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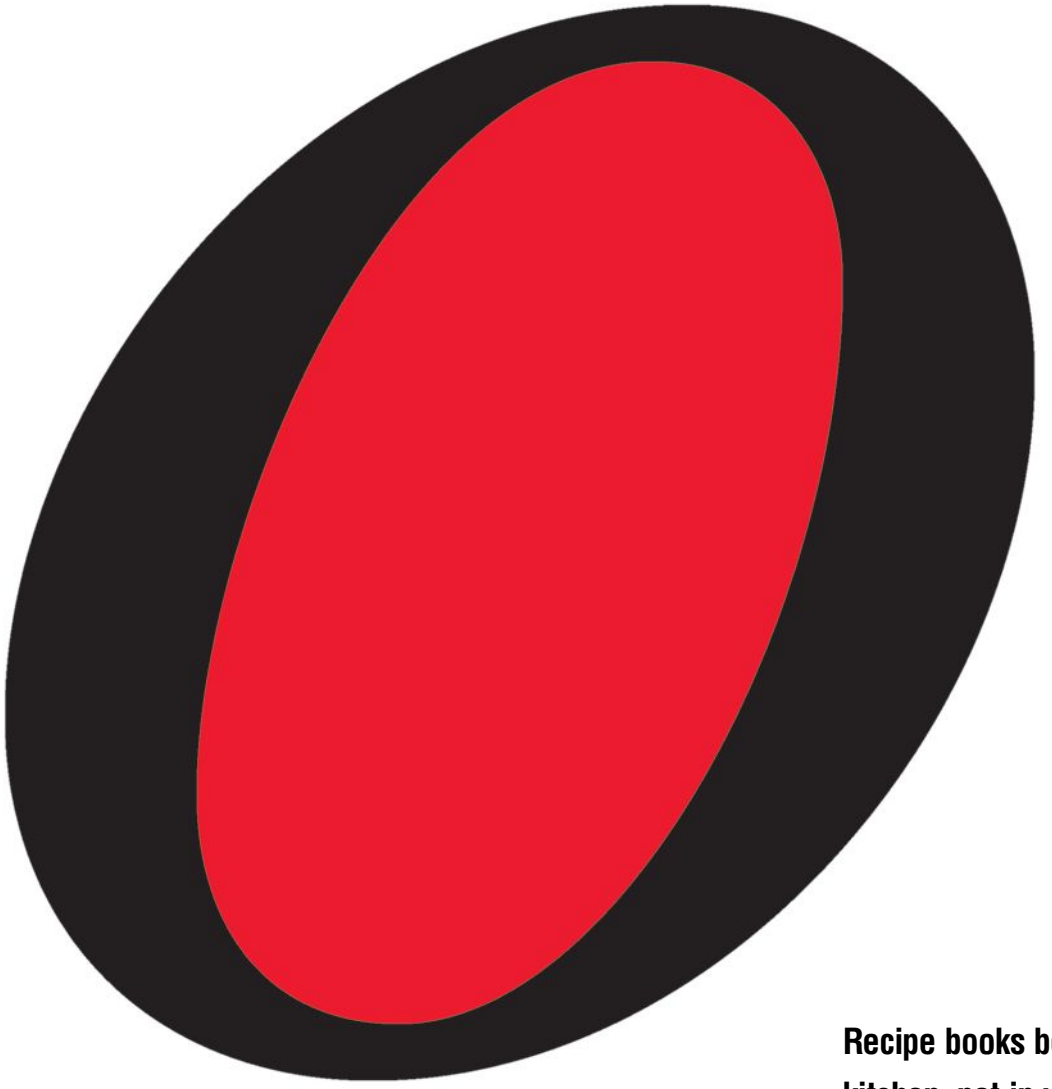
WoundCare CANADA

THE OFFICIAL PUBLICATION OF THE CANADIAN ASSOCIATION OF WOUND CARE

Managing the Challenges of Enterocutaneous Fistulas

Canadian Association of Wound Care
Association canadienne du soin des plaies



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Wound Care Canada is Born!

