

## MEDICAL EMERGENCIES IN THE DENTAL OFFICE

Winter Clinic Conference

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David Isen BSc, DDS

[drisen@sleepfordentistry.com](mailto:drisen@sleepfordentistry.com)

416-498-8484

## Topics

- Avoiding Emergencies
- BLS Protocols (P - CAB - D)
- Automated External Defibrillators
- Medical Emergency Drugs

## The Challenge of Remembering Emergency Training

- Dental treatment is generally safe
  - (Health care offices common calls for EMS)
- Local anaesthetics are generally safe
- We're not practiced at emergency response
- Pilots renew emergency procedures under supervision every 6 months

## Remembering What To Do

- Unpublished study: USC
- Dental residents (endo, pros, perio, pedo, ortho and OMFS)
- Certified in BLS
- 6 months later, BLS written test:
  - Only 13% scored higher than 80%
  - Most unable to adequately perform one-rescuer CPR

Malamud: Oral Health, Feb, 2004

## 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.

## Deaths in Dental Offices

Anecdotal Reported Statistics:

- 1 death every 2–3 wks. in U.S. dental offices\*
- 1000 dental office deaths 2010 – 2015 in U.S.\*\*
- After dental office death in Texas, a reporter extrapolated this to =

~ 1 dental office death every other day

\*Laerdal Rep.

\*\*ADSA Pulse, May 2016

## EMERGENCY

n=30,608

<b>Syncopal</b>	<b>15,407</b>
Mild Allergy	2,583
Angina	2,552
Postural Hypotension	2,475
Seizure	1,595
Bronchospasm (asthma)	1,392
Hyperventilation	1,326
Epinephrine Reaction	913
Hypoglycemia (insulin shock)	<u>890</u>

95%

Martin, Ellis JADA 112:499-501, 1986 , Malamed JADA 124:4-53, 1993

## EMERGENCY

n=30,608

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

5%

Martin, Ellis JADA 112:499-501, 1986 , Malamed JADA 124:4-53, 1993

## Most Common Emergencies in Kids

Usually associated with drug administration:

- Local anaesthetic overdose
- Over-sedation

Or

- Airway obstruction
- Asthma
- Allergy
- Seizures
- Hypoglycemia

All can lead to hypoxia

## EMERGENCY INCIDENCE IN PRACTICE LIFETIME (40 YRS.)

Adverse Reaction to LA	7.0
Grand Mal Seizure	1.52
Angina	1.01
Insulin Shock (hypoglycemia)	1 in 2
Severe asthma	1 in 3
Artificial ventilation	1 in 13
CPR	1 in 17
Stroke	1 in 20
LA Anaphylaxis	1 in 60

Chapman Austral. Dent. J. 42(2) 103-108, 1997

## When Do Emergencies Occur?

Immediately before tx	1.5%
<b>During or after LA</b>	<b>54.9%</b>
<b>During tx</b>	<b>22.0%</b>
After tx	15.2%
After leaving office	5.5%

Matsuura Anes Prog. 36:219-228, 1990

## Tx Performed During Emergency

<b>Extraction</b>	<b>38.9%</b>
<b>Root Canal</b>	<b>26.9</b>
Unknown	12.3
C&B	7.3
Restorative	2.3
Incision	1.7
Other	10.6

Matsuura, Anes Prog, 36: 219-228, 1990

**75%**  
Of Dental Emergencies Are Related  
To Stress and Anxiety

## Level of Dental Fear

Question About Treatment	Frequency	%
Not afraid at all	703	63.9
A little afraid	228	20.7
Somewhat afraid	108	9.8
Very afraid	22	2.0
Terrified	39	3.5
Did not know answer	1	0.1

Chanpong et al Oral Health, Feb 2006

## Sources Of Endogenous Epinephrine

- Life stress
- Personality types
- Anxiety (dental phobia)
- Pain (inadequate local anaesthesia)

Epinephrine can ↑ **50 X** during stress

## Conundrum:

- Medical emergencies occur in dental offices
- Anxiety contributes to this & can change the path of the emergency
- People are fearful of dental visits
- 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

## The Medical History

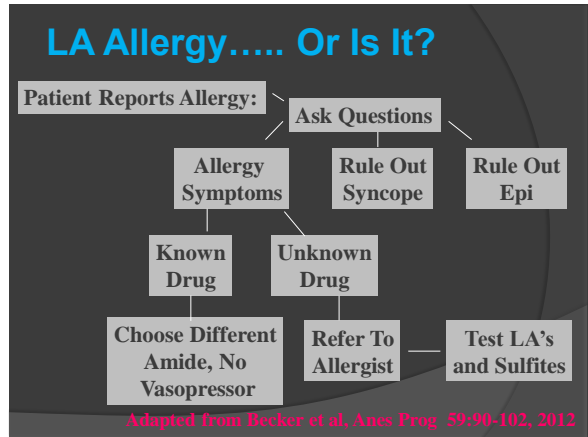
Incomplete medical history evaluation  
increases the risk of a medical  
emergency

ALL INFORMATION IS PRIVATE AND CONFIDENTIAL

NAME: \_\_\_\_\_ DATE OF BIRTH: \_\_\_\_\_ HT: \_\_\_\_\_ WT: \_\_\_\_\_

FAMILY DOCTOR: 1) \_\_\_\_\_  
 2) \_\_\_\_\_  
 name address phone #

1. Have you ever been hospitalized or had any operations? (please list most recent first) \_\_\_\_\_
2. Have you or your relatives ever had problems with anesthesia? (including malignant hyperthermia) \_\_\_\_\_
3. Have you taken any medications or received any medical treatment in the last year? (include dosages of medicines) \_\_\_\_\_
4. Do you have any drug allergies or have you experienced an adverse reaction to any medication? \_\_\_\_\_  
 Egg Allergy? \_\_\_\_\_ Latex Allergy? \_\_\_\_\_



5. Have you ever had heart problems, heart murmur, mitral valve prolapse, angina, rheumatic fever, stroke, please elaborate? \_\_\_\_\_  
 -Hepatitis, jaundice or any liver problem \_\_\_\_\_  
 -High or Low Blood Pressure \_\_\_\_\_  
 -Diabetes or Hypoglycemia \_\_\_\_\_  
 -Bleeding Disorders \_\_\_\_\_  
 -Stomach or Intestinal Disorders (eg. Ulcers, Crohn's) \_\_\_\_\_  
 -Kidney or Thyroid Disorders \_\_\_\_\_  
 -Breathing Difficulties (asthma, pneumonia etc.) \_\_\_\_\_  
 -Tuberculosis \_\_\_\_\_
6. Are you subject to fainting, dizziness, nervous disorders, seizures, convulsions or epilepsy? \_\_\_\_\_
7. Do you have any conditions that could affect your immune system (AIDS, HIV positive, leukemias, etc.)? \_\_\_\_\_
8. Women: Are you pregnant? \_\_\_\_\_
9. Do you wear contact lenses? \_\_\_\_\_
10. May we discuss your medical/dental treatment with your spouse, physician, parents, accompanying adult etc. if necessary? YES \_\_\_\_\_ NO \_\_\_\_\_
11. Is there any other information which may help us make your treatment more comfortable? \_\_\_\_\_

DATE \_\_\_\_\_ PATIENT'S SIGNATURE \_\_\_\_\_  
 REVIEWED BY \_\_\_\_\_ INITIAL BP \_\_\_\_\_ INITIAL PULSE \_\_\_\_\_  
 OTHER PHYSICAL FINDINGS \_\_\_\_\_ ASA \_\_\_\_\_  
 UPDATED \_\_\_\_\_

