CHU Dinant Godinne
UCL NAMUR

L’urgence de l’anesthésie au décours de l’intervention

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AFISO mars 2015

L’urgence de l’anesthésie au décours de la chirurgie

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- Lien de la chirurgie à l’anesthésie, et de l’anesthésie à la chirurgie
- Patient chirurgical électif
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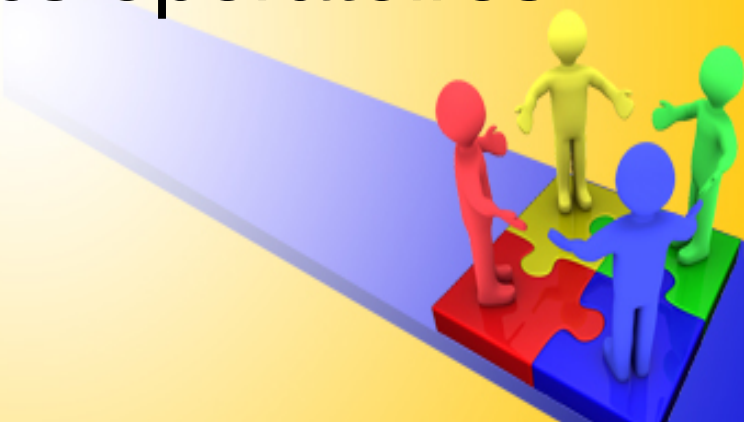

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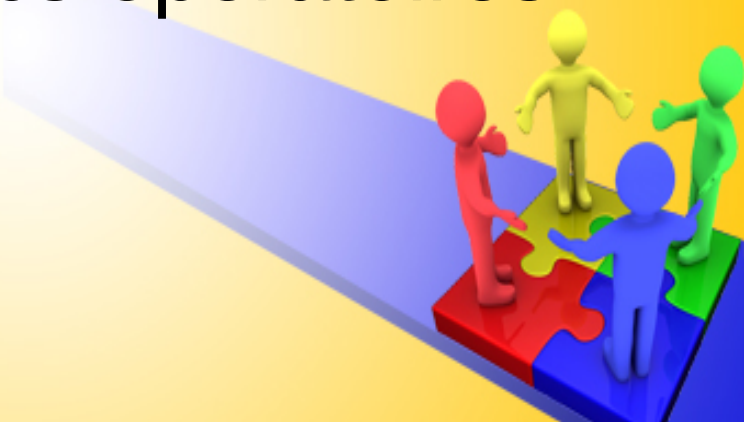


Introduction

- Petite anesthésie

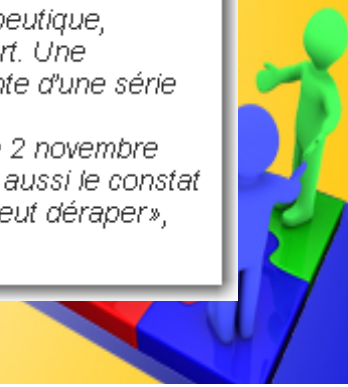
- Petite chirurgie

Introduction

« Les chirurgiens de Corentin, mort à la suite d'une appendicite, pourraient être inquiétés »

Le Monde , Libération

Le Monde constate que « *plusieurs médecins, dont trois chirurgiens, sont susceptibles d'être inquiétés dans l'information judiciaire pour « homicide involontaire » ouverte vendredi 7 novembre « contre X » après la mort d'un jeune patient de 11 ans, à la suite d'une opération de l'appendicite pratiquée le 1er novembre à l'hôpital-clinique Claude-Bernard de Metz* ».
Le journal explique que « *cet établissement privé a confirmé les informations publiées par Le Républicain lorrain. Le quotidien messin avait révélé qu'un spécialiste en chirurgie vasculaire avait été appelé en urgence au bloc opératoire pour tenter de juguler l'hémorragie déclenchée par une lésion accidentelle de l'aorte, à la suite d'un geste malheureux du chirurgien du thorax et de l'appareil digestif à qui l'opération avait été confiée dans un premier temps* ».
« *L'intervention de ce second praticien n'aurait fait qu'aggraver l'état du malade, le foie de l'enfant – l'artère hépatique avait été touchée à son tour. Un troisième chirurgien aurait alors été sollicité tandis que le jeune patient, traité depuis plusieurs heures pour une intervention normalement limitée à 45 minutes, était transfusé* », indique Le Monde.
Le quotidien ajoute que « *les enquêtes devront reconstituer la chaîne des responsabilités* ». Le Monde relève que l'Agence régionale de santé « *a décidé « d'accélérer le cours de l'enquête médico-administrative» diligentée après la mort du patient. L'information judiciaire ouverte par le parquet de Metz et con fiée à la PJ semble s'intensifier* ».
Pour sa part, Libération publie une page sur le sujet, avec ce titre : « *Mort d'un enfant à Metz : présomption d'erreurs en série* ».
Le quotidien revient en détail sur cette affaire, relevant : « *Mauvaise indication thérapeutique, mauvais jour, mauvais geste chirurgical, mauvais relais et, au final, un enfant qui meurt. Une catastrophe chirurgicale est rarement liée à un seul fait, mais bien souvent la résultante d'une série d'éléments* ».
Le journal observe que « *l'histoire tragique de Corentin, ce garçon de 11 ans, mort le 2 novembre des suites d'une opération ratée de l'appendicite à Metz, le montre lourdement. C'est aussi le constat qu'il n'y a pas de petite chirurgie. «Une opération, même présentée comme banale, peut déraper», insiste un grand chirurgien hépatique* ».



Introduction

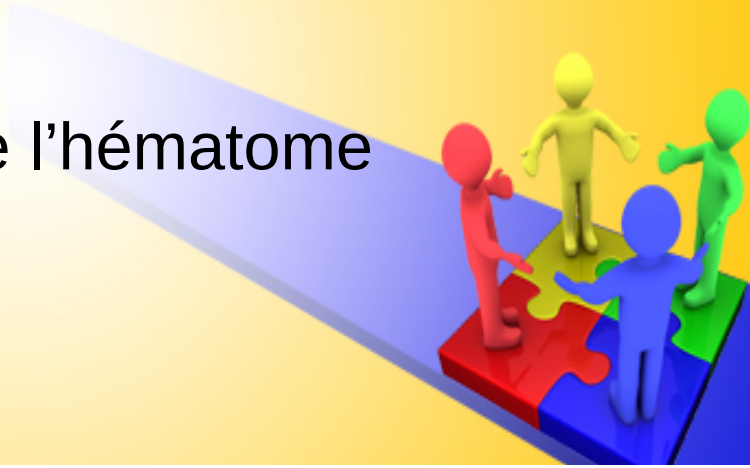
- **Décès d'un bébé dans un hôpital de Knokke :**
- **09/11/2012 -** Un bébé de 8 mois en état de mort clinique après une erreur médicale à Knokke
- **BRUGES 12/02 - La chambre du conseil de Bruges s'est penchée mercredi sur la demande du parquet de Flandre occidentale qui souhaite poursuivre quatre personnes et deux sociétés dans le cadre du décès d'un bébé de huit mois, survenu en 2012 après un problème technique dans un hôpital de Knokke.**
- Le nourrisson avait subi, en novembre 2012, une opération de routine à l'hôpital Onze-Lieve-Vrouw Ter Linden de Knokke, mais la phase de réveil après l'opération s'était mal passée. Une inversion des tuyaux avait conduit à administrer du protoxyde d'azote plutôt que de l'oxygène au bébé.
- Ce dernier avait fait un arrêt cardiaque avant de tomber dans le coma et de s'éteindre quelques jours plus tard.
- Le parquet estime qu'il s'agit clairement d'un "défaut de prévoyance" et veut dès lors renvoyer l'anesthésiste, le chef de service, le directeur technique ainsi que le directeur général de l'hôpital devant la justice. Le ministère public entend également poursuivre le centre hospitalier lui-même et la société Heyer C&I, qui avait procédé à l'installation de la nouvelle salle d'opérations.
- 12/02/2015 Auteur: QUJ/OSA Source: Belga

Introduction

- **Un enfant de 2 ans meurt après une opération des amygdales: "On a menti aux parents du début à la fin"**
- Publié le 17 février 2015 à 09h52 ,
- **Un enfant de deux ans a perdu la vie suite à une opération des amygdales, à Toulouse. Les parents ont porté plainte contre l'équipe médicale qui leur aurait caché la vérité.**
- Les faits se sont produits le 7 février à l'hôpital Pierre-Paul Riquet de Toulouse,. Un enfant de deux ans a été opéré des amygdales. Mais au réveil, rien ne s'est passé comme prévu. L'enfant est décédé.
- Les parents ont décidé de porter plainte contre le personnel médical. "*La volonté unique de ses parents, c'est de connaître la vérité et de savoir pourquoi les médecins et les infirmiers qui étaient présents dans la salle de réveil au moment où cet enfant vomissait du sang n'ont-ils rien fait ? (...) On a laissé cette maman seule avec son enfant dans les bras, ses vêtements tâchés de sang, et on lui a dit 'tout va bien se passer'.*

Introduction

- Cas personnel
  - Hématome de paroi abdominale dû injection HBPM
  - Intervention banale un dimanche après-midi
  - Une seule infirmière en salle d'op
  - Induction anesthésie classique
  - Hypotension majeure
  - MCE
  - Drogues vasocontrictrices et inotropes
  - Artérielle invasive, voie centrale, gazo
  - Hb 5
- Mauvaise appréciation de l'importance de l'hématome



Introduction

- Petite anesthésie
- Petite chirurgie
- Tout acte chirurgical qlq soit est à risque
  - Changt boîtier de pace sous AL (ARCA)
  - Drain thoracique sous AL (drain dans VD)
- Toute action anesthesiologique est à risque
- Et cela dès le départ
  - Se tromper de patient
  - Perfusion qui coule à côté, …
  - Se tromper de côté dans l'installation
  - Tout l'intérêt des check list, …(préparation du travail en amont, …)

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Lien de l’anesthésie à la chirurgie

- Sans chirurgie, pas d’anesthésie au bloc opératoire
- Sans acte invasif, qlq soit la raison (immobilité, douleur, …), pas d’anesthésie
- Selon l’importance de l’acte chirurgical, le nbre d’infirmières sera proportionnel
- Ce qui n’est pas le cas habituellement pour ce qui concerne l’anesthésie

Lien de la chirurgie à l'anesthésie

- Un chirurgien peut officier sans anesthésiste (intervention sous AL).
- Un anesthésiste en salle d'opération ou dans des salles interventionnelles ne peut officier seul.
- Cette dépendance peut rendre les choses complexes, pcq ce qui prime est la chirurgie ou la radiologie, …; le parent pauvre est toujours l'anesthésie. La spécialisation de l'infirmière est tjs réalisée par rapport à l'opérateur.
- Ce qui peut expliquer les relatives difficultés de connaissance de nos syndromes graves et pas seulement, et les difficultés d'aide nursing et ou chirurgicale qui en découle.
- En Belgique, nous avons des infirmières tournantes, des infirmières instrumentistes et bcp trop peu d'infirmières anesthésistes.

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Patient chirurgical électif

- Staff nursing habituel
- Routine
- Événement aigu anesthesiologique est une surprise, et est svt grave pcq chirurgie habituelle et nl rien n’arrive de particulier.

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Patient chirurgical urgent (occlusion, hernie étranglée, paresthésie membre, fracture fémur, …)

- Toute urgence chirurgicale est urgence anesthesiologique

- Le staff présent en salle est à un niveau d'attention supérieur à un cas électif

Urgence chirurgicale vitale

- Elle est aussi urgence anesthesiologique
- Tout le staff disponible nursing et anesthesiologique peut être mobilisé
- Le niveau d’attention est extrême

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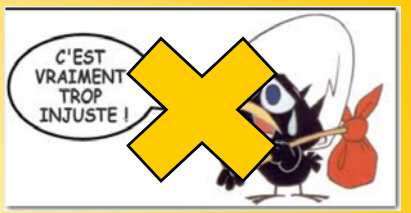
Patient anesthésié en dhs des blocs opératoires (svt electif, pfs urgent) y compris les blocs obstétriques

- Nous sommes loin de tout dans un environnement difficile, ce qui est important est l'acte de l'opérateur, nous sommes un mal nécessaire.



