Do You Use Local Anaesthetics?

Dentists who use local anaesthetic agents should be well versed in diagnosis and management of emergencies which may arise from their use. Resuscitative equipment, oxygen and other resuscitative drugs should be available for immediate use.
<table>
<thead>
<tr>
<th>Condition</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syncope</td>
<td>15,407</td>
</tr>
<tr>
<td>Mild Allergy</td>
<td>2,583</td>
</tr>
<tr>
<td>Angina</td>
<td>2,552</td>
</tr>
<tr>
<td>Postural Hypotension</td>
<td>2,475</td>
</tr>
<tr>
<td>Seizure</td>
<td>1,595</td>
</tr>
<tr>
<td>Brochospasm (asthma)</td>
<td>1,392</td>
</tr>
<tr>
<td>Hyperventilation</td>
<td>1,326</td>
</tr>
<tr>
<td>Epinephrine Reaction</td>
<td>913</td>
</tr>
<tr>
<td>Hypoglycemia (insulin shock)</td>
<td>890</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac Arrest</td>
<td>331</td>
</tr>
<tr>
<td>Anaphylaxis</td>
<td>304</td>
</tr>
<tr>
<td>Myocardial Infarction</td>
<td>289</td>
</tr>
<tr>
<td>Local Anaesthetic Overdose</td>
<td>204</td>
</tr>
<tr>
<td>Acute Pulmonary Edema</td>
<td>141</td>
</tr>
<tr>
<td>(heart failure)</td>
<td></td>
</tr>
<tr>
<td>Diabetic Coma</td>
<td>109</td>
</tr>
<tr>
<td>C.V.A.</td>
<td>68</td>
</tr>
<tr>
<td>Adrenal Insufficiency</td>
<td>25</td>
</tr>
<tr>
<td>Thyroid Storm</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse Reaction to LA</td>
<td>7.0</td>
</tr>
<tr>
<td>Grand Mal Seizure</td>
<td>1.52</td>
</tr>
<tr>
<td>Angina</td>
<td>1.01</td>
</tr>
<tr>
<td>Insulin Shock (hypoglycemia)</td>
<td>1 in 2</td>
</tr>
<tr>
<td>Severe asthma</td>
<td>1 in 3</td>
</tr>
<tr>
<td>Artificial ventilation</td>
<td>1 in 13</td>
</tr>
<tr>
<td>CPR</td>
<td>1 in 17</td>
</tr>
<tr>
<td>Stroke</td>
<td>1 in 20</td>
</tr>
<tr>
<td>Local Anaesthetic Anaphylaxis</td>
<td>1 in 60</td>
</tr>
</tbody>
</table>
Time of Emergency

- Immediately before tx: 1.5%
- During or after LA: 54.9%
- During tx: 22.0%
- After tx: 15.2%
- After leaving office: 5.5%

Matsuura Anes Prog. 36:219-228, 1990
Tx Performed During Emergency

- Extraction 38.9%
- Pulp extirpation 26.9%
- Unknown 12.3%
- Other tx 10.6%
- C&B 7.3%
- Restorative 2.3%
- Incision 1.7%

Matsuura, Anes Prog, 36: 219-228, 1990
# Level of Dental Fear

<table>
<thead>
<tr>
<th>Feeling towards treatment</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not afraid at all</td>
<td>703</td>
<td>63.9</td>
</tr>
<tr>
<td>A little afraid</td>
<td>228</td>
<td>20.7</td>
</tr>
<tr>
<td>Somewhat afraid</td>
<td>108</td>
<td>9.8</td>
</tr>
<tr>
<td>Very afraid</td>
<td>22</td>
<td>2.0</td>
</tr>
<tr>
<td>Terrified</td>
<td>39</td>
<td>3.5</td>
</tr>
<tr>
<td>Did not know answer</td>
<td>1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Chanpong et al Oral Health, Feb 2006
Sources Of Epinephrine

- Life stress
- Personality types
- Anxiety
  - Epi can $\uparrow$ 40X due to stress
- Local anaesthetics
Conundrum:

- Medical emergencies occur in dental offices
- Anxiety contributes to this occurrence & can change the path of the emergency
- People are fearful of dental visits
- Sometimes we need LA with epi

- What can we do?
Avoiding Medical Emergencies

1. Thorough med hx and vital sign assessment
2. Profound and Comfortable LA
3. Stress Reduction Protocol
4. Be prepared
   a) BLS+ EMS
   b) Office plan
   c) Emergency kit
LA Allergy..... Or Is It?

Patient Reports Allergy:

Ask Questions

- Allergy Symptoms
- Rule Out Syncopy
- Rule Out Epi

Known Drug
- Choose Different Amide, No Vasopressor

Unknown Drug
- Refer To Allergist

Test LA’s and Sulfites

Adapted from Becker et al, Anes Prog 59:90-102, 2012
ASA Physical Status Classification

ASA I  Healthy

ASA II  One mild systemic disease
- mild asthma
- controlled epilepsy
- extreme anxiety
- > 60 years old
- BP 140-160/90-95
- well-controlled NIDDM
ASA Classification

ASA III  Severe systemic disease limits activity but not incapacitating.

