

A Pre-test/ Post-test/ Follow-up Test Teaching Tool

By Carol Ott, MD, FRCPC

Medical students and residents generally rotate through wound care clinics for one to three days to learn about wound care. This is often the first and only exposure to this topic they will have in their education.

There are many barriers that can prevent this from being an effective learning experience, including the following:

- Learners come with a variety of backgrounds (for example: different residency programs) and levels of training (medical students, early-year residents and final-year residents). Teachers find it difficult to assess the base knowledge of the learners and teach to an appropriate level in such a short period of time.
- The variety of patients and illnesses that presents in a clinic cannot be controlled, leading to difficulty with standardized experience.
- Time management is a challenge. Lacasse et al. have stated that, "even with protected time, the additional challenges to teaching also exist in this environment, as residents are challenged by time management of patient care, study, and personal issues, making them perhaps less receptive to teaching."¹

Discussion of this issue with other physicians and learners in the clinic led to ideas for ensuring that the most important clinical learning objectives are met during clinic. These comprise specific points that can impact on a learner's future clinical practice. For example, we want to ensure that when learners leave the clinic, they are able to handle the following common wound management challenges:

1. Venous ulcers
 - history, physical exam findings, risk factors and treatment
 - necessity to rule out arterial disease before compression
2. Diabetic foot ulcers
 - history, physical exam findings, risk factors and treatment
 - need to assess vascular status
 - offloading/pressure
 - surgical debridement
3. Arterial ulcers
 - history, physical exam findings, risk factors and treatment
 - testing/referrals needed



4. Pressure injuries

- history, physical exam findings, risk factors and treatment
- Offloading issues

The tool developed to ascertain whether certain learning objectives were achieved in the clinical experience was a pre-test/post-test with follow-up test (see Appendix A). It consisted of nine multiple choice questions and five true or false questions. The test was distributed to all medical students and learners who attended clinic over a one-year period. The same test was taken by each learner on three separate occasions.

1. **Pre-test** After the procedure was adequately explained and consent received from the learner, the test was administered. As a result of its being administered at the beginning of the learning experience, the test identified knowledge gaps in both the learner and the teacher. The questions continued to stimulate discussion around patient care throughout the clinical experience.
2. **Post-test** At the end of the experience, the test was repeated in order to evaluate what the learner had absorbed while in clinic.

3. **Follow-up test** Three months later, the same test was emailed via Survey Monkey to be completed again, this time to evaluate retention of the information.

The following steps were completed to evaluate the three-part teaching tool:

1. A version of the tool was created and trialled informally on learners in the wound care clinic over a three-month period. Learners were of a variety of levels and backgrounds. Based on feedback, improvements were made as needed.
2. A version of the tool was given to the seven members and two teachers of the University of Toronto's Master Teacher Program for Physicians. Students of this program are from a variety of backgrounds: general medicine, oncology, allergy and immunology, family medicine, rheumatology and behavioural neurology. Vigorous evaluation of the questions took place—regarding not only content but also style of question. As the members of this class are from many subspecialties, some knew very little about wound care, making them similar to the learners we have in clinic.



In addition, a confidential evaluation form was designed to be filled out after the post-test to capture what the learners thought of their learning experience. They were asked to rank their agreement with each statement on a scale of 1 to 5, with 1 being “strongly disagree” and 5 being “strongly agree.”

The evaluation questions were as follows:

1. I was given adequate time to complete the pre-test on my own today.
2. This pre-test helped me identify areas of knowledge where I was lacking.
3. One of the attending physicians reviewed this pre-test with me in a non-judgemental way.
4. One of the attending physicians reviewed this pre-test with me and ensured that I had the correct answers.
5. The test questions were clear and appropriate for my level of training.
6. The pre-test added to my experience in clinic.
7. I would like to see a teaching tool like this used in other clinics.

Methods

All medical students and residents attending clinic over a one-year period were offered the pre-test as they arrived at either the Women’s College Hospital Wound Care Centre or the Baycrest Hospital Foot and Wound Clinic—both in Toronto, Ontario. The goal was to trial this on 20 medical learners, both residents and medical students. Ethics approval had been granted at both sites. The process was explained and a consent form signed. The learners were told that their results would not be reflected in their performance evaluation and that they could opt out at any time. They were then given time to complete the pre-test.

Throughout the clinical experience, the test was reviewed by the teacher and learner to ensure teaching in areas identified as deficient took place.

To ensure that the objectives of the tool were attained, an evaluation form was created so that the learner could rate their agreement with the statements.

