

Diabetic foot education and Inlow's 60-second foot screen

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Article points

1. The study assessed whether knowledge and confidence in assessing the diabetic foot can be improved with education and the introduction of a screening tool.
2. The use of Inlow's 60-second diabetic foot screen tool and educational video did initially appear to increase the knowledge and confidence of medical learners when performing foot exams.
3. Although many respondents felt that they would use the tool in the future, after introduction use had declined at the 1-month follow-up.

Key words

- Diabetic screening tool
- Education
- Usability

Authors

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We aimed to determine whether knowledge and confidence in assessing the diabetic foot could be improved with education and the introduction of a bedside screening tool. We also sought to better understand what barriers existed in implementing a diabetic screening tool and in how it should take form, whether as a printed document or in digital form online.

Foot problems are a major source of morbidity and mortality for people with diabetes. The lifetime risk of a person with diabetes developing a foot ulcer is approximately 15% (Singh et al, 2005). Between 70–80% of lower limb amputations are preceded by a foot ulcer (Praxel et al, 2011). Following amputation, mortality ranges from 39%–80% at 5 years. The high costs of treating a diabetic foot ulcer have been well documented (Singh et al, 2005).

Overview

Diabetic foot complications can be linked to peripheral neuropathy, deformity and trauma. The insensate foot is vulnerable to mechanical and thermal trauma, which in the setting of peripheral vascular disease leads to ulceration and poor healing (Botros et al, 2010). Preventive care is extremely important and is known to decrease the rate of lower leg amputations in diabetic populations (King, 2008).

The Canadian Diabetes Association Clinical Practice Guideline recommends that people with diabetes receive a foot exam at least annually to decrease the number of foot lesions and amputations (Canadian Diabetes Association Clinical Practice Guidelines Expert Committee, 2013) Primary care health professionals play an important role in the care of people with diabetes. Unfortunately, many studies have shown very poor rates of adherence to guidelines by primary care physicians for a variety of reasons (Abu-Qamar, 2006; Kirkman et al, 2002).

Research design and methods

Experimental approach

As resident learners we felt there was a gap between our knowledge and the implementation of the diabetic foot exam – a finding shared by our fellow residents. On an elective experience at a wound care clinic we were introduced to “Inlow's 60-second diabetic foot screen” (Inlow, 2004). Other screening methods have been suggested (Boulton et al, 2008; NAWC, 2007) but we found Inlow's to be particularly useful. It was attractive because it offered a systematic approach to screening for all the components leading to a foot ulcer, but also claimed to take a minute or less.

Inlow's 60-second diabetic foot screen is made up of three parts: (i) Looking at the feet and shoes; (ii) Palpating the feet; (iii) Conducting a sensory screen and exam. A printed version of this tool, available on the Canadian Association of Wound Care website (<http://bit.ly/133fZx6>), includes a scoring system based on the exam, which gives guidance on abnormal findings, screening intervals and further care and treatment (Orsted, 2009; Lavery et al, 2008).

This tool has been shown to have content validity, determined in community care and Complex Continuing Care (CCC), and intra-rater and inter-rater reliability in long-term care, CCC, and acute care (dialysis) settings (Inlow's 60 second foot screen, 2010 version CAWC website).

With these resources in hand, we developed a three-part survey with an educational component and applied and received ethics approval from the Research Ethics Boards of Lakehead University and Laurentian University.

The research subjects were Northern Ontario School of Medicine third and fourth year medical students and first and second year family medicine residents.

Part one of the survey involved questions about baseline comfort when performing the diabetic foot exam, ability to identify abnormal results, ability to identify a high-risk diabetic foot and appropriate screening intervals. There was also a question about what the respondents felt were the most important components of the diabetic foot exam. Options (first eight correct, second eight incorrect) were: skin condition; nail condition; foot deformity; temperature; hallux (great toe) range of motion; pedal pulses; monofilament sensation; dependent rubor; clonus; ankle reflexes; vibration; gait; proprioception; 2-point discrimination; calf muscle bulk; response to cold/hot stimuli. Respondents were able to choose as many or as few options as they wanted.

