patient centered
“to practice continual improvement and think of manufacturing as a system, not as bits and pieces”
QI methodology: PDSA

Use of the PDSA Cycle

Iterative Learning and Improvement

- Learning continues
- Implement all successful changes

Plan  Do  Act  Study

- Building knowledge
- Incorporate more ideas

Plan  Do  Act  Study

- Benchmarks
- Ideas
- Recommendations

Baseline data

Performance

Time

Used with permission from John Wiley & Sons, Inc.
QI methodology: small tests of change

Can you explain the concept of small tests of change and how this is different from traditional research and management?

Dr. Berwick explains small tests of change

- One patient
- One doctor
- One nurse
- One day/shift
- One unit
- One division

Small tests of change may involve 5 patients, or one unit, or one doctor and nurse. The idea is to learn quickly about what works and does not, and modify the next cycle, perhaps the very next day or at the end of the week, for the next iteration of the intervention.
Intensive care unit quality improvement: A “how-to” guide for the interdisciplinary team

J. Randall Curtis, MD, MPH; Deborah J. Cook, MD; Richard J. Wall, MD, MPH; Derek C. Angus, MD, MPH, FRCP; Julian Bion, FRCP, FRCA, MD; Robert Kacmarek, PhD, RRT; Sandra L. Kane-Gill, PharmD, MSc; Karin T. Kirchhoff, RN, PhD, FAAN; Mitchell Levy, MD; Pamela H. Mitchell, PhD, CNRN; Rui Moreno, MD, PhD; Peter Pronovost, MD, PhD; Kathleen Punttillo RN, DNSc, FAAN

Initiating or improving a quality improvement program
1. Do background work: Identify motivation, support team work and develop strong leadership.
2. Prioritize potential projects and choose the projects to begin.
3. Prepare for the project by operationalizing the measures, building support for the project, and developing a business plan.
4. Do an environmental scan to understand the current situation (structure, process, or outcome), the potential barriers, opportunities, and resources for the project.
5. Create a data collection system to provide accurate baseline data and document improvement.
6. Create a data reporting system that will allow clinicians and other stakeholders to see and understand the problem and the improvement.
7. Introduce strategies to change clinician behavior and create the change that will produce improvement.

Evaluating and sustaining a quality improvement program
1. Determine whether the target is changing with ongoing observation, periodic data collection, and interpretation.
2. Modify behavior change strategies to improve, regain, or sustain improvements.
3. Focus on sustaining interdisciplinary leadership and collaboration for the quality improvement program.
4. Develop and sustain support from the hospital leadership.
How to measure quality?

Number who have the right thing done

Eligible opportunities to have the right thing done
Quality of sepsis resuscitation (2007)

<table>
<thead>
<tr>
<th>Performance measure</th>
<th>Our performance</th>
<th>Target performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPMO (defects per million opportunities)</td>
<td>111,111</td>
<td>3.4</td>
</tr>
<tr>
<td>Sigma level</td>
<td>2.7</td>
<td>6</td>
</tr>
</tbody>
</table>

Afessa et al 2008
How to measure quality?
A STUDY OF THE DEATHS ASSOCIATED WITH ANESTHESIA AND SURGERY*

BASED ON A STUDY OF 599,548 ANESTHESIAS IN TEN INSTITUTIONS 1948–1952, INCLUSIVE

HENRY K. BEECHER, M.D., AND DONALD P. TODD, M.D.

