

# Clinimetrics and Wound Science

BY Donna Flahr,  
M. Gail Woodbury  
AND Diane Grégoire

**A**s health-care professionals we have an obligation to provide optimal care to our patients. Clinical decision-making is a key component of patient care that can be enhanced by the use of evidence-based measurement tools.

Clinimetrics is the science of development and evaluation of evidence-based clinical assessment tools.<sup>1</sup> Clinimetrics was “defined as the domain concerned with indexes, rating scales, and other expressions that are used to describe or measure symptoms, physical signs, and other distinctly clinical phenomena in clinical medicine”.<sup>1,p5</sup> The clinimetric approach is not entirely different from the psychometric approach employed by psychologists and other social scientists. In fact, much of the terminology used by health scientists is based on the psychometric approach or a combination of psychometric, biostatistical, and clinimetric approaches. In this paper, all terminology in relation to assessment instruments will be considered clinimetric and no further distinctions will be made.

To be considered evidence-based, clinical assessment tools should undergo a clinimetric evaluation that assesses their accuracy, reliability, and validity. We will discuss briefly the important clinimetric properties that clinicians will want to consider when choosing an assessment tool that will provide good clinical evidence for their wound-care practice. The statistical issues related to the clinimetric properties are beyond the scope of this paper.

**Reliability** refers to the reproducibility of measurements with a particular measurement tool.<sup>2</sup> “Reliability addresses the range of fluctuation that is likely to occur in an individual’s score as a result of chance errors”.<sup>3,p.277</sup> Reliability is necessary for validity, although in and of

itself, it is insufficient to make a tool valid.<sup>4</sup> Intrater reliability is the variation among the results of the same rater on subsequent occasions using the same instrument; interrater reliability refers to the consistency in results using the same instrument across a variety of raters.<sup>5,6</sup> A reliable instrument provides precise measurements and therefore requires a smaller amount of change to occur for the change to be considered real (due to treatment) rather than measurement.<sup>2</sup>

**Accuracy** is defined as being exact or free from error; therefore, it is a measurement of the preciseness of a measurement.<sup>4</sup> With all measurements, there is a degree of inaccuracy. Our job as wound-care practitioners is to attempt to make a measured result as accurate as possible in order to assess the effectiveness of interventions. One way to establish accuracy is by setting standards. An example of this would be the use of a consistent approach to wound measurement; for example, by establishing the longest axis as the length and the widest axis perpendicular to this as the width, an attempt is made to improve measurement accuracy and repeatability. When such standards are missing in experiments, there have been reported variations in measurement of over 20 per cent.<sup>7</sup>

**Validity** refers to whether or not the instrument actually measures what it intended to measure.<sup>4,6,8</sup> No wound measurement tool should ever be presumed to have validity. Prior to the use of any measurement tool, there should be an assessment of its usefulness in the context in which it is to be used, i.e., the clinical setting and population. Such an assessment would anticipate the extent to which data that have been obtained in a subsequent study in similar context reflect the truth.<sup>3</sup>

There are several types of validity. Criterion-related validity compares the results from the measuring tool being reviewed to a more accurate measure or "gold standard." Criterion-related validity has two forms: predictive and concurrent.<sup>2</sup> Predictive criterion validity demonstrates the ability of a test to predict a positive or negative outcome measured in the future.<sup>9</sup> Concurrent criterion validity demonstrates the relationship of the results of a new test with those of an existing test that might be considered the gold standard when both tests are measured at the same time.<sup>4</sup>


Data collected in research projects and in clinical practice using reliable and valid instruments and data collection processes have credibility and usefulness for developing and conducting evidence-based practice.

The use of protocols and guidelines in practice are ways of establishing standards of care and can assist in bridging the gap between scientific evidence and clinical decision-making.<sup>10</sup> Improved consistency in documentation and care delivery can improve wound-healing outcomes and reduce practice variability.<sup>11,12</sup>

There are a number of wound-care assessment tools for which clinimetric properties have been assessed and documented. The following are some examples outlined in the literature. The Braden Scale for Risk Assessment has demonstrated interrater reliability when used by registered nurses versus licensed practical nurses or nursing assistants.<sup>13</sup> The other risk assessment scale that has demonstrated some evidence of reliability is the Norton Scale.<sup>13</sup> The Pressure Sore Status Tool (PSST) has been shown to be valid and reliable as a measuring tool,<sup>14</sup> but due to the training and time required to use the tool, it has been deemed more appropriate for use in a research setting.<sup>2,6</sup> The Sessing Scale was found to be valid when compared with ulcer size and the Shea Scale as measures of healing.<sup>15</sup> The Sessing Scale has been proposed to be useful for clinical practice due to its simplicity.<sup>2</sup> The Photographic Wound Assessment Tool (PWAT) for evaluating pressure and leg ulcers has been shown to have concurrent validity as well intrarater and interrater reliability.<sup>16</sup> It is useful for clinical practice or in research.<sup>16</sup> The Leg Ulcer Measurement Tool (LUMT), which has been shown to have good concurrent

validity and interrater and intrarater reliability,<sup>17</sup> has been included in the RNAO best practice guidelines for venous leg ulcers.<sup>18</sup>

For several wound-care assessment tools, there is limited evidence of evaluation of validity and reliability. The following examples outline some of these limitations. Diabetic foot ulcer classification systems like Wagner's are widely used but have minimal evidence of validity or reliability.<sup>4</sup> Gray reports limited evidence exists to support use of the Braden Q Scale among children who are at risk for pressure ulceration or the Neonatal Skin Risk Assessment Scale (NSRAS) in the neonatal intensive care unit.<sup>19</sup> His recommendations for clinical practice are use of the scales combined with individualized and subjective risk assessment, coupled with appropriate preventive measures.<sup>19</sup> Until the validity and reliability of the Braden Q and NSRAS are established, these risk assessment tools will have limited credibility and usefulness for developing evidence-based practice. Systematic literature searches reveal none of the following scales were tested for validity or reliability in the paediatric population: Gosnell Scale, Cubbins Scale, Douglas Scale, Norton Scale, and Risk Assessment Pressure Scale (RAPS).

