Preventing the “Preventable”

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No Conflicts of Interests
And No Interests in Conflicts
Art Institute of Chicago is “Best Museum in the World” - TripAdvisor
To err is human, To forgive is divine  
*Alexander Pope (1688-1744) English poet*


Root Causes of Sentinel Events  
(All categories; 2006)

- Communication  
- Orientation/training  
- Patient assessment  
- Competencies  
- Process  
- Environment  
- Leadership  
- Continuum of care  
- Care planning  
- Organization culture

IOM highlighted that 44,000-98,000 patients die each year as a result of medical errors, a large portion of these being related to communication breakdown!
An Update On Patient Harms Associated With Hospital Care

- Systematic review (N=4)
- Studies investigating preventable harm resulting in patient death

### Table: Preventable Harm Events

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Source</th>
<th>No. Records Reviewed</th>
<th>Serious Adverse Events (AE)</th>
<th>% Deemed Preventable</th>
<th>Lethal AE</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>OIG, 2008</td>
<td>Medicare Bene, 2 countries</td>
<td>278</td>
<td>15%</td>
<td>N/S</td>
<td>1.1%</td>
<td>N/S</td>
</tr>
<tr>
<td>OIG, 2010</td>
<td>Medicare Patients</td>
<td>838</td>
<td>15%</td>
<td>44%</td>
<td>1.4%</td>
<td>7</td>
</tr>
<tr>
<td>Classen, 2011</td>
<td>3 Tertiary care hosp.</td>
<td>795</td>
<td>21%</td>
<td>100%</td>
<td>1.1%</td>
<td>4</td>
</tr>
<tr>
<td>Landrigan, 2010</td>
<td>10 hosp, North Carolina</td>
<td>2341</td>
<td>14%</td>
<td>63%</td>
<td>0.6%</td>
<td>7</td>
</tr>
</tbody>
</table>

**Conclusion:** Using a weighted average of the 4 studies, an estimate of **210,000 deaths** per year were associated with **preventable** harm in hospitals!
High Reliability Organizations (HRO’s)

- Preoccupation with failure
- Resist oversimplification
- Remain sensitive to operations
- Maintain Resilience
- Deference to expertise not title
HRO’s

• The unexpected will occur-  
  *don’t expect it, prepare for it*

• Failure is not an option e.g. Apollo 13

• Diverse expectations avoids oversimplification

• Success breeds complacency  (dwell on failures)

• High performers detect more failures (than low performers) do to honesty of reporting

• “Culture of safety” is key
Normalization of Deviance

“People w/in the organization become accustomed to a deviant behavior that they do not consider deviant despite exceeding their own rules for elementary safety”  Diane Vaughn

• Progressive acceptance, overtime of high risk events that are not supposed to happen

• Early warning signs that are misinterpreted or ignored

• Small, incremental deviations lacking significant negative outcome become tolerated- ”normalized”

• Gradual erosion of normal
"Normalization of deviance breaks the safety culture, substituting a slippery slope of tolerating more errors and accepting more and more risk, always in the interest of efficiency and on-time schedules."
Practices That Should Not be “Normalized”

1. Removing vital monitors at the end of general anesthesia before the patient is awake, trachea is extubated, and homeostasis assured.
2. Handoffs of care at vital times (emergence, induction, separation from cardiopulmonary bypass, etc.).
3. Failure to follow recognized isolation procedures and protocols.
4. Failure to wash the hands before and after patient contact.
5. Failure to properly monitor effects of neuromuscular blocking drugs in every patient.
6. Failure to examine laboratory results before surgery.
7. Excessive noise from operating room personnel, industry representatives, students, and learners at the time of anesthesia induction, along with radio or other noise to levels where monitor sounds cannot be heard.
8. Titration of narcotics in postanesthesia care unit by rigid adherence to the pain score, without necessary modulation based on sound clinical judgment.
9. Nonsterile dressings placed on skin site for peripheral IVs, central catheters, arterial catheters, etc.
10. Failure to place standard monitors before performing a peripheral nerve block for regional anesthesia.

### Human Factors Contributing to Anesthesia Mishaps

<table>
<thead>
<tr>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normalization of deviance</td>
</tr>
<tr>
<td>Poor communication</td>
</tr>
<tr>
<td>Production pressure</td>
</tr>
<tr>
<td>Fatigue and stress</td>
</tr>
<tr>
<td>Emergency operations</td>
</tr>
<tr>
<td>Inadequate anesthesia provider experience</td>
</tr>
<tr>
<td>Inadequate familiarity with equipment, device, surgical procedure,</td>
</tr>
<tr>
<td>anesthetic technique</td>
</tr>
<tr>
<td>Lack of skilled assistance or supervision</td>
</tr>
<tr>
<td>Afferent overload (excess stimuli or noise)</td>
</tr>
<tr>
<td>Normalcy bias (assuming alarms are ‘false alarms’)</td>
</tr>
<tr>
<td>Faulty or absent policy and procedures</td>
</tr>
</tbody>
</table>
Cause Of Errors

“Swiss Cheese Model”

Compliance

- ASA Standards
- ASA Guidelines
- ASA Practice Parameters
- Hospital/Department Policies & Procedures
- Other
2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management

The Joint Task Force on non-cardiac surgery: cardiovascular assessment and management of the European Society of Cardiology (ESC) and the European Society of Anaesthesiology (ESA)

Authors/Task Force Members: Steen Dalby Kristensen* (Chairperson) (Denmark), Juhani Knuuti* (Chairperson) (Finland), Antti Saraste (Finland), Stefan Anker (Germany), Hans Erik Bøtker (Denmark), Stefan De Hert (Belgium), Ian Ford (UK), Jose Ramón Gonzalez-Juanatey (Spain), Bulent Gorenek (Turkey), Guy Robert Heyndrickx (Belgium), Andreas Hoeft (Germany), Kurt Huber (Austria), Bernard Iung (France), Keld Per Kjeldsen (Denmark), Dan Longrois (France), Thomas F. Lüscher (Switzerland), Luc Pierard (Belgium), Stuart Pocock (UK), Susanna Price (UK), Marco Roffi (Switzerland), Per Anton Sirnes (Norway), Miguel Sousa-Uva (Portugal), Vasilis Voudris (Greece), Christian Funck-Brentano (France).

