I – Hypertension –

A. Introduction - Hypertension is an extremely common condition with 50 million or more Americans warranting treatment for this condition. The prevalence of hypertension increases with advancing age, with worldwide estimates of 1 billion persons affected. More than half of people 60–69 years of age and approximately three-fourths of those 70 years of age and older meet the criteria for hypertension.

B. Hypertension is deadly. Risk for heart attacks and strokes increase significantly with increasing blood pressure (both systolic and diastolic). The World Health Organization reports that suboptimal BP (>115 mmHg SBP) is responsible for 62 percent of cerebrovascular disease and 49 percent of ischemic heart disease, and suboptimal BP is the number one attributable risk factor for death throughout the world. See JNC 7 for more details http://www.nhlbi.nih.gov/guidelines/hypertension/jnc7full.pdf

C. Diagnosis of Hypertension –
   Normal = Systolic less than 120, and Diastolic less than 80
   Pre-hypertension = Systolic 120-139, and/or Diastolic 80-89
   Hypertension = Systolic 140+, and/or Diastolic 90+
   Stage 1 = Systolic 140-159, and/or Diastolic 90-99
   Stage 2 = Systolic 160+, and/or Diastolic 100+
   Diabetics – greater than 135 systolic or 85 diastolic = hypertension
   The vast majority of hypertension is Primary or “Essential Hypertension.” This means we don’t know why these people have hypertension. A much smaller percentage of people with hypertension have secondary hypertension. This is hypertension due to another condition such as renal artery stenosis, endocrine tumors, etc. The evaluation for patients diagnosed with hypertension includes basic screening tests including CBC, CMP, UA, EKG, and Chest X-ray.

D. Treatment Goals – The main objective is to reduce cardiovascular and renal morbidity and mortality. The primary focus should be on attaining the SBP goal below 140 (diastolic usually follows). With diabetes or renal disease, the BP goal is <130/80 mmHg

E. Treatment
   - Life style modification
     - Attain and maintain normal body weight (5-20 mmHg)
     - Adopt a DASH (Dietary Approaches to Stop Hypertension) eating plan (8-14 mmHg) Lots of fruits vegetables, and low fat dairy products, and low in saturated and total fats
     - Dietary sodium reduction (2-8 mmHg)
- Regular exercise (4-9 mmHg) 30 minutes or more of aerobic activity most days of the week
- Limit alcohol consumption (2-4 mmHg) less than 1 or 2 drinks daily

F. Medications - see algorithm. We used to use a “stepped care” approach to medications. This was a standard protocol applied to everyone, and was like following a chart. We now try to individualize medication therapy depending on “compelling indications.”

- Diuretics – First line choice in most situations. Inexpensive and shown to reduce CV mortality. Especially helpful in Black persons. Can cause hypokalemia, especially at higher doses.
- Beta Blockers – Another inexpensive choice. They lower heart rate, and help relieve angina. Shown to reduce risk for second heart attack. Sometimes used to treat arrhythmia or tremor. Beta blockers can worsen asthma.
- Alpha Blockers – Also help treat BPH. Can cause marked hypotension with the first dose.
- Calcium Channel Blockers – These also help with angina. Different ones raise or lower heart rate. Major side effect is edema.
- ACE Inhibitors – This popular and important class of medications is used to reduce progression of kidney disease in diabetics. In multiple studies have been shown to reduce mortality with congestive heart failure, or after a heart attack. They also reduce the risk of a stroke. Many people can’t tolerate them due to a cough!
- ARBs – Like ACE inhibitors they reduce the impact of angiotensin, but instead of blocking the production of it, the block the receptors for it and therefore tend not to lead to cough. Most of the benefits of ACEIs have been shown with these also.
- Others (direct renin inhibitors - Tekturna)

G. Role of the Optometrist in hypertension

- Detection and referral, patient education, therapy compliance review, photo documentation of retinal vascular changes and serial blood pressure measurements
II – Atherosclerosis – Atherosclerosis is the build up of plaque in arteries. It can occur in any artery, but the locations where we see most clinical problems are the coronary arteries and the carotid arteries leading to heart attacks and strokes. Coronary artery disease is the number one cause of death in the United States, and cerebrovascular disease is the number 3 cause of death. In addition to deaths, millions of people suffer from angina, heart failure, and the devastation of neurologic deficits from a stroke they survived.

Plaque that narrows arteries is made up primarily of cholesterol and calcium. Most areas of plaque are filled with inflammatory mediators which make the lesion fragile and ready to open up and spill the contents into the artery, leading to a clot at the area which often occludes the vessel. There are many factors that contribute to the development of plaque including elevated cholesterol levels, smoking, diabetes, hypertension, lack of physical activity, and the non-modifiable risk factors of family history, increasing age and male sex.

