SUMMER 2012 | Été 2012
Vol. 10 No. 3 | Vol.10 numéro 3
CAN $9.95 | 9,95 $ CAN

Wound Care

Soins des plaies

The Official Publication of the Canadian Association of Wound Care
La revue officielle de l'Association canadienne du soin des plaies

Understanding the Scientific Literature: What do 95% Confidence Intervals Mean?

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1. Lazaro-Martinez et al. Randomized comparative trial of a collagen/oxidized regenerated cellulose dressing in the treatment of neuropathic diabetic foot ulcers. F.R. Circ. Esp.2007, 82(1), 27-31
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Wound Care / Soins des plaies

Summer 2012 / Été 2012
Volume 10, Number 3
Volume 10, numéro 3
ISSN 1708-6884

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Wound Care Canada is published by BCS Communications Ltd., on behalf of the Canadian Association of Wound Care. Canada's first publication devoted entirely to wound care, *Wound Care Canada* addresses the needs of clinicians, patients, caregivers and industry.

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Canadian Publication Mail
Sales Product Agreement
No. 40065546

Return mail to:
642 King Street West,
Suite 224, Toronto, ON M5V 1M7

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The Canadian Association of Wound Care is a non-profit organization of health-care professionals, industry participants, patients and caregivers dedicated to the advancement of wound care in Canada.

The CAWC was formed in 1995, and its official meeting is the CAWC annual conference held in Canada each year. The association's efforts are focused on five key areas: public policy, clinical practice, education, research and connecting with the international wound-care community. The CAWC works to significantly improve patient care, clinical outcomes and the professional satisfaction of wound-care clinicians.

L'Association canadienne du soin des plaies est un organisme sans but lucratif regroupant des professionnels de la santé, des gens de l'industrie, des patients et des membres du personnel soignant fortement intéressés à l'avancement des connaissances pour le soin des plaies au Canada.

Fondée en 1995, l'ACSP organise, chaque année, au Canada, un congrès qui lui tient lieu de réunion officielle, le Congrès annuel de l'ACSP. L'association consacre ses efforts dans cinq domaines particuliers : les politiques gouvernementales, la pratique clinique, la formation, la recherche et la création de liens avec la communauté internationale directement impliquée dans le soin des plaies. L'Association canadienne du soin des plaies vise une amélioration significative du soin donné au patient, des résultats cliniques et de la satisfaction professionnelle des spécialistes en soin des plaies.

Register for the CAWC Institute of Wound Management and Prevention

The CAWC Institute of Wound Management and Prevention is offering educational sessions across Canada throughout 2012. For further information regarding dates and venues, and to register, please visit **www.cawc.net**.

Best Life Rewarded and CAWC Collaborate to Promote Foot Care Awareness for People with Diabetes

The Canadian Association of Wound Care (CAWC) and Best Life Rewarded (www.bestliferewarded.com) are pleased to announce a collaboration to raise awareness of diabetic foot care and steps that patients can take for healthy feet, including recognition of early warning signs and taking preventive measures.

Free to all Canadians, Best Life Rewarded is an innovative health loyalty program that offers healthy incentives for people who are learning about and tracking healthy behaviours. Best Life Rewarded is a hub of credible health information in partnership with many national not-for-profit groups, which coordinates Canadian health information in a way that is meaningful for the user.

View the module and associated tools at **www.bestliferewarded.com**. For further information regarding the CAWC's *PEP (Peer Education Program) Talk: Diabetes, Healthy Feet and You* foot care peer-education program, please visit http://diabetespeptalk.ca/en/.

CAWC Conference Keynote Speaker Announced

The CAWC is pleased to announce that Meg Soper will be the keynote speaker at the opening plenary of the 2012 annual conference in London, Ontario. Meg is a professional speaker and comedienne, and has been recognized as one of the premiere motivators speaking on life balance in Canada. She combines a remarkable sense of humour with her unique perspective on life to captivate her audience and leave them both motivated and entertained. With more than 25 years' experience in the healthcare industry and as a registered nurse, Meg understands how attitudes affect those around you in both the workplace and home environments.

Her presentation, entitled *Wit, Fit and Balance...Strategies for Success*, examines the stresses of everyday life and sheds a humorous light on them. This presentation will also tackle such issues as life balance and our ability to bounce back when faced with stress. Meg uses her stories to emphasize the fact that humour is one of the key techniques to decreasing the everyday stress that is a part of our lives. Attendees are sure to leave in stitches, armed with a number of practical strategies geared toward a healthier, happier and more productive workplace environment while maintaining a sense of balance.

CAWC and Canadian Diabetes Association Collaborate on *Diabetes, Healthy Feet and You* Initiative

Over the past few years, the CAWC has developed numerous educational materials for patients and healthcare professionals alike, branded as the *Diabetes, Healthy Feet and You* initiative. Materials include brochures, pamphlets, waiting room posters and even an educational video, all of which are available at **http://cawc.net/public/feet**.

Earlier this summer, the CAWC established an agreement with the Canadian Diabetes Association (CDA), which will provide the CDA with open access to all *Diabetes, Healthy Feet* and You tools for the purpose of sharing them with their broader diabetes-related audience. The tools will be co-branded and then launched to healthcare providers in Canada in print and electronic formats; select content from the patient education tools will also be reproduced at the CDA's website (www.diabetes.ca). "We are pleased to be working with the Canadian Diabetes Association on this very important educational initiative and collaboration," says Peggy Ahearn, CAWC Executive Director. "This is just the beginning of what we expect will lead to other opportunities to work together, and thereby reach a much larger audience of diabetes healthcare professionals and patients."

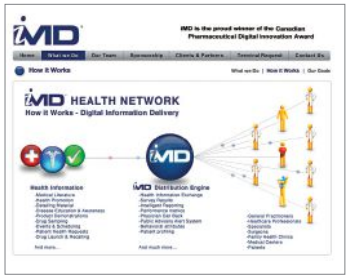
CAWC Executive Director Receives Marketing Hall of Fame Award

The Canadian Association of Wound Care is pleased to announce that Peggy Ahearn, Executive Director, was inducted into the 2012 Canadian Healthcare Marketing Hall of Fame. Presented at the 2012 National Pharmaceutical Congress earlier this year, the award is presented to "individuals who represent a cross-section of the qualities that have contributed to the uniqueness of the industry and are an inspiration to others." Congratulations to Peggy on a lifetime of excellence in health education and marketing endeavours!

CAWC Partners with iMD to Provide Point-of-care Information for Patients

The CAWC is collaborating with iMD, an organization that provides a unique service to help healthcare professionals and patients navigate the complexity of the healthcare literacy system together: iMD is an interactive health terminal that uses a touch-activated interface to visually display regions of the human body, medical conditions, diseases, illnesses, medical resources and treatment options. The health terminal is located directly in the physicians' examination rooms and is driven by the physician or healthcare provider.

The CAWC will provide information regarding wound care prevention and management, which will be uploaded to the iMD terminals currently being used by more than 600 physicians, medical specialists, diabetes education centres, chronic disease clinics and other healthcare providers across Canada. The iMD terminals are connected to a private bidirectional communication system, whereby users will have direct access to digital medical content and industry information as they need it.



The iMD terminal serves as a medical medium for instant communication and provides a wide range of medical illustrations, industry guidelines, videos, documents, drug information, product monographs, research documents, continuing health education, patient literature and counselling tools.

The CAWC is currently forming an advisory group to help determine the most appropriate information from the association to be shared.

Conference Early Bird Winners Announced!

Each year, the Canadian Association of Wound Care holds a draw for those conference attendees who have registered early. Three lucky winners are drawn from all early bird registrants to win free conference registration. This year's lucky winners are:

- **Alice Carter; Dashwood, Ontario**
- **Leann Nelson; Strathroy, Ontario**
- **Patricia Maclean; Watson, Saskatchewan**

We look forward to seeing you at the 18th annual CAWC conference in London, Ontario, which will be held this year from November 8 to 11! For registration information, please visit **www.cawc.net/conference**.

National Wound Alliance Stakeholder Roundtable

In late June 2012, Wound Care Alliance Canada hosted a National Stakeholder Round-table in Mississauga, Ontario. The Alliance speaks with one voice for the Canadian Association for Enterostomal Therapy, the Canadian Association for Wound Care, the Ontario Woundcare Interest Group and the wound care industry as represented by MEDEC's Wound Care Committee. The purpose of the meeting was to start the conversation about a Canadian Wound Care Innovation Centre of Excellence. Co-chaired by Janet Davidson, Canadian head of KPMG's Global Healthcare Practice, and Tom Closson, a healthcare executive and consultant, the meeting was attended by representatives of 35 Canadian healthcare and innovation organizations. For further information, please contact the Wound Care Alliance Acting Executive Director Maureen Latocki via email at **maureen.latocki@woundcarealliance.com**.

2012 CAWC Institute Educational Events

The CAWC Institute of Wound Management and Prevention is offering Levels 1 to 3 Series educational sessions at the following locations. Register now!

- Kelowna, BC: October 11–14
- Toronto, ON: November 29–December 2

The CAWC Institute will also administer the Level 4 International Interprofessional Wound Care Course at the following location:

Michener Institute, Toronto, ON: September 20–23.

For course descriptions and registration information, please visit: http://cawc.net/index.php/educational/.

CAWC's *PEP Talk Peer Education Program* Rolls Out Across Canada

The CAWC's *PEP (Peer Education Program) Talk: Diabetes, Healthy Feet and You* Program has now launched in all 10 provinces. The program consists of workshops that are co-led by volunteer peer leaders who are living with diabetes, and neuropathy and volunteer healthcare professionals committed to improving the lives of people with diabetes. For information regarding workshop dates and locations, please visit the PEP Talk website at **http://diabetespeptalk.ca/en/**.

The website also contains a multitude of information regarding foot care, including resources for people with diabetes, an "ask the expert" section and "your stories," where individuals are encouraged to share their experience regarding foot care management and foot care challenges.

What do 95% Confidence Intervals Mean?

BY M. GAIL WOODBURY PHD BSCPT AND JANET KUHNKE BSN MS ET

In this column, we examine how to interpret confidence intervals (CIs) when you encounter them in a scientific paper.

Example 1: It has been reported that the overall mean prevalence of pressure ulcers in Canadian healthcare settings is 26% (95% CI 25.2–26.8%).[1] What does the 95% CI mean?

Example 2: It has also been reported that the cumulative incidence of heel pressure ulcers in people who have undergone orthopedic surgery and are followed across the continuum of care is 17% (95% CI 8–26%).[2] What does this CI mean?

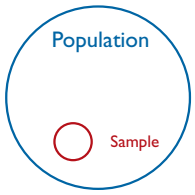
First, understanding CIs requires a basic understanding of the concepts of estimation, populations, samples and normal distribution curve properties.

Estimation

Why are CIs reported? As indicated in the p-value paper,[3] researchers want to know a value (often the mean) of their outcome measure in the target population, but they cannot test the whole population because it would take too much time and money. Instead, they use a randomly selected sample or a convenience sample to estimate that value in the population. The relationship between the sample and the population can be illustrated as in Figure 1.

FIGURE 1

The sample is selected from the target population.



Population and sample

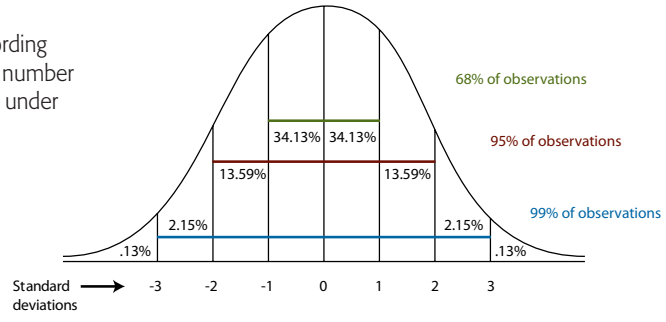
Samples are not always truly representative of the population from which they are drawn. They are always affected by their size and potentially by selection bias. In this instance, selection bias refers to a systematic difference in the characteristics of the subjects selected for the sample compared with the rest of the population. This affects the study's generalizability. Therefore, it is possible that the sample could provide a biased estimate of the mean in the population.

Since the estimate is based on only 1 sample and is not necessarily accurate for the target population, the CI puts limits around the estimate and indicates how certain we are that the true value for the population is between those limits. It is important to understand CIs because they are reported in 75% of papers.[4]

To say the same thing slightly differently: The true value of an estimate in a population is referred to as the population parameter. This is called μ (mu) and cannot be calculated. Instead, it is estimated in a sample referred to as the sample statistic, and the mean is called $\bar{x}$ (x bar). It is an estimate of the actual value of the mean in the population. Therefore, we want to know how certain we are that the estimate is accurate. So, we calculate a CI to describe this. Because we generally want to make a mistake no more often than 5 times out of 100, the CI we use is the 95% CI. (If we are willing to be wrong 10 times out of 100, then we can use the 90% CI.).

FIGURE 2

A normal distribution curve divided according to standard deviations and showing the number of observations included in the sections under the curve.



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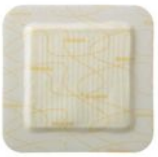

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Normal distribution

Because most variables are distributed normally, the properties of the normal distribution help us to understand them. We know that the mean ±1 standard deviation (SD) describes 68% of observations in the distribution. Similarly, the mean ±2 SDs describes 95% of observations and the mean ±3 SDs describes 99% of observations, as shown in Figure 2.

Back to the examples

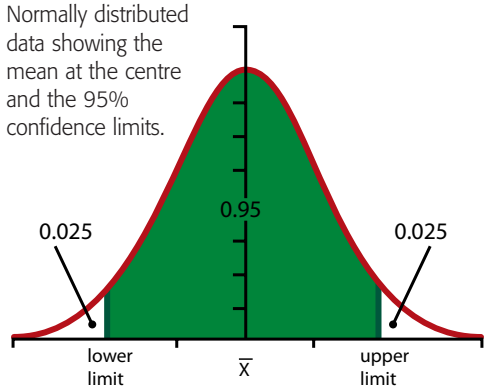
Remember the first example, which states that the overall mean prevalence of pressure ulcers in Canadian healthcare settings is 26% (95% CI 25.2–26.8%)? We can say that the mean prevalence estimate is 26% and the 95% CI of 25.2–26.8% describes the interval in which we expect the mean value in the target population to lie 95% of the time. We state this by saying that we are 95% confident that the population mean lies between 25.2% and 26.8%.

The second example states that the cumulative incidence of heel pressure ulcers in people who have undergone orthopedic surgery and are followed across the continuum of care is 17% (95% CI 8–26%). This means that the cumulative incidence estimate of 17% and the 95% CI of 8–26% describes the interval in which we expect the cumulative incidence in the target population to lie 95% of the time. Again, we can say we are 95% confident that the population incidence value is between 8% and 26%.

In the first example, you will note that the CI is very narrow, not quite 2 percentage points. This is because the mean and the CI are based on a large sample of 10,911 subjects. The larger the sample, the narrower the CI will be. Conversely, in the second example, the CI is wider at 26 percentage points. In this study, the cumulative incidence estimate is based on a sample of just 72 subjects. Whether the 95% CI is wide or narrow, we are confident that the population value (prevalence or incidence, in these examples) is within the interval 95% of the time. Obviously, if the CI is narrow, we believe we are closer to knowing the actual value in the population – especially if we know the sample has been selected in such a way that the risk of bias is minimized.

FIGURE 3

Normally distributed data showing the mean at the centre and the 95% confidence limits.



In summary, the CI provides the best approximation of the range of a population value based on the sample value. Figure 3 illustrates the mean value for a sample and the 95% CI.

Overlap

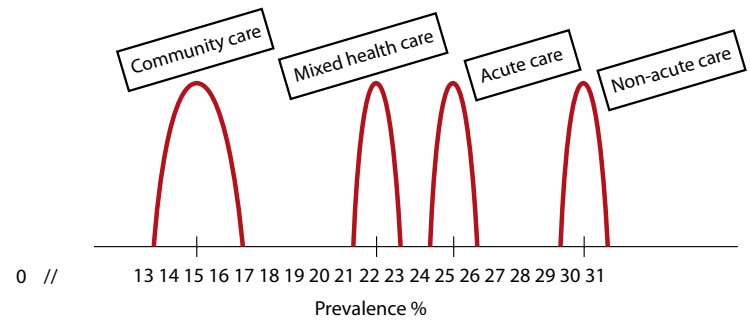
A third example illustrates another important function of 95% CIs: whether they overlap or not.