Although there are a few valid and reliable tools available on which wound-care practitioners can base their assessments, there is considerable need for further evaluation of measurement tools in wound care in various populations, whether they are for accurate wound, risk or vascular assessment. 

#### References

1. Feinstein AR. *Clinimetrics*. London: Yale University Press. 1987.
2. Woodbury MG, Houghton PE, Campbell KE, Keast DH. Pressure ulcer assessment instruments: A critical appraisal. *Ostomy/Wound Management*. 1999;45(5):42-55.
3. Norwood SL. *Quality Control in Research Strategies*. Upper Saddle River, NJ: Prentice Hall Health. 2000:Chapter 13.
4. Smith RG. Validation of Wagner's classification: A literature review. *Ostomy/Wound Management*. 2003;49:1:54-59.
5. Langemo DK, Melland H, Hanson D, Olson B, Hinter S, Henly SJ. Two-dimensional wound measurement: Comparison of four techniques. *Advances in Wound Care*. 1998;11(7):337-343.
6. Houghton PE, Woodbury MG. Assessment of wound appearance of chronic pressure ulcers. In Krasner DL, Rodeheaver GT, Sibbald RG (eds.). *Chronic Wound Care: A Clinical Source Book for Healthcare Professionals*, Third Edition. Wayne PA: HMP Communications. 2001.

references continued on page 48

**Donna Flahr, RN, BScN, IIWCC**, is a graduate of the College of Nursing, University of Saskatchewan, with a Bachelor of Science in Nursing. She worked in a variety of medical-surgical areas for nine years, then as a home care RN for 16 years, and as a Clinical Educator for the past five years. She is currently the Skin and Wound Project Director for the Saskatoon Health Region.

**M. Gail Woodbury, BScPT, MSc, PhD**, is an Investigator, Program in Rehabilitation and Geriatric Care, Lawson Health Research Institute; and an Associate Professor, Department of Epidemiology and Biostatistics, University of Western Ontario, London, ON.

**Diane Grégoire, RN, ET, BScN, MScN**, worked in the community as a visiting nurse for the VON after graduating in 1972. She received her ET diploma in 1989 from Université de Montréal, her Bachelor's degree in 1990 from Université du Québec à Hull, and her MScN in 2002 from the University of Ottawa. She participated in the development of the RNAO Best Practice Guidelines for Venous Leg Ulcers and Diabetic Foot Ulcers and is a member of the CAET and CAWC. She is presently at Children's Hospital of Eastern Ontario as Spina Bifida Co-ordinator/wound care nurse.

## Clinimetrics and Wound Science

continued from page 19

7. Plassmann P, Peters JM. Recording wound care effectiveness. *Journal of Tissue Viability*. 2001;12(1):24-28.
8. Carmines EG, Zeller RA. *Reliability and Validity Assessment*. Beverly Hills, CA: Sage Publications, Inc. 1979.
9. Riegelman RK. *Studying a Study and Testing a Test*, Fourth Edition. Philadelphia PA: Lippincott Williams and Wilkins. 2000.
10. Eccles M, Mason J, Freemantle N. Developing valid cost-effectiveness guidelines: A methodological report from the North of England evidence-based guideline development project. *Quality in Health Care*. 2000;9:127-132.
11. Kopp P. Understanding evidence-based care. *Professional Nurse*. 2000;16(1):853-857.
12. Harrison MB, Graham ID, Friedberg E, Lorimer K. More effective, less expensive—outcomes from the uptake of evidence in practice: community leg ulcer care. *Implementing Evidence Based Practice in Nursing and Midwifery*. (A collection of papers presented at a Concurrent National Symposia, Joanna Briggs Institute.) Adelaide, Australia. June 18, 2004:29-48.
13. Braden BJ. Risk assessment in pressure ulcer prevention. In Krasner DL, Rodeheaver GT, Sibbald RG, (eds.). *Chronic Wound Care: A Clinical Source Book for Healthcare Professionals*, Third Edition. Wayne PA: HMP Communications. 2001:641-651.
14. Bates-Jensen BM, Vredevoe DL, Brecht ML. Validity and reliability of the pressure sore status tool. *Decubitus*. 1992;55(6):20-8.
15. Ferrell BA, Artinian BM, Sessing D. The Sessing Scale for assessment of pressure ulcer healing. *Journal of the American Geriatric Society*. 1995;43:1:37-40.
16. Houghton PE, Kincaid CB, Campbell KE, Keast DH, Woodbury MG. Photographic assessment of the appearance of chronic pressure and leg ulcers. *Ostomy/Wound Management*. 2000;46(4):20-30.
17. Woodbury MG, Houghton PE, Keast DH, Campbell KE. Development, validity, reliability and responsiveness of a new leg ulcer measurement tool. *Advances in Skin & Wound Care*. 2004;17:(4):187-196.
18. RNAO *Nursing Best Practice Guideline Assessment and Management of Venous Leg Ulcers*, p. 98-102. Available online at [www.rnao.org/bestpractices/PDF/BPG\\_venous\\_leg\\_ulcer.pdf](http://www.rnao.org/bestpractices/PDF/BPG_venous_leg_ulcer.pdf). Accessed April 20, 2005.
19. Gray M. Which pressure ulcer risk scales are valid and reliable in a pediatric population? *J WOCN*. 2004;31(4):157-160.