### Assessment of Course Student Learning Outcomes

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<th>General Ed SLOS Assessed</th>
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<td>VII, X</td>
<td>AA8</td>
<td>1. Describe the basic mechanisms of drug action.</td>
<td>75% pass rate on each of the following Midterm exam questions: 46. Fluoxetine (Prozac, an SSRI) mechanism 55. NMJB mechanism 58. Mechanism triggering Bronchoconstriction 59. Propranolol mechanism</td>
<td>46. SSRI mechanism – 83% (N = 12) 55. NMJB mechanism – 83% 58. Bronchoconstriction – 83% 59. Propranolol – 83%</td>
<td>a. Rewrite “end-of-chapter” review questions to be based upon the SLOs – see attached sample. This will give the students concrete goal posts, so to speak. b. Rewrite Lecture “overview” page to include specific objectives that meet the SLOs. – see attached example. c. As a test, all final exam questions for this semester will be based on the new “end-of-chapter” review questions (versus 75% previously). They have always been given old “practice” exams (the exams from the previous term). Giving them the old exams to practice with allows a measure of certainty in a class with a large amount of content. By reworking the end-of-chapter questions into the formal exam question “pool,” this semester will be the first having all the examination material based on the entirely on the SLOs. If this leads to grade inflation, I will return to the practice of drawing 75% questions from the past.</td>
<td>There wasn’t a cost to the College (or University) for this assessment, or for the development of the classroom tools used to evaluate the SLOs. The preparation of this report, and the associated assessment tools, meetings, and correspondence required more than 45 hours of my own time, which was uncompensated. The University pays lecturers for approximately 40 hours of contact time in the classroom (for a 3 unit course like PHRM 203), and another approximately 20 hours of “office” time*. I</td>
</tr>
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</table>

### strengths:
The results indicated that the students are able to describe basic mechanisms for common drug classes, common side effects and individual drugs.

Area(s) to strengthen:
The students who did not show success on this evaluation tool did not routinely attend the pre-class review hour, while those who did attend, showed greater mastery.

Effects of materials and methods:
Honestly, 83% pass rate is really good and indicates that they are getting this aspect of the material, either through lecture, the lecture guide, the review questions or the review sessions.
2. Demonstrate knowledge of the terminology and special concepts useful in the study of pharmacology.

75% pass rate on each of the following Midterm exam questions:

- Inert ingredient(s) – 100%
- Trade names (proprietary) – 100%
- The ACEI stem – 100%
- PSNS receptor – 83%

Strengths:
The results indicate excellent mastery of terminology and special concepts used in the study of pharmacology, the course SLO applicable to this section.

The results indicate a higher probability of students being able to perform effectively in the workplace (since they will have mastered the terminology specific to the job).

Area(s) to strengthen:
This area appears to be a common strength within the current class and does not appear to need remediation.

Effects of materials and methods:
Apparently the materials and methods employed to convey the information related to the special terminology SLO were quite clear and understandable.

3. Describe how differences between individuals govern their responses to drugs.

75% pass rate on each of the following Midterm exam questions:

- Fast versus slow acetylators – 83%
- ACEI – 66%
- Clopidogrel – 42%
- Promethazine – 100%

FINAL RETEST of 120 and 123:

- ACEI – 100%
- Clopidogrel – 13/14 = 93%

Strengths:
Broad concepts regarding individual differences were mastered.

Area(s) to strengthen:
The results were mixed on this SLO. It appears that students have already seen and generated 25% new on every exam.

W X

Strengths:
- Broad concepts regarding individual differences were mastered.