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery: Executive Summary

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With the American College of Surgeons, American Society of Anesthesiologists, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Anesthesiologists, and Society of Vascular Medicine
Active Cardiac Conditions Requiring Treatment Before Surgery

- Unstable coronary syndrome
  Unstable or severe angina, recent MI
- Decompensated HF (NYHA class IV)
- Significant arrhythmias
  High-grade AV block, Mobitz II AV block, symptomatic ventricular arrhythmias, SVT with uncontrolled ventricular rate > 100 bpm, symptomatic bradycardia, new ventricular tachycardia
- Severe valvular heart disease
  Severe aortic stenosis (mean > 40 mm Hg, or area less than 1.0 cm$^2$, or symptomatic), symptomatic mitral stenosis (progressive dyspnea on exertion, exertional presyncope, or HF)
Need for Emergency noncardiac surgery?

Operating room

Perioperative surveillance and postoperative risk stratification and risk factor management

Active cardiac conditions

Evaluate and treat per ACC/AHA guidelines

Consider operating room

Low risk surgery

Proceed with planned surgery

Good functional capacity w/o symptoms

Proceed with planned surgery

No or unknown
Step 5

No or unknown

3 or more clinical risk factors
- Vascular Surgery
  - Consider testing if it will change management

1 or 2 clinical risk factors
- Intermediate risk surgery
  - Vascular surgery
  - Intermediate risk surgery
  - Proceed with planned surgery with heart rate control or consider noninvasive testing if it will change management

No clinical risk factors
- No or unknown

Intermediate risk surgery
- No clinical risk factors
  - Proceed with planned surgery

Clinical Risk Factors
- Ischemic Heart Disease
- Compensated CHF
- Diabetes Mellitus
- Renal Insufficiency
- Cerebrovascular Disease
Effect of Outcome on Physician Judgments of Appropriateness of Care

• 115 anesthesiologists were asked to review 21 cases for whether or not care was appropriate
• Original outcome in each case was classified as either temporary or permanent
• The authors of study then generated a matching alternate case identical to original except that plausible outcome of opposite severity was substituted
• Overall, significant inverse relationship of appropriateness of care observed in 71% of matched pair of cases
• Level of appropriateness decreased by 31% if injury went from temporary to permanent, and increased 28% if went from permanent to temporary
# Examples of Original and Alternate Outcomes

<table>
<thead>
<tr>
<th>Category</th>
<th>Temporary Outcome</th>
<th>Permanent Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airway obstruction</td>
<td>Transient hypoxemia neurologic deficit 48 to 72 h</td>
<td>Permanent brain damage</td>
</tr>
<tr>
<td>Aspiration</td>
<td>Transient hypoxemia; mechanical ventilation; uneventful recovery</td>
<td>Transient hypoxemia; mechanical ventilation; memory deficit and lost of employment</td>
</tr>
<tr>
<td>Brachial plexus injury</td>
<td>Brachial plexus palsy after axillary block; resolved over time</td>
<td>No improvement;</td>
</tr>
<tr>
<td>Convulsion</td>
<td>Cardiac arrest during caesarean section; mother made full recovery</td>
<td>Mother died; new born suffered sustained brain injury</td>
</tr>
<tr>
<td>Difficult intubation</td>
<td>Lip laceration; uneventful healing</td>
<td>Lip laceration; disfiguring scar</td>
</tr>
<tr>
<td>Eye injury</td>
<td>Vitreous damage due to coughing with an open eye; vision impaired only 2 weeks</td>
<td>Vision permanently lost</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>Surgery postponed; no long-term sequelae</td>
<td>Hypotension; patient never awakened; death</td>
</tr>
<tr>
<td>Ulnar nerve injury</td>
<td>Ulnar nerve palsy detected after abdominal surgery; resolved over time</td>
<td>No improvement over time</td>
</tr>
</tbody>
</table>

Caplan RA, JAMA 1991
Effect of Outcome on Physician Judgments of Appropriateness of Care

Caplan, RA JAMA 1991
Enter Patient and Surgical Information

Procedure:
34803 - Endovascular repair of infrarenal abdominal aortic aneurysm or dissection using modular bifurcated prostheses (2 docking limbs)

Begin by entering the procedure name or CPT code. One or more procedures will appear below the procedure box. You will need to click on the desired procedure to properly select it. You may also search using two words (or two partial words) by placing a ‘+’ in between, for example: ‘cholecystectomy + cholangiography’

---

Please enter as much of the following information as you can to receive the best risk estimates. A rough estimate will still be generated if you cannot provide all of the information below.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-84 years</td>
<td>Oral</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex</th>
<th>Hypertension requiring medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Functional Status</th>
<th>Congestive Heart Failure in 30 days prior to surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency Status</th>
<th>Dyspnea</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ASA Class</th>
<th>Current Smoker within 1 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe systemic disease</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Steroid use for chronic condition</th>
<th>History of Severe COPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acute within 30 days prior to surgery</th>
<th>Dialysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Systemic Graft within 48 hours prior to surgery</th>
<th>BMI Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ventilator Dependent</th>
<th>Height (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disseminated Cancer</th>
<th>Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>170</td>
</tr>
</tbody>
</table>

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### Surgical Risk Calculator

**Procedure:** 58803 - Endovascular repair of infrarenal abdominal aortic aneurysm or dissection using modular bifurcated prostheses (5 docking sites)

**Risk Factors:** 80-74 years, ASA 3, Chronic systemic disease, Diabetes (Cryo), HTN, CHF, COPD, Over Weight

#### Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Your Risk</th>
<th>Average Risk</th>
<th>Chance of Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious Complication</td>
<td>12.0%</td>
<td>9.5%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Any Complication</td>
<td>13.9%</td>
<td>10.4%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>1.6%</td>
<td>1.2%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Cardiac Complication</td>
<td>2.4%</td>
<td>1.4%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Surgical Site Infection</td>
<td>1.5%</td>
<td>1.4%</td>
<td>Average</td>
</tr>
<tr>
<td>Urinary Tract Infection</td>
<td>1.3%</td>
<td>1.1%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Venous Thromboembolism</td>
<td>0.7%</td>
<td>0.3%</td>
<td>Below Average</td>
</tr>
<tr>
<td>Renal Failure</td>
<td>2.2%</td>
<td>1.3%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Readmission</td>
<td>9.7%</td>
<td>7.1%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Return to OR</td>
<td>3.0%</td>
<td>2.7%</td>
<td>Average</td>
</tr>
<tr>
<td>Death</td>
<td>1.2%</td>
<td>1.0%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Discharge to Nursing or Rehab Facility</td>
<td>5.4%</td>
<td>4.9%</td>
<td>Above Average</td>
</tr>
</tbody>
</table>

**Predicted Length of Hospital Stay:** 3 days

---

**How to Interpret the Graph Above:**
- **Your Risk**
- **Average Patient Risk**
- **% Risk**

**Surgeon Adjustment of Risks**

This will need to be used infrequently, but surgeons may adjust the estimated risk if they feel the calculated risks are underestimated. This should only be done if the reason for the increased risk was *NOT* already entered into the risk calculator.