Example 3: The overall mean prevalence for the healthcare settings ranged from 15.1% (95% CI 13.4–16.8%) in community care to 29.9% (95% CI 29.3–31.4%) in non-acute care, with mixed health settings at 22.1% (95% CI 20.9–23.4%) and acute care at 25.1% (95% CI 23.8–26.3%).[1]

As illustrated in Figure 4, the 95% CIs for the prevalence estimates in the different healthcare settings do not overlap. This means that the estimates are significantly different. If the CIs did overlap, it would mean the estimates were not significantly different and were drawn from the same population.

FIGURE 4

Mean prevalence estimates and corresponding 95% confidence intervals for various healthcare settings[1] illustrating that the confidence intervals do not overlap.



Glossary

Population:
The target group that the researcher wants to understand (e.g. persons with diabetes).

Sample:
The selected part of the target population that is used to determine an estimate of a value in that population.

Statistic:
The value derived from a sample that is used to estimate the true value of a characteristic in the population.

Parameter:
The true value of a characteristic in the population that is estimated in the sample.

Key points

In summary, samples that are selected to represent a target population are not always representative. The statistic determined using a sample is an estimate of the parameter in the population. The 95% CI for the estimate provides the best approximation of the range of the population parameter, allowing us to state we are 95% confident that the population value lies between the limits. Depending on differences in sample size and variability, the CI can be wide or narrow. Nevertheless, we are still 95% confident that the population value lies within the interval.

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Suggested resources

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- Colton T. *Statistics in Medicine*. Boston, MA: Little Brown and Company, 1974.
- Elzey F. *An Introduction to Statistical Methods in the Behavioral Sciences*. Monterey, CA: Brooks/Cole Publishing Company, 1976.
- Salkind NJ. *Statistics for People Who (Think They) Hate Statistics*, 4th ed. London, UK: Sage Publications Inc., 2011.

Que veulent dire les intervalles de confiance de 95 %?

PAR M. GAIL WOODBURY, PH.D., B.SCPT, ET JANET KUHNKE, B.SC.INF., M.SC., STOMOTHÉRAPEUTE

Le présent article porte sur l'interprétation des intervalles de confiance (IC) dans un article scientifique. (Les lecteurs qui désirent en savoir davantage peuvent consulter la liste de ressources utiles qui suit l'article.)

Exemple nº 1 : On a signalé que la prévalence moyenne globale des plaies de pression dans les établissements de soins de santé canadiens était de 26 % (IC de 95 % : 25,2 à 26,8 %)[1]. Que veut dire l'IC de 95 %?

Exemple nº 2 : On a aussi signalé que l'incidence cumulative des plaies de pression au talon chez les personnes ayant subi une chirurgie orthopédique et dont le suivi couvre le continuum des soins est de 17 % (IC de 95 % : 8 à 26 %)[2]. Que veut dire cet IC?

La compréhension des IC exige une connaissance de base des concepts d'estimation, de population, d'échantillon et de propriétés de la courbe de distribution normale.

Estimation

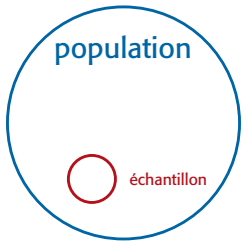
Quelle est l'utilité des IC? Comme il en a été question dans l'article sur les valeurs p[3], les chercheurs veulent connaître la valeur (souvent la moyenne) de leur critère d'évaluation des résultats dans la population cible, mais ils ne peuvent évaluer l'ensemble de la population, car cela exigerait beaucoup de temps et d'argent. Ils évaluent donc plutôt un échantillon choisi au hasard ou un échantillon de commodité pour obtenir une estimation de la valeur dans la population. La figure 1 illustre le rapport entre l'échantillon et la population.

Population et échantillon

Les échantillons ne sont pas toujours vraiment représentatifs de la population de laquelle ils font partie. Leur taille et le biais de sélection possible influent toujours sur les échantillons. Dans le cas qui nous intéresse, le biais de sélection désigne la différence systématique pour ce qui est des caractéristiques entre les sujets choisis pour l'échantillon et le reste de la population. Ce biais influe sur la généralisabilité des résultats de l'étude. Il se peut donc que l'échantillon

FIGURE 1

L'échantillon est choisi dans la population cible.



donne une estimation biaisée de la moyenne dans la population.

Comme l'estimation est fondée sur un seul échantillon et n'est pas nécessairement représentative de la population cible, l'IC comporte des limites inférieure et supérieure de l'estimation et indique dans quelle mesure on est certain que la valeur réelle pour la population se trouve entre ces limites. Il est important de comprendre les IC, car ils sont donnés dans 75 % des articles[4].

Pour dire la même chose un peu différemment : la valeur réelle d'une estimation dans une population s'appelle le paramètre de population. Ce paramètre s'appelle « μ » (mu) et ne peut être calculé. Son estimation dans un échantillon s'appelle « statistique » et la moyenne s'appelle « $\bar{x}$ ». Il s'agit d'une estimation de la valeur réelle de la moyenne dans la population. Par conséquent, on veut savoir dans quelle mesure on est certain que cette estimation est exacte. On calcule donc l'IC pour le décrire. Comme on ne veut en général pas qu'il y ait erreur plus de cinq fois sur 100, on utilise l'IC de 95 %. (Si on accepte qu'il y ait erreur 10 fois sur 100, on utilise un IC de 90 %.)

Distribution normale

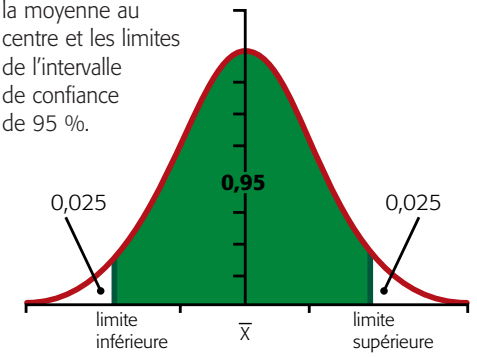
Comme la distribution de la plupart des variables est normale, les propriétés de la distribution normale nous aident à les comprendre. Nous savons que la moyenne ± 1 écart type (ET) décrit 68 % des observations dans la distribution. De la même façon, la moyenne ± 2 ET décrit 95 % des observations et la moyenne ± 3 ET décrit 99 % des observations (voir figure 2).

Retour aux exemples

Dans le premier exemple, la prévalence moyenne globale des plaies de pression dans les établissements de soins de santé canadiens est de 26 % (IC de 95 % : 25,2 à 26,8 %). On peut dire que l'estimation de la prévalence moyenne est de 26 % et que l'IC de 95 % de 25,2 à 26,8 % décrit l'intervalle dans lequel on prévoit que la valeur moyenne dans la population cible se situera dans 95 % des cas. On l'exprime en disant qu'on est certain à 95 % que la moyenne dans la population est d'entre 25,2 et 26,8 %.

FIGURE 3

Distribution normale des données montrant la moyenne au centre et les limites de l'intervalle de confiance de 95 %.



Dans le second exemple, l'incidence cumulative des plaies de pression au talon chez les personnes ayant subi une chirurgie orthopédique et dont le suivi couvre le continuum des soins est de 17 % (IC de 95 % : 8 à 26 %). C'est donc dire que l'estimation de l'incidence cumulative est de 17 % et que l'IC de 95 % de 8 à 26 % décrit l'intervalle dans lequel on prévoit que l'incidence moyenne dans la population cible se situera dans 95 % des cas. Encore une fois, on peut dire qu'on est certain à 95 % que l'incidence dans la population est d'entre 8 et 26 %.

Glossaire

Population : groupe cible que le chercheur veut comprendre (p. ex. les personnes diabétiques)

Échantillon : segment de la population cible utilisé pour estimer une valeur dans cette population

Statistique : valeur obtenue dans un échantillon qui sert à estimer la valeur réelle d'une caractéristique dans la population

Paramètre : valeur réelle d'une caractéristique dans la population qui a été estimée à partir de l'échantillon

FIGURE 2

Courbe de distribution normale divisée en fonction des écarts types et donnant le nombre d'observations comprises dans les zones sous la courbe.

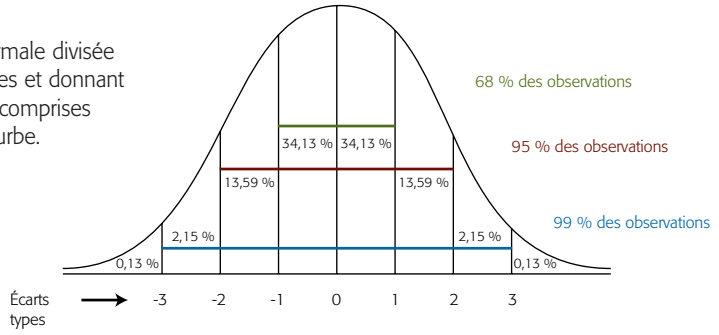
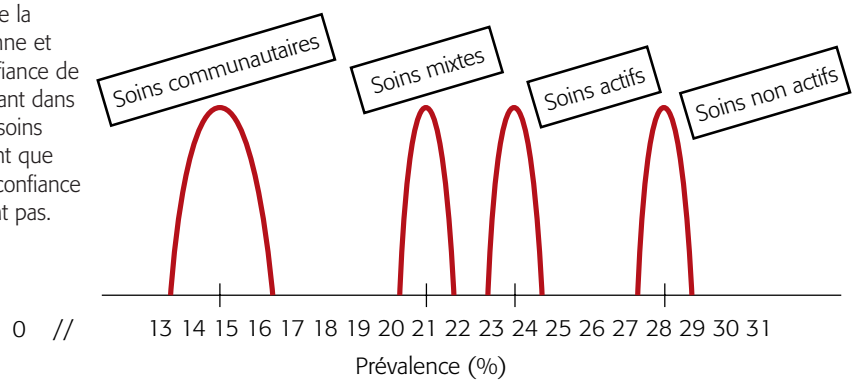


FIGURE 4

Ces estimations de la prévalence moyenne et intervalles de confiance de 95 % correspondant dans divers milieux de soins de santé[1] montrent que les intervalles de confiance ne se chevauchent pas.



Dans le premier exemple, on constate que l'IC est très étroit, soit d'un peu moins de deux points de pourcentage. Cela vient du fait que la moyenne et l'IC sont basés sur un échantillon de grande taille (10 911 sujets). En effet, plus l'échantillon est important, plus l'IC est étroit. Inversement, dans le second exemple, l'IC est plus large, soit de 26 points de pourcentage, parce que l'estimation de l'incidence cumulative dans cette étude est fondée sur seulement 72 sujets. Que l'IC de 95 % soit large ou étroit, on est certain que la valeur dans la population (soit la prévalence ou l'incidence dans les exemples donnés) se situe à l'intérieur de l'intervalle dans 95 % des cas. Manifestement, un IC étroit veut dire qu'on est plus près de connaître la valeur réelle dans la population, surtout si on sait que l'échantillon a été choisi de façon à réduire au minimum le risque de biais.

En résumé, l'IC donne la meilleure approximation de l'écart d'une valeur dans la population selon la valeur dans l'échantillon. La figure 3 illustre la valeur moyenne pour un échantillon et l'IC de 95 %.

Cheauchement

Un troisième exemple illustre une autre importante fonction des IC de 95 %, à savoir s'il y a chevauchement ou non.

Exemple nº 3 : La prévalence moyenne globale dans les divers milieux de soins de santé a été de 15,1 % (IC de 95 % : 13,4 à 16,8 %) pour les soins communautaires, de 22,1 % (IC de 95 % : 20,9 à 23,4 %) pour les soins mixtes, de 25,1 % (IC de 95 % : 23,8 à 26,3 %) pour les soins actifs et de 29,9 % (IC de 95 % : 29,3 à 31,4 %) pour les soins non actifs[1].

Comme le montre la figure 4, les IC de 95 % correspondant aux estimations de la prévalence dans les divers milieux de soins ne se chevauchent pas. Cela veut dire que la différence entre les estimations est significative. Un chevauchement des IC aurait voulu dire que les estimations n'étaient pas significativement différentes les unes des autres et provenaient de la même population.

Points clés

En résumé, les échantillons qui sont choisis pour représenter une population cible ne sont pas toujours représentatifs. La statistique déterminée à partir d'un échantillon est une estimation du paramètre de population. L'IC de 95 % pour l'estimation est la meilleure approximation de l'écart du paramètre de population et permet d'affirmer qu'on est certain à 95 % que la valeur dans la population se situe entre les limites de l'intervalle. Selon la taille et la variabilité de l'échantillon, l'IC peut être large ou étroit, mais il indique toujours qu'on est à 95 % certain que la valeur dans la population se situe dans l'intervalle.

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Q&A with Regroupement Québécois en soins de plaies

***Wound Care Canada* spoke recently with Chantal Labrecque, president of the newly formed Regroupement Québécois en soins de plaies (RQSP). Labrecque is a wound care consultant in both the public and private sectors.**

What is the RQSP?

The RQSP is a non-profit volunteer association for wound care health professionals in the province of Quebec. The idea to form such an association was begun a few years ago by a small group of wound care clinicians who wanted to provide education and advocacy for French-speaking people in the province. However, in the last year or so, a committee was formed to activate the process, and complete the administrative tasks required to officially form a non-profit organization in the province.

Why did you form the RQSP?

Our main rationale for creating the organization was to address the needs of French-speaking people in Quebec. We work well with the Canadian Association of Wound Care (CAWC) and the Canadian Association for Enterostomal Therapy (CAET); however, we wanted to form an organization that would also address the unique local needs of Quebec healthcare practitioners. Educational needs were at the forefront of this rationale – for example, in our province, we do not have the International Interdisciplinary Wound Care Course, so we want to collaborate with Quebec universities and hopefully collaborate on accredited educational programs. We also hope to work with the Quebec government, and help to educate them about wound care needs.

What are the mission and vision of the RQSP?

The principal mission and vision of the association are to provide quality care to people with wounds. We also want to bring best practice to the bedside; for example, the CAWC has a number of excellent best practice recommendations, and we want to ensure that clinicians are aware of them and are using them in practice, to ensure quality of care.

Research is also a key mission; we hope to help clinicians with research projects wherever and whenever we can. We also hope to offer education to all wound care professionals, and network and exchange information at events and activities as often as possible. We held our first educational event this past March in Quebec City, which was attended by about 250 wound care health professionals.

Working in partnership with industry will also be a priority, as their input is invaluable to clinicians regarding new products and therapies.

Who are the members of the RQSP?

Currently, the RQSP has approximately 80 members; members include primary care physicians, specialists, nurses, dietitians, physiotherapists, social workers, nursing assistants and other healthcare professionals involved in wound care. The RQSP also has a board of directors, which is composed of 10 members (see box).

What are your goals for the RQSP?

In the short term, we will be launching a website during the summer – this will prove very helpful with regard to spreading our message to interested parties. With respect to knowledge translation, we are hoping to disseminate the CAWC best practice recommendations to all nurses in Quebec.

We also intend to write some articles regarding clinical care that we will post at the website; these articles will provide basic clinical information regarding wound care that would be easy to access for healthcare professionals requiring such information.

We are also hoping to meet with the Quebec health minister in Autumn 2012 to discuss with him the important issues in wound care in Quebec. Wound care is very costly in the province of Quebec – as it is in other provinces – and we want to form a working committee in concert with the Ministry of Health to tackle financial and other issues related to wound care.

In the long term, we aim to continue to hold an annual provincial conference as well as smaller local meetings throughout the year, depending on interest and availability. We also hope to offer a program in partnership

The board of directors of the newly formed Regroupement Québécois en soins de plaies.

with a university – similar to the International Interdisciplinary Wound Care Course. Although seven of the eight universities in Quebec offer courses in wound healing and wound care, we hope to develop a common program for all universities.

How will you collaborate with affiliated organizations, such as the CAWC and CAET?

The RQSP recognizes that we are not alone in the province of Quebec. We wish to collaborate with both the CAWC and the CAET on educational activities. We want to be sure that every activity that we undertake will be aligned – as necessary – with the CAWC's and CAET's mission, vision and values.

RQSP Board of Directors

- Chantal Labrecque RN BSN MSN (President)
- Maryse Beaumier RN BSN MSN (Director)
- Hélène Bouchard RN BSN ET (Secretary)
- Marie-Josée Demers (Director)
- Danielle Gilbert RN BSN ET (Vice President)
- Gino Henry (ConvaTec) (Ex-officio observer)
- Dominique Lord RN BSN ET (Director)
- Manon Paquin RN BSN ET (Director)
- Pauline Rodrigue (Treasurer)
- Hélène Ste-Marie RN (Director)

PLEINS FEUX SUR LES ASSOCIATIONS AFFILIÉES

Le Regroupement québécois en soins de plaies répond à nos questions

***Soins des plaies Canada* a récemment rencontré madame Chantal Labrecque, présidente du nouveau Regroupement québécois en soins de plaies (RQSP). Madame Labrecque est consultante en soins de plaies dans les secteurs public et privé.**

Qu'est-ce que le RQSP?