- stable angina
- >6 months post MI/CVA  no residual effects
- well controlled IDDM
- exercise-induced asthma
- BP 160-200/95-115
ASA IV  Incapacitating disease which is a constant threat to life
  – unstable angina
  – MI or CVA < 6 months ago
  – uncontrolled IDDM
  – BP > 200/115
  – unable to walk up one flight of stairs
New Physical Status Classification System

- P1: Healthy
- P2: Mild systemic disease
- P3: Severe systemic disease
- P4: Severe systemic disease life threatening
- P5: Won’t survive operation
- P6: Brain dead

Part of “Standard of Care” for all sedation modalities
Who Is At Risk?

Common medical “red flags”:

- Angina/MI history
- Asthma and other chronic respiratory diseases
- Hypertension/Stroke history
- Diabetes
- Seizure disorders

Especially if anxious
Vital Signs

I. Blood pressure
II. Heart rate and rhythm
III. Respiratory rate
IV. Temperature
V. Height
VI. Weight
I. Blood Pressure

Purpose:

-To measure the pressure required to collapse the brachial artery

BP > 140/90 = Hypertension
systolic: amount of work by heart

diastolic: condition of heart

Recently, more emphasis put on SBP as measure of future cardiac health
Why Check BP?  
Overall Health

- 20-25% of Canadians have hypertension
- 40% are unaware
- 40% aware but not controlled below 140/90

∴ only 20% aware and controlled well
Consequences of Chronic ↑BP

- CAD
- Heart failure
- Renal failure
- Retinopathy
- Stroke
- Premature death
Why Check BP?
Dental Visit

- High BP during dental tx =
  - ↑ risk for:
    - Angina
    - MI
    - Stroke
Risk Factors For \( \uparrow \) BP

- Smoking
- Lack of exercise
- Diabetes
- Obesity
- Stress \textit{dental anxiety}!!
  - White coat syndrome
- Excessive alcohol
- Cardiac disease
- Sleep apnea
- Uncontrolled kidney or thyroid disease
Whose BP Should You Check?

• All new patients

• At all visits for those with $h_x$ of:
  – Hypertension
  – Cardiovascular disease
  – Stroke
  – Conditions where BP may be affected
    • eg obese, kidney disease, diabetes, anxiety…
Withings Blood Pressure Monitor
**Precautions**

- Arms may differ 5-10 mg Hg (left higher)  
  - Use the higher value
- Sleeve forming tourniquet
- Rest before measurement (5 min)  
  - Avoid caffeine, exercise, stress... 30 min before
- Cuff too small = elevated readings
- Cuff too big = decreased readings
# Current BP Classification

<table>
<thead>
<tr>
<th>Category</th>
<th>Systolic BP</th>
<th>Diastolic BP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal</strong></td>
<td>&lt; 120</td>
<td>&lt; 80</td>
</tr>
<tr>
<td><strong>Prehypertension</strong></td>
<td>120 – 139</td>
<td>80 – 89</td>
</tr>
<tr>
<td><strong>Hypertension Stage 1</strong></td>
<td>140 – 159</td>
<td>90 – 99</td>
</tr>
<tr>
<td><strong>Hypertension Stage 2</strong></td>
<td>&gt; = 160</td>
<td>&gt; = 100</td>
</tr>
</tbody>
</table>

*US Department of Health and Human Services, 2011*
Explanation

• Prehypertension
  – Not a disease category
  – May be at risk for Stage 1
  – May require lifestyle changes

• Stage 1 Hypertension tx with one drug – usually thiazide diuretic

• Stage 2 usually 2 drugs needed: diuretic + a drug from another class
BP Medications; Examples

• Thiazide diuretics
  – chlorothiazide, microzide...

• Beta blockers
  – corgard, inderal, tenormin...

• ACE inhibitors
  – vasotec, accupril, altace...

• Calcium channel blockers
  – norvasc, cardizem, adalat...
In Office BP Management

- **< 140/90**: No special care
- **> 140-160/90-100**: Reassess at next visit & if elevated refer to MD
- **>160-180/100-110**: Monitor BP during appointment. Refer to MD
- **>180-200/110-120**: No elective dentistry. Refer to MD immediately
- **>200/120**: See MD stat if symptoms (911) or in 24 hrs if not
BP Letter to Physician

Name: _______________________

Date: _______________________

Blood Pressure: _____________

Arm: _______________________

Position: ___________________

Dr. David Isen  416-498-8484
II. Heart Rate & Rhythm

- HR < 60  Bradycardia

- HR > 100  Tachycardia

Regular vs. Irregular
Cardiac Dysrhythmias

• Medical consultation
• If associated with:  - dizziness
  - light headedness
  - syncope
  - weakness

No elective treatment
Implantable Cardiac Devices

- Pacemaker
  - Bradyarrhythmias (heart block)

- Implantable cardioverter-defibrillator (ICD)
  - At risk for sudden cardiac death from V-tach or V-fib
Respiratory Considerations

- Anxiety
- Asthma
- Smoking
- Respiratory disease
  - COPD, emphysema, sarcoidosis…
- Sleep apnea
- Fever
- Age
3. Stress Reduction Protocol