- ### Who Is At Risk?
- Medical history "red flags":
    - ✓ Angina and/or MI history
    - ✓ Stroke history
    - ✓ Abnormal blood pressure or pulse
    - ✓ Asthma and chronic respiratory diseases
    - ✓ Diabetes
    - ✓ Seizure disorders
    - ✓ Allergy

- ### Medical History Thoughts
- Updated drug handbook or online source
  - Most common lie is about drug use
    - 11% of Canadians in 2013 used an illegal drug (cannabis, cocaine, speed, ecstasy...)\*
  - Medical fitness evaluation
    - MD advises risk of treatment
    - May do further tests
    - The buck stops where the treatment is performed
- \*Miller L, Oral Health, June 2016

- ### ASA Physical Status Classification
- ASA I Healthy**
- ASA II One mild systemic disease, lifestyle no change**
- 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, not incapacitating:

- Stable angina
- >6 months post MI/CVA no residual effects
- Well controlled IDDM
- Exercise-induced asthma
- BP 160-200/95-115

## ASA Classification

**ASA IV** Incapacitating disease, a constant threat to life

- Unstable angina
- MI or CVA < 6 months ago
- Uncontrolled IDDM
- BP > 200/115
- Cannot walk up one flight of stairs

## Remote Offices & ASA IV's

- ↑ likelihood of need to treat in remote areas
- Fewer OMFS or DA offices
- Fewer hospital dental facilities
- Less or no access to OR time for OMFS
  - E.g. in the U.S.

## New Physical Status Classification System

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

“Standard of Care” for all sedation modalities

## Vital Signs

- I. Blood Pressure
- II. Heart Rate and Rhythm
- III. Respiratory Rate
- IV. Temperature
- V. Height
- VI. Weight

## 1. Blood Pressure

### Purpose:

Measure the pressure required to collapse the brachial artery

BP >  $\frac{140}{90}$  = Hypertension

systolic: amount of work by heart  
diastolic: condition of heart

## 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

## Dental Office Consequences of ↑BP

- ⊙ Patient may visit DDS more often than MD
- ⊙ Intraoperative high BP =
  - ↑ risk for:
    - Angina
    - MI
    - Stroke

## Risk Factors For ↑ BP

- ⊙ Smoking
- ⊙ Lack of exercise
- ⊙ Diabetes Mellitus
- ⊙ Obesity
- ⊙ Stress *dental anxiety!!*
  - White coat syndrome
- ⊙ Excessive alcohol
- ⊙ Cardiac disease
- ⊙ Obstructive Sleep Apnea Syndrome
- ⊙ Uncontrolled kidney or thyroid disease

## Whose BP Should We Check?

- ⊙ All new adult patients?
- ⊙ At all visits for those with h<sub>x</sub>?
  - Hypertension
  - Cardiovascular disease
  - Stroke
  - Conditions where BP may be affected
    - Eg. obese, kidney disease, diabetes, anxiety, OSA...

## Remember: Overall Cardiovascular Effect of Epinephrine in LA

- ⊙ ↑ BP
- ⊙ ↑ stroke volume
- ⊙ ↑ cardiac output
- ⊙ ↑ heart rate
- ⊙ More forceful cardiac compressions
- ⊙ ↑ myocardial O<sub>2</sub> demand

## Reasons To Limit Epi to 0.04 mg

- ⊙ Angina (**ASA III vs. ASA IV**)
- ⊙ Moderate – severe hypertension
- ⊙ Recent MI
- ⊙ Recent bypass
- ⊙ Uncontrolled dysrhythmias
- ⊙ CHF
- ⊙ Uncontrolled hyperthyroidism
- ⊙ Certain drugs
  - Tricyclics, Strattera, β blockers, Cymbalta

## How Do We Take Blood Pressure?



VS.



## Automatic BP Monitors: Features

- ⊙ Accurate
- ⊙ One-size-fits-all cuff or 2 cuffs included
- ⊙ Error message if cuff not well fitting
- ⊙ Easy to use, good directions
- ⊙ Recognizes irregular pulses
- ⊙ Used by many medical clinics

## Withings Blood Pressure Monitor

- Download app
- Approved for medical use in Canada and U.S.
- Good accuracy



## Precautions

- Arm at level of heart and at rest
  - (this is why wrist & finger devices less accurate)
- Arms may differ 5-10 mm 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

Category	Systolic BP		Diastolic BP
Normal	< 120	and	< 80
Prehypertension	120 – 139	or	80 – 89
Hypertension Stage 1	140 – 159	or	90 – 99
Hypertension Stage 2	> = 160	or	> = 100

US Department of Health and Human Services, 2011

## Explanation

- Prehypertension
  - Not a disease category
  - May be at risk for Stage 1
  - 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 ASAP**
- >200/120 **See MD stat. If symptoms call 911 or go to hospital**

## 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

## Tachycardia Causes:

- ⦿ Anxiety, stress, exercise
- ⦿ Infection
- ⦿ Fever
- ⦿ Anemia
- ⦿ ↑ BP
- ⦿ Smoking, excess alcohol, recreation drugs
- ⦿ Some medications
- ⦿ Hyperthyroidism
- ⦿ Electrolyte imbalance
- ⦿ Abnormal congenital electrical pathways
- ⦿ Damage to heart from heart disease

## Bradycardia Causes

- ⦿ Athlete
- ⦿ Normal aging of the heart
- ⦿ Medication side effect
- ⦿ Hypothyroidism
- ⦿ Obstructive sleep apnea
- ⦿ Some inflammatory diseases (e.g. Lupus)
- ⦿ Damage to heart from heart disease
- ⦿ Congenital heart disorder

1. Radial pulse

2. Brachial pulse

3. Carotid pulse

## Cardiac Dysrhythmias

- ⦿ Medical consultation
- ⦿ 911 if associated with:
  - dizziness
  - light headedness
  - syncope
  - weakness

**No elective treatment**

## Implantable Cardiac Devices

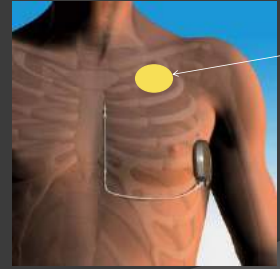
- ⦿ Pacemaker
  - Brady-arrhythmias (heart block)
  - Tachy-arrhythmias (e.g. PSVT)
- ⦿ Implantable cardioverter-defibrillator (ICD)
  - At risk for sudden death from V-tac or V-fib
  - Inside chest, electrodes through vessels to heart
  - Clavicle area



## Subcutaneous Implantable Cardioverter Defibrillator (S-ICD)

- On side of chest
- Less visible than traditional ICD
- Electrodes only in skin, not through vessels
- Less risk of blood clots & other side effects

## S - ICD



T-ICD

## Which Devices Interfere With ICDs?

- **YES?**
  - Ultrasonic scaler? – old devices
  - Ultrasonic cleaning devices?
  - Apex locators?
- **NO:**
  - Piezo scalers
  - Electric toothbrush
  - Electrosurgical unit
  - Electric pulp tester
  - Handpieces
  - Amalgamator
  - Lasers

## Study: Electronic Interference

Tested electronic interference emitted from various endodontic instruments on 3 different ICDs

Dabalti et al, J Dent 46:68-72, 2016

## Results:

	Biotronik PM	Medtronic PM	Medtronic ICD
Laser	No	No	No
Optical Microscope	No	No	No
Endo Rotary Motors	No	No	No
Gutta-percha Gun	No	No	No
Gutta-percha Heat Carrier	No	Yes	Yes
Apex Locator	No	Yes	Yes

