

# The Prevention of Deep Vein Thrombosis Through Leg Exercises

In postoperative patients, how does the action of performing leg exercises compared to staying immobile prevent the formation of deep vein thrombosis?

Prepared by: Clare-Anne Queenan, Carly Longstaff, Binderpal Tiwana, Jessica Park

## Introduction

- Deep Vein Thrombosis is when a thrombus (clot) forms, usually in the iliac or femoral veins. There are three factors – Virchow's Triad – that contribute to the formation of venous thrombosis (Lewis, Dirksen, Heitkemper, Bucher, & Camera, 2014).
- According to research, when postoperative patients perform lower extremity exercises, venous stasis is averted and deep vein thrombosis prevented (Wang, Chen, Ye, Shi, & Zhang, 2016).
- Performing each exercise 5 times every 2 hours is an inexpensive and noninvasive form of deep vein thrombosis prophylaxis in a hospital setting (Lewis et al., 2014).

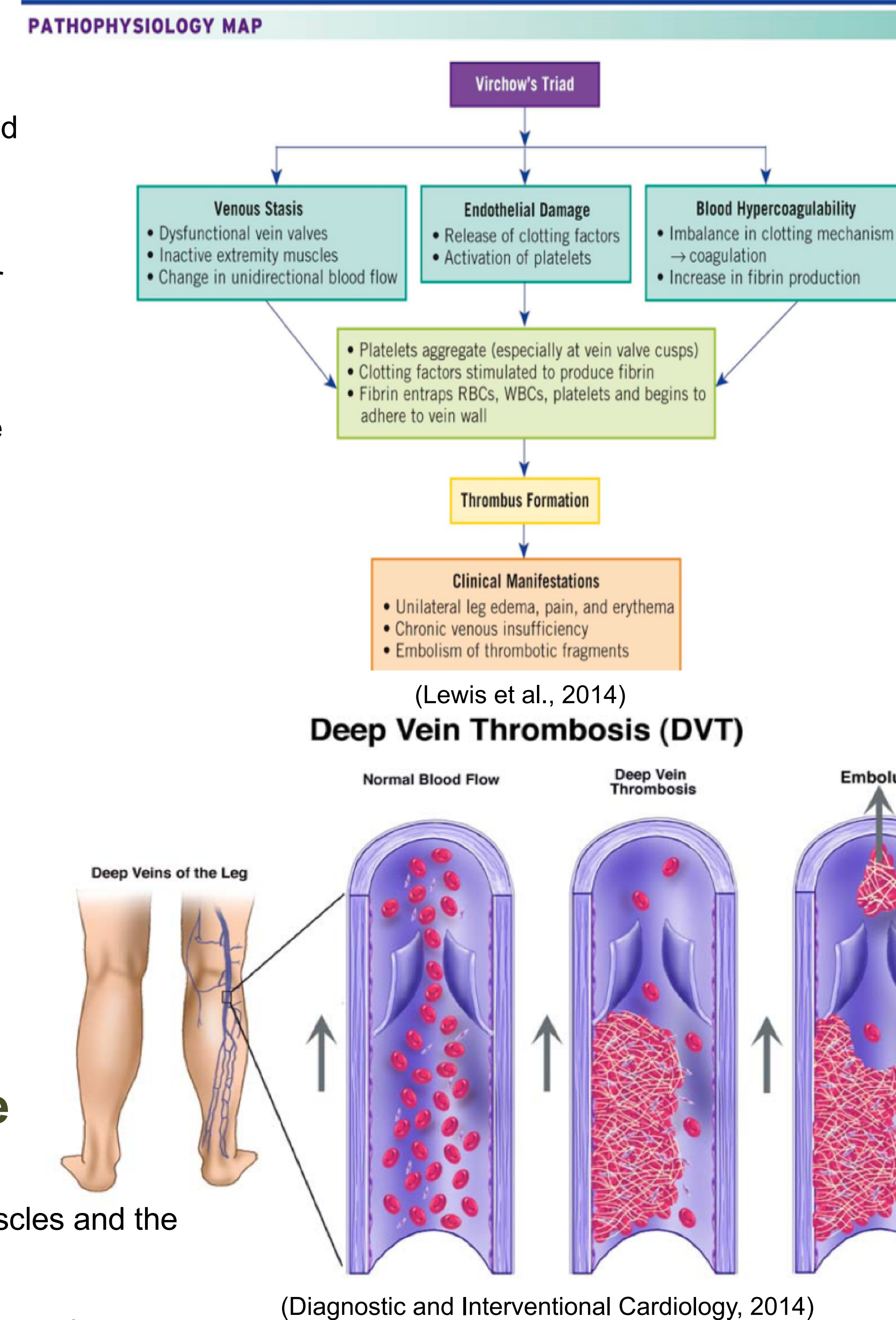
## What are some complications that can arise?