- Recognize anxiety
- Get personal
- Early morning appointment
- Minimize waiting
- Easy, quick procedures first
- Go slow, tell-show-do?
- Anxiolytics
- Refer: DA or OMFS
# Other Methods of Anxiety Management

<table>
<thead>
<tr>
<th>Method</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio headphones</td>
<td>71</td>
</tr>
<tr>
<td>Video/DVD in op</td>
<td>50</td>
</tr>
<tr>
<td>Virtual reality eyewear</td>
<td>9</td>
</tr>
<tr>
<td>Other</td>
<td>14</td>
</tr>
</tbody>
</table>

*Dental Products Report Survey, Nov 2006*
### Using Anxiolytics

<table>
<thead>
<tr>
<th>Sedation Procedure</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrous oxide</td>
<td>57</td>
</tr>
<tr>
<td>Oral</td>
<td>56</td>
</tr>
<tr>
<td>None</td>
<td>20</td>
</tr>
<tr>
<td>Injectable</td>
<td>9</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
</tbody>
</table>

*Dental Products Report Survey, Nov 2006*
Anxiolytics For Adults

- Nitrous oxide
- Diazepam
- Lorazepam
- Triazolam

-Watch drug for interactions!!!!!!!

-Beware of DOCS
## Comparing Benzodiazepines

<table>
<thead>
<tr>
<th></th>
<th>Diazepam</th>
<th>Lorazepam</th>
<th>Triazolam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset (min)</td>
<td>45 – 90</td>
<td>45 – 120</td>
<td>30 – 60</td>
</tr>
<tr>
<td>Duration (hr)</td>
<td>2 – 4</td>
<td>4 – 6</td>
<td>1 – 3</td>
</tr>
<tr>
<td>Active metabolite</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>½ life (hr)</td>
<td>20 – 50</td>
<td>15</td>
<td>2 – 3</td>
</tr>
<tr>
<td>Adult sedative po dose (mg)</td>
<td>5 – 20</td>
<td>1 – 2</td>
<td>0.125 – 0.25</td>
</tr>
<tr>
<td>Supplied (mg)</td>
<td>2, 5, 10</td>
<td>0.5, 1, 2</td>
<td>0.25 – 0.5</td>
</tr>
</tbody>
</table>
Anxiolytics For Kids

- Nitrous oxide
- Midazolam
- Hydroxyzine (1.1 mg/kg)
- Chlortal hydrate
Cardio Pulmonary Resuscitation

- **THE PURPOSE:**
  - Is not to revive the patient

- **THE PURPOSE:**
  - Chest compressions + defib ASAP
  - Prevent cerebral hypoxia
  - Buy time until EMS arrives
What happens without oxygen

- when the heart stops, oxygen is not being circulated
- within 4 min. brain damage begins (**clinical death**)
- within 10 min. brain death occurs (**biological death**)

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 min.</td>
<td>Breathing stops. Heart will soon stop beating.</td>
</tr>
<tr>
<td>4-6 min.</td>
<td>Brain damage possible.</td>
</tr>
<tr>
<td>6-10 min.</td>
<td>Brain damage likely.</td>
</tr>
<tr>
<td>Over 10 min.</td>
<td>Irreversible brain damage certain.</td>
</tr>
</tbody>
</table>
1. Immediate recognition of arrest and EMS activation
2. Early CPR – emphasis on chest compressions
3. Rapid defibrillation
4. Effective advanced life support
5. Integrated post-cardiac arrest care
Position

• Conscious vs.

• Unconscious
New AHA Guidelines - 2010

- Last guidelines published 2005
- Based on review of resuscitation literature
- Debates by global experts
- De-emphasize step-by-step approach by 1 rescuer
- Emphasize team approach
Emphasizes High Quality CPR:

• Compression rate at least 100/min
  – Used to be “approximately” 100/min

• Allow chest to recoil

• Minimize compression interruptions

• Avoid excessive ventilation

• Differentiates untrained vs. trained rescuers

• HCP’s rotate every 2 minutes
Untrained Vs. Trained Rescuer

Highly Trained

Team Work

Multi-rescuer Coordinated CPR

Rescue Breaths

30:2 CPR

Chest Compressions

Hands-only CPR

No Training
Change From ABC to CAB

Rationale:

• Most adult arrests: witnessed with VF /pulseless VT
• What saves lives? Chest compressions + early defib
• CAB = faster delivery of compressions
• Ventilation delay minimal – only ~20 sec (after 1\textsuperscript{st} 30 compressions)
• Residual O\textsubscript{2} in lungs?
• Too much O\textsubscript{2} in lungs can ↓ compression effectiveness
Change From ABC to CAB

• Also studies have shown:

  Similar survival rates if compressions only vs. compressions + ventilations for out-of-hospital arrests.
Unresponsive
No breathes
No normal breathes (only gasping)