Sue Rosenthal

Two years ago, several of us involved in the Canadian Association of Wound Care seemed to have an idea pop into our heads simultaneously: it was time for the CAWC to produce its own wound-care publication. At the time, the CAWC was emerging as a world leader in wound care, and we felt the organization had an obligation and an opportunity to further move the process forward. A dedicated group of interested individuals with a shared vision then worked to make it come to fruition. What was once only an idea has now become the reality you hold in your hands — *Wound Care Canada*, the official publication of the CAWC.

Wound Care Canada is aimed at health-care professionals who are involved in wound management across the country and around the world. It covers a wide range of topics, based on the pillars of the CAWC: Clinical Practice, Education, Public Policy, Research and International Partnerships, as well as innovation, resources and more — and always with a focus on best practice. Our plan is to produce two issues for the first year and then consider expanding our production to four issues per year.

"We are proud of the hard work that has gone into the development of this first issue. Enjoy!"

Heather L. Orsted, CAWC President

Wound Care Canada is the latest piece in the CAWC's core communications net, which includes a comprehensive Web site, electronic bulletins, the annual conference and other educational events.

We invite you to become involved in *Wound Care Canada* by offering feedback to our articles through letters to the editor, submitting ideas for future articles and sharing your stories with us. We want to hear from you!

Sue Rosenthal, Editor

Sue Rosenthal, BA, MA, specializes in health and wellness communications and has been associated with the CAWC since 2000.

La revue *Wound Care Canada* est née !

Il y a deux ans, plusieurs d'entre nous, impliqués auprès de l'Association canadienne du soin des plaies, avons eu la même idée simultanément : il était temps pour l'ACSP de produire sa propre publication sur le soin des plaies. À ce moment, l'ACSP prenait la tête de file dans ce domaine et nous avions le sentiment que l'organisation avait l'obligation et l'occasion de contribuer au progrès. Un groupe spécifique fut formé avec des personnes intéressées, ayant une vision commune, pour commencer à développer l'idée. Ce qui fut seulement une idée est maintenant devenue la réalité que vous tenez entre vos mains – *Wound Care Canada*, la publication officielle de l'ACSP.

La revue *Wound Care Canada* vise à rejoindre les professionnels de la santé impliqués dans la gestion des plaies à travers le pays et le monde. Elle couvre un large éventail de sujets basés sur les centres d'intérêts de l'ACSP : la pratique clinique, la formation, les politiques gouvernementales, la recherche et la collaboration internationale, autant du point de vue de l'innovation que des ressources et bien davantage – et ceci, toujours en vue d'une meilleure pratique. Notre projet est de publier deux numéros la première année, et par la suite, d'envisager la production de quatre parutions annuellement.

« Nous sommes fiers de l'effort fourni qui a permis l'élaboration de cette première parution. Bonne lecture ! »

Heather L. Orsted, Présidente de l'ACSP

La revue *Wound Care Canada* est le dernier élément du réseau principal pour les communications de l'ACSP qui comprend un site web polyvalent, des bulletins électroniques, un congrès annuel et d'autres activités éducatives.

Nous vous invitons à vous impliquer dans la revue *Wound Care Canada* en nous faisant parvenir vos commentaires sur nos articles par le biais de lettres à la rédactrice, en soumettant des idées pour de futurs articles et en partageant vos expériences vécues avec nous. Nous espérons avoir de vos nouvelles !

Sue Rosenthal, Rédactrice

Canadian Association of Wound Care / Association canadienne du soin des plaies

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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.

Features

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All editorial material published in *Wound Care Canada* represents the opinions of the authors and not necessarily those of the Canadian Association of Wound Care.

Discussions, views and recommendations as to medical procedures, choice of treatments, dosage or other medically specific matters are the responsibility of the authors. No responsibility is assumed by the publisher or publishing partners for any information, advice, errors or omissions contained herein.

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Special thanks to Smith & Nephew for augmenting the *Wound Care Canada* mailing list.