Leg exercises can prevent deep vein thrombosis formation and the following associated complications:

- Chronic venous insufficiency
- Pulmonary embolism (clot dislodges and ends up in patient's lungs, MOST SERIOUS)
- Phlegmasia cerulea dolens (severe cyanosis of the leg causing arterial occlusion, gangrene, and amputation) (Lewis et al., 2014)

## Why is this important for post-operative patients?

- Unidirectional venous return occurs due to the contraction of muscles and the function of venous valves (Lewis et al., 2014).
- When the muscles are inactive and stasis occurs, the valves become key areas for platelet aggregation (Lewis et al., 2014).
- Post-surgical patients are at risk for venous stasis due to bedrest, fractured legs or hips, and lack of mobility due to long surgical procedures (Lewis et al., 2014).



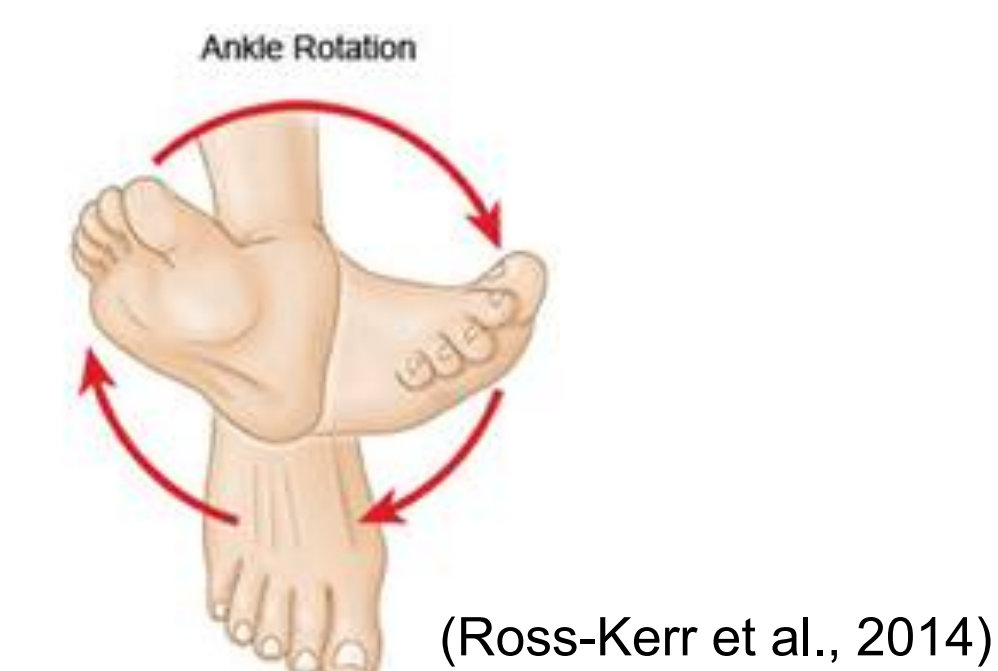
## What leg exercises can we perform?

### Leg Exercises

- The following in-bed exercises increase venous return in bed (Potter, Perry, Stockert, & Hall, 2014).