Closer device is to ICD = ↑ interference

Dabalti et al, J Dent 46:68-72, 2016

## Electromagnetic Interference

- ADA statement:

“Ultrasonic scalers or instrument cleaning systems could interfere with some ICDs”

- New ICDs have protective shields

### III. Respiratory Rate

Normal respiratory rate:

12-20 breathes / min

### Respiratory Considerations: Disorders

- Anxiety
- Asthma
- Smoking
- Respiratory disease
- Fever

### Respiratory Considerations: Anatomy

- Snoring
- Tonsil hypertrophy
- Obesity
- Obstructive sleep apnea
  - 3-7% males, 2-5% females\*
- Anatomic airway abnormalities
  - Retrognathic mandible

\*Pare et al, Adv Cardio, 46:1-42, 2011

### OSA Risk Assessment : STOP-BANG

OSA	Question
S	Do you <b>S</b> nore?
T	Are you <b>T</b> ired?
O	Do you have <b>O</b> bstructive breathing?
P	Do you have high blood <b>P</b> ressure?
B	Is your <b>B</b> ody mass index (BMI) >35
A	Is your <b>A</b> ge > 50?
N	Is your <b>N</b> eck size >16?
G	Is your <b>G</b> ender male?

### STOP BANG

Score:

- 5 – 8 **yes** = high risk for OSA
- 3 – 4 **yes** = moderate risk for OSA
- 0 – 2 **yes** = low risk for OSA

### ↑ Numbness and ↓ Pain

- Gauge of needle
  - Aspiration, 30 gauge and breakage
- Quality of needle
  - Electron microscope
- Temperature of anaesthetic
- pH of anaesthetic
  - Plain vs. vaso, Onset and Anutra
- Speed of injection

### 3. Stress Reduction Protocol

- Recognize signs of anxiety
- Minimize waiting
- Early morning appointment

### Stress Reduction Protocol

- Get personal
- Easy, quick procedures first
- Go slow or go fast
- Hide scary instruments
- Tell-show-do?
- Distraction aids
- Refer? DA, OMFS, hospital

### Sedative Dose Considerations

- ASA status
- Age
- Weight
- Medications that effect liver
- Medications that potentiate a sedative
  - E.g. fentanyl patch, sleeping aids, other pain meds
- OSA
- Have an office protocol
- Get RCDSO Standards of Care

### Anxiolytics For Adults

- Nitrous oxide
- Alprazolam
- Diazepam
- Lorazepam
- Temazepam
- Triazolam

-Watch for drug interactions & liver function!  
-Beware of multi-dosing. Cannot exceed MRD

### Drug & Brand Name

Drug Name	Brand Name eg.
alprazolam	Xanax
diazepam	Valium
lorazepam	Ativan
temazepam	Restoril
triazolam	Halcion

### Comparing Benzodiazepines

	Diazepam	Lorazepam	Triazolam
Onset (min.)	45 – 90	45 – 120*	30 – 60
Duration (hr.)	2 – 4	4 – 6	1 – 3
Active Metabolite	YES	NO	NO
½ Life (hr.)	20 – 50	15	2 – 3
Adult Sedative Oral Dose (mg)	5 – 20	1 – 3	0.125 – 0.5
Supplied (mg)	2, 5, 10	0.5, 1, 2	0.25 – 0.5

\*Lorazepam disadvantage: Peak effect takes long to occur

## Suggested Oral Dose (RCDSO) Adult ASA I & II

Minimal Sedation	Moderate Sedation
<b>Tx Less Than 2 Hrs:</b> triazolam 0.125 - 0.25 mg	<b>Tx Less Than 2 Hrs:</b> triazolam 0.375 – 0.5 mg
<b>Tx Longer Than 2 Hrs:</b> triazolam 0.25 mg OR diazepam 10 – 15 mg OR temazepam 15 mg	<b>Tx Longer Than 2 Hrs:</b> triazolam 0.5 mg OR diazepam 20 – 30 mg OR temazepam 30 mg
<b>Tx Longer Than 3 Hrs:</b> lorazepam 0.5 – 1 mg OR alprazolam 0.25 mg	<b>Tx Longer Than 3 Hrs:</b> lorazepam 2 – 3 mg OR alprazolam 0.50 mg

RCDSO Dispatch Nov/Dec 2014

## MRD (RCDSO) Adult ASA I or II

Drug	MRD
alprazolam	0.5 mg
diazepam	30 mg
lorazepam	4.0 mg
temazepam	30 mg
triazolam	0.75 mg

Not product monograph recommendations

RCDSO Dispatch Nov/Dec 2014

## Anxiolytics For Kids

- Nitrous oxide
- Oral midazolam (0.2–0.7 mg/kg, max 20 mg)
  - Shortest half-life
  - Intranasal (0.3 – 0.5 mg/kg)
- Hydroxyzine
- (Chloral hydrate)

## Hydroxyzine

- E.g. Atarax, Vistaril
- Antihistamine
  - Antiemetic, antisialogogue
- 1 mg/kg (some use 2 mg/kg)
- 30 minute onset
- Half-life 2 hours

## TOPICS

1. PATIENT ASSESSMENT
2. THE P-CAB-D,s
3. EMERGENCY DRUGS
4. EMERGENCY ALGORITHMS

## Basic Life Support

- SCA most likely to occur at home
- So, likely doing BLS on someone familiar
- But, only 30% of bystanders try a rescue
- Why??

## Bystander Apathy

- Fear of hurting someone
- Don't know what to do
- Panic
- HCP: fear of catching something

## Remembering What To Do

- Unpublished study: USC
- Dental residents (endo, pros, perio, pedo, ortho and OMFS)
- Certified in BLS
- 6 months later, BLS written test:
  - Only 13% scored higher than 80%
  - Most unable to adequately perform one-rescuer CPR

Malamed: Oral Health, Feb, 2004



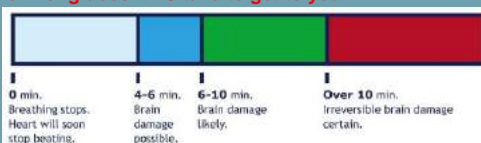
## Cardio Pulmonary Resuscitation

- THE PURPOSE:
  - Not to revive the patient
- THE PURPOSE:
  - Chest compressions + defib ASAP
  - Prevent cerebral hypoxia
  - Buy time until EMS arrives

## What Happens Without O<sub>2</sub>

- When heart stops, oxygen is not circulated
- Within 4 min. brain damage begins (clinical death)
- Within 10 min. brain death occurs (biological death)

How long does EMS take to get to you?