In part two, we introduced respondents to a webpage with a link to the PDF version as well as an online version of Inlow's 60-second diabetic foot screen tool (<http://bit.ly/118kcgCm>). We also asked them to view a 60-second video of a sample exam (<http://bit.ly/10RNJvq>). The website and online tool were created specifically for this project with the help from Doug McFarlane of KodeSource. We produced the video.

Participants answered the same set of questions after the educational intervention. Additionally we asked them how likely they thought they were to use the tool in the future and what the perceived barriers might be.

One month later, part three of the project was carried out when we invited all respondents to answer the basic questions again without access to the tool or video. In addition, we asked respondents if they had used the tool and, if so, whether they preferred the printed or online version.

In all three parts of the study, the survey (*Appendix A*) was deployed and data collected and hosted using a website (www.fluidsurveys.com).

Statistical analysis

The average number of correct and incorrect responses of the important components of the diabetic foot exam were compared for each respondent using paired (pre vs post) or independent (1-month follow-up vs pre or post) two-tailed t-tests.

The pattern of responses for pre and post data on comfort with and perceived ability to identify abnormal results, a high risk diabetic foot, and appropriate screening intervals were tested with Bhapkar's version of the chi-squared test suitable for paired data. Unpaired data for the same outcomes were plotted as proportions with 95% confidence intervals.

RESULTS

Demographics

A total of 55 respondents filled out the pre (first) and post (second) survey completely. Thirty surveys were excluded as they were incomplete, leaving an N of 25. Completed responses to the first survey were made up of third (26%) and fourth (11%) year medical students, first year family medicine residents (35%) and second year family medicine residents (28%).

The third survey 1 month later had 30 respondents. They were made up of third (27%) and fourth (23%) year medical students, first year family medicine residents (30%) and second year family medicine residents (20%).

Knowledge

The number of correct answers improved after the educational component from pre to post (2-tailed t -test $P < 0.0001$), but was not maintained 1 month later ($P = 0.165$). The same is true for incorrect responses ($P < 0.0001$, $P = 0.904$).

The top three choices—monofilament sensation, skin condition and pedal pulses—were identified consistently at the pre, post and follow-up surveys as the most important components of the diabetic foot exam.

Confidence

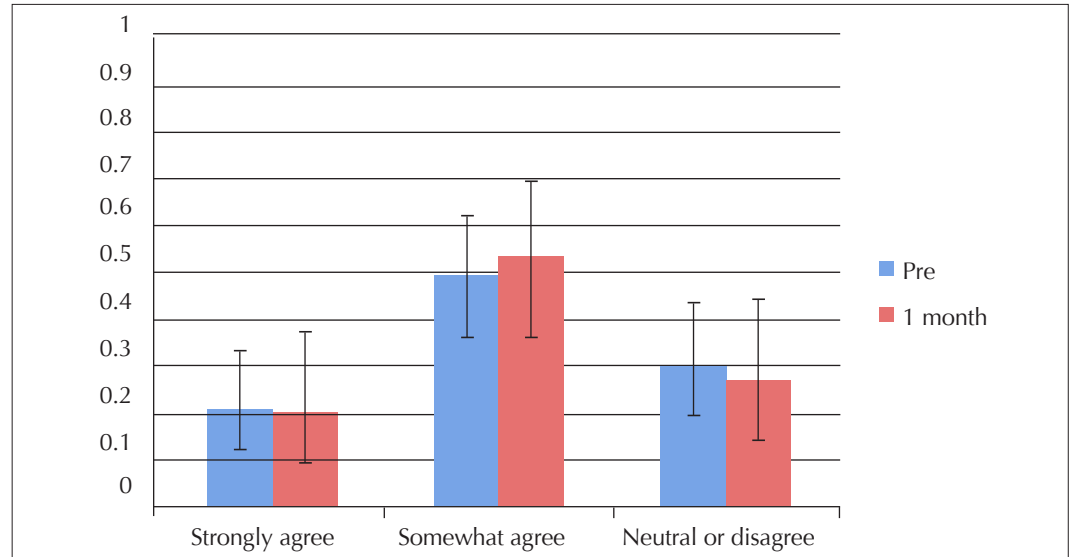
Respondents' comfort in performing the diabetic foot exam improved with an educational component (Bhapkar's $\chi^2_{(2)} = 32.7$, $P < 0.01$). A similar improvement for identifying the high-risk foot and appropriate screening intervals was also seen (Bhapkar's $\chi^2_{(2)} = 24.6$, $P < 0.01$; Bhapkar's $\chi^2_{(2)} = 20.9$, $P < 0.01$). The perception of ability to identify an abnormal result did not achieve significance (Bhapkar's $\chi^2_{(2)} = 5.4$, $P = 0.07$).

