New Drug Update
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WSPA New Drugs New Laws
Seattle
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Disclosure: No Conflicts of Interest

Objectives
At the completion of this presentation, the pharmacist will be able to:
• Describe indications, pharmacology, adverse effects, and dosing of new drugs and dosage forms recently or soon to be approved by the FDA.
• Discuss key counseling and monitoring issues for the new drugs and the role these products may play in the participant’s practice.
• Compare the new drugs against existing agents.
• Identify products approved with REMS, and describe the role of the pharmacist in the strategy

And the technician will be able to:
• Recognize new drugs and dosage forms recently or soon to be approved by the FDA.
• Describe indications and dosing of the new products.
• Compare the new drugs against existing agents.
New Drugs Approved in 2016

22 novel drugs
- 8 First-in class
- 9 Orphan Drugs
- 8 Fast Track
- 7 Breakthrough
- 15 Priority Review
- 6 Accelerated
- 21 First cycle
- 19 U.S. first

So far in 2017: 12 new molecular entities

Lixisenatide Injection
(Adlyxin, sanofi-aventis)

- Approved July 27, 2016

- Adjunct to diet and exercise to improve glycemic control in adults with type 2 diabetes mellitus

- Glucagon-like peptide-1 (GLP-1) receptor agonist
Lixisenatide...
- Efficacy when added to metformin:
- Noninferiority established vs exenatide twice daily for HbA1c reduction (-0.79% with lixisenatide vs -0.96% with exenatide)
  - Less weight loss (-2.96 kg vs -3.98 kg)
  - Less nausea (24.5% vs 35.1%, P<0.05)
  - Less hypoglycemia (2.5% vs 7.9%, P<0.05)
- Less effective than liraglutide for HbA1c reduction when added to metformin (-1.21% vs -1.83%, P<0.0001)
  - Fewer achieved goal (HbA1c < 7%): 45.5% vs 74.2% (P<0.0001)
  - No difference in weight loss (-3.67 kg and -4.26 kg)
  - No difference in nausea (21.8% for both)

Diabetes Care. 2013;36:2945-51; EASD 2015 Presentation Abstract 75

Lixisenatide...
- Contraindications
  - Hypersensitivity
- Cautions
  - Pancreatitis
  - Acute kidney injury
  - Hypoglycemia with insulin secretagogues
  - Gastroparesis
  - Injection site reactions
- Common ADRs: nausea (25%), vomiting (10%), headache (9%), diarrhea (8%), dizziness (7%)
Lixisenatide...

- Dosing
  - 10 mcg subcutaneously once daily x 14 days
  - Abdomen, thigh or upper arm 1 hour before 1st meal of the day
  - 20 mcg subcutaneously once daily from day 15 on
- Starter pack: one 10 mcg/dose pen and one 20 mcg/dose pen
- Maintenance pack: two 20 mcg/dose pens
- Store in refrigerator prior to first use; up to 14 days at room temperature

Basal Insulin/GLP-1 Agonist Combinations

- Insulin degludec/liraglutide (Xultophy, Novo Nordisk)
  - Approved November 21, 2016
- Insulin glargine/lixisenatide (Soliqua 100/33, Sanofi-Aventis)
  - Approved November 21, 2016
- Versus individual components
  - Greater reduction in HbA1c (1.6-1.9%)
  - More patients achieve goal
  - Less weight loss than GLP-1 agonist alone, but more than with insulin
  - Less nausea than with GLP-1 alone, but more than with insulin
  - Less hypoglycemia than with insulin alone, but more than with GLP-1 agonist

Diabetes pending

• Exenatide implantable mini-pump – continuous subcutaneous
  – ITCA 650, Intarcia Therapeutics
  – FDA action date: 4th quarter 2017
• Semaglutide (NovoNordisk)
  – GLP-1 analog administered once weekly
  – FDA action date: 4th quarter 2017
• Ertugliflozin (Merck/Pfizer)
  – SGLT-2 inhibitor administered once daily
  – Single-agent, combo sitagliptin, combo metformin
  – FDA action date: 4th quarter 2017

