

Medical Emergencies in the Dental Office: Are You Ready?

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“Dentistry’s Perfect Storm”

- “Six Links of Survival” are suggested for medical emergency preparedness
 1. Dentist training
 2. Staff/team training
 3. Routine practice drills
 4. A written protocol
 5. Proper medications
 6. Proper equipment

Ref.: Sangrik, Dentistry Today, Sept. 2010

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Medical Emergencies

- Of greatest concern to us are the cardiovascular and respiratory systems
- Be prepared for a worst-case scenario

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Risky business?

- How healthy are your patients?
 - How do you know?
- What are you watching for?

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30,602 Emergencies

▪ Syncope	15,407
▪ Mild Allergy	2,583
▪ Angina	2,552
▪ Postural Hypotension	2,475
▪ Seizure	1,595
▪ Bronchospasm (asthma)	1,392

Malamed, JADA, 124 (August): 40-53, 1993

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The Big 12

▪ Syncope	▪ COPD
▪ Angina	▪ Hyperventilation
▪ Myocardial infarction	▪ Allergies
▪ Hypertension	▪ Diabetic imbalances
▪ Hypotension	▪ Epilepsy/seizure disorders
▪ Asthma	▪ Bleeding problems

Ref.: Sangrik, Dentistry Today, Sept. 2010

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Medical History & Patient Evaluation



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Who Is At Risk?

- Everyone, but not equally
- 90% of office emergencies are predictable in some way

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Who Is At Risk?

- Patient risk factors
 - Medical history
 - Age
 - Existing disease(s)
 - Medications
 - Allergies
 - Psychological
 - Especially fear & anxiety

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Who Is At Risk?

- Medications:
 - Antianginals
 - Antihypertensives
 - Diabetic medications
 - Corticosteroids
 - Coumadin & other antithrombotics
 - Oxygen

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Who Is At Risk?

- Psychological Factors
 - Ask the patient
 - Ask the rest of the team
 - Acknowledge and treat dental anxiety

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Medical History


- Vital Signs
 - Blood pressure
 - Heart rate
 - Respiratory rate
- Establish a patient baseline...in your office

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Measuring Blood Pressure

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Blood Pressure Categories




BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120-129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130-139	or	80-89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

heart.org/bplevels

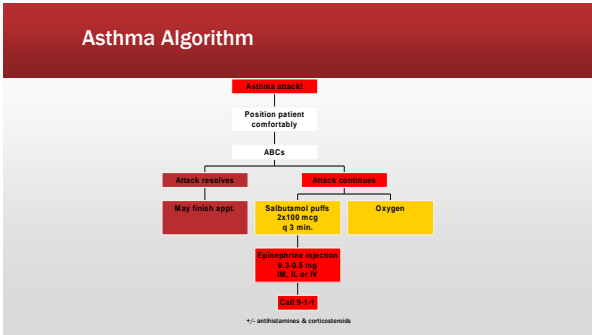
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Sphygmomanometers

- Mercury manometer
 - Accurate
- Aneroid manometer
 - Less accurate
 - Prone to decalibration
- Automated
 - Accurate (with good machines)
 - Ref.: Roerecke et al., 2019



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- ### Treating the Asthmatic Patient
- -
 -
 -
 -

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Emergency Drugs & Equipment

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New: The BC College of Oral Health Professionals

REPRESENTS DENTAL HYGIENISTS, DENTAL SURGEONS, DENTAL TECHNICIANS, & DENTURISTS

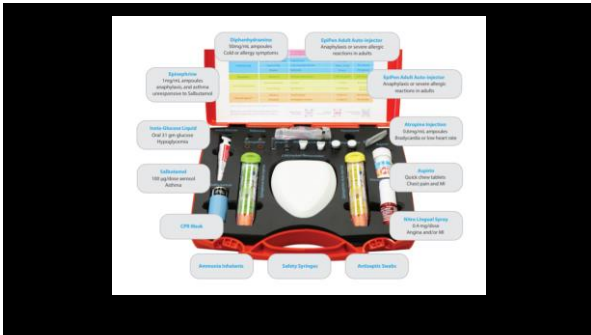
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Appendix C
Emergency Medications Required for Minimal Sedation

