

Introducing a device to assist in the application of anti-embolism stockings

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ABSTRACT

Using a device to help with the application and removal of anti-embolism stockings, often called thromboembolic deterrent stockings (TEDS), can potentially facilitate greater adherence to the use of stockings, and potentially reduce the risk of deep-vein thrombosis (DVT). This article describes a quality improvement project which used the Plan, Do, Study, Act (PDSA) cycle to facilitate the introduction of a device to aid in the application of thromboembolic deterrent stockings in an orthopaedic ward. The project findings showed that Neo-slip[®], a product designed to facilitate the use of compression stockings, can be effectively introduced into an orthopaedic ward, with positive feedback from both staff and patients.

Key words: Deep-vein thrombosis ■ Anti-embolism stockings
■ Thromboembolic deterrent stockings

The use of devices to help with the application and removal of anti-embolism stockings, often called thromboembolic deterrent stockings (TEDS), can potentially facilitate greater adherence to the use of stockings, and, in the long-term, potentially reduce the risk of deep-vein thrombosis (DVT).

A number of devices have been developed to aid in the application of TEDS. These include a hosiery application aid for open/closed stockings by Arion Magnide and a variety of devices from the Medi company, including the two-in-one donning and doffing aid. Another of these devices is Neo-slip[®], a low-friction pouch that aids in the application of stockings (*Figure 1*). Neo-slip was developed by a registered nurse who saw the potential to develop an easy-to-use device because she saw many patients struggling to put the stockings on with ease. There has been no formal evaluation of Neo-slip to date, although the product has been distributed widely and has received commendation from a number of sources, such as the Royal College of Nursing. The aim of this project was to undertake an evaluation of the introduction of Neo-slip in one ward of an NHS trust in the UK.

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Accepted for publication: March 2016



Figure 1. Neo-slip in use

Literature review

Anti-embolism stockings are recommended for use after surgery. Guidance from the National Institute for Health and Care Excellence (NICE) (2010) recommends that, when patients are discharged with anti-embolism stockings, they understand the benefits of wearing them and the need for daily hygiene removal, and are able to remove and replace them, or have someone who will be able to do this for them.

However, many patients find it very difficult to remove and replace stockings every day and a range of reasons for non-adherence have been described. Intolerance of the tightness of the stocking, poor fit, and inability to apply the stocking have all been cited as reasons why patients do not wear them at home following surgery.

A survey of more than 60 patients (Quinn et al, 2015) found that over half of the patients had difficulty in application of compression stockings, while physicians correctly predicted that difficulty in application was the main reason for non-adherence.

There is limited published literature regarding the use of donning devices. In a Swiss study, Sippel et al (2015) found that the use of devices significantly improved the ability of elderly patients to apply compression stockings successfully. A randomised controlled trial in an Australian setting (Kapp et al, 2014) compared two types of device, one material and one metal-framed, and found that only 9% of participants did not wish to use any device at all, but both devices were acceptable for use with open- and closed-toe stockings of different sizes.

In the UK there has been little investigation into the implementation and use of devices to aid in the application of stockings, especially following surgery. The overall aim of this quality improvement project was to evaluate the introduction of Neo-slip in an orthopaedic ward in a London trust. The Standards for Quality Improvement Reporting Excellence (SQIRE) (2015) guidelines were used as a framework for the project.

Methodology

Quality improvement methodology is different from research methodology and the Plan, Do, Study, Act (PDSA) cycle for learning and improvement used by the Institute for Healthcare Improvement in the USA is often used in healthcare settings in the UK (Figure 2). This project was planned around the PDSA cycle and ran in three stages:

- Collection of data pre-intervention (before the introduction of Neo-slip)
- Introduction of Neo-slip
- Collection of data post-intervention (after the introduction of Neo-slip).

Ethical considerations

The project was approved in August 2015 by the trust's research governance team to be undertaken as a service evaluation. Health Research Authority approval was therefore not required. The project was subsequently approved to run in one ward in the trust and this was approved by the care group lead clinician.

Plan: collection of data pre-intervention (before the introduction of the device)

Before Neo-slip was introduced into the ward, it was important to collect some baseline data. These included data concerning the time taken to put on stockings, plus informal interviews with staff and patients about their experiences of applying stockings. The interviews with nurses and patients were not recorded, but hand-written notes were taken following the conversations. The project was explained to all nurses and patients and verbal consent was taken prior to the informal interviews being undertaken.