Area(s) to strengthen:
- The results were mixed on this SLO. It appears that students have already seen and generated 25% new on every exam.

a. Rewrite "end-of-chapter" review questions to be based upon the SLOs – see attached sample.

b. Rewrite Lecture “overview” page to include specific objectives that meet the SLOs. – see attached example.

c. All exam questions will be based on the new “end-of-chapter” review questions (versus 75% previously) – see above.

d. Retest questions 120 and 123 on the final exam after having reviewed the correct answers and generally reviewed
that students were able to master broad concepts (e.g., fast versus slow acetylators) and common drugs (e.g., promethazine), but not do as well on concepts and drugs they were less familiar with (the ACEI and clopidogrel).

**Effects of materials and methods:**
When a broad concept is understood, but not a specific example, it often indicates that the specific example was not studied.

4. Define how drugs are **processed and biotransformed** by the body.

<table>
<thead>
<tr>
<th>75% pass rate on each of the following Midterm exam questions</th>
<th>a. Rewrite “end-of-chapter” review questions to be based upon the SLOs – see attached sample.</th>
</tr>
</thead>
<tbody>
<tr>
<td>30. Phase 1 reactions – 92%</td>
<td>b. Rewrite Lecture “overview” page to include specific objectives that meet the SLOs. – see attached example.</td>
</tr>
<tr>
<td>31. Phase 2 reactions – 92%</td>
<td>c. All exam questions will be based on the new “end-of-chapter” review questions (versus 75% previously) – see above.</td>
</tr>
<tr>
<td>33. (Other) Phase 1 reactions– 83%</td>
<td></td>
</tr>
<tr>
<td>34. Insignificant excretion route– 92%</td>
<td></td>
</tr>
</tbody>
</table>

The students demonstrated mastery of this kinetics-related SLO, which indicates they understood the major metabolic and excretory pathways for drugs.

**Strengths:**
This is another SLO area with demonstrated overall mastery of concepts related to kinetics.

**Area(s) to strengthen:**
Again, it appears that the class is already performing at a high standard.

**Effects of materials and methods:**
The materials and methods clearly conveyed the SLO-related concepts regarding kinetics.

5. Describe **significant interactions between drugs.**

<table>
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<tr>
<th>75% pass rate on each of the following Midterm exam questions</th>
<th>a. Rewrite “end-of-chapter” review questions to be based upon the SLOs – see attached sample.</th>
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<tr>
<td>28. CYP 3A4 induction – 75%</td>
<td>b. Rewrite Lecture “overview” page to include specific objectives that meet the SLOs. – see attached example.</td>
</tr>
<tr>
<td>29. CYP 3A4 inhibition – 75%</td>
<td>c. All exam questions will be based on the new “end-of-chapter” review questions (versus 75% previously) – see above.</td>
</tr>
<tr>
<td>32. Probenecid + penicillin – 83%</td>
<td></td>
</tr>
<tr>
<td>100. HYCD + APAP</td>
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</tbody>
</table>

The results were on the borderline for questions 28 and 29, which seemed surprising on one hand, because of their demonstrated mastery of questions 30, 31 & 33. On the other hand, these questions were designed to tease out a deeper understanding of the material.
understanding of pharmacodynamics than those more general questions (30, 31 & 33).

That said, they are demonstrating strength in understanding the concept, while having more of a challenge applying the concept to specific examples. This is expected and they still performed respectfully.

**Area(s) to strengthen:**
The need more work on applying the concepts related to factors affecting pharmacokinetics and pharmacodynamics, including the specific issue of drug:drug interactions. Some of these interactions are very confusing, including the issue of metabolic enzyme induction and inhibition. At the PHRM 203 level, it requires more repetition of examples.

**Effects of materials and methods:**
It appears that they did not have enough repetition of examples in lecture, the lecture guide, the review questions, the flash cards, or the review sessions.