Le RQSP est une association bénévole sans but lucratif qui s'adresse aux professionnels de la santé québécois du domaine du soin des plaies. Il y a quelques années, un petit groupe de cliniciens spécialistes du soin des plaies a eu l'idée de former une telle association pour éduquer et défendre les intérêts des francophones de la province. Au cours des deux dernières années, un comité a été mis sur pied pour accélérer le processus et voir aux tâches administratives nécessaires à la formation officielle d'un organisme sans but lucratif dans la province.

Pourquoi le RQSP a-t-il été formé?

L'organisme a été mis sur pied surtout pour répondre aux besoins des francophones du Québec. Nous avons de bons rapports avec l'Association canadienne du soin des plaies (ACSP) et avec l'Association canadienne des stomothérapeutes (CAET), mais nous voulions former un organisme qui répond aux besoins particuliers des professionnels de la santé du Québec. Nous avions surtout en tête les besoins de formation – par exemple, au Québec, comme le Cours pluridisciplinaire international sur le soin des plaies n'est pas offert, nous voulons nous associer aux universités québécoises pour créer des programmes d'éducation accrédités. Nous espérons aussi travailler avec le gouvernement du Québec et le sensibiliser aux besoins en matière de soin des plaies.

Quelle est la mission du RQSP?

La principale mission de l'association est de faire en sorte que les personnes qui présentent une plaie reçoivent des soins de qualité. Nous voulons aussi promouvoir la pratique exemplaire : par exemple, l'ACSP a énoncé d'excellentes recommandations en matière de pratique exemplaire et nous voulons nous assurer que les cliniciens les connaissent et les mettent en œuvre afin d'offrir des soins de qualité.

La recherche est aussi une importante mission pour le RQSP; nous espérons aider les cliniciens qui mènent des projets de recherche chaque fois que nous le pourrons. Nous entendons aussi éduquer tous les professionnels du soin des plaies, réseauter et échanger des renseignements le plus souvent possible au cours d'activités. Nous avons tenu notre première activité éducative à Québec en mars et environ 250 professionnels du soin des plaies y ont assisté.

Travailler en partenariat avec l'industrie sera aussi une de nos priorités, car en matière de nouveaux produits et de traitements, l'apport de l'industrie est inestimable pour les cliniciens.

Qui sont les membres du RQSP?

Le RQSP compte actuellement environ 80 membres, dont des médecins de premier recours, des spécialistes, des infirmières, des diététistes, des physiothérapeutes, des travailleurs sociaux, des infirmières auxiliaires et d'autres professionnels de la santé qui offrent des soins des plaies. Le RQSP a un conseil d'administration de dix membres (voir l'encadré).

Quels sont les objectifs du RQSP?

Cet été, nous allons lancer un site Web qui nous aidera beaucoup à diffuser notre message aux intéressés. Au chapitre du transfert des connaissances, nous espérons communiquer les recommandations de l'ACSP en matière de pratique exemplaire à toutes les infirmières du Québec.

Nous prévoyons rédiger quelques articles donnant des renseignements de base sur les soins cliniques des plaies et afficher ces articles sur notre site Web pour que les professionnels de la santé puissent les consulter facilement.

Nous espérons en outre rencontrer le ministre de la Santé du Québec à l'automne 2012 pour lui parler des importantes questions liées au soin des plaies au Québec. Le soin des plaies est très coûteux au Québec, comme dans les autres provinces, et nous désirons former, de concert avec le ministère de la Santé, un comité de travail pour s'attaquer aux problèmes financiers et autres ayant trait au soin des plaies.

À long terme, nous espérons continuer de tenir une conférence provinciale chaque année, ainsi que de petites réunions régionales à divers moments de l'année, selon l'intérêt et la disponibilité des professionnels. Nous voulons aussi offrir, en partenariat avec une université, un programme semblable au Cours pluridisciplinaire international sur le soin des plaies. Sept des huit universités québécoises offrent des cours sur la cicatrisation et le soin des plaies, mais nous espérons développer un programme commun pour toutes les universités.

Comment allez-vous collaborer avec les organismes affiliés, comme l'ACSP et la CAET?

Le RQSP reconnaît qu'il n'est pas le seul organisme du domaine du soin des plaies au Québec. Nous entendons collaborer tant avec l'ACSP qu'avec la CAET pour offrir des activités éducatives. Nous voulons nous assurer que toutes nos activités s'harmonisent, au besoin, avec la mission, la vision et les valeurs de l'ACSP et de la CAET.

Conseil d'administration du RQSP

- Chantal Labrecque, inf., B.Sc.Inf., M.Sc.Inf. (présidente)
- Maryse Beaumier, inf., B.Sc.Inf., M.Sc.Inf. (administratrice)
- Hélène Bouchard, inf., B.Sc.Inf., stomothérapeute (secrétaire)
- Marie-Josée Demers (administratrice)
- Danielle Gilbert, inf., B.Sc.Inf., stomothérapeute (vice-présidente)
- Gino Henry (ConvaTec) (observateur d'office)
- Dominique Lord, inf., B.Sc.Inf., stomothérapeute (administratrice)
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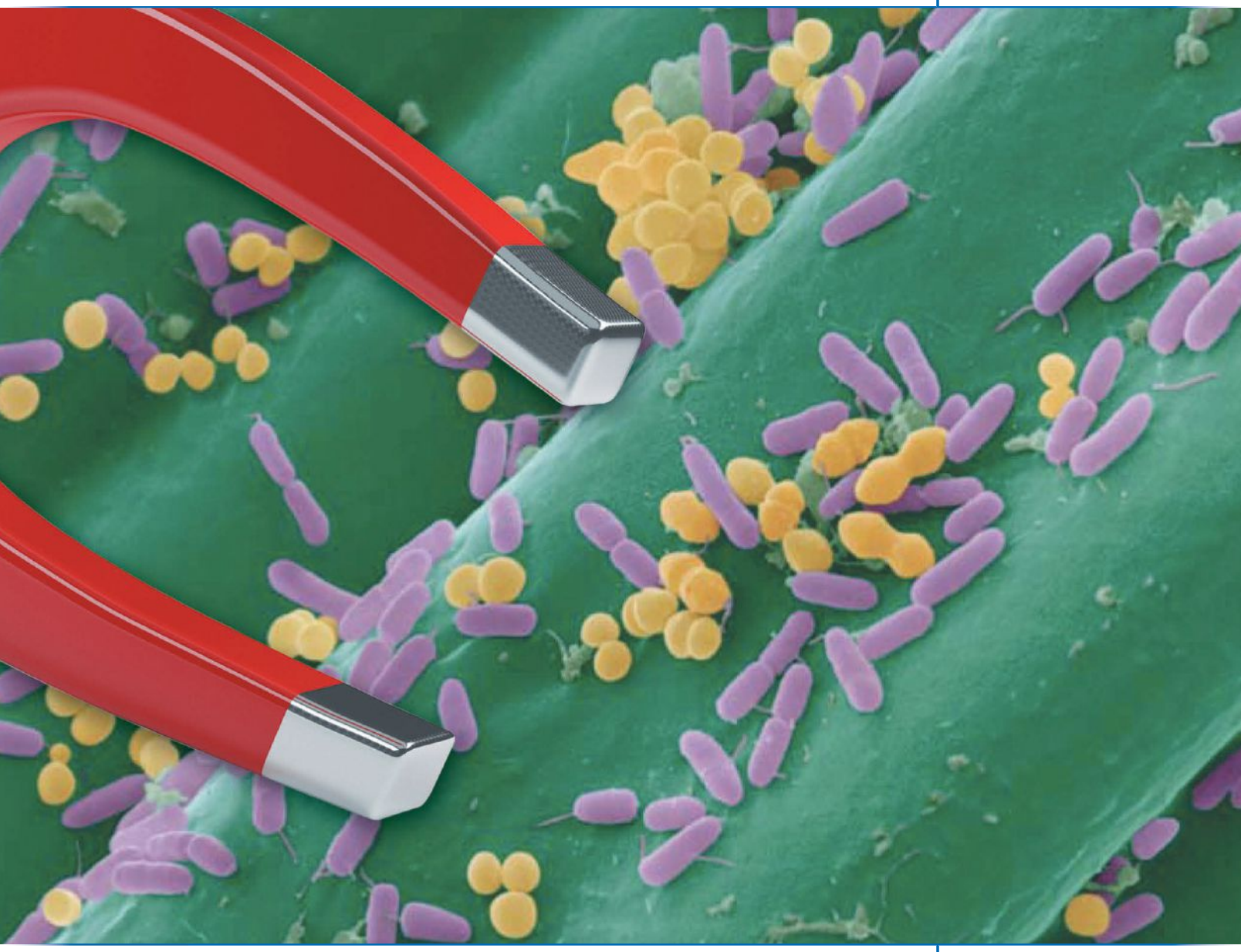

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Living Without the Gift of Pain:

A Peer-led Educational Program for Preventing Diabetic Foot Ulcers

"God's greatest gift to mankind is pain. Insensitive feet have lost the warning signal that ordinarily brings a person to their doctor." – Paul Brand MD, orthopedic surgeon[1]

BY MARIAM BOTROS DCH IIWCC

M. GAIL WOODBURY PHD BSCPT

JANET KUHNKE BSN MS ET

MARC DESPATIS MD MSC FRCS

ANDREA MARTIN

Introduction

Diabetic foot ulcers represent a significant medical and financial burden to the healthcare system. It is estimated that 15–20% of people with diabetes will develop a foot ulcer during their lifetime.[2] Additionally, foot complications account for longer hospital stays than any other complication of diabetes.[2] Furthermore, diabetes is the most common cause of non-traumatic lower-limb amputation, occurring in approximately 20% of people with diabetic foot ulcers.[3]

Neuropathy and foot ulcers

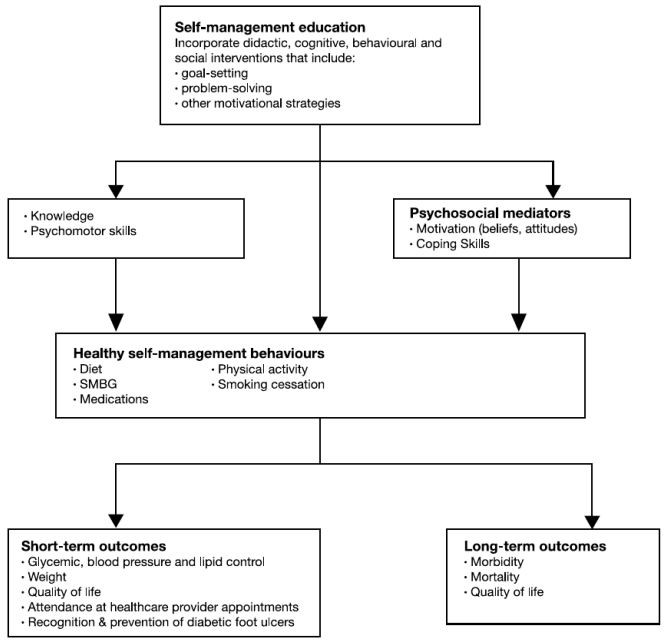
Approximately 40–50% of people who have had diabetes for 10 years or more are affected by sensorimotor polyneuropathy.[4] This condition causes decreased sensation, and is associated with an increased risk for complications such as diabetic foot ulcers and lower-limb amputation.[5]

Foot ulcers and educational programs

Education for people with diabetes regarding proper foot care, especially for those who are at high risk, may help prevent diabetic foot ulcers and amputations.[6] Education has been shown to improve people's foot care knowledge and behaviours, although more research is required to determine whether these improvements are sustained over the long term. In addition, the best type of educational format – with respect to effectiveness and sustainability – has yet to be determined in this high-risk group.[7]

FIGURE 1

Process of teaching people to manage their diabetes[9]



Self-management education and diabetes

There is a growing utilization of self-management education in chronic diseases in general and in diabetes specifically.[8] The aim of self-management education is to increase individuals' self-confidence and foster their motivation to control their disease.

Empowerment is an essential cornerstone of the self-management educational model, as it allows participants to feel accepted

Mariam Botros, Foot Specialist, Clinical Coordinator, Wound Healing Clinic, Women's College Hospital, Toronto, Ontario

M. Gail Woodbury, Toronto, Ontario

Janet Kuhnke, Kingston, Ontario

Marc Despatis, Vascular Surgeon, Centre Hospitalier Universitaire de Sherbrooke, Sherbrooke, Quebec

Andrea Martin, Coordinator, Diabetes, Healthy Feet and You Project, CAWC, Toronto, Ontario

and explore further aspects of their disease management. In addition, self-management facilitates the active involvement of all parties (e.g. patients and healthcare professionals) in the education process.

Educational approaches that increase individuals' participation and collaboration in decision-making regarding their care have been shown to be more effective when face-to-face delivery, cognitive reframing teaching methods and practical application of the teaching lessons are involved. Figure 1 shows the steps involved in teaching people to self-manage their diabetes.[9] Recognition and prevention of diabetic foot ulcers, as well as amputation prevention, are also important self-management issues.

Support systems that include family members and caregivers in self-management educational interventions have been found to be beneficial in improving patients' diabetes-related knowledge, as well as their ability to cope with the disease.[10,11] Moreover, self-management education programs led by peer leaders and supported by health professionals foster self-care for people with chronic conditions such as diabetes. Indeed, these programs have demonstrated short-term improvements in patients' confidence to manage their chronic condition.[10]

Lay peer educators can enrich the delivery and depth of the self-management education by sharing their personal journeys and commitment to change with participants. They are able to empower and motivate participants because there are no boundaries between them (as there sometimes are between clinicians and patients) and they can relate to each other's stories and experiences. Peer-led programs are also an economical intervention that can provide a valuable link between people with diabetes and healthcare professionals in the healthcare delivery system (Figure 2).[10–12]

According to a recent World Health Organization report, several randomized controlled trials have demonstrated improved glycemic control, quality of life and self-efficacy among patients with diabetes who take part in peer-led educational programs. Peer-led, face-to-face self-management programs have also demonstrated short-term improvements in participants' self-rated health, cognitive symptoms and diabetes self-management. Even so, more research is needed to determine the optimal program settings and types – specifically, how peer-support programs can be integrated into clinical and outreach services over the long term.[11,13]

The strength of evidence varies across peer-led educational programs; at this time, no peer-led diabetes foot care program has been developed that specifically focuses on the prevention of foot complications and diabetic foot ulcers. Still, the success of peer-led programs is attributed to the leadership from and support of a person who has experienced the challenges of living with a similar condition, in this case diabetic neuropathy and its complications.[10,11]

"Peer leaders are charged with rolling out the program in the community. I believe that the ripples created so far will create waves of awareness and reduce lower-limb and foot complications."

– Axel Rohrmann BSc Pod Med;
PEP Talk healthcare practitioner and workshop leader

Our commitment to preventing diabetic foot ulcers

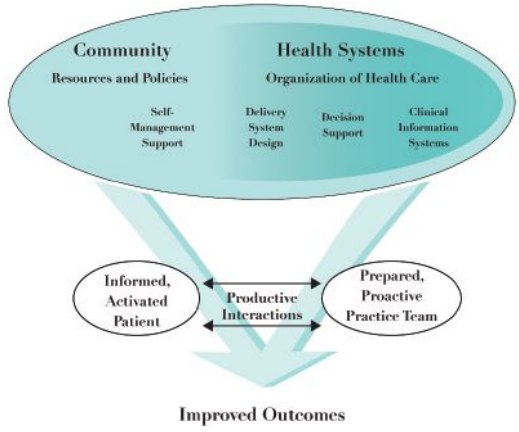
The CAWC is committed to reducing the number of diabetes-related foot ulcers and other potential neuropathic foot complications that can lead to lower-limb amputation. In 2010, the CAWC, in partnership with the Public Health Agency of Canada, launched the *Diabetes, Healthy Feet and You* interactive educational program and website for persons living with diabetes.

In Phase 1 of the program, a variety of self-management educational tools were developed in collaboration with people with diabetes, with the aim of motivating people living with the disease to prevent diabetic foot ulcers. Some of the educational materials developed through this program have been translated into 17 languages. For more information, visit http://www.cawc.net/diabetesandhealthyfeet.