- Le risque patient est encore bien plus grand, au vu aussi de l'éloignement par rapport au QO où d'autres anesthésistes sont dans les environs proches

- Les infirmières spécialisées pour l'acte précis sont présentes, mais pour l'anesthésie ?

- Ce qui pose question, et justifie pleinement ces formations

Unaibode
Union Nationale des Associations d'Infirmiers(ères) de Bloc Opératoire Diplômés(ées) d'Etat

A.E.E.I.B.O.

COMMUNIQUE DE PRESSE

Salon infirmiers 2014 :
Mais qui est l'infirmier de bloc opératoire ?
Son métier, son rôle et ses conseils

…un infirmier multicasquette

Dans sa fonction, l'Ibode exerce alternativement 3 rôles en fonction des opérations planifiées :

- **Circulant** : contrôle du fonctionnement des équipements nécessaires à l'intervention. Accueil, préparation et installation du patient.
- **Instrumentiste** : gestion de la table d'instrumentation stérile.
- **Aide-opératoire** : assistance du chirurgien.

…un infirmier à haut niveau de compétences

L'infirmier de bloc opératoire exerce un métier complexe et exigeant qui demande :

- **Rigueur** et **responsabilité** car le bloc opératoire est un secteur à haut risque infectieux qui impose le respect de règles strictes pour garantir la sécurité de l'usager.
- **Polyvalence** en raison des différents rôles que demande le métier.
- **Adaptabilité** car l'évolution des technologies et de la médecine, a fait du bloc opératoire un haut lieu d'innovation.
- **Autonomie** car aujourd'hui, l'infirmier de bloc opératoire a d'importantes responsabilités et doit pouvoir une aptitude à décider au bon moment.

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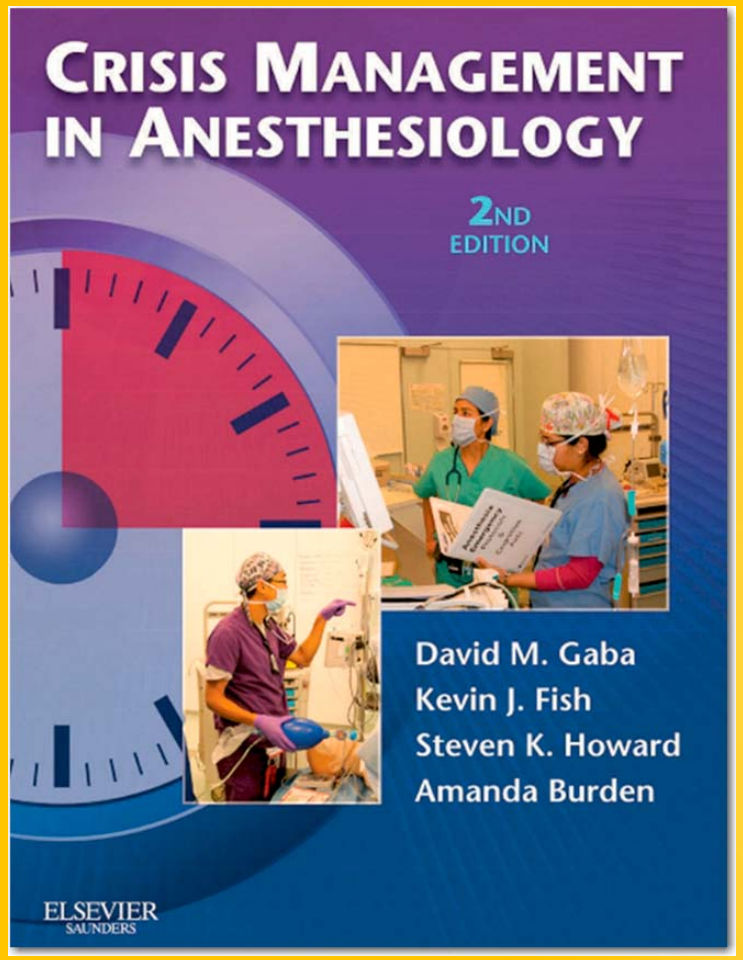
Les urgences anesthésiologiques sont souvent vitales

- Toute urgence anesthesiologique n'est pas nécessairement chirurgicale
- Observation (exemple désaturation, CO_2 peu élevé, …)
- Diagnostic (intubation oesophagienne, hypotension majeure, …)
- Communication (chacun a droit à la parole, les remarques de chacun sont utiles)
- Appel à l'aide si besoin
- Action thérapeutique

- La place de l'infirmière est d'être une collaboratrice qui sait, et qui participe effectivement en connaissance de cause.

Les urgences anesthésiologiques sont souvent vitales



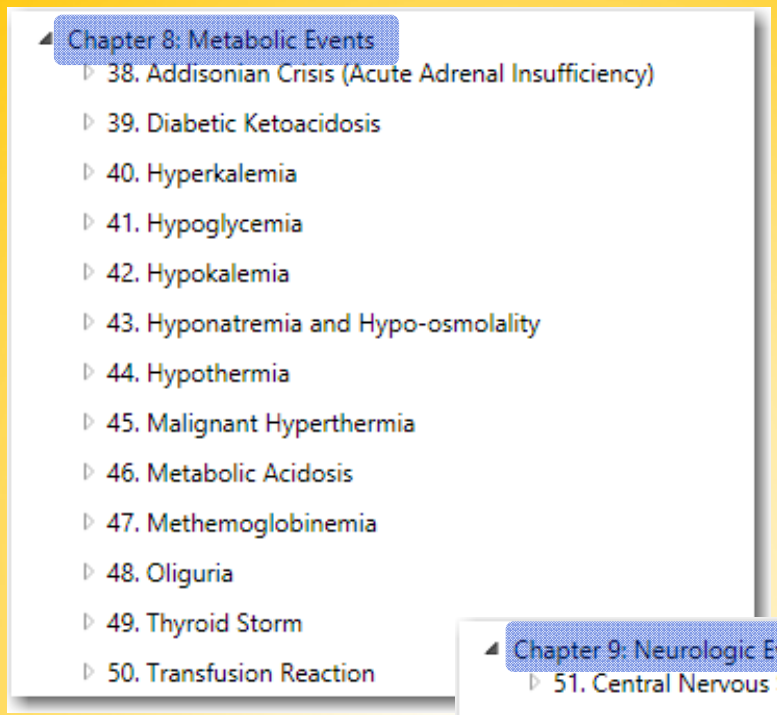
Chapter 5: Generic Events

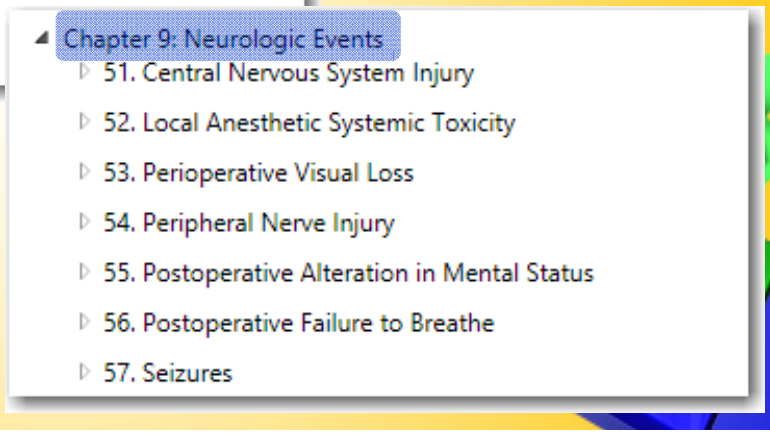
1 . Acute Hemorrhage
2 . Cardiac Arrest
3 . Difficult Tracheal Intubation
4 . Emergent (Crash) Induction of Anesthesia
5 . Esophageal Intubation
6 . High Inspired CO2
7 . High Peak Inspiratory Pressure
8 . Hypertension
9 . Hypotension
10 . Hypoxemia
11 . Operating Room Fire
12 . ST Segment Change
13 . The Septic Patient
14 . The Trauma Patient

Chapter 6: Cardiovascular Events

15. Acute Coronary Syndrome
16. Anaphylactic and Anaphylactoid Reactions
17. Autonomic Dysreflexia
18. Cardiac Tamponade
19. Nonlethal Ventricular Arrhythmias
20. Pulmonary Edema
21. Pulmonary Embolism
22. Sinus Bradycardia
23. Supraventricular Arrhythmias
24. Venous Gas Embolism

Les urgences anesthésiologiques sont souvent vitales





Les urgences anesthésiologiques sont souvent vitales

- Chapter 10: Equipment Events
  - 58. Carbon Monoxide in the Anesthesia Circuit
  - 59. Circle System Expiratory Valve Stuck Closed
  - 60. Circle System Inspiratory Valve Stuck Closed
  - 61. Circle System Valve Stuck Open
  - 62. Common Gas Outlet Failure
  - 63. Drug Administration Error
  - 64. Electrical Power Failure
  - 65. Faulty Oxygen Supply
  - 66. Gas Flow Control Malfunction
  - 67. Intravenous Line Failure
  - 68. Loss of Pipeline Oxygen
  - 69. Major Leak in the Anesthesia Breathing Circuit
  - 70. Pop-Off Valve Failure
  - 71. Ventilator Failure
  - 72. Volatile Anesthetic Overdose
  - 73. Waste Anesthesia Gas Disposal System Malfunction

- Chapter 11: Cardiac Anesthesia Events
  - 74. Cardiac Laceration
  - 75. Coagulopathy Following Cardiopulmonary Bypass
  - 76. Emergent "Crash" onto Cardiopulmonary Bypass
  - 77. Hypotension During Cardiopulmonary Bypass
  - 78. Low Cardiac Output State After Cardiopulmonary Bypass
  - 79. Massive Systemic Air Embolism
  - 80. Protamine Reaction

Les urgences anesthésiologiques sont souvent vitales

- Chapter 12: Obstetric Events
  - 81. Amniotic Fluid Embolism (Anaphylactoid Syndrome of Pregnancy)
  - 82. Cardiac Arrest in the Parturient
  - 83. Difficult Airway in the Parturient
  - 84. Emergency Cesarean Section
  - 85. Hypotension Following Neuraxial Anesthesia
  - 86. Magnesium Toxicity
  - 87. Obstetric Hemorrhage
  - 88. Preeclampsia and Eclampsia
  - 89. Total Spinal Anesthesia

- Chapter 13: Pediatric Events
  - 90. Acute Hemorrhage in the Pediatric Patient
  - 91. Anaphylaxis in the Pediatric Patient
  - 92. Aspiration of a Foreign Body
  - 93. Bradycardia in the Pediatric Patient
  - 94. Cardiac Arrest in the Pediatric Patient
  - 95. Difficult Airway Management in the Pediatric Patient
  - 96. Hypotension in the Pediatric Patient
  - 97. Laryngospasm
  - 98. Masseter Muscle Rigidity
  - 99. Sinus Tachycardia in the Pediatric Patient

Les urgences anesthésiologiques sont souvent vitales

2 Cardiac Arrest

DEFINITION

Cardiac arrest is the absence of effective mechanical activity of the heart.

