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| **Topic** | AF & Anticoagulation Management |
| **Chapter** | How the effect of vitamin K antagonists is monitored |
| **Audience** | Healthcare professional |
| **Type** | Core content |
| **Version** | 3 |

**1. What should I learn from this topic?**

The aim of this topic is give you an understanding of how the effect of vitamin K antagonists is monitored.

By the end of this chapter you should be able to:

1. Explain what the INR means

2. Describe the significance of the ISI of thromboplastins

3. Describe the target INR and range for a number of conditions as expressed by the British Haematological Society guidelines

**2. Check your understanding**

Before you start reading this topic check how much you already know by taking a short quiz. You will have an opportunity to take the quiz again at the end of the module, where we will reveal the correct answers.

**a) The INR measures how thin the blood is**

True / **False**

**b) The INR is a reflection of the prothrombin time (PT)**

**True**  / False

**c) The higher the value of the thromboplastin ISI, the more reliable the INR result is likely to be.**

True / **False**

**d) The INR value for some who has had a PE is expressed either as a target INR 2.5 or as a range 2.0 - 2.5**

**Tru**e / False

**e) A patient who has had a recurrent DVT whilst on oral anticoagulation should have an INR target of 3.0**

True / **False**

**f) Prior to cardioversion, a target INR of 3.0 can be aimed for.**

**True**  / False

**g) Which of the following will determine the INR target in someone with a mechanical heart valve (select all that apply)**

1. **The position of the valve**
2. **The type of valve**
3. **If the person has atrial fibrillation**
4. The age of the person

**3. How is the effect of vitamin K antagonists monitored? (the INR)**

*(image - 14\_MP900422310.JPG)*

* The effect of vitamin K antagonists is measured by the prothrombin time (PT) which is then expressed as the **International Normalised Ratio (INR).** The INR is sometimes said to measure the ‘thinness’ of the blood; in fact it measures how long it takes blood to clot.
* The prothrombin time is the time taken for citrated plasma to clot after the addition of calcium and tissue thromboplastin. The INR is then expressed as the ratio of the PT of the patient to the PT of a pool of plasma from healthy subjects on no medication.
* However, **thromboplastins** are not standardised among manufacturers or between batches from the same manufacturer. This can lead to significant variability in PT results for warfarinised patients.
* To overcome this, all commercially available thromboplastins are compared to an international reference thromboplastin and assigned an **International Sensitivity Index (ISI).** This value is used to mathematically convert the PT to the INR as follows:

 **INR = (PT patient / PT mean normal)ISI**

POINTS TO PONDER …

How would you explain to a patient what the INR means?

* The aim of the INR system, approved by the World Health Organisation (WHO) in 1983, is to provide a more uniform and safe way to monitor oral anticoagulation therapy.
* As the **value of the ISI** increases above a value of 1.0, the INR result will become less reliable.
* **Prior to 1983, laboratories used a thromboplastin reagent with a high International Sensitivity Index, or ISI, around 1.9 or more. This led to a wide variation in INR results between different laboratories testing the same sample of blood.**
* **Now it is mandatory that all laboratories should use a more responsive reagent with an ISI of 1.4 or less. An ISI of 1.0 is best, resulting in the least variation in INR results between laboratories sampling the same blood sample.**

**WHAT HAPPENS NEAR ME?**

Take a look at the methods of INR testing you will use in your clinics. What is the ISI for the thromboplastins used in your laboratory or in your near-patient testing coagulometer (if necessary, speak to your laboratory or contact the coagulometer manufacturer to find out)? If you use both methods of testing, how close are the ISI values? What is the significance of this?

**4. What is the target INR?**

* The dose of a vitamin K antagonist is adjusted to keep the patient’s INR at, or near, an optimum value; this is called the **target INR**.
* This optimum value can also be expressed as a target range of values, +/- 0.5 either side of the INR target. For example a target INR of 2.5 will usually have a target range of 2.0 – 3.0.

* The target INR is that which reduces the risk of thromboembolic events without producing an unacceptable risk of haemorrhage.

*(image – balance.svg)*

* This value is based on clinical evidence where available, and varies according to the condition being treated. The recommended target INR for each indication is regularly reviewed and published in the UK by the British Committee for Standards in Haematology (BCSH).

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| **Indication** | **Target INR** | **Duration** | **Notes** |
| **Venous thromboembolism (PE or DVT)** |  |  |  |
| Proximal DVT / PE | 2.5 | At least 3 months |
| Isolated distal DVT | 2.5 | 6 weeks |
| Recurrence whilst on anticoagulant | 3.5 | Optimum duration unclear |
| **Antiphospholipid syndrome** | 2.5 | Lifelong |
| **Atrial fibrillation (AF)** | 2.5 | Lifelong |
| **Cardioversion** | 2.5 | At least 3 weeks prior to and 4 weeks after procedure | A higher INR of 3.0 can be used prior to procedure |
| **Mitral stenosis or regurgitation with other risk factors (e.g. AF)** | 2.5 |  |  |
| **Mechanical heart valves** | 2.5 – 3.5 | Lifelong | The target INR will depend on:* the type of valve
* valve position
* patient-related risk factors
 |
| **Bioprosthetic (tissue) heart valve**  |  |  |  |
| In mitral position | 2.5 | 3 months |
| With other risk factors (e.g. AF, low ejection fraction) | 2.5 | At least 3 months |

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**INR Target Ranges (BCSH, 2011)**

* Note that these target INRs and treatment durations provide guidance only, and may be adjusted according following an individual’s risk assessment. For example, if a person is anticoagulated for stroke prevention and is experiencing frequent nose bleeds, the INR target may be lowered.

Now please take a look at the BCSH’s Guidelines on oral anticoagulation with warfarin (4th edition, 2011)

http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2141.2011.08753.x/full

**DEMONSTRATE YOUR UNDERSTANDING**

Now try to answer the questions ate the start of this chapter again. Did you get a higher score?