What Should Dentists Know about Medicine...

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Why Bother? (Martin S. Greenberg, 2007)

1. Integration into the dental school curriculum has been slow.
2. Many dental schools face multiple challenges including:
   - Serious financial concerns, which decrease enthusiasm.
   - Pressure to maximize clinic income by increasing patient volume may decrease the time available.
   - Subjects related to new dental technology (esthetics, implants) compete for the limited time available curriculum.
   - A shortage of dentists who are adequately trained in dental treatment for patients with complex medical disorders who will both teach this subject and be strong advocates on dental school curriculum committees for improved educational programs.

What’s the Solution?

1. Scope of the problem must be defined by encouraging research that studies the rate of complications as a result of a variety of dental procedures performed on patients with specific medical disorders.
2. Increase the number of experts in the management of patients with severe medical problems.
3. Lectures in medicine must be followed by substantial clinical experiences.

Why Bother? (Martin S. Greenberg, 2007)

In the decades ahead, the average dentist will treat an increasing number of patients who have complex medical histories that will significantly modify the dental treatment plan. The population is aging.

- 88% of patients over 65 are taking prescription medications with a majority taking multiple medications.
- Hospitalizations for coronary artery disease more than doubled in the 1990s for patients over the age of 65.
- The number of patients taking immunosuppressive drug therapy to prevent graft rejection and treat autoimmune diseases also increased during the 1990s from under 35,000 per year to over 35,000.

What’s the Solution?

4. Dental schools should have clinics primarily devoted to dental treatment of patients with serious medical problems.
5. There must be improved coordination between faculty who teach OM, OMFS clinics and faculty who are teaching in restorative, periodontics, and endodontic clinics where a majority of the dental care is provided and a majority of the clinical instruction carried out.

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Hypertension: Dental Management Considerations

- BP is determined by how much blood the heart pumps (CO) and by the resistance to blood flow (TPR) in the vascular system.
- CO in turn is determined by how often the pump contracts (HR) and by the amount of blood ejected during each beat (SV).
- High blood pressure, therefore, results from either narrow inflexible arteries, an elevated heart rate, increased blood volume, more forceful contractions, or any combination of the above.
- The long-term regulation of BP is controlled predominantly by the kidneys through their variable release of the enzyme renin.

Hypertension: Dental Management Considerations

- BP is never constant; it peaks right after the ventricles contract (systole) and reaches its low point as the ventricles fill (diastole).
- Mean arterial pressure (MAP) is calculated by multiplying the diastolic BP by two, adding the systolic BP, and dividing by three.
- MAP readings are primarily under control of the kidneys, while fear and stress can provoke the ANS to quickly and dramatically raise values.

Hypertension: Diagnosis

<table>
<thead>
<tr>
<th>Classification</th>
<th>Systolic BP</th>
<th>Diastolic BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120</td>
<td>&lt;80</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120-139</td>
<td>80-90</td>
</tr>
<tr>
<td>Stage 1 hypertension</td>
<td>140-159</td>
<td>90-100</td>
</tr>
<tr>
<td>Stage 2 hypertension</td>
<td>&gt;160</td>
<td>&gt;100</td>
</tr>
</tbody>
</table>

Note that a patient with a “normal” systolic blood pressure (less than 120) would be classified with Stage 1 hypertension if the diastolic blood pressure is 95.

Hypertension: Diagnosis

Why and how chronic elevated BP can be a problem:
1. Untreated hypertension heart works harder
2. Untreated hypertension Atherosclerosis nephrosclerosis heart attacks, strokes, loss of vision, and acute/chronic renal failure
3. Untreated hypertension Less sensitive to painful stimulation (electric pulp testing)

Hypertension: Treatment

Goals of management to reduce pre-hypertension range (<140/90) and to <130/80 in patients with existing end-organ disease or diabetes.

Lifestyle Modifications: initial treatment involves diet restrictions (intake of fruits, vegetables, and low-fat dairy products, with restriction of sodium to less than 2.4 g/day); regular exercise, weight control, and low limits on the use of alcohol.

Hypertension: Drugs

1. Diuretics (e.g., hydrochlorothiazide, triamterene, furosemide).
2. Beta-blockers (e.g., propranolol, sotalol).
3. ACE inhibitors (e.g., captopril, enalapril).
4. Calcium Channel Blockers (e.g., amlodipine, nifedipine, diltiazem).
5. Alpha blocking agents (e.g., prazosin, terazosin).
6. Direct acting vasodilators (e.g., nitroglycerin, minoxidil).
7. Other centrally acting agents (e.g., methyldopa, clonidine).
8. Angiotensin 2 receptor blockers (e.g., losartan, telmisartan).
**Hypertension: Drugs**

- **Diuretics** (eg, hydrochlorothiazide, triamterene, furosemide) are the most researched class of drugs and work to reduce BP by both reducing vascular resistance and by reducing blood volume. For most patients, the first drug given for the treatment of high BP is a diuretic.