FROM THE ANESTHESIA DEPARTMENT OF THE HARVARD MEDICAL SCHOOL AT THE MASSACHUSETTS GENERAL HOSPITAL, BOSTON

Anesthesia might be likened to a disease which afflicts 8,000,000 persons in the United States each year. More than twice as many citizens out of the total population of the country die from anesthesia as die from poliomyelitis. Deaths from anesthesia are certainly a matter for "public health" concern.
Distribution of Human Errors

- Ventilation/breath. circ.: 19.5% (57)
- Drug administration: 19% (56)
- Anesthesia machine use: 19% (56)
- Airway management: 12% (36)
- IV apparatus use: 7% (19)
- Monitoring: 4.5% (13)
- Fluid management: 4% (11)
- Other: 15% (45)

Total incidents = 293
* = disconnects
Preventable anesthesia mishaps: a study of human factors*

Jeffrey B Cooper, Ronald S Newbower, Charlene D Long, Bucknam McPeek¹

CLASSIC PAPER

Barriers to Quality Improvement: Importance of Ergonomics


Courtesy Dr Y Donchin
Lessons from anesthesia

- Death attributed to anesthesia has dropped 160 times!
  - 64/100,000 procedures to <0.4/100,000
Randomized Evaluation of Pulse Oximetry in 20,802 Patients: II.

- No difference in any of predefined complications and patient outcomes!
  - Pulse oximetry led to more work up and interventions…
Mortality Related to Severe Sepsis and Septic Shock Among Critically Ill Patients in Australia and New Zealand, 2000-2012

No. of patients: 2708  3783  4668  5221  6375  6987  7627  8529  8797  10277  11367  12213  12512
Twenty Years of Fatal Airline Accidents
Since a 1997 goal to reduce the rate of airline accidents by 80 percent, fatal accidents have fallen. Roll over the boxes for details.

Number of fatal accidents per 1 million departures

Each box represents one fatal accident on a major airline or commuter plane.

Number of fatalities
- 1 or 2
- 3 to 30
- 30+

Note: Box heights have been scaled according to the number of departures each year. Accidents caused by terrorism or other criminal acts are not shown.

Source: National Transportation Safety Board

Courtesy Yue Dong, M.D.
### Probability of Performing Perfectly

<table>
<thead>
<tr>
<th>Number of Steps</th>
<th>Probability of Success for Each Step in the Process</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.95 0.990 0.999 0.9999</td>
</tr>
<tr>
<td>1</td>
<td>0.95 0.990 0.999 0.9999</td>
</tr>
<tr>
<td>25</td>
<td>0.28 0.78 0.98 0.998</td>
</tr>
<tr>
<td>50</td>
<td>0.08 0.61 0.95 0.995</td>
</tr>
<tr>
<td>100</td>
<td>0.006 0.37 0.90 0.990</td>
</tr>
</tbody>
</table>

1) **Reduce steps**

2) **Improve reliability**

"Less is more" - do away with iatrogenic waste: Patient–centered care instead

Say **NO** to:

- Sedative infusions
- Liberal transfusion
- Routine (daily) X-rays
- Routine lab draws
- Unnecessary monitoring (pulmonary artery catheter…)
- Prolonged use of invasive devices (arterial and central venous catheters, urinary catheters, endotracheal tubes)

Say **YES** to:

- Early physical therapy
- Family presence in the ICU
- Safety culture
- Checklists
- Point of care ultrasound
- Restrictive transfusion
- Early extubation
- Noninvasive ventilation
- Early removal of invasive devices
### Probability of Performing Perfectly

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1) **Reduce steps**
2) **Improve reliability**

A CHECKLIST FOR CHECKLISTS

**Development**
- Do you have clear, concise objectives for your checklist?

**Is each item:**
- A critical safety step and in great danger of being missed?
- Not adequately checked by other mechanisms?
- Actionable, with a specific response required for each item?
- Designed to be read aloud as a verbal check?
- One that can be affected by the use of a checklist?

**Have you considered:**
- Adding items that will improve communication among team members?
- Involving all members of the team in the checklist creation process?