1. Immediately recognize 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**

## Position



## Latest AHA Guidelines - 2015

- New guidelines every 5 years
- Based on review of resuscitation literature
- Debates by global experts
- De-emphasize step-by-step for 1 rescuer
- Emphasize team approach
- Try to activate EMS without leaving victim

## 2015 Changes

	Old	New
Compression Rate	At least 100 / min.	100 – 120 / min.
Depth	5 cm or 1/3 AP chest diameter	5 – 6 cm or 1/3 AP chest diameter
Assessment	Breathing and pulse check separate	HCP check pulse & breathing same time
When To Call EMS	Witnessed: Right away Unwitnessed: After 1 round of CAB	With cell phone simultaneous during rescue

## Emphasis On Good Compressions

- Compression rate 100 – 120 / min.
  - Used to be at least 100/min
- Let chest recoil
- Minimize compression interruptions
- Avoid excessive ventilation
- Differentiates untrained vs. trained rescuer
- HCP's rotate every 2 minutes
- **60% of a rescue should be spent doing "C"**

## Change From ABC to CAB

### Rationale:

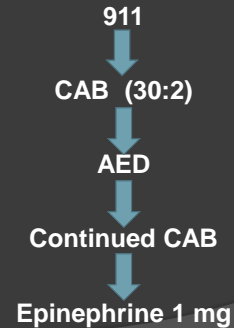
- What saves lives in adult SCA? Chest compressions + early defib
- CAB = faster delivery of compressions
- Ventilation delay minimal: Only ~20 sec (after 1<sup>st</sup> 30 compressions)
- Residual O<sub>2</sub> in lungs?
- Over-inflate lungs ↓ compression effectiveness

## Change From ABC to CAB

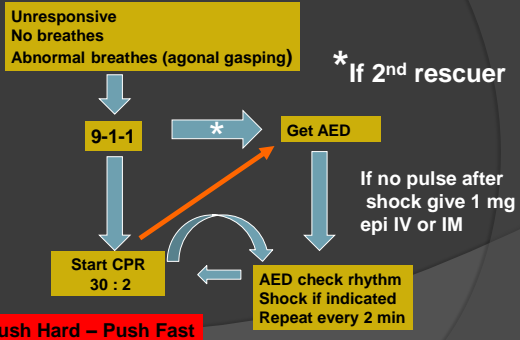
- Also studies show:

Similar survival rates if compressions only vs. compressions + ventilations for out-of-hospital arrests.

## Simplified Cardiac Arrest Algorithm



## Simplified Adult BLS



C

## Circulation:



*Check carotid pulse*  
Health care providers only

Begin chest compressions ASAP  
**PUSH HARD AND PUSH FAST**

CPR: Cerebral oxygenation is only ~25%

## Visual Signs of Cardiac Arrest

- Diaphoresis
- Cold to the touch
- Pale, grey colour
- Blue lips
- Agonal breathing
- Good clues for those not checking pulse

## Landmarking

- No longer using rib cage
- Expose chest, look for lower half of sternum
- In some people, between nipples
- Or: Find armpits and slide hand across to midline



## C Ratio of Compressions : Breaths

# 30:2

Adult, child & infant

Unless 2 HCP rescuers for child & infant. Then 15:2

## C High Quality Compressions: Depth

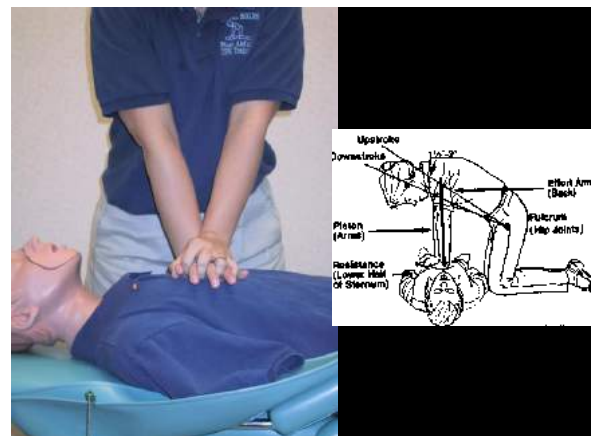
Guidelines	Adult	Child	Infant
Old	1.5- 2 inches	1-1.5 inches	0.5-1 inch
New	1/3 A-P diameter of chest (5 - 6 cm)	1/3 A-P diameter of chest	1/3 A-P diameter of chest

## Chest Compressions

	Adult	Child (1 – 8)	Infant (<1)
Ratio 1 rescuer	30:2	30:2	30:2
2 rescuers	30:2	15:2 (HCP)	15:2 (HCP)
Hands	Heel of hand, over other hand	Heel of one hand or same as adult	2-3 fingers
Area Of Compression	Lower 1/2 of sternum (between nipples)	Lower 1/2 of sternum (between nipples)	Lower 1/2 of sternum, just below nipple line
Depth	2 in. 5-6cm	At least 1/3 chest thickness	At least 1/3 chest thickness
Rate / Minute:	100 - 120	100 - 120	100 - 120

## Maximize Compression Effectiveness

- Correct hand position
- Correct rescuer body position
- Correct depth
- Hard surface
- Complete recoil of chest
- Rotate rescuers every two minutes to avoid fatigue
- **60% of rescue should be compressions**



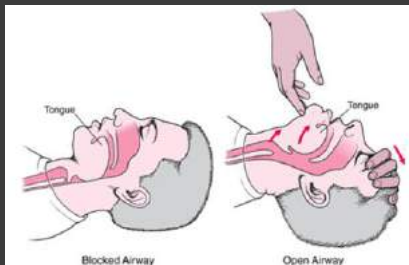
## A Airway

- ⦿ **Check:** Shake and Shout
- ⦿ **Do:** Head – tilt – chin - lift

## Head-Tilt-Chin-Lift

- ⦿ One hand on forehead
- ⦿ Other hand under chin
- ⦿ Tilt head back

## Head-Tilt-Chin-Lift



## B Breathing

- ⦿ **Check:** Used to be: Look, listen and feel  
Now: Look for chest rise & fall
- ⦿ **Do:** Used to be: Give 2 breathes  
Now: Start chest compressions

## Airway Obstruction

- ⦿ Dental instruments
- ⦿ Restorative materials, crowns
- ⦿ Teeth
- ⦿ Blood
- ⦿ Vomitus
- ⦿ Water
- ⦿ **Anaphylaxis**
- ⦿ **Asthma**

## Conscious - Mild Obstruction

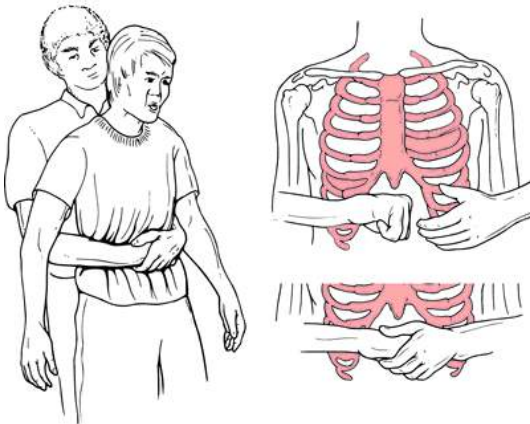
- ⦿ Encourage coughing

## Conscious – Severe Obstruction

Adult	Child	Infant
5 back blows 5 abdominal thrusts	5 back blows 5 abdominal thrusts	5 back blows 5 chest thrusts

## Abdominal Thrusts (Heimlich): Conscious Choking Adult

- ◉ 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, Conscious Choking Adult

- ◉ Stand facing victim's side
- ◉ Reach across their chest for support
- ◉ Bend victim forward by pushing on back
- ◉ Hit victim between scapula 5X
- ◉ Repeat 5 abdominal thrusts + 5 back blows until they breathe or unconscious



## Abdominal Thrusts (Heimlich): Conscious Choking Child

- ◉ 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
- ◉ Repeat until not choking or unconscious

## Age

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

\* Look at body size



## Conscious Choking Infant

- Get close to floor in case baby drops
- Cradle infant in arms, head pointing down
- Two fingers on sternum, do 5 chest thrusts
- Flip baby over (hold tight) – head still down
- Do 5 back blows
- Repeat until not choking or unconscious



## Conscious Choking Modifications

- **You're alone and choking**
  - Back of chair
  - Hard object
- **Pregnant**
  - Victim's back against wall, **compress chest**
- **Victim too large, rescuer too small**
  - Rescuer wrap arms around victim's chest instead
  - Victim stands against wall, **compress abdomen**



