anesthesia & mass casualty events

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I am experienced in this area

I have no conflicts of interest to disclose
why are we talking about this?
content

• SF current risk assessment

• best practice for mass casualty events for anesthesia
San Francisco General Hospital & Trauma Center
Updated Hazard Vulnerability & Impact Analysis (HVA)

- annual analysis
- TJC mandate
- involves
  - probability of occurrence
  - risk
  - preparedness status
TJC

- define point-in-time and longitudinal surge capacity
- aid agreements with others
- 48-72h stand alone capability (personnel and materials)
- direct caregivers; training & equipment
- maintain ability to provide routine care
- incident command
- program testing, <1/yr
- oversight of preparedness system
for the year 2015

(risk = probability * severity)

- major earthquake (78% risk)
- electrical power failure/info system failure (61% risk)
- epidemic/disease outbreak (50% risk)
- multi casualty incident (44% risk)
- active shooter (41% risk)
- water failure, internal flood, drought (39% risk)
content

- SF current risk assessment

- best practice for mass casualty events for anesthesia
role of anesthesia/ologist

- provide care
- organize care
- triage
- organize systems

likelihood complexity
what do you need to be successful in those roles?

• organizational setup in place
• good clinical care
what do you need to be successful in those roles?

- trauma anesthesia/ resources
- checklists
  - trauma anesthesia
  - massive bleeding/transfusion
  - mass casualty organization/ triage
what do you need?

- trauma anesthesia/ resources
- checklists
  - trauma anesthesia
  - massive bleeding/transfusion
  - mass casualty organization/ triage
general trauma anesthesia checklist

Society of Critical Care Anesthesiologists
Section Editor: Avery Tung

SPECIAL ARTICLE

A Checklist for Trauma and Emergency Anesthesia

Joshua M. Tobin, MD,* Andreas Grabinsky, MD,† Maureen McCunn, MD, MIPP, FCCM,‡ Jean-Francois Pittet, MD,§ Charles E. Smith, MD,∥ Michael J. Murray, MD, PhD,# and Albert J. Varon, MD, MHPE, FCCM¶
BEFORE PATIENT ARRIVAL

☐ Room temperature 25°C or higher
☐ Warm IV Line
☐ Machine Check
☐ Airway Equipment
☐ Emergency Medications
☐ BLOOD BANK: “6U O Neg PRBC, 6U AB FFP, 5-6 Units of random donor plat (1 standard adult dose) available”

PATIENT ARRIVAL

☐ Patient identified for trauma / emergency surgery?
☐ BLOOD BANK: “Send blood for T&C and initiate MTP now!”
☐ IV Access
☐ Monitors (SaO2, BP, ECG)
☐ SURGEON: “PREP & DRAPE!”
☐ Pre-oxygenation

INDUCTION

☐ Sedative hypnotic (ketamine v. propofol v. etomidate)
☐ Neuromuscular Blockade (succ v. roc)

INTUBATION

☐ (+) ETCO2, SURGEON: “GO!”
☐ Place Orogastric Tube

ANESTHETIC

☐ (Volatile Anesthetic and/or Benzodiazepine) + Narcotic
☐ Consider TIVA
☐ Insert additional IV access if needed and an arterial line

RESUSCITATION

☐ Send baseline labs
☐ Follow MAP trend
☐ Goal FFP:PRBC controversial, but consider early FFP
☐ Goal Urine Output 0.5-1 mL/kg/hr
☐ Consider tranexamic acid if <3 hr after injury; 1 gm over 10 min x1, then 1 gm over 8 hrs
☐ Consider calcium chloride 1 gm
☐ Consider hydrocortisone 100 mg
☐ Consider vasopressin 5-10 IU
☐ Administer appropriate antibiotics
☐ Special Considerations for TBI (SBP > 90-100 mmHg, SaO2>90%, pCO2 35-45 mmHg)