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Departments

See page 38

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CAWC EVENTS

Tenth Annual Conference of the CAWC
November 2004
Calgary, AB
www.cawc.net/open/conference/conferences.html

Regional:
The CAWC is planning an expanded S-series agenda for spring 2004 with events tentatively scheduled for Halifax, Montreal, Toronto and Winnipeg. Complete information will be posted on the CAWC Web site in December.

The CAWC at work.

International:
The CAWC Goes International
The CAWC has been invited to participate in the second World Union of Wound Healing Societies conference, which will take place in Paris, July 8–13, 2004. We'll be sending some of Canada's top clinicians to make presentations.

OTHER EVENTS

Fourth Annual Meeting of the American Society for Laser Medicine and Surgery
April 1–5, 2004
Dallas, TX
Tel: 715-845-9283
E-mail: information@aslms.org

Seventeenth Annual Symposium on Advanced Wound Care
May 2–5, 2004
Disney's Coronado Springs Resort
Lake Buena Vista, FL
www.woundcaresymposium.com

Canadian Physiotherapy Association National Congress 2004
May 27–30, 2004
Quebec City, QC
www.physiotherapy.ca

Canadian Paediatric Society
June 16–20, 2004
Montreal, QC
www.cps.ca

Second World Union of Wound Healing Societies Meeting
July 8–13, 2004
Paris, France
www.wuwhs.org

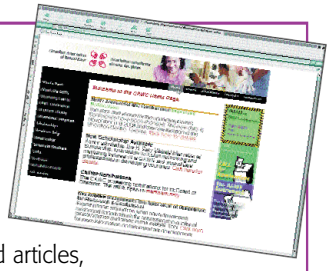
Canadian Association of Practical Nurse Educators Conference
October 5–7, 2003
Vancouver Community College
Vancouver, BC
www.cpna.ca

Canadian Association of Enterostomal Therapy 23rd Annual Conference
October 14–17, 2004
The Grand Okanagan Hotel
Kelowna, BC

COMING UP

The results of the prevalence study (see Pamela Houghton's and Gail Woodbury's article on page 30 in this issue) will be released by the CAWC in the near future.

The CAWC has agreed to fund the second annual "CAWC Survey on Clinical Practice Issues," to be conducted at the 2003 conference. It is a project of the association's Clinical Practice Committee under the guidance of Karen Campbell and Gail Woodbury. This study will be an in-depth look at defining the key clinical issues in Canadian wound care. Watch for results in the first half of 2004 on the CAWC Web site and in the next issue of *Wound Care Canada*.



Visit the CAWC Web site at **www.cawc.net** for the latest wound-care news and information. **For our francophone readers:** The French side of the Web site is expanding, with added articles, news and information. The CAWC best practice articles are being translated and will appear on the CAWC Web site as they become available.

When you see the Web Connect icon associated with an article, look for more information on the CAWC Web site at www.cawc.net. Click on *Wound Care Canada*.

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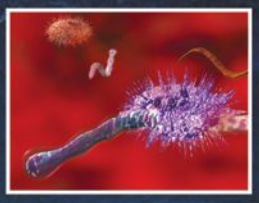

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Managing the Challenges of Enterocutaneous

BY Kathryn Kozell
AND
Lina Martins

Enterocutaneous fistulas (ECF) present as devastating complications following postoperative abdominal surgery and as secondary manifestations due to primary intra-abdominal pathologic processes. Management challenges focus on fluid resuscitation, nutritional supplementation, electrolyte replenishment, control of sepsis, containment of effluent, skin integrity and surgery. Patient and family remain integral to the plan of care, as their physical and psychological challenges will be many. A review of ECF etiology and classifications will be presented, augmented by a four-phase approach to management.

Kathryn Kozell, RN, BA, BScN, MScN, ACNP/ET is an Acute Care Nurse Practitioner/Clinical Nurse Specialist in surgery at St. Joseph's Health Care London, Ontario. She has been an Enterostomal Therapy Nurse since 1981. She is also a member of the CAET and CAWC.