Figure 1: Training Level and Program of the Learners

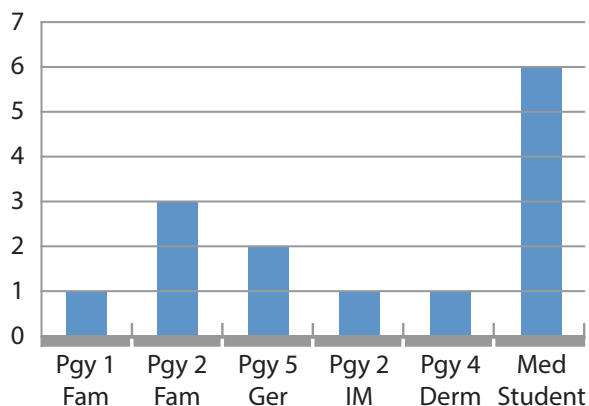


Figure 2: Median Scores

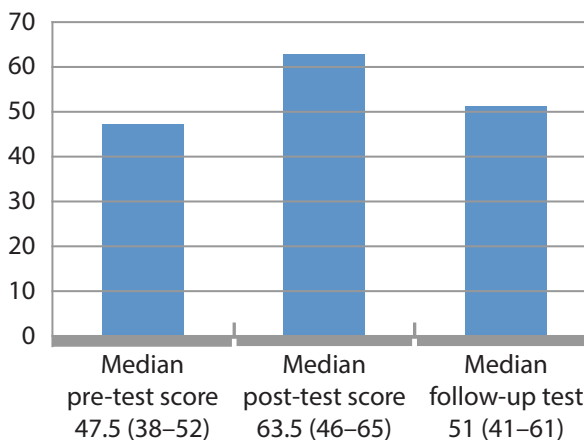
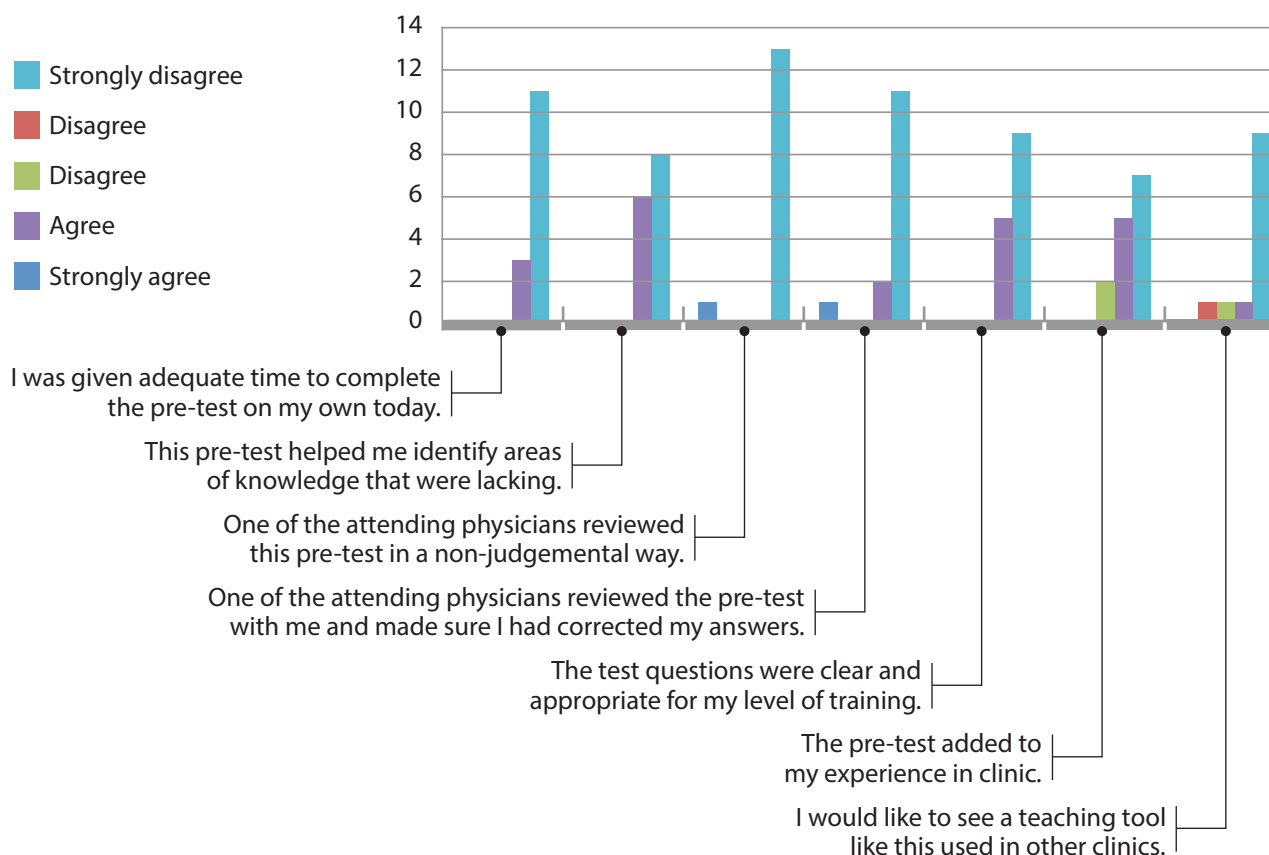


