Applying the Latest Practice Guidelines

Thomas W. Barkley Jr., PhD, ACNP-BC, ANP, FAANP
President
Barkley & Associates, Inc.

www.NPcourses.com
and
Professor Emeritus
California State University, Los Angeles
School of Nursing

Disclosures

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Objectives

Upon completion of this session, the participant should be able to:

1. Recognize changes to practice as a result of following the latest clinical practice guidelines.
2. Describe relevant options and implications in utilizing the latest clinical practice guidelines.
3. State at least two strategies to improve clinical practice as a result of heightened awareness of the latest guidelines.

Topical Outline

- Hypertension Guidelines: What Is New? What Do We Do?
- Type 2 Diabetes Guidelines
- Antibiotics in 2018: Are You with the Guidelines?

Hypertension

The most frequently encountered medical condition
(1/3 of adults in the U.S. and 2/3 of adults aged > 60 years of age)

- Sustained elevation in blood pressure
- Primary/Essential
  - 95%; onset usually < 55 years of age
- Secondary
  - 5%; secondary to known causes
- Exacerbating factors: Smoking, obesity, alcohol intake, use of NSAIDS, etc.
### Goal BP for Hypertension: JNC-8

1. Systematic literature review restricted to RCTs
2. Definitions of hypertension and pre-hypertension not addressed

<table>
<thead>
<tr>
<th>Population</th>
<th>Goal BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>General ≥ 60</td>
<td>&lt; 150/90</td>
</tr>
<tr>
<td>General &lt; 60</td>
<td>&lt; 140/90</td>
</tr>
<tr>
<td>Diabetes</td>
<td>&lt; 140/90</td>
</tr>
<tr>
<td>Chronic Kidney Disease</td>
<td>&lt; 140/90</td>
</tr>
</tbody>
</table>

### Treatment of Hypertension Updated Guidelines – 2017


### Hypertension Guidelines

- New updates now include up to 30 million more individuals who will be diagnosed with HTN or are prehypertensive
- How we diagnose has changed
- Consider preexisting conditions carefully
- Consider age
- Rethink medications

### Treatment of Hypertension

New guidelines incorporate information from:

1. CV disease risk
2. At-home BP monitoring
3. Ambulatory BP monitoring
4. When to initiate drug treatment
5. How to improve treatment goals
**What is the New Normal?**

**Classifications**

<table>
<thead>
<tr>
<th>Blood Pressure Classifications</th>
<th>Systolic BP</th>
<th>Diastolic BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal BP</td>
<td>&lt; 120</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>Elevated BP</td>
<td>120 to 129</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>Stage 1 Hypertension</td>
<td>130 to 139</td>
<td>80 to 89</td>
</tr>
<tr>
<td>Stage 2 Hypertension</td>
<td>≥ 140</td>
<td>≥ 90</td>
</tr>
</tbody>
</table>

**Treatment of Hypertension**

- Patients should be encouraged to do at-home monitoring at different times of day (night time, evening, early morning)
- BP is redefined, once again
  - The guidelines encourage assessment based on:
    1. Risk of cardiovascular events that may occur in patients who have other risk factors (family history, primary risk factors), and
    2. Age

**Screen for CVD Risk Factors**

1. Smoking
2. Diabetes
3. Dyslipidemia
4. Low fitness
5. Unhealthy diet
6. Psychosocial stress
7. Excessive weight
8. Sleep apnea

- Fasting blood glucose, complete blood cell count, lipids, basic metabolic panel, thyroid stimulating hormone, urinalysis, electrocardiogram with optional echocardiogram, uric acid, and urinary albumin-to-creatinine ratio
- Screen for secondary causes of HTN in cases of abrupt onset:
  - Pheochromocytoma, Cushing's, hyperthyroidism, etc.
  - More aggressive treatment will be needed in these cases
1. Nonpharmacologic interventions include:
   a. Weight loss for overweight or obese patients with a heart healthy diet
   b. Sodium restriction, and potassium supplementation within the diet
   c. Increased physical activity with a structured exercise program
   d. Men limited to no more than 2 and women no more than 1 standard alcohol drink(s) per day

2. Each lifestyle change equivalent to:
   - 4-5 mm Hg decrease in SBP and
   - 2-4 mm Hg decrease in DBP
   But…a diet low in:
   - Sodium, saturated fat, total fat
   - Alcohol restriction: 3.8 mm Hg
   - Aerobic exercise: 4.6 mm Hg
   - Fish oil supplements: 2.3 mm Hg

3) Good evidence for the following interventions and their effects on BP:
   - Sodium restriction: 3.8 mm Hg
   - Alcohol restriction: 3.8 mm Hg
   - Aerobic exercise: 4.6 mm Hg

4) In this study, no effects were seen with potassium, magnesium or calcium supplementation

Who Gets What for HTN?
Is the patient “prehypertensive”?
1) Lifestyle modifications alone may be sufficient to lower BP
2) Monitoring is key! Follow up in 2-3 months; encourage home monitoring
3) Good evidence for the following interventions and their effects on BP:
   - Improved diet (low saturated fat, increased fiber): 5 mm Hg
   - Aerobic exercise: 4.6 mm Hg
   - Alcohol restriction: 3.8 mm Hg
   - Sodium restriction: 3.8 mm Hg
   - Fish oil supplements: 2.3 mm Hg
4) In this study, no effects were seen with potassium, magnesium or calcium supplementation

Pooled Cohort Equation: Optimizing Lipid Panels
Identify individuals who may benefit from statin therapy:
1) Individuals with clinical evidence of ASCVD
2) Individuals with elevated LDL-C ≥ 190 mg/dL
3) Diabetics 40 – 75 years of age with LDL-C between 70 – 189 mg/dL but without clinical evidence of ASCVD
4) Individuals without ASCVD or diabetes with LDL-C between 70 – 89 mg/dL but with an estimated 10-year risk ASCVD of 7.5% or higher

<table>
<thead>
<tr>
<th>Indications for Statin Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High-Intensity Statin Therapy</strong></td>
</tr>
<tr>
<td>Daily dose lowers LDL-C on average, by greater than 50%</td>
</tr>
<tr>
<td>atorvastatin 40–80 mg</td>
</tr>
<tr>
<td>rosuvastatin 20–40 mg</td>
</tr>
<tr>
<td>lovastatin 40 mg</td>
</tr>
<tr>
<td>fluvastatin 80 mg</td>
</tr>
<tr>
<td>pitavastatin 2–4 mg</td>
</tr>
</tbody>
</table>
Consider Pharmacologic Interventions

In at-risk patients for primary prevention of HTN:

a. Diabetics
b. Smokers
c. Chronic kidney disease
d. Atherosclerotic cardiovascular disease (ASCVD)
e. Older patients

For prevention in adults with no history of CVD but with an estimated 10-year ASCVD risk of ≥10% and SBP ≥130 mm Hg or DBP ≥80 mm Hg
In adults with no history of CVD and with an estimated 10-year ASCVD risk <10% and a SBP ≥140 mm Hg or a DBP ≥90 mm Hg
For secondary prevention of cardiovascular disease events in patients with an average SBP ≥130 mm Hg or a DBP ≥80 mm Hg

Drug Therapy

1. Initial first-line therapy for stage 1 hypertension:
   - Thiazide diuretics
   - CCBs
   - ACE inhibitors
   - ARBs

2. Two, first-line drugs of different classes are recommended with stage 2 hypertension and average BP of 20/10 mm Hg above the BP target

3. Target goal should be <130 mm Hg / <80 mm Hg in adults with known risk factors

Primary Drugs Used for HTN

1. Drugs used take into consideration whether the patient has or is at risk for CKD, diabetes or ASCVD
2. In patients with no other health risk factors, thiazide diuretics are first-choice drugs
   a. In Black patients, a CCB is an option also, alone or in combination with the diuretic
   b. In non-Black patients, an ACEI or ARB or CCB is an option, alone or with the diuretic
3. In the patient with CKD, an ACEI or ARB should be the primary drug, regardless of patient race.