## Unconscious Choking Adult

- 911
- Slowly slide victim down
- Protect head and your back
- Check mouth: remove object if visible
- 1 breath
- Reposition head – 2<sup>nd</sup> breath
- **30 chest thrusts**, same as chest compressions
- Check mouth
- 2 breaths
- Repeat until air into lungs or EMS arrives
- If air into lungs, check pulse. **Then CAB**

## Unconscious Choking Child

- ◉ 911
- ◉ Same steps as adult
- ◉ Heel of one hand only for chest thrusts
- ◉ Repeat until air into lungs or EMS arrives
- ◉ If air into lungs, check pulse. **Then CAB**

## Unconscious (Limp) Choking Infant

- ◉ 911
- ◉ 5 back blows
- ◉ 5 chest thrusts
- ◉ Check the mouth
- ◉ Try 2 breaths
- ◉ Repeat until air into lungs or EMS arrives
- ◉ If air into lungs, check pulse. **Then CAB**

## D: Definitive Diagnosis

### CHECK:

Render a **D**iagnosis

### DO:

Drugs or **D**efibrillation

## Defibrillation - SCA

- ◉ 400,000 die of SCA in U.S., 40,000 in Canada
- ◉ Every 7 min. a death from SCA or stroke in Can.
- ◉ 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 immediately**

## SCA

- ◉ Sometimes no signs or symptoms
- ◉ Hypertension before SCA which is also usually silent
- ◉ Sometimes angina or MI previously

## Automated External Defibrillator

- ◉ AED
- ◉ **Automated:** Device reads heart rhythm
- ◉ **External:** Electrodes on outside of chest
- ◉ **Defibrillator:** Take away fibrillation
- ◉ Work best in conjunction with CPR
- ◉ Fully automatic vs. semi-automatic

## Defibrillators In Dentistry

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

## The Mikey Network

- Promotes AEDs in public places and dental offices
- Registered charity
- Buy AED through this program, \$ given to The Mikey Network

## 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

## Rhythms With No Pulse

### 1. Asystole (flat line)



### 2. Pulseless electrical activity (PEA)

- From major blood loss, hypothermia....

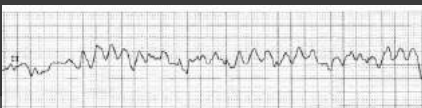


## Rhythms With No Pulse

### 3. Pulseless ventricular tachycardia

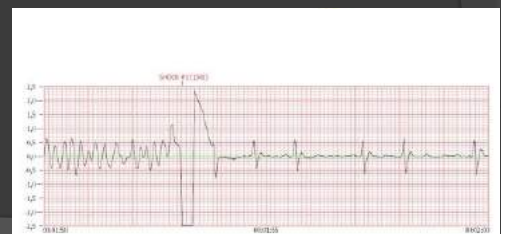


### 4. Ventricular fibrillation



## Defibrillation

- Stops all electrical activity
- Allows for normal pacemakers to take over
  - Jump starts the heart



## Good AEDs

- ⦿ Reputable company, good warranty (5–7 yrs.)
- ⦿ Non-proprietary batteries with long shelf life
- ⦿ Easy to use
- ⦿ Adult & child use (pedo pads for 1–8 yrs.)
- ⦿ Metronome guide compression rate, 100/min

## Using An AED

- ⦿ Expose chest – cut clothes
- ⦿ Turn AED on
- ⦿ Beware of wet surfaces
- ⦿ Beware of metal surfaces
- ⦿ Place pads:

## Preparing Chest

- ⦿ Shave
- ⦿ Remove jewellery, medication patches
- ⦿ Dry skin
  - Diaphoresis common in cardiac arrest
- ⦿ Avoid direct contact with ICDs but use in these people is ok

## Pad Placement

- ⦿ Recorders and shock delivery
  - ⦿ Metal foil and sticky gel (can dry out)
1. Upper right sternal boarder, directly below clavicle
  2. Lateral & below left nipple with top of pad below axilla
- ⦿ Adult and pedo size



## AED Use In Children

- ⦿ Not usually needed in pediatric emergencies
- ⦿ Children 1 – 8 yrs.
- ⦿ Pediatric pads **or**
- ⦿ Pediatric attenuator **or**
- ⦿ **Or** place pads anterior – posterior
- ⦿ Do 1 min. of BLS in pulseless child before calling EMS

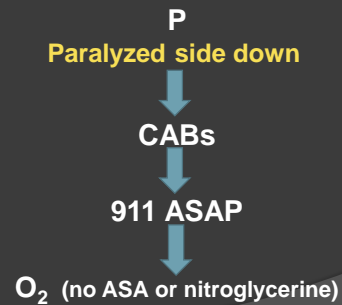
## Stroke: Signs & Symptoms

- ⦿ **FAST:**
  - **F**ace droop on one side
  - Can't raise both **A**rms to same height
    - Do this with eyes closed
  - **S**peech is slurred or mumbled
  - **T**ime: 911 ASAP

## Stroke: Other Signs & Symptoms

- ◉ Weak or numb on one side, leg or arm
- ◉ Dim or blurred vision one or both eyes
- ◉ Severe sudden headache
- ◉ Dizziness, sudden fall
- ◉ Confusion
- ◉ Do not give ASA or nitroglycerine

## Stroke Emergency Management



## Designated Emergency Plan

- ◉ Team leader
- ◉ 9-1-1 caller
- ◉ Ambulance greeter
- ◉ Emergency kit and AED retrieval
- ◉ Airway and Breathing person
- ◉ Circulation person
- ◉ Drugs
- ◉ Fire safety
- ◉ Incapacitated DDS

## EMS: 9-1-1

- ◉ Do not hesitate
- ◉ What is office address??
- ◉ 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

## Other Concerns

- ◉ Patients in the reception area
- ◉ Patients in other ops
- ◉ Family members
- ◉ Follow-up
- ◉ PLP

## RCDSO Standard of Care:

- ◉ All dental staff BLS-trained
- ◉ Written emergency protocol in place
- ◉ Each staff member aware of role during emergency
- ◉ Protocol is periodically reviewed



## Must Haves

1. Oxygen
2. Epinephrine
3. An antihistamine (e.g. diphenhydramine)
4. Salbutamol
5. Nitroglycerine
6. ASA
7. Glucose
8. Flumazenil and/or naloxone

## Other Drugs

- Atropine
- Diazepam or midazolam
- A corticosteroid
- Aromatic ammonia

## 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
- Easily portable
- Stored in an organized system
  - Labelled trays / bags or
  - Purchased, organized and appropriate kit

## 1. Oxygen

For all emergencies

Except:

**Hyperventilation**

Timely or prophylactic use of O<sub>2</sub> may prevent cardiac or respiratory arrest

## Oxygen

**E cylinder** 622 L - Good portable O<sub>2</sub> size (30 minutes)  
-Gives ~1.5 hrs. @ 5-6 l/min

**H cylinder** 6900 L - large O<sub>2</sub>

## When Should Tank Be Replaced?

Cylinder Size	Full Volume	Full Pressure	Conversion Factor (f)
E	622 L	2200 psi	L/psi = 0.28
H	6900 L	2200 psi	L/psi = 3.14

$$\text{Time left in tank} = \frac{\text{current psi} \times f}{\text{flow L/min}}$$