Figure 3: Evaluation by the Learners



At the end of the experience, which was usually a half- or full-day clinic, the learners were asked to complete the test again to evaluate information learned.

Following this, the clinic secretary collected the completed confidential evaluation forms and placed them in an envelope to ensure anonymity,

and I collected them at a later date. The only personal information collected through the evaluation form was learners' education program/level. Their email addresses were obtained separately from all tests and evaluations.

The follow-up test was emailed to the learners three months after their clinical learning experience.

Results

Twenty learners from a variety of programs completed the pre-test and post-test. Eleven of the 20 responded to the online survey despite being sent three to five reminder emails. Fourteen of the 20 filled out the evaluation form, and these 14 provided information on what program and year they were in (see Figure 1).

All 20 learners enrolled in the study filled out both the pre- and post-test. The median score of the pre-test was 47.5 and increased to 63.5 for the post-test. For the follow-up test, the median score was 51 (41–61) (see Figure 2).

The experience was well received by most learners. In the evaluation, they were presented with six statements that reflected the learning objectives of the experience and were asked to rate these on a scale of 1 to 5 (1 being “strongly disagree” and 5 being “strongly agree”) (see Figure 3). The one learner who reported a 1 for the statements 3 and 4 wrote the comment “Pre-test not reviewed, would have been helpful.”

Discussion

In medical education, the self-directed learning theory states that the responsibility of learning is not only on the teacher, but also on the learner.^{1,3} Our hope is that the results of these tests will inspire learners to pursue additional self-directed learning activities. In particular, in wound care, the knowledge base of residents in pressure ulcer identification knowledge is known to lag behind the knowledge base of nurses,⁴ indicating that this area requires improvement.

The learners showed by their increasing marks between the pre-test (47.5) and post-test (63.5) that they were able to improve their knowledge base during the clinical experience. Three to six months later, the scores were less impressive (51) but still above the pre-test baseline. This indicates that some retention of the material occurred, although, because they were asked to answer the questions from memory, it is difficult to say how much. The lack of retention of the material is most likely due to learners moving on to new rotations and focusing on other subjects.



This tool was well received by the learners in clinic. It made it easier to ensure that certain teaching points were addressed whether or not the full range of patients and clinical scenarios were present. It was difficult at times, however, due to patient issues, to ensure that the appropriate amount of time was spent reviewing the answers to test questions. When developing the test, I purposely grouped the questions about different types of ulcers together and divided them into history questions and physical exam findings. This was a useful approach, as we could then review that particular section when an appropriate patient was available.

It was suggested that the learners would want to take home the corrected test and use it for further study. I did not ask in the evaluation if learners wanted to do this. Residents have so many papers that it may not be a reasonable plan. An emailed summary might be more useful.

Conclusion

The pre-test, post-test teaching tool was easily administered in clinic and well received. It ensured that significant topics were covered. The follow-up test was more difficult to administer successfully, as people do not always fill out email surveys. As a pre-test, post-test teaching tool only, it could be tried with learners in other clinics as well.

What's next?

Plans are underway to repeat this study on a larger scale in the Foot and Wound Clinic at Baycrest Health Sciences.

At the Baycrest Wound Care Clinic, we have multiple learners from many health-care disciplines from a variety of schools at various stages of training. Usually they come in for a period of half a day to three days. These learners include nursing students, nurse practitioner students, medical students, family medicine residents, subspecialty medicine residents and master's studies students doing practicums. We currently have a staff of

three—a personal support worker, a nurse and a physician—who do rounds on the wound patients on the wards and evaluate patients in clinic. We can have up to four learners per day with differing educational needs.

We plan on trying the pre-test and post-test in the Baycrest clinic to ascertain what level of knowledge the learners have and ensure we are covering what they need to know. As a quality improvement project, we will follow the results of the tests as well as the follow-up evaluation questionnaire to look for ways to improve our teaching performance.