- **1 - No adjustment necessary**
- **2 - Low adjustment necessary**
- **3 - Moderate adjustment necessary**
- **4 - High adjustment necessary**
- **5 - Major adjustment necessary**

**Step 3 of 4**
Calculate by QxMD

Free on: iPhone | iPad | Windows | Android | Web

Download on the App Store | Get it on Google Play | Download from Windows Store

Use Web App
DIFFICULT AIRWAY ALGORITHM

1. Assess the likelihood and clinical impact of basic management problems:
   A. Difficult Ventilation
   B. Difficult Intubation
   C. Difficult with Patient Cooperation or Consent
   D. Difficult Tracheotomy

2. Actively pursue opportunities to deliver supplemental oxygen throughout the process of difficult airway management

3. Consider the relative merits and feasibility of basic management choices:
   A. Awake Intubation
   B. Non-Invasive Technique for Initial Approach to Intubation
   C. Preservation of Spontaneous Ventilation
   D. Intubation Attempts After Induction of General Anesthesia

4. Develop primary and alternative strategies:

   A. AWAKE INTUBATION
      - Airway Accessible by Non-Invasive Intubation
        - Success: Intubation
        - Failure: Consider Feasibility of Other Options
      - Airway Accessible by Intubation
        - Success: Intubation
        - Failure: Consider Feasibility of Other Options

   B. FACE MASK VENTILATION ADEQUATE
      - Ventilation Adequate, Intubation Unsuccessful
        - Alternative Approaches to Intubation
          - Success: Intubation
          - Failure: Consider Feasibility of Other Options

   C. FACE MASK VENTILATION NOT ADEQUATE
      - Consider / Attempt LMA
        - LMA ADEQUATE
          - Ventilation Adequate, Intubation Unsuccessful
            - Alternative Approaches to Intubation
              - Success: Intubation
              - Failure: Consider Feasibility of Other Options
        - LMA Not Adequate or Not Feasible
          - Ventilation Not Adequate, Intubation Unsuccessful
            - Emergency Non-Invasive Airway Ventilation
              - Success: Ventilation
              - Failure: Consider Feasibility of Other Options

* Confirm ventilation, tracheal intubation, or LMA placement with exhaled CO2

a. Other options include (but are not limited to): surgery utilizing face mask or LMA anesthesia, tracheal intubation in the emergency department or local anesthesia in the operating room. Some of these options usually imply that mask ventilation will not be possible. Therefore, these options may be considered if the patient has been intubated via the Emergency Pathway.

b. Intubation attempts include surgical or percutaneous tracheotomy or cricothyrotomy.

c. Other non-invasive approaches to difficult intubation include but are not limited to: use of different laryngoscope blades, LMA as an intubation device (with or without tracheal guidance), oropharyngeal intubation, orotracheal intubation, nasal or tube intubation, and blind oral or nasal intubation.

d. Consider pre-intubation of the airway for difficult intubations before intubation or hard intubations.

e. Options for emergency non-invasive airway ventilation include (but are not limited to): bagging without tracheal intubation, or intubation.
DIFFICULT AIRWAY ALGORITHM

Clinical impact of basic management problems:

1. Cooperation or Consent
2. Airway
   - Intubation
   - Intubation Attempts After Induction of General Anesthesia
   - Technique for Initial Intubation
   - Invasive Technique for Initial Approach to Intubation
   - Ventilation
   - Abolition of Spontaneous Ventilation

Management strategies:

A. INTUBATION ATTEMPTS
   - Initial Intubation
   - Initial Intubation Attempts Successful

B. INJECTION OF SEDATIVE
   - Initial Intubation
   - Initial Intubation Attempts Successful

FACE MASK

NON-EMERGENCY Ventilation Adequacy

- Attem
- Successful Intubation

* Confirm ventilation
  a. Other options include mask, LMA, and cricoid pressure
  b. Intubation is the Emergency Plan

TOOL KIT
- Emergency tracheal intubation
- Tracheostomy
- Airway Access
- Ventilation

Illustrations include (but need labeling):
- Endotracheal tube
- Cricothyroidotomy
- Tracheostomy
Reversal of Neuromuscular Block

• NMBAs are given to most patients having a GA in the US
• At the end of surgery, most anesthesiologists do not reverse the effects of the NMBAs
• Failure to reverse the effects of NMBA increases the risk of PRNB
• Small prospective studies have demonstrated that PRNB is associated with an increased risk of adverse respiratory events in the PACU
• Is failure to reverse NMBAs/PRNB associated with more significant postoperative respiratory events (reintubation)?
Hazards of Inadequate NMBA Reversal

- Residual neuromuscular block: Residual muscle weakness that is present at the end of surgery due to incomplete recovery from the effects of NMBAs administered intraoperatively.
- RNMB is associated with adverse respiratory events in the PACU, longer PACU LOS, poorer QoR, and postoperative pulmonary complications.
- Failure to reverse NMBAs/RNMB → postoperative reintubation.
Residual Neuromuscular Blockade and Critical Respiratory Events in the Postanesthesia Care Unit

Glenn S. Murphy, MD  
Joseph W. Szokol, MD  
Jesse H. Marymont, MD  
Steven B. Greenberg, MD  
Michael J. Avram, PhD  
Jeffery S. Vender, MD

BACKGROUND: Incomplete recovery of neuromuscular function may impair pulmonary and upper airway function and contribute to adverse respiratory events in the postanesthesia care unit (PACU). The aim of this investigation was to assess and quantify the severity of neuromuscular blockade in patients with signs or symptoms of critical respiratory events (CREs) in the PACU.

METHODS: We collected data over a 1-yr period. PACU nurses identified patients with evidence of a predefined CRE during the first 15 min of PACU admission. Train-of-four (TOF) ratios were immediately quantified in these patients using acceleromyography (cases). TOF data were also collected in a control group that consisted of patients undergoing a general anesthetic during the same period who were matched with the cases by age, sex, and surgical procedure.

RESULTS: A total of 7459 patients received a general anesthetic during the 1-yr period, of whom 61 developed a CRE. Forty-two of these patients were matched with

- Data was collected in 7,459 patients undergoing GA during the 1-year period
- CREs identified in 61 patients (0.8%)
- Multiple logistic regression analysis revealed the only preoperative or intraoperative factor associated with CREs was residual neuromuscular block
Nondepolarizing Neuromuscular Blocking Agents, Reversal, and Risk of Postoperative Pneumonia

Catherine M. Bulka, M.P.H., Maxim A. Terekhov, M.S., Barbara J. Martin, R.N., M.B.A., Roger R. Dmochowski, M.D., Rachel M. Hayes, B.S.N., Ph.D., Jesse M. Ehrenfeld, M.D., M.P.H.