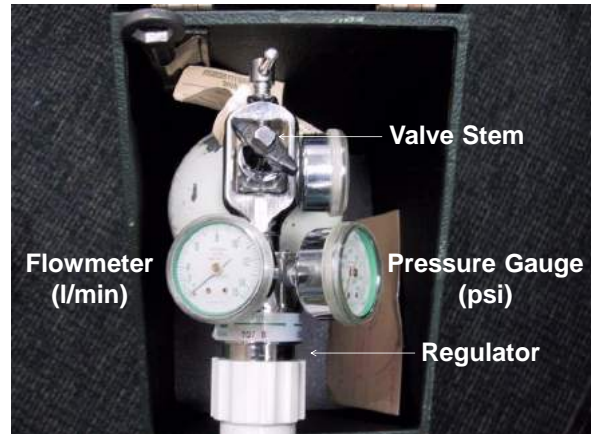
Becker et al, Anes Prog, 61:78-83, 2014

## When Should Tank Be Replaced?

- Example:
  - 500 psi on pressure gauge & flow rate at 10 l/min

$$\frac{500 \times 0.28}{10} = 14 \text{ min. of O}_2 \text{ flow E tank}$$

$$\frac{500 \times 3.14}{10} = 157 \text{ min. of O}_2 \text{ flow H tank}$$



## Oxygen Delivery Breathing Patient

Delivery System	% Oxygen
Room Air	21%
Nasal Cannula	24 – 44%
Face Mask	40 – 60%
Face Mask + O <sub>2</sub> Reservoir (With Non-Rebreather NRB)	> 60% at 6 l/min ~100% at 10 l/min (NRB)

## Nasal Hood

- Rubber or silicone, no metal
- Anterior procedures?
- Variety of sizes
- Disposable, flavoured
- 1 – 4 attachments for tubing
- Exhale valve with wafer on top of hood
- **What happens if LOC and mouth breather?**

## Full Face Mask Non-Rebreather Mask



## Oxygen Delivery Non-Breathing Patient

Delivery System	% Oxygen
Mouth-To-Mouth	16%
Mouth-To-Mask + Supplemental O <sub>2</sub>	~50%
Bag-Valve-Mask + Supplemental O <sub>2</sub>	100%

## Oxygen Flow Rate Volume

	Flow Rate (LPM)
Child at rest	2
Adult at rest	5 - 6
NRB Mask	10 – 15
BVM	15

## Oxygen Delivery Rate If Not Breathing

	Normal Rate / Minute	One Breath Every:
Infant	20 – 30	2 – 3 seconds
Child	16 – 20	3 – 4 seconds
Adult	10 - 12	5 – 6 seconds

## Bag Valve Mask

- BVM without supplemental O<sub>2</sub> gives ~21% O<sub>2</sub>
- Crimp bag to fill up reservoir first
- Valve makes this a 1 way flow
- Mask transparent
- Beards?



## One Rescuer BVM

“E – C” Finger Position



- C** = Thumb and index finger: Seals mask
- E** = Other 3 fingers: Jaw thrust

## Two Rescuer BVM



Thumb and index seal mask

Other fingers thrust jaw

Pressing too hard in soft area:  
Tongue pressed into hard  
palate & blocks airway

## O<sub>2</sub> Not Getting To Lungs?

Problem	Solution
Chest not rising:	<ul style="list-style-type: none"> <li>• Ensure mask seal</li> <li>• Ensure airway is open -head-tilt-chin-lift, jaw thrust</li> <li>• 2 rescuers</li> <li>• Airway adjuncts</li> </ul>
Stomach rising*:	<ul style="list-style-type: none"> <li>• Ensure airway is open -head-tilt-chin-lift, jaw thrust</li> <li>• Push less air</li> <li>• 2 rescuers</li> </ul>

\*O<sub>2</sub> in stomach could cause vomiting & aspiration

## 2. Epinephrine

	Strength	Action	Result	When Effective
α <sub>1</sub>	+++	Vasoconstriction of local, small submucosal vessels	↑ SBP	Cardiac Arrest Anaphylaxis
β <sub>1</sub>	+++	Cardiotropic: Stimulates receptors in SA node and heart muscle	↑ HR, Contractility & ↑ SBP	Cardiac Arrest Anaphylaxis
β <sub>2</sub>	++	Vasodilation of large peripheral arteries (due to systemic absorption) & Bronchodilation	Slight ↓ DBP*	Anaphylaxis Life-threatening Asthma

- \*Minor change in MAP with smaller doses of epinephrine
- People on β blockers may have blunted effect

## Epinephrine

- Light sensitive
- Store at room temperature
- 1 – 2 year shelf life
- Contains sodium metabisulfite
- Half-life is 2 – 3 minutes

## Epinephrine Formulations

Device	Dose / Injection	# of Doses	Weight
Ampoule 1:1,000 (1mg/ml)	Variable	Variable	0.01 mg/kg*
Adult Auto-Injector	0.3 mg	1**	> 30 kg (66 lbs.)
Pediatric Auto-Injector	0.15 mg	1**	15 – 30 kg (33-66 lbs)

+Use dose of 0.01 mg/kg for children < 15 kg

\*\*Twinject has 2 doses

## Doses of Epinephrine

Pediatric Dose: 0.01 mg/kg

Anaphylaxis: 0.3 - 0.5 mg IM

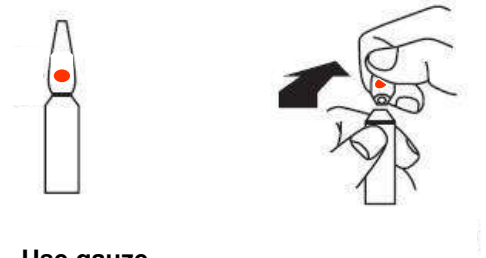
Asthma: 0.3 - 0.5 mg IM

Cardiac Arrest: 1.0 mg IV

## Anaphylaxis

- 35% anaphylactic rxns need 2<sup>nd</sup> dose of epi.
- Need for multiple doses directly related to severity of rxn.
- However, some mild cases require a 2<sup>nd</sup> dose
- Anaphylaxis Canada & WHO recommend **always have 2 doses.**

Korenblat et al Allergy & Asthma Proc, Nov-Dec, Vol 20(6), 1999



Use gauze  
Break tip away from you

## Auto-Injectors

- First developed for U.S. military in 1959: administer atropine – protection from nerve gas poisoning
- 30 – 70% do not carry their devices\*
- Most healthcare workers unaware of proper use\*

\*Simons FER, J Allergy Clin Immunol, 121:S402-S407, 2008

## How to Use Auto-Injector

- Follow specific instructions
- Never put thumb over an end
- Swing arm like pendulum
- Push (consider larger patients)
- Leave in muscle for **10 seconds**
- Contain sulphite

## Using Auto-Injectors

Study: 50 users, trained & given written instructions.

- 58% injected incorrectly
- 28.6% did not remove safety cap
- 19% used it upside-down
- 19% injected wrong area
- 100s of cases / yr. health care workers injecting thumb (ischemic tissue necrosis?)