ETIOLOGY

Cardiovascular disease (e.g., myocardial infarction [MI], myocardial ischemia, cardiomyopathy, arrhythmia, valvular disease, aortic dissection)

Hypovolemia
- Surgical maneuvers or positioning that causes decreased venous return
- Hemorrhage

Hypoxemia
- Failed airway management
- Respiratory arrest

Shock (e.g., anaphylaxis, sepsis)

Bradycardia
- After neuraxial blockade or any acute vagal reflex
- After repeated doses of succinylcholine

Tension pneumothorax

Auto positive end-expiratory pressure (PEEP)

Pulmonary, venous air, or amniotic fluid embolism

Cardiac tamponade

Toxins (e.g., cocaine, methamphetamine)

Anesthetic drug-related complications (e.g., IV or anesthetic overdose, medication error, vasodilator bolus, local anesthetic systemic toxicity [LAST])

MH

Acidosis

Hypoglycemia

Electrolyte abnormalities (e.g., hyperkalemia, particularly in renal failure)

Hypothermia

Pulmonary hypertension

Transfusion reactions

Pacemaker failure

Les urgences anesthésiologiques sont souvent vitales

PREVENTION

Evaluate pacemaker function prior to surgery and manage appropriately
Place a transvenous or transcutaneous pacemaker prophylactically for patients with high-grade atrioventricular (AV) block or significant sinus bradycardia
Treat arrhythmias with appropriate antiarrhythmic therapy and continue through surgery
Aggressively treat bradycardia/hypotension following neuraxial blockade
Treat ACS to restore myocardial blood flow
Avoid surgery and anesthesia after recent MI
Administer vagolytic drug in patients or in procedures with a high risk of increased vagal tone (e.g., neuraxial blockade)
Drill and practice management of unstable patients (using simulation if available)
Administer vagolytic prior to, or mixed with, anticholinesterases that cause bradycardia

MANIFESTATIONS

Unresponsive to verbal commands
Absence of pulse oximeter waveform
Loss of consciousness or seizure-like activity
No palpable carotid pulse (palpation of peripheral pulses unreliable)
    Noninvasive blood pressure (NIBP) unmeasurable
    Invasive arterial pressure without pulsations
        Mean arterial pressure (MAP) less than 20 mm Hg without CPR
Absence of heart tones on auscultation
Apnea
    Loss of, or decreased, ET CO_2
Arrhythmias (ventricular tachycardia [VT], ventricular fibrillation [VF], asystole)
Pulseless electrical activity (PEA) (rhythm in PEA may appear normal)
Cyanosis
Regurgitation and possible aspiration of gastric contents
Lack of ventricular contraction on TEE or TTE

Les urgences anesthésiologiques sont souvent vitales

SIMILAR EVENTS

Anaphylaxis (see Event 16, Anaphylactic and Anaphylactoid Reactions)
Pulmonary, venous air, or amniotic fluid embolism (see Event 21, Pulmonary Embolism, Event 24, Venous Gas Embolism, and Event 81, Amniotic Fluid Embolism)

Sepsis (see Event 13, The Septic Patient)
Acute hemorrhage (see Event 1, Acute Hemorrhage)
Medication reaction (see Event 63, Drug Administration Error)
Local anesthetic overdose (see Event 52, Local Anesthetic Systemic Toxicity)
Total spinal anesthesia (see Event 89, Total Spinal Anesthesia)
Cardiac disease (MI, ischemia [see Event 15, Acute Coronary Syndrome], cardiomyopathy, aortic dissection)
Hypotension (see Event 9, Hypotension)
Seizures (see Event 57, Seizures)
Artifacts on monitoring devices
- Electrocardiogram (ECG)
- Pulse oximeter
- Blood pressure measurement systems (NIBP or invasive)

Les urgences anesthésiologiques sont souvent vitales

MANAGEMENT

Treat the patient, not the monitor
Verify that there is no pulse (and that an "awake" patient has become unresponsive)
- Check pulse oximeter and ET CO_2 waveforms
- Palpate the carotid, femoral, or other pulse
  - Surgeon may have better access to palpable pulses
- Check NIBP and ECG monitors and leads
- Check arterial line waveform

Immediately notify surgeons and other OR personnel of the cardiac arrest
- **Call for help**
- **Call OR or hospital "code"**
- **Call for crash cart and defibrillator**
- **Start CPR immediately (C-A-B: compressions, airway, breathing)**
- **Apply defibrillation pads to chest**

Turn off ALL anesthetics
Administer 100% O_2 at high flows to flush circuit of inhaled anesthetics and verify change
Begin basic life support (BLS)
- **Assign someone to start chest compressions**
  - Compressions should be at least 100 per minute and at least 2 inches deep
  - Rotate compressors every 2 minutes and monitor for fatigue of the person performing chest compressions
  - Allow for complete recoil of the chest with each compression
  - Minimize interruptions in compressions and keep interruptions brief (less than 10 seconds)
  - Adequate compressions should generate an ET CO_2 of at least 10 mm Hg and a diastolic pressure of greater than 20 mm Hg (if an arterial line is in place). You **MUST** improve CPR quality and vascular tone if above conditions are not met.
- **Airway/Ventilation**
  - If patient is not intubated, establish bag mask ventilation with 100% O_2 at a compression to ventilation ratio of 30:2 and prepare for definitive airway
    - Place a supraglottic airway (SGA) or endotracheal tube (ETT) without stopping compressions and then ventilate at a rate of 10/minute with continuous compressions

Les urgences anesthésiologiques sont souvent vitales

Assign tasks to skilled responders
- **Ensure adequate IV access**
  - **If difficult IV access, place IO infusion line**
- **Place arterial line**
- **Call for TEE/TTE machine**

Begin ACLS

Employ cognitive aids (ACLS algorithms) to help determine diagnosis and treatment

Diagnose and treat arrhythmias
- Determine if patient is in a shockable rhythm
  - Analyze rhythm during very short breaks in CPR (e.g., during ventilation phase of the 30:2 compression-to-ventilation ratio or while rotating compressors)
    - CPR artifact can appear as a shockable rhythm
- **VT/VF (shockable pathway)**
  - Continue high-quality CPR
  - Defibrillate as soon as possible with 200 J or follow manufacturer's recommendations
  - Immediately resume chest compressions after each defibrillation
    - **Do not check pulse or rhythm**
  - If a shockable rhythm persists after the initial defibrillation, continue CPR and administer epinephrine IV, 1 mg every 3 to 5 minutes
  - Consider replacing 1 dose of epinephrine with vasopressin IV, 40 units
  - DEFIBRILLATE EVERY 2 MINUTES
  - Consider antiarrhythmics
    - Amiodarone IV, 300 mg
    - Lidocaine IV, 100 mg
  - Search for treatable causes for VT/VF
    - Torsades de pointes
      - Administer magnesium sulfate ($MgSO_4$) IV, 2 g
    - Hyperkalemia (see Event 40, Hyperkalemia)
      - Administer calcium chloride ($CaCl_2$) 10% IV, 500 to 1000 mg
      - Administer dextrose 50% IV, 50 g, and regular insulin IV, 10 units
    - Local anesthetic toxicity (see Event 52, Local Anesthetic Systemic Toxicity)
      - Administer 20% lipid emulsion (Intralipid)
    - MI (see Event 15, Acute Coronary Syndrome)

If rhythm changes to non-shockable rhythm, switch to PEA/asystole pathway

PEA/asystole (non-shockable pathway)
- Continue high-quality CPR
- Administer epinephrine IV, 1 mg every 3 to 5 minutes
- Consider replacing 1 dose of epinephrine with vasopressin IV, 40 units

Search for treatable causes of PEA/asystole
- **Hypovolemia** (see Event 1, Acute Hemorrhage, and Event 9, Hypotension)
  - Administer fluid bolus, rule out occult bleeding, administer sufficient blood products for massive hemorrhage or severe anemia
  - Evaluate fluid status with TEE or TTE
  - **Inadequate preload from caval compression**
    - Release pneumoperitoneum
    - Left uterine displacement for gravid uterus
    - Return prone patient with large abdomen to supine position
    - Release surgical retraction
    - Disconnect breathing circuit if breath stacking (auto-PEEP) and adjust ventilation appropriately

Les urgences anesthésiologiques sont souvent vitales

Hypoxemia (see Event 10, Hypoxemia)
- Ventilate and oxygenate with 100% O_2
- Auscultate breath sounds
- Suction ETT
- Reconfirm presence of ET CO_2

Tension pneumothorax (see Event 35, Pneumothorax)
- Auscultate for unilateral breath sounds
- Absence of sliding pleura sign on TTE
- Distended neck veins or deviated trachea
  - Perform emergent needle decompression at 2nd intercostal space, midclavicular line
    - Patient will require pleural drainage after needle decompression

Coronary thrombosis (see Event 15, Acute Coronary Syndrome)
- Unexplained cardiac arrest may be secondary to MI; consider TEE or TTE to evaluate global myocardial function and regional wall motion abnormalities

Toxins (including infusions)
- Confirm that IV and volatile anesthetics are off
- Check all infusions
  - Confirm they are the correct drug and rate of administration
  - Discontinue if they are not indicated
- If the potential for LAST exists (see Event 52, Local Anesthetic Systemic Toxicity)
  - Administer 20% lipid emulsion (Intralipid)
  - Consider Intralipid for any overdose of a lipid-soluble drug
- Send toxicology screen

Cardiac tamponade
- Use TEE or TTE to rule out pericardial effusion
  - If present, perform emergent pericardiocentesis

Electrolyte and acid/base abnormalities
- Send stat labs (ABG and metabolic panel)
  - Evaluate for acidosis, hyperkalemia, hypokalemia, hypoglycemia, hypocalcemia

VGE (see Event 24, Venous Gas Embolism)
- Acute hypotension with drop in ET CO_2
- Flood surgical field with saline
- Aspirate CVP catheter, if present

PE (see Event 21, Pulmonary Embolism)

Pulmonary hypertension
- Use TTE or TEE to assess right ventricular (RV) function

Hyperthermia
- Rule out MH (see Event 45, Malignant Hyperthermia)

Hypothermia (see Event 44, Hypothermia)

Continually reassess patient without interrupting chest compressions
- Return of spontaneous circulation is indicated by
  - ECG and palpable pulse or BP
  - Pulse oximetry waveform
  - Increase in ET CO_2

Consider postresuscitation hypothermia for brain protection

COMPLICATIONS

Aspiration of gastric contents
Laceration of liver
Pneumothorax or hemothorax
Rib fracture
Hypoxic brain injury
Death

Les urgences anesthésiologiques sont souvent vitales

EMERGENCY NUMBERS:

To download free copy with CC licensing : HTTP://EMERGENCYMANUAL.STANFORD.EDU
To report adverse events & near misses: WWW.AQIAIRS.ORG

ACLS (for perioperative setting)
Asystole 1
Bradycardia – Unstable 2
PEA 3
SVT Unstable – Tachycardia 4
SVT Stable – Tachycardia 5
VF/VT 6