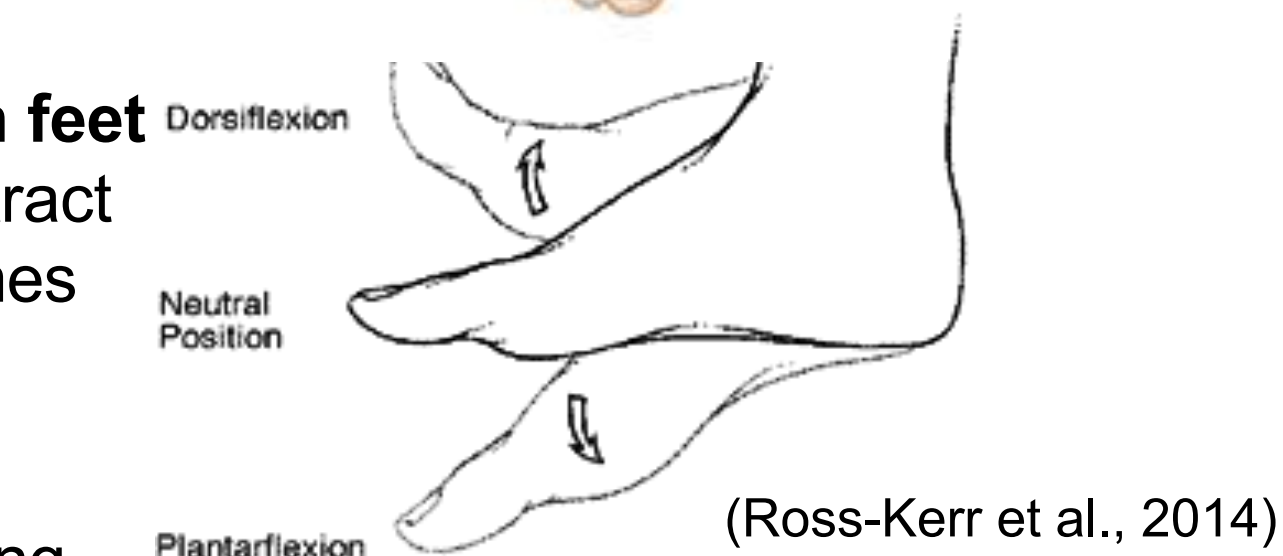
### Ankle Rotation

- Rotate each ankle in complete circle. Instruct patient to draw imaginary circle with big toe. Repeat it five times (Ross-Kerr et al., 2014).



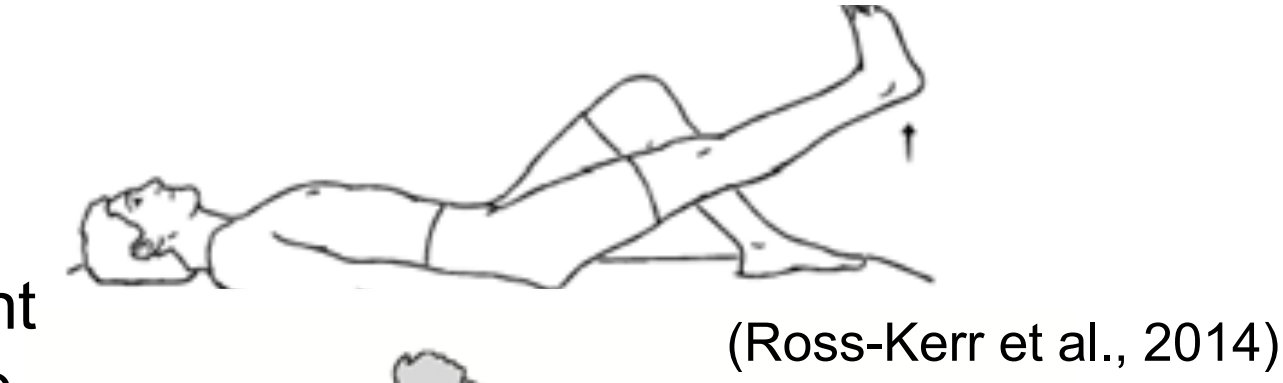
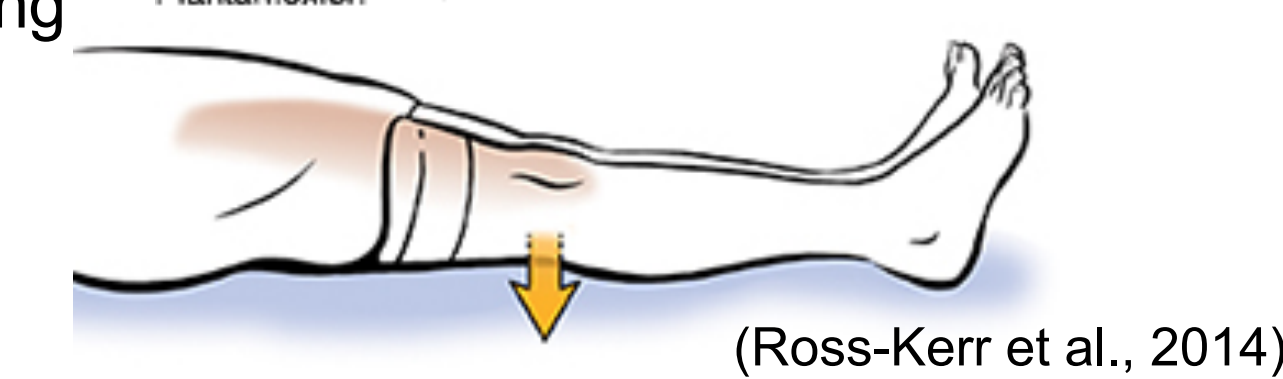
### Dorsiflexion and Plantarflexion of both feet

- Direct patient to feel calf muscles contract and relax alternately. Repeat it five times (Ross-Kerr et al., 2014).



### Quadriceps setting

- Perform quadriceps setting by tightening thigh and bringing knee down toward mattress and then relaxing. Repeat it five times (Ross-Kerr et al., 2014).



### Raising legs

- Patient alternately raises each leg straight up from bed surface while keeping legs straight. Then have patient bend leg at hip and knee. Repeat it five times (Ross-Kerr et al., 2014).