Drug Therapy in Special Populations

CKD patient:
- Treatment with an ACEI or ARB is preferred
- BP goal is <130 mm Hg / <80 mm Hg

Diabetic patient:
- All classes of first-line agents acceptable (diuretics, CCBs, ACEI, ARBs)
- ACEI or ARBs preferable in cases of microalbuminuria

Metabolic Syndrome
- Lifestyle interventions are the most effective.
- Thiazide diuretics are as effective as the other agents.
- Beta blockers should be avoided unless used for ischemic heart disease.

Valvular Heart Disease
- For treatment of systolic hypertension, avoid beta blockers.

Aortic Heart Disease
- Beta blockers – preferred

Race/Ethnicity
- In Black adults with HTN without HF or CKD, including those with DM, initial antihypertensive treatment: a thiazide-type diuretic or CCB

Preoperative Patient
- If taking a beta blocker, the patient should remain on the beta blocker; other antihypertensives should also be continued
- ACEI or ARBs may be temporarily discontinued
Titration and Treatment Strategies for Hypertension

1. If patients are not at goal BP after initiating treatment, maximize dose of the first medication.
2. Then, add a second medication from a different class (do not add an ACEI to an ARB) or use a fixed dose combination
   a. Reinforce lifestyle modifications
   b. If a thiazide diuretic was not an initial medication, add it now
   c. Continue monitoring
3. If not at goal, add a medication class not previously selected, still staying within the group of thiazides, CCBs and ACEI/ARBs
4. If not at goal, add a beta blocker or an aldosterone antagonist, and/or consider referring patient to a physician with expertise in BP management

Follow-Up Monitoring

1. In low risk adults with elevated BP or stage 1 hypertension with low ASCVD risk:
   a. BP should be repeated after 3 – 6 months of nonpharmacologic therapy
2. Adults with stage 1 hypertension and high ASCVD risk (≥ 10% 10-year ASCVD risk):
   a. Should be managed with both nonpharmacologic and antihypertensive drug therapy with repeat BP in 1 month

High-Risk Patients: Monitoring

For adults with a very high average BP (e.g., ≥ 160 mm Hg or DBP ≥ 100 mm Hg), prompt evaluation and drug treatment followed by careful monitoring and upward dose adjustment is recommended.

- Follow these patients regularly and monitor:
  - BP
  - Vision
  - Mental status
  - Headache history
  - Circulatory status
  - Renal function

Drug Therapy in Hypertension: Pearls (11)

1. Thiazide diuretics are the most widely used drugs for HTN
   - Reduce cardiovascular risk
   - Good in combination with ACEI and ARBs because these decrease K, while ACEI and ARBs cause K retention
2. ACEI, ARBs and direct renin inhibitors should NOT be used in combination with each other (hyperkalemia will result)
3. ACEI and ARBs increase the risk of hyperkalemia in CKD; these also need to be discontinued during pregnancy
Drug Therapy in Hypertension: Pearls (11)

4. CCB dihydropyridines (e.g., amlodipine) cause edema; non-dihydropyridine CCBs (e.g., verapamil) cause heart block and should not be used in heart failure with reduced ejection fraction (HFrEF).

5. Loop diuretics are preferred in heart failure and when GFR is < 30 mL/min.

6. Amiloride and triamterene can be used with thiazides in adults with low serum K+, but should be avoided with GFR < 45 ml/min.

7. Spironolactone or eplerenone are preferred for the treatment of primary aldosteronism and in resistant hypertension.

8. Beta-blockers are not first-line therapy except in CAD and HFrEF. Abrupt cessation of beta-blockers should be avoided.

   - Bisoprolol and metoprolol succinate are preferred in hypertension with HFrEF and bisoprolol when needed for hypertension in the setting of bronchospastic airway disease. Beta-blockers with both alpha- and beta-receptor activity such as carvedilol are preferred in HFrEF.

9. Alpha-1 blockers are associated with orthostatic hypotension; this drug class may be considered in men with symptoms of benign prostatic hyperplasia.

10. Central acting alpha-1 agonists should be avoided, and are reserved as last-line due to side effects and the need to avoid sudden discontinuation.

11. Direct-acting vasodilators are associated with sodium and water retention and must be used with a diuretic and beta-blocker.

Your patient must meet how many of the 5 components of Metabolic Syndrome to be diagnosed with this disorder?

A. 2
B. 3
C. 4
D. 5

Type 2 Diabetes Guidelines

2018 ADA Standards of Medical Care in Diabetes & 2015 AACE/ACE Guidelines plus 2018 AACE/ACE Consensus Statement

Metabolic Syndrome

1. Waist circumference
   - ≥ 40 inches in men
   - ≥ 35 inches in women

2. BP ≥ 130/85

3. Triglycerides ≥ 150

4. FBG ≥ 100

5. HDL
   - a. < 40 in men
   - b. < 50 in women
Diabetes

- In the adult population, 9.4% of adults has T2DM and 33.9% of the adult population is prediabetic.
- Most patients with prediabetes progress to diabetes
- 48% of those 65 and older are prediabetic
- The disease is being recognized in younger patients as well
- African Americans, Asians/Pacific Islanders, Hispanics show a higher prevalence than non-Hispanic whites
- Prognosis is strongly correlated with disease control

Diagnosis: Type 2 Diabetes

ADA Diagnostic Criteria:

1. A fasting plasma glucose (FPG) level of 126 mg/dL (7.0 mmol/L) or higher, or
2. A 2-hour plasma glucose level of 200 mg/dL (11.1 mmol/L) or higher during a 75-g oral glucose tolerance test (OGTT), or
3. A random plasma glucose of 200 mg/dL (11.1 mmol/L) or higher in a patient with classic symptoms of hyperglycemia or hyperglycemic crisis
4. A hemoglobin A1c (HbA1c) level of 6.5% or higher should be a primary diagnostic criterion or an optional criterion remains a point of controversy

T2DM Indicators for Screening

1. Sustained blood pressure > 135/80 mm Hg
2. Overweight and 1 or more other risk factors for diabetes:
   - First-degree relative with diabetes
   - BP > 140/90 mm Hg, and HDL < 35 mg/dL and/or triglyceride level > 250 mg/dL
3. ADA recommends screening at age 45 years in the absence of the above criteria

To Prevent Complications in the Diabetic Patient...