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EMERGENCY MANUAL

COGNITIVE AIDS FOR PERIOPERATIVE CRITICAL EVENTS 2014, V2.2

STANFORD ANESTHESIA COGNITIVE AID GROUP

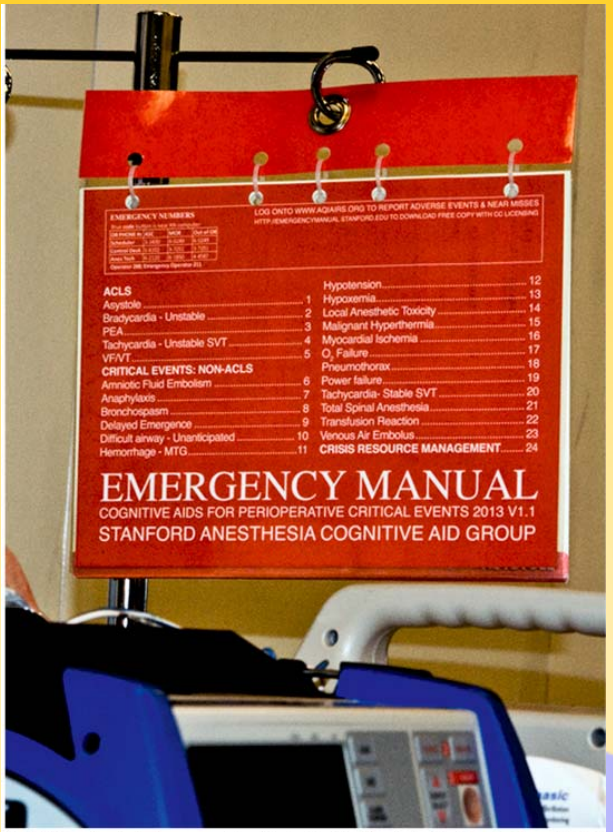
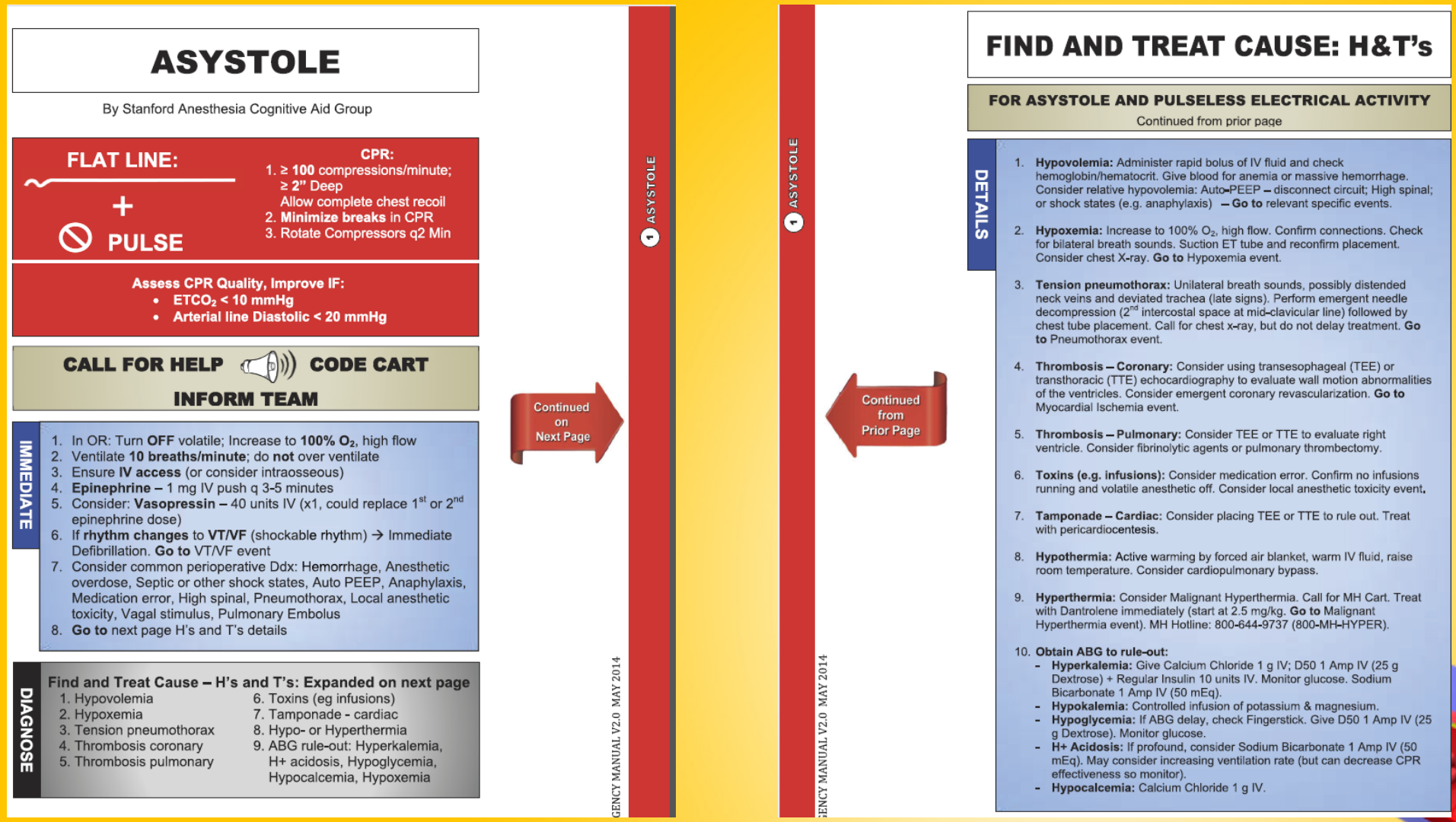


FIGURE 2-1 Anesthesia Emergency Manual by the Stanford Anesthesia Cognitive Aid Group (SACAG) shown hanging on a crash cart. A full-size physical manual such as this has distinct advantages (and some disadvantages) compared to pocket-size or smartphone types of manuals. SACAG core contributors, in random order: Howard S, Chu L, Goldhaber-Fiebert SN, Gaba DM, Harrison TK. *(From Stanford Anesthesia Cognitive Aid Group: Emergency Manual: cognitive aids for perioperative critical events. Creative Commons BY-NC-ND, 2013; photo courtesy David M. Gaba.)*

Les urgences anesthésiologiques sont souvent vitales



ASYSTOLE

By Stanford Anesthesia Cognitive Aid Group

FLAT LINE: + **PULSE**

CPR:
1. ≥ **100** compressions/minute; ≥ **2"** Deep
   Allow complete chest recoil
2. **Minimize breaks** in CPR
3. Rotate Compressors q2 Min

Assess CPR Quality, Improve IF:
- **$ETCO_2$ < 10 mmHg**
- **Arterial line Diastolic < 20 mmHg**

CALL FOR HELP **CODE CART**

INFORM TEAM

IMMEDIATE

1. In OR: Turn **OFF** volatile; Increase to **100% O_2**, high flow
2. Ventilate **10 breaths/minute**; do **not** over ventilate
3. Ensure **IV access** (or consider intraosseous)
4. **Epinephrine –** 1 mg IV push q 3-5 minutes
5. Consider: **Vasopressin –** 40 units IV (x1, could replace 1st or 2nd epinephrine dose)
6. If **rhythm changes** to **VT/VF** (shockable rhythm) → Immediate Defibrillation. **Go to** VT/VF event
7. Consider common perioperative Ddx: Hemorrhage, Anesthetic overdose, Septic or other shock states, Auto PEEP, Anaphylaxis, Medication error, High spinal, Pneumothorax, Local anesthetic toxicity, Vagal stimulus, Pulmonary Embolus
8. **Go to** next page H's and T's details

DIAGNOSE

Find and Treat Cause – H's and T's: Expanded on next page

1. Hypovolemia
2. Hypoxemia
3. Tension pneumothorax
4. Thrombosis coronary
5. Thrombosis pulmonary
6. Toxins (eg infusions)
7. Tamponade - cardiac
8. Hypo- or Hyperthermia
9. ABG rule-out: Hyperkalemia, H+ acidosis, Hypoglycemia, Hypocalcemia, Hypoxemia

Continued on Next Page

ASYSTOLE

GENCY MANUAL V2.0 MAY 2014

ASYSTOLE

Continued from Prior Page

GENCY MANUAL V2.0 MAY 2014

FIND AND TREAT CAUSE: H&T's

FOR ASYSTOLE AND PULSELESS ELECTRICAL ACTIVITY

Continued from prior page

DETAILS

1. **Hypovolemia:** Administer rapid bolus of IV fluid and check hemoglobin/hematocrit. Give blood for anemia or massive hemorrhage. Consider relative hypovolemia: Auto-PEEP – disconnect circuit; High spinal; or shock states (e.g. anaphylaxis) – **Go to** relevant specific events.
2. **Hypoxemia:** Increase to 100% O_2, high flow. Confirm connections. Check for bilateral breath sounds. Suction ET tube and reconfirm placement. Consider chest X-ray. **Go to** Hypoxemia event.
3. **Tension pneumothorax:** Unilateral breath sounds, possibly distended neck veins and deviated trachea (late signs). Perform emergent needle decompression (2nd intercostal space at mid-clavicular line) followed by chest tube placement. Call for chest x-ray, but do not delay treatment. **Go to** Pneumothorax event.
4. **Thrombosis – Coronary:** Consider using transesophageal (TEE) or transthoracic (TTE) echocardiography to evaluate wall motion abnormalities of the ventricles. Consider emergent coronary revascularization. **Go to** Myocardial Ischemia event.
5. **Thrombosis – Pulmonary:** Consider TEE or TTE to evaluate right ventricle. Consider fibrinolytic agents or pulmonary thrombectomy.
6. **Toxins (e.g. infusions):** Consider medication error. Confirm no infusions running and volatile anesthetic off. Consider local anesthetic toxicity event.
7. **Tamponade – Cardiac:** Consider placing TEE or TTE to rule out. Treat with pericardiocentesis.
8. **Hypothermia:** Active warming by forced air blanket, warm IV fluid, raise room temperature. Consider cardiopulmonary bypass.
9. **Hyperthermia:** Consider Malignant Hyperthermia. Call for MH Cart. Treat with Dantrolene immediately (start at 2.5 mg/kg. **Go to** Malignant Hyperthermia event). MH Hotline: 800-644-9737 (800-MH-HYPER).
10. **Obtain ABG to rule-out:**
    - **Hyperkalemia:** Give Calcium Chloride 1 g IV; D50 1 Amp IV (25 g Dextrose) + Regular Insulin 10 units IV. Monitor glucose. Sodium Bicarbonate 1 Amp IV (50 mEq).
    - **Hypokalemia:** Controlled infusion of potassium & magnesium.
    - **Hypoglycemia:** If ABG delay, check Fingerstick. Give D50 1 Amp IV (25 g Dextrose). Monitor glucose.
    - **H+ Acidosis:** If profound, consider Sodium Bicarbonate 1 Amp IV (50 mEq). May consider increasing ventilation rate (but can decrease CPR effectiveness so monitor).
    - **Hypocalcemia:** Calcium Chloride 1 g IV.

ARCA en position ventrale

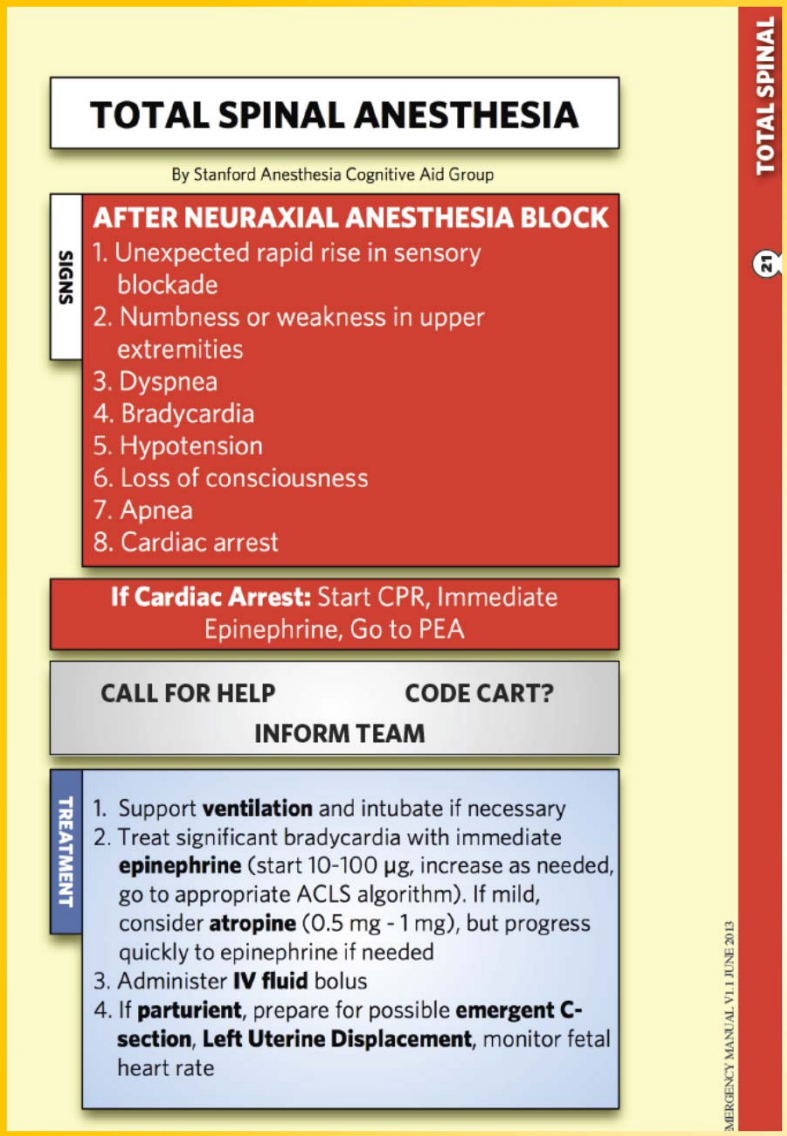
- Selon la situation de la chirurgie ou de l’examen interventionnel
  - Adaptation au moment
    - Exemple personnel (table de traction pour fixation colonne)
    - Essai de MCE en attendant l’aide supplémentaire
    - Aide pour retourner le patient
    - Aide pour la thérapeutique patient
    - Simultanément traiter l’étiologie

