Inpatient Warfarin Dosing Management

Slide 2
Welcome to the online education for warfarin management for inpatients.

Slide 3
Novant Health pharmacy leadership is excited to offer this course to help prepare you for providing appropriate, therapeutic anticoagulant therapy to our inpatients.

Slide 4
Let's get started by reviewing the learning objectives! After completing this module, you will be able to:

- Recall the evidence for effective, therapeutic warfarin dosing
- Use the provided dosing protocols to make appropriate recommendations for how to initiate, adjust and monitor warfarin therapy
- And Access and apply the Novant Health Inpatient Warfarin Dosing Program Guidance

Slide 5
Please note that there is a Warfarin Inpatient Dosing Guide linked to the end of this course that features key learnings. Also, there is an online assessment. A 90 percent or higher score is required for successful completion, so you don't want to miss any information!

As you advance through the course, please wait to be prompted to "continue" on each page so you don't skip anything.

We will begin by introducing the Novant health inpatient warfarin dosing program.

Slide 6

The Novant Health Inpatient Warfarin Dosing Program provides recommendations to manage warfarin therapy. The program signifies that **pharmacy managed warfarin dosing strategy for all inpatients is preferred.**

The purpose of the program is to:

- Establish collaboration between Novant Health providers and pharmacists for management of warfarin therapy for all hospitalized adult patients through utilization of a standardized approach
- And to optimize warfarin therapy by increasing efficacy, minimizing adverse effects, and educating patients and healthcare professionals regarding the safe use of warfarin

Slide 7

Carefully read the bulleted items regarding the applicability of the Novant Health Collaborative Practice Inpatient Warfarin Dosing Program.

Then, click the image of the team in the middle of the page to receive details about important team members.

Slide 8

It is important for pharmacists to understand the expectation of Warfarin Dosing Program. Carefully review the information on the next two pages that highlights pharmacists' responsibilities.

Slide 10

Pharmacists should also document any consults in the RX Warfarin Monitoring system list and conduct reviews as highlighted here.

Slide 11

Warfarin is a vitamin K antagonist with a narrow therapeutic index.

Inhibition of specific vitamins and proteins are essential for warfarin's role as an anticoagulant.

Improper dosing of warfarin can lead to bleeding or thromboembolism which may prolong hospital stay, require frequent follow up, and increase healthcare cost.

Pharmacists are responsible for overseeing the appropriate dosing of warfarin consult patients with Provider collaboration.

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On the right side of the page, you see an illustration of warfarin's mechanism of action in the liver. Carefully read through the provided details in the bulleted items to learn specifics about warfarin's mechanism of action.

When you're ready, you may advance to the next page to see what warfarin's coagulation cascade looks like.

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The coagulation cascade of secondary hemostasis has two initial pathways which lead to fibrin formation – these are the contact activation and the tissue factor pathways. Both lead to the same fundamental reactions that produce fibrin as illustrated on this page.

When fibrin molecules aggregate, a clot is formed. An internal clot that remains in the area in which it was formed is called a thrombus, and the general condition called thrombosis.

The coagulation factors you see highlighted with boxes are the factors warfarin inhibits. As mentioned earlier, coagulation factors II, VII, IX, and ten are inhibited to prevent fibrin formation, and therefore prevent thrombus formation.

By suppressing these clotting factors, warfarin prevents thrombus formation and propagation.

Some additional basics we need to cover include the pharmacokinetic and pharmacodynamics of warfarin located on the following page.

Slide 15

Warfarin is highly protein bound. CYP 2C9 is the main enzyme of warfarin metabolism, although 1A2, and 3A4 also play a role. Many of the drug interactions with warfarin occur as a result of CYP enzyme interaction.

The clotting factors each have different half-lives, and are depleted at different times as a result.

Please note that the effects of warfarin may be seen within the first 24 hours due to inhibition of factor VII, but peak effect is not seen for 72-96 hours with factor II inhibition.

Let's review some more CYP enzyme interactions on the following page.

Page 16

Here are some contraindications for warfarin therapy to consider.

Warfarin is not recommended during pregnancy. Instead, enoxaparin should be considered for pregnant patients. In addition, warfarin is Contraindicated in pregnancy except in pregnant women with mechanical heart valves at high risk of thromboembolism.

Warfarin is also contraindicated when the risk of hemorrhage or bleeding is greater than the potential benefits. These are relative contraindications and may vary depending on the patient.