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<table>
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<th>IV, X</th>
<th>AA3</th>
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| 6. **Use information** from the pharmacokinetics of a specific drug to determine **dosing schedules and the best route of drug administration.**

- 75% pass rate on each of the following Midterm exam questions
  1. Effect of 1st pass
  26. Cataracts and corticosteroids
  119. Beta blockers
  121. Nitroprusside

**MIDTERM**
1. Effect of 1st pass – 92%
26. Cataracts and corticosteroids – 83%
119. Beta blockers – 83%
121. **Nitroprusside – 58%**

**RETEST ON FINAL OF #121**
121. Nitroprusside – 93% correct

**Strengths:**
The fact that they all understood the rather complicated processes related to 1st pass is a good indicator of success on this SLO related to pharmacokinetics, dosing and routes of administration.

They also demonstrated mastery of drug class examples, as shown by the 83% pass rate on above.

d. A substantial amount of repetition.

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a. Rewrite “end-of-chapter” review questions to be based upon the SLOs – see attached sample.

b. Rewrite Lecture “overview” page to include specific objectives that meet the SLOs. – see attached example.

c. All exam questions will be based on the new “end-of-chapter” review questions (versus 75% previously) – see above.

d. Retest question 121 on the final exam after having reviewed the correct answers and generally reviewed the material.
questions 26 and 119.

**Area(s) to strengthen:**
The results indicate a potential problem with question 121. Students seemed to demonstrate mastery of the general concept, but failed to apply the principles in the case of a specific drug. This may be due to wording (bad question) or a simple failure to study that particular drug in sufficient detail.

**Effects of materials and methods:**
There may be a wording issue with question 121 and so the question will be reframed.

75% pass rate on each of the following Midterm exam questions

- 61. Clonidine
- 63. Metoprolol
- 81. Atorvastatin
- 101. Fentanyl

**MIDTERM**

- 61. Clonidine – 33%
- 63. Metoprolol – 83%
- 81. Atorvastatin – 75%
- 101. Fentanyl – 92%

**RETEST ON FINAL OF #61:**

- 61. Clonidine – 100% correct

**Strengths:**
They clearly understand the therapeutic use of fentanyl, metoprolol and to a somewhat lesser extent, atorvastatin. These are among the top selling drugs in the world, and they will undoubtedly encounter them in their professional careers.

**Area(s) to strengthen:**
Again, the results indicate a general mastery with one exception. In this case, it appears a matter of insufficient study of a particular drug rather than a lack of understanding.

Stating the therapeutic use is a question of memorization – they have a lot of drugs to memorize and this one, clonidine, fell through the cracks. All of these drugs are in the “Top 200,” so are commonly prescribed drugs, but clonidine
is more obscure for several reasons.

It may also be due to a “bad” question.

**Effects of materials and methods:**
Other factors to take into account include the fact that metoprolol and atorvastatin both are drugs with “stems.” Stems allow you to easily identify the class of a drug, and we studied and drilled on these and other stems. Fentanyl is generally recognizable to the vast majority of students in PHRM 203 because it is a common opioid analgesic. Clonidine, though, doesn’t enjoy those benefits. It is a common antihypertensive, but that doesn’t make it easier for them to remember.

This class may not be using the flashcards as heavily as previous classes because I’ve been posting chapter “drug lists” and they are using those lists to study. They asked for the drug lists to summarize the information for each chapter and it is essentially the same as the information on the flashcards, but presented (obviously) in a different format. The benefit of using the flashcards, though, over the lists, is that the flashcards can be more easily shuffled, which tests the memory better.

This class is also not taking advantage of the online flashcards I created.

| IV, VI, X | AA2, AA11 | Course Level SLO doesn’t exist | Case Studies 75% of students with “C” or above | 92%

The students are demonstrating mastery at searching for information (as directed) on the internet and compiling a report based upon guidelines.

The case studies focus on jobs (clinical trials) and job performance (medication errors).

No action required; attainment already achieved.
| VI, VII, IX | AA6, AA7 | Service-Learning Option – 100% completion for students opting to perform SL | 100% The single student who completed a service-learning option gave two outstanding oral reports to the class on her progress, including the application of PHRM 203 learning in the workplace. |  |  |  |
SLO 1. Describe the basic mechanisms of drug action AND SLO 7. State the therapeutic uses for each major drug group.