Time taken to apply stockings without the device

Previously recorded data on the time that it took 15 nurses and healthcare assistants (HCAs) to apply stockings, using their normal technique, were collated. These data were collected by a member of the Neo-slip team in early 2015 within another trust. Times varied considerably and depended to a great extent on the experience of the staff member and also the condition of the patient's foot/leg. Larger feet and obese calves usually meant that it took longer to apply the stockings. It also took longer for patients with frail and delicate skin. On average, the application of stockings took between 65 and 120 seconds.

Focus groups/interviews with HCAs and registered nurses

Thirty-five nurses and HCAs had informal interviews with one of the investigators (NB). Most of these 35 staff were involved in

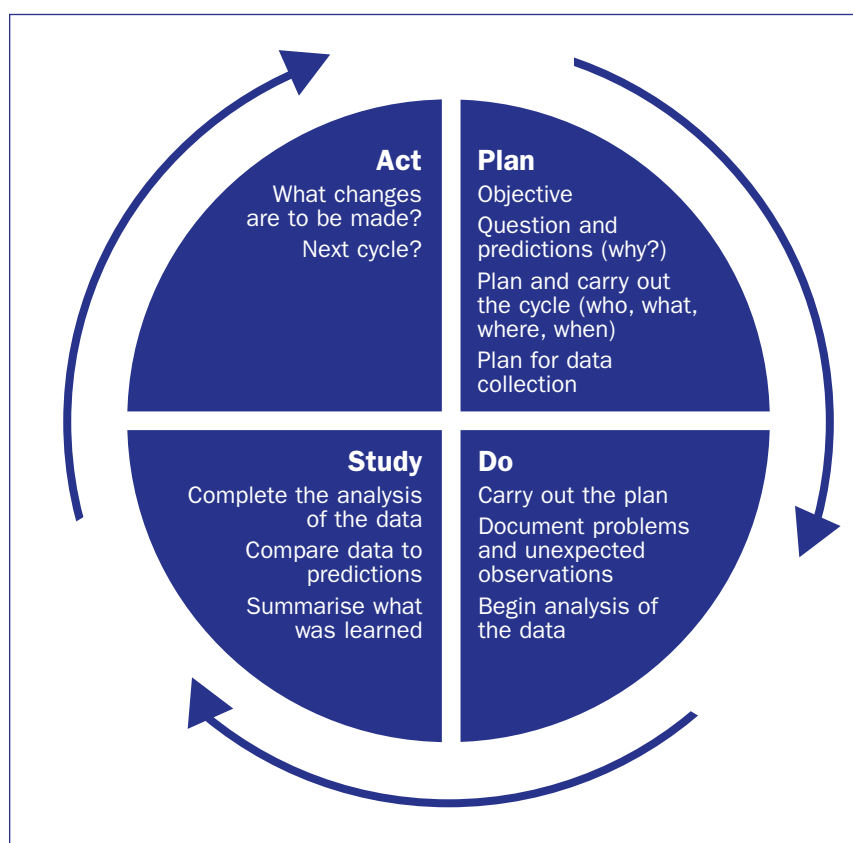


Figure 2. The PDSA Cycle (adapted from Edwards Deming, 2000)

changing, measuring and applying stockings on a regular basis. Fourteen spoke of the time it took to put stockings on and 32 spoke of difficulty in application: 'it is a massive struggle' and 'it requires all my strength'. One of the main issues appeared to be pulling the stockings up over the patient's heel.

Informal interviews with patients

Eleven patients were interviewed before the intervention was implemented. The interviews were informal and the purpose was to get an idea of the patients' thoughts on application of stockings. All patients were postoperative and had been actively prescribed anti-embolism stockings. Nine patients spoke of the difficulties of applying their stockings. One patient commented 'the nurse used a carrier bag in hospital (to apply the stockings) but when I got home, I struggled to get them on'. Another patient said 'my stockings are uncomfortable to apply and took a lot of my energy'.

Do: introduce the donning device in one orthopaedic ward

In Autumn 2015, there was discussion with the ward manager and matron of the orthopaedic ward on how best to introduce Neo-slip. Nurses and HCAs were also asked for their ideas on the process, along with the person responsible for stocks and supplies.

Training was then provided to 28 staff on how to use Neo-slip (during November 2015). The training took 15 minutes and included information on how to use the device and choosing

the correct size. Training also included an overview of signs and symptoms of DVT, plus a risk assessment on how to know if a patient requires Neo-slip to help apply stockings.