Lina Martins, RN, BScN, ET, MSCN (c), is a Surgical Nurse Clinician at the London Health Sciences Centre, London, Ontario. She has been an ET and a member of the CAET since 1999 and is also a member of the CAWC.

Incidence and Etiology

A fistula is an abnormal epithelialized tract between two or more structures or spaces. It may involve a communication tract from one body cavity or hollow organ to another hollow organ or to the skin. It is estimated that 90% of ECF arise after surgical procedures. Schein and Decker[1] cite a 37% mortality rate in post-operative high output ECF. The majority of these deaths are attributed to electrolyte imbalance, malnutrition and sepsis. Gynecologic patients are extremely vulnerable to fistula development (5% to 30%) because of malignancy and aggressive treatment regimes. Radiation-induced endarteritis affects the vascular supply, causing vasculitis, fibrosis and impaired collagen synthesis[2]. Fistulas may develop immediately or years later in conjunction with other processes such as diabetes mellitus, pelvic inflammatory disease, pelvic surgery, hypertension and atherosclerosis.

Fistulas are either iatrogenic or spontaneous in development. Postoperative complications include unintentional enterotomy and anastomotic breakdown (85%–90%) as a result of a foreign body close to the suture line, tension on the suture line, complicated suture techniques, distal obstruction, hematoma, abscess formation at the anastomotic site, or tumor. Emergent/urgent surgical procedures involving unprepped bowel, underresucitation, malnourishment or previously radiated tissue are other causes for fistula development. Spontaneous fistula development (10%–15%) is attributed to intestinal diseases such as Crohn's disease, malignancy and infectious processes, as in tuberculosis, diverticulitis, vascular insufficiency, radiation exposure and mesenteric ischemia.

Classification

Fistulas may be classified according to complexity, anatomic location or physiology. Simple fistulas are described as short with a direct tract. There is no organ involvement or associated abscess. Type I complex fistulas are associated with an abscess or multiple organs. Type II complex fistulas find the distal end

The Canadian Association for Enterostomal Therapy (CAET) is a professional, non-profit organization whose members are dedicated to the representation and advancement of the specialty of Enterostomal Therapy Nursing. The Enterostomal Therapy (ET) nurse is an advanced practitioner whose role includes consultation, direct care, education, research and administration. The ET nurse offers comprehensive services for people of all ages with select disorders of the gastro-intestinal, genito-urinary, and integumentary systems, including ostomies, fistulas, tubes, dermal wounds and incontinence. The development of innovative, creative and individualized care plans for people with complex problems results in accelerated outcomes for the patient.

Fistulas

within the base of a disrupted wound. Anatomically, the location of the fistula is identified according to site of origin *(see Table 1 – Fistula Classification)*. Type I ECF originate from esophageal, gastric and duodenal sources; Type II from small bowel; Type III from large bowel; and Type IV from large abdominal wall defects greater than 20cm^2. Physiologic classification quantifies fistula output over a 24-hour period: low volume fistula <200 ml/24-hour, moderate volume between 200 and 500 ml/24 hours, and high volume >500 ml/24 hours. High volume fistulas are generally associated with high morbidity, high mortality and less chance of spontaneous closure.

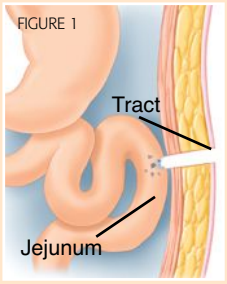
Manifestations

Excess fluid exudating from a wound or cutaneously is the usual first indication of an external fistula. Examination of the fluid will assist in determining the source *(See Table 2 – Type of Fluid Loss from Various Fistula Sites* on next page*)*. Skin excoriation rapidly occurs secondary to the high concentration of digestive enzymes in the chyme. Internal fistulas are fissuring tracts inside the body, which erode directly into adjacent viscus. These are basically asymptomatic unless the distal portion of the fistula enters a structure such as the bladder, rectum or vagina. Reported symptoms such as recurrent diarrhea, mucus, blood, cystitis, pneumaturia, flatus or stool from the vagina, perianal/perineal skin excoriation, pressure and discomfort may direct investigations toward a probable external fistula.