<table>
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<tr>
<th>Student Learning Objective</th>
<th>Terms &amp;/or concepts covered in this section that address each SLO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Atorvastatin (Liptor) – HMG-CoA reductase inhibitor (statin) PO SID indicated as an adjunct to diet to reduce the risk of MI/stroke/angina; to reduce levels of total cholesterol (C), LDL-C, Apo B and TG and to increase levels of HDL-C.</td>
</tr>
<tr>
<td>2.</td>
<td>Cholestyramine (Questran) – bile acid sequestrant indicated PO SID or BID as an adjunct to diet to reduce LDL-C and for the relief of pruritus associated with partial bile duct obstruction.</td>
</tr>
<tr>
<td>3.</td>
<td>Nicotinic acid (Niacor = vitamin B3 = niacin) – Individualize PO doses BID/TID up to 2 grams/day. It is an adjunct to diet and usually another drug (Questran) to lower LDL-C and TG.</td>
</tr>
<tr>
<td>4.</td>
<td>Gemfibrozil (Lopid) – a fibric acid given PO BID 30 minutes before am and pm meals to lower TG levels (and raise HDL-C).</td>
</tr>
<tr>
<td>5.</td>
<td>Ezetimibe (Zetia) – inhibits cholesterol absorption from the intestines. It is indicated PO SID as an adjunct to diet to decrease total-C, LDL-C, non-HDL-C and apo B.</td>
</tr>
<tr>
<td>6.</td>
<td>Warfarin (Coumadin) – oral anticoagulant available IV/IM/PO. Individualized therapy is required based on PT/INR response. It is indicated for venous thrombosis and pulmonary embolism, thromboembolism associated with atrial tachyarrhythmias or cardiac valve replacement. Given chronically SID/BID PO.</td>
</tr>
<tr>
<td>7.</td>
<td>Enoxaparin (Lovenox, LMWH) – SC or IV SID for 7-17 days for DVT, and thrombosis/ischemia related to angina or MI.</td>
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<tr>
<td>8.</td>
<td>Heparin (UFH) – IV or deep SC to prevent thrombosis.</td>
</tr>
<tr>
<td>9.</td>
<td>Bivalirudin (Angiomax) – parenteral anticoagulant given IV to prevent thrombosis during cardiac procedures and in patients who can't take heparin.</td>
</tr>
<tr>
<td>10.</td>
<td>Clopidogrel (Plavix) – inhibits ADP receptor on platelets. Taken PO SID without regard to food. Indicated for CAD, PVD, and cerebrovascular disease.</td>
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<tr>
<td>11.</td>
<td>Cilostazol (Pletal) – inhibits cAMP PDE. Taken PO BID 30 minutes before or 2 hrs after meals. Indicated for intermittent claudication.</td>
</tr>
<tr>
<td>12.</td>
<td>Eptifibatide (Integrilin) – inhibits glycoprotein IIB/IIIA receptors on platelets. Given IV only, it is indicated to prevent clots during angioplasty and in acute coronary syndrome (MI) patients.</td>
</tr>
<tr>
<td>13.</td>
<td>Alteplase (Activase) – recombinant tissue plasminogen activator fibrinolytic drug. It activates a natural enzyme that breaks apart clots. Given IV, it is indicated for acute MI, unstable angina, and lysis of objectively diagnosed thrombi in lungs or deep veins.</td>
</tr>
<tr>
<td>14.</td>
<td>Aminocaproic acid (Amicar) – inhibits fibrinolysis. Given PO or as IV Infusion with a loading dose and then hourly up to about 8 hours. Indicated for hyperfibrinolytic states (conditions where clots don't form such as certain cancers, heart surgery etc.)</td>
</tr>
<tr>
<td>15.</td>
<td>Factor IX complex (Benefix) – antihemophilic agent (replaces clotting factors). Given IV only to control bleeding in hemophilia type B as well as for peri-operative management of bleeding in hemophilia type B.</td>
</tr>
</tbody>
</table>