Phase 2 of the Diabetes, Healthy Feet and You initiative involves a series of peer-led self-management workshops that will empower people with diabetes to

FIGURE 2

The chronic care model[13]



"Neuropathy is like no other health indicator. There is no pain or discomfort. It is the absence of symptoms. That means our body's early-warning signals are useless. We have to think and not feel!"

– Douglas Cowling; person with diabetes living with neuropathy

understand and apply proper daily foot care practices. The overarching goal of the program is to train community leaders from each province and territory to facilitate community-based workshops in partnership with healthcare professionals, thereby empowering people living with diabetes to "discover and use their own innate abilities to gain mastery of their diabetes" and foot care.[14]

PEP Talk participants proudly display their certificates of learning.

PEP (Peer Education Program) Talk: Diabetes, Healthy Feet and You consists of workshops that are co-led by volunteer peer leaders who are living with diabetes and neuropathy and volunteer healthcare professionals committed to improving the lives of people with diabetes. The self-management program incorporates multiple educational strategies, including social activities, interactive presentations, goal setting, problem solving, group activities and other motivational strategies that empower and motivate participants to adopt an approach to preventative foot care.[9]

PEP Talk: Diabetes, Healthy Feet and You encourages people with diabetes and their family members to attend a self-management educational workshop. The program's aim is to influence positive behaviour change in participants by increasing their knowledge of the risk factors for foot ulcers. Peers leaders can also offer individuals the support and resources needed to prevent and treat foot ulcers, and link them to available community resources with the same focus.

Educational programs that help people with diabetes to recognize and manage foot complications in a timely fashion are the cornerstone of preventing diabetic foot ulcers and amputations.[6,15] The challenge is that education alone may not always result in the necessary behaviour changes, particularly when people with diabetes may already have a loss of protective sensation. The *PEP Talk* program offers support to people with diabetes who are living without "the gift of pain." Peer leaders can share their experiences with the aim of educating other people with diabetes about: the hidden dangers of living with a lack of protective sensation; the risk of forming ulcerations; and the risk of potential ulcer complications that can lead to amputation. Program participants are more likely to reflect on the information that is shared in the program because they can truly say that the peer leader has walked in their shoes.

For more information on the *PEP Talk* program specifically, or diabetic foot health in general, visit www.diabetespeptalk.ca.

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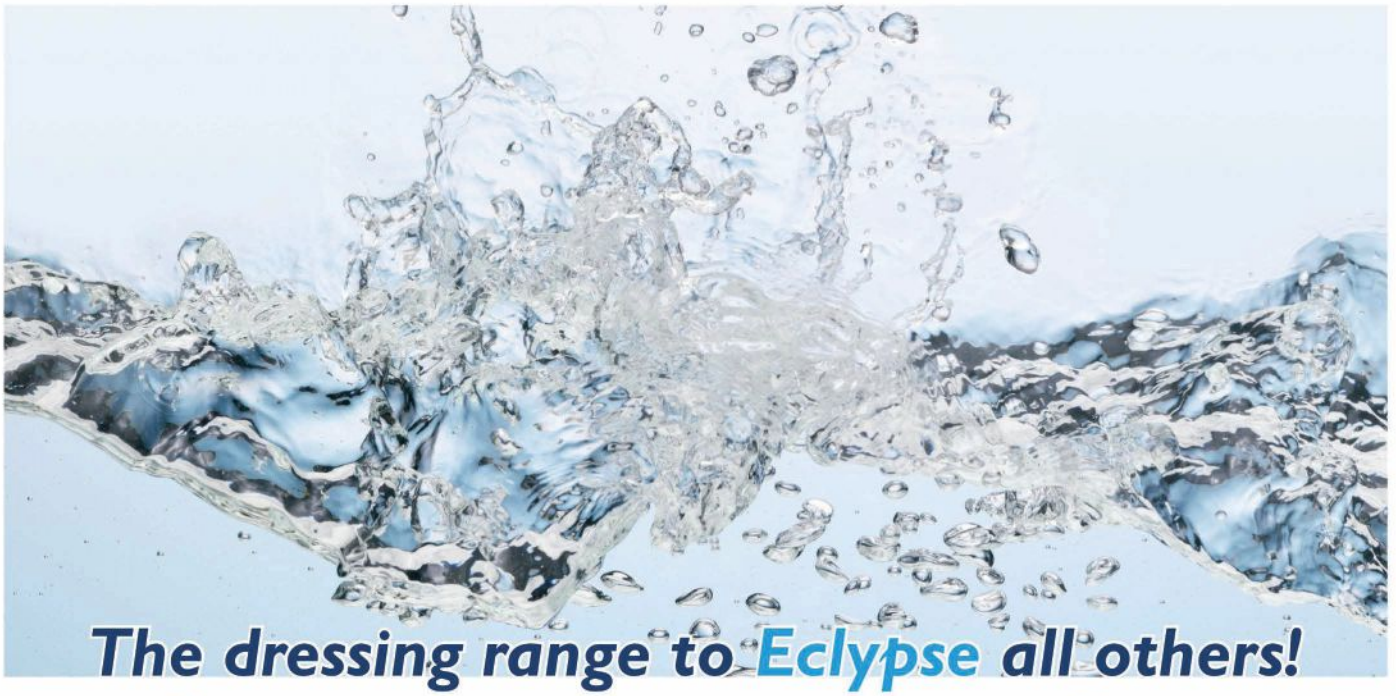

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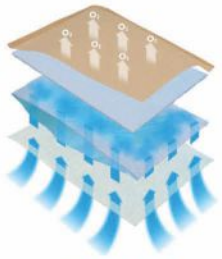

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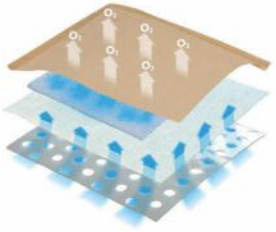

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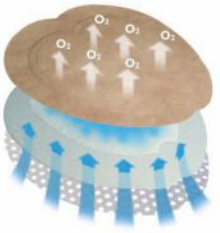

Eclypse Adherent Sacral®

Eclypse Boot®

Product	Size	Stock code	Pack size
Eclypse®	10cm x 10cm	CR3818	20
Eclypse®	15cm x 15cm	CR3769	20
Eclypse®	20cm x 30cm	CR3743	20
Eclypse®	40cm x 60cm	CR3808	10
Eclypse Adherent®	10cm x 10cm	CR3881	10
Eclypse Adherent®	10cm x 20cm	CR3883	10
Eclypse Adherent®	15cm x 15cm	CR3863	10
Eclypse Adherent®	20cm x 30cm	CR3864	10
Eclypse Adherent Sacral®	17cm x 19cm	CR3985	10
Eclypse Adherent Sacral®	22cm x 23cm	CR3986	10
Eclypse Boot®	60cm x 70cm	CR4014	5

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The Effectiveness of a New Antimicrobial Dressing

with Microbinding Action for the Management of Chronic Wounds

BY GARY SIBBALD BSc MD, FRCPC (MED, DERM) MACP FAAD MED MAPWCA

DR. KEVIN Y. WOO PHD RN FAPWCA

PATRICIA COUTTS RN

Abstract

The primary aim of this study was to evaluate the effectiveness of a new antimicrobial dressing. This dressing has a broad spectrum of action, no measurable host cytotoxicity, no currently identified allergenicity and no demonstrated risk of bacterial resistance. The study involved a sample of 14 subjects (8 with diabetic foot ulcers, 6 with venous leg ulcers). Dressings were changed up to 3 times a week for the 4-week study duration. The results were promising with respect to wound surface area reduction and pain improvement. This new antimicrobial dressing stalled chronic wounds with signs of increased bacterial burden.

Introduction

Chronic wounds constitute a major financial burden to society, and have a profound effect on quality of life.[1] The underlying causes of wounds need to be addressed as according to Table 1 but, arguably, localized wound infection (often referred to as critical colonization, increased bacterial burden or covert infection) is 1 of the most common challenges in the treatment of healable wounds.[2,3]

With the emergence of bacteria that are resistant to commonly used antibiotics or topical antibiotics, the use of topical non-antibiotic antimicrobial agents has become a sensible option for local wound care and surface bacterial damage.[3,4]

Preferred topical agents should have a broad spectrum of activity, relatively low tissue toxicity, low allergenicity and generally not be used systematically. However, with the advent of a plethora of newer topical antimicrobial agents, clinicians are often confused about when and what antimicrobial agents should be used. Many dressings are impregnated with active ingredients (e.g. silver, iodine, chlorhexidine, honey, gentian violet/methylene blue) that are released into the wound in the presence of wound fluid or exudate. Alternatively, a microbinding dressing can entrap and sequester bacteria in its microarchitecture and ultimately inactivate them.

This trial tested an antimicrobial dressing with microbinding action (Cutimed® Sorbact®; Cutimed,

TABLE 1

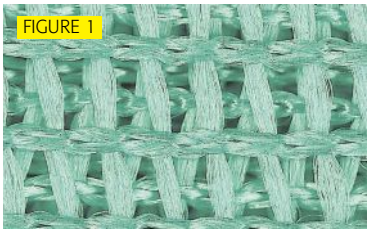
Causes of common chronic ulcers and recommendations for care

Type of chronic ulcer	Cause/aggravating factor	Recommendations for care
Venous leg ulcer	Dermal edema Lipodermatosclerosis associated with venous insufficiency	Compression bandages for healing Compression stockings for maintenance Compression for life (in the absence of arterial disease or other contraindications)
Pressure ulcer	Deep ulcers: Abnormal pressure and shear Superficial ulcers: Friction and moisture Aggravating factors: inactivity, poor nutrition	Relieve, reduce and redistribute pressure Increase activity and mobility Manage incontinence and moisture Reduce shear and friction Optimize nutrition
Diabetic foot ulcer (callus = pressure; blister = friction and shear)	Loss of protective sensation Aggravating factors: infection, ischemia, deformity	Ensure an adequate vascular supply Control infection Redistribute plantar pressure

Boucherville, QC). The dressing is composed of meshed cellulose acetate that reduces the risk of tissue ingrowth and minimizes trauma and pain upon dressing removal. It is available with dressing components, including 1 with an absorbent core to handle moderate to heavy exudation. As a unique feature, the surface of the dressing is coated with a natural fatty acid: dialkyl carbamoyl chloride, which has hydrophobic properties (Figure 1). In the moist environment of an infected wound, microorganisms are attracted to the dressing, where they become immediately and irreversibly bound to it by the hydrophobic interaction (Figures 2 and 3). This antimicrobial dressing can be used in conjunction with other topical agents, providing they do not contain fatty substances (e.g. ointment dressings).

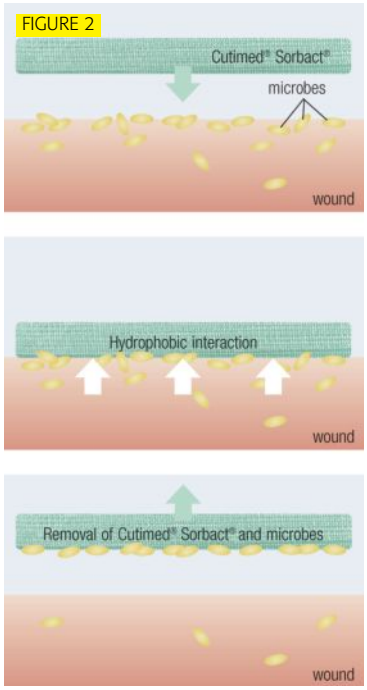
The effectiveness of the antimicrobial dressing with microbinding action has been demonstrated in a number of studies, including a multicentre investigation that involved 116 patients.[5] In addition, its binding capacity has been tested in an in vitro study;[6] within the first 30 seconds the dressing started to bind with *Staphylococcus aureus* and *Pseudomonas aeruginosa*, with increased binding after 10 minutes. Maximal binding was observed at 120 minutes, when 107 out of 108 inoculums had bound to the dressing.

FIGURE 1



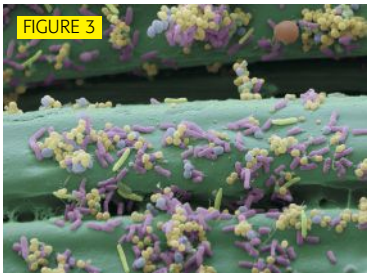
The hydrophobic dressing coating.

FIGURE 2



Hydrophobic interaction: Sequestering bacteria, preventing them from causing further localized tissue damage.

FIGURE 3



Staphylococcus aureus and *Pseudomonas aeruginosa* bound to the dressing.

Description

This clinical study enrolled a total of 16 patients, with 14 completing the study. One patient withdrew consent prior to dressing application and another patient developed an uncontrolled systemic inflammatory process after study entry (necrobiosis lipoidica of the deep dermis), which was unrelated to the local dressing application. The process subsequently evolved into an aggressive deep infection requiring intravenous antibiotics and study discontinuation.

The evaluable subjects were 18–85 years of age (mean 60.8 years), with 13 men and 1 woman. All wounds were chronic (>1 month) and the patients had received treatment of the underlying cause (Table 1), along with local wound care as outlined in the paper by Sibbald and colleagues.[3] Eligibility criteria included an adequate blood supply to heal (ankle brachial pressure index >0.5), no uncontrolled systemic disease and the absence of medication that would prevent healing. Written informed consent was obtained from all participants.

The dressings were changed up to 3 times a week for period of 4 weeks. All subjects were evaluated at weeks 0, 2 and 4 (at the end of the study). Where appropriate, debris within the ulcer was debrided with curette, scissors or scalpel blade. Wound surface areas were estimated by the longest wound length and wound width that were perpendicular to each other. Wound-related pain was evaluated by using an 11-point numeric rating scale. The characteristics of the wound base and surrounding skin were evaluated.

Results

Improved healing was demonstrated in all subjects (Figure 4), except for 4 who had several factors for delayed healing, including complex coexisting diseases and poor adherence to a pressure-offloading device. The cumulative patient total average surface area reduced from 1.74 at visit 1 to 1.15 cm^2 at visit 4 (t=0.998; df 14; p=0.337) (Figure 5). The mean pain level improved from 3 to 2.07, respectively, on a scale of 1–10 (t=1.54; df 14; p=0.145) (Figure 6).

There was no significant difference in the NERDS and STONEES checklist criteria for signs of superficial or deep infection.[7] The dressing was easy to apply and remove. No serious adverse events were reported.

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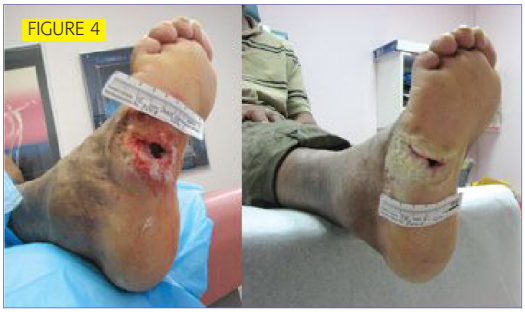
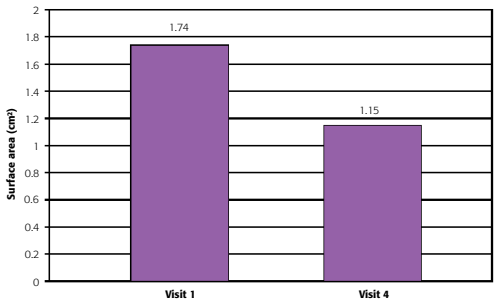
FIGURE 4



Wound improvement between the first visit and week 4.

FIGURE 5



Reduction in surface area between the first visit and week 4.

Conclusions

Persons with chronic wounds often experience stalled wound healing because of local wound-related factors, even after the cause of the wound has been corrected and patient-centred concerns addressed. With adequate debridement and moisture balance achieved, wound healing can stall because of persistent and abnormal inflammation and/or bacterial damage of both the superficial and deep compartments.

One way to neutralize the surface damage is to sequester the bacteria and their related inflammatory mediators. This meshed dressing with bound fatty acids is able to absorb harmful exudate with associated bacteria and inflammatory mediators. In this clinical study there was a trend toward wound surface area reduction over a 4-week period, indicating improvement of the bacterial-related stalled healing response. Pain (which has been associated with wound critical colonization and infection) also improved over time, indicating the dressing neutralized surface inflammation. The ability of the antimicrobial dressing with microbinding action to reduce pain symptoms has also been demonstrated in other studies.[8–10]

The results of this study demonstrate a link between the antimicrobial dressing with microbinding action properties and a tendency to reduced wound surface area and chronic-wound-associated pain.

FIGURE 6

Reduction in surface area between the first visit and week 4.