Betrixaban
(Portola)

• FDA action date: June 24, 2017

• Extended prophylaxis of venous thromboembolism in acute medically ill patients with risk factors for VTE

• Factor Xa inhibitor
• Oral, once daily

Andexanet alfa
(*AndexXa, Portola/Bayer*)

- FDA complete response August 17, 2016
- Needed for approval:
  - Additional manufacturing info
  - Data to support use in edoxaban and enoxaparin in label
  - Finalized post-marketing commitments
- Anticipated indication: acute reversal of apixaban and rivaroxaban (and possibly edoxaban and enoxaparin)
- Recombinant protein derived from human coagulation factor X
  - Decoy – strong affinity for direct factor Xa inhibitors
  - Binds anticoagulant and prevents it from binding factor Xa
  - Allows factor X to remain in coagulation cascade and stimulate hemostasis

Sodium zirconium cyclosilicate
(*Lokelma, ZS Pharma*)

- FDA action date: ?
  - Complete Response May 26, 2016 – manufacturing issues
  - Resubmitted, complete response 3/20/17 – manufacturing issues
- Treatment of hyperkalemia
- Non-absorbed, potassium-binding, inorganic cation exchange compound
  - Reductions within 1 hour, with normalization within 48 hours
  - Maintained normokalemia with daily administration

Formoterol fumarate/Glycopyrrolate  
*Bevespi Aerosphere, AstraZeneca*

- Approved April 25, 2016
- Long-term maintenance treatment of airflow obstruction in patients with chronic obstructive pulmonary disease (COPD)
- Long-acting beta-agonist (LABA)/anticholinergic (LAMA)
- Inhalation aerosol: 4.8 mcg formoterol/9 mcg glycopyrrolate
- Two inhalations twice daily

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**Additional inhalation products**

- Fluticasone propionate inh powder (*ArmonAir RespiClick, Teva*)
- Fluticasone propionate/salmeterol inh powder (*AirDuo RespiClick, Teva*)
  - Asthma
  - Approved January 30, 2017
- Nebulized glycopyrrolate (Sunovion)
  - COPD
  - FDA action date: May 19, 2017
- Fluticasone furoate/umeclidinium/vilanterol (GSK)
  - Once daily inhalation for COPD
  - FDA action anticipated: 4th quarter 2017
Dust mite allergen extract (Odactra, Merck)

- Approved March 1, 2017
- Treatment of house dust mite-induced allergic rhinitis +/- conjunctivitis in adults 18-65 years of age
- Allergen extract (Dermatophagoides farina & D. pteronyssinus)
- Sublingual immunotherapy once daily
- 16-18% reduction in symptoms and need for medication compared with placebo

Abaloparatide (Radius Health)

- FDA action date: June 30, 2017
- Postmenopausal osteoporosis
- Activates parathyroid hormone type 1 receptor
- Subcutaneous injection daily
- Reduced vertebral and nonvertebral fractures vs placebo
  - Less hypercalcemia than teripаратide
- Also being developed as transdermal patch

_JAMA_. 2016;316:722-33
Romosozumab  
(UCB/Amgen)
- FDA action date: July 19, 2017
- Postmenopausal osteoporosis
- Monoclonal antibody that binds sclerostin, increasing bone formation and decreasing bone resorption
- Subcutaneous injection monthly
- Reduced vertebral fractures vs placebo

*Note: NOT FDA APPROVED*

Bezlotoxumab  
(Zinplava, Merck)
- Approved October 23, 2016
- Reduce recurrence of *Clostridium difficile* infection in adults receiving antibacterial treatment for *C. difficile* infection and are at high risk for recurrence
- Monoclonal antibody that binds to *C. difficile* toxin B
- Neutralizes its effect

*Note: CDC. “Antimicrobial resistance: urgent threats”*
Bezlotoxumab...