- HbA1c every 3-6 months
- Yearly dilated eye examinations
- Annual microalbumin checks
- Foot examinations at each visit
- Blood pressure < 130/80 mm Hg, lower in diabetic nephropathy
- Statin therapy to reduce low-density lipoprotein cholesterol

History: Drug Classes for T2DM

1. Biguanides
2. Sulfonylureas
3. Meglitinide derivatives
4. Alpha-glucosidase inhibitors
5. Thiazolidinediones (TZDs)
6. Glucagonlike peptide-1 (GLP-1) agonists
7. Dipeptidyl peptidase IV (DPP-4) inhibitors
8. Selective sodium-glucose transporter-2 (SGLT-2) inhibitors
9. Insulins
10. Amylinomimetics
11. Bile acid sequestrants
12. Dopamine agonists

Drugs for Diabetes

<table>
<thead>
<tr>
<th>Biguanide</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>metformin (Fortamet, Glucophage, Glumetza, Riomet)</td>
<td>Drug of choice as a “starter” drug for most patients with T2DM. Lowered basal and postprandial glucose levels by affecting glucose absorption and hepatic gluconeogenesis. Improves insulin sensitivity by increasing glucose utilization by muscle. Promotes weight loss. Monitor renal function; avoid in liver disease. Can reduce LDL-C. Discontinue 1-2 days before receiving iodinated radiographic contrast medium. Black box warning: Lactic acidosis.</td>
</tr>
</tbody>
</table>
**Drugs for Diabetes**

### Meglitinides

- repaglinide (Starlix)
- nateglinide (Starlix)

Comments:
- Shorter-acting insulin secretagogues (increase insulin secretion from the pancreas)
- May be used as monotherapy or added to metformin or a thiazolidinedione
- May be used in patients who are allergic to sulfonylureas
- Carry a risk of weight gain similar to the sulfonylureas
- Liver and renal patient considerations
- Rapid onset (given just before meals)
- Nonsulfonylureas (Glinides)

- May be used as monotherapy or added to metformin or a thiazolidinedione
- Shorter-acting to sulfonylureas
- May cause weight gain (~ 4.4 lbs)
- Cause glucose dependent insulin release from pancreatic beta (increase insulin secretion from the pancreas)
- Stimulate glucose-dependent insulin release
- May cause modest weight loss
- Containanduced in history of pancreatitis or thyroid cancer

- Alpha-glucosidase inhibitors

- acarbose (Precose)
- miglitol (Glyset)

Comments:
- Delay the digestion and absorption of carbohydrates
- Adjunct therapy; used in combination, if at all
- Avoid use in renal dysfunction
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- Delay the digestion and absorption of carbohydrates
- Avoid use in renal dysfunction
- May cause weight gain (~ 4.4 lbs)
- May cause weight gain (~ 4.4 lbs)

- Insulin secretagogues: Stimulate insulin release from pancreatic beta cells
- Enhances beta cell sensitivity to glucose
- May cause weight gain (~ 4.4 lbs)
- Liver and renal patient considerations
- Should be used with diet and exercise

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**Glucagon-like Peptide 1 Agonists (GLP-1 agonists): Insulin mimetics**

- albiglutide (Tanzeum)
- dulaglutide (Trulicity)
- exenatide (Bydureon)
- lixisenatide (Victozy)
- liraglutide (Victozy)
- semaglutide (Ozempic)

Comments:
- Injectables that mimic endogenous incretin GLP-1 (ormone that slows gastric emptying; gives one’s own insulin more time to work)
- Stimulate glucos-dependent insulin release and reduce glucagon
- Use with metformin or others in combination therapy
- May cause modest weight loss
- Containanduced in history of pancreatitis or thyroid cancer

### Beta-blockers

- Aromatase inhibitors (eg, letrozole)

Special Notes:
- aminosalicylates: Once weekly stabilizes both fasting plasma glucose (PPG) and A1c in patients with fewer GI side effects; contraindicated in severe renal dysfunction
- Iglutid: Used daily stabilizes sugars and caused more weight loss than albiglutide
- Use weekly; causes more injection site reactions and loss less weight than liraglutide, but fewer GI side effects

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**Acamprosate**

Comments:
- May cause weight gain (~ 4.4 lbs)
- Should be used with diet and exercise

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**Semaglutide**

Comments:
- Delay the digestion and absorption of carbohydrates
- Adjunct therapy; used in combination, if at all
- Avoid use in renal dysfunction
- May cause weight gain (~ 4.4 lbs)
- May cause weight gain (~ 4.4 lbs)

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**Diabetes Education**

- Importance of lifestyle changes (diet, exercise, weight loss)
- Importance of regular monitoring (blood sugar levels)
- Importance of continuous glucose monitoring

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**Conclusion**

- The management of diabetes requires a multidisciplinary approach involving healthcare providers, patients, and families.
- Regular follow-up and monitoring are essential to achieve optimal control and prevent complications.
- Lifestyle modifications, nutritional counseling, and physical activity are fundamental in the treatment of diabetes.

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**References**

### Drugs for Diabetes

**GLP-1 and DPP-4 MOA:**

![GLP-1 and DPP-4 MOA Diagram](image)

**Drugs for Diabetes**

- **Sodium Glucose Transporter-2 Inhibitors (SGLT-2 Inhibitors)**
  - **canagliflozin** *(Invokana)*
  - **dapagliflozin** *(Farxiga)*
  - **empagliflozin** *(Jardiance)*
  - **ertugliflozin** *(Steglatro)*
  
  **Comments:**
  - PO meds that lower renal glucose reabsorption, causing increased renal glucose excretion
  - May cause genital yeast infections, UTIs, pancreatitis, renal impairment
  - Increased risk of amputations, diabetic ketoacidosis, kidney injury, bladder cancer, urinary tract infections, lactic acidosis
  - Black box warning: All of these drugs may cause genital yeast infections, UTIs, pancreatitis, renal impairment

### Drugs for Diabetes

- **Dipeptidyl Peptidase-4 Inhibitors (DPP-4 Inhibitors)**
  - **sitagliptin** *(Januvia)*
  - **saxagliptin** *(Onglyza)*
  - **linagliptin** *(Tradjenta)*
  - **alogliptin** *(Symlin)*
  
  **Comments:**
  - Mimics the effects of amylin, which is secreted by the pancreatic beta cells and delays gastric emptying, decreases postprandial glucagon release and modulates appetite
  - If used with insulin or other drugs, consider lowering the dose of insulin or glucagon release
  - PO meds that lower renal glucose excretion
  - Increased risk of ketoacidosis when co-administering with SGLT-2 inhibitors
  - May cause decreased appetite and nausea
  - Can cause severe hypoglycemia
  - PO meds that lower renal glucose excretion
  - Increased risk of ketoacidosis
  - All of these drugs may cause genital yeast infections, UTIs, pancreatitis, renal impairment
  - Increased risk of amputations, diabetic ketoacidosis, kidney injury, bladder cancer, urinary tract infections that lead to blood infections, lactic acidosis
  - Black box warning: All of these drugs may cause genital yeast infections, UTIs, pancreatitis, renal impairment
  - SAFETY warnings: joint pain, decreased appetite, nausea, weight loss is typical.
Bile Acid Sequestrants Comments:
- colesevelam (Welchol)
  - May be safely added in early T2DM
  - May lower BG to a small degree, along
    with favorably impacting the lipid profile
  - Should not be used in patients with high
    triglycerides

