



INR Testing

Quiz Feedback

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bpac^{nz} GP Review Panel:

Dr Janine Bailey, Motueka
Dr Stephen Kuzmich, Wellington
Dr Randall Sturm, Auckland
Dr Neil Whittaker, Nelson

Expert Reviewer:

Avril Lee, Integration Pharmacist, Waitemata Health

Panel discussion facilitated and summarised by:

Rachael Clarke
Sonia Ross
Dr Trevor Walker

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Email: rachael@bpac.org.nz

Fax: 0800 bpac nz
0800 27 22 69

Phone: 03 477 5418

Website: www.bpac.org.nz

INR Testing Quiz

There are always many possible options in medical practice. Answer the following questions as applying to the usual situation.

- Which statement about the INR target range is correct?
 - Risk of haemorrhage is decreased below this intensity of anticoagulation
 - There is no risk of haemorrhage at this intensity of anticoagulation
 - There is no risk of thromboembolic events at this intensity of anticoagulation
 - Thromboembolic risk is increased above this intensity of anticoagulation
- How do you prescribe warfarin?
 - By brand name
 - By generic name
 - Depends on situation
- What is the usual INR target range for a patient taking warfarin because of stable atrial fibrillation?
 - 1.0 – 2.0
 - 1.5 – 2.5
 - 2.0 – 3.0
 - 2.5 – 3.5
 - 3.0 – 4.0
- Which of the following statements about INR testing is correct?
 - INR testing and dose adjustment need to be carried out on the same day
 - INR testing should always be performed in the early morning
 - More frequent testing results in more stable INR results
 - Testing can be extended to four to six weekly for most patients
- When should INR be tested when stopping warfarin therapy?
 - Daily until INR returns to normal
 - Monthly until INR returns to normal
 - Weekly until INR returns to normal
 - None of the above
- Which of the following is usually appropriate for a woman on warfarin who is going for a minor dental extraction?
 - Reduce warfarin dose by 20%
 - Stop warfarin at least one week before procedure
 - Stop warfarin three days before the procedure
 - None of the above
- An otherwise healthy 33 year-old woman is on warfarin because of DVT two months ago. Her INR is usually within target range. Her latest INR is 3.5. When do you repeat her INR?
 - One day
 - 2 – 3 days
 - One week
 - Two weeks
 - One month

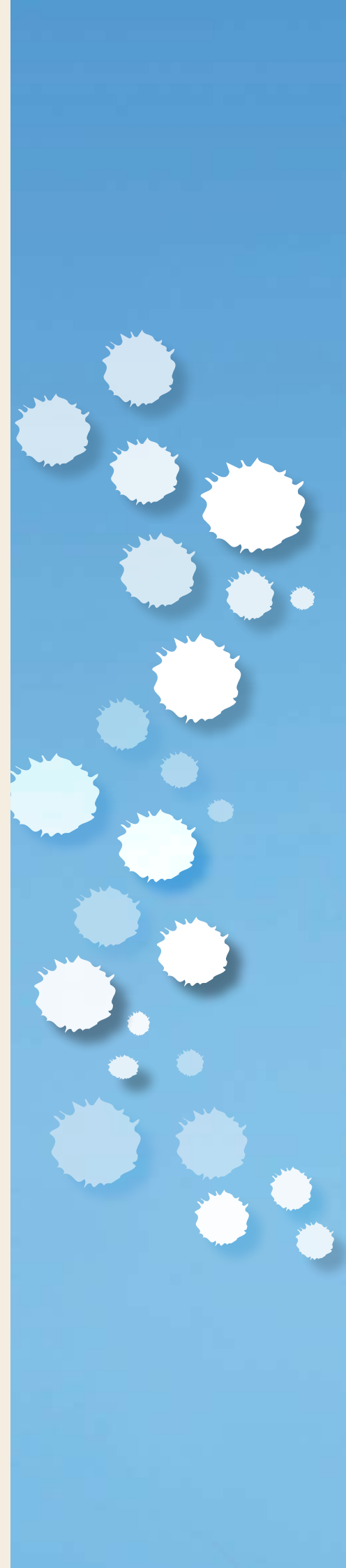
This quiz was designed to demonstrate a range of situations encountered when monitoring warfarin treatment.