- Administered in conjunction with antibiotics for C. difficile
- Recurrence reduced with bezlotoxumab
  - 17% vs 28% with placebo MODIFY 1
  - 16% vs 26% with placebo MODIFY 2

_N Engl J Med. 2017;376:305-17_

Bezlotoxumab...

- Contraindications: none in labeling
- Warnings: heart failure
- ADRs: nausea, pyrexia, headache
- Dose: 10 mg/kg IV as an infusion over 60 minutes
  - Administer as diluted solution via central or peripheral line
  - Low-protein binding 0.2 to 5 micron in-line or add-on filter
Herpes zoster subunit vaccine (HZ/su) (GlaxoSmithKline)

- FDA action date: 3rd quarter 2017
- Prevention of herpes zoster and postherpetic neuralgia
- Herpes zoster vaccine combining VZV glycoproteinE with adjuvant AS01B
- Subjects 50 years and older: risk of herpes zoster 97.2% lower than with placebo
- Subjects 70 years and older: risk of herpes zoster 91.3% lower than with placebo; risk of postherpetic neuralgia 88.8% lower


Sofosbuvir/Velpatasvir (*Epclusa*, Gilead)

- Approved June 28, 2016
- Treatment of adult patients with chronic hepatitis C virus genotype 1, 2, 3, 4, 5 or 6 infection
  - Without cirrhosis or with compensated cirrhosis
  - With decompensated cirrhosis with ribavirin
  - Guidelines: among preferred regimens for all 6 genotypes, the only preferred regimen for genotype 2
- Sofosbuvir is an HCV NS5B RNA-dependent RNA polymerase inhibitor
- Velpatasvir is an HCV NS5A inhibitor
- Dose: 1 tablet (400 mg sofosbuvir/100 mg velpatasvir) once daily with or without food x 12 weeks

Hepatitis C Online ([www.hepatitisc.uw.edu](http://www.hepatitisc.uw.edu)); AASLD & IDSA HCV Guidance ([www.hcvguidelines.org](http://www.hcvguidelines.org))
Sofosbuvir/Velpatasvir...

• Efficacy assessed in genotypes 1-6
• SVR12 rates – overall 99% (vs 0% with placebo)
  – Genotype 1a: 98%
  – Genotype 1b: 99%
  – Genotype 2: 100%
  – Genotype 3: 95%
  – Genotype 4: 100%
  – Genotype 5: 97%
  – Genotype 6: 100%
  – Patients with cirrhosis: 99%
  – Patients with decompensated cirrhosis (with ribavirin): 94%


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Sofosbuvir/Velpatasvir...

• Contraindications
  – Ribavirin contraindications if coadministered
• Warnings
  – Amiodarone - bradycardia
• Adverse reactions: headache and fatigue
• Drug Interactions
  – P-gp inducers and/or moderate CYP inducers – not recommended
  – Acid reducing agents – separate or avoid altogether
  – Monitor digoxin
  – Atorvastatin & rosuvastatin – monitor – may increase statin levels
Hepatitis C Antivirals

- Glecaprevir/pibrentasvir (AbbVie)
  - HCV genotypes 1-6
  - FDA action date: June 19, 2017
- Sofosbuvir/velpatasvir/voxilaprevir (Gilead)
  - HCV genotypes 1-6
  - FDA action: 4th quarter 2017

Meropenem/Vaborbactam
(\textit{Carbavance}, The Medicines Company)

- FDA action date: August 2017
- Complicated urinary tract infections
- Carbapenem antibiotic + beta-lactamase inhibitor
- Gram-negative infections including carbapenem-resistant \textit{Enterobacteriaceae}
- Treatment success 98.4% with M/V vs 94% with piperacillin/tazobactam (P<0.05) in cUTIs

\textit{Open Forum Infect Dis. 2016;3(suppl. 1):LB-7.}
Delafloxacin
(*Baxdela, Ligand/Melinta*)