Dopamine Agonists Comments:
- bromocriptine (Cycloset)
  - PO medication that is given in a timed
    PO morning dose
  - Causes a minimal effect on blood
    glucose
  - Adverse effects: Orthostatic hypotension
    and syncope

**Targeted Treatments for Hyperglycemia**

**Glycemic Targets:**

<table>
<thead>
<tr>
<th>Category</th>
<th>ADA</th>
<th>AACE/ACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin A1C</td>
<td>&lt; 7.0%</td>
<td>≤ 6.5%</td>
</tr>
<tr>
<td>Pre-prandial glucose</td>
<td>80-130 mg/dL</td>
<td>&lt; 110 mg/dL</td>
</tr>
<tr>
<td>Post-prandial glucose</td>
<td>&lt; 180 mg/dL</td>
<td>&lt; 140 mg/dL</td>
</tr>
</tbody>
</table>

More or less stringent glycemic goals may be appropriate for individual patients. Goals should be individualized based on duration of diabetes, age/life expectancy, comorbid conditions, known CVD or advanced microvascular complications, hypoglycemia unawareness and individual patient considerations.

**ADA Classification of Hypoglycemia**

<table>
<thead>
<tr>
<th>Level</th>
<th>Glycemic Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoglycemia Alert Value</td>
<td>≤ 70 mg/dL</td>
<td>Sufficiently low for treatment with fast-acting carbohydrate and</td>
</tr>
<tr>
<td>(Level 1)</td>
<td></td>
<td>dose adjustment of glucose-lowering therapy</td>
</tr>
<tr>
<td>Clinically significant</td>
<td>&lt; 54 mg/dL</td>
<td>Sufficiently low to indicate serious, clinically important</td>
</tr>
<tr>
<td>hypoglycemia (Level 2)</td>
<td></td>
<td>hypoglycemia</td>
</tr>
<tr>
<td>Severe hypoglycemia</td>
<td>No specific glucose threshold</td>
<td>Hypoglycemia associated with severe cognitive impairment requiring external assistance for recovery</td>
</tr>
<tr>
<td>(Level 3)</td>
<td></td>
<td></td>
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</table>

**Which Drug for Monotherapy?**

- For the patient with A1c of < 7.5%, monotherapy may be initiated with the following drugs in order of preferred use (American Association of Clinical Endocrinologists):
  1) Metformin
  2) GLP-1 Agonist
  3) SGLT-2 Inhibitor
  4) DPP-4 Inhibitor
  5) Alpha-Glucosidase inhibitor
  6) Thiazolidinedione (use with caution)
  7) Sulfonylurea (use with caution)

- If the patient is not at goal in 3 months, proceed to double therapy
For the Patient Needing Dual Therapy

- For the patient whose A1c is > 7.5%, start the patient on Metformin or other first-line agent, PLUS (in order of preferred use):
  1) GLP-1 Receptor agonist
  2) SGLT-2 Inhibitor
  3) DPP-4 Inhibitor
  4) Thiazolidinedione (use with caution)
  5) Basal insulin (use with caution)
  6) Colesevelam
  7) Bromocriptine
  8) Alpha-Glucosidase Inhibitor
  9) Sulfonamide (use with caution)

- If the patient is not at goal in 3 months, proceed to triple therapy

For the Patient Needing Triple Therapy

- Metformin (or other first-line agent) plus second line agent PLUS (in order of preferred use):
  1) GLP-1 Receptor agonist
  2) SGLT-2 inhibitor
  3) TZD (use with caution)
  4) Basal insulin (use with caution)
  5) DPP-4 inhibitor
  6) Colesevelam
  7) Bromocriptine
  8) Alpha-glucosidase inhibitor
  9) Sulfonamide (use with caution)

- If not at goal in three months, proceed to or intensify insulin therapy

Glycemic Targets: Diabetic Hospitalized Patients

<table>
<thead>
<tr>
<th>Target</th>
<th>ADA</th>
<th>AACE/ACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-prandial glucose</td>
<td>140-180 mg/dL</td>
<td>&lt; 140 mg/dL</td>
</tr>
<tr>
<td>Random blood glucose</td>
<td>-</td>
<td>&lt; 180 mg/dL</td>
</tr>
<tr>
<td>Critically Ill Patients:</td>
<td>140-180 mg/dL</td>
<td>140-180 mg/dL</td>
</tr>
</tbody>
</table>

Critically ill patients require an intravenous insulin protocol that has demonstrated efficacy & safety in achieving the desired glucose range without increasing risk for severe hypoglycemia.

Management of Hospitalized Patients

Noncritical Care Setting:
1. Basal insulin or basal plus bolus correction insulin regimen is the preferred treatment
2. Sole use of sliding scale insulin in the inpatient hospital setting is strongly discouraged
3. More stringent glycemic goals (< 140 mg/dL), may be appropriate for selected patients, as long as this can be achieved without significant hypoglycemia

Critical Care Setting:
1. Continuous intravenous insulin infusion has been shown to be the best method for achieving glycemic targets, however, the optimal blood glucose range remains controversial
2. Utilization of a proactive approach is preferable to a reactive administration regimen ("sliding scale" insulin) to treat hyperglycemia

Antibiotics 2018: Are You with the Guidelines?
Sepsis

Did You Know?
# 1 Reason for Hospital Readmissions:

- Antimicrobial Resistance
  - Each year in the US, at least 2 million people acquire serious infections with resistant bacteria
  - At least 23,000 people die each year as a direct result of these antibiotic-resistant infections
  - Infections caused by antibiotic-resistant pathogens are associated with increased costs, morbidity and mortality

STOP Antimicrobial Resistance

1. Does my patient need antibiotics?
2. Have I chosen the most appropriate agent?
3. What is the duration of therapy?
4. Can we transition to an oral antibiotic?
5. Get help from the experts (Infectious Disease MD/NP/Rx)
6. WASH YOUR HANDS

Role of Procalcitonin (PCT)

1. Procalcitonin (PCT): An acute-phase reactant released in response to various cytokines
2. Bacterial infections cause PCT to be produced by almost every organ of the body, resulting in a rapid rise of PCT levels in the blood
3. PCT appears to be a more specific marker for bacterial infections than either CRP or ESR
4. Viral infections very rarely, and not to the same level, cause this increase in PCT blood levels
5. Controlled clinical trials: Support that it can be a valuable tool for the practitioner to help assess mortality risks of patients with infections

General Approach to Managing Infections “P-S-S-P”

1. Establish Presence of Infection
   - Signs & symptoms: Increased (decreased) WBC, fever, infiltrates on chest x-ray, erythema, pus, secretions
2. Establish Severity of Infection
   - Age of patient, immune status, comorbidities
3. Establish Site of Infection
   - Respiratory, skin, blood, IV line, urine
4. Determine Likely Pathogen
   - Based on anatomical site and/or patient factors