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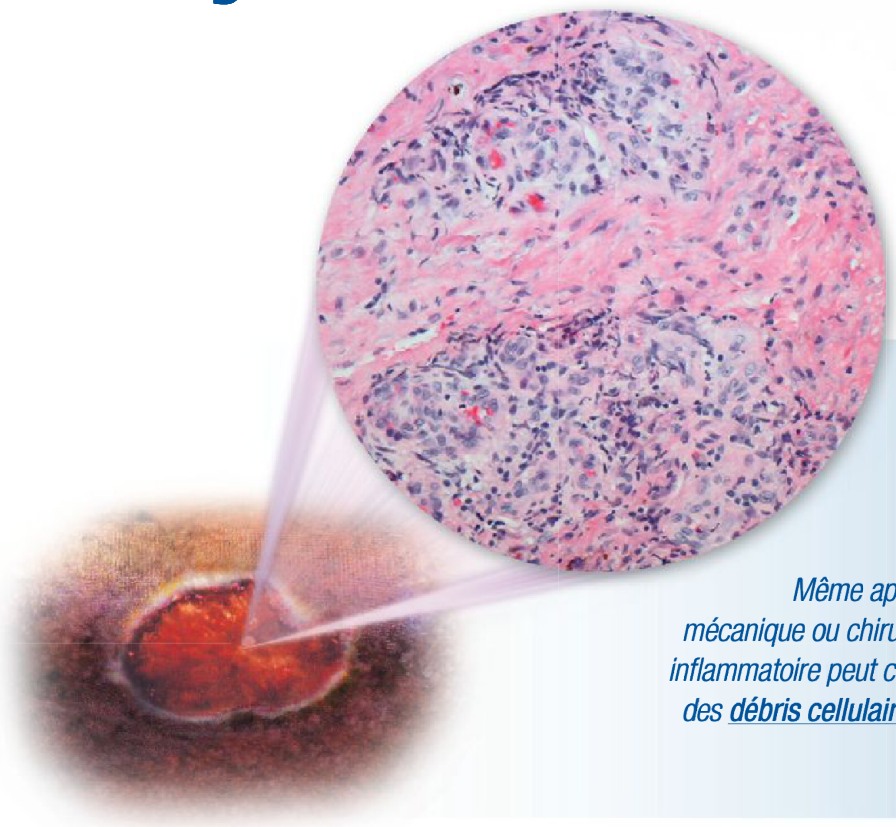

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Occasional slight transient erythema has been noted in surrounding tissue when applied outside the wound. One case of systemic hypersensitivity has been reported after 1 year of treatment with collagenase and cortisone.

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Please see complete Prescribing Information on adjacent page.

On a noté un érythème occasionnel et léger sur les tissus environnants lorsque l'application de l'onguent dépasse le pourtour de la plaie. Un cas d'hypersensibilité systémique a été rapporté après un an de traitement à la collagénase et à la cortisone.

L'utilisation de l'onguent SANTYL® avec collagénase devrait être cessée lorsque le débridement est complété et que la granulation est bien entamée.

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Collagénase® Santyl®
Onguent 250 unités/g

L'agent de microdébridement actif continu

Collagenase Santyl®

Ointment 250 units/g

Supports natural healing

DESCRIPTION: Santyl® (collagenase) ointment is a sterile topical enzymatic debriding agent that contains 250 units of collagenase per gram of white petrolatum USP. The enzyme collagenase is derived from the fermentation of *Clostridium histolyticum*. It possesses the unique ability to selectively digest denatured and undenatured collagen that binds necrotic debris to the wound surface.

CLINICAL PHARMACOLOGY: Santyl® (collagenase) possesses the ability to digest insoluble collagen, undenatured and denatured, by peptide bond cleavage, under physiological conditions of pH and temperature. This ability makes it particularly effective in the removal of detritus from dermal lesions, contributing towards the more rapid formation of granulation tissue and subsequent epithelization of dermal ulcers and severely burned areas. Collagen in healthy tissue or in newly formed granulation tissue is not digested.

INDICATIONS: Santyl® (collagenase) is a sterile ointment indicated for the debridement of dermal ulcers or severely burned areas.

CONTRAINDICATIONS: Application is contraindicated in patients who have shown local or systemic hypersensitivity to collagenase.

WARNINGS: Debilitated patients should be closely monitored for systemic bacterial infections because of the theoretical possibility that debriding enzymes may increase the risk of bacteremia.

PRECAUTIONS: The enzyme's optimal pH range is 6 to 8. Significantly lower pH conditions have a definitive adverse effect on the enzyme's activity, and appropriate precautions should be carefully taken. The enzymatic activity is also adversely affected by detergents, hexachlorophene and heavy metal ions such as mercury and silver that are used in some antiseptics and by cobalt, magnesium and manganese. When it is suspected such materials have been used, the site should be carefully cleansed by repeated washings with normal saline before Santyl® (collagenase) ointment is applied. Soaks containing metal ions or acidic solutions such as Burow's solution should be avoided because of the metal ion and low pH. Cleansing materials such as hydrogen peroxide or Dakin's solution followed by sterile normal saline do not interfere with the activity of the enzyme. The ointment should be confined to the area of the lesion in order to avoid the possible risk of irritation or maceration of normal skin; however, the enzyme does not damage newly forming granulation tissue. A slight erythema has been noted occasionally in the surrounding tissue particularly when the enzyme ointment was not confined to the lesion. This can be readily controlled by protecting the healthy skin with a material such as zinc oxide paste. Since the enzyme is a protein, sensitization may develop with prolonged use.

ADVERSE REACTIONS: Although no allergic sensitivity or toxic reactions have been noted in the recorded clinical investigations to date, one case of systemic manifestations of hypersensitivity has been reported in a patient treated for more than one year with a combination of collagenase and cortisone. Irritation, maceration or erythema has been noted where prolonged contact of normal skin with Santyl® (collagenase) ointment has been allowed, either by application of the ointment to areas of normal skin or by excessive application of ointment to the wound crater with subsequent spread to normal skin when dressings are applied. The reported incidence for this type of reaction was 1.8%.

SYMPTOMS AND TREATMENT OF OVERDOSE: Symptoms: To date, the irritation, maceration or erythema reported on prolonged contact of normal skin with Santyl® (collagenase) ointment constitute the only symptoms of overdosage reported. **Treatment:** Santyl® (collagenase) ointment can be rendered inert by the application of Burow's solution USP (pH 3.6 - 4.4) to the treatment site. If this should be necessary, reapplication should be made only with caution.

DOSAGE AND ADMINISTRATION: For external use only. Santyl® (collagenase) ointment should be applied once daily, or more frequently if the dressing becomes soiled (as from incontinence) in the following manner: **(1)** Prior to application the lesions should be gently cleansed with a gauze pad saturated with sterile normal saline, to remove any film and digested material. If a stronger cleansing solution is required, hydrogen peroxide or Dakin's solution may be used, followed by sterile normal saline. **(2)** Whenever infection is present, as evidenced by positive cultures, pus, inflammation or odor, it is desirable to use an appropriate antibacterial agent. Should the infection not respond, therapy with Santyl® (collagenase) ointment should be discontinued until remission of the infection. **(3)** Santyl® (collagenase) ointment should be applied (using a tongue depressor or spatula) directly to deep wounds, or when dealing with shallow wounds, to a non-adherent dressing or film dressing which is then applied to the wound. The wound is covered with an appropriate dressing such as a sterile gauze pad and properly secured. **(4)** Use of an occlusive or semi-occlusive dressing may promote softening of eschar, if present. Alternatively, crosshatching thick eschar with a #11 blade is helpful in speeding up debridement then cleanse with sterile saline. It is also desirable to remove as much loosened detritus as can be done readily with forceps and scissors. **(5)** All excess ointment should be removed each time the dressing is changed. **(6)** Use of Santyl® (collagenase) ointment should be terminated when debridement of necrotic tissue is complete and granulation is well under way.

HOW SUPPLIED: Available in 30 gram tubes of ointment. Sterile until opened. Contains no preservative. Do not store above 25°C.

Product monograph available upon request.

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Collagénase Santyl®

Onguent 250 unités/g

Favorise la guérison naturelle

DESCRIPTION : Santyl® (collagénase) onguent est un agent de débridement topique stérile enzymatique qui renferme 250 unités de collagénase par gramme de pétrolatum blanc U.S.P. L'enzyme collagénase est dérivée de la fermentation de *Clostridium histolyticum* possédant le pouvoir unique de digérer de manière sélective le collagène aussi bien naturel que dénaturé qui lie les fibres nécrosées à la surface de la plaie.

PHARMACOLOGIE CLINIQUE : Santyl® (collagénase) a la capacité de digérer le collagène insoluble, non dénaturé et dénaturé, par clivage de la liaison peptidique à un pH et à une température physiologiques. Cette caractéristique le rend particulièrement efficace dans l'élimination des déchets des lésions dermiques favorisant ainsi la formation du tissu de granulation et l'épithélialisation ultérieure des zones dermiques ulcérées et gravement brûlées. Le collagène des tissus sains ou du nouveau tissu de granulation n'est pas digéré.

INDICATIONS : Santyl® (collagénase) est un onguent stérile indiqué pour le débridement des zones dermiques ulcérées ou gravement brûlées.

CONTRE-INDICATIONS : L'application est contre-indiquée chez les patients ayant présenté une hypersensibilité locale ou systémique à la collagénase.

MISE EN GARDE : Les patients atteints de conditions débilitantes doivent être surveillés étroitement pour éviter la généralisation des infections bactériennes. Les enzymes de débridement augmenteraient le risque de bactériémie.

PRÉCAUTIONS : Le pH optimal de l'enzyme est de 6 à 8. Un pH nettement inférieur à un effet nettement adverse sur l'action de l'enzyme et des précautions appropriées doivent alors être prises. L'action de l'enzyme est également contrariée par les détergents, l'hexachlorophène et les ions de métaux lourds, comme le mercure et l'argent, présents dans certains antiseptiques, et par le cobalt, le magnésium et le manganèse. Quand on soupçonne l'utilisation de ces produits, la zone affectée doit être soigneusement nettoyée par des lavages répétés avec une solution saline avant l'application de l'onguent Santyl® (collagénase). Les bains contenant des ions de métaux ou des solutions acides comme la solution de Burow doivent être évités en raison de l'ion métal et du faible pH. Les solutions nettoyantes comme l'eau oxygénée ou la solution de Dakin suivie d'une solution stérile saline n'entravent pas l'action de l'enzyme. L'application de l'onguent doit se limiter à la zone affectée pour éviter le risque possible d'irritation ou de macération de la peau saine. Cependant, l'enzyme n'altère pas le nouveau tissu de granulation. Un érythème bénin dans le tissu avoisinant pourrait se produire. Cela peut facilement être évité en protégeant la peau saine avec un produit comme de la pâte d'oxyde de zinc. Compte tenu de la nature protéique de l'enzyme présent dans le médicament, son emploi prolongé pourrait amener une sensibilisation.

EFFETS SECONDAIRES : Bien qu'aucune sensibilité allergique ni réaction toxique n'aient été notées à ce jour dans les compte rendus d'études, on a signalé un cas de manifestations systémiques d'hypersensibilité chez un patient traité pendant plus d'un an avec une association de collagénase et de cortisone. On a noté de l'irritation, de la macération ou de l'érythème dans le cas de contact prolongé de la peau normale avec l'onguent Santyl® (collagénase), soit par application de l'onguent sur les régions normales de la peau, soit par application excessive de l'onguent dans le cratère de la plaie, permettant à celui-ci de s'étendre à la peau normale lors de l'application des pansements. L'incidence signalée de ce type de réaction était de 1,8%.

SYMPTÔMES ET TRAITEMENT DU SURDOSAGE: Symptômes: Jusqu'ici, l'irritation, la macération ou l'érythème signalés en cas de contact prolongé de la peau saine avec l'onguent Santyl® (collagénase) représentent les seuls symptômes signalés de surdosage. **Traitement :** On peut rendre l'onguent Santyl® (collagénase) inerte en appliquant la solution de Burow U.S.P. (pH 3.6-4.4) sur la plaie. La réapplication du produit, si elle est considérée nécessaire, ne se fera qu'avec prudence.

POSOLOGIE ET ADMINISTRATION : Pour usage externe seulement. L'onguent Santyl® (collagénase) doit être appliqué une fois par jour ou plus fréquemment si le pansement se souille (à cause d'incontinence par exemple) de la façon suivante : **(1)** Avant application, les lésions doivent être nettoyées doucement avec une gaze saturée d'une solution stérile saline normale pour enlever toute pellicule et toute matière digérée. Si l'on a besoin d'une solution nettoyante plus puissante, on peut utiliser de l'eau oxygénée ou de la solution de Dakin suivie de solution stérile saline normale. **(2)** En cas d'infection, révélée par la présence de cultures positives, de pus, d'une inflammation ou d'une odeur, il serait souhaitable d'employer un agent antibactérien approprié. Il faut interrompre le traitement au Santyl® (collagénase) jusqu'à rémission de l'infection, si l'infection ne se résorbe pas. **(3)** Appliquer Santyl® (collagénase) directement sur les blessures profondes à l'aide d'un abaisse-langue ou d'une spatule. Pour les plaies superficielles, appliquer l'onguent sur une compresse non adhérente ou un pansement transparent à être déposée sur la plaie; puis recouvrir d'un pansement approprié tel une compresse de gaze stérile adéquatement retenue. **(4)** L'utilisation d'un pansement occlusif ou semi-occlusif peut favoriser le ramollissement de l'escarre, le cas échéant. Ou, si l'on hachure une escarre épaisse à l'aide d'une lame numéro 11, on peut accélérer le débridement. Nettoyer alors avec une solution saline stérile. Il est également souhaitable d'enlever autant de détritus lâches que possible à l'aide de pinces et de ciseaux. **(5)** Enlever tout excès d'onguent à chaque renouvellement du pansement. **(6)** Arrêter les applications de l'onguent Santyl® (collagénase) dès que le tissu nécrosé est suffisamment débridé et que le bourgeonnement est bien entamé.

PRÉSENTATION : Disponible en tubes de 30 grammes d'onguent. Stérile dans l'emballage non ouvert. Aucun agent de conservation. Ne pas entreposer au-dessus de 25°C.

Monographie du produit sur demande.

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Special Considerations in Wound Bed Preparation 2011: An Update

Part one of this article was published in the Spring 2012 issue of *Wound Care Canada*. Part two is published here.

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Local Wound Care

5. Assess and monitor the wound history and physical examination

Documentation of a detailed patient and wound assessment is a legal requirement from both an organizational and professional standards perspective. Specific details about the wound history and physical appearance will facilitate communication within the patient's circle of care. This includes the type of wound and its history, the patient-centred plan of care and targeted patient-specific goals.[57] The details of the wound assessment should be communicated to other professionals when referrals are made. Whether a wound is healable, nonhealable or maintenance, an individualized care plan is made to identify specific interventions and outcomes that the patient and interprofessional team agree upon and modify based on a new holistic interprofessional assessment.

Using a framework allows consistent documentation of a wound. When a framework is used to assess a wound over time, clinicians can identify if a wound is improving, stalled or deteriorating. One example of such a framework is the mnemonic MEASURE[58] – the wound location plus MEASURE is described:

- **M**easure size – the longest length and the widest width at right angles.
- **E**xudate amount (none, scant, moderate, heavy) and characteristics (serous, sanguineous, pustular or combinations).
- **A**ppearance (base: necrotic [black], fibrin [firm yellow], slough [soft yellow] or granulation tissue [pink and healthy vs. red and friable = easy bleeding, unhealthy]).
- **S**uffering (pain).
- **U**ndermining (measure in centimetres and use hands of clock to document: 12 o'clock, 6 o'clock and so on).
- **R**e-evaluate.
- **E**dge (hyperkeratotic, macerated, normal).

There are several new electronic technologies available for wound assessment, but they may be costly for clinicians and healthcare systems. Novel camera systems accurately calculate the length, width, depth and surface of exposed wound areas. Limitations include undermined areas or sinuses that are not measureable using this technology, requiring supplementation by visual clinical inspection and probing. Wound assessment devices differ markedly from computer-based documentation systems that capture multiple data points and assessments about wound parameters inputted by skilled clinicians.