<table>
<thead>
<tr>
<th>NMBA Analysis</th>
<th>Received an NMBA (n = 1,455)</th>
<th>Did Not Receive an NMBA (n = 1,455)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed postoperative pneumonia</td>
<td>38 surgical cases</td>
<td>22 surgical cases</td>
</tr>
<tr>
<td>Person-time at risk (d)</td>
<td>42,202</td>
<td>42,161</td>
</tr>
<tr>
<td>Incidence per 10,000 person-days at risk</td>
<td>9.00</td>
<td>5.22</td>
</tr>
<tr>
<td>Incidence rate ratio (95% bootstrapped CI)</td>
<td>—</td>
<td>1.79 (1.08–3.07)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NMBA Reversal Analysis</th>
<th>No Reversal (n = 1,320)</th>
<th>Reversal with Neostigmine (n = 1,320)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed postoperative pneumonia</td>
<td>149 surgical cases</td>
<td>70 surgical cases</td>
</tr>
<tr>
<td>Person-time at risk (d)</td>
<td>35,300</td>
<td>37,138</td>
</tr>
<tr>
<td>Incidence per 10,000 person-days at risk</td>
<td>4.22</td>
<td>1.88</td>
</tr>
<tr>
<td>Incidence rate ratio (95% bootstrapped CI)</td>
<td>—</td>
<td>2.26 (1.65–3.03)</td>
</tr>
</tbody>
</table>
Predictors of Survival Following Cardiac Arrest in Patients Undergoing Noncardiac Surgery

- Medical records reviewed on all cardiac arrests that occurred at the Mayo Clinic over a 10-year period (1990-2000)
- Data collected on cardiac arrest that occurred after anesthesia initiated in the OR until discharge from the PACU or admission to the ICU
- Patient, anesthetic, and surgical factors analyzed

Results
- Cardiac arrest occurred in 223 of 518,294 anesthetics
- 24 patients had arrest primarily related to anesthesia
  - 13 medication-related
  - 11 airway/ventilation-related
  - 9 of the 24 “related to the use of NMBAs or RNMB”

Sprung J, Anesthesiology 2003
Out of OR Liability

Remote Location Claims: Mechanism of Injury

Remote Location Claims: Liability

Mentzner, ASA Newsletter, February 2010
A morbidly obese 36-year old ASA 3 woman with gallstone pancreatitis underwent endoscopic retrograde cholangiopancreatography (ERCP) under MAC. The patient received midazolam 2 mg I.V. and fentanyl 100 mcg I.V. and was positioned in the prone position with supplemental oxygen via nasal prongs. \(O_2\) saturation was measured, but not end-tidal capnography. Propofol 30 mg followed by an infusion of 20-50 mcg/kg/min was titrated intravenously, with \(O_2\) saturation of 90-95%. After 20 minutes, the patient developed nodal bradycardia to a rate of 40 bpm. Atropine 0.6 mg I.V., followed by 1.0 mg I.V., was administered with no effect. Five minutes later, the patient became asystolic. The patient was turned to the supine position, which took several minutes due to her size, and CPR begun. Although the patient was resuscitated, she never regained consciousness and support was withdrawn after discussion with the family.
Out of OR Liability

• 30% of claims absolute or relative overdose of sedative, hypnotic or analgesics
• Greater than 50% of GI suite and 70% of radiology involved over sedation
• Capnography used in only 15% of cases involved in over sedation
• Almost 92% of cases involving over sedation in remote locations resulted in death or severe brain damage
• Three-fourths of claims of over sedation resulted in payment with median payment of $460,000
• 54% of patients died compared to 29% receiving care in the ORs
Trends in Pain Medicine Liability

Myth: Monitored Anesthesia Care is Safer than General Anesthesia

- Closed Claims analysis of MAC, regional, and general anesthesia
- Respiratory event most common cause at 21% of MAC cases
- Followed by burns at 17% of claims

Authors concluded that nearly half of the claims were preventable by better monitoring including capnography, improved vigilance, or audible alarms. Also, special attention should be paid to cases involving the use of electrocautery

Bhanakar, Anesthesiology 2006
Retrospective review of legal literature regarding patients with OSA undergoing surgery
- OSA had to be directly related to adverse outcome
- Adverse outcome had to be adjudicated in a court of law
- 24 cases found, 17 (71%) patients died
- Plaintiffs won 58% of cases with average penalty of $2.5 million
EMR/AIMS-E-iatro genesis: “All that glitters is not gold”

- Missing data
- Cut and paste
- Modifying
- Wrong patient
- Audit trails
- Templates/Drop Down boxes

- Confidentiality
- HIPPA
- Work flow disruption
- Compliance
- Alerts/hard stops (fatigue)
- Varying versions
Definition of *Behaviors That Undermine a Culture of Safety*

<table>
<thead>
<tr>
<th>Interfere with ability to achieve intended outcomes</th>
<th>Create intimidating, hostile, offensive (unsafe) work environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threaten safety <em>(aggressive or violent physical actions)</em></td>
<td>Violate policies <em>(including conflicts of interest and compliance)</em></td>
</tr>
</tbody>
</table>

*It’s About Safety*

Excepts from Vanderbilt University and Medical Center Policy #HR-027, 2010
Academic vs. Community Medical Center Physicians

5% of physicians associated with 35% of concerns

35-50% of physicians are associated with NO concerns

The PARS/CORS Process

Share comparative feedback with tiered interventions using the *Pyramid for Promoting Reliability and Professional Accountability.*

- Identify and train *Peer Messengers*
- Position for protection from discovery
- Promote accountability

References
- Pichert et al, 2011.
- Pichert et al, 2013.
- Talbot et al, 2013.

Adapted from Hickson, Pichert, Webb, & Gabbe. Acad Med. 2007. ©2013 Vanderbilt Center for Patient and Professional Advocacy
Claims Dollars Paid* Per Physician Year (at an AMC) Before and After First PARS Interventions

*N=80 PARS High Risk Physicians with at least one year of follow-up data, p < .001

**No claims for these physicians exceeded the $2MM cap after interventions
What are the Tangibles of Having a PARS/CORS Program?