Les urgences anesthésiologiques sont souvent vitales

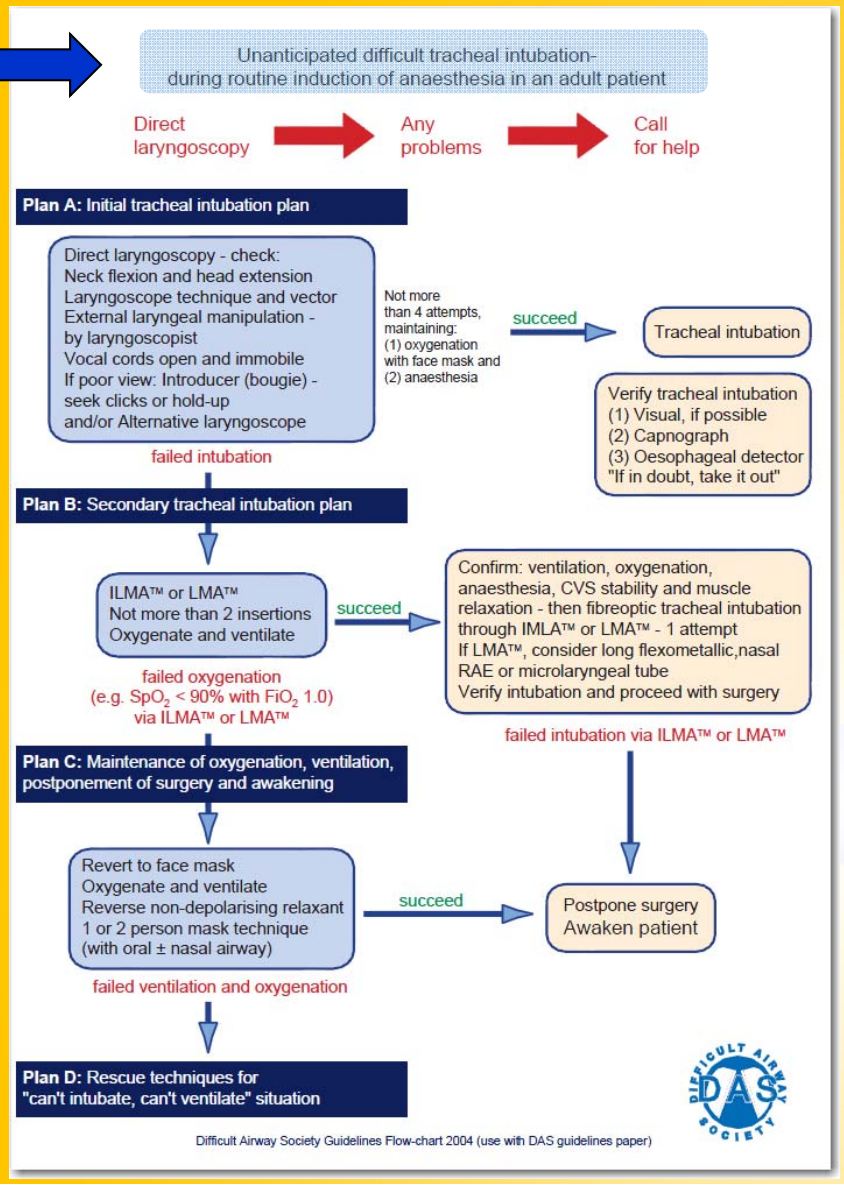
- Rachianesthésie
  - Monitoring habituel
  - Mise en place perfusion
  - Rachi
  - Qlq secondes à qlq minutes après injection et remise en décubitus dorsal ou ventral selon la chir.
  - Bradycardie, hypotension, arrêt respiratoire, perte de conscience et mydriase bilatérale
- = Rachi totale (plexus)
  - Remettre sur le dos si position ventrale
  - ABCD
  - Tout le monde s'affaire à la réanimation

Les urgences anesthésiologiques sont souvent vitales

PEA pulseless electrical activity



Les urgences anesthésiologiques sont souvent vitales



Les urgences anesthésiologiques sont souvent vitales

91 Anaphylaxis in the Pediatric Patient

DEFINITION

Anaphylaxis in the pediatric patient is an IgE-mediated response that is caused by exposure to an antigenic substance in a sensitized pediatric patient.

ETIOLOGY

Administration of, or exposure to, an agent that the patient has been previously sensitized to, with production of antigen-specific IgE

TYPICAL SITUATIONS

In patients with a known allergy or sensitivity to a specific agent or a history of atopy or allergy to nondrug allergens

After exposure to substances that can trigger anaphylaxis
- Neuromuscular blocking drugs
- Latex
- Antibiotics
- Opioids
- Protamine
- Amino-ester local anesthetic agents
- Blood and blood products
- Iodinated contrast material
- Chlorhexidine preparation solutions
- Sedative-hypnotics
- Colloid administration (e.g., dextrans, hydroxyethyl starch)

Patients with frequent latex exposure
- Patients requiring multiple reconstructive surgical procedures (e.g., myelomeningocele repair for spina bifida, patients with congenital genitourinary abnormalities)
  - Avoid contact with, or manipulation, of latex devices
  - Use nonlatex surgical gloves
  - Use syringe/stopcock methods or unidirectional valves for injecting medications
  - Do not insert a needle through any multiple-dose vial with a natural rubber stopper
    - Take the top of the vial completely off
    - Use the same medication from a glass ampule, if available
  - Use glass syringes as an alternative to plastic syringes with natural rubber seal on plunger (plastic syringes may use nonlatex seals—check manufacturer's information for syringe materials)

Obtain a careful history of previous allergic reactions, atopy, asthma, or significant latex exposure

Avoid transfusion of blood or blood products whenever possible

If a specific drug must be administered to a patient known to be at risk of an allergic reaction, administer prophylaxis
- Corticosteroids, H_1 antagonists

Administer test dose of drug

Obtain consultation from an allergist if a critical allergy must be defined

Les urgences anesthésiologiques sont souvent vitales

MANIFESTATIONS

Anaphylaxis has the potential for acute onset with catastrophic consequences. Severe hypotension, increased peak airway pressure, and hypoxemia are the most common initial signs but need not be present simultaneously.

Cardiovascular
- Severe hypotension
- Tachycardia
- Bradycardia may be initial sign
- Arrythmias
- Cardiac arrest

Respiratory
- Hypoxemia
- Decreased lung compliance
- Severe bronchospasm

Cutaneous—may be obscured by surgical drapes
- Flushing, hives, urticaria, pruritus

Swelling of mucosal membranes, angioedema, head and neck swelling

PREVENTION

Avoid agents to which the patient has a documented allergy

Minimize the use of latex products in health care
- If there is a history of latex allergy, establish a latex-free environment

Les urgences anesthésiologiques sont souvent vitales

SIMILAR EVENTS

Medication causing direct histamine release (e.g., morphine)
Anesthetic overdose or medication error (see Event 72, Volatile Anesthetic Overdose, and Event 63, Drug Administration Error)
Cutaneous allergy (rapid urticarial reactions)
Bronchospasm (see Event 29, Bronchospasm)
Hypotension from other causes (see Event 9, Hypotension)
Pulmonary edema from other causes (see Event 20, Pulmonary Edema)
Cutaneous manifestations of mastocytosis, carcinoid syndrome, hereditary angioedema

Transfusion reaction (see Event 50, Transfusion Reaction)
Cardiac tamponade (see Event 18, Cardiac Tamponade)
Stridor (see Event 97, Laryngospasm)
PE (see Event 21, Pulmonary Embolism)
Vasovagal reaction
Septic shock (see Event 13, The Septic Patient)
Aspiration of gastric contents (see Event 28, Aspiration of Gastric Contents)
Pneumothorax (see Event 35, Pneumothorax)
Esophageal intubation

Les urgences anesthésiologiques sont souvent vitales

MANAGEMENT

Stop administration of any possible antigen (e.g., discontinue antibiotics)
- Retain blood products for analysis
- Identify all latex products and remove from contact with the patient

Inform the surgeons and call for help
- Check to see whether they have injected or instilled a substance into a body cavity
- Consider aborting surgical procedure if severe or there is no response to initial treatment
  - Anaphylaxis can be biphasic and can recur after successful initial treatment

Ensure adequate oxygenation and ventilation
- Administer 100% O_2
- Intubate the trachea if not already intubated
  - The airway can rapidly become edematous, making intubation more difficult or impossible

Anaphylaxis is treated with epinephrine (the drug of CHOICE in anaphylaxis) and IV fluid

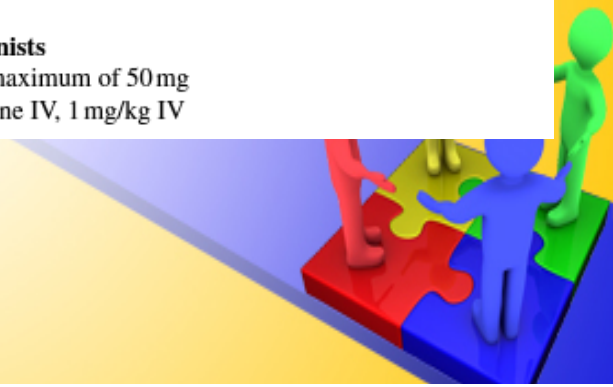
Epinephrine dosing and route—drug calculations are CRITICAL
- For patients with profound hypotension or shock and a KNOWN working IV/IO line, administer epinephrine 0.5 to 1 µg/kg and increase rapidly up to 10 µg/kg as needed; maximum dose 1000 µg
- For patients in early phase without profound hypotension, shock or cardiac arrest, or for those patients in which IV/IO access HAS NOT BEEN OBTAINED, administer epinephrine IM, 10 µg/kg q5-15m; maximum 300 µg per dose
  - Given difficulty in obtaining IV access in children, the IM dose is preferred by some anesthesia professionals and clinicians who deal with pediatric emergencies
- For cardiovascular collapse or cardiac arrest, give epinephrine IV, 10 µg/kg (see Event 94, Cardiac Arrest in the Pediatric Patient)
- Consider epinephrine infusion (20-200 ng/kg/min) with increasing dose to maintain BP

Rapidly expand the circulating blood volume
- Administer 10-30 mL/kg NS or LR
- Immediate fluid needs may be massive

Decrease or stop the administration of anesthetic agents if hypotension is severe

If bronchospasm is present
- Administer bronchodilator
  - Inhaled β-agonist (e.g., albuterol MDI)
  - Volatile anesthetic agents may be administered for bronchodilation if the patient is normotensive

Administer H_1 and H_2 histamine antagonists
- Diphenhydramine IV, 1 mg/kg up to maximum of 50 mg
- Famotidine IV, 0.25 mg/kg, or ranitidine IV, 1 mg/kg IV



Les urgences anesthésiologiques sont souvent vitales

Administer corticosteroids

Methylprednisolone IV, 1 to 2 mg/kg, or dexamethasone IV, 0.2 mg/kg

In the absence of any other cause, consider latex allergy

Ensure all latex products in contact with the patient have been removed from the surgical field

Consider placement of an arterial line and urinary catheter to help guide vasopressor and fluid management

Obtain blood sample for mast cell tryptase levels within 2 hours to confirm the diagnosis of anaphylaxis

Arrange admission to ICU for continued postoperative management

Consider referring patient to an allergist on discharge from the hospital

COMPLICATIONS

Hypoxemia

Inability to intubate, ventilate, or oxygenate

Hypertension and tachycardia from vasopressors

ARDS

Renal failure

Cardiac arrest

DIC

Death

Les urgences anesthésiologiques sont souvent vitales

16 Anaphylactic and Anaphylactoid Reactions

DEFINITION

Anaphylactic and anaphylactoid reactions are serious allergic reactions that are rapid in onset and may cause death.