Facilitating Closure

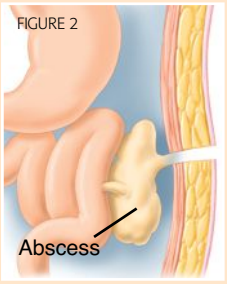
Closure of a fistula either spontaneously or surgically is the ultimate goal. Rolstad and Bryant[2] identify five objectives toward caring for the fistula: fluid and electrolyte replacement, adequate nutrition, perifistular skin protection, infection control and measures to facilitate closure. A goal not to be overlooked throughout a challenging and prolonged course of treatment is the maintenance of a trusting partnership between the patient, the family and the health-care team.

FIGURE 1



Simple enterocutaneous fistula.

FIGURE 2



Complex Type I fistula with associated abscess.

Both figures adapted from Rolstad BS, Bryant R. Management of drain sites and fistulas. In Bryant R (ed.), *Acute and Chronic Wounds*. St. Louis: Mosby. 2000:318.

Management

Wong and Buie[3] have organized the approach to fistula management into four phases: stabilization, investigation, conservative treatment and surgery.

TABLE 1

Fistula Classification

Location	Internal	Tract contained within body
	External	Tract exits through skin
Involved structures	Colon	Colon
	Entero-	Small bowel
	Vesico-	Bladder
	Vaginal	Vagina
	Cutaneous	Skin
	Recto-	Rectum
Volume	High output	Over 200 ml per 24 hours
	Low output	Under 200 ml per 24 hours

Adapted from Rolstad BS, Bryant R. Management of drain sites and fistulas. In Bryant R (ed.), *Acute and Chronic Wounds*. St. Louis: Mosby. 2000:317–341.

TABLE 2

Type of Fistula Loss from Various Fistula Sites

Fluid Type	Origin Of Fistula
Watery	Gastric
Bile	Gastric, biliary, duodenum
Yellow/orange	Small bowel
Colourless	Pancreas
Brown fecal	Large bowel

Modified from Metcalf C. Enterocutaneous fistulae. *Journal of Wound Care*. 1999(3):142.

Phase 1 Stabilization: The gastrointestinal tract secretes five to nine litres of sodium, potassium, chloride and bicarbonate daily. The loss of these essential electrolytes and fluid volume threatens the overall circulatory system. Hypovolemia, inadequate tissue perfusion, renal failure and circulatory collapse can occur in the presence of a high output fistula. Sepsis, hemorrhage and evisceration call for immediate surgical intervention. Local and systemic sepsis must be treated with appropriate drainage and antibiotics. Placing the patient on a 'nothing by mouth' regimen minimizes intestinal output. This decreases content within the intestinal lumen, intraintestinal stimulation and pancreaticobiliary secretions, which ordinarily would activate the fistula. H2 antagonists to prevent stress ulcers and to decrease gastric secretions, and somatostatin to inhibit stomach, pancreas, biliary tract and small intestinal secretions are effective in 'resting the gut.'

Phase 2 Investigation: Assessment of the anatomical features of the fistula is accomplished through radiography. Maturation of the fistula track occurs postoperatively on day seven to 10. It is believed that this time period is acceptable to introduce contrast dye for investigation. Fistulogram assists in the determination of the origin of the fistula, the length of the tract, the continuity of the bowel and other manifestations such as an abscess or distal obstruction. Computed tomography, cystoscopy, intravenous pyelogram and ultrasound can also be used to identify impediments to fistula closure.

Phase 3 Conservative Treatment: The conventional approach to fistula management encompasses aspects of nutritional provision, effluent containment, attention to facilitating ease of care, efficacious utilization of patient-care dollars and an overall goal of promoting the patient's physical and psychological well-being. In addition, a comprehensive, systematic assessment of the fistula presentation with concise documentation of findings is instrumental in the selection and guidance of care options *(See – Fistula Assessment and Documentation)*.