Start CPR
30 : 2

Push Hard – Push Fast

Activate EMS
Get AED

-Check rhythm
-Shock if indicated
-Repeat every 2 min

Simplified Adult BLS (Rescuer Untrained)
1 vs. 2 Rescuers

• 1 Rescuer:
  – 30 compressions C
  – Open airway A
  – 2 breathes B

• 2 Rescuers:
  – 1 starts compressions, the other opens airway, gives 2 breathes after 30 compressions

For untrained rescuer: no more “look-listen-and-feel”
BLS Trained Rescuer

• Briefly check breathing if non-breathing or “no normal breathing” (agonal gasps)
  – Look for chest to rise
• Activate EMS or send someone
• Get AED or send someone
• Check pulse – must take less than 10 sec.
• Chest compressions – defib
• A
• B
<table>
<thead>
<tr>
<th>Sequence</th>
<th>Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognition</td>
<td>Unresponsive, no breathes or agonal breathing HCP: no pulse felt after 10 sec check EMS</td>
</tr>
<tr>
<td>CPR sequence</td>
<td>C-A-B</td>
</tr>
<tr>
<td>Compression rate</td>
<td>At least 100/min</td>
</tr>
<tr>
<td>Chest wall recoil</td>
<td>Allow. HCP rotate every 2 min.</td>
</tr>
<tr>
<td>Compression interruptions</td>
<td>Minimize. Limit to &lt; 10 sec.</td>
</tr>
<tr>
<td>Airway</td>
<td>Head tilt-chin lift (HCP jaw thrust if trauma)</td>
</tr>
<tr>
<td>Compression:ventilation ratio</td>
<td>30:2 unless 2 HCP rescuers for child and infant, then 15:2</td>
</tr>
<tr>
<td>Ventilations if rescuer untrained, or not proficient</td>
<td>Compressions only</td>
</tr>
<tr>
<td>Defibrillation</td>
<td>AED ASAP. Chest compressions again, right after shock</td>
</tr>
</tbody>
</table>
Circulation:

*Check carotid pulse*

Health care providers only

Begin chest compressions ASAP

**PUSH HARD AND PUSH FAST**

**CPR = Cerebral oxygenation is only 25% of cardiac output**
Ratio Compressions:Breaths

30:2

Adult, child & infant

Unless 2 HCP rescuers for child & infant. Then 15:2
# High Quality CPR

## Depth of Compressions

<table>
<thead>
<tr>
<th></th>
<th>Adult</th>
<th>Child</th>
<th>Infant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Old Guidelines</strong></td>
<td>1.5 – 2 inches</td>
<td>1 – 1.5 inches</td>
<td>0.5 – 1 inch</td>
</tr>
<tr>
<td><strong>New Guidelines</strong></td>
<td>At least 2 inches (5 cm)</td>
<td>At least $\frac{1}{3}$ A-P thickness of chest ~ 2 inches</td>
<td>At least $\frac{1}{3}$ A-P thickness of chest ~ 1.5 - 2 inches</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>Child (1 – 8)</td>
<td>Infant (&lt;1)</td>
</tr>
<tr>
<td>------------------</td>
<td>-------</td>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>Ratio</strong></td>
<td>30:2</td>
<td>30:2</td>
<td>30:2</td>
</tr>
<tr>
<td><strong>2 rescuers</strong></td>
<td>30:2</td>
<td>15:2 (HCP)</td>
<td>15:2 (HCP)</td>
</tr>
<tr>
<td><strong>Hands</strong></td>
<td>Heel of one hand, other hand on top</td>
<td>Heel of one hand or same as adult</td>
<td>2-3 fingers</td>
</tr>
<tr>
<td><strong>Area of</strong></td>
<td>Lower ½ of sternum (between nipples)</td>
<td>Lower ½ of sternum (between nipples)</td>
<td>Lower ½ of sternum, just below nipple line</td>
</tr>
<tr>
<td><strong>Depth</strong></td>
<td>At least 2 inches</td>
<td>At least ⅓ chest thickness</td>
<td>At least ⅓ chest thickness</td>
</tr>
<tr>
<td><strong>Rate at least:</strong></td>
<td>100/min</td>
<td>100/min</td>
<td>100/min</td>
</tr>
</tbody>
</table>
Age

- **Infant:** Birth to 1 yr. old
- **Child:** 1 yr. old to puberty
- **Adult:** Puberty and older

* Look at body size
Airway

**CHECK:**
Shake & Shout

**DO:**
Head tilt, chin lift
Breathing

CHECK:
- Used to be: Look, Listen and Feel, - Now simply look for chest rise

DO:
- Used to be: Give 2 breaths
- Now start compressions if not breathing
Airway Obstruction

- Dental instruments
- Restorative materials, crowns
- Teeth
- Blood
- Vomitus
- Water
- Anaphylaxis
- Asthma
Conscious: Mild Obstruction

- Encourage coughing
Conscious: Severe Obstruction

<table>
<thead>
<tr>
<th>Adult</th>
<th>Child</th>
<th>Infant</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 back blows</td>
<td>5 back blows</td>
<td>5 back blows</td>
</tr>
<tr>
<td>5 abdominal</td>
<td>5 abdominal thrusts</td>
<td>5 chest thrusts</td>
</tr>
<tr>
<td>thrusts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Heimlich Maneuver: Adult (Abdominal Thrusts)