CLOSING / POST-OP

☐ ICU: “Do you have a bed?”
☐ Initiate low lung volume ventilation (TV = 6mL/kg ideal body weight)

Figure 1. Checklist for trauma and emergency anesthesia.
SFGH trauma anesthesia checklist

- Stop the bleeding
- Call for help
- Control airway & FiO2 100%
- Activate MTP
- Consider 6x O+ PRBC in main OR
- Large bore peripheral (>16G) or central access (cordis/ MAC)
- Belmont rapid infuser
- Damage control resuscitation
  - Permissive hypotension
    - SBP <100mmHg
    - MAP 50-60
    - Individual decision if: severe TBI, significant carotid stenosis/ CAD
  - Judicious use of crystalloids/ colloids
  - Early use of blood products
    - Initial transfusion empiric 1:1:1
    - Consider 1g of Calcium for every 3 blood products
    - Avoid vasoconstrictors
- Arterial line placement & point of care testing (ABG, ROTEM)
- Tailored resuscitation
  - Use ROTEM to guide coagulopathy resuscitation
  - Use ABG to guide hematocrit
  - Use clinical signs & serial Lactate/ BE to guide fluid administration
- Prevent hypothermia
  - Esophageal temperature probe
  - Warmed fluids only
  - Bair hugger upper body & lower body
  - Elevated room temperature
- Consider cell saver
- Repeat point of care testing (ABG & ROTEM) every 30 minutes
- After surgical hemostasis
  - Rapid intravascular filling
  - Step wise deepening of anesthesia
    - Repeated Fentanyl boluses
    - Incremental vapor concentration
  - Possible use of vasoactive infusions
  - Goal: normalization of Lactate and Base Deficit
- Consider Foley catheter
- Constant communication with all team members
- Deactivate MTP when appropriate
✓ Stop the bleeding
✓ Call for help
✓ Control airway & FiO2 100%
✓ Activate MTP
✓ Consider 6x O+ PRBC in main OR
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Damage control resuscitation
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SFGH trauma anesthesia checklist
Arterial line placement & point of care testing (ABG, ROTEM)
Tailored resuscitation
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  • Goal: normalization of Lactate and Base Deficit
✓ Consider Foley catheter
✓ Constant communication with all team members
✓ Deactivate MTP when appropriate
## Preoperative History
- Bleeding HX
- Medication (Aspirin, GIIb/IIIa inhibitors, Coumadin, Heparin, LMWH etc.)

## Preoperative Coagulation Parameters
- INR, PT, PTT, Fibrinogen, plts

IF Clopidogrel within 10days - tranexamic acid/ amicar

## BLOOD LOSS >30-50% and ACTIVE, DIFFUSE BLEEDING

<table>
<thead>
<tr>
<th>ROTEM (exTEM, inTEM, fibrTEM, apTEM)</th>
<th>Always correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>hepTEM if Heparin given (i.e. vascular case)</td>
<td>• Temperature &gt; 36º C (bair hugger, warm infusion, room temperature, HME)</td>
</tr>
<tr>
<td>ABG</td>
<td>• Calcium, ionized &gt; 1.10 mmol/l</td>
</tr>
<tr>
<td>fibrTEM, A10 &lt; 8 mm</td>
<td>• Acidosis, pH &gt; 7.20</td>
</tr>
<tr>
<td>extTEM, A10 &lt; 30 mm</td>
<td>• Anemia, Hb &gt; 7-9 g/l</td>
</tr>
<tr>
<td>inTEM/ intEM &gt; 15 % lysis</td>
<td>• Hypertension, MAP 55-65 mmHg</td>
</tr>
<tr>
<td>injTEM, CT &gt; 240 sec &amp; CThep/CTin &lt; 0.8</td>
<td>• Hypoxia, PaO2 &gt;100, but &lt; 200 mmHg</td>
</tr>
</tbody>
</table>