Reported throughout the literature as contributing to improved spontaneous closure rates for ECF is adequate nutritional support, a positive nitrogen balance, adequate trace minerals, vitamin replacement and caloric and protein requirements contingent with the patient's pre-existing status. Thirty-seven to 45 calories/kg per 24 hours is an acceptable range for caloric needs, whereas acceptable protein requirements between 1.5 to 1.75 g/kg in a 24-hour period are quoted[4]. The route of nutritional support will take the form of oral, enteral or parenteral nutrition dependent upon patient tolerance, ability to ingest sufficient quantities, the fistula tract location and the bowel mucosa's absorptive capacity. Moran and Green[5] describe the maintenance of a normal intestinal structure as being directly related to the sustained use of the gastroin-

Odour Assessment Scoring Tool

1. Strong odour evident upon entering room (2–3 metres away from patient); dressing is intact.

2. Moderate odour evident upon entering room (2–3 metres) and dressing is removed.

3. Slight odour evident at close proximity when dressing is removed.

4. No odour evident even when at patient's bedside with dressing removed.

Adapted from Baker and Haig scale, adapted from Poteet[6]

testinal tract. The initiation of enteral feeds is suggested for this population when at all feasible. Obvious contraindications to this route exist if increased fistula output is manifested. The oral route of nutrition is reasonable for patients with colonic fistulas, whereas patients with esophageal and distal ileum fistulas are better supported via the enteral route. Ultimately, total parenteral nutrition (TPN) is the route of choice for those with high output proximal small bowel fistulas. The early initiation of a registered dietitian consult is essential in guiding the nutritional assessment, route of delivery and ongoing nutritional follow-up.

Containment of fistula effluent is a complex challenge for the health-care provider. Advanced assessment skills, knowledge of appropriate product selection, competence in product application and teaching of same are components of developing an individualized plan of care. An effective containment protocol will protect perifistular skin, measure effluent supporting electrolyte resuscitation and nutritional supplementation and control odour. Practitioners may choose to follow an algorithm for selecting a fistula containment system to assist in the decision-making process.

The ease with which care can be provided for this patient population should not be underestimated (See *Figure 3 – Algorithm for Selecting a Fistula Containment System*). Failure to achieve adequate containment can result in a cascade of events that compromise patient comfort and condition. Repeated failure in replication of a containment protocol can be demoralizing for the patient. The health-care practitioner must be cognizant of the psychosocial implications of isolation, withdrawal and depression inherent in such prolonged treatment courses. The practitioner is also accountable for monitoring the product's effectiveness over time. In addition, labour intensiveness of the application and maintenance must be factored in to the overall cost containment equation.

Finally, the patient and family's physical and psychological health is of pivotal concern for the health-care team. As the plan of care evolves, education and re-education of the family unit are required. The unpredictable outcome and longevity of living with a fistula cannot be minimized. Diversional therapy and consultation with team members from social work and psychology are beneficial. Long-term pain issues must be addressed, and colleagues in both acute and palliative care can provide expert guidance in this area.

Phase 4 Surgical Intervention: Spontaneous closure of a colonic fistula can take 30–40 days; an ileal fistula 40–60 days. Ninety per cent of enteric fistulas that do close will do so within 50 days[7,8]. Impediments to spontaneous closure can influence the decision to proceed with surgery. The surgeon will choose to

Fistula Assessment and Documentation[2]

1. Source
(e.g. small bowel, large bowel, bladder)

2. Characteristics of effluent:
(a) volume
low < 200 ml/24h
high > 200 ml/24h
(b) odour (if yes, describe)
(c) consistency
(e.g., liquid, semi-formed, formed, gas)
(d) composition – colour
(e.g., clear, yellow, green, brown)
– active enzymes
– extremes in pH