Please let us know if there is any way we can make our case studies more useful to you. We want our resources to be helpful with your day-to-day clinical practice. We would be pleased to receive any suggestions that you have.

If you have any questions please email these to us and we will answer via the 'Your Questions Answered' section of our web site.

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Quiz feedback

Responses from Colleagues, GP Panel and Expert Review

1. Which statement about the INR target range is correct?

	You	Your Peers	GP Panel
Risk of haemorrhage is decreased below this intensity of anticoagulation		87%	✓
There is no risk of haemorrhage at this intensity of anticoagulation		4%	
There is no risk of thromboembolic events at this intensity of anticoagulation		7%	
Thromboembolic risk is increased above this intensity of anticoagulation		5%	

GP Panel

This question was designed to highlight that there is still a risk of haemorrhagic and thromboembolic events when the INR is within the target range. Around 10% of respondents stated that there is no risk of haemorrhage or thromboembolic events at this intensity of anticoagulation. Either of these could be dangerous assumptions. However the panel pointed out the question did need careful reading and the responses might not represent the actual belief of respondents.

The panel stressed that the limits of the INR target range do not represent firm cut off points. As the INR increases, the risk of haemorrhage increases and the risk of thromboembolic event falls. The target range is a range in which the benefits of anticoagulation are provided whilst minimising the risks of bleeding.

Expert comment

It is useful to remember that the aim is to achieve an INR level that balances the therapeutic goal with the risk factors for bleeding on an individual basis. Morbidity and mortality risk is significantly increased with an INR above 4 and below 1.5. Maintaining people within their target INR range reduces clinical risk but does not eliminate it.

It is important to:

- Ensure that your patients understand the importance of regular testing and why the interval may change.
- Support patient self-responsibility towards INR testing.
- Adopt an inter-disciplinary approach, so that doctors, nurses and pharmacists are giving consistent messages, in ways that patients can understand.

2. How do you prescribe warfarin?

	You	Your Peers	GP Panel
By brand name		51%	✓
By generic name		41%	
Depends on situation		8%	

GP Panel

All panel members, including bpac^{nz} members, prescribed warfarin by generic name until they were involved with this INR programme. We have all been taught that 'good prescribers' use generic prescribing. Warfarin is one of the few exceptions to this generally sound practice.

Marevan and Coumadin cannot be assumed to be bioequivalent and in addition have different strengths of tablet and different colour codes that can cause confusion. Marevan accounts for approximately 95% of warfarin prescribed in New Zealand and we were not sure why this is. We are looking forward to the comments of our expert commentator.

Expert Comment

Marevan is the brand of warfarin routinely used in hospitals, and as the majority of patients commence treatment with warfarin in hospital, this has driven the selection of this brand.

Due to the confusion in brands and strengths available, it is important to prescribe by brand so that pharmacists dispensing the medicine can ensure therapy is consistent, and support key messages around dosing and INR testing. Patients do get confused by the strengths available. We still have frequent admissions to hospital for people with raised INRs as they have finished one bottle of tablets before starting the next one - not realising they were different strengths. Once patients are stabilised on their warfarin dose, it is really important to ensure they do understand exactly how many of each strength they need to take.

It would be helpful to restrict Coumadin to the 2-3% of patients who are allergic to Marevan brand.