Drug	Amount on Hand
Oxygen	One (1) Full "E" Cylinder
Epinephrine or EpiPens	Two (2) amps of 1:1000 or 1 EpiPen
Nitroglycerin	One (1) spray/pump
Diphenhydramine or Chlorpheniramine	One (1) vial of 50mg
Salbutamol Inhalation Aerosol	One (1) inhaler
ASA	One (1) small bottle
Flumazenil*	One (1) vial
Naloxone**	Two (2) amps
Supplemental glucose for oral use	One (1) source

**BC Medical
Emergency Kit**

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Oxygen

- Indicated for all medical emergencies
- Mechanism of action: **C'mon!**
- Dose: **Some is good, lots is better!**
 - Guideline for supplementation: 1 L of O₂ = +4% of [O₂]

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Oxygen

- E cylinder
- 660 L - good portable O₂ size
- Provides >30 minutes* of supplemental O₂
- Can estimate remaining time using the following equation:

$$\text{Time remaining} = \frac{\text{Remaining pressure (psi)}}{200 \times \text{flow rate (L/min)}}$$

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Epinephrine

- Indicated in sudden cardiac arrest, asthma, and allergy/anaphylaxis
- Can be administered IL/IM/IV

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Epinephrine

- Mechanism of action: α 1 agonist (peripheral vasoconstriction), β 1 agonist (heart) and β 2 agonist (bronchodilation, vasodilation)
- Adult dose: 0.3-1.0 mg IM/IL/IV
 - Children's dose: 0.01 mg/kg IM/IV
- Duration: 5-10 minutes

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Where Not To Give Epinephrine

- Subcutaneous
 - This area is populated predominantly by α -receptors, which leads to vasoconstriction and a delay in uptake
- Sublingual
 - Potential for airway complications
 - Dose recommendations and rate of absorption have not been studied

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Epinephrine = 9-1-1

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Nitroglycerin

- Indicated in angina and MI
- Mechanism of action: relaxes vascular smooth muscle in arteries and veins
 - ↓ venous return to the heart (↓ preload)
 - ↓ myocardial O₂ demand
 - ↓ BP
- Dose: 0.3-0.4 mg sublingual

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Nitroglycerin

- Light- and oxygen-sensitive
- Store tablets in the dark, at room temp, tightly closed
- Opened bottle has shelf life of 3 months
- Do not use if systolic < 90 mmHg or...

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Sublingual Spray

- Nitrolingual® pumpspray
 - 1-2 metered-doses (0.4 mg)
 - Given q 3-5 min (x 3)
 - Sprayed onto or under the tongue
 - 200 metered doses/bottle
 - Shelf life of 2-3 years

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Diphenhydramine HCl

- Indicated to block histamine-mediated reactions (e.g. allergy, asthma)
- Available in many formulations
 - Injectable form: 1 ml vial with 50 mg (25 mg for kids)
 - The 50 mg/ml IV concentration is irritating to veins and may be irritating sublingually also
 - Capsules are 25 or 50 mg
- Sedative and antiemetic actions are secondary

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Diphenhydramine HCl

- Mechanism: H₁-receptor site competition
- Dose: 50 mg po/IM/IV
 - Children's dose = 1 mg/kg
- Duration: 4-6 hours

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Chlorpheniramine (Alternate Antihistamine)

- A sedating antihistamine
- IM dose = 10 mg
- $t_{1/2}$ = 21-27 h

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Salbutamol (Albuterol)

- Indicated in acute asthma attacks
- An inhaled bronchodilator
- Addresses 1 key element of asthma attacks
- Trade name = Ventolin®

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Salbutamol (Albuterol)

- Mechanism: Direct action to relax bronchial smooth muscle (β -2 agonist)
- Dose: 200 μ g (2 puffs) q 3-5 min *prn*
 - Children's dose = 100 μ g q 3-5 min
 - Puffer = metered dose inhaler (MDI)
- Duration: 3-6 hours

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Aerochamber & MDI



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ASA

- Indicated in cases of suspected myocardial infarction
- Contraindicated in stroke

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ASA

- Mechanism of action: inhibits platelet aggregation (clot formation)
- Prevents ischemia → injury → infarction
- Decreases overall mortality from acute MI
- Dose: 160-320 mg po*
- CHEW, SWISH & SWALLOW
- Duration: ~3 days

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ASA

- Can be given up to 24 h after myocardial infarction onset
- Contraindications:
 - Allergy
 - Recent history of significant gastric bleed
 - Asthma