6. Gently cleanse wounds with low-toxicity solutions: saline, water and acetic acid (0.5–1.0%). Do not irrigate wounds where you cannot see where the solution is going or cannot retrieve (or aspirate) the irrigating solution

The standard of care for wound cleansing is to use solutions that are gentle and the least cytotoxic to the wound: saline, water and acetic acid (0.5–1.0%). Research has shown that certain solutions can be cytotoxic to healing cells, such as fibroblasts, in vitro.[59]

In an analysis of Cochrane Reviews prior to 2008, the authors concluded: "There is not strong evidence that cleansing wounds per se increases healing or reduces infection." The Cochrane Collaboration updated evidence reviews on wound cleansing for PUs in 2011 and concluded there is "no good evidence to support use of any particular wound cleansing solution or technique for PUs."[60] A specific type of solution for wound cleansing in adults was the subject of an additional evidence review in 2010. The authors concluded that there was no evidence to indicate that using tap water to cleanse an acute wound increases infection rates. In addition, there was no strong evidence demonstrating that cleansing of wounds at all decreases healing infection or

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promotes healing.[61] Expert opinion recommends that caution should be considered in the use of tap water for immunocompromised individuals, especially the use of nonpotable water, which may be a problem in developing countries.

Avoiding cytotoxic solutions, such as Dakin's and povidone-iodine, to cleanse healable wounds or using them for only limited periods is reasonably prudent practice. However, there is a place for these agents in the management of maintenance or nonhealable wounds to potentially control bioburden and odour. In these cases, the reduction in bioburden and moisture reduction outweighs the small potential for tissue toxicity.

Wound irrigation has also been the subject of controversy and disagreement between health professionals. In general, the authors recommend that clinicians should not irrigate wounds where they cannot see where the solution is being instilled into the dead space at the base of the wound, or if they cannot retrieve the irrigating solution. More research on wound cleansing is needed.

7. Debride: healable wounds – sharp or conservative surgical, autolytic, mechanical, enzymatic, biological (medical maggots); nonhealable and maintenance – conservative surgical or other methods of removal of nonviable slough

The wound bed is optimally prepared by aggressive and regular debridement of any firm eschar or soft slough if the wound is healable. A firm eschar serves as a pro-inflammatory stimulus inhibiting healing, whereas the slough acts as a culture media for bacterial proliferation and should be removed.[62] Debridement may also promote healing by removing senescent cells that are deficient in cellular activities and biofilms that contain the bacterial colonies.[63]

Sharp debridement is the most expeditious method but may not always be feasible because of pain, bleeding potential, cost, professional/system regulations and lack of clinician expertise. Cardinal et al conducted a retrospective review of 366 persons with VLUs and 310 persons with DFUs over 12 weeks, observing wound surface area changes and closure rates.[64] Interestingly, VLUs had a significantly higher median wound surface area reduction with surgical debridement (when clinically indicated due to the presence of debris) vs. no surgical debridement (34%, $p<0.019$). Centres with more frequent debridement were associated with higher rates of wound closure ($p<0.007$ VLUs, $p<0.015$ DFUs). The debridement frequency did not statistically correlate to higher rates of wound closure. There was some minor evidence of a positive benefit of serial debridement in DFUs (odds ratio 2.35; $p<0.069$).

Alternatively, autolytic debridement is most accepted to work by keeping a moist wound environment to enhance the activities of phagocytic cells and endogenous enzymes on nonviable tissues. Mechanical debridement with saline wet-to-dry dressing contributes to local trauma and pain. In the US, the Centers for Medicare and Medicaid Services, in its Tag F314 guidance, cautions that there should be limited use of wet-to-dry dressings. Emerging technology using ultrasonic devices has also been demonstrated to aid wound bed preparation without the incumbent painful and traumatic scraping and cutting associated with sharp and mechanical debridement. When using enzymatic debridement, clinicians should ensure that the cleansing solutions and type of dressing used to cover the wound do not interfere with or cancel out the action of the enzyme.

In summary, the different methods of debridement have distinct features in terms of pain potential, cost, healthcare professional time and skill level required, resources used and wound characteristics. Select the appropriate method of wound debridement considering the patient, the wound characteristics, and the skill and knowledge of the clinician, along with the available resources.

8. Assess and treat the wound for superficial critical colonization/deep infection/abnormal persistent inflammation (mnemonic NERDS), deep infection (mnemonic STONEES) or persistent inflammation: any 3 NERDS – treat topically: Nonhealing, ↑ Exudate, Red friable tissue, Debris, Smell; any 3 STONEES – treat systemically: ↑ Size, ↑ Temperature, Os, New breakdown, ↑ Exudate, ↑ Erythema/edema (cellulitis), Smell; persistent inflammation (non-infectious): topical and/or systemic anti-inflammatories.

Chronic wounds containing bacteria and/or the presence of bacteria obtained from a surface swab do not define or portend infection. In fact, the mean number of bacterial species per chronic ulcer has been found to range from 1.6 to 4.4.[65] Critical to wound healing, however, is achieving an appropriate bacterial balance and understanding the differences between contamination, colonization and frank bacterial damage with surface critical colonization or surrounding/deep infection. The risk of infection is determined by the number and nature of invading bacteria as well as host resistance, as outlined in the following equation:

Infection = number of organisms x organism virulence

Host resistance

Host resistance is the most important factor in infection, and refers to the host's ability to resist bacterial

invasion and prevent bacterial damage through the immune response.[66] In addition, an adequate blood supply is needed for the wound to heal, as a decreased or inadequate blood supply favours bacterial proliferation and damage that may prevent or delay healing. Infection is more prevalent in certain disease conditions. For example, individuals with diabetes have at least a 10-fold greater risk of being hospitalized for soft tissue and bone infections of the foot than individuals without diabetes.[67] Local factors inhibiting healing may include a large wound size, the presence of foreign bodies (e.g. prosthetic joints, a thread or remnants of gauze or a retained suture) and an untreated deeper infection, such as osteomyelitis.[68] External contamination of the wound bed by microorganisms can occur from the ambient environment, dressings and the patient's secretions and hands, along with the hands of healthcare providers (alcohol hand rinses are more effective in reducing hand bacteria than washing with soap and water).

By using this superficial and deep-surrounding tissue separation, the clinician can identify wounds with increased bacterial burden that may respond to topical antimicrobials and deep infection that usually requires the use of systemic antimicrobial agents. The mnemonics NERDS and STONEES represent the initials of the signs to categorize the 2 levels of bacterial damage or infection (see Enabler on page 22, Spring 2012). This concept was introduced in 2007 and validated in 2009.[66,69] Three or more of these signs should be sought for the diagnosis in each level. If increased exudate and odour are present, additional signs are needed to determine if the damage is superficial, deep or both.

There are now at least 5 classes of antimicrobial dressings and some miscellaneous products for use in chronic wounds with critical colonization, as defined by any 3 of the NERDS criteria:

- Silver dressings combined with alginates, foams, Hydrofibers and hydrogels.
- Honey dressings in a calcium alginate wafer and hydrogel.
- Iodine in a cadexomer carbohydrate or polyethylene glycol slow-release formulation.
- PHMB (polyhexamethylene biguanidine) derivative of chlorhexidine in a foam or gauze packing.
- Miscellaneous antimicrobial dressings, often with a paucity of clinical studies to support their use.

The treatment of critical colonization often takes 2–4 weeks in a healable wound where the cause has been corrected and patient-centred concerns have been addressed. There is some, but limited, evidence to show the benefit of these dressings.[70] If the wound is in bacterial balance, antibacterial dressings are not needed for the re-epithelialization stage of wound healing, unless they also provide anti-inflammatory activity.[70,71] They are also not efficacious in the treatment of deep and surrounding tissue infection that requires the use of systemic agents. Studies that do not select the proper subpopulation (e.g. healable critically colonized wounds without deep infection) or measure complete wound healing have failed to demonstrate any benefit from these dressings.[72]

The use of antimicrobial dressings should be reviewed at frequent and regular intervals every 1–2 weeks and discontinued if critical colonization has been corrected or if they do not demonstrate a beneficial effect after 2–4 weeks. There is currently a great tendency to overuse antimicrobial dressings, creating a cost-inefficient use of these useful devices. The conflicting evidence and misuse of these dressings have led some European healthcare systems to completely delist silver products.

Silver dressings

The effectiveness of silver-releasing dressings in the management of nonhealing (stalled) chronic wounds has been reviewed in a meta-analysis.[73] In comparison to alternative antimicrobials, silver dressings significantly:

- improved the wound-healing rate (95% confidence interval [CI] 0.16–0.39, $p<0.001$);
- reduced odour (95% CI 0.24–0.52, $p<0.001$) and pain-related symptoms (95% CI 0.18–0.47, $p<0.001$);
- decreased wound exudate (95% CI 0.17–0.44, $p<0.001$); and
- had a prolonged dressing wear time (95% CI 0.19–0.48, $p<0.028$).

Silver's broad spectrum of antimicrobial activity can be used in critically colonized chronic wounds that have the ability to heal. Silver must be ionized to exert an antimicrobial effect. Ionized silver requires an aqueous or water environment and should not be used in a maintenance or nonhealable wound where the desired outcome is the combination of moisture reduction and bacterial reduction. Silver should not be in close proximity to any oil-based products (e.g. petrolatum, zinc oxide) where the oil molecules may interfere with the ionization of the silver. Products that produce a continuous supply of ionized silver are likely to be more efficacious, and higher levels of silver release are often necessary to treat micro-organisms such as *Pseudomonas* in a complete environment, such as a wound.

Pseudomonas requires a higher silver level than most other bacterial organisms. Silver resistance is uncommon because there are at least 3 antimicrobial mechanisms with silver targeting and combining with membranes, cytoplasmic organelles and DNA.

The amount of silver released from these dressings is a fraction of that released from silver sulfadiazine cream formulations. Serum silver levels even from high-release silver dressings are in the 1–5 μm range. Modern silver dressings seldom exceed the normal range unless large surface areas are treated over a prolonged time or the patient has a large skin surface area to total weight ratio. Silver dressings can cause temporary periwound staining but do not leave permanent silver deposits in the dermis (argyria or blue discoloration of the skin). The silver in the dressing should be combined with the appropriate moisture balance format matched to the wound to control exudate and prevent maceration, but facilitate the delivery of ionized silver to the wound surface.

Honey, iodine and PHMB

The Cochrane Collaboration conducted a systematic review of the honey literature and concluded that honey, as a topical treatment for superficial and partial-thickness burns, may improve healing times compared with some conventional dressings. Jull et al conducted a multicentre randomized controlled trial on VLUs with compression comparing honey to usual care.[74] There were 187 patients in the honey group and 181 patients in the usual-care group, with no difference between the 2 groups for total wound healing at 12 weeks.

In clinical practice, honey dressings may be useful for thick eschar, which often continuously reforms when treated with other dressings. Some of this action may be due to the antibacterial and hyperosmolar characteristics of the honey. Scoring the wound with a blade to help break down the eschar may facilitate the process. Ten trials have been conducted with cadexomer iodine and some are old, with venous ulcers treated topically without compression. In a randomized controlled trial study comparing cadexomer iodine with standard care with both groups receiving compression, the daily or weekly healing rates favoured cadexomer iodine.[75] In a pilot study of PHMB foam compared with foam alone, the PHMB dressing resulted in decreased pain and no change in wound size.[76]

Evaluating Evidence of Antimicrobials in Vitro and Animal Models: The Literature

Beware of in vitro testing of antimicrobial dressings because these results often do not correlate with clinical activity. Although studies may demonstrate statistical significance, clinical significance is the parameter of interest; moreover, the strength of evidence for the majority of these in vitro studies is low. When evaluating topical antimicrobial agents for wound treatment, appropriate tests must be used. For instance, the in vitro evaluation of an antimicrobial agent such as silver can be performed with a multitude of tests, but of these, only the logarithmic reduction or decimal reduction time test conducted in serum has been shown to predict clinical outcomes.[77,78] In vivo antimicrobial assays, such as the Walker Mason modified model (rodent) or the Wright model (porcine), can also be used with success to determine antimicrobial efficacy.[79] Similarly, the efficacy of topical agents on wound healing can be evaluated in vitro (cellular culture or tissue explant models) or in vivo (rodent or porcine wound-healing models). However, the only model that predicts a clinical outcome is the porcine model of wound healing.[80]

A recent Cochrane Review explored antibiotic and antiseptic use for persons with VLUs. The authors concluded that there is no evidence for the routine use of systemic antibiotics[75] when treating the cause of VLUs.

9. Select a dressing to match the appropriate wound and individual person characteristics:

- Healable wounds: autolytic debridement: alginates, hydrogels, hydrocolloids, acrylics
- Critical colonization: silver, iodides, PHMB, honey
- Persistent inflammation: anti-inflammatory dressings
- Moisture balance: foams, Hydrofibers, alginates, hydrocolloids, films, acrylics
- Nonhealable, maintenance wounds: chlorhexidine, povidone-iodine

Whenever patients and healthcare professionals develop a treatment plan for patients with wounds, dressing selection is an important primary focus. Once the healable, nonhealable or maintenance status of a wound is determined, appropriate holistic interprofessional interventions that address cofactors can be optimized. The dressing selection should be the last part of the process because if the healability is not accurately assessed or other cofactors are unmanaged, the wound will not heal. Dressing choice needs to consider unit costs and clinical effectiveness. Kerstein et al explored cost-effectiveness for venous ulcers and PUs, and concluded that the purchase price of the dressing should not be the only indicator.[81] Normal saline gauze dressings (least expensive for product) were found to be the most expensive when nursing time and patient feedback were taken into account (Table 6).

TABLE 6

Modern classes of dressings

Class	Description	Tissue debridement	Infection	Moisture balance	Indications/contraindications
1. Films/membranes	• Semipermeable adhesive sheet; impermeable to water molecules and bacteria	+	–	–	• Moisture vapour transmission rate varies from film to film • Should not be used on draining or infected wounds* • Create an occlusive barrier against infection
2. Nonadherent	• Sheets of low adherence to tissue • Nonmedicated tulles	–	–	–	• Allow drainage to seep through pores to secondary dressings • Facilitate application of topical medications
3. Hydrogels	• Polymers with high water content • Available in gels, solid sheets or impregnated gauze	++	–/+	++	• Should not be used on draining wounds • Solid sheets should not be used on infected wounds
4. Hydrocolloids	• May contain gelatine, sodium carboxymethylcellulose, polysaccharides and/or pectin; sheet dressings are occlusive with a polyurethane film outer layer	+++	–/+	++	• Use with care on fragile skin • Should stay in place for several days • Should not be used on heavily draining or infected wounds* • Create an occlusive barrier to protect the wound from outside contamination • Odour may accompany dressing change and should not be confused with infection
5. Acrylics	• Clear acrylic pad enclosed between 2 layers of transparent adhesive film	+++	–/+	++	• Use on low- to moderately draining wounds where the dressing may stay in place for an extended time • May observe wound without changing
6. Calcium alginates	• Sheets or fibrous ropes of calcium sodium alginate (seaweed derivative); have hemostatic capabilities	++	+	+++	• Should not be used on dry wounds • Low tensile strength – avoid packing into narrow, deep sinuses • Bioreabsorbable
7. Composite	• Multilayered, combination dressings to increase absorbency and autolysis	+	–	+++	• Use on wounds where dressings may stay in place for several days*
8. Foams	• Nonadhesive or adhesive polyurethane foam; may have occlusive backing; sheets or cavity packing; some have fluid lock	–	–	+++	• Use on moderately to heavily draining wounds • Occlusive foams should not be used on heavily draining or infected wounds*
9. Charcoal	• Contains odour-absorbing charcoal within product	–	–	+	• Some charcoal products are inactivated by moisture • Ensure dressing edges are sealed
10. Hypertonic	• Sheet, ribbon or gel impregnated with sodium concentrate	+	+	++	• Gauze ribbon should not be used on dry wounds • May be painful on sensitive tissue • Gel may be used on dry wounds
11. Hydrophilic fibres	• Sheet or packing strip of sodium carboxymethylcellulose; converts to a solid gel when activated by moisture (fluid lock)	+	–	+++	• Best for moderate amount of exudates • Should not be used on dry wounds • Low tensile strength – avoid packing into the narrow, deep sinus
12. Antimicrobials	• Silver, iodides, PHMB, honey aniline dyes with vehicle for delivery: sheets, gels, alginates, foams or paste	+	+++	+	• Broad spectrum against bacteria • Should not to be used on patients with known hypersensitivities to any product component
13. Other devices	• Negative-pressure wound therapy applies localized negative pressure to the surface and margins of wound	–	+	+++	• This negative pressure-distributing dressing actively removes fluid from wound and promotes wound edge approximation • Advanced skill required for patient selection
14. Biologics	• Living human fibroblasts provided in sheets at ambient or frozen temperature; extracellular matrix • Collagen-containing preparations; hyaluronic acid, platelet-derived growth factor	–	–	–	• Should not be used on wounds with infection, sinus tracts or excessive exudate or with patients known to have hypersensitivity to any of the product components • Cultural issues related to source • Advanced skill required for patient selection

Adapted from the CAWC.

