A deep vein thrombosis (DVT) is a condition whereby a blood clot (a thrombus) is formed in a vein. This can dislodge, then travel into the bloodstream and towards the lungs, where it can cause a pulmonary embolism (PE); this is a blockage in the pulmonary circulation that is known to be life threatening (National Institute for Health and Care Excellence, 2020). DVT and PE are both in the category of venous thromboembolic (VTE) disorders. A DVT is most often found in the lower extremities and can be linked to increased morbidity by progressing to a PE or causing long-term complications, such as post-thrombotic syndrome (Bhatt et al, 2020). Thromboses can potentially be found in every deep vein in the body; the arm is another of the most common locations for a DVT and is estimated to account for around 5% of all thromboses (Isma et al, 2010).

Thomas (2014) identified that patients who are non-complex but have a suspected DVT are ideally placed to be diagnosed and managed in primary care. The development of treatment pathways, as advocated by NICE (2020), were aimed at preventing unnecessary hospital admissions, thereby reducing costs to the NHS. The NHS Long Term Plan focuses on improving the patient journey – which is key to increasing patient satisfaction and boosting proactive care – by screening and diagnosing at-risk patient groups at an earlier point in time (NHS, 2019).

In Next Steps on the Five Year Forward View, the NHS (2017) identified DVT as a patient-safety concern as part of its harm-reduction initiative. It reflected that nurses will increasingly be required to identify and assess for DVT in both primary and secondary care, and so need the skills to assess the clinical risk of the patient. This article explains how to: understand deep vein thrombosis in terms of its associated risk factors, use the two-level Wells score for estimating a patient’s risk, and carry out a leg assessment for a suspected deep vein thrombosis.

In this article...

- Understanding the risk factors for deep vein thrombosis
- Diagnostic testing to inform an assessment
- How to assess the leg for a suspected deep vein thrombosis

Clinical assessment of the leg for a suspected deep vein thrombosis

Key points

- There are multiple risk factors for venous thromboembolic disorders, making them complex to diagnose
- The two-level Wells score is a systematic standardised approach to deep vein thrombosis assessment
- Other risk factors and variables must be considered during a deep vein thrombosis assessment
- The procedure for a leg assessment for a suspected deep vein thrombosis is within the skillset of nurses
- Nurses must be aware of referral pathways and National Institute for Health and Care Excellence guidance on managing patients with suspected deep vein thrombosis

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Keywords

Deep vein thrombosis/Leg assessment

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two-level Wells score as a decision-making tool to estimate a patient’s risk of a DVT;
- Demonstrate the process of a leg assessment for a suspected DVT.

**Causes of a DVT**

Virchow’s triad (republished in 1998) refers to three factors that can contribute to a venous thrombosis:
- Venous trauma, whereby damage occurs to the vessel walls;
- Venous stasis, characterised by poor blood flow;
- Hypercoagulability, otherwise described as abnormal blood constituents (Welch, 2010). The more risk factors a patient has, the greater their risk of developing a thrombus. Patients who are pregnant, or have had recent hospitalisation or surgery, may become high risk because they are less mobile (which causes a reduction in blood flow) or have vascular wall injury as a result of an intervention. Those with cancer and already increased coagulability may have had chemotherapy, be immunocompromised or have acquired infections, which can combine to make them high risk. More recently, studies have found increased risk associated with a VTE in patients with severe Covid-19 admitted to critical care, despite prophylactic anticoagulation (Fontana et al, 2020; Hasan et al, 2020).

There have been calls for further research into VTE, Covid-19 and the therapeutic treatment of patients in this at-risk group on an individual basis, instead of it being protocol driven (Hasan et al, 2020). Fig 1 demonstrates the categories and some causes in Virchow’s triad, which can contribute to a thrombosis (Dunn and Kendall, 2020).

The evidence-based screening tool advocated by NICE (2020) is the two-level Wells model for predicting the probability of DVT (Fig 2), developed by Wells et al (2003). The tool is used to support decision making in practice and, although it is systematic, it cannot safely rule out a DVT in isolation. When the Wells score is calculated as ≤1 (which is considered low probability) and combined with a negative D-dimer test, it explicitly excludes a DVT (Iorio and Douketis, 2014). Patients score one point for any of the clinical features with which they present on the screening tool. If it is considered that an alternative diagnosis to DVT is likely, it is always important to subtract two points from the total final score to produce the final outcome.