- Lean person back
- Rescuers leg between victims
- Make a fist with thumb tucked in
- Forearms over iliac crest
- Turn fist in towards umbilicus
- Cup other hand over fist
- In and up “J” 5X
- Then:
Back Blows (Adult)

- Stand beside victim facing opposite direction
- Reach across their chest with nearest arm and hold opposite shoulder
- Bend victim forward
- Hit victim between scapula 5X
- Repeat 5 abdominal thrusts with 5 back blows until they breathe or go unconscious
Heimlich Maneuver: Child (Abdominal Thrusts)

- Rescuer kneels
- Lean child back
- Make a fist with thumb tucked in
- One forearm over iliac crest
- Turn fist in towards umbilicus
- In and up “J” 5X
- Then back blows 5X
Unconscious Choking Adult:

- Slowly slide victim down
- Protect head **and your back**
- Check mouth
- 1 breath
- Reposition head – 2\textsuperscript{nd} breath
- **30 chest thrusts** (same as chest compressions)
- Check mouth
- 2 breaths…..
Unconscious Choking Child & Infant

- Child same steps as adult
- If infant: **5 back blows, 5 chest thrusts** while conscious choking and when unconscious, (limp) back blows, chest thrusts, check the mouth, 2 breaths……
Definitive Diagnosis

CHECK:
Render a diagnosis

DO:
Drugs or defibrillation
Defibrillation

- 350,000 die of SCA in U.S., 40,000 in Canada
- 60-70% occur outside of a hospital
- Surviving SCA outside hospital >8% (with CPR)
- Immediate shock: chance of survival ~73%
- Survival ↓ 10% every minute shock is delayed
- After shock, start CPR again immediately
Automated External Defibrillators In Dentistry

- Several states have passed laws requiring AEDs in dental offices
- Dentistry Today regularly advertises different AED models
- Costco
Defibrillation Sequence

• CAB, chest compressions ASAP
  – If VF for a few min, initial compressions can give heart $O_2 +$ energy and ↑ chance shock will work

• Retrieve AED ASAP

• Attach leads and shock if indicated

• Resume CPR

• Repeat every 2 minutes
Conduction System
Other Lethal Arrhythmias

- Asystole - known as “flatline”

- Pulseless Electrical Activity
  - E.g. Blood loss
Life Threatening Electrical Impulses

Ventricular Fibrillation

<table>
<thead>
<tr>
<th>Heart Rate</th>
<th>Rhythm</th>
<th>P Wave</th>
<th>PR interval (in seconds)</th>
<th>QRS (in seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300-600</td>
<td>Extremely irregular</td>
<td>Absent</td>
<td>N/A</td>
<td>Fibrillatory baseline</td>
</tr>
</tbody>
</table>
Life Threatening Electrical Impulses

Ventricular Tachycardia
Heart rate > 120 b/min
Defibrillation

- Stops all electrical activity
- Allows normal pacemaker to take over
  - “jump stops the heart”
Good AEDs

- Reputable company
- Non-proprietary batteries with long shelf life
- Easy to use
- Can be used on kids over 1 yr. (need pedo pads for aged 1 – 8)
Pad Placement

- Bare chest - cut clothes
- Shave
- Dry skin
  - Diaphoresis common in cardiac arrest
- Avoid direct contact with implanted pacemaker but use in these people is ok
Pad Placement

1. Upper right sternal borderer
directly below clavicle

2. Lateral and below left
nipple with top of pad
below axilla
Using an AED: Risk vs. Responsibility

• If DDS uses AED, this fits into definition of PLP covered services.

• Chase McEachern Act (2007 Ontario): health care provider & public protected from civil liability when AED used in good faith.
Designated Emergency Plan

- Team leader
- 9-1-1 caller
- Ambulance greeter
- Emergency kit and AED retrieval
- Airway and Breathing person
- Circulation person
- Drugs
EMS - 9-1-1

• Do not hesitate
• Average urban response time is 9 min
• 15 min rural
• Irreversible CNS damage in 4-8 minutes
• Survival rates of SCA ↓ 10% for each minute defibrillation is delayed
## EMS Response Time, GTA

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
</table>

Based on 90% of the most serious calls
Other Concerns

- Patients in the reception area
- Patients in other ops
- Family members
- Follow-up
- PLP
RCDSO standard of care:

- All dental staff CPR-trained
- Written emergency protocol in place
- Each staff member is aware of role during emergency
- Protocol should be periodically reviewed
RCDSO standard of care:

It is only after the basic CAB’s have been assessed should one consider the use of an emergency kit.
RCDSO standard of care:

- Drugs should not be stale-dated
- Stored in an organized fashion
- Labelled trays or bags
Timely or prophylactic use of $O_2$ may prevent cardiac or respiratory arrest
1. Oxygen

E cylinder 682L - good portable $O_2$ size
(30 minutes)
-gives 1.5 hrs @ 5-6 l/min