Lombardelli S., Euro Ac Aller Clin Immun, Abstract 1599, Jun 2010

## Which End Has Needle?



## 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)

Stecher, D et al, Pedtr, 124:65, 2009

## Recall (April 2017):

- Batch # 5GU763 (adult)
- Batch # 5GR765 (pedo)
- Needle failed to activate in some devices. (None in Canada)

## New EpiPen

- Single or “2-Pak”
- ~\$100 - \$200
- If you carry adult and pedo version, ~\$400?
- 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 covers needle

## Allerject

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



## Sanofil (U.S.) Recall

- Both adult and pedo
- Delivers incorrect dose
- Lot #s 2299596 to 3037230

## Allerject

- Voice prompt (**eng or french**) when removed from case
- During injection there is **click and hiss**
- 5 second injection
- Needle goes back into device after injection
- Voice prompt counts while injecting
  - Most common error:** not holding device in muscle long enough
- Pedo and adult version (blue vs. orange)

## I.M. Injection Locations

- Gluteus medius
- Vastus lateralis
- Deltoid
- PSA block for pterygoid plexus of veins?
- Ventral surface of tongue or floor of mouth
  - Possible close airway by swelling tongue**
- Onset of action **2 min.**
- Peak plasma concentration for IM is **~8 min.**
- Peak plasma concentration for SC is **~34 min.**

## IM Injection Locations

	Deltoid	Vastus Lateralis	Gluteus Medius
Volume Allowed	1 ml	2 ml	3 ml
Depth of Injection*	~15 - 25 mm	~25 - 40 mm	Variable
Advantages	<ul style="list-style-type: none"> <li>Easy access</li> <li>Fewer Injuries</li> </ul>	<ul style="list-style-type: none"> <li>Fastest drug uptake</li> <li>Injury to nerves or vessels unlikely</li> </ul>	<ul style="list-style-type: none"> <li>Well taught in medicine and accepted</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>Slower uptake than thigh</li> <li>Small volume</li> </ul>	<ul style="list-style-type: none"> <li>Remove pants?</li> <li>Fat may make muscle hard to find</li> </ul>	<ul style="list-style-type: none"> <li>Possible injury to sciatic nerve or superior gluteal artery</li> <li>Slower drug uptake due to fatty muscle</li> </ul>

\*Depth varies based on patient size and fat

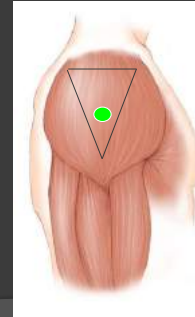
## Vastus Lateralis



- Lateral thigh
- Largest muscle in body
- Good arterial supply
- More rapid rise of epi in blood compared to deltoid
- Best with auto-injector
- **Arrow shows injection site**

## Deltoid Injection

Target is 2 - 3 finger widths (2 - 3 cm) below bony part of shoulder (acromion process)



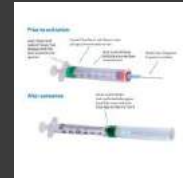
## Deltoid Injection

- ⦿ Prepare drug and syringe
- ⦿ Expose deltoid area
- ⦿ Clean with alcohol and dry
- ⦿ Patient relaxes muscle, arm supported
- ⦿ Stretch skin over muscle
  - **Do not pinch skin together**
- ⦿ Hold syringe like a dart & insert 15-25 mm
- ⦿ Inject perpendicular to skin
- ⦿ Aspirate
- ⦿ Inject

## IM Safety Needle Examples



BD Eclipse Safety Needle



BD Safety-Lok



Integra Safety Syringe

## Ampoule vs. Autoinjector

	Ampoule	Autoinjector
Multiple doses	Yes	No
Risk of operator injury	Yes	Yes
Possible incorrect use	No	Yes
Needle length	Can choose 1 - 2 inches	5/8 or 1/2 inch
Must draw drug	Yes	No
Must calculate dose	Yes	No
Shelf life	2 years	1 year
Cost	~\$1	~\$100

## 3. Nitroglycerin

- ⦿ Relaxes smooth muscle in arteries & veins
- ⦿ ∴ ↓ venous return to heart due to peripheral pooling (↓ pre-load)
- ⦿ Dilates coronary arteries so ↑ O<sub>2</sub> to heart
- ⦿ ∴ ↓ myocardial O<sub>2</sub> demand
- ⦿ ↓ BP
- ⦿ Limits cardiac damage following MI

**For angina or MI**



## Nitroglycerin Protocol

- Tablets light & oxygen sensitive (open bottle shelf life 3 months). Store in dark, close lid.
- **Tablet** under tongue, dissolves into vessels in floor of mouth (not swallowed)
- **Spray** on or under tongue, not inhaled
- Taken 3 X, 5 min. intervals, if pain persists
- **911** if pain persists
- Call ASAP if unstable angina or suspected MI

## Nitroglycerin Contraindications

- SBP < 60
- Suspected stroke
- Those taking drugs for erectile dysfunction:
  - **Within 24 hrs** for sildenafil (Viagra) or vardenafil (Levitra)
  - **Within 48 hrs** for tadalafil (Cialis)
  - Or for those who take these drugs daily

## Coronary Artery Disease

- 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 (Effort Angina)

- Physical activity (not usually at rest)
- Temperature extremes
- Large meals
- Emotional stress, anxiety
- Caffeine, smoking (stimulants)
- Fever
- **Characteristic pain** alleviated with nitroglycerine
- **ASA III**

## Unstable Angina (Crescendo Angina)

- At rest or with minimal exertion
- Pain can last longer than 10 min.
- **Pain differs** in character, duration &/or severity
- Nitroglycerin may not work
- Within 3 mos., ~ 10 % die, ~ 20 % will have MI
- Severe obstructive CAD
- **ASA IV**

## Sublingual Tablets

- **Nitrostat™**: 0.3, 0.4 or 0.6 mg
- q 5 min. x 3 doses
- 100 tablets per container
- Unstable



## Sublingual Spray

- Nitrolingual® Spray
- 1 - 2 metered-doses (0.4 mg- 0.8 mg)
- q 5 min. x 3 doses
- On or under tongue
- Mouth closed - not inhaled
- 200 metered doses / bottle
- Shelf life 2 years

## Emergency Drugs

Drug	Use	Adult Dose	Child Dose
Oxygen	Most Emergencies	100%	100%
Epinephrine	Anaphylaxis Asthma Cardiac Arrest	0.3-0.5 mg IM* 0.3-0.5 mg IM* 1 mg IV	0.01mg/kg
Nitroglycerin	Angina MI	0.4 mg tablet 0.4 mg spray	N/A

\*IM dose can be given as a sublingual injection

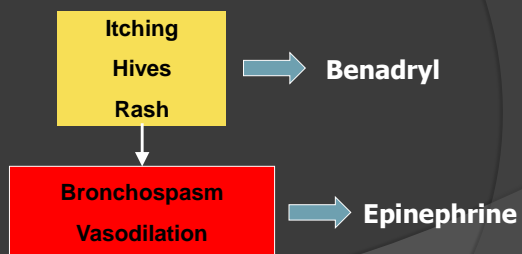
## 4. Diphenhydramine

- An antihistamine
- Blocks histamine mediated reactions
- Available in many formulations
  - **Injectable** form: 1 ml vial with 50 mg dose
  - **Capsules** are 25 or 50 mg
  - **Elixir** 12.5 mg / 5 ml

## Diphenhydramine

- Useful for:
  - Mild allergic reactions
  - Asthma
  - Nausea
  - Sedative
  - Local anaesthesia

## Allergy Symptoms



## Diphenhydramine Emergency Dose

- Adults 50 mg IM or IV
- Children 1 mg/kg IM or IV to a maximum of 50 mg



## 5. Salbutamol

- Trade name = Ventolin®
- Bronchodilation via  $\beta$ -2 stimulation
  - Direct action relaxing bronchial smooth muscle
- 1 puff = 100  $\mu$ g
  - **2 - 4 puffs q 2 minutes x 2**  
(first few puffs may loosen airway for subsequent puffs)
- Onset 5 - 15 minutes
- Duration: 3 - 6 hours

