

COMPRESSION STOCKINGS FOR PREVENTING DEEP VEIN THROMBOSIS IN AIRLINE PASSENGERS

- *Original publication: Clarke MJ, Broderick C, Hopewell S, Juszczak E, Eisinga A. Compression stockings for preventing deep vein thrombosis in airline passengers. Cochrane Database of Systematic Reviews 2016, Issue 9. Art. No.: CD004002. DOI: 10.1002/14651858.CD004002.pub3.*
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■ KEY MESSAGES FROM THE ORIGINAL PUBLICATION

- ➔ Air travel might increase the risk of deep vein thrombosis (DVT).
- ➔ Wearing compression stockings during long-haul flights lasting more than 4 hours reduces the risk of symptomless deep vein thrombosis (high-quality evidence). The risk is reduced from 10 per 1000 in passengers without stockings to 1 per 1000 with stockings.
- ➔ Leg swelling is also reduced with compression stockings (low-quality evidence).
- ➔ Wearing compression stocking is well tolerated.



■ SUMMARY OF THE ORIGINAL PUBLICATION

Context

Because of the increasing number of people taking long-haul flights, there is a growing interest in preventing circulatory problems in airline passengers among which deep vein thrombosis (DVT). Prolonged immobilisation of the legs may activate coagulation leading to DVT, a partial or total blockage of the deep venous system by blood clot. The symptoms of DVT do not usually develop immediately and diagnosis can be problematic. Untreated DVT may lead to pulmonary embolism when a fragment of thrombus migrates in the lungs.

Compression stockings are thought to reduce the risk of DVT by exerting graduated pressure on the leg, with the pressure being greatest at the ankle. This, when combined with muscular activity in the limb, is thought to displace blood from the superficial venous system to the deep venous system, increasing velocity and volume of blood flow.

Method

This systematic literature review included randomized controlled trials (RCTs) that compared people wearing compression stockings versus people not wearing them during flights lasting at least four hours. This includes trials in which no other form of prevention was used, and trials in which other forms of prevention were available equally to both groups (e.g. physical exercises or sufficient fluid intake).

The primary outcome was symptomatic or symptomless DVT as assessed by ultrasound, venogram or isotope. Secondary outcomes were pulmonary embolism, death, superficial vein thrombosis, oedema, adverse effects arising from the use of compression stockings.

The quality of the included RCTs was appraised using the Cochrane risk of bias assessment tool. The level of evidence was assessed by means of GRADE.

What is KCE has read for you?

KCE has read for you synthesises a recently published high-quality systematic review or health technology assessment with relevance for the Belgian health system.



The original publication was appraised and contextualised by KCE researchers. KCE has read for you is not based on original research conducted by KCE.

More details on methodology can be found on the KCE website



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This document includes:



- **Key findings** of the publication under evaluation
- **A contextualisation** within the Belgian healthcare system

Not included:



- Recommendations
- Detailed descriptions



Trustworthy original publication

The methodological quality of the systematic review was assessed with the AMSTAR tool.



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Results

Eleven RCTs, published between 1998 and 2008, were included (2 906 participants). One trial allocated passengers to wear a tight on one leg during an outward flight and on the other leg on the return and was not included in quantitative analysis. Among the ten trials randomizing participants to compression stockings on both legs versus no stocking, advice on in-flight exercises was also provided to all participants in one, and advices on in-flight exercises, fluid and nutritional intake in the other nine. Allocation concealment and blinding of outcome assessment was unclear in the majority of trials.

Symptomless deep vein thrombosis

Nine trials reported on DVT and included follow-up of 2 637 passengers. The overall incidence of symptomless DVT was 1.45% in the seven trials that recruited people judged to be at low or medium risk, and 2.43% in the two trials that recruited high-risk participants (previous episodes of DVT, coagulation disorders, severe obesity, limited mobility due to bone or joint problems, neoplastic disease within the previous two years, large varicose veins or, in one of the studies, participants taller than 190 cm and heavier than 90 kg).

In three of the nine trials, no symptomless DVTs were found in any of the participants, regardless of whether they wore compression stockings or not. Overall 50 people developed a symptomless DVT. Among those, 3 wore compression stockings and the remaining 47 did not (Odds Ratio 0.10; 95% CI: 0.04 – 0.25; $p < 0.001$; high-quality evidence). Such risk reduction would translate in an absolute risk reduction of DVT from 10 ‰ to 1 ‰ (95%CI: 0 – 3 ‰) in low risk passengers and 30 ‰ to 3 ‰ (95%CI: 1 – 8 ‰) in high risk passengers.

Conclusions

High-quality evidence shows that wearing compression stockings by airline passengers taking long-haul flights (lasting at least four hours) reduces the incidence of symptomless DVT. In addition, leg oedema is also reduced if they wear compression stockings (low-quality evidence).

Assessing the effect of wearing compression stockings on death, pulmonary embolism or symptomatic DVT would require larger trials. Comparison between compression stockings and other preventive strategies, as well as testing various strengths of compression, would also be informative.

KCE VIEWPOINT

Quality of the original publication

Two KCE researchers independently appraised the quality of this review using the AMSTAR tool. The score obtained by the review was 10/11. Although the quality of evidence for symptomless DVT was graded high by the authors, it should be noted that the outcome assessment was not blinded in the majority of trials and that could have introduced a detection bias. Whether passengers wearing compression stockings behaved differently than controls as regards the other preventive advices (e.g. physical exercise) was not described. Results were not stratified by baseline risk of DVT (low-medium vs. high) probably because of insufficient data. It is therefore unknown whether compression stockings would be more effective in high-risk passengers.

Belgian context

In 2015, there were more than 15.5 million passengers registered in Belgian airports. The number of Belgian travellers that may benefit from wearing compression stockings is unknown but this number is most likely substantial, and expected to grow in the future. Wearing compression stockings would be worthwhile considering, particularly by high-risk passengers on flights lasting at least four hours, along with other preventive measures.

Superficial vein thrombosis

Out of 1 804 participants from eight trials, 4 passengers with compression stockings developed superficial vein thrombosis and 12 passengers without stocking. There was no significant difference between groups (OR=0.45; 95% CI 0.18 – 1.13; $p=0.09$; moderate-quality evidence). Of note, the 4 events in the compression stockings group were from the same trial and occurred in varicose veins in the knee region which were compressed by the upper edge of the stocking.

Oedema

This outcome was reported in eight trials. There was a reduction in risk of oedema when passengers wore compression stockings. The variety of measurement procedures precluded the computation of an overall point estimate (low-quality evidence).

Symptomatic deep vein thrombosis, pulmonary embolism and death

The effect of wearing compression stocking on symptomatic DVT, pulmonary embolism or death could not be assessed because no event occurred in any of the included trials.

Adverse effects arising from the use of compression stockings

No adverse effect was reported (assessed in 4 trials).

What is the Cochrane collaboration?

The Cochrane Collaboration is an international independent network of researchers, healthcare professionals and users of healthcare, carers, and people interested in health that aims to promote evidence-informed health decision making by producing systematic reviews.

What is GRADE?

GRADE (Grading of Recommendations Assessment, Development and Evaluation) offers a system for rating quality of evidence in, amongst other, systematic review. More information on GRADE can be found in the GRADE website and in the KCE process book.

What is the Cochrane's tool for assessing risk of bias?

This Cochrane's tool for assessing risk of bias provides judgements made on six domains including randomisation sequence generation, allocation concealment methods, blinding (participants, personnel and outcome assessors), incomplete outcome data, selective outcome reporting, and any other relevant biases. For each domains, one of the following risk level can be attributed: low, unclear, or high risk.