- Promotes a fair and just culture
- Reduces medical malpractice risk/costs
- Addresses behaviors or performances that threaten patient safety and healthcare quality
- Helps to meet Joint Commission Sentinel Event Alerts
- Provides insights to high-risk physicians as to their behavior
How to Avoid a Lawsuit

• Sometimes inevitable
• Communication
• Compliance
• Caps on non-economic and punitive damages
• AIMS reduce liability?
• Good and timely documentation
• Good rapport with patients
• Pay attention to high risk areas
• Police bad actors
• Culture
Preparation

“If you don’t look, you won’t find “
“Don’t look if you don’t care”

• Chart review/Labs
  • allergies; latex; steroids; medications;
• T&S, T&C
• Coagulation studies
• Pre-post op dialysis lytes
• CBC (baseline Hgb)
• Glucose
• Chest x-ray (be careful with this one)
• Old anesthesia record (airway)
Healthcare Handoffs: Definition

•The transfer of care from one clinician to the next and involves a transfer of information, responsibility and authority for patient care. It is the transfer of professional responsibility and accountability between individuals and teams.

MY WORDS CAME OUT FINE!
THEY WERE PROCESSED INCORRECTLY
BY YOUR BRAIN !!!
The Presumed Price Of Error

- 2006 Joint Commission Report
  - Communication errors responsible for approximately 70% of all sentinel events reported in US hospitals!
  - 20% of sentinel events related to lack of available information
- 444 perioperative malpractice claims reviewed
  - 60 were related to communication breakdowns
  - 43% occurred during handoffs
- ICU Australian Incident Monitoring Study
  - Communication failures (116/176) most common factor related to adverse outcomes
  - 31% of incidents had significant adverse outcomes

The Spark For Growth of Interest

• Joint Commission (2006-2008) includes requirement 2e in its National Patient Safety Goals:
  
  • "Implement a standardized approach to "hand off” communications, including an opportunity to ask and respond to questions."

  • The primary objective of a “hand off” is to provide accurate information about a [patient’s] care....

Areas Of Communication Failures

**CULTURE**
- Autonomy
- Lack of team training
- Hierarchy/Power
- Handoffs mixed with social update
- Trust

**ENVIRONMENT**
- Interruptions
- Time constraints/workload
- Multiple conversations
- No face-face contact
- Noise

**STRUCTURE**
- Change in patient condition, orders, lab results, treatment
- Information transfer not clear
- High-risk issues not clarified
- Checklist underutilized
- Illegible or unclear notes
- Incomplete data

Do All Patients Require A Structured Handoff?

<table>
<thead>
<tr>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication breakdown #1 cause of sentinel events</td>
</tr>
<tr>
<td>Communication failures correlate with increased risk for malpractice</td>
</tr>
<tr>
<td>More providers care for a given patient</td>
</tr>
<tr>
<td>Joint Commission Safety Goal 2E</td>
</tr>
<tr>
<td>ACGME Requirement</td>
</tr>
<tr>
<td>High reliability organizations/fields do it!</td>
</tr>
</tbody>
</table>
But... Do All Patients Require a Structured Handoff?

<table>
<thead>
<tr>
<th>CON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only some information is important</td>
</tr>
<tr>
<td>Attention span limited</td>
</tr>
<tr>
<td>Handoffs should follow Grice’s Maxim</td>
</tr>
<tr>
<td>Limited evidence structure improves outcomes</td>
</tr>
<tr>
<td>Violates the “Less is More” philosophy</td>
</tr>
<tr>
<td>Outcomes data is limited/HROs employ less structure than medicine</td>
</tr>
</tbody>
</table>
### Structured Handoff: Notable Trials With Positive Outcomes

<table>
<thead>
<tr>
<th>Trial</th>
<th>Design</th>
<th>Number (N)</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catchpole et al. 2007</td>
<td>Pre-, post interventional</td>
<td>50 post-surg. patients</td>
<td>↓technical errors</td>
</tr>
<tr>
<td>Agarwal HS, et al. CCM 2012;</td>
<td>Prosp. Observ. Verbal vs. standardized</td>
<td>175-team members</td>
<td>↓postop complications and loss of information</td>
</tr>
<tr>
<td>Starmer AJ, et al. JAMA 2013;</td>
<td>Pre, post-interventional</td>
<td>N-1155 patients (peds)</td>
<td>↑adverse events, errors, no increase in duration</td>
</tr>
<tr>
<td>Breuer RK, et al. CCM 2015</td>
<td>Pre, post intervention</td>
<td>N-16 bed PICU</td>
<td>Improved communication and patient outcomes</td>
</tr>
</tbody>
</table>
Factors Precluding Effective Communication in Critical Care

- Prolonged complex life threatening admissions
- Information overload
- Rapidly changing clinical problems
- The presence of a shift system (increasing frequency of handoffs)
- Ambient noise
- Poor human-computer interaction design

Intraoperative Transitions of Anesthesia Care and Postoperative Adverse Outcomes

Leif Saager, Dr. med., Brian D. Hesler, M.D., Jing You, M.S., Alparslan Turan, M.D., Edward J. Mascha, Ph.D., Daniel I. Sessler, M.D., Andrea Kurz, M.D.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Total Number of Anesthesia Handovers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>N = 82,644</td>
</tr>
<tr>
<td>In-hospital mortality</td>
<td>0.80%</td>
</tr>
<tr>
<td>Cardiac</td>
<td>2.12%</td>
</tr>
<tr>
<td>Respiratory</td>
<td>0.44%</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>3.17%</td>
</tr>
<tr>
<td>Urinary</td>
<td>0.83%</td>
</tr>
<tr>
<td>Bleeding</td>
<td>2.01%</td>
</tr>
<tr>
<td>Infection</td>
<td>1.46%</td>
</tr>
<tr>
<td>Colapsed composite</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comparison</th>
<th>OR (98.75% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 handover (N = 24,275)* vs. no handover (N = 40,102)*</td>
<td>1.06 (0.98–1.14)</td>
<td>0.05</td>
</tr>
<tr>
<td>2 handovers (N = 12,051)* vs. no handover (N = 19,688)*</td>
<td>1.12 (1.01–1.23)</td>
<td>0.005‡</td>
</tr>
<tr>
<td>3 handovers (N = 4,769)* vs. no handover (N = 7,721)*</td>
<td>1.24 (1.07–1.43)</td>
<td>&lt;0.001‡</td>
</tr>
<tr>
<td>≥4 handovers (N = 2,358)* vs. no handover (N = 3,720)*</td>
<td>1.48 (1.22–1.79)</td>
<td>&lt;0.001‡</td>
</tr>
</tbody>
</table>
A recent study\(^1\) demonstrated increased risk of major morbidity/mortality associated with handovers...

**RISK**
- 8.8%
- 11.6%
- 14.2%
- 17.0%
- 21.2%

where 1 or more handovers occurred in 39% of cases in that population...