Anatomic Sites of Pathogens

- Skin
  - Staphylococcus aureus
  - Group A Streptococcus
  - Diphtheroids

- Mouth
  - Oral anaerobes

- Upper Respiratory Tract
  - Strep throat

- Lower Respiratory Tract
  - Normally sterile
Pharmacology Update for Health Care Providers

**Anatomic Sites of Pathogens**

<table>
<thead>
<tr>
<th>Stomach</th>
<th>Small Intestine</th>
<th>Large Intestine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Streptococcus sp</strong></td>
<td><strong>Lactobacillus</strong></td>
<td><strong>Enterobacteriaceae</strong></td>
</tr>
<tr>
<td><strong>Streptococcus sp</strong></td>
<td><strong>Enterococcus</strong></td>
<td><strong>Pseudomonas sp</strong></td>
</tr>
<tr>
<td><strong>Other anaerobes</strong></td>
<td><strong>Other bacteria</strong></td>
<td><strong>Enterobacteriaceae</strong></td>
</tr>
</tbody>
</table>

**Pharmacology Update for Health Care Providers**

**Patient Case # 1**

67-year-old male with DM presents with significant erythema and swelling of the right foot with purulent discharge from a wound. Labs reveal elevated WBC & ESR. PE: + fever, RLE edema. The patient undergoes I & D of the lesion, and tissue is submitted for culture.

What are we treating?

A. Cellulitis
B. Osteomyelitis
C. Abscess
D. A and C only
E. All of the above

A. All of the above
B. E. piperacillin/tazobactam
C. ciprofloxacin
D. cefepime plus metronidazole plus vancomycin
E. daptomycin

**Patient Case # 2**

A 42-year-old female has an infection of her total knee arthroplasty. She underwent irrigation and debridement of the infected joint with retention of the prosthesis. Intraoperative cultures have grown methicillin-susceptible S. aureus (MSSA). She will be discharged home on outpatient parenteral antibiotic therapy for her infection.

Which one of the following is the best treatment option for this patient?

A. linezolid
B. vancomycin
C. ciprofloxacin
D. cefazolin
E. daptomycin

**Patient Case # 3**

A 75-year-old woman has had two previous episodes of CDI treated with metronidazole. Her previous use of antibiotics was caused by chronic urinary tract infections. Today she presents with chronic diarrhea, low-grade fever (99.8°F [37.6°C]) and abdominal pain. A C. difficile toxin test is ordered.

What should be chosen for the initial management?

A. Oral metronidazole
B. Oral vancomycin
C. Oral vancomycin plus IV metronidazole
D. IV vancomycin plus oral fidaxomicin
E. IV vancomycin plus oral metronidazole
Patient Case # 4

A 45-year-old female presents to an ambulatory care clinic on Tuesday with a nonproductive cough, sore throat, malaise and a temperature of 100.8°F (38.2°C) oral. His medical history is unremarkable. He first noticed symptoms on Saturday.

What is the best option for her management?

A. Oseltamivir 75 mg orally twice daily
B. Zanamivir 10 mg (two inhalations) twice daily
C. Ciprofloxacin 500 mg orally twice daily
D. Live Virus intranasal influenza vaccine
E. Symptomatic care only

A. B. C. D. E.
**Patient Case # 5**

A 55-year-old male c/o a 3-day history of worsening SOB, subjective fevers, chills, right-sided chest pain and productive cough. The patient states symptoms of SOB began approximately 1 week ago. He has been taking acetaminophen and an OTC cough & cold preparation, but feels that his symptoms are getting “much worse.” He admits right-sided pleuritic chest pain & productive cough with rust-colored sputum X 3 days, and feels feverish with chills, although he did not take his temperature. On presentation to the ED, he is febrile and appears visibly short of breath. Your choice?

A. azithromycin plus levofloxacin  
B. vancomycin plus piperacillin/tazobactam  
C. ceftriaxone plus doxycycline  
D. daptomycin plus ciprofloxacin  
E. imipenem plus linezolid

**Evidence-Based Empiric Therapy: PNA**

<table>
<thead>
<tr>
<th>Clinical Setting</th>
<th>Pathogen</th>
<th>Empiric Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous Healthy</td>
<td>P. aeruginosa, H. influenzae</td>
<td>A. ceftazidime or leupizidine + ceftriaxone or cefotaxime or cephalosporin of second or third generation</td>
</tr>
<tr>
<td>Endemic/Medium Risk Area</td>
<td>P. aeruginosa, H. influenzae, M. catarrhalis</td>
<td>A. ceftazidime or leupizidine + ceftriaxone or cefotaxime or cephalosporin of second or third generation</td>
</tr>
<tr>
<td>ICU</td>
<td>P. aeruginosa, H. influenzae, M. catarrhalis</td>
<td>A. ceftazidime or leupizidine + ceftriaxone or cefotaxime or cephalosporin of second or third generation</td>
</tr>
</tbody>
</table>

**Patient Case # 6**

A 78-year-old female was admitted to the hospital 5 days ago for heart failure exacerbation. The patient now c/o severe SOB and a worsening cough with sputum production. RR: 43, HR: 100, BP: 162/95, O2 sat: 87% on 2L NC. The plan is to transfer to the ICU and intubate due to severe fluid overload and worsening respiratory status. Cardiac markers were obtained, given the patient’s symptoms and history of MI. Imaging and blood & sputum cultures were obtained prior to transfer. What is the most appropriate therapy to initiate?

A. tigecycline  
B. vancomycin plus cefepime  
C. ceftriaxone plus linezolid  
D. daptomycin plus aztreonam  
E. eritopen plus linezolid

**Evidence-Based Empiric Therapy: PNA**

<table>
<thead>
<tr>
<th>Clinical Setting</th>
<th>Pathogen</th>
<th>Empiric Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAP or MAg</td>
<td>P. aeruginosa, H. influenzae, MSSA, enteric gram negative bacilli</td>
<td>A. piperacillin/tazobactam or carbapenem or imipenem or meropenem or ertapenem or amikacin or gentamicin or tobramycin or cidofovir</td>
</tr>
<tr>
<td>High risk of mortality IV</td>
<td>P. aeruginosa, H. influenzae, MSSA, enteric gram negative bacilli</td>
<td>A. piperacillin/tazobactam or carbapenem or imipenem or meropenem or ertapenem or amikacin or gentamicin or tobramycin or cidofovir</td>
</tr>
<tr>
<td>Respiratory</td>
<td>P. aeruginosa, H. influenzae, MSSA, enteric gram negative bacilli</td>
<td>A. piperacillin/tazobactam or carbapenem or imipenem or meropenem or ertapenem or amikacin or gentamicin or tobramycin or cidofovir</td>
</tr>
<tr>
<td>Typical PNA</td>
<td>Legionella pneumophila, Mycoplasma pneumoniae</td>
<td>A. ceftriaxone or ceftazidime or amoxicillin/clavulanic acid or amoxicillin or trimethoprim-sulfamethoxazole or tetracycline</td>
</tr>
</tbody>
</table>

**Patient Case # 7**

A 22-year-old female w/ DM and Sickle Cell Disease on your inpatient service is c/o urinary frequency and urgency, dysuria, right flank & abdominal pain. PE is unremarkable except for a T: 101.1 and all labs are currently pending. Allergies: PCN (hives, SOB)