- FDA action date: June 19, 2017

- Acute bacterial skin and skin structure infections
  - Also studying for community and hospital-acquired pneumonia, complicated intraabdominal infections, complicated urinary tract infections

- Fluoroquinolone antibiotic – IV and PO
  - Potent in vitro activity: MSSA, MRSA, *S. pneumoniae*, viridans group streptococci, β-hemolytic streptococci
  - Noninferior to vancomycin + aztreonam in ABSSSI

Bezlotoxumab is administered at a dose of:

a. 10 mg/kg IV every 6 hours x 4 doses
b. 10 mg/kg IV over 60 minutes as a single dose
c. 10 mcg subcutaneously once daily
d. 10 mg orally once daily for 12 weeks
Sofosbuvir/velpatasvir is indicated for the:

a. Treatment of complicated urinary tract infections  
b. Treatment of acute bacterial skin and skin structure infections  
c. Treatment of HCV genotypes 1-6  
d. Prevention of recurrence of C. difficile infection

Lifitegrast 5% Ophthalmic Solution  
(*Xiidra*, Shire)  
- Approved July 11, 2016  
- Treatment of the signs and symptoms of dry eye disease  
- Lymphocyte function-associated antigen-1 (LFA-1) antagonist  
  – Interrupts T-cell mediated inflammation on the ocular surface and lacrimal ducts  
- ADRs: eye irritation, unpleasant taste, reduced visual acuity  
- Dose: 1 drop into each eye twice daily  
- Single-use foil pouch (dose both eyes & discard)
Crisaborole Ointment 2%  
(*Eucrisa*, Pfizer)

• Approved December 14, 2016

• Mild to moderate atopic dermatitis  
  – Patients 2 years and older

• Non-steroidal topical PDE4 inhibitor

Crisaborole...

• Efficacy: rated clear or almost clear  
  – 32.8% vs 25.4% with vehicle Trial 1  
  – 31.4% vs 18% with vehicle Trial 2

• Contraindications: hypersensitivity
• Warnings: hypersensitivity
• ADRs: application site pain (4%)

• Dose: apply thin layer twice daily
Dupilumab
(Dupixent, Sanofi)
• Approved March 28, 2017
• Adults patients with moderate to severe atopic dermatitis not adequately controlled with topical therapies
  — Used with or without topical corticosteroids
  — Also undergoing study in asthma and hives
• Monoclonal antibody against interleukin-4 receptor alpha
• Efficacy: clear or almost clear
  — 38% every other week, 37% weekly vs 10% placebo – SOLO1
  — 36% every other week, 36% weekly vs 8% placebo – SOLO2


Dupilumab...
• Contraindication: hypersensitivity
• Warnings:
  — Hypersensitivity
  — Conjunctivitis and keratitis
  — Comorbid asthma
  — Avoid live vaccines
• ADRs: injection site reactions, conjunctivitis, blepharitis, oral herpes, keratitis, eye pruritus, other HSV infections, dry eye
• Subcutaneous injection 600 mg initially, followed by 300 mg every other week
Brodalumab
(*Siliq*, Valeant)

- Approved February 15, 2017

- Treatment of moderate to severe plaque psoriasis
  - Adult patients
  - Failed or lost response to at least one systemic therapy

- Interleukin-17 receptor A (IL-17RA) antagonist

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Brodalumab...

- Efficacy studies vs ustekinumab

<table>
<thead>
<tr>
<th>Endpoints</th>
<th>Trial 1</th>
<th>Trial 2</th>
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<tbody>
<tr>
<td></td>
<td>Brodalumab (n=612)</td>
<td>Ustekinumab (n=300)</td>
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<tr>
<td>PASI75 response</td>
<td>86%</td>
<td>70%</td>
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<tr>
<td>PASI100 response</td>
<td>44%</td>
<td>22%</td>
</tr>
<tr>
<td>sPGA success clear or almost clear</td>
<td>79%</td>
<td>61%</td>
</tr>
</tbody>
</table>

*N Engl J Med. 2015;373:1318-28*
Brodalumab...