- **ACE inhibitors** (eg, captopril, enalapril) work by retarding the renin-angiotensin system. They produce vasodilatation by interfering with the conversion of angiotensin I into angiotensin 2. With a reduction in angiotensin 2, vasoconstriction decreases, lowering BP.

- **Calcium Channel Blockers** (eg, amlodipine, nifedipine, diltiazem) typically reduce all the variables in BP by minimizing calcium influx into smooth and cardiac muscle. They decrease total peripheral resistance and often slow the heart rate and decrease the force of contraction.

**Hypertension: Drugs**

- **Beta-blockers** (eg, propranolol, sotalol) are frequently prescribed and decrease BP by reducing the rate and force of contractions. They are often used on patients with coexisting cardiac issues, such as angina and histories of myocardial infarctions.

- **Selective beta-blockers** (eg, atenolol, metoprolol) preferentially target and block the beta-1 receptors on the heart, avoiding the beta-2 receptors of the bronchioles.

- **Nonselective beta-blockers** are therefore contraindicated in patients with asthma, as their inhalers (beta-agonists) are "blocked" by their antihypertensive medicine.

**Hypertension: Drugs**

- **Alpha Blocking Agents** (eg, prazosin, terazosin) impede the sympathetic transmitter norepinephrine from binding to receptors in the arterioles, leading to vasodilatation.

- **Direct acting vasodilators** (eg, nitroglycerin, minoxidil) work independent of the ANS to relax vascular smooth muscle.

- **Other centrally acting agents** (eg, methyldopa, clonidine) act in the central nervous system to decrease sympathetic nervous system output.

- **Angiotensin** 2 receptor blockers (eg, losartan, telmisartan), which work by preventing vasoconstriction in the arterioles, thus promoting vasodilatation.

**Hypertension: Drugs**

- **Topical fluoride**, **Betadine**, and **nasal decongestants** can help prevent dental issues as well as dental care. Patients may experience dental issues following surgical procedures, so patients should be counseled to maintain good dental hygiene. Patients should also be counseled to avoid alcohol intake for at least 48 hours following dental care.

**Hypertension: Drugs**

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Hypertension: Recommendations

- Above what BP values should we not provide dental treatment?
- Should the BP value differ depending on whether we are giving emergency care for a swollen symptomatic patient versus elective care?
- Should we limit the amount of epinephrine for hypertensive patients?

Hypertension: Recommendations

- Pharmacologic Anxiolytic Measures, (nitrous oxide or oral sedatives).
- 5 mg of diazepam versus captopril for hypertensives presenting to the emergency room with BP readings greater than 190/110 - responded equally well to both treatments, reducing systolic BP by 30 mm Hg, and diastolic values by 25 mmHg (Ginneman et al, 2003).
- If Pharmacologic anxiolytic interventions are not available or if they fail to bring the patient’s BP down, what is a dentist to do? A phone consultation made to the patient’s physician for advice! BUT...

Hypertension: Recommendations

- Many patients with no prior history of hypertension present with toothache, swelling, and BP in the 190/110 range.
- They are sick, anxious, desparate, and difficult to turn away just because of their elevated BP.
- Many such patients have their pressure respond favorably by simple relaxation techniques - Sounds, smells, lighting, colors, and the perception that the doctor is competent.
- Sounds of water decreased the patient's BP while, the sounds of a dental turbine increased readings (Malamed et al, 2004).

Hypertension: Recommendations

- Many physicians are not familiar with the doses of epinephrine used by dentists – “go ahead and treat..... but use no epinephrine.”
- “The primary responsibility for the care of the patient rests solely in the hands of the person who performs the treatment, not the one who gives the advice.” (Malamed SF 2004)

Hypertension: Recommendations

- "how healthy is the patient," or "risk assessment," is key in determining the likelihood of complications - American Society of Anesthesiologists (ASA):
  - ASA Class I. A normal healthy patient
  - ASA Class II. A patient with mild systemic disease
  - ASA Class III. A patient with severe systemic disease
  - ASA Class IV. A moribund patient who is not expected to survive without the operation

Questions for the dentist to consider when deciding on dental care are:

- Will the procedure be long or invasive?
- What is the health of the patient?
- Is there any advice from the patient’s physician?
Hypertension: Recommendations

- Little if any cardiovascular change occurs from slow (with aspiration) administration of 2-3 cartridges of local anesthetic with epinephrine 1:100,000 – total epinephrine dose 0.06 – 0.54 mg (Kohler JD et al., 2002).
- Patients release their own epinephrine and other vasoactive mediators in amounts in excess of this if they are feeling pain during a procedure.
- A stressed patient can release up to 40 times his or her baseline catecholamine level (Kohler JD et al., 2002).
- Half-life of epinephrine is only 2 to 5 minutes and it is rapidly inactivated by catechol-o-methyltransferase (Vagella A, 2009).