SLO 2. Demonstrate knowledge of the terminology and special concepts useful in the study of pharmacology.

| 16.                       | Statin = HMG-CoA reductase inhibitors used to lower cholesterol. |
| 17.                       | Mechanisms for anticoagulation include: inhibition of the enzyme that produces vitamin K dependent clotting factors (warfarin), increases the activity of an enzyme (antithrombin) that reverses the clotting process (heparin), various anti-platelet processes (NSAIDs, clopidogrel, cilostazol, eptifibatide) and activation of an enzyme (tissue plasminogen) that functions to break apart clots (t-PA). |
### SLO Breakdown: Cardiovascular 3 – Antihyperlipidemics, blood thinners & clotting agents

| SLO 3. Describe how differences between individuals govern their responses to drugs. | 18. Warfarin is pregnancy category X  
19. Clopidogrel (Plavix) requires a blood test for CYP2D19 function (genetically deficient folks can't metabolize it to active form) |
| --- | --- |
| SLO 4. Define how drugs are processed and biotransformed by the body. | 20. Warfarin has a very narrow therapeutic margin and is highly PPB  
21. Warfarin dosing individualized by monitoring the PT/INR; factors affecting dosing include age, race, body weight, sex, concomitant medications and pre-existing diseases as well as genetic factors (CYP2C9 and VKORC1 genotypes) |
| SLO 5. Describe significant interactions between drugs. | 22. Cholestyramine may delay or reduce the absorption of other PO medications including warfarin, thiazide diuretics, propranolol, tetracycline, penicillin G, phenobarbital, thyroid and thyroxine preparations, estrogens and progestins, and digitalis as well as fat soluble vitamins (A, D, E, and K). Therefore, cholestyramine should be taken 1 hour after or 6 hours before other medications  
23. Warfarin and any CYP2C9 inhibitor or any drug heavily PPB – increased levels of warfarin and increased bleeding risk  
24. Warfarin and any CYP2C9 inducer – decreased warfarin and treatment failure (increased risk of clotting and embolism)  
25. Warfarin and vitamin K – Vitamin K negates the effect of warfarin  
26. Many botanicals contain coumarins or have potential anticoagulant effects for other reasons (licorice, red clover, aloe, black cohosh, dandelion, feverfew, ginger, ginkgo biloba, ginseng)  
27. |
| SLO 6. Use information from the pharmacokinetics of a specific drug to determine dosing schedules and the best route of drug administration. | 28. Gemfibrozil bioavailability decreased by food, so take 30 minutes before am and pm meal. |

### Student Learning Objective Questions that address each SLO

| SLO 1. Describe the basic mechanisms of drug action AND SLO 7. State the therapeutic uses for each major drug group. | 1. Which of the following is a(n) HMG-CoA reductase inhibitor (statin) taken PO SID and indicated as an adjunct to diet to reduce the risk of MI/stroke/angina; to reduce levels of total cholesterol (C), LDL-C, Apo B and TG and to increase levels of HDL-C?  
a. Atorvastatin  
b. Cholestyramine  
c. Ezetimibe  
d. Gemfibrozil  
e. Nicotinic acid  
2. Which of the following is a(n) bile acid sequestrant indicated PO SID or BID as an adjunct to diet to reduce LDL-C and for the relief of pruritus associated with partial bile duct obstruction?  
a. atorvastatin  
b. cholestyramine  
c. ezetimibe  
d. gemfibrozil  
e. nicotinic acid |
3. Which of the following is niacin? The PO doses BID/TID must be individualized up to 2 grams/day. It is an adjunct to diet and usually another drug (Questran) to lower LDL-C and TG?
   a. Atorvastatin  
   b. Cholestyramine  
   c. Ezetimibe  
   d. Gemfibrozil  
   e. Nicotinic acid