T cylinder 9331L - large $O_2$
## Oxygen Delivery

Breathing Patient

<table>
<thead>
<tr>
<th>Delivery System</th>
<th>% Oxygen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room Air</td>
<td>21%</td>
</tr>
<tr>
<td>Nasal Cannula (no positive pressure attachment)</td>
<td>24 – 44 %</td>
</tr>
<tr>
<td>Face Mask</td>
<td>40 – 60 %</td>
</tr>
<tr>
<td>Face Mask with O$_2$ Reservoir</td>
<td>&gt;60 % at 6 L/min</td>
</tr>
<tr>
<td></td>
<td>~100 % at 10 L/min</td>
</tr>
</tbody>
</table>
Nasal Hood

- Rubber or silicone – no metal
- Anterior teeth??
- Variety of sizes - airtight
- Disposable, flavoured
- 1-4 attachments for tubing
- Valve on top of hood
  - exhale valve + wafer – sucked out by scavenger
## Oxygen Delivery

### Non-Breathing Patient

<table>
<thead>
<tr>
<th>Delivery System</th>
<th>% Oxygen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouth-to-mouth</td>
<td>16 %</td>
</tr>
<tr>
<td>Mouth-to-mask with supplemental oxygen</td>
<td>~50 %</td>
</tr>
<tr>
<td>Bag-valve-mask with supplemental $O_2$ and positive pressure</td>
<td>100 %</td>
</tr>
</tbody>
</table>
Bag Valve Mask

- BVM without supplemental O$_2$ gives ~21% O$_2$
- Crimp to fill up bag first
- Valve makes this a 1 way flow
One Rescuer

“E – C” Finger Position

C = thumb and index finger: seals mask

E = middle, ring and pinky: jaw thrust
Two Rescuers

Thumb and index seal mask

Other fingers thrust jaw

Pressing too hard in soft area can = tongue pressed up onto hard palate & block airway
2. Epinephrine

- $\alpha$ and $\beta$ adrenergic agonist

$\alpha$ effects = peripheral vasoconstriction
- Advantageous during cardiac arrest due to $\uparrow$ coronary & cerebral perfusion pressure
- Advantageous during anaphylaxis to combat hypotension
Epinephrine

**$\beta_1$ effect:**
- $\uparrow$ rate & contractility of heart and therefore $\uparrow$ cardiac output
- Advantageous in arrest & anaphylaxis

**$\beta_2$ effect:**
- Relaxes bronchiol smooth muscle
- Advantageous in anaphylaxis & severe unresponsive asthma

*Patients on $\beta$ blockers may have blunted effect*
Epinephrine

- Light sensitive
- Store at room temperature
- 1 yr. shelf life
- Half-life is 10 minutes
## Formulations

<table>
<thead>
<tr>
<th>Formulation</th>
<th>[ ]</th>
<th>Amt (mls)</th>
<th>Dose per Injection</th>
<th># of Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampoule</td>
<td>1:1000*</td>
<td>1</td>
<td>Variable</td>
<td>Variable</td>
</tr>
<tr>
<td>EpiPen</td>
<td>1:1000</td>
<td>2</td>
<td>0.3 mg</td>
<td>1</td>
</tr>
<tr>
<td>EpiPen Jr</td>
<td>1:2000±</td>
<td>2</td>
<td>0.15 mg</td>
<td>1</td>
</tr>
<tr>
<td>Twinject</td>
<td>1:1000</td>
<td>0.6</td>
<td>0.3 mg</td>
<td>2</td>
</tr>
<tr>
<td>Twinject Pedo</td>
<td>1:1000</td>
<td>0.6</td>
<td>0.15 mg</td>
<td>2</td>
</tr>
</tbody>
</table>

* 1:1000 = 1 mg/ml  
±1:2000 = 0.5 mg/ml
Dosages

• **EpiPen** for people greater than 66 lbs (30kg)

• **EpiPen Jr.** for 33 – 66 lbs (15 – 30 kg)

• If using ampoule, can give variable dose of 0.01mg / kg
Using An EpiPen (old version):

- Not necessary to expose skin
- Remove **grey** cap
- Jab **black** end into muscle (outer thigh)
- Leave in for several seconds
- Remove and check for needle protrusion
- 1.7 ml remains inside device
- Discard
- 1 yr. shelf life
Anaphylaxis

- 35% of anaphylactic rxns require 2^{nd} dose epi.
- Need for multiple epi doses directly related to severity of rxn.
- However, some mild cases required a 2^{nd} dose
- Anaphylaxis Canada & WHO recommend having 2 doses at all times.