- 61%
- 7%
- 14.2%
- 17.0%
- 21.2%

compared to a national dataset, where 1 or more handovers occurred in only 5.2% of all cases...

- 94.8%

...representing 654,290 cases and 724,529 handovers over 4 years.
• Cases (140,754) examined between 2005 and 2014
• Collapse composite outcomes and handovers
  ✓ Cardiac
  ✓ Respiratory
  ✓ Gastrointestinal bleeding
  ✓ Urinary
  ✓ Bleeding
  ✓ Infectious complications
• No association between anesthesia care transitions and postoperative outcomes \(P=0.19\)
Bottom Line

In the practice of medicine (anesthesia) "risk" is not avoidable but is it absolutely "manageable"
Thank You!
Anesthesia Care Transitions and Risk of Postoperative Complications

Joseph A. Hyder, MD, PhD,*‡ J. Kyle Bohman, MD,* Daryl J. Kor, MD,*‡ Arun Subramanian, MBBS,* Edward A. Bittner, MD, PhD,§ Bradly J. Narr, MD,|| Robert R. Cima, MD, MA,‡∥∥∥ and Victor M. Montori, MD, MSc**

BACKGROUND: A patient undergoing surgery may receive anesthesia care from several anesthesia providers. The safety of anesthesia care transitions has not been evaluated. Using unconditional and conditional multivariable logistic regression models, we tested whether the number of attending anesthesiologists involved in an operation was associated with postoperative complications.

CONCLUSIONS: In our study, care by additional attending anesthesiologists and in-room providers was independently associated with an increased odds of postoperative complications. These findings challenge the assumption that anesthesia transitions are care neutral and not contributory to surgical outcomes. (Anesth Analg 2016;122:134–44)
Morning Handover Of On-Call Issues Opportunities for Improvement

• Prosp Point prevalence
  • 2 tertiary care hospital (Toronto & Ontario Canada)
  • Participants:
    • 3rd year medical students & 2nd and 3rd year residents

• Results:
  • On-Call trainee omitted ≈40% clinical important issues during morning handover
  • No documentation of important information in medical record ≈ 85.8%

Conclusion: On-call trainees omit a substantial amount of information during morning handover. Running the list in person without distractions may reduce these omissions!

Conclusion: This study showed a significant decrease in the accuracy of information during sequential patient handoff exercises!
Improving Hand-Off Communication

• Use a standardized process (specific minimum content)
• Allow opportunity for receiver to review patient data
• Use verification process
• Allocate a specific schedule for handoffs
• Allow for opportunity to ask and respond to questions and *limit interruptions*

The Value of Adding a Verbal Report to Written Handoffs on Early Readmission Following Prolonged Respiratory Failure

Dean R. Hess, PhD, RRT, FCCP; Arthur Tokarczyk, MD; Mary O’Malley, RN; Susan Gavaghan, RN; Judith Sullivan, RN; and Ulrich Schmidt, MD, PhD, FCCP

Table 3—Results of Logistic Regression Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handoff with call</td>
<td>0.42</td>
<td>0.17-1.04</td>
<td>.06</td>
</tr>
<tr>
<td>Respiratory unit days</td>
<td>0.97</td>
<td>0.91-1.03</td>
<td>.31</td>
</tr>
<tr>
<td>Hospital days</td>
<td>1.00</td>
<td>0.98-1.03</td>
<td>.78</td>
</tr>
<tr>
<td>Age</td>
<td>1.01</td>
<td>0.98-1.04</td>
<td>.48</td>
</tr>
<tr>
<td>Sex</td>
<td>1.37</td>
<td>0.57-3.27</td>
<td>.48</td>
</tr>
<tr>
<td>Medical admission</td>
<td>2.33</td>
<td>0.63-8.60</td>
<td>.20</td>
</tr>
<tr>
<td>Surgical admission</td>
<td>2.12</td>
<td>0.52-8.56</td>
<td>.29</td>
</tr>
<tr>
<td>Pulmonary comorbidity</td>
<td>0.44</td>
<td>0.18-1.12</td>
<td>.09</td>
</tr>
<tr>
<td>Cardiac comorbidity</td>
<td>0.68</td>
<td>0.26-1.79</td>
<td>.44</td>
</tr>
<tr>
<td>Neurologic comorbidity</td>
<td>1.46</td>
<td>0.53-4.05</td>
<td>.47</td>
</tr>
<tr>
<td>Renal comorbidity</td>
<td>2.35</td>
<td>0.50-11.13</td>
<td>.28</td>
</tr>
<tr>
<td>Discharged on ventilator</td>
<td>2.11</td>
<td>0.46-9.75</td>
<td>.34</td>
</tr>
<tr>
<td>Discharged with tracheostomy</td>
<td>1.00</td>
<td>0.33-3.02</td>
<td>&gt;.99</td>
</tr>
<tr>
<td>Discharged on noninvasive</td>
<td>1.01</td>
<td>0.09-11.68</td>
<td>&gt;.99</td>
</tr>
</tbody>
</table>

Conclusion: Supplementing a written report with a verbal report was associated with significant reduction in cost (average savings of ~ $184,000 for every 100 patients discharged)  

The Structured Handoff: Alphabet Soup

- **SBAR**
  - Situation
  - Background
  - Assessment
  - Recommendation
  - +2 (includes Introduction & Questions)

- **5P’s**
  - Patient
  - Plan
  - Purpose
  - Problem
  - Precautions

- **I PASS the BATON**
  - Introduction
  - Patient
  - Assessment
  - Situation
  - Safety
  - Background
  - Actions
  - Timing
  - Ownership
  - Next

Runy LA. *H&HN* research and Sentara Health Care, 2008
Clinical paper

SBAR improves nurse-physician communication and reduces unexpected death: A pre and post intervention study

Resuscitation 84 (2013) 1192–1196

K. De Meester a,b,⁎, M. Verspuy b, K.G. Monsieurs a,c, P. Van Bogaert a,b

• Pre-, post-interventional (N-16 hospitals)
  • Nurses trained to use SBAR to communicate with physicians regarding patient deterioration

Conclusion: After introducing SBAR, there was an increase in perception of effective communication, increase in unplanned ICU admissions, and a decrease in unexpected deaths!
SBAR Poor Quality Research

**Situation, Background, Assessment, Recommendation**

- 1987 - 2008 46 articles describing 24 handoff mnemonics
- 82% published 2006-2008
- SBAR is cited in ~70%
- 7 handoff research articles, only 4 evaluate mnemonics
- Small sample sizes (10-100), no validated instruments
- Only 1 study with IRB approval
- At present, almost no literature complies with the SQUIRE Guidelines (Standards for Quality Improvement Reporting Excellence)

Should A Detailed Structured Approach To Handoffs Be Used For All Patients?