Figure 1 shows agreement by proportion of individuals' perceived abilities to identify appropriate

“The average number of correct and incorrect responses of the important components of the diabetic foot exam were compared for each respondent.”

“After being introduced to the tool, many respondents indicated they would use it in the future, however, actual use declined at 1-month follow-up.”

Figure 1. Agreement by proportion of individuals’ perceived ability to identify appropriate screening intervals for the diabetic foot initially and at the 1-month follow-up.



screening intervals for the diabetic foot initially and a repeat of the exam 1 month later. As can be seen, confidence intervals are overlapping, which would suggest there is no significant difference. Similar figures can be graphed for other areas of confidence (Appendix B). These results should be interpreted with caution because the data are unpaired.

Usability

After being introduced to the tool, many respondents indicated they would use it in the future, however, actual use declined at 1-month follow-up (Figure 2). Only 10% of respondents had actually used the tool by the 1-month follow-up. Out of these, all had used it less than five times. Two of the individuals used the online version and one individual used the printed version. Regarding barriers to using the tool, four people felt they might use another tool or screening approach, one person was not comfortable using the tool as they had not practiced with it, another said they would not be performing diabetic exams in the future and a final person said they did not know where to access the tool.

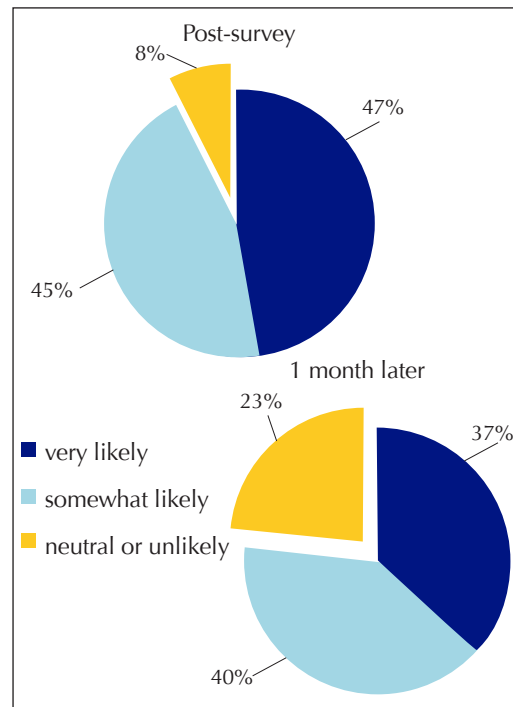


Figure 2. Respondents’ perception of future use of Inlow’s 60-second foot screen after introduction and 1 month later.

INTERPRETATION

Overall, respondents’ comfort with the diabetic foot exam, identifying a high-risk diabetic foot and screening intervals were increased after the educational video and tool, however after 1 month this returned to baseline. There was no change in respondents’ confidence in their ability to identify abnormal test results.

Initially, respondents were able to identify approximately four out of eight of Inlow’s recommended components forming the diabetic foot exam with two incorrect items. After the educational video and tool were introduced, this

improved to six correct items and one incorrect one. After 1 month they returned to baseline.

Only three out of 30 respondents for the third survey were able to use the tool in a 1-month period. Two used the online format and one the printed version. Despite this, most respondents still felt that they would use the tool in the future.

In a previous study, an attempt to increase compliance in performing a proper diabetic foot exam by primary care providers was done using an educational campaign. A baseline chart audit showed that a proper diabetic foot exam was documented only 14% of the time. After an intervention that consisted of two lectures and an announcement of a quality assurance project at a staff meeting there was 58% compliance at three months and 62.1% compliance at 6 months. In addition, clinic support staff were instructed to remove the socks and shoes of all diabetic patients and signs were placed in exam rooms to remind diabetics to do the same (O'Brien et al, 2003).