### Limitations:

- Patient noncompliance to schedule
- Incorrect techniques used
- Pain
- Sedation/cognitive awareness

### Strengths:

- Free
- Easy to perform
- No equipment required
- Independent intervention

## Conclusion

- Deep vein thrombosis is a serious complication that can occur to post operative patients (Lewis et al., 2014).
- Leg exercises in post operative patients have been shown to successfully prevent thrombus formation by increasing venous flow rate (Sochart & Hardinge, 1999).
- Performing each exercise five times every two hours is manageable for patients in post operative recovery (Lewis et al., 2014).
- As nurses, teaching these exercises to patients is a simple way to have them become engaged members in their care plan. It is an individual activity that requires simple teaching preoperatively and postoperatively (Lewis et al., 2014).
- This form of intervention is not only beneficial to the patient, but is cost effective for our healthcare system, due to the fact it requires no equipment (Sochart & Hardinge, 1999).

## References

- Diagnostic and Interventional Cardiology (2014, March 7) Society of interventional radiology: understand long-term risks of DVT. Retrieved from <https://www.dicardiology.com/article/society-interventional-radiology-understand-long-term-risks-dvt>
- Lewis, S.L., Dirksen, S.R., Heitkemper, M.M., Bucher, L. & Camera, I.M. (Eds.). (2014). *Medical-surgical nursing: Assessment and management of clinical problems*, (8rd Cdn. ed.) (S.L. Lewis, S.R. Dirksen, M. M. Heitkemper, L. Bucher & I.M. Camera Cdn. Adapt.). Toronto, ON: Elsevier Canada.
- Li, Y., Guan, X., Wang, R., Li, B., Ning, B., Su, W., ... Li, H. (2016). Active ankle movements prevent formation of lower-extremity deep venous thrombosis after orthopedic surgery. *Medical Science Monitor*, 22(1), 3169-3176. doi: 10.12659/MSM.896911
- Potter, P. A., Perry, P. G., Stockert, P. A., & Hall, A. M. (Eds.). (2014). *Canadian fundamentals in nursing* (5th Cdn. ed.) (J. C. Ross-Kerr, M. J. Wood, B. J. Astle & W. Duggleby, Cdn. Adapt.). Toronto, ON: Elsevier Canada.
- Sochart, D. H. & Hardinge, K. (1999). The relationship of foot and ankle movements to venous return in the lower limb. *The Journal of Bone and Joint Surgery (Br)*, 18-B(4), 700-704. Retrieved from <http://bjj.boneandjoint.org.uk/content/18-B/4/700.full.pdf>
- Wang, Z., Chen, Q., Ye, M., Shi, G. H. & Zhang, B. (2016). Active ankle movement may prevent deep vein thrombosis in patients undergoing lower limb surgery. *Annals of Vascular Surgery*, 32, 65-72. doi: 10.1016/j.avsg.2015.10.012

## From Research

- Wang, Chen, Ye, Shi and Zhang (2016) focus on patients that have received lower limb surgeries and the rehabilitative effects of postoperative ankle movements in order to prevent DVT.
- They chose 174 patients with 78 of them in the control group and the 96 of them in the experimental group. The control group received regular routine nursing interventions; whereas, the other received active ankle movement interventions in addition to the regular routine ones.
- Independent variable: active ankle movement; Dependent variable: DVT
- Overall, the study indicated that active ankle movements can, in fact, prevent the formation of DVT in patients by relieving swelling and augmenting the maximum venous outflow, which prohibits venous stasis.

- A quasi-experimental study conducted by Dr. Ye Li and colleagues (2016) evaluated if active ankle movements would increase blood flow from the legs and prevent deep vein thrombosis formation in patients who had undergone orthopedic surgery.
- The study consisted of 193 patients divided into a control group (97 participants) or a case group (96 participants).
- Independent variables: routine nursing care and the addition of active ankle movements; Dependent variables: The maximum venous outflow (how much blood could return from legs), maximum venous capacity (how much blood the veins could hold) and whole blood viscosity.
- Researchers concluded that active ankle movements are an effective addition to routine nursing care for prevention of deep vein thrombosis by promoting the return of blood to the heart and decrease pooling blood in the lower extremities.

- A quasi-experimental study conducted by Dr. Sochart and Dr. K. Hardinge (1999) explored the relationship between active and passive foot and ankle movements, and how each movement affected blood flow from lower limbs.
- The study consisted of 20 individuals with no previous history of illness. Researchers constructed a machine that performed leg movements for participants, and researchers evaluated venous blood flow with a doppler.
- Independent variables: Active movement of the foot and ankle and passive movement of the foot and ankle; Dependent variables: The amount of blood return from lower extremities.
- It was found that a combination of active movements – flexion and rotation – had the most effective venous return when compared to passive motions.

In conclusion, all three studies stated that active ankle and foot movements help decrease venous stasis and can help prevent deep vein thrombosis.