Some risks may include, but are not limited to high fall risk, unsupervised dementia or psychosis patients who may have compliance issues, or alcohol or drug abusing patients.

Next, let's identify specifics for when warfarin therapy ***is indicated*** as appropriate therapy.

Slide 18

As you can see in the chart displayed here, for most indications an INR goal range of 2-3 is recommended. It's important to remember that with mechanical heart valves in the mitral position, a higher goal of 2.5-3.5 is recommended.

Second Indication Chart Slide: This table highlights recommendations when INR is between 2.5 and 3.5. Click on the chart in the lower right corner to learn more!

Close Popup: Click forward to learn about Optimal INR.

Slide 19

Optimal INR is where the highest point of benefits meets the lowest point of adverse effects. Review the bulleted items and the corresponding chart displayed here.

Click forward when you have completed reviewing this page.

Slide 20

Warfarin therapy can seem unpredictable due to several causes. Some of the more common ones are shown here. Take a moment to carefully read through them.

Slide 21

Carefully review the table and information on this page to learn more about additional factors that affect Warfarin sensitivity. When you're finished reviewing these sensitivities, the next topic covers drug, food and dietary supplement interactions with Warfarin.

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Factors such as patient characteristics, past medical history, and drug interactions can lead to differences in warfarin sensitivity.

These conditions are **not** contraindications, however, **close monitoring is necessary**.

Some disease states that will increase warfarin sensitivity, and therefore increase the INR, are listed in the two windows shown here. If patients are acutely ill in the hospital with these diagnosis you will most likely see a greater effect, such as acute decompensated heart failure or dehydration due to diarrhea or vomiting.

The opposite is true for patients who are volume overloaded or have edema; a decrease in INR will be seen until the extra fluid is diureced.

Take a moment to consider the items listed for what increases and decreases warfarin sensitivity. Below the windows is a link to a drug interaction chart – click it to view additional details.

(for pop-up window) Many medications interact with warfarin. It is not always necessary or possible to avoid these medications, but it is important to monitor closely and adjust warfarin dose accordingly.

Close Popup: Click forward for a more detailed review of dietary and drug interactions with warfarin.

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It is important to be aware of dietary interactions and patients' dietary status when dosing warfarin. Carefully review the information on this page about these interactions and steps you should take to identify and document them. Once you have completed reviewing this page, click forward to view a table that highlights these interactions.

Slide 24
This table highlights possible drug interactions with warfarin based on class. Take a moment to review these interactions. When you're ready, click forward to view additional drug interactions.

Slide 25
This table is a continuation of information presented on the previous page. Review the information here and click forward when you are ready to continue.

Slide 26
When done viewing these drug interactions, click forward to learn more about warfarin enzymes.

Slide 27
Inducers are medications that may speed up the metabolism of warfarin (thereby decreasing the INR), and inhibitors may slow metabolism of warfarin causing increase in INR. Carefully review the items listed on this page. Click on the image to learn more about enzyme induction.

Image Click: Remember this! Enzyme induction takes days to weeks. Enzyme inhibition occurs more rapidly as both drugs are taken together

Close Button Click: Let's review what we've learned so far. Click forward to access a brief knowledge check.

Slide 34

Some essentials regarding inpatient dosing are shown here. Take a moment to study them.

You'll notice that "pharmacogenetic" is linked. Click it to view details about genetic variables that affect warfarin sensitivity.

Close Popup: So, where do you start with dosing warfarin? Let's answer that question by next taking a close look at a chart featuring specific starting points for warfarin dosing

Slide 35

The chart displayed here shows the recommended doses to initiate warfarin therapy.

For more detailed dose adjustment guidelines, see Table 2 or 5 in the Novant Health Collaborative Practice Inpatient Warfarin Dosing Program.

Remember that the dosing charts provided should be used as guidelines only. Use of clinical judgment is essential, as dose adjustments may vary based on specific patient circumstances.

Before you leave this page, click the patient chart in the lower right corner to study some special considerations for treating patients with acute VTE PE.

(For VTE/PE pop-up window) When treating VTE or PE, guidelines recommend at least 5 days of overlap with UFRACTIONATED HEPARIN or LOW MOLECULAR WEIGHT HEPARIN and warfarin so that all the clotting factors are depleted or mostly depleted. Remember, the clotting factors have different half-lives and will be depleted at different times.