You determine to treat empirically for acute pyelonephritis, the most appropriate agent to initiate is:

A. eritopen  
B. vancomycin  
C. ceftriaxone  
D. levofloxacin  
E. nitrofurantoin

**Evidence-Based Empiric Therapy: UTI**

<table>
<thead>
<tr>
<th>Clinical Setting</th>
<th>Pathogen</th>
<th>Recommended Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Uncomplicated Cystitis</td>
<td>Escherichia coli, Staphylococcus epidermidis</td>
<td>A. nitrofurantoin + trimethoprim-sulfamethoxazole + fosfomycin + tetracycline + doxycycline + trimethoprim-sulfamethoxazole</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>As above</td>
<td>A. amoxicillin/Clavulanate + cephalosporin + trimethoprim-sulfamethoxazole</td>
</tr>
</tbody>
</table>

**Pharmacology Update for Health Care Providers**

Evidence-Based Empiric Therapy: PNA

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<td>Endemic/Medium Risk Area</td>
<td>P. aeruginosa, H. influenzae, M. catarrhalis</td>
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<tr>
<td>ICU</td>
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<tr>
<td>Typical PNA</td>
<td>Legionella pneumophila, Mycoplasma pneumoniae</td>
<td>A. ceftriaxone or ceftazidime or amoxicillin/clavulanic acid or amoxicillin or trimethoprim-sulfamethoxazole or tetracycline</td>
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**Evidence-Based Empiric Therapy: UTI**

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<td>A. nitrofurantoin + trimethoprim-sulfamethoxazole + fosfomycin + tetracycline + doxycycline + trimethoprim-sulfamethoxazole</td>
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<tr>
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<th>Clinical Setting</th>
<th>Pathogen</th>
<th>Recommended Therapy</th>
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</thead>
<tbody>
<tr>
<td>Acute pyelonephritis</td>
<td>E. coli</td>
<td>Fluoroquinolone</td>
</tr>
<tr>
<td>Acute pyelonephritis</td>
<td>Gram-positive bacteria</td>
<td>Amoxicillin or amoxicillin/clavulanic acid</td>
</tr>
<tr>
<td>Complicated</td>
<td>E. coli</td>
<td>Fluoroquinolone</td>
</tr>
<tr>
<td>Complicated</td>
<td>P. mirabilis</td>
<td>Fluoroquinolone</td>
</tr>
<tr>
<td>Complicated</td>
<td>K. pneumoniae</td>
<td>Extended-spectrum PCN plus AMG</td>
</tr>
<tr>
<td>Complicated</td>
<td>P. aeruginosa</td>
<td>Fluoroquinolone or beta-lactam + β-lactamase inhibitor</td>
</tr>
<tr>
<td>Prostatitis</td>
<td>E. coli</td>
<td>Trimethoprim-sulfamethoxazole</td>
</tr>
<tr>
<td>Prostatitis</td>
<td>K. pneumoniae</td>
<td>Fluoroquinolone</td>
</tr>
<tr>
<td>Prostatitis</td>
<td>Proteus spp.</td>
<td>Fluoroquinolone</td>
</tr>
<tr>
<td>Prostatitis</td>
<td>P. aeruginosa</td>
<td>Fluoroquinolone</td>
</tr>
</tbody>
</table>

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**Management Pneumonia**

<table>
<thead>
<tr>
<th>Clinical Setting</th>
<th>Pathogen</th>
<th>Empiric Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outpatient/Community</td>
<td>S. pneumoniae, M. pneumoniae, H. influenzae, C. pneumoniae, M. catarrhalis</td>
<td>Macrolide or tetracycline</td>
</tr>
<tr>
<td>Previous healthy</td>
<td>S. pneumoniae, M. pneumoniae, H. influenzae, C. pneumoniae, M. catarrhalis</td>
<td>Macrolide or tetracycline</td>
</tr>
<tr>
<td>Comorbidities (DM, heart/lung/liver/renal disease &amp; EtOH)</td>
<td>MDR S. pneumoniae</td>
<td>Fluoroquinolone or beta-lactam + β-lactamase inhibitor</td>
</tr>
<tr>
<td>ICU</td>
<td>S. pneumoniae, S. aureus, Legionella, gram-negative bacilli, H. influenzae</td>
<td>β-lactam + macrolide or fluoroquinolone</td>
</tr>
<tr>
<td>IF</td>
<td>P. aeruginosa</td>
<td>Suspected piperacillin/tazobactam or meropenem or cefepime + AMG/azithromycin</td>
</tr>
<tr>
<td>IF MRSA suspected</td>
<td>Above + vancomycin or linezolid</td>
<td></td>
</tr>
<tr>
<td>Viral oseltamivir or zanamivir if &lt;48 hr onset</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Most Commonly Prescribed Drugs in the United States: Clinical Pearls**

**Objectives**

Upon completion of this session, the participant should be able to:

1. Recognize recent developing issues and trends regarding the most commonly prescribed drugs in the United States.
2. Describe relevant options and controversies, warnings, and implications for the management of patients being prescribed the most common drugs in the United States.
3. State at least two strategies to improve clinical practice as a result of heightened awareness of the most commonly prescribed drugs in today’s market.

---

**Major Causes of Death vs. Hospital Admissions in the United States**
Which of these four choices is the most commonly prescribed drug in the United States today?

A. Prednisone  
B. Azithromycin  
C. Metformin  
D. Lisinopril

What are the Most Commonly Prescribed Drugs in the United States?

**Most Commonly Prescribed Drugs**

<table>
<thead>
<tr>
<th>#</th>
<th>Drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Metoprolol (Lopressor)</td>
</tr>
<tr>
<td>2</td>
<td>Furosemide (Lasix)</td>
</tr>
<tr>
<td>3</td>
<td>Hydrochlorothiazide</td>
</tr>
<tr>
<td>4</td>
<td>Zolpidem (Ambien)</td>
</tr>
<tr>
<td>5</td>
<td>Azithromycin (Zithromax)</td>
</tr>
</tbody>
</table>