Anaphylactic reaction (immunologic) involves antigen and IgE antibodies; requires previous sensitization to the antigen

Anaphylactoid reaction (nonimmunologic) mediated primarily by histamine; may occur with the first exposure to a triggering agent

Complement activation may follow both immunologic and nonimmunologic reactions

Les urgences anesthésiologiques sont souvent vitales

ETIOLOGY

Administration or exposure to an agent that the patient has been sensitized to by prior exposure, with production of antigen-specific IgE (anaphylactic reaction)
Allergic reaction to agent requiring no previous exposure (anaphylactoid reaction)

TYPICAL SITUATIONS

The true incidence is unknown, but is estimated at 1 in 10,000 to 1 in 20,000 anesthetic procedures. Approximately 1500 deaths occur each year in the United States from anaphylaxis in all settings.

In patients with a known allergy or sensitivity to a specific agent or with conditions making a reaction to an agent more likely
- Allergic reactions to protamine are more likely in patients with fish allergy, prior protamine administration, or after treatment with protamine-zinc insulin
- Patients with a history of allergy to nondrug allergens have a higher risk of anaphylaxis during anesthesia

After exposure to substances that can trigger anaphylactic or anaphylactoid reactions
- Neuromuscular blocking drugs (60% of anesthesia-related anaphylaxis)
- Latex (20% of anesthesia-related anaphylaxis)
- Antibiotics (15% of anesthesia-related anaphylaxis, with penicillins and cephalosporins responsible for 70% of antibiotic induced anaphylaxis)
- Opioids
- Amino-ester local anesthetic agents
- Blood and blood products
- Iodinated contrast material
- Chlorhexidine preparation solutions
- Individuals with frequent latex exposure
  - Health care workers
  - Patients who have undergone multiple surgical procedures
  - Patients who require intermittent bladder catheterization
    - SCI patients
    - Chronic care patients

Les urgences anesthésiologiques sont souvent vitales

PREVENTION

Avoid agents to which the patient has a documented allergy
Minimize the use of latex products in health care (in the United States many institutions have replaced most products with latex-free versions)
If there is a history of latex allergy, establish a latex-free environment
- Avoid contact with or manipulation of latex devices
- Use nonlatex surgical gloves
- Use syringe/stopcock or unidirectional valves for injecting medications
- Do not insert a needle through any multiple-dose vial with a natural rubber stopper
  - Take the top of the vial completely off
  - Use medication from a glass ampule, if available
- Use glass syringes with glass plunger or plastic syringes with known non-latex plungers. (Check manufacturer for materials used.)

Obtain a careful history of previous allergic reactions, atopy, asthma, or significant latex exposure
Avoid transfusion of blood or blood products whenever possible
- Check the identity of the patient and blood products carefully prior to transfusion

If a specific drug must be administered to a patient known to be at risk of an allergic reaction, administer prophylaxis
- Corticosteroids
  - Dexamethasone IV, 20 mg, or methylprednisolone IV, 100 mg
- H_1 antagonist
  - Diphenhydramine IV, 25 to 50 mg
- Administer a test dose of drug

Obtain a consultation from an allergist if a critical allergy must be defined

Les urgences anesthésiologiques sont souvent vitales

MANIFESTATIONS

Anaphylaxis has the potential for acute onset with catastrophic consequences. Severe hypotension, increased PIP, and hypoxemia are the most common initial signs but need not be present simultaneously.

Cardiovascular
- The awake patient may complain of dizziness or lose consciousness
- Severe hypotension
- Bradycardia—may be initial sign
- Arrhythmias
- Cardiac arrest

Respiratory
- The awake patient may complain of dyspnea or chest tightness
- Hypoxemia
- Decreased lung compliance
- Severe bronchospasm

Cutaneous—may be obscured by surgical drapes
- Flushing, hives, urticaria, pruritus

Swelling of mucosal membranes, conjunctiva, lips, tongue, and uvula

Les urgences anesthésiologiques sont souvent vitales

SIMILAR EVENTS

Anesthetic overdose (see Event 72, Volatile Anesthetic Overdose)
Pulmonary edema (see Event 20, Pulmonary Edema)
Hypotension from other causes (see Event 9, Hypotension)
ACS (see Event 15, Acute Coronary Syndrome)
Cardiac tamponade (see Event 18, Cardiac Tamponade)
Venous air embolism (see Event 24, Venous Air or Gas Embolism)
Vasovagal reaction
Septic shock (see Event 13, The Septic Patient)
Drug administration error (see Event 63, Drug Administration Error)
Stridor (see Event 36, Postoperative Stridor)
PE (see Event 21, Pulmonary Embolism)
Aspiration of gastric contents (see Event 28, Aspiration of Gastric Contents)
Pneumothorax (see Event 35, Pneumothorax)

Bronchospasm (see Event 29, Bronchospasm)
Skin manifestations of drug reactions not associated with anaphylaxis
Transfusion reaction (see Event 50, Transfusion Reaction)
Fat embolism syndrome
Amniotic fluid embolism (see Event 81, Amniotic Fluid Embolism)

Les urgences anesthésiologiques sont souvent vitales

MANAGEMENT

Stop administration of any possible antigen
- Retain blood products for analysis
- Remove all latex-containing products from contact with the patient

Inform the surgeons and call for help
- Check to see whether they have injected or instilled a substance into a body cavity
- Consider aborting the surgical procedure if severe
  - Anaphylaxis may be biphasic and can recur after successful initial treatment

Ensure adequate oxygenation and ventilation
- Administer 100% O_2
- Intubate the trachea if not already intubated
  - The airway can rapidly become very edematous making intubation (or extubation) more difficult or impossible

Treat hypotension
- Epinephrine is the drug of choice for treatment of anaphylaxis
  - For mild to moderate hypotension, administer epinephrine IV, 10 to 50 µg increments, and repeat as necessary with escalating doses
  - For cardiovascular collapse or cardiac arrest, administer epinephrine IV, 500 to 1000 µg boluses, and repeat as necessary (see Event 2, Cardiac Arrest)
- Administer vasopressin IV, 10 to 40 U, in cases of anaphylactic shock resistant to catecholamines; in pulseless arrest, follow the ACLS pulseless arrest algorithm
- Norepinephrine infusion may be required
- Glucagon IV, 1 to 5 mg, may be useful in patients receiving β-blocker therapy who do not respond to epinephrine
- Methylene blue IV, 10 to 50 mg, has been successfully used in catecholamine- and vasopressin-resistant anaphylaxis

Rapidly expand the circulating fluid volume
- Place patient in Trendelenburg position
- Immediate fluid needs may be massive (several liters of crystalloid)
- Ensure adequate IV access

Decrease or stop administration of anesthetic agents if hypotension is severe

If bronchospasm is present
- Administer bronchodilator
  - Albuterol metered dose inhaler (MDI), 5 to 10 puffs
- Volatile anesthetics may be administered for bronchodilation if the patient is normotensive

Administer an H_1 and H_2 histamine antagonist
- Diphenhydramine IV, 50 mg
- Ranitidine IV, 50 mg

Administer corticosteroids
- This is not helpful for the acute event, but may reduce risk of further episodes
- Dexamethasone IV, 20 mg bolus, or methylprednisolone IV, 100 mg bolus

Les urgences anesthésiologiques sont souvent vitales

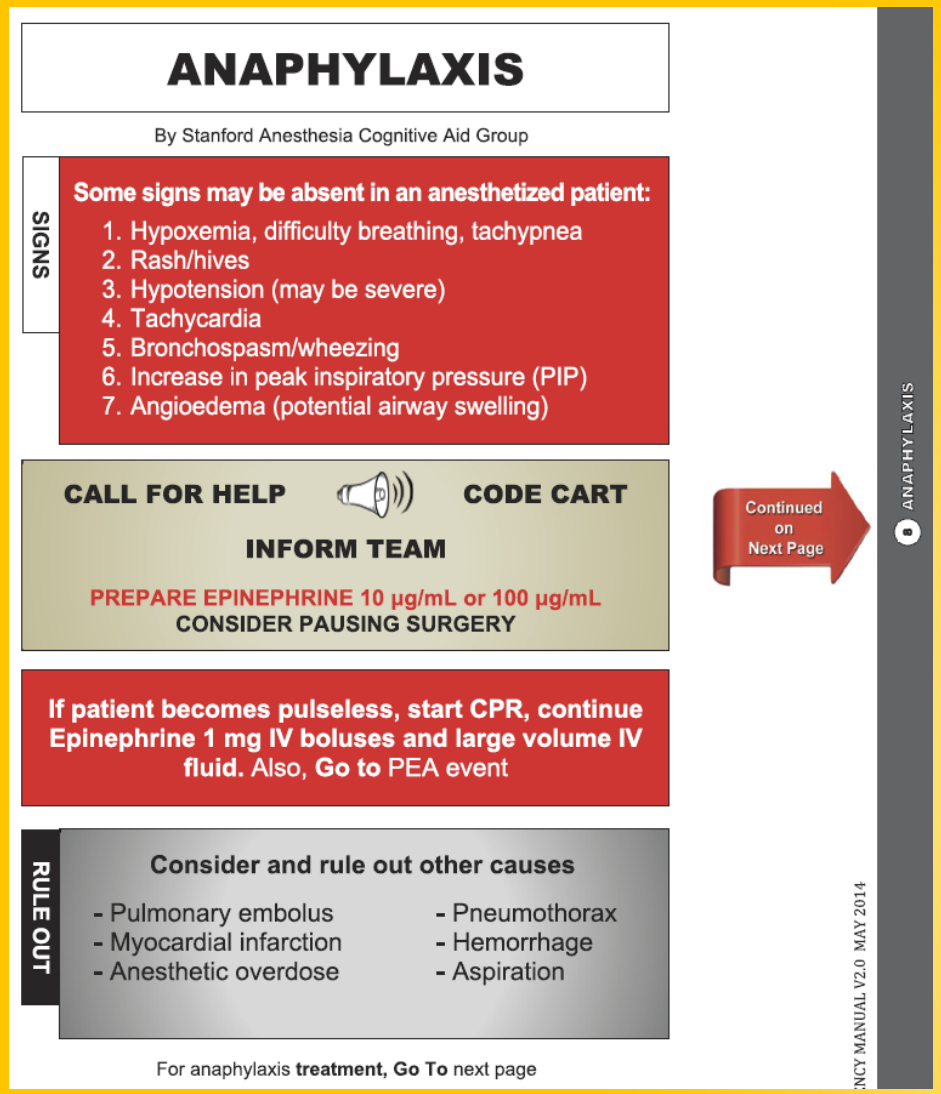
In the absence of any other cause, consider latex allergy

- Ensure all latex products in contact with the patient have been removed from the surgical field (double check whether these products do or do not contain latex)
  - Surgical gloves
  - Urinary catheter
  - Medications drawn up through a latex stopper
- Place invasive monitors to help guide fluid and vasopressor management
  - Arterial line
  - CVP or PA catheter
  - TTE or TEE
  - Urinary catheter
- Obtain blood sample for measurement of mast cell tryptase within 2 hours of onset to confirm diagnosis of anaphylactic reaction
- Arrange admission to an ICU for postoperative management and observation
- Consider referring patient to an allergist on discharge from the hospital