Korenblat et al Allergy & Asthma Proc, Nov-Dec, Vol 20 No 6, 1999
The New EpiPen

• Comes as singles or “2-Pak”
• Better directions on unit
Using the New EpiPen

• Take off **yellow** cap and remove from tube
• With **orange** tip down, remove **blue** safety cap
• **Orange** end into thigh – swinging motion
• Push firm against outer thigh until it clicks
• Leave in for 10 seconds
• Message area
Other Thoughts

• Never push orange end
  – If injected into finger by mistake??
• If dropped, check for integrity
• Should be perpendicular to mid-thigh
• Do not inject into buttocks – sciatic nerve
• When removed, orange cap will cover needle
Twinject

- By Paladin
- Auto-injector with 2 doses
- $T_{1/2}$ 18 months (EpiPen 1 yr.)
- Cost $83 (EpiPen $85)
- Directions on device
Using Twinject: 1st Injection

- Remove green caps #1 and #2
- Jab red end into muscle (mid thigh)
- Press down firmly
- Hold 10 seconds
- Remove and check if needle was exposed
2nd Injection

- If required (wait 10 minutes):
- Unscrew red cap (watch exposed needle)
- Remove syringe from barrel

- Slide yellow (0.3 mg)/ orange (0.15 mg) safety collar off plunger

- Inject full amount 5 cm away from 1st injection
Precaution:

• Since 2\textsuperscript{nd} syringe uses same needle, it might be damaged after 1\textsuperscript{st} injection

• Possible side effects include ↑ HR and anxiety
Allerject

- Same size as playing card (5/8 inch thick)
Allerject

- Has voice prompt when removed from case
- During injection there is a click and hiss
- 5 second injection
- Needle goes back into device after injection
- Voice prompts counting during injection
  - Not holding device in muscle long enough is most common error
- Pedo and adult version (blue vs. orange)
Auto-Injector Precaution

Study:

- Ultrasound measure distance from skin to vastus lateralis in children 1 – 12 yrs.
- 12% of children less than 30 kg, distance from skin to muscle greater than length of needle on EpiPen Jr. or Twinject Pedo (½ inch)

# Auto-Injector Needle Lengths

<table>
<thead>
<tr>
<th>Auto-Injector</th>
<th>Length of Needle Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>EpiPen</td>
<td>5/8</td>
</tr>
<tr>
<td>EpiPen Jr.</td>
<td>1/2</td>
</tr>
<tr>
<td>Twinject 1&lt;sup&gt;st&lt;/sup&gt; Injection</td>
<td>1/2</td>
</tr>
<tr>
<td>Twinject 2&lt;sup&gt;nd&lt;/sup&gt; Injection</td>
<td>5/8</td>
</tr>
<tr>
<td>Twinject Pedo 1&lt;sup&gt;st&lt;/sup&gt; Injection</td>
<td>1/2</td>
</tr>
<tr>
<td>Twinject Pedo 2&lt;sup&gt;nd&lt;/sup&gt; Injection</td>
<td>5/8</td>
</tr>
<tr>
<td>Allerject Adult</td>
<td>5/8</td>
</tr>
<tr>
<td>Allerject Pedo</td>
<td>1/2</td>
</tr>
</tbody>
</table>
Other Auto-Injector Precautions

- Mistaken injection
- May not get to muscle in obese people
- They contain sulphite
Doses of Epinephrine

Pediatric dose 0.01 mg/kg

Anaphylaxis: 0.5 mg IM

Asthma: 0.5 mg IM

Cardiac Arrest: 1.0 mg IV
I.M. Injection

Ventral surface of tongue

Deltoid muscle

Thigh (vastus lateralis)

Onset of action

2 minutes
Vastus Lateralis

IM injection into lateral thigh leads to more rapid rise in blood levels compared to deltoid.
I.M. Injections

• Expose deltoid area
• Clean with alcohol and dry
• Pinch deltoid into a mound (pt to relax)
• Hold syringe like a dart & insert 4-5 mm
• Aspirate
• Inject
3. Nitroglycerin

- Relaxes smooth muscle in arteries & veins
- \( \downarrow \) venous return to heart (\( \downarrow \) pre-load)
- \( \downarrow \) myocardial O\(_2\) demand
- \( \downarrow \) BP
- Limits cardiac damage following MI

For angina or MI
Nitroglycerin

- Tablets are light & oxygen sensitive
- Opened bottle has $T_{1/2}$ of 3 months
- Store in dark, room temp, tightly closed
- Indicated for angina pectoris or MI
- Do not use if systolic < 90
Nitroglycerine

• Contraindicated in those taking drugs for erectile dysfunction:
  – Within 24 hrs for sildenafil (Viagra) or vardenafil (Levitra)
  – Within 48 hrs for tadalafil (Cialis)
CAD

- Level 1: Angina with excessive exercise
- Level 2: Angina with mild exercise
- Level 3: Angina with normal activity
- Level 4: Angina at rest
Stable Angina

- Physical activity
- Temperature extremes
- Large meals
- Emotional stress, anxiety
- Caffeine
- Fever
- Smoking
- Characteristic pain alleviated with nitroglycerine
Unstable Angina

- At rest or with minimal exertion
- Nitroglycerin may not alleviate pain
- Within 3 months, ~10% die, ~20% will have MI
- Severe obstructive CAD
- ASA IV
- Pain differs in character, duration &/or severity
Sublingual Tablets

Nitrostat™ 0.3 or 0.6 mg
q 5 min x 3 doses
(Bottles of 100)
Sublingual Spray

Nitrolingual® Spray -
1 - 2 metered-doses (0.4mg- 0.8mg)
q 5 min x 3 doses

• On or under tongue
• Mouth closed - no inhalation
(200 metered doses / bottle)