Risk factors for IHD

1. Family history (IHD at an early age in a patient’s parents significantly increases his risk)
2. Gender (greatest impact between ages 55 and 64 with a M:F, 3:1)
3. Age
4. Total Serum Cholesterol (Total cholesterol 240 mg/dL) and increased total-to-HDL cholesterol ratio
5. Systolic and Diastolic blood pressure (Systolic BP of 140 or diastolic BP of 90 increases the likelihood of IHD)
6. Cigarette Smoking
7. Diabetes Mellitus

Ischemic Heart Disease: Dental Management Considerations

- Ischemic heart disease (IHD) is the most common medical problem in the general population
- People who reach 40, 49% of ♀ and 32% of ♂ show clinical manifestations of IHD during their lifetime.
- Since IHD is so prevalent, stay up to date.
- Though dentists are not expected to diagnose IHD, heart disease in a patient can jeopardize the safe delivery of dental care.

Other Risk factors for IHD

18. Abdominal Obesity
19. Lack of Regular Exercise
20. Lack of Regular Inclusion of Fruits and Vegetables in the diet
21. Excessive Ethanol Use
22. Increased Psychologic Stress
23. Collagen Vascular Diseases
24. Laboratory Findings of either elevated levels of:
   - C-reactive protein (CRP)
   - Cytokine C
   - Homocysteine
   - Micro-albuminuria
**Angina**

- Sub-sternal squeezing or pressure sensation in the chest.
- Heart rate increases to the point at which coronary artery oxygenated blood supply CANNOT keep pace with myocardial oxygen requirements.
- Due to atherosclerotic lesions narrowing the calibre of coronary arteries.
- In rarer cases coronary 
  
  **Angina to Myocardial Infarction**

  - Angina (a partial obstruction, which is why the symptom can come and go without myocardial damage.
- MI (myocardial infarction) is ulceration or rupture of the fibrous cap covering the plaque.
- Exposed contents of plaque triggers deposition of platelets and clotting of adjacent blood at site of atherosclerotic lesion (a thrombus forms).
- If and when the thrombus becomes large enough, it obstructs blood flow - myocardial tissue downstream from the obstruction begins to suffer ischemia.
- Initially, this obstruction occurs only at times of demand for increased flow, such as when heart rate increases, causing anginal symptoms.
- Over time, the obstruction can become large enough to compromise blood flow at all times, leading to angina even at rest.

- 40% atherosclerosis of the circumference of the intimal layer of the artery must be involved before the calibre of the lumen begins to be compromised. Eventually, the lesion is large enough to obstruct blood flow.

- This occurs no matter what the level of oxygen demand.
- The ischemia produces angina.
- If the ischemia lasts long enough, the affected myocardium begins to infarct, usually beginning in the sub-endocardial layer that is furthest from coronary capillary blood flow, but not in contact with intracardiac blood.
- If the thrombus spontaneously dissolves, is mechanically removed by insertion of a stent, or is pharmacologically lysed with thrombolytic agents - the ischemia resolves.
- At that point, the duration of the ischemia determines the extent of lasting myocardial injury.

- Determine the level of each patient’s IHD control
  - Stable angina has a predictable quality
  - The activities necessary to cause an anginal event are usually known: a patient knows how many stairs before angina occurs.
  - Once a patient’s angina appears it usually stops once the patient ceases the activity that triggers it.
  - Nitroglycerin (GTN) is required to relieve the angina - the amount is similar with each event.
  - Determine any change in IHD risk factors.

- Patient with stable angina can usually undergo routine dental care safely
- Remember the usual triggering event to angina and how to manage the angina should it occur.
Stable Angina

• The major instigator of angina in the dental setting is tachycardia provoked by FEAR or PAIN

Angina-prone patients who experience greater than normal stress from the thought of dental work benefit from oral anesthetics, nitrous oxide and/or intravenous sedation.

Pain control is critical for lessening the chances of angina in IHD patients. Use profound local anesthesia:
1. Longer-acting anesthetics, bupivacaine, or use a vasoconstrictor. Epinephrine and neurectin, can both cause a rise in heart rate. Use them in concentrations of 1:200,000 and 1:20,000, respectively, or less.
2. Avoid intravascular administration with aspiration before injection.
3. Avoid excessive extravascular deposits by limiting the amount of vasoconstrictor to 10 mg of epinephrine (about two cartridges containing 1,000,000 epinephrine).