Another study tried to increase the adherence of primary care physicians to diabetic guidelines over a 2-year period. Initially, they found the rate of performance of a documented diabetic foot exam to be only 19%. They used intensive interventions, such as a number of linked patient-physician education sessions delivered by experts, practice aids (chart stickers to remind clinic staff to remove the shoes of diabetic patients and flow charts). They were able to double the rate of performance of the diabetic foot exam and maintain this two years later. Interestingly, the only outcomes to achieve significance two years later were those whose interventions were directly linked to clinic staff and not solely physicians (Kirkman et al, 2002).

Limitations

One of the limitations of our study was that unique identifiers linking the individual's first and second surveys to their third survey were not used. This meant that any trends seen in the 1 month later survey should be interpreted with caution since the data were unpaired

Another limitation was that several incomplete surveys were returned and, again, because there were no unique invite codes to the surveys, it is difficult to know whether these failed attempts were due to technological issues, or were truly

incomplete responses. It is recommended that future online surveys include unique identifiers so that complete/incomplete surveys and multipart surveys can be distinguished.

Conclusions and future directions

Different approaches have been used to improve screening of the diabetic foot. The use of Inlow's 60-second diabetic foot screen tool and educational video did initially appear to increase the knowledge and confidence of medical learners when performing foot exams. This was not maintained 1 month later, a finding which could be due to a number of factors.

Barriers, as reported in many other studies, are mainly systemic (Praxel et al, 2011; Kirkman et al, 2002; O'Brien et al, 2003). We suspect lack of time and opportunity to practice using the tool or poor access to the tool may have been hindrances in our case. Not all learners may have been in primary care settings during the study period. In order to increase tool usage we suggest that an app or linked electronic medical record version of the tool be considered.

The effect of practice environment and the education of patients and clinic staff on the importance of the diabetic foot exam cannot be underestimated. By requesting the removal of socks and shoes of all diabetic patients, clinicians will increase the number of diabetics screened and, hopefully, with the help of Inlow's tool, will increase their confidence and knowledge in the process. ■

Acknowledgements

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This research was conducted while we were residents in the Family Medicine program at the Northern Ontario School of Medicine which provided funds for research expenses. The views expressed in the paper are our views and do not necessarily reflect those of the Northern Ontario School of Medicine.

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60 Second Diabetic Foot Screen

Initial Survey.

Which of the following best describes you?

- 3rd year NOSM medical student
- 4th year NOSM medical student
- 1st year NOSM family medicine resident
- 2nd year NOSM family medicine resident
- Other, please specify: _____

Please rate your agreement with the following statements regarding the diabetic foot exam.

- | | |
|--|---|
| I feel comfortable performing the diabetic foot exam | <input type="radio"/> Strongly agree |
| | <input type="radio"/> Somewhat Agree |
| | <input type="radio"/> Neutral |
| | <input type="radio"/> Somewhat disagree |
| | <input type="radio"/> Strongly disagree |
| I know how to recognize abnormal diabetic foot exam results | <input type="radio"/> Strongly agree |
| | <input type="radio"/> Somewhat Agree |
| | <input type="radio"/> Neutral |
| | <input type="radio"/> Somewhat disagree |
| | <input type="radio"/> Strongly disagree |
| I am confident that I can identify a high risk diabetic foot | <input type="radio"/> Strongly agree |
| | <input type="radio"/> Somewhat Agree |
| | <input type="radio"/> Neutral |
| | <input type="radio"/> Somewhat disagree |
| | <input type="radio"/> Strongly disagree |

I know how to identify appropriate screening intervals for the diabetic foot

- Strongly agree
- Somewhat Agree
- Neutral
- Somewhat disagree
- Strongly disagree

What are the most important components of a diabetic foot exam? Please check all that apply.

- Skin condition
- Nail condition
- Foot deformity
- Temperature
- Hallux (great toe) range of motion
- Pedal pulses
- Dependent rubor
- Mono-filament sensation
- Ankle reflexes
- Response to cold/hot stimuli
- Clonus
- Calf muscle bulk
- Gait
- Proprioception
- 2-point discrimination
- Vibration

Please click on the following link to watch a 1 minute video of Inlow's 60-second diabetic foot screen. This approach has been shown to have content validity as well as intra- and interrater reliability.