COMPLICATIONS

Inability to intubate, ventilate, or oxygenate
Hypertension, tachycardia from vasopressors
ARDS
Renal failure
Cardiac arrest
Anoxic brain injury
Death

Les urgences anesthésiologiques sont souvent vitales



ANAPHYLAXIS

By Stanford Anesthesia Cognitive Aid Group

SIGNS

Some signs may be absent in an anesthetized patient:

1. Hypoxemia, difficulty breathing, tachypnea
2. Rash/hives
3. Hypotension (may be severe)
4. Tachycardia
5. Bronchospasm/wheezing
6. Increase in peak inspiratory pressure (PIP)
7. Angioedema (potential airway swelling)

CALL FOR HELP **CODE CART**

INFORM TEAM

PREPARE EPINEPHRINE 10 µg/mL or 100 µg/mL
CONSIDER PAUSING SURGERY

If patient becomes pulseless, start CPR, continue Epinephrine 1 mg IV boluses and large volume IV fluid. Also, **Go to** PEA event

RULE OUT

Consider and rule out other causes

- Pulmonary embolus
- Myocardial infarction
- Anesthetic overdose
- Pneumothorax
- Hemorrhage
- Aspiration

For anaphylaxis **treatment, Go To** next page

Continued on Next Page

ANAPHYLAXIS

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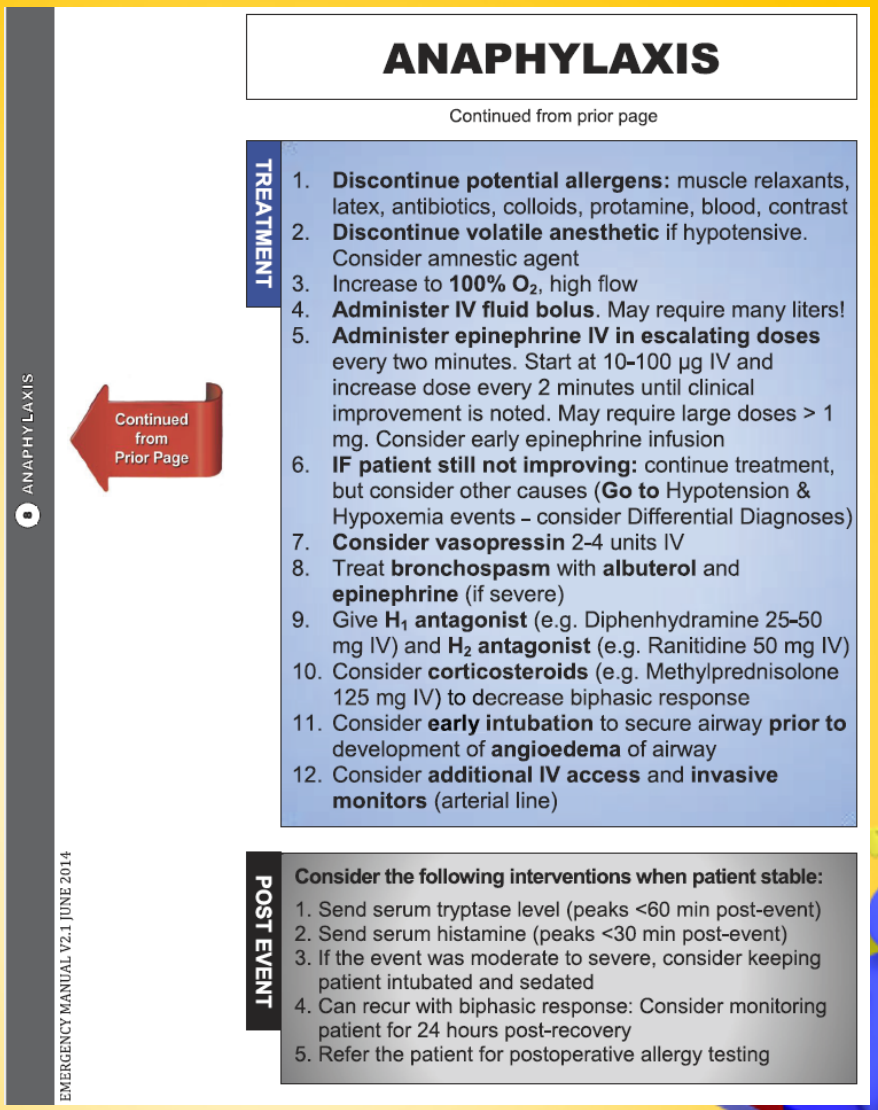

ANAPHYLAXIS

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ANAPHYLAXIS

Continued from prior page

TREATMENT

1. **Discontinue potential allergens:** muscle relaxants, latex, antibiotics, colloids, protamine, blood, contrast
2. **Discontinue volatile anesthetic** if hypotensive. Consider amnestic agent
3. Increase to **100% O_2**, high flow
4. **Administer IV fluid bolus**. May require many liters!
5. **Administer epinephrine IV in escalating doses** every two minutes. Start at 10-100 µg IV and increase dose every 2 minutes until clinical improvement is noted. May require large doses > 1 mg. Consider early epinephrine infusion
6. **IF patient still not improving:** continue treatment, but consider other causes (**Go to** Hypotension & Hypoxemia events – consider Differential Diagnoses)
7. **Consider vasopressin** 2-4 units IV
8. Treat **bronchospasm** with **albuterol** and **epinephrine** (if severe)
9. Give **H_1 antagonist** (e.g. Diphenhydramine 25-50 mg IV) and **H_2 antagonist** (e.g. Ranitidine 50 mg IV)
10. Consider **corticosteroids** (e.g. Methylprednisolone 125 mg IV) to decrease biphasic response
11. Consider **early intubation** to secure airway **prior to** development of **angioedema** of airway
12. Consider **additional IV access** and **invasive monitors** (arterial line)

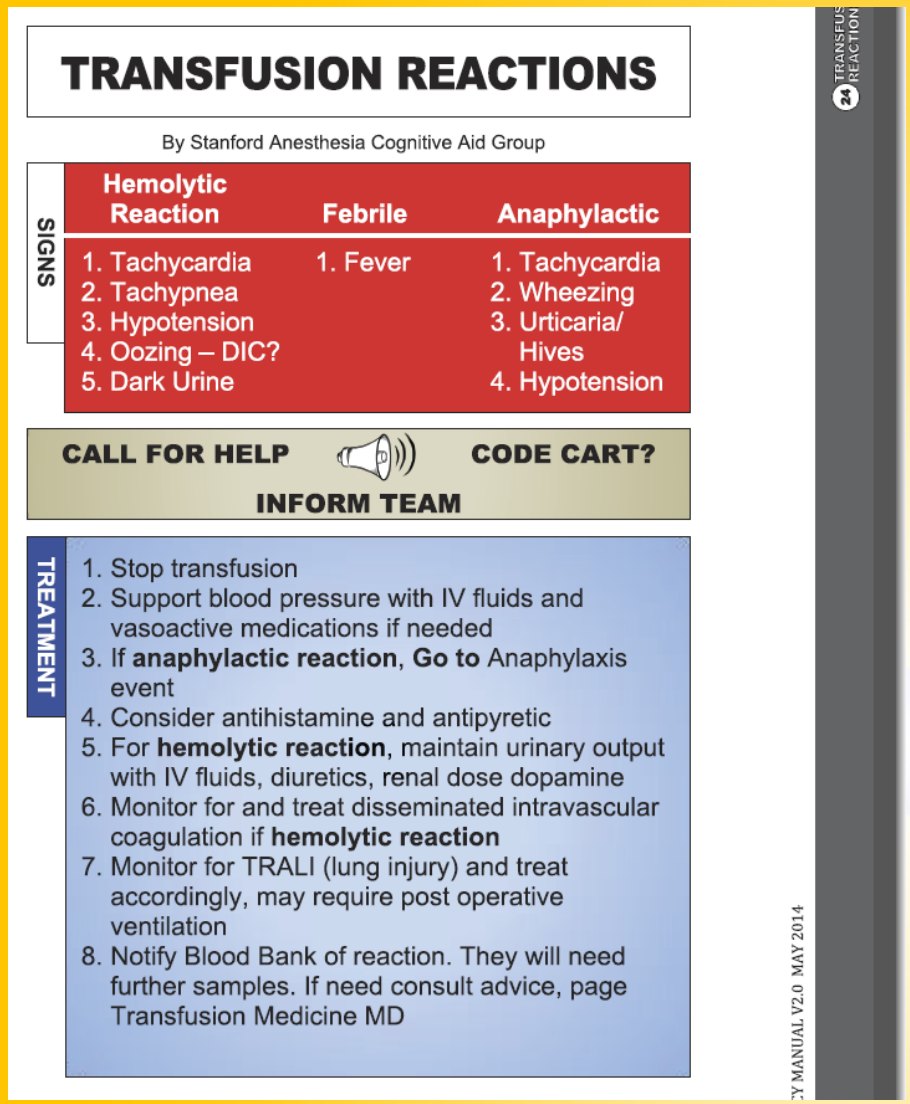
POST EVENT

Consider the following interventions when patient stable:

1. Send serum tryptase level (peaks <60 min post-event)
2. Send serum histamine (peaks <30 min post-event)
3. If the event was moderate to severe, consider keeping patient intubated and sedated
4. Can recur with biphasic response: Consider monitoring patient for 24 hours post-recovery
5. Refer the patient for postoperative allergy testing

EMERGENCY MANUAL V2.1 JUNE 2014

Les urgences anesthésiologiques sont souvent vitales



TRANSFUSION REACTIONS

By Stanford Anesthesia Cognitive Aid Group

SIGNS	Hemolytic Reaction	Febrile	Anaphylactic
	1. Tachycardia 2. Tachypnea 3. Hypotension 4. Oozing – DIC? 5. Dark Urine	1. Fever	1. Tachycardia 2. Wheezing 3. Urticaria/ Hives 4. Hypotension

CALL FOR HELP **CODE CART?**

INFORM TEAM

TREATMENT

1. Stop transfusion
2. Support blood pressure with IV fluids and vasoactive medications if needed
3. If **anaphylactic reaction**, **Go to** Anaphylaxis event
4. Consider antihistamine and antipyretic
5. For **hemolytic reaction**, maintain urinary output with IV fluids, diuretics, renal dose dopamine
6. Monitor for and treat disseminated intravascular coagulation if **hemolytic reaction**
7. Monitor for TRALI (lung injury) and treat accordingly, may require post operative ventilation
8. Notify Blood Bank of reaction. They will need further samples. If need consult advice, page Transfusion Medicine MD

TRANSFUSION REACTION

CY MANUAL V2.0 MAY 2014

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NEWSLETTER

The Official Journal of the Anesthesia Patient Safety Foundation

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Emergency Manuals: The Time Has Come

Michael F. Mulroy, MD, for Emergency Manual Implementation Collaborative

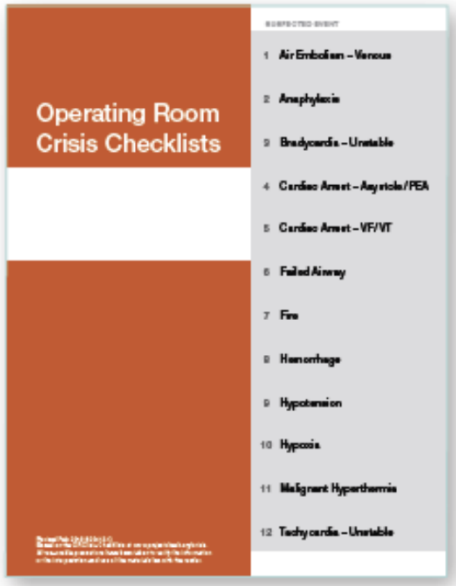

Figure 1. Table of Contents of Ariadne Group checklists.