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Other Emergency Equipment

- Naloxone
- Flumazenil
- Pen and paper
- Glucometer & Instagluose
 - Dr. Becker maintains that glucose* cannot be absorbed through oral mucosa
- CPR pocket mask

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Local Anaesthetics

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LA maximum doses

Drug	Max (mg/kg)	Max (mg)	Max (mg w/o epi)	# cart. (for 70 kg adult)
lidocaine	7	500	300	13
articaine	7	500	300	7
prilocaine	8	600	400	8
bupivacaine	2	200	75	10
mepivacaine	7	450	300	8

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Expressing a % solution in mg/ml

Expressing a % solution in mg/ml

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LA Dosage

Example: 2% Iidocalne
 2% = 20 mg/ml
 1 cartridge has 1.8 ml of fluid
 = 36 mg of drug/cartridge

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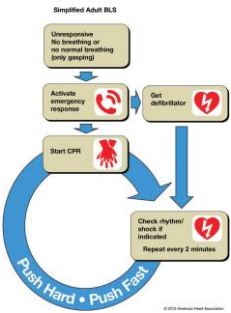
Approaching Emergencies

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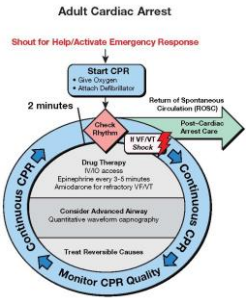
Basic Principles

- Don't hesitate to seek help
- KISS
- Once you are prepared for emergencies, there's no reason to panic (not that we need a reason)

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Circulation

CHECK:
 Shake and Shout (check responsiveness)
 Check for a pulse & for breathing

THEN DO:
 If no pulse, start CPR and prepare AED
 (Push hard, push fast)

CPR → cerebral and coronary perfusion
 (provides 25% of cardiac output)

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CPR Backboard



The best combination = Dental chair + chair support + backboard

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Airway & Breathing

CHECK:

Look, Listen & Feel

THEN DO:

If no response, head tilt & chin lift

If not breathing, give 2 breaths

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Four D's

CHECK:

Differential Diagnosis

THEN DO:

Drugs or Defibrillation

Disposition

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Differential Diagnosis

- How did we get here? Where is here?
- Assess the patient
 - How sick are they?
 - How sick were they?
- What is the medical history?
 - Baseline vital signs?

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Defibrillation

- Surviving SCA outside hospital <8% (with CPR)
- Survival ↓ 10% every minute defibrillation is delayed
- Immediate shock: survival 49-85% with biphasic defibrillators

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Drugs

- Choice is based on the situation
- Know the 6 RCDSO-mandated drugs well
 - Know others as they pertain to your practice

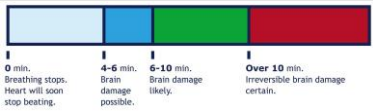
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Airway Management

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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)



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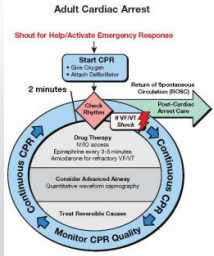
Airway Adjuncts

- Bag-valve-mask device



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Simplified ACLS Algorithm



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Chest Pain Diagnosis

- 3 categories for chest pain:
 1. Known angina, typical presentation
 2. Known angina, more pronounced presentation
 3. No previous angina (unstable)

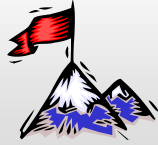
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Acute Coronary Syndromes

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Chest Pain Risk Factors

- History of HTN, angina, MI, stroke, diabetes, high cholesterol
- Age
- Sex
- Family history*
- Smoking



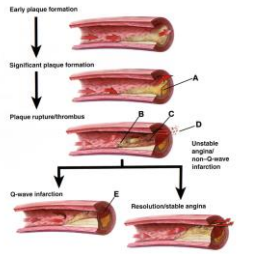
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Myocardial Infarction

- Deficient coronary blood to heart → tissue necrosis
- 90% of MIs are due to CAD
- Little or no relief from nitroglycerin
- 1/3 die before reaching hospital
- Know the risk factors