<table>
<thead>
<tr>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed structure helps organize complex patients</td>
</tr>
<tr>
<td>Information overload leads to misinformation, loss of information, information decay</td>
</tr>
<tr>
<td>Detailed structure reduces errors of omission and commission</td>
</tr>
<tr>
<td>Detailed structure may be more satisfying</td>
</tr>
<tr>
<td>Detailed structure reduces errors from ambient noise and distractions</td>
</tr>
<tr>
<td>Detailed structure aids provider communication where there is poor human-computer interactive design</td>
</tr>
</tbody>
</table>
But…Should The Same Detailed Structured Handoff Be Used For All Patients?

<table>
<thead>
<tr>
<th>CON</th>
</tr>
</thead>
<tbody>
<tr>
<td>One form cannot fit all</td>
</tr>
<tr>
<td>Most handoffs hide the relevant in a mass of extraneous information</td>
</tr>
<tr>
<td>Structure ignores priority</td>
</tr>
<tr>
<td>Provider adherence is poor</td>
</tr>
<tr>
<td>We need better interface design, not a structured handoff</td>
</tr>
<tr>
<td>Again, this violates Grice’s Maxim!!!!</td>
</tr>
</tbody>
</table>
Patient handover from surgery to intensive care: using Formula 1 pit-stop and aviation models to improve safety and quality

**Intervention Handover Model**

**Formula 1 Pit Stop Model**
## Handover Impact: Patient Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>Pre vs. 3 mos</th>
<th>Post-Intervention, 12 mos</th>
<th>Pre vs. 12 mos</th>
</tr>
</thead>
<tbody>
<tr>
<td>% patients receiving delayed dose of antibiotics</td>
<td>345</td>
<td>139</td>
<td>0.03</td>
<td>12.1</td>
<td>0.03</td>
</tr>
<tr>
<td>% of patients w/6 hr pain score &gt; admit pain score</td>
<td>548</td>
<td>227</td>
<td>0.02</td>
<td>21.2</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Conclusion: Postoperative communication and patient outcome can be improved and sustained with standardized handover protocol.

Long And Detailed Handoffs Are Superior To Short And Sweet Conversations

<table>
<thead>
<tr>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduces the human propensity for error during information exchange</td>
</tr>
<tr>
<td>This approach does not take significantly more time</td>
</tr>
<tr>
<td>Provides unity within a multidisciplinary team</td>
</tr>
<tr>
<td>This approach may reduce inappropriate extraneous conversation</td>
</tr>
<tr>
<td>May allow for more complete information exchange</td>
</tr>
</tbody>
</table>
Can Checklists (or Structured Protocols) Handoffs Improve Outcomes?
Can Checklists (or Structured Protocols) Handoffs Improve Outcomes?

1. Involvement of experts
2. Task analysis
3. Request specific outcomes
4. Identification of conflicting physical demands (e.g., if the task requires both hands, the checklist cannot require the use of hands if it is to be done alone)
5. Consideration of all possible task scenarios
6. Be realistic about the task, e.g., know how people actually perform the task, not how the task is prescribed to be performed
7. Include pauses
8. Adhere to basic usability guidelines
9. Indicate task possession, e.g., allocate tasks to individuals
10. Test the checklist

Can We Make Postoperative Patient Handovers Safer? A Systematic Review of the Literature

Noa Segall, PhD,* Alberto S. Bonifacio, BSN,† Rebecca A. Schroeder, MD,* † Atilio Barbeito, MD,* † Dawn Rogers, BSN,† Deirdre K. Thornlow, RN, PhD,† James Emery, PhD,§ Sally Kellum, RN-BC, MSN,|| Melanie C. Wright, PhD,¶ and Jonathan B. Mark, MD* †; On behalf of the Durham VA Patient Safety Center of Inquiry

• Evaluated 31 articles on handovers from OR to PACU/ICU
  • Recommendations:
    • Standardize process (checklists/protocols)
    • Complete urgent clinical tasks before handover
    • All relevant team members should be present
    • Allow only patient-specific discussions during handover
    • Provide training in team skills and communication

Conclusion: More research is required to define optimal handover & to determine effect of quality of handover and outcomes!

Every patient should have on discharge from ICU, a standardized documentation for the reasons for admission, the diagnosis, ongoing problems, and issues that need to be resolved. New and old drugs and their duration should be addressed. This documentation should form part of the routine patient record and should be available to all clinical teams caring for the patient post-ICU discharge!
Checklists (Or Structured Protocols) Make Handoffs Better

<table>
<thead>
<tr>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure completeness of important variables</td>
</tr>
<tr>
<td>Improve care over time (length of stay, reduced adverse events, etc.)</td>
</tr>
<tr>
<td>Limit variation</td>
</tr>
<tr>
<td>“To err is human”</td>
</tr>
<tr>
<td>Improve efficiency by promoting repetition</td>
</tr>
</tbody>
</table>
Can Integration Of Handoffs Into the Electronic Medical Record (EMR) Be Worthwhile?
A systematic review of the literature on the evaluation of handoff tools: implications for research and practice  

Joanna Abraham, Thomas Kannampallil, Vimla L Patel

- Systematic review (N-36 articles)
  - Evaluating handoff tools

**Conclusion:** The nature, methodological, and theoretical foundations of handoff tool evaluations varied significantly in terms of quality and rigor. Future studies need to evaluate effects of handoff tools on patient related outcomes!
## An Electronic Checklist Improves Transfer and Retention of Critical Information at Intraoperative Handoff of Care

(Anesth Analg 2015;120:96–104)

Aalok V. Agarwala, MD, MBA, Paul G. Firth, MB, ChB, Meredith A. Albrecht, MD, PhD, Lisa Warren, MD, and Guido Musch, MD

<table>
<thead>
<tr>
<th>Information</th>
<th>Without Checklist (%)</th>
<th>With Checklist (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admin</td>
<td>44</td>
<td>85</td>
<td>0.008</td>
</tr>
<tr>
<td>Admin antiemetics</td>
<td>15</td>
<td>46</td>
<td>0.015</td>
</tr>
<tr>
<td>EBL</td>
<td>57</td>
<td>85</td>
<td>0.014</td>
</tr>
<tr>
<td>Urine output</td>
<td>52</td>
<td>85</td>
<td>0.006</td>
</tr>
<tr>
<td>Comm. about potential concern</td>
<td>57</td>
<td>92</td>
<td>0.001</td>
</tr>
<tr>
<td>Postop planning</td>
<td>43</td>
<td>92</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>75</td>
<td>97</td>
<td>0.02</td>
</tr>
<tr>
<td>Muscle Relaxants</td>
<td>63</td>
<td>97</td>
<td>0.0003</td>
</tr>
<tr>
<td>Amt Fluids</td>
<td>72</td>
<td>97</td>
<td>0.008</td>
</tr>
</tbody>
</table>

**Conclusion:** Electronic checklist improved relay and retention of critical patient information and clinical communication at intraop handoff of care!
Can Integration Of Handoffs Into the Electronic Medical Record (EMR) Be Worthwhile?