3. What is the usual INR target range for a patient taking warfarin because of stable atrial fibrillation?

	You	Your Peers	GP Panel
1.0 – 2.0		<1%	
1.5 – 2.5		1%	
2.0 – 3.0		97%	✓
2.5 – 3.5		1%	
3.5 – 4.0		0%	

GP Panel

The majority of our respondents and the GP panel indicated that the INR target range for a patient taking warfarin because of stable atrial fibrillation is 2.0 – 3.0. This is the target range for most situations. However patients with some conditions under specialist care will have different target ranges set. Therefore it cannot be assumed that the target range for all patients is 2.0 – 3.0. For this reason we suggest that the target range for each individual patient is displayed prominently in their clinical notes and in their patient held record.

Expert comment

With an increasing number of elderly people taking warfarin for atrial fibrillation, the advice to the left is really important. Generally older people have an increased sensitivity to the anticoagulant effect of warfarin and will require a mean lower dose than younger people. This is probably related to comorbidity associated with age and partly because they tend to store less vitamin K than younger people.

We probably need wide debate on the appropriateness of using warfarin in the frail elderly with atrial fibrillation to reduce the risk of stroke. Hospital staff tend to commence therapy without necessarily undertaking a risk: benefit analysis. GPs are really familiar with individual patients' histories and are ideally placed to challenge some of the thinking around the place of warfarin in this high risk group.

4. Which of the following statements about INR testing is correct?

	You	Your Peers	GP Panel
INR testing and dose adjustment need to be carried out on the same day		16%	
INR testing should always be performed in the early morning		5%	
More frequent testing results in more stable INR results		3%	
Testing can be extended to four to six weekly for most patients		95%	✓

GP Panel

Warfarin has a long half-life and this means firstly that there is no particular time of day when an INR test should be done, and secondly that for stable patients there is no need to perform INR testing and dose adjustment on the same day. The time constraints resulting from performing testing and dose adjustment on the same day may mean that a range of different clinicians are involved as the results return when the usual prescriber is not available. It may suit the practice and the patient better to avoid this rush.

During initiation or when the INR is unstable it may be necessary to test and adjust dose on the same day.

More frequent testing of INRs will indicate variation due to a wide range of factors; it is how you respond to these results that is important. Panel members indicated that they were comfortable with mild variations in INR results in patients who had been on the same dose of warfarin for some time. Dose adjustment for these people often results in over correction followed by a period of instability. The panel felt they got better results by discussing possible reasons for the INR fluctuation with patients, leaving the dose the same and maybe re-testing earlier than usual.

Testing can be extended to four to six weekly for most patients. Most patients understand the importance of INR testing, and will attend without recall; others however do not. The panel noted that patients who were well educated about warfarin therapy and understood the possible adverse effects were less likely to default from regular testing.

The panel went on to discuss how they recalled people on warfarin therapy. All had developed different systems to suit their own practices. One panel member routinely puts a recall on his computer for two weeks beyond the date of the planned next test. This means that for the patients who turn up on time (the majority) no recall note is generated; but a safety net is in place for those who do not turn up.

Expert comment

The effective half life of warfarin ranges from 20-60 hours, with a mean of about 40 hours. The duration of effect is 2-5 days. The drug is completely absorbed after oral administration, and peak concentrations occur within 4 hours. The elimination of warfarin is almost entirely by metabolism, with very little excreted in the urine and bile. Metabolism occurs mainly in

the liver, involving the cytochrome P450 and in particular the CYP2C9 isoenzyme.

Drug interactions can therefore critically interfere with warfarin control. The INR should be tested more frequently after starting, stopping or changing the dose of a concomitant medication. It takes several days for enzyme induction or other drug effects to take place, so that an INR measured about one week after a change in medication should reflect clinically significant interactions.

Additionally, a change in warfarin dose will take several days to influence the INR, so testing within 24 – 48 hours of a dose change may not truly reflect the steady-state response to the dose adjustment.

As the panel indicated, effective patient education can minimise compliance problems with warfarin and / or testing.

The point of care testing systems, coupled with software management support, may assist with 'hard to reach' populations by offering a 'one stop shop' approach to INR management.