We will be able to use the results to tailor our education accordingly and satisfy the learners.

Though in future we plan to look at the follow-up test to determine the level of knowledge retention, the focus now is on improving the quality of our teaching during the clinical experience. 🙌

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References

1. Lacasse M, Lee S, Ghavam-Rassoul A, Batty H. Integrating teaching into the busy resident schedule: A learner-centered approach to raise efficiency (L-CARE) in clinical teaching. University of Laval, Canada, University of Toronto, Canada; 2009; 31:e507–e513.
2. Knowles M. Self-directed Learning. A Guide for Learners and Teachers. Englewood Cliffs, NJ: Cambridge Adult Education; 1975.
3. Kaufman DM. Applying educational theory in practice. BMJ. 2003;326(7382):213–216.
4. Levine JM, Ayello EA, Zulkowski KM, Fogel J. Pressure ulcer knowledge in medical residents: An opportunity for improvement. Adv Skin Wound Care. 2012;25(3):115–7.
5. Little SH, Menawat SS, Worzniak M, Feters MD. Teaching wound care to family medicine residents on a wound care service. Advances in Medical Education and Practice. 2013;4:137–144.

Appendix A

Teaching Tool: Pre-test Questionnaire for Wound Care Clinic

Please answer the questions to the best of your ability. This will help ensure that areas of knowledge gaps are covered in this clinic experience today. Each question has multiple right answers and is designed to lead to discussion.

The most common types of wounds we see in this clinic are venous stasis ulcers, arterial ulcers, pressure ulcers and diabetic foot ulcers. These questions are to test your knowledge of risk factors, findings on history and physical, and treatment of these ailments.

1. Risk factors for venous stasis disease include the following:

- a. Occupation involving standing most of the day
- b. Family history of venous disease
- c. Previous pregnancies
- d. Diabetes
- e. History of DVT
- f. History of venous stripping
- g. Smoking

2. Venous stasis disease presents with the following symptoms and physical exam findings:

- a. Swelling in legs – particularly at the end of the day associated with aching
- b. Hemosiderin deposition
- c. Pain relieved by hanging the foot off the bed
- d. Dry gangrene
- e. Shallow ulcers usually located on the posterior medial malleolus area
- f. Painless ulcers
- g. Varicosities

3. Identify correct statements about compression treatment for venous stasis disease:

- a. As tight as the patient can tolerate
- b. Tighter than option a (above)
- c. Bandaging is for treatment of wounds; stockings are for preventing wounds
- d. Must have toeless compression stockings
- e. The right compression strength is the one that the patient will wear

4. Risk factors for arterial disease include:

- a. Smoking
- b. Diabetes
- c. Occupation involving standing most of day
- d. History of coronary artery disease
- e. Neuropathy
- f. Hypertension
- g. Running
- h. Hypercholesterolemia

5. Peripheral arterial disease presents with symptoms and physical exam findings of:

- a. Pain – relieved by elevating feet
- b. Pain – relieved by putting foot down
- c. Pale foot
- d. Claudication pain
- e. Varicosities
- f. Dependent rubor
- g. Punched-out lesions on the dorsum of the foot
- h. Increased hair and nail growth

6. Treatment for peripheral arterial disease includes:

- a. Pentoxifylline
- b. Bypass
- c. Stripping of arteries
- d. Angioplasty
- e. Smoking cessation
- f. Nitroglycerin patches
- g. Viagra
- h. Maggot therapy

7. Diabetic neuropathic foot ulcers can be associated with:

- a. Peripheral arterial disease
- b. B12 deficiency
- c. Charcot joints
- d. Tingling in feet
- e. Duration of diabetes at least 10 years
- f. Loss of toenails
- g. Fungal infections on feet and between toes

8. Treatment for chronic diabetic neuropathic foot ulcers include:

- a. Treatment with ACEI for prevention
- b. HbA1c target below 9
- c. Change patient to insulin
- d. Consider long-term antibiotic treatment

9. The four main contributing factors to pressure ulcer formation include:

- a. Pressure
- b. Moisture
- c. Incontinence
- d. Friction
- e. Shear
- f. Not being turned every two hours

True or False

- T F** Patients with peripheral neuropathy will benefit from having shoes professionally fitted.
- T F** Smoking cessation is important only in the healing of arterial ulcers.
- T F** If a wound is not decreased by 40 per cent by week 4, it is unlikely to heal by week 12.
- T F** The physician is the most important member of the wound care team.
- T F** Infection is diagnosed by clinical picture, and culturing the wound is unnecessary.