Consider PRBC:FFP in a 2:1 ratio

## Blood loss > 60% and ACTIVE, DIFFUSE BLEEDING

<table>
<thead>
<tr>
<th>ROTEM (exTEM, inTEM, fibrTEM, apTEM)</th>
<th>Same goals as under 30-50% blood loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>hepTEM if Heparin given (i.e. vascular case)</td>
<td>Consider PRBC:FFP:plts in a 1:1:1 ratio (give 6pack of plts early)</td>
</tr>
<tr>
<td>aBGA</td>
<td>Plts &gt; 100,000/mcl</td>
</tr>
<tr>
<td>INR, PT, PTT, Fibrinogen, plts</td>
<td></td>
</tr>
</tbody>
</table>

## BLOOD LOSS > 100-150%

<table>
<thead>
<tr>
<th>ROTEM (exTEM, inTEM, fibrTEM, apTEM)</th>
<th>Same goals as under 30-50% blood loss</th>
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<tbody>
<tr>
<td>hepTEM if Heparin given (i.e. vascular case)</td>
<td>PRBC:FFP:plts in a 1:1:1 ratio (give 6pack of plts early)</td>
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<td></td>
</tr>
</tbody>
</table>

## FibrTEM < 12 mm

<table>
<thead>
<tr>
<th>extTEM, A10 &lt; 40 mm &amp; fibrTEM A10 &gt; 10mm</th>
<th>Platelet concentrates (each unit is a 6pack)</th>
</tr>
</thead>
<tbody>
<tr>
<td>extTEM/ intEM &gt; 15 % lysis</td>
<td>1st choice: Tranexamic acid 1g</td>
</tr>
<tr>
<td>extTEM CT &gt; 90 sec</td>
<td>alternative: Aminocaproic acid 4-5g</td>
</tr>
</tbody>
</table>

Consider PCC (Kcentra®) 20-40 IU/kg

## ONGOING MASSIVE DIFFUSE HEMORRHAGE

<table>
<thead>
<tr>
<th>With corrected</th>
<th>Consider rFVIIa (NovoSeven) 40 – 90 mcg/kg bolus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidosis</td>
<td>Repeat: half of initial dose after 2-4hours</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>Consider 2) DDAVP</td>
</tr>
<tr>
<td>Hypocalcemia</td>
<td></td>
</tr>
<tr>
<td>Hct &gt; 21 – 24%</td>
<td></td>
</tr>
<tr>
<td>Fibrinogen level</td>
<td></td>
</tr>
<tr>
<td>Plts &gt; 100,000/mcl</td>
<td></td>
</tr>
</tbody>
</table>
mass casualty checklist

✓ Consult Disaster Manual.
✓ Assign someone to activate the call-in disaster list.
✓ Assess the number of available ORs that you can staff immediately and over next several hours.
✓ Contact running ORs and alert them to finish as soon as safely possible and prepare for trauma.
✓ Assign free staff to set up for trauma/emergency cases.
✓ Anesthesia floor manager should co-locate with the OR nursing manager to ease communication and coordination. (Anesthesia floor manager should become OR Medical Director until relieved.)
✓ Hold up elective cases.
✓ Coordinate with anesthesia techs to ensure adequate supplies of fluids, drugs, disposables.
✓ Call PACU to accelerate transfer of post op patients to floors/ICUs.
✓ Send a senior anesthesiologist to the ED to act as a liaison (your eyes and ears).
✓ Consider assembling additional "stat" teams.
✓ If HAZMAT or WMD event, review special personal protective procedures such as DECON and isolation techniques. Consider if part of the OR or hallways should be considered "hot" or should have ventilation altered.

Jay McIsaac, MD
SALT triage

Lerner et al, USE OF SALT TRIAGE IN A SIMULATED MASS-CASUALTY INCIDENT, PREHOSPITAL EMERGENCY CARE. 2010;14:21–25
questions