5. When should INR be tested when stopping warfarin therapy?

	You	Your Peers	GP Panel
Daily until INR returns to normal		3%	
Monthly until INR returns to normal		<1%	
Weekly until INR returns to normal		2%	
None of the above		94%	✓

GP panel

The panel and the majority of respondents would not normally test INR after the cessation of warfarin therapy. Panel members could see some situations they might test, for example if the warfarin had been stopped because of very high INR results or it had been stopped for a surgical procedure that required the INR to be down below a particular level.

Expert comment

Once patients have reached their expected duration of treatment there is no need to monitor their INR.

If the INR has been too high, then re-testing of INR is usually within 24 hours of withdrawing treatment (dependant on INR level) and warfarin only resumed once INR is in therapeutic range.

For patients undergoing surgery, warfarin is usually withheld 5 days before surgery. (The exception to this are those procedures with a low risk of bleeding). Warfarin is then usually started on the day of surgery at the previous maintenance dose.

Patients with prosthetic valves and those who have suffered an acute thrombosis within the preceding 3 months should have some anticoagulation treatment in the peri and post operative period.

6. Which of the following is usually appropriate for a woman on warfarin who is going for a minor dental extraction?

	You	Your Peers	GP Panel
Reduce warfarin dose by 20%		2%	
Stop warfarin at least one week before procedure		<1%	
Stop warfarin three days before the procedure		14%	
None of the above		83%	✓

GP panel

Warfarin therapy need not be stopped for dental extraction for people with INR less than 3.0.

The panel pointed out that INR levels could be above levels that are normal for the patient because of medications she may have taken related to a dental procedure. For example erythromycin, roxythromycin, miconazole gel, NSAIDs, and paracetamol all potentiate the action of warfarin.

Expert comment

Concomitant use of macrolide antibiotics (erythromycin and roxythromycin) or miconazole oral gel and warfarin increases the INR – often significantly. In my area of practice we routinely admit people to hospital with INRs greater than 10 due to these interactions. The addition of a NSAID adds to the risk.

Please ensure that your PMS systems have the warfarin interactions alert switched on.

Also it would be good practice to record any sample medicines you dispense to patients. Some people have been admitted to hospital with unexplained bleeds, which have been ultimately been identified as due to Cox-2 inhibitor samples given in GP practices.

Alternatives? Use doxycycline as an alternative to a macrolide, and nystatin as an antifungal in people taking warfarin.

Your nursing staff should be aware of the drug interactions with warfarin, and it may be helpful to discuss this with your local community pharmacists to ensure they equally do not turn off the interaction warnings.

It is good practice to ensure your practice staff to remind patients taking warfarin that they must inform a health professional about starting or stopping other medications (including complementary or over the counter medicines). A large number of patients assume that their pharmacist will automatically remember that they are taking this medicine and will intervene when they are purchasing over the counter remedies.

7. **An otherwise healthy 33 year-old woman is on warfarin because of DVT two months ago. Her INR is usually within target range. Her latest INR is 3.5. When do you repeat her INR?**

	You	Your Peers	GP Panel
One day		1%	
2 – 3 days		10%	
One week		85%	✓
Two weeks		2%	
One month		2%	

GP panel

The panel would maintain the same dose of warfarin and repeat testing in one week as suggested by the nomogram on page 15 of the INR monitoring resource. However they would also carefully seek reasons for the change, such as non-adherence to the advised dosage regimen, changes to concurrent medications or comorbidities, commencement of herbal or alternative remedies and major changes in diet or alcohol intake.

Expert comment

It is important to understand that it is the INR trend over time that is important, not just one INR result. Close questioning should identify any potential changes to medications, diet or alcohol consumption over this time. It is important that the person feels supported, and that a safe environment is developed for them to discuss any changes. There is widespread evidence that people will often tell the doctor what they think they want to hear – not what they are actually doing.

Sometimes it is quite unusual – e.g. one patient bought liquorice allsorts when they went on special at the supermarket, and then could not understand why their INR went up periodically!



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