• Contraindications
  – Crohn’s disease

• Warnings
  – Suicidal ideation – REMS program
  – Infections
  – TB testing prior
  – Avoid live vaccines

• Common ADRs (>2%): arthralgia, headache, fatigue, diarrhea

Brodalumab...

• Dose: 210 mg subcutaneously at weeks 0, 1, and 2
• Then 210 mg every 2 weeks
• Discontinue if inadequate response at 12-16 weeks

• REMS – limited distribution program
  – Prescribers and pharmacies must be certified
  – Patients must sign agreement
Guselkumab (Janssen)

- FDA action date: July 14, 2017
- Psoriasis and rheumatoid arthritis
- Anti-interleukin-23 monoclonal antibody
- Psoriasis studies:
  - PASI90 at week 16 73% vs 50% adalimumab & 3% placebo – VOYAGE1
  - PASI90 at week 16 70% vs 47% adalimumab & 2% placebo – VOYAGE2
    - Among adalimumab nonresponders, 66% achieved PASI90 upon switch to guselkumab


Baricitinib (Lilly)

- FDA action date: April 19, 2017
- Rheumatoid arthritis
- Janus kinase (JAK1 and JAK2) inhibitor
- Superior to adalimumab in patients with inadequate response to methotrexate
  - ACR20 response 70% vs 61% (95% CI difference 2-15%)

### Biosimilars

“a biological product that is approved based on a showing that it is highly similar to an FDA-approved biological product, known as a reference product, and has no clinically meaningful differences in terms of safety and effectiveness from the reference product.”

- **Infliximab-dyyb** *(Inflectra, Celltrion)*
  - Biosimilar to Remicade
- **Etanercept-szzs** *(Erelzi, Sandoz)*
  - Biosimilar to Enbrel
- **Adalimumab-atto** *(Amjevita, Amgen)*
  - Biosimilar to Humira


### Pain Meds – New formulations

- **Pain Medications**
  - Abuse deterrent formulations
    - Oxycodone extended-release *(Xtampza ER, Collegium)*
    - Oxycodone/naltrexone extended-release *(Troxyca ER, Pfizer)*
    - Hydrocodone bitartrate extended-release *(Vantrela ER, Teva)*
    - Morphine sulfate extended-release *(Arymo ER, Egalet)*
    - Benzhydrocodone/acetaminophen IR *(Apadaz, KemPharma)* – pending?
    - Oxycodone long-acting *(Remoxy, King)* – pending – more studies needed
    - Oxycodone extended-release *(Rexista XR, IntelliPharmaCeutics)* - pending
  - Sufentanil sublingual *(Dsuvia?, AcelRx)* - pending
- **Dependence**
  - Buprenorphine implants *(Prophurbine, Braeburn)*
Methylnaltrexone bromide oral 
(*Relistor*, Valeant)

- Approved July 19, 2016
- Alternative to injectable methylnaltrexone or oral naloxegol
- Treatment of opioid-induced constipation
- Peripherally-acting opioid-receptor antagonist
- Response rate: 52% vs 38% with placebo
- 450 mg (three 150 mg tablets) once daily at least 30 minutes before the first meal of the day

Naldemedine

(*Symproic*, Shionogi/Purdue)

- Approved March 23, 2017
- Treatment of opioid-induced constipation in adults with non-cancer pain
- Peripherally-acting opioid-receptor antagonist
- Dose 0.2 mg (1 tablet) once daily
- CII due to structural similarity to naltrexone – requested descheduling
- Response rates: 48-53% vs 34-35% with placebo
Plecanatide
(Trulance, Synergy Pharmaceuticals)

- Approved January 19, 2017
- Treatment of chronic idiopathic constipation
  - Adults only
- Submitted for approval for irritable bowel syndrome with constipation in March
- Guanylate cyclase-C agonist
- Elevates intracellular cGMP → stimulates secretion of chloride and bicarbonate into intestinal lumen → increased intestinal fluid and accelerated transit
- Same mechanism as linaclotide

Plecanatide...