* Use with caution if critical colonization is suspected.

–, no activity. +, minimal activity. ++, moderate activity. +++, strong activity.

Persistent Inflammation

Chronic wounds may stall in the inflammatory stage. These wounds demonstrate markedly increased activity of inflammatory cells and associated mediators such as matrix metalloproteinases (MMPs) and elastase.[82] Wound healing is stalled because degradation of the extracellular matrix and growth factors occurs more rapidly than their synthesis, hindering the wound from progressing toward the proliferative phase and ultimately re-epithelialization. Harding et al reported that the longer a wound remains in the inflammatory phase, the more cellular defects are detected with potentially delayed healing.[83] Recently, there has been a renewal of interest in wound diagnostic testing that will result in tests for increased MMPs at the bedside. There are wound dressings with oxidized reduced collagen and cellulose that can trap MMPs, and these dressings can be combined with antimicrobials such as silver. In the Sibbald cube (see Enabler on page 22, Spring 2012), these specialized dressings can be combined antimicrobials, depending on the presence of the mnemonic NERDS (superficial antibacterial dressing criteria) or STONEES (systemic antibiotic criteria) and where the presence of increased inflammation can also be treated topically or systemically.

Appropriate moisture is required to facilitate the action of growth factors, cytokines and migration of cells including fibroblasts and keratinocytes. Moisture balance is a delicate process. Excessive moisture can potentially damage the surrounding skin of a wound, leading to maceration and potential breakdown.[84] Conversely, inadequate moisture in the wound environment can impede cellular activities and promote eschar formation, resulting in poor wound healing. A moisture-balanced wound environment is maintained primarily by modern dressings with occlusive, semi-occlusive, absorptive, hydrating and hemostatic characteristics, depending on the drainage and other wound bed properties.

TABLE 7

Summary of advanced therapy options

Substantiated advanced therapies	Indication	RCT or meta-analysis available?	Results
OASIS	VLU	Yes[87]	Complete healing
	DNFU	Yes[88]	Complete healing equal to PDGF
Growth factors (PDGF)	DNFU	Yes[89,90]	Complete healing
Apligraf	DNFU	Yes[91–93]	Complete healing
(epidermal cells, dermal fibroblasts, bovine collagen)	VLU	Yes[94]	Complete healing
Dermagraft (fibroblasts)	DNFU	Yes[95–97]	Complete healing
Hyperbaric oxygen therapy	DNFU	Yes[98]	Prevents amputation
Electrical stimulation	PU	Yes[99]	Complete healing
Therapeutic ultrasound	VLU	Yes[100]	Faster healing
	DNFU	Yes[101]	Complete healing
Negative-pressure wound therapy	Postsurgical wounds	Yes[102]	Complete healing
Promogran	VLU	Yes[103,104]	Decrease wound size

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DNFU = diabetic neurotrophic foot ulcer; PDGF = platelet-derived growth factor; PU = pressure ulcer; RCT = randomized controlled trial

10. Evaluate expected rate of wound healing: healable wounds should be 30% smaller by week 4 to heal by week 12. Wounds not healing at the expected rate should be reclassified or reassessed, and the plan of care revised

It is noted that a 20–40% reduction in 2 and 4 weeks is likely to be a reliable predictor of healing.[11,85] Sheehan et al noted that a 50% reduction at week 4 was a good predictor for persons with DFUs.[86] One measure of healing is the clinical observation of the edge of the wound. If the wound edge is not migrating after appropriate wound bed preparation (debridement, bacterial balance, moisture balance) and healing is stalled, then advanced therapies should be considered. The first step prior to initiating the edge-effect therapies is a reassessment of the patient to rule out other causes and cofactors. Clinicians need to remember that wound healing is not always the primary outcome. Consider other wound-related outcomes, such as reduced pain, reduced bacterial load, reduced dressing changes or an improved quality of life.

11. Use active wound therapies (e.g. skin grafts, biological agents, adjunctive therapies) when other factors have been corrected and healing still does not progress (stalled wound)

A nonhealing wound may have a cliff-like edge between the upper epithelium and the lower granulation in comparison to a healing wound with tapered edges like the shore of a sandy beach. Several edge-effect therapies support the addition of missing components: growth factors, fibroblasts, or epithelial

cells or matrix components. If all the factors are corrected in a healable wound, active adjunctive therapies may be considered (Table 7).[87-104]

Provide Organization Support

12. For improved outcomes, education and evidence-informed practice must be tied to interprofessional teams and improved cost-effective patient care outcomes with the cooperation of healthcare systems

When a patient has a wound, it is important that the healthcare team provides education to the patient and his/her circle of care and involves everyone in the treatment plan. Healthcare professionals may assume that patients know more about their wounds than their current understanding. One study surveyed persons with DFUs and their self-foot-care behaviours. Healthcare providers conducted a detailed foot assessment and provided education on each visit. The results indicated that the knowledge base is often less than expected by the healthcare professional and that this leads to treatment gaps.[105] The behaviour of healthcare providers changed during the course of the study, resulting in an increased chance that the patient's socks were removed, leading to a thorough examination and patient education.

Importance of Holistic Interprofessional Coordinated and Collaborative Care

Accurate wound diagnosis and the development of successful treatments plans can be a challenging undertaking, given the complexity of chronic wounds. A holistic interprofessional approach to care requires that each member of the team has unique professional knowledge that contributes to the individualized plan of care. In the management of patients with DFUs, utilizing a team approach and primary healing outcomes can be associated with relatively low costs related to a visit to an interprofessional team, antibiotics and plantar pressure downloading in the community setting.[106] When healing occurs following an amputation, multiple hospital admissions and an extended length of hospital stay are tabulated, with a significantly higher cost of healing. Implemented treatment plans that do not yield wound-healing rates at the expected trajectory require a timely referral to an interprofessional team that can re-evaluate the diagnosis and causative factors. Redefining the treatment goals with input from the patient, family and healthcare provider is essential. Given geographical and system differences, the ideal full complement of an interprofessional expert team may not always be accessible. Therefore, it is important to realize that only 2 disciplines working collaboratively with the patient and/or family may be successful.

Clinicians must distinguish between interdisciplinary networks with 2 members of the same profession (such as 2 nurses or assistants vs. a nurse practitioner, who may have a similar role to a physician on an interprofessional team), compared with the physician and nurse of an interprofessional team. For chronic wound care, the physician and nurse are best supplemented with a member of the allied healthcare team (e.g. occupational therapist, physical therapist, foot care specialist, dietitian, social worker).

Many patients with chronic stalled wounds are complex older adults who live with multiple comorbidities, and who require lengthy assessment and coordination of the treatment interventions. This necessitates the healthcare system policy maker to support interprofessional clinician teams to provide the best possible evidence-informed practice.

Conclusion

The concept of wound bed preparation includes the treatment of the whole patient (treat the cause and patient-centred concerns) (Table 8). The approach to the local wound bed has 4 components, starting with

TABLE 8
Summary

Wound bed 2011	Recommendations
Treat the cause	• Determine blood supply to heal • Identify/treat the cause (if possible) to determine healability • Review cofactors/comorbidities to create an individualized plan of care
Patient-centred concerns	• Assess, support and provide education for individualized concerns (e.g. pain, activities of daily living, psychological well-being, smoking, access to care)
Local wound care (DIM+ E)	• Cleanse, assess characteristics and monitor local wounds • Debride healable wounds (conservative for nonhealable or maintenance wounds) • Treat critical colonization, infection and persistent inflammation • Achieve moisture balance • Consider advanced therapies for healable but stalled chronic wounds
Systems	• Link improved cost-effective patient outcomes to education, evidence-informed practice, interprofessional teams and healthcare system support

Practice Pearls

- Clinicians should classify wounds as healable, nonhealable or maintenance. Treatment plans differ depending on healability.
- Distinguish a superficial increased bacterial burden that can be treated topically versus from surrounding tissue infection requiring systemic therapy (mnemonics NERDS and STONEES).
- A new topical diagnostic will help distinguish wounds stuck in the inflammatory stage.
- Wound bed preparation emphasizes treating the whole patient and not just the hole in the patient (treat the cause).
- Patient-centred concerns include the accurate documentation and treatment of pain.
- Optimal local wound care for a healable wound includes debridement, infection/inflammation and moisture balance before the edge effect and use of advanced therapies.
- If a wound is not 30% smaller by week 4, it is unlikely to heal by week 12. Reassess and consider interprofessional team involvement if "stalled."

the mnemonic DIM (Debridement, Infection/prolonged inflammation control and Moisture balance) before the mnemonic DIME, which includes advanced Edge-effect therapies for wounds with the ability to heal. In addition, this article has introduced the concept of healable, nonhealable and maintenance wounds, along with the integration of clinical criteria for superficial critical colonization (mnemonic NERDS) and topical antimicrobial dressings versus deep and surrounding tissue infections (mnemonic STONEES) requiring systemic agents. Bacterial damage needs to be distinguished from persistent inflammation with soon-to-be-available bedside MMP testing. The ultimate treatment process should include the leadership of an interprofessional wound management team, and patient participation is paramount for the best achievable outcome. After reading this article, clinicians will be able to distinguish between healable, nonhealable and maintenance wounds and design appropriate management plans.

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The Wound CARE Instrument provides a set of standards that support healthcare providers, organizations and health authorities to undertake a comprehensive and collaborative evidence-informed appraisal process before launching a wound management educational event or program.

The Wound CARE Instrument can be used to evaluate existing wound care programs, as well as to develop new programs.

Visit http://cawc.net/index.php/resources/wound-care-instrument/ to download a copy.

Two Generations Living with Lymphedema

BY LYNN ZIEGLER AND MARLISE ZIEGLER

Lynn's Story

All parents look forward to the arrival of their child and most expect the baby to be physically perfect. At my birth in 1947, my parents were shocked to see my severely swollen feet and legs. What was wrong?

No one knew the answer. The family doctor in our rural community pointed out that everything else was as it should be and perhaps the swelling would go away in time. My mother cried, the church prayed over me, my feet were kept hidden in the receiving blanket, and life went on.

"Will she walk?" was the next question. I did, and also progressed normally in every other aspect of growing. I had no awareness of disability; no recognition of pain or discomfort. What had always been was normal for me; although, perhaps I welcomed bedtime more than most children, as this was when lymph drainage took place.

School time

I started school wearing shoes that were slit open at the top to accommodate the swelling, but I still didn't feel that I was different from my classmates. Then it was time for my first Christmas concert and I wanted to know why I couldn't have shiny patent leather shoes like the other kids.

Time passed and I still hadn't really realized I had a disability. Then, one day, a teacher stopped me in the hall as I came in from recess. It was hot and the veins were prominent in my legs and my feet were very swollen. "Oh, my goodness," she exclaimed. "How did you hurt yourself?" I looked at her in alarm and then down at my legs. I answered, "They're like this all the time." I'll never forget the look of pity on her face as she patted me on the head and told me to go to my classroom.

Loss of innocence can be devastating, but it usually doesn't happen this way. Afterwards, I put a lot of energy into denying I was different and hiding the ugliness of my lymphedema from others. I became very aware of the other girls' slim legs and feet and pretty shoes, and envied them while feeling ashamed of my own reality.

Lynn and Marlise Ziegler: Two generations living with lymphedema.

My parents took me to various doctors. They looked at me and even did tests, but could provide no answers. I shied away from sports because I felt exposed and awkward. I kept my legs tucked behind me and wore long pants when I could get away with it. I didn't cultivate friends and was very introverted.

continued on page 36

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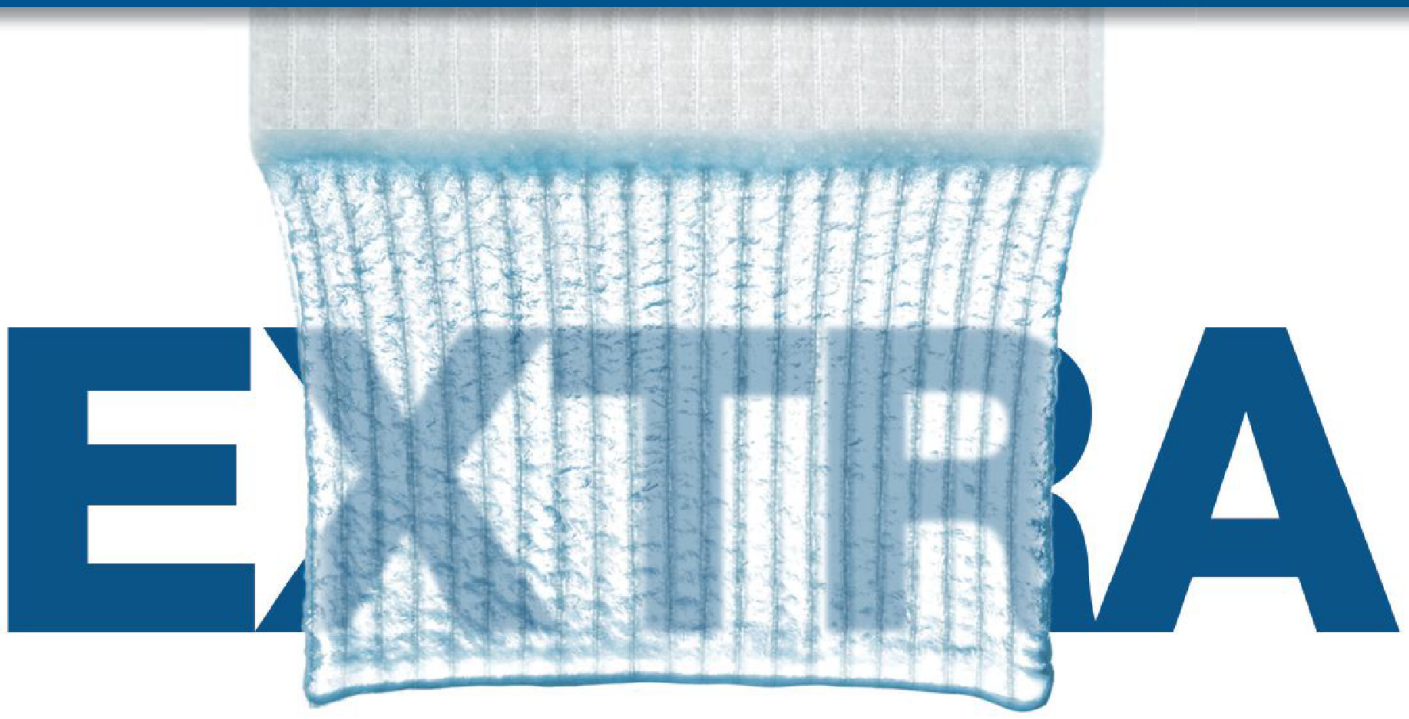

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Through the generations

I didn't research my condition, look for compression aids or try to find a support group. I left home at 18, went to university, got married, worked as a teacher and got pregnant. Our first child was born – with lymphedema! I was stunned, but my husband focused on the fact that she was a beautiful baby girl. The doctor said to us, "I don't know what she's got, but she'll have to wear moccasins for the rest of her life."

We went to see a plastic surgeon. He was confident that a z-plasty would solve the problem or at least show the reason for it. My daughter Marlise was less than a year old when the surgery was done. There was no improvement or learning. In fact, the resultant scar tissue made the swelling worse.

Our second daughter arrived – again with lymphedema. This time the disability was less severe. I soon became pregnant again and the doctor offered an abortion. We refused and the new baby had no lymphedema. However, she was 6 weeks premature and a question occurs to me as I write: Did that make a difference? Does the lymph system in the lower extremities develop in the last trimester?

We went for genetic testing and were told there was no hidden or latent sign of lymphedema in our youngest daughter, my parents or my husband. We were told the condition was rare and probably a genetic mutation that had become dominant. Following my parents' example, we treated our children as normal kids and life went on. Luckily we lived on a hobby farm and everyone was busy with chores that required taking many steps during the day. Unknowingly, we were doing the right thing – working the leg muscles and stimulating the lymph system. We also bought a trampoline. Exercising on it had the same positive effect.

Staying in control

At the age of 44, I decided I should look at wearing compression stockings. My doctor referred me to Alberta Aids to Daily Living (AADL) and I was allotted 2 pairs per year – AADL paid 75% and we paid the rest. Everyone should try to make 2 pairs of stockings last for a year! Everyone should have the experience of legs and feet encased like sausages in lycra, especially on a hot day. But despite the discomforts, I will never give the stockings up!