<table>
<thead>
<tr>
<th>Does the Checklist:</th>
<th>Have you:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilize natural breaks in workflow (pause points)?</td>
<td>TRIaled the checklist with front line users (either in a real or simulated situation)?</td>
</tr>
<tr>
<td>Use simple sentence structure and basic language?</td>
<td>Modified the checklist in response to repeated trials?</td>
</tr>
<tr>
<td>Have a title that reflects its objectives?</td>
<td></td>
</tr>
<tr>
<td>Have a simple, uncluttered, and logical format?</td>
<td></td>
</tr>
<tr>
<td>Fit on one page?</td>
<td></td>
</tr>
<tr>
<td>Minimize the use of color?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is the font:</th>
<th>Does the checklist:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sans serif?</td>
<td>Fit the flow of work?</td>
</tr>
<tr>
<td>Upper and lower case text?</td>
<td>Detect errors at a time when they can still be corrected?</td>
</tr>
<tr>
<td>Large enough to be read easily?</td>
<td></td>
</tr>
<tr>
<td>Dark on a light background?</td>
<td></td>
</tr>
<tr>
<td>Are there fewer than 10 items per pause point?</td>
<td></td>
</tr>
<tr>
<td>Is the date of creation (or revision) clearly marked?</td>
<td>Can the checklist be completed in a reasonably brief period of time?</td>
</tr>
</tbody>
</table>

| | Have you made plans for future review and revision of the checklist? |

Please note: A checklist is NOT a teaching tool or an algorithm
Barriers to quality improvement

Sources of Behavior Change

Knowledge → Attitudes → Behavior

Barriers to evidence uptake

Lack of familiarity / awareness
- Volume of information
- Time needed to stay informed
- Access to resources

Lack of agreement with evidence
- Uncertain interpretation
- Unclear applicability
- Methodological weakness
- Perceived biases
- Nihilism

External Barriers
- Environmental factors (lack of time, resources, organizational constraints)
  - Patient factors (expectations and preferences)
  - Perceived medico-legal concerns
  - Institutional factors (peer influences, barriers to institute practice change at the departmental level)

Lack of motivation / inertia of previous practice
Need for Ambient Intelligence

The hospital of the future: building intelligent environments to facilitate safe and effective acute care delivery

Brian W Pickering, John M Litell, Vitaly Herasevich and Ognjen Gajic
AWARE – ambient intelligence built by clinicians

Reduced cognitive load
(happy clinicians)

Reduced errors
(happy patients)

Reduced time
(happy administrators)

AWARE components

- **Resuscitation module**
  - Addresses time sensitive clinical interventions

- **Multipatient viewer**
  - Group level population management

- **Single patient viewer**
  - Pertinent clinical information

- **Administrative dashboard**
  - Resource planning, Quality improvement

---

**Hand over**
- Essential information at a glance
- Focused on patient problems

**Claim patient**
- Links provider and patients
- One stop communication

**Task list**
- Shared list of tasks
- Outside of clinical note

**Rounding tool (Checklist)**
- Structured clinical assessment
- Generates clinical note

---

**ED** ➔ **OR** ➔ **PACU** ➔ **ICU** ➔ **Floor**
AWARE process of care/QI dashboard
Real time monitoring

Task: EMR solution to help providers maintain 100% adherence with SCIP-4.
- Not disruptive.
- Zero data entry

SCIP-4 glucose control metric
Real time monitoring

SCIP-4 glucose control metric
Control of implementation process
Quality and Safety in the ICU: Declaration of Vienna

• Human factors
  • Ergonomics
  • Adequate staffing (nurse/patient)
  • Telemedicine help for remote locations
  • Safety culture

• Systems engineering
  • Lean
  • Checklists
CONCLUSIONS

The answer to the question in the title of this article is both yes and no. Much of the higher level monitoring and benchmarking activity has not proven to be effective in improving outcomes and may represent waste in our systems. However, when used at a lower level where there is a vision, commitment, and a culture of improvement, the monitoring and use of relational databases is very useful and effective in improving outcome. To be effective, these databases should be developed and controlled at the level where change is to occur, and the closer to the frontline the better.
We need to be AWARE & CERTAIN

Special thanks to AWARE and CERTAIN teams

gajic.ognjen@mayo.edu
herasevich.vitaly@mayo.edu
pickering.brian@mayo.edu
http://www.icertain.org/

...to prevent DEATH
(Diagnostic Errors and Therapeutic Harm)
The hospital of the future: building intelligent environments to facilitate safe and effective acute care delivery