<http://www.youtube.com/watch?v=fNOkLF62tUQ>

Please click on the following link to familiarize yourself with an online version of Inlow's 60-second diabetic foot screen screening tool.

Feel free to bookmark for future use!

<http://dl.dropbox.com/u/1979274/DiabeticFootScreen.html>

Please rate your agreement with the following statements regarding the diabetic foot exam after viewing the online tool and educational video.

I feel comfortable performing the diabetic foot exam

- Strongly agree
- Somewhat Agree
- Neutral
- Somewhat disagree
- Strongly disagree

I know how to recognize abnormal diabetic foot exam results

- Strongly agree
- Somewhat Agree
- Neutral
- Somewhat disagree
- Strongly disagree

I am confident that I can identify a high risk diabetic foot

- Strongly agree
- Somewhat Agree
- Neutral
- Somewhat disagree
- Strongly disagree

I know how to identify appropriate screening intervals for the diabetic foot

- Strongly agree
- Somewhat Agree
- Neutral
- Somewhat disagree
- Strongly disagree

What are the important components of a diabetic foot exam? Please check all that apply.

- Skin condition
- Nail condition

- Foot deformity
- Temperature
- Hallux (great toe) range of motion
- Pedal pulses
- Dependent rubor
- Mono-filament sensation
- Ankle reflexes
- Response to cold/hot stimuli
- Clonus
- Calf muscle bulk
- Gait
- Proprioception
- 2-point discrimination
- Vibration

After viewing the video and online tool how likely are you to use this screening tool in the future?

- Very Likely
- Somewhat Likely
- Neutral
- Somewhat Unlikely
- Very Unlikely

If you do not use the tool in the future what would be the reason(s) why? Please check all that apply and expand where applicable.

- Prefer to use another screening tool or approach _____
- Do not feel comfortable with the screening tool _____
- Screening tool was too complicated _____
- Screening tool took too long _____
- Will not have to perform diabetic foot exams in future _____
- Do not see value added by the tool _____
- Other, please specify: _____

Other Comments?

One month post-survey

Which of the following best describes you?

- 3rd year NOSM medical student
- 4th year NOSM medical student
- 1st year NOSM family medicine resident
- 2nd year NOSM family medicine resident
- Other, please specify: _____

Please rate your agreement with the following statements regarding the diabetic foot exam.

- | | |
|--|---|
| I feel comfortable performing the diabetic foot exam | <input type="radio"/> Strongly agree |
| | <input type="radio"/> Somewhat Agree |
| | <input type="radio"/> Neutral |
| | <input type="radio"/> Somewhat disagree |
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| | <input type="radio"/> Neutral |
| | <input type="radio"/> Somewhat disagree |
| | <input type="radio"/> Strongly disagree |
| I am confident that I can identify a high risk diabetic foot | <input type="radio"/> Strongly agree |
| | <input type="radio"/> Somewhat Agree |
| | <input type="radio"/> Neutral |
| | <input type="radio"/> Somewhat disagree |
| | <input type="radio"/> Strongly disagree |
| I know how to identify appropriate screening intervals for the diabetic foot | <input type="radio"/> Strongly agree |
| | <input type="radio"/> Somewhat Agree |

- Neutral
- Somewhat disagree
- Strongly disagree

What are the important components of a diabetic foot exam? Please check all that apply.

- Skin condition
- Nail condition
- Foot deformity
- Temperature
- Hallux (great toe) range of motion
- Pedal pulses
- Dependent rubor
- Mono-filament sensation
- Ankle reflexes
- Response to cold/hot stimuli
- Clonus
- Calf muscle bulk
- Gait
- Proprioception
- 2-point discrimination
- Vibration

Did you have a chance to practice Inlow's 60 second diabetic foot screen?

- Yes
- No

(THE FOLLOWING 2 QUESTIONS ARE SKIPPED IF THE ANSWER TO THE ABOVE QUESTION IS NO)

Which version of the screening tool did you use. Check all that apply.

- Printed/PDF format
- Online format

How many times did you use the screening tool?

- Less than 5 times
- 5 times or more

How likely are you to use this screening tool in the future?