- Contraindications
  - Patients less than 6 years of age – serious dehydration risk
  - Gastrointestinal obstruction
- Warnings
  - Diarrhea
  - Avoid use in patients 6 to 18 years of age
- ADR: diarrhea (6%)
- Dose: 3 mg tablet once daily
  - Can be crushed and administered with applesauce or water
Obeticholic acid
(*Ocaliva*, Intercept Pharmaceuticals)

- Approved May 31, 2016

- Primary biliary cholangitis in combination with ursodiol in adults with inadequate response to ursodiol, or as monotherapy in adults unable to tolerate ursodiol

- Farnesoid X receptor agonist – reduces hepatocyte bile acid levels
- Dose: 5-10 mg orally once daily
- Severe pruritus – add bile acid resin or antihistamine, reduce dose

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**Lifitegrast is most likely to be compared with:**

a. Lineclotide
b. Cyclosporine
c. Crisaborole
d. Delafloxacin
Which of the following is available as a topical agent for eczema?

a. Dupilumab  
b. Plecanatide  
c. Baricitinib  
d. Crisaborole

Daclizumab injection  
(Zinbryta, Biogen)

• Approved May 27, 2016

• Treatment of relapsing forms of multiple sclerosis  
• Reserved for patients with an inadequate response to two or more drugs for MS

• Interleukin-2 receptor blocking antibody  
• Inhibits activation and proliferation of T cells
Daclizumab...

• Efficacy in relapsing-remitting MS:
  – Annualized relapse rate: 0.21 vs 0.46 with placebo
  – Annualized relapse rate: 0.22 vs 0.39 with interferon beta-1a

• Dose: 150 mg subcutaneously once monthly
  – Thigh, abdomen, back of upper arm

• Stored in refrigerator
  – Allow to warm to room temperature before administration


Daclizumab...

• Contraindications
  – Pre-existing hepatic disease or impairment
  – History of autoimmune hepatitis
  – Hypersensitivity

• Warnings
  – Hepatic injury & immune-mediated disorders – Boxed Warning
  – Severe liver injury – monitor transaminase and bilirubin monthly
  – Infection
  – Acute hypersensitivity reactions
  – Depression and suicidal ideation

• Common ADRs: nasopharyngitis, upper respiratory tract infection, rash, fever, influenza-like illness, elevated liver enzymes

• REMS: prescribers and pharmacies must be certified, patients must be enrolled
  – Comply with ongoing monitoring
Ocrelizumab infusion
(*Ocrevus*, Genentech)

- Approved March 28, 2017
- Relapsing MS
- Primary progressive MS
- Anti-CD20 monoclonal antibody

Ocrelizumab...

- Relapsing MS
  - Relapse rate reduced 46-47% vs interferon beta
  - Annualized relapse rate: 0.16 vs 0.29
  - Relapse free at 1 year: 83% with ocrelizumab vs 71% with interferon beta-1a (NNT 9)
  - Disability progression: 9.8% with ocrelizumab vs 15.2% with interferon beta-1a (NNT 19)
- Progressive MS
  - Disability progression: 32.9% with ocrelizumab vs 39.3% with placebo (NNT 16)
  - Reduction in T2 lesions to week 120 vs increase in placebo group

Ocrelizumab...

- **Contraindications:**
  - Active hepatitis B infection
  - History of life-threatening reaction to ocrelizumab
- **Warnings:**
  - Infusion reactions in 34-40% of patients
  - Infections
  - Malignancies
  - Avoid live vaccines
  - May cause fetal harm
- **ADRs:** upper and lower respiratory tract infections, infusion reactions, skin infections

Ocrelizumab...