Liaison with the ward housekeeper and procurement team was undertaken to understand the process of stock-take and re-ordering. This enabled the investigators to find a convenient space to store Neo-slip in the treatment room, next to the supply of stockings. A delivery day that suited the ward was agreed and subsequently a stock of Neo-slip was delivered and signed for.

There was regular contact with the ward during the implementation period (December 2015–January 2016) to identify possible problems with the process or other barriers to implementation.

Study: collection of data post-intervention (after the introduction of the device)

Following the introduction of Neo-slip in February 2016, supplies of the product ran out very quickly. The original supply to the ward was 10 large size, 30 medium and 10 small size aids. Size guides and information leaflets were provided for staff, as well as reminder cards to display alongside the stockings. The medium size Neo-slip was the most popular due to the average shoe size; however, all sizes were used up within 12 days of being placed in the ward.

After the supplies of Neo-slip ran out, nurses and HCAs were again asked about their use of Neo-slip and whether they had received any patient feedback. Of the 12 nurses/HCAs asked, 5 had not received training in the use of Neo-slip. All but two had used the product, but one person had been on annual leave, so when she returned there were no supplies left. One nurse did not use Neo-slip and said ‘I don’t like it because it’s an additional cost’.

All nurses who had used Neo-slip found the process of using it easy. Comments included: ‘it was straightforward as Neo-slip was next to the stockings’ and ‘definitely useful for our ward and made it easier’. Others said ‘bring some more ASAP’ but one commented that it ‘would be good if we didn’t run out’.

Previously collated data have shown that the reduction in time spent by nurses and HCAs in applying the stockings when using Neo-slip is approximately 1 minute per patient.

Act: sustaining the introduction of the device

The implementation of Neo-slip into this one ward went ahead easily, without any significant barriers. Only one nurse wished to carry on using the plastic bag that contained the stockings as the donning device, but this potentially has patient safety issues, such as reduction in skin integrity, caused by increased friction between the skin and the removal of a plastic bag. Rougher textiles, such as plastic, produce higher coefficients of friction (Reger et al, 2010: 14). On reflection, it might have been worthwhile to explain to staff during training that the continued use of the plastic bag is potentially a patient safety issue.

There is anecdotal evidence that when patients are provided with stockings on discharge, they do not apply them properly or at all when at home. It was clear that patients needed further information about stocking application and the use of Neo-slip,

so a patient information leaflet was produced. The leaflet is freely available from the Florence Nightingale Foundation (<http://tinyurl.com/lgig4xj>). A driver to implementation in other areas would be to explain the cost-effectiveness of using Neo-slip to the nursing staff. Although a full economic costing of the project has not been carried out, it is important to consider the cost against the saved nursing time when using Neo-slip, alongside patient experience and patient safety issues (potential skin damage and infection control issues if a plastic bag is used).

Discussion

It is well-known that quality improvement projects often fail because of a number of different reasons at each stage of the project. These include convincing people there is a problem in the first place, convincing staff that the solution chosen is the right one, getting data measurement correct, and lack of staff engagement (Crisp, 2013). However, the use of a quality improvement methodology to bring about change was successful in this project. There was no doubt there was a problem here, as every nurse or HCA who has struggled to apply TED stockings will know. One staff member was reluctant to change to using Neo-slip to apply stockings but a lesson learned is that there should have been further emphasis during training on potential patient safety issues if the ‘old way’, using the plastic bag, continued. Finally, all staff were involved in the project, especially those (for example, the ward housekeeper) who are not routinely involved in quality improvement initiatives. Perceived ownership of a project is critical to successful sustainability of an intervention (Crisp, 2013).

Limitations

Unfortunately, there are very few studies that have explored the implementation of devices to assist with stocking application, so comparison with other study results is not possible. Audit data from a theatre setting (Donnelly and McNeely, 2015) found that 43% of patients (n=30) received information on the postoperative use of stockings; 83% of theatre personnel accepting the handover of the patient for surgery were aware of the local policy regarding anti-embolism stockings, whereas only 60% of the ward staff had knowledge of the policy.

One limitation of this study is that the implementation of the intervention was carried out in only one ward in one hospital trust. It was not possible to extend the project to other trusts because of difficulties with availability of Neo-slip within the procurement process. However, since this study, Neo-slip has now become available through the NHS Supply Chain (from May 2017).