Many studies have proven the benefits of exercise, low fat diet, control of diabetes and hypertension, and lowering cholesterol levels.

When evaluating someone’s lipids we routinely look at a panel that includes total cholesterol, HDL, LDL, and triglycerides. There are many other parameters that we often follow as well such as LPa, homocystine, Apo B and others. These are beyond the scope of this discussion. C-reactive protein is an additional test that we often monitor as an assessment of inflammation in a person’s system. Many studies have shown a correlation with an elevated CRP and risk for a coronary artery event. Treatment of an elevated CRP is essentially the same as treatment of elevated cholesterol levels, with the notable exception that a recent study showed that 1000 mg daily of vitamin C may reduce the CRP by as much as 25%.

(http://www.ncbi.nlm.nih.gov/pubmed/18952164)

Current guidelines for lipid levels are different depending on a person’s underlying risk for CAD, and are mainly for the LDL levels. Below is a summary of the recommendations from the 2012 ACCE guidelines: (https://www.aace.com/files/lipid-guidelines.pdf)

<table>
<thead>
<tr>
<th>Risk category</th>
<th>Risk factors/10-year risk</th>
<th>LDL-C treatment goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high risk</td>
<td>Established or recent hospitalization for coronary, carotid, and peripheral vascular disease or diabetes plus 1 or more additional risk factor(s)</td>
<td>&lt;70 mg/dL</td>
</tr>
<tr>
<td>High risk</td>
<td>≥2 risk factors and 10-year risk</td>
<td>&lt;100 mg/dL</td>
</tr>
<tr>
<td></td>
<td>&gt;20% or CHD risk equivalents, including diabetes with no other risk factors</td>
<td></td>
</tr>
<tr>
<td>Moderately high risk</td>
<td>≥2 risk factors and 10-year risk</td>
<td>&lt;130 mg/dL</td>
</tr>
<tr>
<td>Moderate risk</td>
<td>≥2 risk factors and 10-year risk</td>
<td>&lt;130 mg/dL</td>
</tr>
<tr>
<td>Low risk</td>
<td>≤1 risk factor</td>
<td>&lt;160 mg/dL</td>
</tr>
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Diet and Exercise:

Herbal Supplements –

**Garlic** – maybe a few points at best
Red Yeast Rice – most of these products actually contain a very small amount of lovastatin, results are minimal and extremely variable.

**Fenugreek, artichoke leaf** extract and many other common **herbs and spices** are touted to help lower cholesterol, but there are no convincing studies at this time to recommend any of these.

**Omega 3 fatty acids** are found in abundance in some foods – in particular in Salmon. There is evidence that these supplements do help lower cholesterol to some degree, and they have some mild anti-inflammatory as well as anticoagulant properties.

Prescription Medications

Statins – Now the most common treatment for elevated cholesterol. Side effects often limit their use. Chemical hepatitis and myalgias are the most common limiting factors.

Niacin and nicotinic acid derivatives – Often used when statins are not tolerated, or when elevated triglycerides are then main lipid abnormality.

Bile sequestering agents – This older class of medications is rarely used now, but can still be used when other agents are not tolerated.

Revascularization procedures.

**Angioplasty** – Balloon dilation of the coronary arteries. A stent is often placed to reduce the rate of restenosis after dilating the artery.

**Coronary artery bypass** – Surgical replacement of the coronary arteries with a new or different, patent vessel.

III – Arrhythmia – The rhythm of the heart is normally generated by the SA node. When a beat is initiated from another location of the heart the associated electrical tracing takes on a different appearance and we call it an ectopic beat. Many ectopic beats are common and nothing of concern. Sometimes people are aware of the unusual beats, and other times people are aware of and disturbed by these ectopic beats. We frequently monitor a person’s rhythm for 24 (Holter monitor) or more hours with a portable device. Certain abnormal patterns of rhythm are considered nothing to worry about, and other patterns are felt to have the potential to deteriorate into a dangerous rhythm such as ventricular tachycardia. We have several medications we use to
suppress these abnormal beats, but many of these have lots of side effects, so if we feel that abnormal rhythms are problematic we often use techniques to surgically eliminate the problem.

There is now a subspecialty in cardiology called electrophysiology. What the electrophysiologist does is to study the heart through a catheter and determine the areas where the abnormal heart beats arise from. Those very small areas are then destroyed through the catheter, thus eliminating the impetus for the abnormal beats.

Atrial fibrillation – One of the most common arrhythmias we need to treat. Often the rapid irregular rate must be slowed to allow maintenance of normal BP. We treat with medications to slow rate, or stop the arrhythmia by cardioversion. An EPS study and ablation may normalize the rate. The slow, stagnate flow in the atria leads to increased risk for blood clots and risk of CVA, so we treat with anticoagulants.