I'm now 63. I have kept the lymphedema under control and am thankful for my high pain threshold. I have no ulcers or wounds. I have had 1 knee replacement and await the second. I try not to think about whether my lymph system will be further compromised by this invasive surgery. So far, so good. But another question arises: Did the pressure of the swelling in my lower legs contribute to my worn-out knees? Doctors don't speculate on the answer.

At this stage in my life, am I psychologically damaged, afraid to go out and friendless? No. Luckily, I married the perfect person who saw me, not the disability and I "came out!" I am now a widow and I miss my husband of 38 years. But I believe life is good, despite my lymphedema, and I try not to worry about whether it will make aging more complicated than it is for other "normal" people. Again – so far, so good.

Marlise's Story

It has never really bothered me to have lymphedema; after all, I was born this way. It's normal for me. I've mostly been able to ignore it or forget I have it. When I get upset about not being able to find shoes that fit or having to work my way into compression stockings (try it someday...it takes about 15 minutes and at the end I'm all sweaty and ready to go back to bed), it always seems there are worse things that could have happened to me. After all, I can still walk, run and jump, and do everything that "normal" people do.

Other people's problems

I never thought my lymphedema was "that bad" either. Until … I meet someone who feels compelled to point out that I'm wearing panty hose (and ugly panty hose, mind you) in the middle of summer with shorts and sandals ... or I meet a medical professional who either doesn't know what congenital lymphedema is or doesn't care, and leaves me with the impression that I'm at fault for having it. One medical professional said, "Well, it can't be that bad if you haven't gotten new stockings for a year." Hmm, I guess he ignored me when I said I wasn't allowed more than 2 pairs a year through AADL, and at that time I was a student and couldn't afford to buy them on my own.

Another doctor said, "I've never heard of someone being born with lymphedema; are you sure you didn't have cancer?" I imagine I would have remembered having cancer. My personal favourite was from a compression-stocking fitter: "Well, you're too fat, you should never have had kids. Look at what you've condemned them to. Really, you should be ashamed of yourself." Imagine yourself the recipient of those comments and then imagine how you would react. Generally, I allow talk like this to flow off me and patiently correct the commenter's erroneous impres-

sion of my disability; then again, sometimes the offence is far too large to ignore.

A disability?

Of course, I never saw lymphedema as a disability. Why should I? I wasn't in a wheelchair, using a multitude of medical aids or sentenced to a shorter life span. I didn't have to take medication or make frequent doctor or hospital visits. My employment and fertility options weren't limited.

Then, one day, my doctor enumerated the multiple ways lymphedema could negatively impact or shorten my life and outlined the limited medical aids available for a person with my condition. He stated unequivocally that I should never have had children because it worsened my lymphedema and I may have passed on a deadly and debilitating abnormality to them. He advised me not to consider employment in which I was required to stand or sit (really?!). It was then I realized I was disabled and had been fooling myself when I thought I was normal. Apparently, not only was I disabled but I was also an incredibly selfish person. I found this realization rather upsetting.

Now, to look at it rationally: My children are normal, with no signs of lymphedema. I will have them genetically tested when they are older to see if they have the gene. I refuse to apologize for my decision to have children and will not accept blame for raising happy, healthy, socially responsible adults who do not see me as abnormal. Having children did worsen my condition, but that was a choice I made and I will live with it and adapt my lifestyle accordingly.

There are limited medical aid options and they are difficult to obtain because of the expense involved. My condition will not disappear, so I will need compression stockings and manual lymph drainage for the rest of my life. Private insurance companies such as Blue Cross won't offer individual insurance to people with lymphedema because of potential complications and because it is an ongoing condition.

Public healthcare assistance consists of AADL, which has stringent conditions and limited coverage. I am now allowed 3 pairs of compression stockings each year. AADL will cover up to $150 per pair, which is generous. The stockings I wear cost $275 per pair and are effective in reducing the swelling in my legs for about 2 months. Ideally I should get new stockings every 2 months, but this would cost me $1,200 per year. Manual lymph drainage, which is done on a weekly basis, is very effective in helping the lymph to drain from my legs; it is also reasonable at about $120 per visit. Unfortunately, it's not available where I live and the travel cost combined with the massage fee would be about $155. Yearly this would be over $8,000 and that's just not feasible. AADL doesn't currently cover manual lymph drainage. I know these costs are tax deductible, but the money to pay for them still needs to be available up front.

"I never saw lymphedema as a disability. Why should I?"

– Marlise Ziegler

If I am unlucky enough to develop infections and ulcers, then I will be visiting my doctor and the hospital frequently, as well as taking a lot of medications.

As for employment at which I would neither sit nor stand for long periods of time (definition: more than 1 hour) – well, I can't think of what that job might be. So I decided that since I have a disability, I should make it work for me. I have self-defined myself as disabled, requiring some freedom of movement and position changes at my place of employment. My employer wishes to provide equal-opportunity employment for all as well as a healthy work environment, so my situation is working out quite satisfactorily.

A work in progress

It may seem I have adapted quite well to having lymphedema – that I have a good understanding of the negative ways it could impact my life and am developing strategies to deal with them accordingly. Do not be deceived. It has been a long and unhappy road to get to this point. I have felt ugly, humiliated and worthless simply because my legs swell. I feel belittled and ashamed when people comment on my abnormality, particularly those people I am asking for help in making my situation more liveable. It has required a great deal of manufactured self-confidence and self-perception to realize those comments are born of ignorance and arrogance. I do not define myself by my lymphedema and I will not allow other people to do so.

Publish in *Wound Care Canada*!

Contact wcceditor@cawc.net for further information.

Industry News

New developments in Canada's wound care industry

Systagenix Acquires O2 Insights Inc., Adding a Third Marker to its Wound Diagnostics Pipeline

Systagenix announced today that it completed the acquisition of the assets of O2 Insights Inc., an Ohio based technology start-up developing rapid, reliable and cost effective point-of-care diagnostics for the measurement of transcutaneous tissue oxygenation.

Transcutaneous oxygen perfusion measurement (TCOM), or TcpO2, is a key marker for chronic wounds where ischemia and/or hypoxia may be playing a role in delayed wound healing. In clinical practice, TcpO2 is measured to help assess peripheral vascular oxygenation, assist in determining the need for revascularization procedures, and to assess the potential benefits of hyperbaric oxygen therapy.

O2 Insights' technology aims to address many of the shortcomings of current TCOM devices which can be complex to operate, take up to 45 minutes to generate a result, and can require a dedicated technician to operate. The O2 Insights Inc. technology holds the promise of providing easy to use, accurate, and reliable transcutaneous oxygen perfusion measurements in a matter of minutes and at significantly lower capital equipment cost, thus making measurement of TcpO2 accessible to much larger numbers of patients and health care providers in various clinical settings.

With this acquisition, Systagenix continues to increase its point of care wound diagnostics leadership and footprint by investing in the development of clinically relevant markers and devices to penetrate an untapped potential multi-billion dollar wound diagnostics market.

"We launched WOUNDCHEK™ Protease Status – the world's first point of care test for chronic wounds to detect Elevated Protease Activity (EPA) – in Europe, the Middle East and South Africa earlier this year. More recently we reached a very significant milestone by completing the first trial on our wound infection point-of-care test currently in development, and today by joining forces with O2 Insights Inc., we set out to develop an easy to use, rapid, and cost effective point-of-care test for tissue oxygenation" comments Ernest Waaser, Systagenix Chief Executive Officer. "Our goal is to provide physicians better diagnostic tools to help them guide targeted treatment earlier and increase chances of healing more rapidly and cost effectively. We are now well on our way to providing the tools to answer three key questions every clinician would like to know about a chronic wound – does it have elevated protease activity, does infection need to be addressed, and is there adequate tissue oxygenation?"

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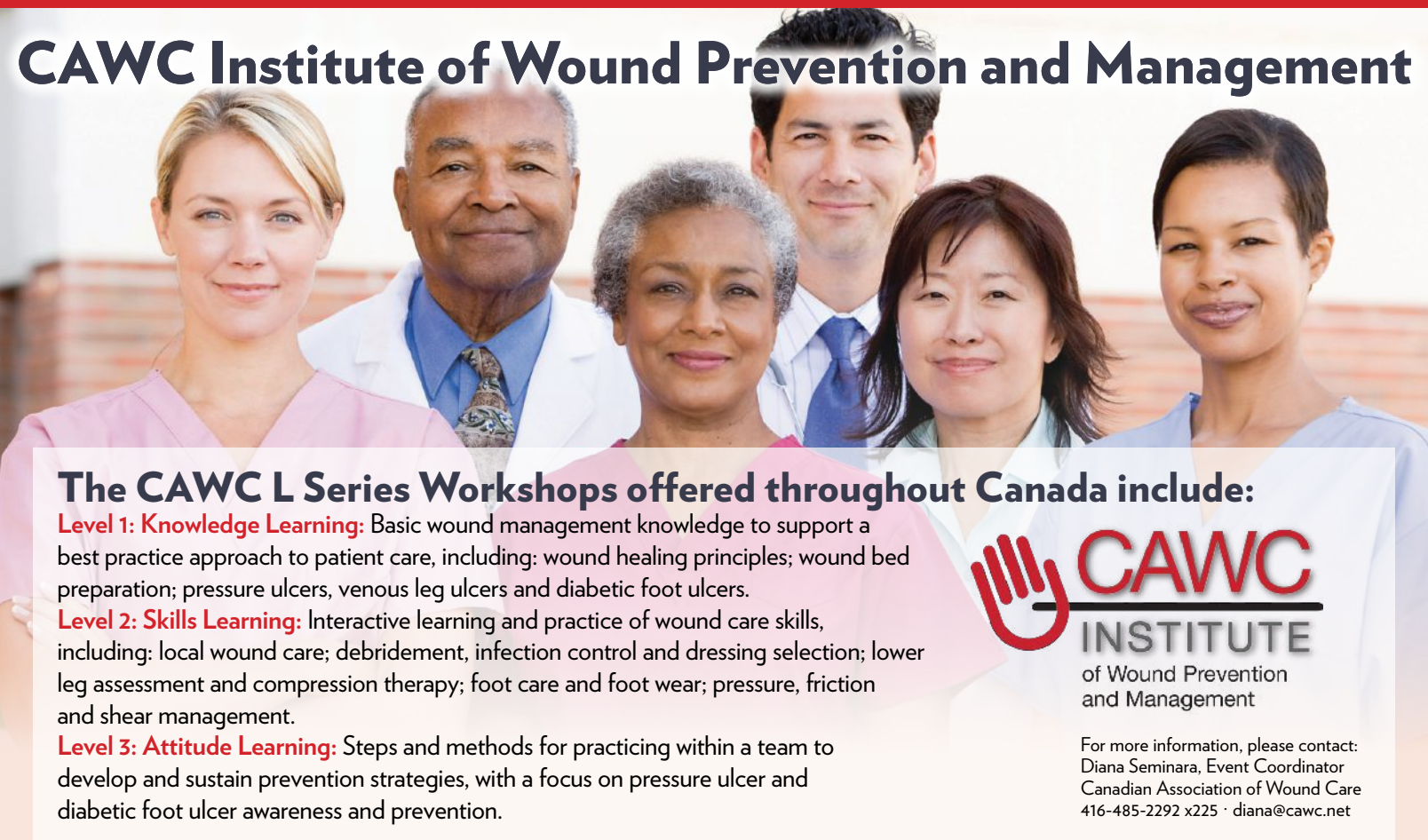

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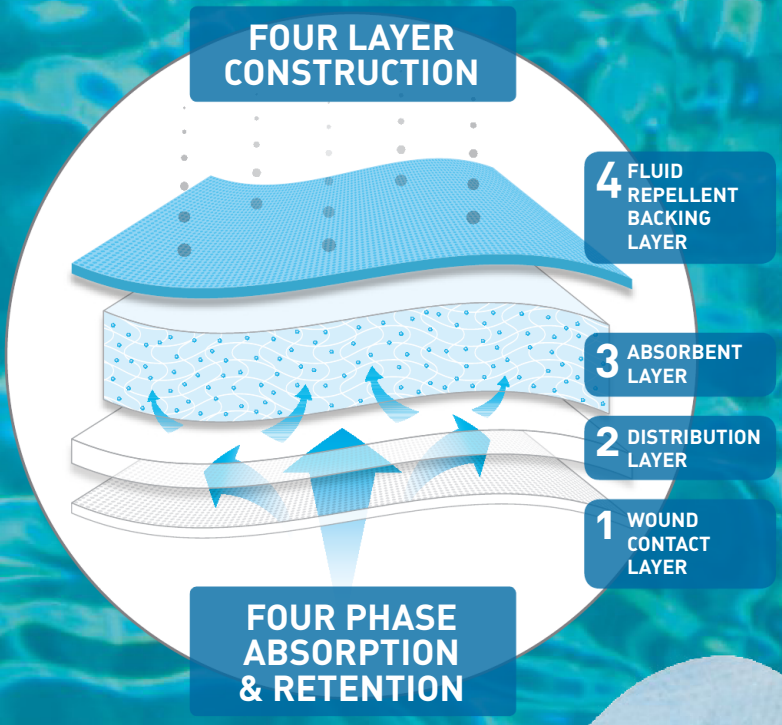

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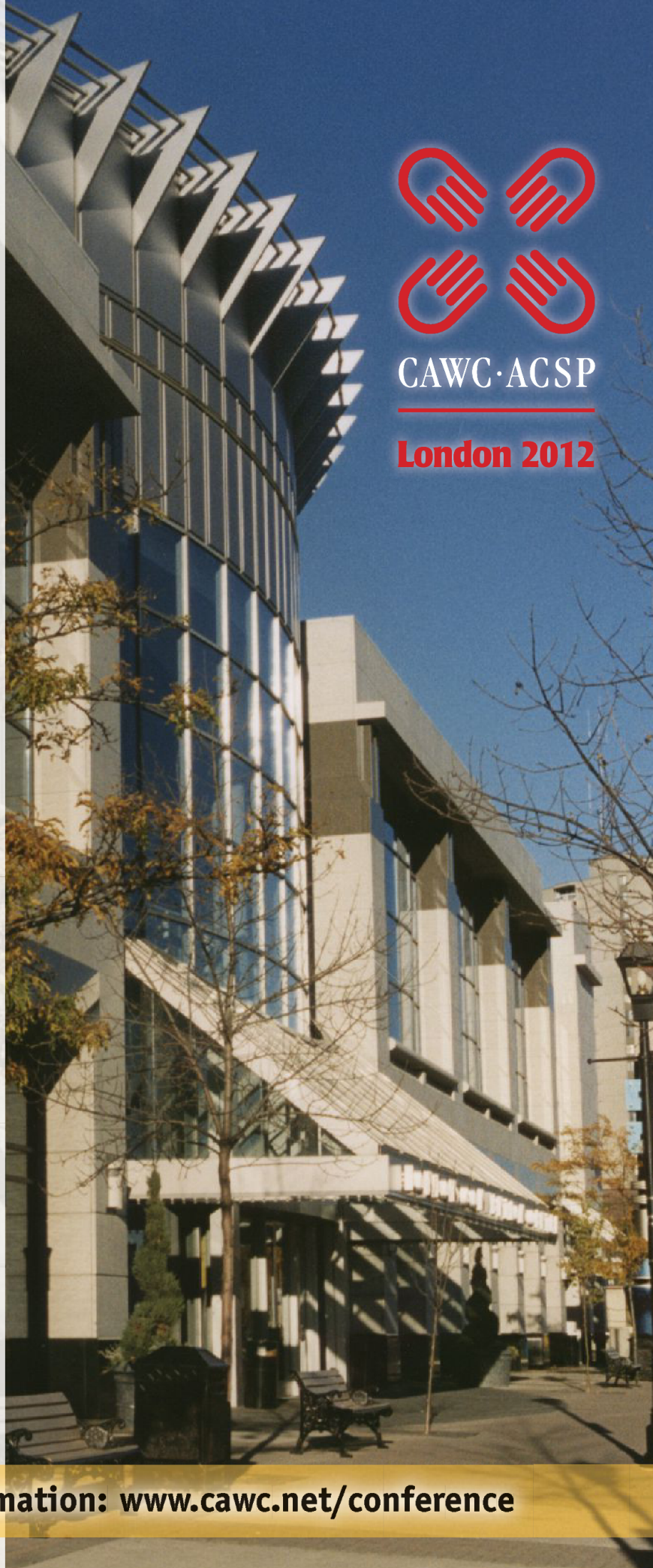

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