4. Which of the following is a fibric acid given PO BID 30 minutes before am and pm meals to lower TG levels (and raise HDL-C)?
   a. Atorvastatin  
   b. Cholestyramine  
   c. Ezetimibe  
   d. Gemfibrozil  
   e. Nicotinic acid

5. Which of the following inhibits cholesterol absorption from the intestines? It is indicated PO SID as an adjunct to diet to decrease total-C, LDL-C, non-HDL-C and apo B.
   a. Atorvastatin  
   b. Cholestyramine  
   c. Ezetimibe  
   d. Gemfibrozil  
   e. Nicotinic acid

6. Which of the following is a(n) oral anticoagulant available IV/IM/PO? Individualized therapy is required based on PT/INR response. It is indicated for venous thrombosis and pulmonary embolism, thromboembolism associated with atrial tachyarrhythmias or cardiac valve replacement. Given chronically SID/BID PO.
   a. Bivalirudin  
   b. Cilostazol  
   c. Clopidogrel  
   d. Eptifibatide  
   e. Warfarin

7. Which of the following is a(n), LMWH given SC or IV SID for 7-17 days for DVT, and thrombosis/ischemia related to angina or MI.
   a. Bivalirudin  
   b. Cilostazol  
   c. Enoxaparin  
   d. Heparin  
   e. Warfarin

8. Which of the following is given IV or deep SC to prevent thrombosis? It is known to cause thrombocytopenia and with long-term use, osteoporosis.
   a. Bivalirudin  
   b. Enoxaparin  
   c. Heparin  
   d. Warfarin  
   e. None of the above
9. Which of the following is a parenteral anticoagulant given IV to prevent thrombosis during cardiac procedures and in patients who can’t take heparin?
   a. Bivalirudin
   b. Enoxaparin
   c. Heparin
   d. Warfarin
   e. Eptifibatide

10. Which of the following inhibits ADP receptors on platelets? It may be taken PO SID without regard to food. Indicated for CAD, PVD, and cerebrovascular disease.
    a. Alteplase
    b. Aminocaproic acid
    c. Cilostazol
    d. Clopidogrel
    e. Eptifibatide

11. Which of the following inhibits cAMP PDE? It should be taken PO BID 30 minutes before or 2 hrs after meals. Indicated for intermittent claudication.
    a. Alteplase
    b. Aminocaproic acid
    c. Cilostazol
    d. Clopidogrel
    e. Eptifibatide

12. Which of the following inhibits glycoprotein IIB/IIIA receptors on platelets. Given IV only, it is indicated to prevent clots during angioplasty and in acute coronary syndrome (MI) patients.
    a. Warfarin
    b. Clopidogrel
    c. Eptifibatide
    d. Alteplase
    e. Aminocaproic acid

13. Which of the following is a recombinant tissue plasminogen activator fibrinolytic drug? It activates a natural enzyme that breaks apart clots. Given IV, it is indicated for acute MI, unstable angina, and lysis of objectively diagnosed thrombi in lungs or deep veins.
    a. Aminocaproic acid
    b. Alteplase
    c. Clopidogrel
    d. Enoxaparin
    e. Warfarin

14. Which of the following inhibits fibrinolysis? Given PO or as an IV Infusion with a loading dose and then hourly up to about 8 hours. Indicated for hyperfibrinolytic states (conditions where clots don’t form such as certain cancers, heart surgery etc.)
    a. Aminocaproic acid
    b. Alteplase
    c. Factor IX complex
    d. Cilostazol
    e. Bivalirudin
15. Which of the following is an antihemophilic agent (replaces clotting factors)? It is given IV only to control bleeding in hemophilia type B as well as for peri-operative management of bleeding in hemophilia type B.
   a. Amicar
   b. Angiomax
   c. Benefix
   d. Coumadin
   e. Lovenox