Close Popup: Next, we'll review best practices for warfarin dosing at home.

Slide 37

What is bridge therapy? Bridging anticoagulation is the administration of short acting anticoagulation such as low molecular weight heparin or unfractionated heparin when warfarin therapy is interrupted, and its anticoagulant effect is below the target therapeutic range.

Bridging anticoagulation aims to reduce patient's risk of developing blood clots, such as stroke, but may also increase patients' risk of developing potentially peri and post operative bleeding complications.

Read through the bulleted items and then at the bottom of this page, click the link to view Suggested Peri-operative management of warfarin and bridge therapy.

(For *Suggested Risk Stratification for Perioperative Thromboembolism chart*)

ACCP stratifies patients receiving warfarin into 3 categories for evaluation of the need for bridge therapy. In patients at high risk of stroke or developing a clot it is recommended to bridge with UFRACTIONATED HEPARIN or LOW MOLECULAR WEIGHT HEPARIN; patients who fall into that category you can see listed here in the high risk row.

For Patients who fall into the moderate risk category, bridging therapy should be considered, and the benefits of clot prevention weighed against the risks of bleeding.

Bridge therapy is not necessary in low risk patients. Click forward to learn more about Peri-operative management of warfarin and bridge therapy.

Slide 38

These charts specify the recommended guidelines for interrupting warfarin therapy. Please study them carefully and be aware they will be featured in the Warfarin Inpatient Dosing Guide linked to the end of this course.

Our last topic regarding bridge therapy will detail the agents used for this purpose.

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Bridge therapy agents include unfractionated heparin or low molecular weight heparin. Carefully review the data provided for dosing recommendations. Click forward to continue.

Slide 42
Here are some basics to begin our review of warfarin monitoring. Take a moment to review each item. Before advancing, you'll need to click on the INR link and explore this term further.

When you're ready to continue, on the following page we'll explore some important topics regarding best practices for warfarin monitoring.

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A list of essential warfarin monitoring topics is provided on the clipboard shown to the right.

Click each topic on the clipboard to view details. All tables and charts on this page can be found in the Warfarin Inpatient Dosing Guide at the end of the presentation.

(For *INR monitoring pop-up window*)
Please read all bullets to be sure not to miss any important information! Remember, the pharmacist will order and monitor daily PT and INRs until the patient is stable, as stated in the warfarin dosing program.

(For *Adjusting home dose of warfarin while inpatient pop-up window*)
Use this chart as a dosing guideline for adjusting patients' home dose of warfarin, or patients who have been receiving warfarin for at least 7 days.

Slide 44
There are several agents prescribed for warfarin reversal. Click each of the reversal agents listed below to learn more.

After you've completed your review of this page, you'll be ready for a review of Section 3.

Slide 49
When converting to and from other direct oral anticoagulants (DOAC), it is important to monitor renal function and INR. Here are the recommendations for conversion between warfarin and other oral anticoagulants.

Slide 50
This table is a continuation of the information presented on the previous page. Click forward to continue.

Slide 51
It is important to properly document warfarin dosing after a consult. Carefully review the bulleted list on how to enter Eye Vent and Ancillary Notes in the Electronic Health Record. Click on the link in the lower left corner to view a Warfarin Note Template. When done, click forward to continue.

Slide 52
Patient counseling is a critical component of warfarin administration. Take a moment to consider each of the following counseling points and how you will incorporate them into practice when you sit down with a patient and/or family to provide education. The list is continued on the next page.

Slide 53

Here are some additional patient education topics for you to review.

There's information linked to monitoring unusual bleeding. Click that item to view further details before advancing to the patient scenarios.

Close Pop Up: You have viewed all of the content for this module. We'll finish by applying what we've covered in two patient scenarios. Click the screen as instructed to begin the first scenario.

Slide 59

Let's take a moment to recap what we covered. During this learning experience, you learned how to:

- Recall the evidence for effective, therapeutic warfarin dosing
- Use the provided dosing protocols to make appropriate recommendations for how to initiate, adjust and monitor warfarin dosing
- ...and access the Novant Health Collaborative Practice Inpatient Dosing program

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Thank you for taking the time to participate in this online education. The information shared in this course is featured in a Warfarin Inpatient Dosing Guide linked to the next page. Also, you'll be given instructions to access the assessment.

Again, thanks for taking this important step towards enhancing your ability to provide remarkable patient care!