<table>
<thead>
<tr>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides easier access to patient information</td>
</tr>
<tr>
<td>May efficiently synthesize pertinent data</td>
</tr>
<tr>
<td>May provide common ground for providers to interact</td>
</tr>
<tr>
<td>May improve satisfaction</td>
</tr>
<tr>
<td>May allow for more complete and efficient information exchange</td>
</tr>
</tbody>
</table>
How Can Integration Of Handoffs Into the Electronic Medical Record (EMR) Be Worthwhile?

<table>
<thead>
<tr>
<th>CON</th>
</tr>
</thead>
<tbody>
<tr>
<td>May reduce face-to-face interaction: screen time is already a problem</td>
</tr>
<tr>
<td>Forces all problems to fit into the form.</td>
</tr>
<tr>
<td>Detailed structure is likely a poor fit everywhere.</td>
</tr>
<tr>
<td>May frustrate conversation, as the quality metric will be that ALL of the boxes have been checked</td>
</tr>
<tr>
<td>Tedious</td>
</tr>
</tbody>
</table>
Conclusions

• We are all prone to uncommon and common errors: **YES EVEN Doctors, Nurse Practitioners and Nurses!!!**

• Structured handoffs reduce errors of omission while not significantly adding more time

• Checklists have been used to handoff information and improve outcomes in observational studies

• Customized structured handoffs seem to be most appropriate and allows for building teamwork

• EMR integrated handoffs may provide more efficiency and effectiveness to this process in the now and in the future!
Grice’s Maxims

- **The maxim of quantity**, where one tries to be as informative as one possibly can, and gives as much information as is needed, and no more.

- **The maxim of quality**, where one tries to be truthful, and does not give information that is false or that is not supported by evidence.

- **The maxim of relation**, where one tries to be relevant, and says things that are pertinent to the discussion.

- **The maxim of manner**, when one tries to be as clear, as brief, and as orderly as one can in what one says, and where one avoids obscurity and ambiguity.
• Prosp Before-After Intervventional (N-1255 patients)
  • 3 month eval period each in 2 units @ Boston Children’s, Boston, MA
  • The Resident Handoff Bundle:
    • Standard communication/handoff training
    • Verbal pneumonic
    • New team handoff structure
  • Primary outcomes: Measured by daily systematic surveillance
    • Rate of medical errors
    • Rate of preventable adverse events
  • Secondary outcomes:
    • Omissions in printed handoff document
    • Resident time-motion activity
• Survey of 169 ACGME hospitals, (N-661 intensivists completed survey (38%)

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Quotes from Providers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Errors</td>
<td>The patient’s code was not clarified on the handoff....he underwent full resuscitation.... Informed by family he was a DNR.... Plan for ventilator and sepsis management was not discussed and patient continued on suboptimal therapy</td>
</tr>
<tr>
<td>Family Communication Issues</td>
<td>“Extreme family dissatisfaction with change of care plan following attending handoff without family knowledge.”</td>
</tr>
<tr>
<td>Serious Adverse Events</td>
<td>Failed to communicate difficult airway led to death following a planned extubation that failed.”</td>
</tr>
</tbody>
</table>

Conclusion: ICU attending handoffs in US exhibit marked heterogeneity. Some intensivists perceive a link between suboptimal handoffs, inappropriate treatment and subsequent serious adverse events.
**Conclusion:** Implementation of a handoff bundle significantly reduced medical errors and preventable adverse events among hospitalized children. Resident workflow did not change adversely!

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Before (N-642)</th>
<th>After (N-613)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Errors (Rate per 100 admissions)</td>
<td>217 (33.8%)</td>
<td>112 (18.3%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Intercepted potential adverse events (total)</td>
<td>96</td>
<td>51</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total Computer Time (% time/24hr)</td>
<td>24%</td>
<td>23.2%</td>
<td>0.64</td>
</tr>
<tr>
<td>Patient/Family Contact (% time/24hr)</td>
<td>8.3%</td>
<td>10.6%</td>
<td>0.03</td>
</tr>
</tbody>
</table>
Patient handover from surgery to intensive care: using Formula 1 pit-stop and aviation models to improve safety and quality

- Before/After prosp intervention study
- 50 post-surgery patient handovers evaluated (23 old, 27 new protocol)

Intervention Handover Model

Liability Associated with Obstetric Anesthesia

A Closed Claims Analysis


[Graph and bar chart showing trends in complications in OB claims 1970s vs. 1990s]
Results

<table>
<thead>
<tr>
<th>Performance measure</th>
<th>Constant</th>
<th>New protocol</th>
<th>RACHS levels 3-6</th>
<th>Teamwork</th>
<th>New protocol × teamwork</th>
<th>$r^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical errors</td>
<td>Gradient</td>
<td>-9.96</td>
<td>0.47</td>
<td>-1.17</td>
<td>0.700</td>
<td>63.4%</td>
</tr>
<tr>
<td></td>
<td>$t$</td>
<td>-3.63</td>
<td>0.974</td>
<td>-6.05</td>
<td>3.04</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$P$</td>
<td>&lt;0.001</td>
<td>0.001</td>
<td>0.001</td>
<td><strong>0.004</strong></td>
<td></td>
</tr>
<tr>
<td>Duration of handover</td>
<td>Gradient</td>
<td>-5.42</td>
<td>1.09</td>
<td>0.311</td>
<td>0.350</td>
<td>10.8%</td>
</tr>
<tr>
<td></td>
<td>$t$</td>
<td>-0.939</td>
<td>1.56</td>
<td>-0.77</td>
<td>0.72</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$P$</td>
<td>0.353</td>
<td>0.126</td>
<td>0.447</td>
<td><strong>0.473</strong></td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: A simple, easy trainable handover process using expertise from high risk industries reduced errors and improved information transfer with no penalty in handover duration or training overhead!

Types of Miscommunication

Asynchronous communication: Where Communication doesn’t happen in real time.
- Misperception
- Misinterpretation
- Misconception

Synchronous communication: Communication happens in real time. Eg. telephone, meetings, etc.

No communication: Where there is no verbal communication.
- Fear
- Assumption