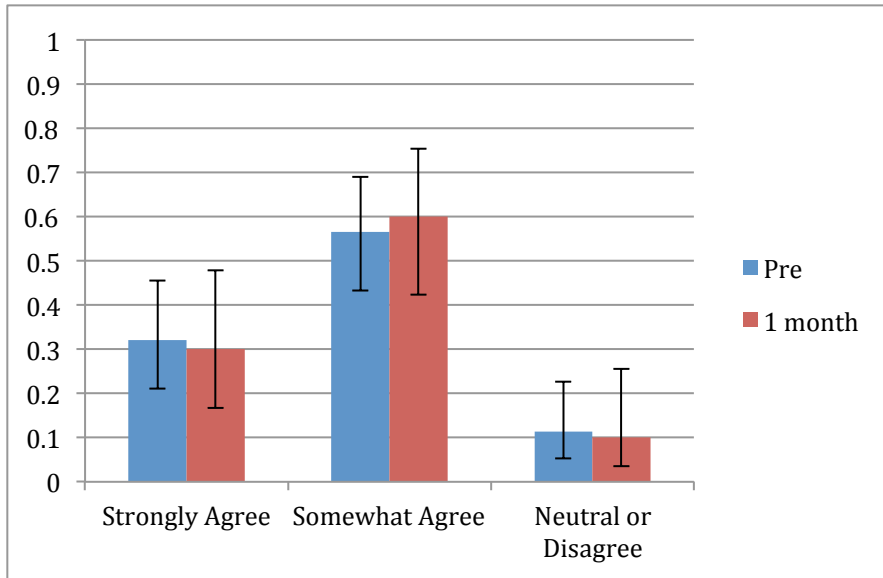
- Very likely
- Somewhat likely
- Neutral
- Somewhat unlikely
- Very Unlikely

If you do not use the tool in the future what would be the reason(s) why? Please check all that apply and expand where applicable.

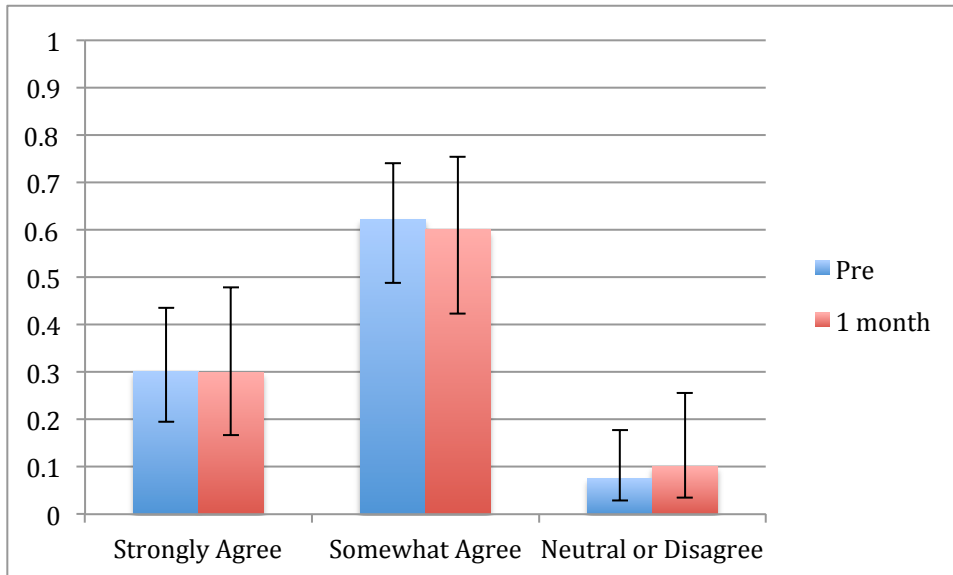
- Prefer to use another screening tool or approach _____
- Do not feel comfortable with the screening tool _____
- Screening tool was too complicated _____
- Screening tool took too long _____
- Will not have to perform diabetic foot exams in future _____
- Do not see value added by the tool _____
- Other, please specify: _____

Other Comments?

Agreement by proportion of individuals' comfort with performing the diabetic foot exam initially and at the 1-month follow up.



Agreement by proportion of individuals' perceived ability to recognize an abnormal results on the diabetic foot exam initially and at the 1-month follow up.



Agreement by proportion of individuals' perceived ability to recognize a high risk diabetic foot initially and at the 1-month follow up.