Unstable Angina (Not Acute Coronary Syndrome, ACS)

• Patients with ‘unstable’ angina, nocturnal angina and recent hospital admissions due to angina are RISKY to treat in a non-medically supported environment

- Determine the level of each patient’s IHD control:
  - If it is changing, for the worse in some parameter:
  - If angina is now occurring more frequently,
  - Appears at lower levels of exertion or at rest,
  - Requires larger doses of nitrates for relief.
- Relief from angina takes longer than in prior episodes.
- Immediate referral to the patient’s physician is indicated.

Myocardial Infarction (MI)

• differs little from that used for patients prone to angina.
- Physicians sought to limit non-cardiac surgical interventions on these patients for at least 6-months.
- If MI is recognized early and rapid interventions are successful, damage can be minimal and there is little reason to delay even elective surgical procedures, including dental procedures.
- Same considerations should be taken for the MI patient as are taken for angina patients.

Managing Patients who are Taking Warfarin & Undergoing Dental Treatment

Assess the Patient's Thrombotic Risk:

• 'Low risk' patients (most patients)
  - Patients with atrial fibrillation or subvalvular heart disease which has NOT been complicated by a previous arterial thrombotic event;
  - Patients who have had a venous thromboembolic event MORE than 3 months ago.

• 'High risk' patients
  - Patients with atrial fibrillation or subvalvular heart disease which HAS been complicated by a previous arterial thrombotic event;
  - Patients who have had a venous thromboembolic event LESS than 3 months ago.
  - Patients with a Starr-Edwards (ball and cage) prosthetic heart valve.
  - Patients with multiple heart valve replacements.
  - Patients who are not clearly in the low risk group above – contact haematology or vascular medicine for advice regarding patient risk group and management of high risk patients.

Stable Angina

• Routine use of oxygen in patients subject to angina makes little sense.
- Should not be put into a sedated state that impairs ability to report angina.
- Regularly check patient’s heart rate and BP during long appointments.
- Address associated conditions e.g., hypertension, congestive heart failure, and diabetes.
- Medication induced postural hypotension.

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Managing Patients who are Taking Warfarin & Undergoing Dental Treatment

General Guidelines:

- If International Normalised Ratio (INR) of below 4.0, patients can usually receive dental treatment in primary care without needing to stop warfarin or adjust dose.
- The risk of thromboembolism after temporary withdrawal of warfarin therapy outweighs the risk of oral bleeding following dental surgery.
- Patients on warfarin may bleed more than normal, but bleeding is usually controlled with local measures.

Managing Patients who are Taking Warfarin & Undergoing Dental Treatment

Drug Interactions:

- Erythromycin and other macrolide antibiotics (for example, azithromycin) – interact with warfarin unpredictably and only in certain individuals. Patients should be advised to be vigilant for any signs of increased bleeding. If increased bleeding occurs then the patient should be advised to contact the GP or anticoagulant clinic to arrange additional INR testing and dose review.
- Metronidazole – interacts with warfarin and should be avoided if possible. If it cannot be avoided, the warfarin dose may need to be reduced by a third to a half, and re-adjusted again when the antibiotic is discontinued. Contact the GP or anticoagulant clinic to arrange additional INR testing and dose review.
- Non-steroidal anti-inflammatory drugs – Drugs including ibuprofen, aspirin and diclofenac should not be used as analgesics in patients taking warfarin.

Managing Patients who are Taking Warfarin & Undergoing Dental Treatment

Drug Interactions:

- Amoxicillin – there have been anecdotal reports that amoxicillin interacts with warfarin causing increased prothrombin time and/or bleeding, but documented cases are relatively rare. However, a single three gram dose for endocarditis prophylaxis has NOT been shown to produce a clinically relevant interaction. Patients requiring a course of amoxicillin should be advised to be vigilant for any signs of increased bleeding.
- Clindamycin – does not interact with warfarin when given as a single dose for endocarditis prophylaxis. Clindamycin is restricted to specialist use for treatment and should not be used routinely for dental infections due to its serious side effects. There is a single case report of an interaction between warfarin and clindamycin.

Managing Patients who are Taking Warfarin & Undergoing Dental Treatment

Dental surgery covered by this advice includes:

- Treatment where the INR does not need to be checked:
  - Prosthodontics.
  - Conservation.
  - Endodontics.
- Treatment where the INR does need to be checked (follow flow diagram):
  - Extractions.
  - Minor oral surgery (fewer than 4 roots being extracted).
  - Periodontal surgery.
  - Biopsies.

Images:

- Diagram showing the process of dental treatment.
- Flyer about prophylaxis against infectious endocarditis.
Thank You