Brian W Pickering1,2, John M Litell2,4, Vitaly Herasevich1,2 and Ognjen Gajic2,3

- "Less is more" - do away with iatrogenic waste
- Ambient intelligence
- Safety culture
- Telemedicine
- Point of care diagnostics (bedside ultrasound)
- Early rehabilitation
- Death of a hospital ward (ED/OR/ICU/Rehabilitation)
Multicenter Implementation of a Severe Sepsis and Septic Shock Shock Treatment Bundle

Russell R. Miller III1,2, Li Dong3, Nancy C. Nelson3, Samuel M. Brown1,2, Kathryn G. Kuttler3,4, Daniel R. Probst3, Todd L. Allen3, and Terry P. Clemmer1,2; for the Intermountain Healthcare Intensive Medicine Clinical Program

B

Mortality (%) vs Total Bundle Compliance (%)

2004: n=151, 7.0%
2005: n=158, 19.9%
2006: n=118, 20.0%
2007: n=150, 15.5%
2008: n=290, 12.2%
2009: n=305, 60.0%
2010: n=254, 12.2%
Questions/tasks are different!

- Regulatory: have compliance report
- Administration: get 100% compliance
- **Provider: EASY tool to be 100% compliant**
- Patient: make sure it was done

AWARE address this.
That is automatically address other 3 goals
Outcomes of interest

**Better care:**
- Adherence to and appropriateness of processes of care
- Provider satisfaction

**Better health:**
- Rate of ICU acquired complications,
- Discharge home,
- Hospital mortality,
- ICU and hospital readmission

**Lower cost:**
- Resource utilization,
- Severity adjusted length of ICU and hospital stay
- Cost
ICU Length of Stay in MB7D and MB7E
01/01/2004 to 10/31/2011 by MONTH

3σ Limits:

UCL

\( \mu = 3.0 \)

LCL

Subgroup Sizes: Min n = 76, Max n = 166

\( \mu \) is based on ICU admissions from 1/1/2006 to 12/31/2006.
\( \sigma \) is based on the sample standard deviations in each by group.

ICU Length of Stay in MB6B and MB6G
01/01/2004 to 10/31/2011 by MONTH

3σ Limits:

UCL

\( \mu = 2.32 \)

LCL
Determinants of Critical Care Delivery

Pickering B et al. Applied Clinical Informatics 2010
Determinants of High Quality Critical Care Delivery

Pickering B et al. Applied Clinical Informatics 2010
Methodology for developing and testing of clinical ambient intelligence

1. Field observation
2. Surveys & interviews
3. Workflow & workshops
4. Simulated tests
Sepsis Checklist + Training = Sepsis Response Team

• Hospital mortality from septic shock dropped from 32% to 22% (without ANY new interventions)!

Schramm et al Crit Care Med 2011
Telemedicine: Sharing Critical Care Expertise

Quality and Safety in the ICU: Declaration of Vienna

• Human factors
  • Ergonomics
  • Adequate staffing (nurse/patient)
  • Telemedicine help for remote locations
  • Safety culture

• Systems engineering
  • Lean
  • Checklists

Moreno R, Donchin Y 2009
What Makes a Good Quality Measure?

Elizabeth A. McGlynn, PhD; John L. Adams, PhD

- The editorial summarize the elusive relationships between quality measures and mortality
  - brings up an ethical imperative to aim for a good quality regardless
- Reducing pressure ulcers, pain or delirium does not translate in improved mortality
  - the patient still does not want to have pressure ulcer, pain or delirium.
- Also, they argue that the effect should be evaluated only in subsets of patients to whom the quality intervention may apply
  - rather than all patients (as noise will blunt the signal if any)
Surviving Sepsis Campaign (SSC)

• In 2002, the SSC declared goal to reduce the relative mortality of sepsis by **25% in five years**
  • Developed Sepsis Bundles
  • Created Education Materials
  • Recruited Sites and Local Champions
  • Local and National Launch of Campaign
  • Distributed Secure Database for Data Collection and Transfer
  • Developed Interface for Practice Audit and Local Feedback