- Screen for hepatitis B before first dose
- Premedicate with methylprednisolone & antihistamine
  - Consider also giving acetaminophen
- Assess for active infections
- Initial dose: 300 mg IV as infusion followed by 300 mg 2 weeks later
- Subsequent doses: 600 mg IV infusion every 6 months
- Monitor during and for at least 1 hour after infusion
  - Interrupt infusion for severe reactions; reduce rate for mild to moderate reactions
  - Permanently discontinue for life-threatening or disabling reactions
Safinamide
(*Xadago*, Newron Pharmaceuticals)

- Approved March 21, 2017
- Adjunctive treatment for patients with Parkinson’s disease who experience “off” episodes while taking levodopa/carbidopa
- Selective monoamine oxidase B inhibitor – increases dopamine levels
- Efficacy: “on” time without troublesome dyskinesia increased 1.42 hrs with safinamide vs 0.57 hrs with placebo (baseline 9 hrs)
- No head-to-head comparisons with rasagiline or selegiline

*JAMA Neurol.* 2017;74:216-24

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Safinamide...

- Contraindications
  - Other inhibitors of monoamine oxidase – hypertensive crisis risk
  - Opioids, serotonin-norepinephrine reuptake inhibitors, tri- or tetracyclic antidepressants, cyclobenzaprine, methylphenidate, amphetamine, St. John’s wort – serotonin syndrome risk
  - Dextromethorphan – psychosis risk
  - Hypersensitivity
  - Severe hepatic impairment (Child-Pugh C)
Safinamide...

• Warnings
  – Hypertension
  – Tyramine-containing foods
  – Serotonin syndrome
  – Falling asleep during activities of daily living
  – Dyskinesias – consider levodopa dose reduction
  – Hallucinations and psychotic behavior
  – Impulse control and compulsive behaviors
  – Withdrawal-emergent hyperpyrexia and confusion
  – Retinal pathology

Safinamide...

• ADRs: dyskinesia, falls, nausea, insomnia

• Dose: 50 mg orally once daily
  – May increase to 100 mg daily after two weeks
  – Taper 100 mg dose to 50 mg for one week before stopping
  – Max dose 50 mg in moderate hepatic impairment
Pimavanserin
(*Nuplazid, Acadia*)

- Approved April 30, 2016
- Hallucinations and delusions in Parkinson’s disease
- Antipsychotic – selective serotonin 2A inverse agonist
- Class warning – avoid use in dementia-related psychosis
- QT prolongation
- Minimal worsening of dyskinesia

Deutetrabenazine
(*Teva*)

- FDA Action Date: April 3, 2017 for Huntington’s chorea
- Also August 30, 2017 for tardive dyskinesia
- Huntington’s chorea
- Moderate to severe tardive dyskinesia
- Tics associated with Tourette
- Selective inhibitor of vesicular monoamine transporter 2 (VMAT2) that depletes dopamine in the CNS
- Form of tetrabenazine with prolonged half-life and lower daily dose
**Valbenazine**  
(Ingrezza, Neurocrine Biosciences)  
- FDA action date: April 11, 2017  
- Tardive dyskinesia  
- VMAT2 inhibitor

<table>
<thead>
<tr>
<th>Nusinersen</th>
<th>Spinraza, Biogen</th>
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<tbody>
<tr>
<td>Approved</td>
<td>December 23, 2016</td>
</tr>
<tr>
<td></td>
<td>Spinal muscular atrophy in pediatric and adult patients</td>
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<tr>
<td></td>
<td>Survival motor neuron-2 (SMN2)-directed antisense oligonucleotide that increases production of normal SMN protein</td>
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<td>Administered intrathecally</td>
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<td>Improves muscle and motor function</td>
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Eteplirsen injection  
(*Exondys 51, Sarepta*)

- Approved September 19, 2016
- Treatment of Duchenne muscular dystrophy in patients with confirmed mutation of the DMD gene amenable to exon 51 skipping
- Antisense oligonucleotide or “molecular patch”
- Binds exon 51 of dystrophin pre-mRNA resulting in exclusion of that exon during mRNA processing
- Increased dystrophin in skeletal muscle in some patients
- Clinical benefit must be verified in a confirmatory trial