16. HMG-CoA reductase inhibitors used to lower cholesterol are also known as ___?___
   a. Anticoagulants
   b. Fibrinolytics
   c. Statins
   d. Tissue Plasminogen Activators
   e. None of the above

17. Mechanisms for anticoagulation include: ___?___
   a. Inhibition of the enzyme that produces vitamin K dependent clotting factors
   b. Activation of an enzyme that reverses the clotting process
   c. Anti-platelet processes
   d. Activation of an enzyme that functions to break apart clots
   e. All the above

18. Warfarin is pregnancy category ___?___
   a. A
   b. B
   c. C
   d. D
   e. X

19. Clopidogrel (Plavix) has a boxed warning that requires a blood test for ___?___
   a. CYP2D19 function because genetically deficient folks can’t metabolize it to active form
   b. CYP3A4 function to make sure it works
   c. P-glycoprotein to make sure they have enough pumps
   d. Prothrombin time to make sure clotting is not interfered with
   e. None of the above

20. Warfarin dosing is individualized by monitoring the PT/INR. Factors affecting dosing include:
   a. Age and body weight
   b. Race
   c. Sex
   d. Concomitant medications and pre-existing diseases as well as genetic factors (CYP2C9 and VKORC1 genotypes)
   e. All of the above

21. Cholestyramine may delay or reduce the absorption of other PO medications including warfarin, thiazide diuretics, propranolol, tetracycline, penicillin G, phenobarbital, thyroid preparations, estrogens & progestins, & digitalis as well as fat soluble vitamins (A, D, E, & K). Therefore, it should be taken:
   a. 1 hour after or 6 hours before other medications
   b. At the same time as other medications
   c. 12 hours apart from other medications
   d. It doesn’t matter when you give cholestyramine
   e. None of the above
**SLO Breakdown: Cardiovascular 3 – Antihyperlipidemics, blood thinners & clotting agents**

<p>| | |</p>
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| **22.** Giving Warfarin and any CYP2C9 inhibitor or any drug heavily PPB will __?__  
   a. Increase levels of warfarin and increase the risk of bleeding  
   b. Decrease warfarin levels, but increase the bleeding risk  
   c. Decrease warfarin levels and decrease the risk of bleeding  
   d. Increase warfarin levels and decrease the risk of bleeding  
   e. None of the above |   |
| **23.** Giving Warfarin and any CYP2C9 inducer may lead to __?__  
   a. Decreased warfarin and treatment failure (increased risk of clotting and embolism)  
   b. Decreased warfarin and improved treatment outcome  
   c. Decreased warfarin so less monitoring is required  
   d. Increased warfarin levels which requires more monitoring  
   e. Increased warfarin levels which decreases the risk of bleeding |   |
| **24.** Giving Warfarin and vitamin K __?__  
   a. Improves the efficacy of warfarin  
   b. Increases the risk of bleeding  
   c. Nullifies the effects of warfarin  
   d. Removes the requirement for monitoring  
   e. Has no effect on warfarin therapy |   |
| **25.** Many botanicals contain __?__ or have potential __?__ effects for other reasons (licorice, red clover, aloe, black cohosh, dandelion, feverfew, ginger, ginkgo biloba, ginseng)  
   a. Coumarins/anticoagulant  
   b. Statins/lipid lowering  
   c. Heparin/anticoagulant  
   d. St John’s wort/P450  
   e. None of the above |   |
| **SLO 6. Use information from the pharmacokinetics of a specific drug to determine dosing schedules and the best route of drug administration.** | **26.** Gemfibrozil bioavailability is decreased by __?__, so take 30 minutes before __?__  
   a. Other drugs/taking another drug  
   b. Food/am and pm meal.  
   c. Water/drinking anything  
   d. GI motility/getting out of bed  
   e. All of the above |   |