Shelf life 2 years
# Emergency Drug Kit

<table>
<thead>
<tr>
<th>Drug</th>
<th>Use</th>
<th>Adult Dose</th>
<th>Child Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td>Most emergencies</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>Anaphylaxis, Asthma, Cardiac Arrest</td>
<td>0.3-0.5 mg IM* 0.3-0.5 mg IM* 1 mg IV</td>
<td>0.01mg/kg</td>
</tr>
<tr>
<td>Nitroglycerin</td>
<td>Angina, MI</td>
<td>0.3 mg tablet 0.4 mg spray</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*IM dose can be given as a sublingual injection
4. Diphenhydramine HCl

- An antihistamine
- Blocks histamine-mediated reactions
- Available in many formulations
  - Injectable form: 1 ml vial with 50 mg (25 mg for kids)
  - Capsules are 25 or 50 mg
  - Chewable tablet 12.5 mg
Diphenhydramine HCl

• Useful in:
  – Mild allergic reactions
  – Asthma??
  – Nausea
  – Premedication (weak anxiolytic and sedative)
  – Local anaesthetic
Histamine

- Itching
- Hives
- Rash

- Bronchospasm
- Vasodilation

Benadryl

Epi
5. Salbutamol

- Trade name = Ventolin®
- Provides bronchodilation via β-2 stimulation
  - Mechanism: Direct action to relax bronchial smooth muscle
- 1 puff = 100 µg
  - Adults: 1 - 2 puffs q 10 minutes x 2
  - Children: 1 puff q 10 minutes x 2
- Duration: 3-6 hours
Using the Inhaler

• Shake it
• Blow out
• Inhale drug
• Hold for 2 – 3 seconds
6. ASA

- The newest addition to basic drug kit
- Inhibits platelet aggregation
  - Prevents ischemia → injury → infarction
  - Decreases overall mortality from acute MI
ASA

- Give stat or up to 24 hrs after MI
- CHEW, SWISH & SWALLOW
- Minimum dose = 162 mg
- Contraindications:
  - Allergy
  - History of significant gastric bleed
  - Severe asthma
# Emergency Drug Kit

<table>
<thead>
<tr>
<th>Drug</th>
<th>Use</th>
<th>Adult Dose</th>
<th>Child Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salbutamol</td>
<td>Asthma</td>
<td>2 puffs 100μg/puff</td>
<td>1 puff</td>
</tr>
<tr>
<td>Diphenhydramine</td>
<td>Allergic reaction</td>
<td>50 mg IV/IM 10 mg IV/IM</td>
<td>1 mg/kg</td>
</tr>
<tr>
<td>Chlorpheniramine</td>
<td></td>
<td>162 or 325 mg mg</td>
<td>N/A</td>
</tr>
<tr>
<td>ASA</td>
<td>MI thrombolytic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Other Kit Considerations

<table>
<thead>
<tr>
<th>Drug</th>
<th>Use</th>
<th>Adult Dose</th>
<th>Child Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine</td>
<td>MI Analgesia</td>
<td>2-5mg sc/iv q 5-15 min</td>
<td>N/A</td>
</tr>
<tr>
<td>Glucose</td>
<td>Hypoglycemia</td>
<td>OJ, soda, icing sugar</td>
<td>OJ, soda, icing sugar</td>
</tr>
<tr>
<td>Diazepam</td>
<td>Seizure &gt; 5min</td>
<td>5mg iv q 5 min</td>
<td>0.3 mg/kg iv ?</td>
</tr>
<tr>
<td>Midazolam</td>
<td></td>
<td>5mg im q 5 min</td>
<td></td>
</tr>
<tr>
<td>Naloxone</td>
<td>Reverse unintended deep</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Flumazenil</td>
<td>sedation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Flumazenil Rescue Dose

Adult
• 0.6 – 1 mg IV total via 0.2 mg increments
• Or 0.2 mg in each deltoid if IV not possible

Child
• 0.01 mg/kg IV up to max 0.05 mg/kg
Naloxone

**Adult**
- 0.1 mg every 2 – 3 min IV
- Or 0.4 mg IM

**Child**
- 0.005 – 0.01 mg every 2 – 3 min IV
- 0.01 mg/kg IM or SC
Basic Emergency Equipment

- Magill forceps
- Yankauer suction
- AED
- Stethoscope
- Sphygmomanometer with cuffs
  - Sizes adult small, medium and large
- Wall clock with second hand
- Oropharyngeal airways?
Emergency Bags

1. Syncope / hypoglycemia
2. Chest pain / MI
3. Cardiac arrest
4. Allergy/Anaphylaxis
5. Asthma
Avoiding a Catastrophe
Before Treatment

• Obtain a thorough medical history
• Assess vital signs
• Assign an ASA status
• Anxiolytics if needed
• Contemplate referral
• Stress reduction protocol
Avoiding a Catastrophe
During Treatment

- Continue stress reduction protocol
- Gentle LA
- Profound LA
- Monitor vital signs if necessary
- Be aware
Avoiding a Catastrophe During An Emergency

• Emergency kit
  – organized, locatable, updated, algorithms
• BLS updated: know the CAB’s and D’s
• AED
• Office emergency plan and EMS access