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Pathophysiology of ACS



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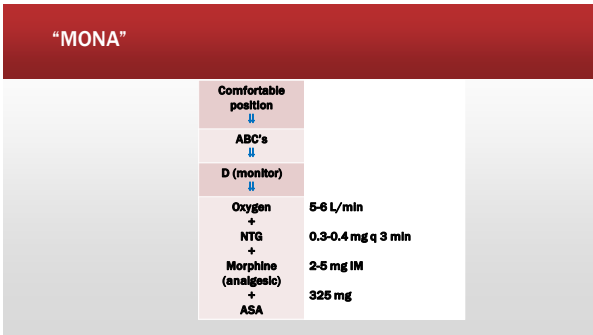
The Impact of Cardiovascular Disease

- Statistics Canada estimates 51,000 cardiac arrests in Canada each year
- 6,000 out-of-hospital cardiac arrests in BC annually (2016-17)
- The overall survival rate for out-of-hospital cardiac arrest is ~5%

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"MONA greets all chest pain"

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Initial Treatment

- Morphine
 - Used if pain persists despite NTG
- Contraindications:
 - Hypotension
 - RV dysfunction
- *Not life-saving (symptom relief)*

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Initial Treatment

- Oxygen
 - Target SpO₂ > 94%
 - *Not life-saving (symptom relief)*

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Initial Treatment

- Nitroglycerin
 - 0.4 mg SL q 5 min x 3 doses
- Contraindications:
 - Hypotension
 - Inferior MI with RV dysfunction
 - Viagra/Adcirca or Levitra = 24 h
 - Cialis = 72 h
- *Not life-saving (symptom relief)*

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Initial Treatment

- asa (Aspirin)
 - 160 mg* chew-swish-swallow
 - 23% mortality reduction in AMI!
 - Contraindicated if allergy or active GI bleed

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“MONA” can be a bad girl

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ECG

ECG findings for infarction and ischemia



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Anaphylaxis

- Almost always occurs within minutes
 - “Faster is worse”
- 96% of fatalities within 1 hour
- May occur or recur (5%) in 1-72 hours
- Involves CV and/or respiratory system
 - Definition applies to multi-organ involvement and cardiovascular compromise

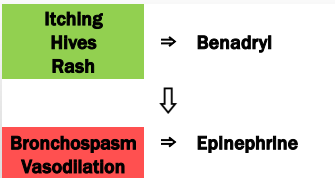
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Allergy

- Patient with allergy histories are more likely to have allergic response to dental drugs
- Penicillin allergy is most common medication allergy
 - Approx. 1 in 10,000 doses

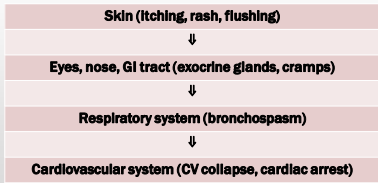
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Histamine-release treatments



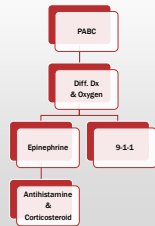
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Progression of Anaphylaxis



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Anaphylaxis Algorithm



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Stroke

- A sudden loss of brain function
- Caused by interruption of blood flow to the brain (ischemic) or the rupture of blood vessels in the brain (hemorrhagic)
- 80-85% of strokes are ischemic
- Overall 15% die, 10% recover completely
- Cerebrovascular accidents are the 3rd leading cause of death in North America

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Stroke

- Warning signs:
 - Weakness
 - Trouble speaking
 - Vision problems
 - Headache
 - Dizziness

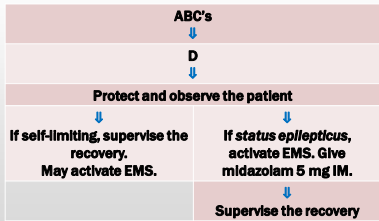
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Stroke

- Treatment in dental offices is palliative
- Assess, activate EMS and support the victim
- Fibrinolytic therapy is done in-hospital
- tPA is used within 3 hours of symptoms
- 15% of stroke victims die, 10% recover completely

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Seizure Algorithm



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Diabetes Mellitus

- Hypo- and hyperglycaemia each present very real and very different dangers
- Hypoglycemia is fast-onset and fairly easy to treat
- Hyperglycaemia is slow-onset and dangerous when symptomatic