Causes of Death vs. Hospital Admissions

<table>
<thead>
<tr>
<th>Major Causes of Death</th>
<th>Top Reasons for Hospital Admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td># 1 Heart Disease</td>
<td># 1 Circulatory Disease (MI, CVA)</td>
</tr>
<tr>
<td># 2 Cancer</td>
<td># 2 Respiratory Disease (Asthma, COPD)</td>
</tr>
<tr>
<td># 3 Lower Respiratory Disease</td>
<td># 3 Respiratory Disease (Asthma, COPD)</td>
</tr>
<tr>
<td># 4 Unintentional Injuries (accidents)</td>
<td># 4 MI/Connective Tissue Disorders?</td>
</tr>
<tr>
<td># 5 CVA</td>
<td># 5 Circulatory Disease (MI, CVA)</td>
</tr>
<tr>
<td># 6 Alzheimer’s Disease</td>
<td># 6 Mental Disorders</td>
</tr>
<tr>
<td># 7 Diabetes</td>
<td># 7 Diabetes</td>
</tr>
<tr>
<td># 8 Influenza and Pneumonia</td>
<td># 8 Poisoning/Drug Toxicities</td>
</tr>
<tr>
<td># 9 Kidney Disease</td>
<td># 9 Circulatory Disease?</td>
</tr>
<tr>
<td># 10 Suicide</td>
<td># 10 Poisoning/Drug Toxicities</td>
</tr>
<tr>
<td># 11 Diabetes</td>
<td># 11 Poisoning/Drug Toxicities</td>
</tr>
<tr>
<td># 12 Diabetes</td>
<td># 12 Poisoning/Drug Toxicities</td>
</tr>
<tr>
<td># 13 Diabetes</td>
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</tr>
<tr>
<td># 14 Diabetes</td>
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</tr>
<tr>
<td># 15 Diabetes</td>
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<tr>
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<tr>
<td># 18 Diabetes</td>
<td># 18 Poisoning/Drug Toxicities</td>
</tr>
<tr>
<td># 19 Diabetes</td>
<td># 19 Poisoning/Drug Toxicities</td>
</tr>
<tr>
<td># 20 Diabetes</td>
<td># 20 Poisoning/Drug Toxicities</td>
</tr>
</tbody>
</table>

Which drugs are "top" addressed by:

a. Numbers of prescriptions written (Total? Medicare?)
   OR....

b. Where prescribed? (Inpatient? Outpatient?)
   OR....

c. Numbers of dollars generated by prescriptions
   (Also remember, a drug can go from #1 on one list to #10 on another the day it goes generic)
**Most Commonly Prescribed Drugs**

1. Losartan (Cozaar)
2. Metoprolol ER (Toprol XL)
3. Hydrocodone/Acetaminophen (Lortab)
4. Simvastatin (Zocor)
5. Amlodipine (Norvasc)

**Most Commonly Prescribed Drugs in the U.S.**

1. Atorvastatin
2. Levothyroxine
3. Lisinopril
4. Omeprazole
5. Metformin
6. Amlodipine
7. Simvastatin
8. Hydrocodone/Acetaminophen
9. Metoprolol ER
10. Losartan

**Indications for the Most Commonly Prescribed Drugs**

1. Atorvastatin (Lipitor)
2. Levothyroxine (Synthroid)
3. Lisinopril (Prinivil)
4. Omeprazole (Prilosec)
5. Metformin (Glucophage)

**Most Commonly Prescribed Drugs**

1. Atorvastatin (Lipitor)
2. Levothyroxine (Synthroid)
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**Most Commonly Prescribed Drugs**

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2. Levothyroxine (Synthroid)
3. Lisinopril (Prinivil)
4. Omeprazole (Prilosec)
5. Metformin (Glucophage)
### Most Commonly Prescribed Drugs: Indications

**Cardiovascular**
- Atorvastatin
- Lisinopril
- Amlodipine
- Simvastatin
- Metoprolol ER
- Losartan
- Hydrochlorothiazide
- Furosemide
- Metoprolol

**Gastrointestinal**
- Omeprazole
- Pantoprazole

**Central Nervous System**
- Hydrocodone/APAP
- Zolpidem
- Gabapentin
- Sertraline

**Endocrine**
- Levothyroxine
- Metformin

**Anti-infectives**
- Azithromycin
- Amoxicillin

**Anti-inflammatory**
- Prednisone

---

### How many of the most commonly prescribed drugs target the leading 10 causes of death?

<table>
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<tr>
<th>#</th>
<th>Drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tr>
<tr>
<td>2</td>
<td>Levothyroxine</td>
</tr>
<tr>
<td>3</td>
<td>Lisinopril</td>
</tr>
<tr>
<td>4</td>
<td>Omeprazole</td>
</tr>
<tr>
<td>5</td>
<td>Metformin</td>
</tr>
<tr>
<td>6</td>
<td>Amlodipine</td>
</tr>
<tr>
<td>7</td>
<td>Simvastatin</td>
</tr>
<tr>
<td>8</td>
<td>Hydrocodone/Acetaminophen</td>
</tr>
<tr>
<td>9</td>
<td>Metoprolol ER</td>
</tr>
<tr>
<td>10</td>
<td>Losartan</td>
</tr>
<tr>
<td>11</td>
<td>Azithromycin</td>
</tr>
<tr>
<td>12</td>
<td>Zolpidem</td>
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</tr>
<tr>
<td>14</td>
<td>Furosemide</td>
</tr>
<tr>
<td>15</td>
<td>Metoprolol</td>
</tr>
<tr>
<td>16</td>
<td>Pantoprazole</td>
</tr>
<tr>
<td>17</td>
<td>Gabapentin</td>
</tr>
<tr>
<td>18</td>
<td>Amoxicillin</td>
</tr>
<tr>
<td>19</td>
<td>Prednisone</td>
</tr>
<tr>
<td>20</td>
<td>Sertraline</td>
</tr>
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### Most Commonly Prescribed Drugs in the U.S. Targeting the Leading Causes of Death?

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</table>

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### Most Commonly Prescribed Drugs in the U.S. Targeting the 7 Leading Reasons for Hospital Admissions?

<table>
<thead>
<tr>
<th>#</th>
<th>Drug</th>
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<tbody>
<tr>
<td>1</td>
<td>Atorvastatin</td>
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<tr>
<td>2</td>
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Most Commonly Prescribed Drugs in the U.S.

Targeting the 7 Leading Reasons for Hospital Admissions?

1. Atorvastatin*
2. Levothyroxine
3. Lisinopril*
4. Omeprazole
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20. Sertraline*

A Closer Look:

Clinical Pearls

A. Increased appetite
B. Alopecia
C. Weight loss
D. Rash

Levothyroxine

Agent: levothyroxine (T4) (Levotroid, Synthroid)
MOA: Activation of nuclear receptors results in gene expression with RNA formation and protein synthesis
Indication: Hypothyroidism
Comments:
- Agent of choice due to stability, low cost, lack of allergic foreign protein, easy lab measurement of levels, and once-daily dosing
- Maximum effect seen after 6-8 weeks of therapy
- Not appropriate for treatment of obesity
- Toxicity: Symptoms of thyroid excess

GERD: Clinical Pearls

Your patient has hypothyroidism and is started on levothyroxine. Which of these would you not include in patient teaching about initial common side effects, as this complaint is most unlikely?