It was a "standard" interscalene block for shoulder surgery, a single injection of a ropivacaine/tetracaine mixture under ultrasound guidance. But then the convulsion started; the patient lost consciousness and stopped breathing. The blood pressure dropped, but sinus rhythm was maintained. The anesthesiologist reported: "I sort of froze: Four people were doing a lot of things at once, it was chaotic, but I remembered to get the checklist." The checklist he remembered was the ASRA guideline for managing local anesthetic toxicity (LAST) that he had just simulated at a meeting, and which was now posted on the operating room wall. The checklist was read out loud; administration of a large dose of propofol (drawn up and being connected to the IV) was immediately stopped and Intralipid™ given instead in the correct dose. After following the steps on the list, the patient awakened with no permanent complications, and received surgery at a later date.

This is the story shared by Paul Preston, MD, of the Kaiser Hospital system in Northern California. He added that "using the checklist really helped the team get organized and more effectively do the correct steps. It greatly added to situational awareness. Nobody could remember the exact dose of Intralipid even though two of the providers had been through LAST simulation a month earlier—this let the team rapidly get it right."

The reality is that none of us can any longer function as that "lone expert" recalling every procedure and drug dose from memory, especially in crisis situations. The American Heart Association has developed algorithms for managing cardiac arrest, the MHAUS association has a detailed checklist for managing malignant hyperthermia (www.mhaus.org), the Central Line Bundle is now used to prevent infections

See "Manuals," Page 9

Checklists Improve Performance in Emergencies

"Manuals," From Page 1

in the ICU, and ASRA has shared the LAST checklist.[1] We are now adapting to the checklist concept that has been used in aviation for 80 years, and for anesthesia machine checks for 50. We have seen that effective use of the WHO surgical checklist in the operating room reduces morbidity and mortality. The Stanford Patient Simulation Center has an extensive history of developing and testing cognitive aids for operating room teams through simulation.[2] This concept has also been explored by researchers at Ariadne Labs, a joint center for health system innovation at Brigham and Women's Hospital and Harvard School of Public Health, to introduce a broad set of 12 Crisis Management checklists for the operating room (Figure 2).[3]

Simulation testing of such cognitive aids in Palo Alto , Boston,[3] and Seattle[1] has shown, not surprisingly, that performance in emergency situations is greatly improved with a checklist. The use of these tools in teaching new residents how to manage emergency situations has also been demonstrated at Northwestern University.[5] Distribution of emergency manuals in the VA Hospital system has resulted in anecdotal reports of efficacy in real time crisis situations.[6]

While every hospital needs an Emergency Manual that meets their specific needs (including the phone number for fire reporting, the location of the MH kit, etc.), there are several sets of cognitive aids available as potential templates. The Stanford published handbook of checklists[7] is now supplemented by a website with a set of 23 anesthesia cognitive aids (http://emergencymanual.stanford.edu) (Figure 3) and a second website with additional

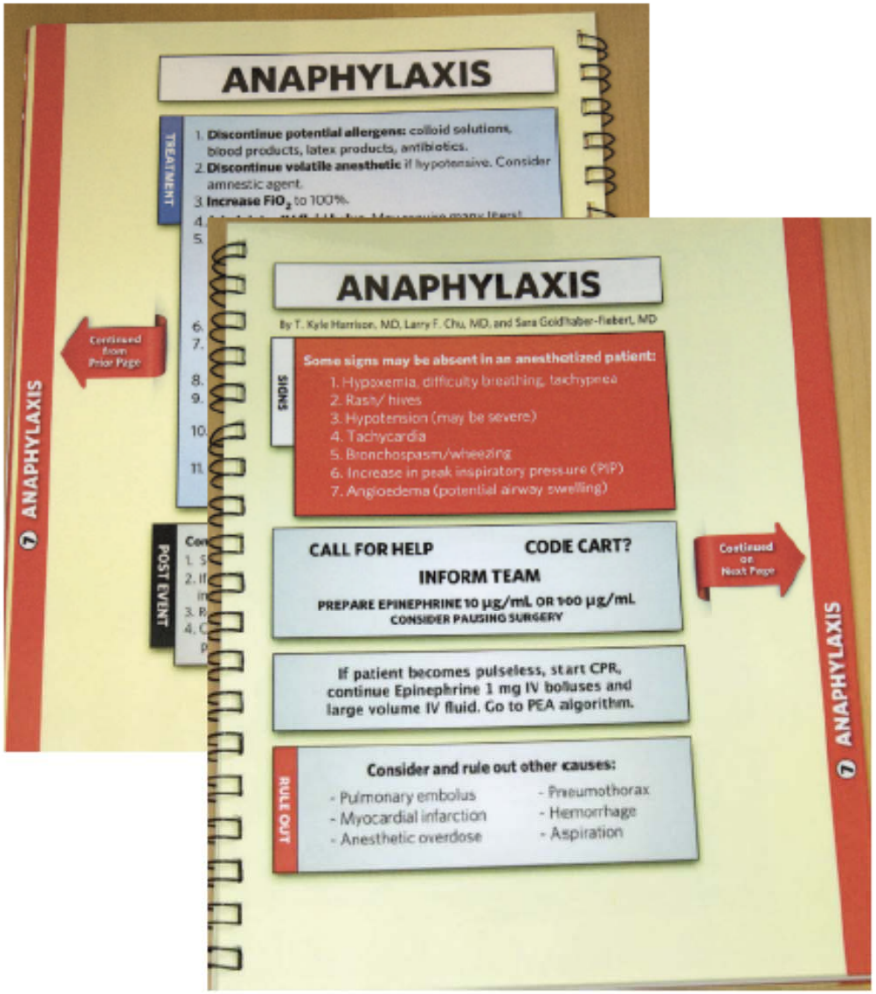

Figure 3. Example of checklist from Stanford Anesthesia Cognitive Aid Group.

Crisis checklists will not be used if the potential users are unaware of them and untrained. Neily and colleagues at the VA found that, despite the positive response to the concept by 98 % of staff, 13% and 41% in 2 surveys admitted they were not even aware of the tools.[8] Awareness alone is also not enough—practice is critical. Burden and colleagues found in their simulation trials that a designated "reader" was essential for the more complex scenarios, such as malignant hyperthermia.[10] The ASRA group discovered in their initial simulation that the first guideline was ambiguous and had to be revised to be effective.[1] Using the crisis checklists as templates for multidisciplinary simulation is the ideal way to ensure that the steps are clear, and that all members of the operating team are really prepared to handle emergencies—the Stanford group has been constantly revising their lists based on simulation experience.

Anesthesia Patient Safety Foundation

Section Editor: **Sorin J. Brull**

SPECIAL ARTICLE

Implementing Emergency Manuals: Can Cognitive Aids Help Translate Best Practices for Patient Care During Acute Events?

Sara N. Goldhaber-Fiebert, MD,* and Steven K. Howard, MD†*

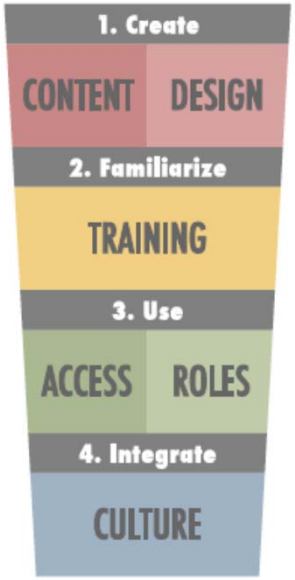

Figure 3. Four vital elements for implementing emergency manuals.
© 2012 Diagram: S. Goldhaber-Fiebert and S. Howard.

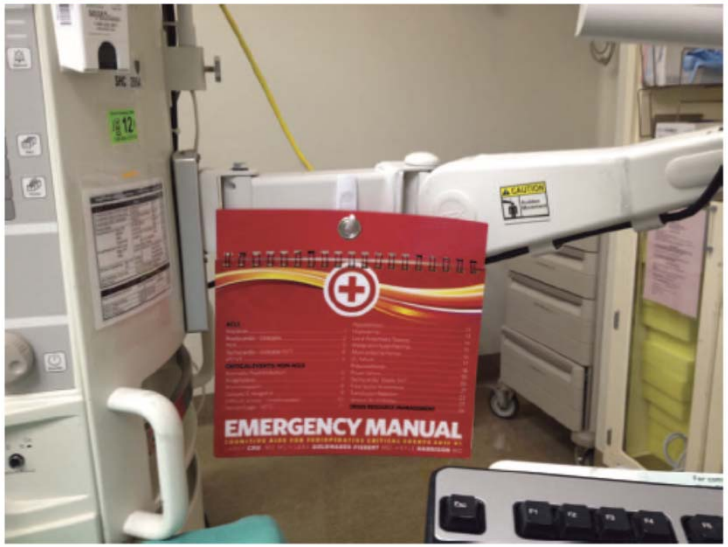

Figure 6. Location of 2012 Stanford emergency manual: hanging from the computer arm near anesthesia machine. Placement should balance the need for accessibility and consistent location, without interfering with routine work flow.

CRISIS RESOURCE MANAGEMENT

Call for Help Early
- Call for help early enough to make a difference
- Err on the side of getting more help
- Mobilize early personnel with special skills if they may be needed

Designate Leadership
- Establish clear leadership
- Inform team members who is in charge
- 'Followers' should be active in asking who is leading

Anticipate and Plan
- Plan & prepare for high work-load periods during low work-load periods
- Know where you are likely headed during the crisis and make backup plans early

Know the Environment
- Maintain situational awareness
- Know how things work and where things are
- Be aware of strengths and vulnerabilities of environment

Establish Role Clarity
- Determine who will do what
- Assign areas of responsibility appropriate to knowledge, skills, and training
- Active followers may offer specific roles

Use All Available Information
- Monitor multiple streams of data and information
- Check and cross check information

Distribute the Workload
- Assign specific tasks to team members according to their abilities
- Revise the distribution if there is task overload or failure

Allocate Attention Wisely
- Eliminate or reduce distractions
- Monitor for task saturation & data overload
- Avoid getting fixated
- Recruit others to help w/ monitoring

Mobilize Resources
- Activate all helpful resources including equipment and additional personnel

Communicate Effectively
- Command and request clearly
- Seek confirmation of request (close the loop)
- Avoid "thin air" statements
- Foster input and atmosphere of open information exchange among all personnel

Use Cognitive Aids
- Be familiar with content, format, and location
- Support the effective use of cognitive aids

Pré-conclusion des urgences anesthesiologiques

- Pour soi :
  - Anticipation maximale par une préparation adéquate
  - Connaissance de son métier
  - Aide demandée sans gêne
  - Stress management (CRM) : apprentissage
  - Report d'incident ou d'événement indésirable

- Pour l'équipe :
  - Apprendre à travailler en team
  - Leadership
  - Communication
  - Assertivité (capacité à s'exprimer et à défendre ses droits sans empiéter sur ceux des autres)
  - Utiliser ttes les ressources à disposition
  - Lieu de rencontre commun (lieu de parole, lieu où tous les métiers se cotoient, où l'on apprend à se connaître)

- Crise passée :
  - Debriefing obligatoire en équipe, réunion dites de sécurité (anciennement mortalité-morbidité)
  - Amélioration des procédures, check list
  - Simulation : rejouer l'incident, en faire d'autres pour être plus efficace (personnellement et en groupe)

Conclusions

- Complexité du rôle de l'infirmière de bloc opératoire et site hors bloc :
  - Partenaire du chirurgien (connaissances multiples de la chirurgie) y compris de l'individu (compétence, caractère)
  - Partenaire de l'anesthésiste (connaissances multiples) y compris de l'individu (compétences)
  - Partenaire de ses collègues infirmières (communication)
  - Rôle difficile à tenir
  - Rôle difficile à valoriser
  - Rôle à part entière
  - Formation continue obligatoire (évolution de la médecine, congrès commun médecin et infirmière)
  - Seul une connaissance mutuelle du travail de chacun est une voie d'amélioration de la prise en charge du patient

CHU Dinant Godinne
UCL NAMUR

Merci de votre attention !