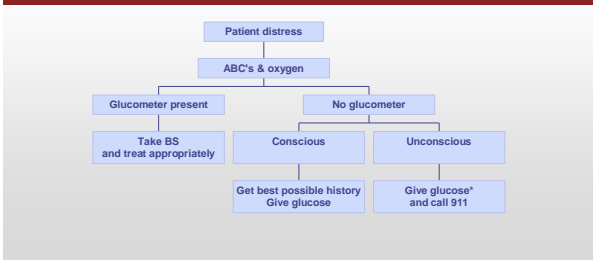
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Diabetes Mellitus

- Definition
 - A disease caused by insulin deficiency
 - Affects 2-5% of the population
 - Characterized by hyperglycemia, polyphagia, polyuria, and polydipsia
 - There is an overall excess of glucose extracellularly, and a glucose deficiency intracellularly

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Blood Sugar Algorithm



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The Office Plan

- **All** office staff should be current in BLS training
- A written, reviewed and practiced emergency protocol should be in place
 - Reviews should include specific individual responsibilities in a worst-case scenario
 - Rescue algorithms
- *Who does what?*

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Example: Lighthouse Deluxe Med Emerg Kit

- Epinephrine Auto-Injector, Adult
 - Epinephrine Auto-Injector, Pediatric
 - Epinephrine Ampoules
 - Diphenhydramine
 - Salbutamol HFA AEROLSOL Inhaler
 - Nitroglycerin Pump-Spray
 - Aspirin
 - Glucose
 - Ammonia Inhalants*
 - Alcohol Prep Swabs
 - Syringes
 - CPR Pocket Mask
 - Medications for Sedation-Related Emergencies (Optional)
 - OnTraq™ Quality Refill System
 - Disposal-by-Mail of expired products
 - Online video Training (by Dr. Don Cohen)
- Distributed by HANSAMed (\$625.95, 2018) [Available?]

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Emergency Baggies plus O₂

- Allergy/Anaphylaxis
- Asthma
- Chest Pain/MI
- Hypo/Hyperglycemia

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Emergency Baggies
Allergy/Anaphylaxis

- Antihistamine
 - Chlorpheniramine 10 mg
 - Diphenhydramine 50 mg
 - Children = 1 mg/kg
- Corticosteroid
 - Hydrocortisone IV 100 mg (x1)
- Epinephrine
 - 1:1000 ampoule & syringe or Epi-Pen 0.3-0.5 mg (x2)
 - Children = 0.01 mg/kg

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Emergency Baggies
Asthma

- Salbutamol (x1)
 - plus AeroChamber
 - Children = 1 puff
- Epinephrine
 - 1:1000 ampoule & syringe or Epi-Pen 0.3-0.5 mg (x2)
- Antihistamine
 - Diphenhydramine 50 mg (x2)

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Emergency Baggies
Chest Pain/MI

- Nitroglycerin spray (x1)
- ASA 160-325 mg
 - Children's tablets = 80 mg
- Demerol 25-50 mg IM/IV

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Emergency Baggies
Hypo/Hyperglycemia

- Glucometer
- Icing sugar and/or juice box
- Glucaagon 1 mg IM

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Emergency Drug Kit

DRUG	USE	ADULT DOSE	CHILD DOSE
Oxygen	Most emergencies	100%	100%
Epinephrine	Anaphylaxis Asthma Cardiac Arrest	0.5 mg im 0.5 mg im 1 mg iv	0.01mg/kg
Nitroglycerin	Angina MI	0.3-0.6mg tablet 0.4 mg spray	N/A

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Emergency Drug Kit

DRUG	USE	ADULT DOSE	CHILD DOSE
Salbutamol	Asthma	2 puffs 100µg/puff	1 puff
Diphenhydramine Chlorpheniramine	Allergic reaction	50 mg iv/im 10 mg iv/im	1 mg/kg
ASA	MI thrombolytic	160-325 mg	N/A

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Other Kit Considerations

DRUG	USE	ADULT DOSE	CHILD DOSE
Morphine	MI Analgesia	2-5mg im/iv q 5-15 min	N/A
Glucose	Hypoglycemia	Orange juice Soda Icing sugar	Orange juice Soda Icing sugar
Midazolam	Status epilepticus	5mg iv q 5 min 5mg im q min	0.3 mg/kg iv ?

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The Office Plan

1. Prevention is best.
2. Algorithms work.
3. *“Prepare the umbrella before it rains.”* (Malay proverb)

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