In practice, decision-making tools should never override clinical autonomy, and patient safety is always our key priority. It must be noted that pregnancy is one exclusion of the Wells risk assessment; the tool has not been validated for use in this situation and false positives, along with the potential for unnecessary anticoagulation in people in such a high-risk group, could lead to unnecessary harm (Righini et al, 2013).

**Fig 2. Wells model for predicting DVT probability**

<table>
<thead>
<tr>
<th>Clinical feature</th>
<th>Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer (treatment ongoing, within 6 months or palliative)</td>
<td>1</td>
</tr>
<tr>
<td>Paralysis, paresis or recent plaster immobilisation of the lower extremity</td>
<td>1</td>
</tr>
<tr>
<td>Recently bedridden for ≥3 days, or undergone major surgery within 12 weeks requiring general/regional anaesthesia</td>
<td></td>
</tr>
<tr>
<td>Localised tenderness along the distribution of the deep venous system</td>
<td>1</td>
</tr>
<tr>
<td>Entire leg swollen</td>
<td>1</td>
</tr>
<tr>
<td>Calf swelling at least 3cm larger than asymptomatic side</td>
<td>1</td>
</tr>
<tr>
<td>Pitting oedema confined to the symptomatic leg collateral superficial veins (non-varicose)</td>
<td></td>
</tr>
<tr>
<td>Collateral superficial veins (non-varicose)</td>
<td>1</td>
</tr>
<tr>
<td>Previously documented DVT</td>
<td>1</td>
</tr>
<tr>
<td>An alternative diagnosis is at least as likely as DVT</td>
<td>-2</td>
</tr>
</tbody>
</table>

**Clinical probability simplified score**

- DVT likely: ≥2 points
- DVT unlikely: <2 points

**Clinical Practice**

**Review**

The Wells score, as highlighted, is comprehensive, but a patient’s history must not be overlooked, as many conditions that could predispose an individual to a thrombus are not included in its scoring system. As an example, the following can also increase the risk of a VTE:

- Haematological conditions, such as thrombophilia;
- Pregnancy;
- Autoimmune disorders;
- Obesity;

**D-dimer testing**

Diagnostic testing is required to exclude VTE and inform the assessment; in addition to clotting, the following investigations are all considered best practice:

- D-dimer (see below);
- General inflammatory markers;
- Baseline blood count;
- Hepatic function;
- Renal function (NICE, 2020).

A D-dimer is a blood test that can detect levels of fibrin degradation (fibrin is a protein in the blood and a primary component of blood clotting). A value of <500µg/L is conventionally used to safely rule out VTE; it has a low false-negative rate. However, a D-dimer range can vary according to the reagents used in laboratory testing and so may be different across hospitals; this must be taken into account when following a local pathway.

A D-dimer has the advantage that it is quick and can be taken with other routine blood tests for use in conjunction with a clinical history wherever there is clinical suspicion of VTE. Elevated levels are generally found in patients with those conditions that are associated with thrombosis, such as pregnancy and advanced cancer; therefore, the D-dimer test should not be used independently of other investigations because it can produce false negatives (Weitz et al, 2017).

Developments in D-dimer testing mean the age-adjusted D-dimer is now being used in combination with other clinical probability assessments to rule out suspicion of VTE, with the level of the result adjusted accordingly to calculate the risk to the individual. An age-adjusted D-dimer, with a cut off for patients aged ≥50 years, for ruling out DVT has been deemed safe in some studies (Nybo and Hvas, 2017; Righini et al, 2014) and is recommended in the NICE (2020) guidance; however, local policies and procedures must always be adhered to when treating and assessing patients with DVT.