## Using the Inhaler

- Shake inhaler vigorously for 5 - 10 seconds
- Empty lungs (blow out)
- Remove blue cap
- Put inhaler in mouth and press top down
- Inhale drug
- Hold for 2 - 3 seconds



## 6. ASA

- Inhibits platelet aggregation
- 23%  $\downarrow$  in mortality when used after MI\*
  - Prevents ischemia  $\rightarrow$  injury  $\rightarrow$  infarction

\*Bennet JD et al, "Medical Emergencies in Dentistry", 2002

## ASA

- Give stat or up to 24 hrs. after MI
- **CHEW, SWISH & SWALLOW**
- Dose 160 - 320 mg
- Baby aspirin is sweet & **not enteric coated**
- Bitter taste might exacerbate nausea / vomiting

## Why Chew?

- Swallow: max blood levels of ASA in **26 minutes**
- Chew: max blood levels of ASA in **14 minutes**

## NSAID Contraindications

- Allergy
- History of significant GI bleed
- Asthma
- NSAID exacerbated respiratory disease
- History of renal disease
- Prior MI on antithrombotic therapy

JADA 147(2), 98-109, 2016

## Emergency Drugs

Drug	Use	Adult Dose	Child Dose
Salbutamol	Asthma	2 - 4 puffs 100µg/puff	2 - 4 puffs
Diphenhydramine	Allergy	50 mg IV/IM	1 mg/kg
ASA	MI Thrombolytic	162 to 325 mg	N/A

## Emergency Drugs Cost

Drug	~Cost	Shelf Life
Epinephrine Ampoule	\$2	2 years
Epi-Pen	\$100	1 year
Nitro Tablets	\$12 / 100 tablets	6 months
Nitro Spray	\$12	2 years
Benadryl Vial	\$5	2 years
Ventolin Inhaler	\$10	1 year
ASA	\$4 / 24 tablets	2 years

## 7. Oral Glucose

- Simple glucose better for GI absorption
- Carbonation helps GI absorption
- Glucose poorly absorbed through oral mucosa
- Patient awake enough to swallow
- Adult 20 grams
- Child 15 grams

## Oral Glucose

Source	Grams of Glucose
350 ml. Can of Cola (not diet!!)	39
Insta-Glucose	30
200 ml. Apple Juice Box	21
Glucose Tablet	15
Sugar Packet	4
1 LifeSaver	2

## Insta-Glucose

- Thick syrup
- Twist off cap
- Adult whole tube (30 g), child half



## Other Emergency Drugs

Drug	Use	Dose & Route
Atropine	Hypotension, pulse less than 60 (if symptomatic)	0.6 mg IM or SL
Ephedrine	Hypotension, pulse greater than 60	25 mg IM or SL
Corticosteroid	Anaphylaxis Adrenal Insufficiency	IV, in hospital
Anti-Epileptic (diazepam or midazolam)	Seizure > 5 min	IV best but midazolam ok IM
Ammonia spirits	Unconsciousness	

## Corticosteroids For Anaphylaxis

- Dexamethasone, hydrocortisone, prednisolone
- Helps reduce inflammation
  - Stabilize mast cells to ↓ histamine release
- Given after epi and antihistamine
- Not for acute phase – onset 1 hr.
- Best emergency route is IV but 1 – 2 wk. course of oral steroid after emergency (PO, IM, IV)
- Some corticosteroids contain sulphites

## Adrenal Insufficiency: Emergency Drugs

	Adult IM Dose	Adult IV Dose	Pedo IM Dose	Pedo IV Dose
Dexamethasone	8 mg	0.5 - 9 mg	0.03 - 0.15 mg/kg	0.02 - 0.3 mg/kg
Hydrocortisone	100 - 200 mg	100 mg	4 - 8 mg/kg	1 - 2 mg/kg

- No best recommended steroid  
**CPS recommends hydrocortisone**
- Dose differs from various sources

## Aromatic Ammonia

- Smelling salts
- A vaporole
- Noxious odor when cracked or crushed
- Irritates airway to stimulate a breath
- No data that they shorten syncope episode\*
- **May cause nausea, vomiting, trigger asthma**

\*Goodchild JH et al. Gen Dent, Nov-Dec, 10-13, 2016

## Aromatic Ammonia



## Flumazenil (Anexate) Rescue Dose

### Adult

- 0.6 – 1 mg IV total via 0.2 mg increments every minute
- Or 0.2 mg in each deltoid if IV not possible

### Child (1 – 17 yrs.)

- 0.01 mg/kg IV up to max 0.05 mg/kg

\*\*\*\*911 and CABS\*\*\*\*



## Sublingual Flumazenil Study

Adults given 3 incremental doses of 0.25 mg triazolam in 90 min. to induce deep sedation

0.2 mg of flumazenil given sublingually

Results: deep sedation was not totally reversed and reversal that did occur did not persist

Hosaka K et al, J Am Dent Assoc, 140(5):559-66, 2009

## Naloxone

	IV	IM / SC
Onset	2 min	10 min
Duration	30 min	1 – 4 hrs
Adult Dose	0.1 mg q 2–3 min	0.4 mg q 5 min x2

- Supplied as 0.4 mg/ml or 1 mg/ml
- Maximum dose is 0.8 mg
- Nasal spray available
- 911 and CAB



## Naloxone or Flumazenil First?

- ◉ Respiratory depression usually caused by opioid
- ◉ Naloxone better at reversing respiratory depression
- ◉ \*\*\*Give Naloxone first

## Pitfalls of Reversal Agents

- ◉ O<sub>2</sub> and 911 still paramount
- ◉ Reversal agent has shorter half life than sedative (1/2 hour)
  - Recurrence of sedation
  - Keeping patient in office for duration of reversal agent action (~ 1 hr.)
- ◉ IM use long onset (5 – 10 min.) and limited effectiveness

## Emergency Equipment: Monitors

- ◉ Automatic BP cuff
  - Two size adult cuffs
  - Pedito cuff or auto device?
- ◉ Pulse oximeter
- ◉ Glucometer
- ◉ Wall clock with second hand
- ◉ AED

## Emergency Equipment: Tools

- ◉ Clear masks for passive and positive pressure O<sub>2</sub> delivery
  - Various sizes
- ◉ Yankauer suction
  - High volume suction adapter
- ◉ Emesis basin
- ◉ Oropharyngeal airways



MedicalMart has purchasing program based on RCDSO sedation Standards of Care



## Emergency Bags

1. Syncope / hypoglycemia
2. Chest pain: Angina / MI
3. Cardiac arrest
4. Allergy / Anaphylaxis
5. Asthma



## Avoiding A Catastrophe: Practice

Perfect practice pays off:

- ⦿ Practice emergency protocols
- ⦿ Practice using emergency drugs
- ⦿ Have a written office policy regarding emergency protocol
- ⦿ Everyone knows their role

## Avoiding a Catastrophe: Before Treatment

- ⦿ Obtain a thorough medical history
- ⦿ Assess vital signs
- ⦿ Assign an ASA status
- ⦿ Contemplate referral or MD consultation
- ⦿ Stress reduction protocol

## Avoiding a Catastrophe: During Treatment

- ⦿ Continue stress reduction protocol
- ⦿ Minimize treatment induced discomfort
- ⦿ Be aware

## Minimizing a Catastrophe: During An Emergency

- ⦿ Emergency kit
  - organized, locatable, updated, algorithms
- ⦿ BLS updated: **know the P - CAB's and D's**
- ⦿ AED
- ⦿ Institute office emergency plan and EMS access protocol