• From 2004 to 2009, **12.1% to 35.2% decrease** in in-hospital mortality

SurvivingSepsis.org; Gaieski DF et al, 2013
Real-time feedback to clinicians

- "Are you AWARE" sign posted in ICUs
- AWARE formal launch in ICU
- Critical Care Fellows 2 hour AWARE training
- AWARE training mandatory to all Nurse Practitioners
- Pulmonary Fellows trained
- One-on-one training for attendings
- Real time compliance reports become available
- Anesthesia Residents trained
- New residents and fellows started
- Real-time feedback to clinicians

Graph showing real-time compliance reports and percentage of compliance over time.
Surviving Sepsis Campaign: Association Between Performance Metrics and Outcomes in a 7.5-Year Study

Mitchell M. Levy, MD, FCCM¹; Andrew Rhodes, MB BS, MD (Res)²; Gary S. Phillips, MAS³; Sean R. Townsend, MD⁴; Christa A. Schorr, RN, MSN⁵; Richard Beale, MB BS⁶; Tiffany Osborn, MD, MPH⁷; Stanley Lemeshow, PhD⁸; Jean-Daniel Chiche, MD⁹; Antonio Artigas MD, PhD¹⁰; R. Phillip Dellinger, MD, FCCM¹¹

Slope = 0.7% drop in mortality/quarter,  p-value < 0.001
Participant ICUs

ClinicalTrials.gov
A service of the U.S. National Institutes of Health

Home > Find Studies > Study Record Detail

The Checklist for Early Recognition and Treatment of Acute Illness (CERTAIN)
Checklist with timer for critical procedures

**Intubation**

**Indications**
- Continuous monitoring: HR, rhythm, RR, BP, SpO2
- Equipment: Suction, bag and mask, laryngoscope, different sized blades, stylet, different sized ET tubes, preparation for difficult airway, drugs, fixing material
- Preoxygenation (3 minutes), handholding and reassurance
- Medications (Click on the options in the table to select, then issue)

<table>
<thead>
<tr>
<th>Seq.</th>
<th>RSI</th>
<th>Non-RSI</th>
<th>Awake fiberoptic intubation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Midazolam 2 mg</td>
<td>Midazolam 5 mg</td>
<td>Topical anesth. of oropharynx</td>
</tr>
<tr>
<td>2</td>
<td>Ketamine 50 mg</td>
<td>Propofol 70 mg</td>
<td>Midazolam 2 mg</td>
</tr>
<tr>
<td>3</td>
<td>Propofol 50 mg</td>
<td>Fentanyl 100 mcg</td>
<td>Fentanyl 100 mcg</td>
</tr>
<tr>
<td>4</td>
<td>Succinylcholine 100 mg</td>
<td>Rocuronium 50 mg</td>
<td>Incremental doses as needed</td>
</tr>
</tbody>
</table>

**Precautions**
- Intubation
- Check tube position: Auscultation, EtCO2 monitoring, chest X-ray, etc.
- Fix the tube: Record the depth of ETT at the lip (~24 cm/men, ~22 cm/women)
- Ventilation
  - Mode: AC
  - PEEP: 5-15 cmH2O
  - TV: 450 ml (men), 350 ml (women)
  - Rate: 20-35 /minute

**Order entry**
- **Hypnotic sedatives**
  - Midazolam 2 mg
  - Ketamine 50 mg
  - Propofol 50 mg
  - Etorphine 15 mg
- **Opioids**
  - Fentanyl 50 mcg
- **Neuromuscular blockers**
  - Succinylcholine 100 mg
  - Rocuronium 50 mg
- **Other drugs (as needed)**
  - Phentolamine 0.2 mg
  - Ephedrine 10 mcg
  - Metoprolol 5 mg

**BW** 64

**Drug**

**Dose**

**Unit**

**Route**

**Order**
Keeping track of interventions