**Box 1. How to conduct a leg for assessment using the Wells screening tool**

1. Obtain informed consent from the patient and explain the procedure
2. Maintain privacy and dignity at all times and consider a screened area or cubicle to assess your patient
3. Wash your hands following local policy, and use personal protective equipment according to local policy
4. Position the patient to allow full visibility of both legs and ensure their comfort
5. Expose both legs to identify any asymmetry or unilateral swelling, skin changes, wounds, oedema, erythema, varicosities
6. Measure the difference in circumference of the calves; this is measured 10cm below the tibial tuberosity. If there is >3cm difference to the asymptomatic side, a DVT is the likely diagnosis (Wells et al, 1997)
7. Check for heat with your hand above the suspected area of DVT before palpation
8. Palpate both legs, checking for pitting oedema, pain and breaks in the skin. Pain specific to the deep venous system can be a symptom of a DVT (Wells et al, 2003)
9. Check capillary refill time is <2-3 seconds; this is a marker of peripheral perfusion
10. Palpate foot pulses. Check the dorsalis pedal pulse, which is on the top of the foot (Fig 3) and the posterior tibial pulse, which is located behind the medial malleolus (ankle bone) (Fig 4)
11. Assess whether your patient can weight bear and mobilise effectively, and whether this is a change from their normal condition
12. Assess range of movement in the patient's joints by gently moving the leg to detect any arthritic swelling or acute pathology that may explain symptoms
13. At the end of the assessment, make the patient comfortable, ensuring their privacy and dignity
14. Document your findings and report any concerns according to local policy

DVT = deep vein thrombosis

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**Clinical assessment of the leg**

The leg needs to be examined fully to correctly use the Wells screening tool (Wells et al, 2003), and examining a leg properly requires nurses to demonstrate that they are competent to carry out the steps outlined in Box 1.

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**Fig 3. Checking the dorsal pedal pulse**

**Fig 4. Checking the posterior tibial pulse**

Communication must be maintained throughout and the patient informed of the proposed plan of care. The clinical examination and consultation with the patient must be taken in the context of a full clinical history and the National Early Warning Score (NEWS) 2 system (Royal
College Physicians, 2017). A thorough clinical examination is important to highlight concerns as, in the next stage of the patient’s journey, it will be used in conjunction with a D-dimer test, or ultrasound in secondary or ambulatory care, to make a diagnosis following NICE (2020) guidance.

Symptoms of a PE such as pleuritic chest pain, haemoptysis or acute shortness of breath need to be assessed as this will inform the need for diagnostic imaging, such as a computed tomography pulmonary angiogram.

Fig 5 shows a patient with varicose veins, which are a risk factor for DVT. Visible signs of a DVT are an acutely swollen leg and dilatation of superficial veins; other features are the leg being hot to touch and pain on palpation of the calf. However, <50% of patients with a DVT present like this (Forbes and Jackson, 2003).

Differential diagnosis

It is important to consider differential diagnosis when assessing for a DVT – not just for calculating the Wells score, but also to:

- Treat the patient’s symptoms;
- Alleviate anxiety;
- Potentially investigate further if the cause for the leg swelling is unclear.

Other causes for a swollen leg may include chronic venous insufficiency, a Baker’s cyst, superficial thrombophlebitis, cellulitis and musculoskeletal pain. Schellong et al (2013) identified that other occurrences such as lower-limb oedema, lymphoedema, diabetic foot lesions and, even, tumours can also lead to symptoms that resemble those of a DVT. It is important to be aware, however, that this list of differential diagnosis is not exhaustive.

“The severe inflammatory processes manifested by Covid-19 can increase the incidence of deep vein thrombosis”

Medical management

NICE (2020) guidance states that, once a patient has been assessed, if a DVT has to be excluded, a proximal leg vein ultrasound scan is needed. If a scan cannot be arranged within four hours, the patient must receive an interim therapeutic dose of anticoagulation therapy, such as a low molecular weight heparin, until a DVT is excluded. Patients must be weighed for the correct dose.

Best practice is to explain the therapy given and supplement this with a patient information leaflet to alert the patient to the risk of bleeding or other complications they may experience. Patients can be treated and discharged if they are medically stable, then return for their scan and follow-up at the earliest opportunity.

Conclusion

The identification of a suspected DVT is the responsibility of nurses in all clinical settings, and the risk factors, implications and clinical assessment of suspected patients is in the skillset of all nurses. As the identification of Covid-19 as a potential risk factor for a VTE may increase the prevalence of DVTs, there should be greater awareness of the referral pathway for further investigation; this would simplify the investigative process of this treatable disorder and save lives.

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