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**Deflazacort**  
(*Emflaza, PTC Therapeutics*)

- Approved February 9, 2017
- Duchenne muscular dystrophy
- Glucocorticoid, prodrug prednisolone derivative
- Prednisone alternative
- Used to improve strength, improve timed motor function, delay loss of ambulation, improve pulmonary function, delay onset of cardiomyopathy, increase survival

## Oncology Medications

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<th>Drug</th>
<th>Route</th>
<th>Class &amp; Indication</th>
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<tbody>
<tr>
<td>Ribociclib <em>(Kisqali, Novartis)</em></td>
<td>PO</td>
<td>Kinase inhibitor; postmenopausal hormone receptor-positive, HER2-negative breast cancer</td>
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<tr>
<td>Rucaparib <em>(Rubraca, Clovis Oncology)</em></td>
<td>PO</td>
<td>Poly (ADP-ribose) polymerase (PARP) inhibitor; deleterious BRCA mutation associated advanced ovarian cancer previously treated with 2+ chemotherapies</td>
</tr>
<tr>
<td>Niraparib <em>(Zejula, Tesaro)</em></td>
<td>PO</td>
<td>PARP inhibitor; maintenance treatment of ovarian, fallopian tube, or primary peritoneal cancer in a response to platinum-based chemotherapy</td>
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<tr>
<td>Cabozantinib <em>(Cabometyx, Exelixis)</em></td>
<td>PO</td>
<td>Kinase inhibitor; Advanced renal cell carcinoma in patients who have received anti-angiogenic therapy</td>
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<tr>
<td>Venetoclax <em>(Venclexta, AbbVie)</em></td>
<td>PO</td>
<td>BLC-2 inhibitor; chronic lymphocytic leukemia with 17p deletion after at least 1 prior therapy</td>
</tr>
</tbody>
</table>

## Oncology Medications...

<table>
<thead>
<tr>
<th>Drug</th>
<th>Route</th>
<th>Class &amp; Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atezolizumab <em>(Tecentriq, Genentech)</em></td>
<td>IV</td>
<td>Programmed death-ligand 1 (PD-L1) blocking antibody; urothelial cancer (after platinum-based chemotherapy)</td>
</tr>
<tr>
<td>Avelumab <em>(Bavencio, Serono)</em></td>
<td>IV</td>
<td>PD-L1 blocking antibody; metastatic Merkel cell carcinoma; approval also anticipated for urothelial cancer</td>
</tr>
<tr>
<td>Olaratumab <em>(Lartruvo, Eli Lilly)</em></td>
<td>IV</td>
<td>Platelet-derived growth factor receptor alpha (PDGFR-α) blocking antibody; soft tissue sarcoma with a histologic subtype for which anthracycline is not appropriate and not amenable to curative radiotherapy or surgery</td>
</tr>
<tr>
<td>Irinotecan liposome <em>(Onivyde, Merrimack)</em></td>
<td>IV</td>
<td>Topoisomerase inhibitor; with 5-FU/leucovorin for pancreatic adenocarcinoma (after gemcitabine-based therapy)</td>
</tr>
<tr>
<td>Talimogene laherparepvec <em>(Imlygic, Amgen)</em></td>
<td>Intralesional</td>
<td>Cutaneous, subcutaneous, and nodal lesions in melanoma recurrent after initial therapy</td>
</tr>
</tbody>
</table>
### Matching

<table>
<thead>
<tr>
<th>Agent</th>
<th>Reason for REMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>c  Ocrelizumab</td>
<td>a. Suicide risk</td>
</tr>
<tr>
<td>a  Brodalumab</td>
<td>b. Liver injury</td>
</tr>
<tr>
<td>b  Daclizumab</td>
<td>c. None – No REMS required</td>
</tr>
<tr>
<td>c  Safinamide</td>
<td></td>
</tr>
</tbody>
</table>

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**College of Pharmacy**

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  - Phone: (509) 358-7662