A. Increased appetite
B. Alopecia
C. Weight loss
D. Rash

A. B. C. D.
Nonpharmacologic Measures to Treat GERD

1. Lose weight (if overweight)
2. Stop smoking
3. Avoid alcohol, chocolate, citrus juice, and tomato-based products, peppermint, coffee, and possibly the onion family
4. Eat small, frequent meals rather than large meals
5. Wait 3 hours after a meal to lie down
6. Refrain from ingesting food (except liquids) within 3 hours of bedtime
7. Elevate the head of the bed 8 inches
8. Avoid bending or stooping positions

Pharmacology Update for Health Care Providers

Antacids

- Antacids are most effective for mild GERD
- Remember: Do not decrease the amount of gastric acid
- These should be taken after each meal and at bedtime
- Be mindful of other medications – do not take these concurrently
- These should be avoided with long term use

Medication Classes for GERD

1. H2 receptor antagonists (ranitidine, cimetidine, famotidine, nizatidine)
2. Proton pump inhibitors (omeprazole, lansoprazole, rabeprazole, esomeprazole, pantoprazole)
3. Prokinetic agents
4. Antacids (aluminum hydroxide, magnesium hydroxide)

Drugs for GERD

H2 Receptor Antagonists

- cimetidine (Tagamet)
- famotidine (Pepcid)
- nizatidine (Axid)
- ranitidine (Zantac)

Comments:

- Bind to the H2 receptor and cause a decrease in acid secretion, gastric volume
- First line therapy for mild to moderate symptoms and grade I-II esophagitis
- Will heal mild esophagitis in 70-80% of patients and will prevent relapse
- Useful in Barrett’s esophagus for nocturnal acid breakthrough
- Use with caution in renal insufficiency

Drugs for GERD

Prokinetic Agents and Reflux Inhibitors

- metoclopramide (Reglan)

Comments:

- Long-term use is not recommended (fatal outcomes)
- BBW: Tardive dyskinesia depending on long term use
Most Commonly Prescribed Drugs
Clinical Pearls:
FDA Safety and Black Box Warnings

How many of the most commonly prescribed drugs have FDA Safety or Black Box Warnings?

Most Commonly Prescribed Drugs in the U.S.

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#2 Levothyroxine
#3 Lisinopril
#4 Omeprazole
#5 Metformin
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#7 Simvastatin
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#13 Hydrochlorothiazide
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Most Prescribed Drugs:
Safety and Black Box Warnings*

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Most Prescribed Drugs:
Safety and Black Box Warnings

#1 Atorvastatin
#2 Levothyroxine
#3 Lisinopril
#4 Omeprazole
#5 Metformin

SW: Safety Warning
BBW: Black Box Warning

#1 Atorvastatin
SW: Increase risk of myopathy during treatment with drugs in this class with concurrent administration of:
cyclosporine, fibrin acid derivatives, erythromycin, clarithromycin, the hepatitis C protease inhibitor telaprevir, combinations of HIV protease inhibitors, including saquinavir plus ritonavir, lopinavir plus ritonavir, tipranavir plus ritonavir, darunavir plus ritonavir, osamiprevir, and fosamprenavir plus ritonavir, niacin, or azole antifungals

#2-Levothyroxine
BBW: Ineffective and potentially toxic for weight reduction; high doses may cause toxic effects with other anorectic drugs; watch in CV disease

#3 Lisinopril
BBW: Contraindicated in pregnancy (can cause injury to the developing fetus in the 2nd and 3rd trimester)
SW: Risk of angioedema

#4 Omeprazole
BBW: Increased risk of hip fracture
SW: Increased risk of chronic kidney disease; (though not SW: dementia)
Beers Criteria: Avoid scheduled use of PPIs for longer than 8 weeks in older adults due to risk of Clostridium difficile infection

#5 Metformin
BBW: Lactic acidosis risk
#7 Simvastatin  
SW: Increase risk of myopathy during treatment with drugs in this class with concurrent administration of other drugs (see Atorvastatin)  
#8 Hydrocodone/Acetaminophen  
BBW: Risk of abuse, addiction, overdose and death; respiratory suppression  
#9 Metoprolol ER and #15 Metoprolol  
BBW: Do not discontinue abruptly due to potential tachycardia, HTN, and ischemia  
#10 Losartan  
BBW: Contraindicated in pregnancy  
SW: Risk of angioedema  
#11 Azithromycin  
SW: Increased risk for fatal dysrhythmias

Aligning Money and Prescriptions 2018

1. Top prescribed drugs are not necessarily the top revenue-generating drugs  
2. New drugs tend to be the most expensive  
3. Demand often drives drug costs  
4. Niche drugs are very, very expensive  
5. Until a drug goes off patent, the price is typically fixed and as high as the market will allow  
6. Top revenue-generating drugs include....

Top Revenue Generating Drugs by SALES

<table>
<thead>
<tr>
<th>Generic</th>
<th>Trade</th>
<th>Uses</th>
<th>Sales in $</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Adalimumab</td>
<td>Orencia</td>
<td>Eczema, inflammatory, arthritis, Crohn’s</td>
<td>$15.7 B</td>
</tr>
</tbody>
</table>
| #2 Ledipasen/  
  Belotuzumab |     | Hepatitis C               | $11.6 B   |
| #3 Rituximab     |     | Non-Hodgkin’s lymphoma, CLL, combination with methotrexate for RA | $7.3 B   |
| #4 Belotuzumab   |     | Metastatic: colon CA, non- squamous cell lung CA, platinum-resistant ovarian CA, cervical CA, recurrent glioblastomas | $7.0 B   |
| #5 Insulin glargine | Lantus | Diabetes                  | $6.9 B   |
| #6 Trastuzumab   | Herceptin      | HER2/neu positive breast CA, stomach and esophageal CA | $5.8 B   |
| #7 Lenalidomide  | Revlimid       | Multiple myeloma, mantle cell lymphoma | $6.7 B   |
| #8 Pneumococcal/  
  13-valent  
  polysaccharide  
  vaccine     |     | Pneumococcal diseases | $6.1 B   |
| #9 Rituximab     |     | RA, psoriatic arthritis, plaque psoriasis, ulcerative colitis, Crohn’s, erythema nodosum | $5.8 B   |
| #10 Fluocinonide/ 
  sodium      |     | Asthma                    | $5.0 B   |
| #11 Infliximab   | Remicade       | RA, ankylosing spondylitis, Crohn’s, ulcerative colitis, ulcerative stomatitis | $5.8 B   |
| #12 Zolpidem     |     | Risk of amnesia leading to sleep driving and sleep walking | $5.8 B   |
| #13 Furosemide   |     | In excessive doses, may cause profound diuresis and electrolyte disturbances | $5.8 B   |
| #14 Pantoprazole |     | Increased risk of chronic kidney disease; (though not SW: dementia) | $5.8 B   |
| #15 Sertraline   |     | Risk of serotonin syndrome | $5.8 B   |
**Drugs That Generate Revenue:**

$5/10 are biologics

**Consensus?**

1. 5/10 are biologics
   - a. Modulate the immune response to cancers or inflammation
   - b. Often dosed as injectables, adding to cost
   - c. Life-threatening anaphylaxis may be an adverse effect (the patient may require monitoring when the drug is injected)
   - d. Additional Adverse Effects: Emergence of rare cancers or infections due to effects on the immune system

2. Other drugs to treat:
   - a. Hepatitis C, diabetes, anemia in myelodysplastic syndrome, pneumococcal disease, and asthma
   - b. Often dosed as injectables, adding to cost
   - c. Life-threatening anaphylaxis may be an adverse effect (the patient may require monitoring when the drug is injected)
   - d. Additional Adverse Effects: Emergence of rare cancers or infections due to effects on the immune system

**References?**


Barr, J., Fraser, G. L., Puntillo, K., Ely, E. W., Gélinas, C., Dasta, J. F., ... Jasschke, R. Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit. Critical Care Medicine, 41(1), 263–286. doi:10.1097/CCM.0b013e3182783672


References


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~ THANK YOU ~

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