It is acknowledged that the patient perspective has not been evaluated in this project, and patient experiences are invaluable when evaluating a quality improvement project of this type. It is not known what happens when patients go home, and whether they adhere to the guidance that has been provided, such as the recommendations from NICE (2010). The guidance states that patients who are discharged with anti-embolism stockings:

- Understand the benefits of wearing them
- Understand the need for daily hygiene removal
- Are able to remove and replace them, or have someone

available who will be able to do this for them

- Know what to look for, such as skin marking, blistering or discolouration, particularly over the heels and bony prominences
- Know who to contact if there is a problem.

As many patients return home with one or two pairs of anti-embolism stockings, provided by the local NHS trust, it is not cost-effective if patients are not applying them correctly or not using them at all. There does not appear to be any study that evaluates how far patients adhere to the advice on stocking use once at home. A study by Miller (2011) of 80 surgical patients found that 29% were fitted with the incorrect size for limb measurement and 70% reported not receiving any information regarding the reason for anti-embolism stocking use.

Conclusion

This quality improvement project has shown that Neo-slip, a product designed to facilitate the use of compression stockings, can be effectively introduced into an orthopaedic ward, with positive feedback from both staff and patients. This innovation was developed by a registered nurse who saw a patient problem that needed a solution. It is rare for frontline nurses to have the support they need to bring about change, so further training and support in this area is recommended. **BJN**

Declaration of interest: Neomi Bennett is the owner of Neo Innovations Limited, the company that owns the intellectual property for the Neo-slip product.

- Crisp H (2013) Overcoming challenges in improvement work. *Journal of Renal Care* 39(Suppl 2): 30–4. <https://doi.org/10.1111/j.1755-6686.2013.12027.x>
- Donnelly T, McNeely B (2015) The shocking stocking audit: an audit on the use of thromboembolic deterrent stockings (TEDS) for patients having surgery at Sligo regional hospital. *J Perioper Pract* 25(4):83–6
- Edwards Deming W (2000) *The New Economics for Industry, Government, and Education*. 2nd edn. MIT Press, Cambridge, MA
- Kapp S, Miller C, Donohue L (2014) The use and acceptability of devices for compression stocking application and removal. *Wound Practice and Research* 22(1): 34–43
- Miller JA (2011). Use and wear of anti-embolism stockings: a clinical audit of

KEY POINTS

- The use of anti-embolism stockings can reduce the risk of deep-vein thrombosis
- Many patients have difficulty in applying the stockings correctly
- There are 'donning devices' available that can assist with application of stockings
- This quality improvement project shows that a donning device can be easily implemented in a ward setting

surgical patients. *Int Wound J* 8(1): 74–83. <https://doi.org/10.1111/j.1742-481X.2010.00751.x>

- National Institute for Health and Care Excellence (2010) Venous thromboembolism: reducing the risk for patients in hospital. Clinical guideline 92. Updated June 2015. <https://www.nice.org.uk/guidance/cg92>
- Quinn C, Deegan B, Cooke J et al (2015) Therapeutic use of compression stockings for orthostatic hypotension: an assessment of patient and physician perspectives and practices. *Age Ageing* 44(2): 339–42. <https://doi.org/10.1093/ageing/afu162>
- Reger SI, Ranganathan VK, Orsted HL, Ohura T, Gefen A (2010) Shear and friction in context. In: Wounds International, *International Review: Pressure Ulcer Prevention: Pressure, Shear, Friction and Microclimate in Context. A consensus document*. <http://tinyurl.com/j7w5jyx> (accessed 24 April 2017)
- Sippel K, Seifert B, Hafner J (2015) Donning devices (foot slips and frames) enable elderly people with severe chronic venous insufficiency to put on compression stockings. *Eur J Vasc Endovasc Surg* 49(2): 221–9. <https://doi.org/10.1016/j.ejvs.2014.11.005>
- SQUIRE (2015) Revised Standards for Quality Improvement Reporting Excellence. <http://tinyurl.com/z3594mq> (accessed 24 April 2017)

CPD reflective questions

- Think about how you educate patients about the importance of applying anti-embolism stockings correctly
- Ask your ward manager if she/he has considered ordering 'donning devices' to help in the application of anti-embolism stockings
- Think about how easy it is for patients to apply anti-embolism stockings at home following discharge