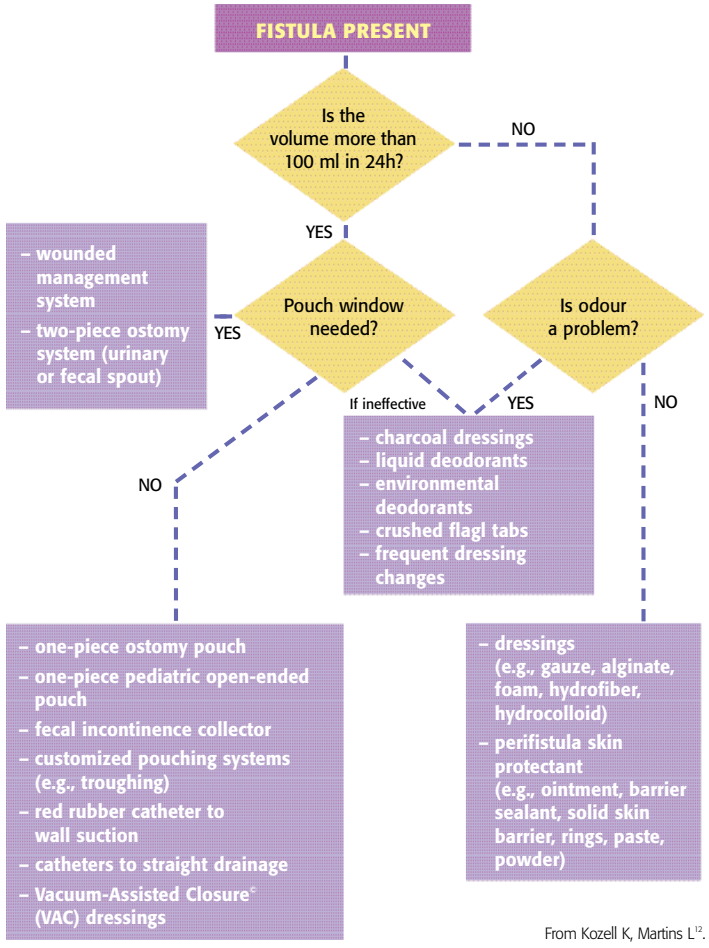
3. Topography and size:
(a) number of sites
(b) location(s)
(c) length and width of each
(include patterns)
(d) openings
(e.g., below, at or above skin level)
(e) proximity to bony prominences, scars, abdominal creases, incision, drain(s), stoma
(f) muscle tone surrounding opening
(e.g., firm, soft, flaccid)
(g) contours at fistula opening (e.g., flat, shallow, moderate or deep depths)

4. Perifistular skin integrity at each location
(e.g., intact, macerated, erythematous, denuded or eroded, ulcerated, infected).

operate in the presence of bowel necrosis or abscess. The patient's condition must be optimized: positive nitrogen balance, sepsis-free for six to eight weeks and the abdominal wall and surrounding tissues should be soft and supple[3,9]. Premature attempts at operative closure with inflamed, erythematous or necrotic tissue increases the risk of peritoneal contamination, the formation of dense adhesions and recurrent fistula formation. Delaying laparotomy reduces the risk of peritonitis, minimizes blood loss between anatomical planes at the time of dissection and improves wound closure and healing[10]. Closure of a Type II complex fistula is invariably a surgical closure. The timing of closure varies between 10 weeks to 13 months[11]. The surgical approach will be either resection of the fistula or diversion of the fecal stream proximal to the fistula, creating an ostomy or end-to-end/side-to-side anastomosis.

FIGURE 3

Algorithm for Selecting a Fistula Containment System



From Kozell K, Martins L[12].

Conclusion

Medical and nursing care demand a complementary, interdisciplinary approach if successful closure of an enterocutaneous fistula is to be achieved. The patient and family are challenged by physical and psychological stressors, which often result in weeks and even months of hospitalization. As health-care practitioners, we must remember to treat the patient as a whole person and not just 'as a hole.' The fistula should not become the only focus of care, but rather an element of the overall treatment plan.

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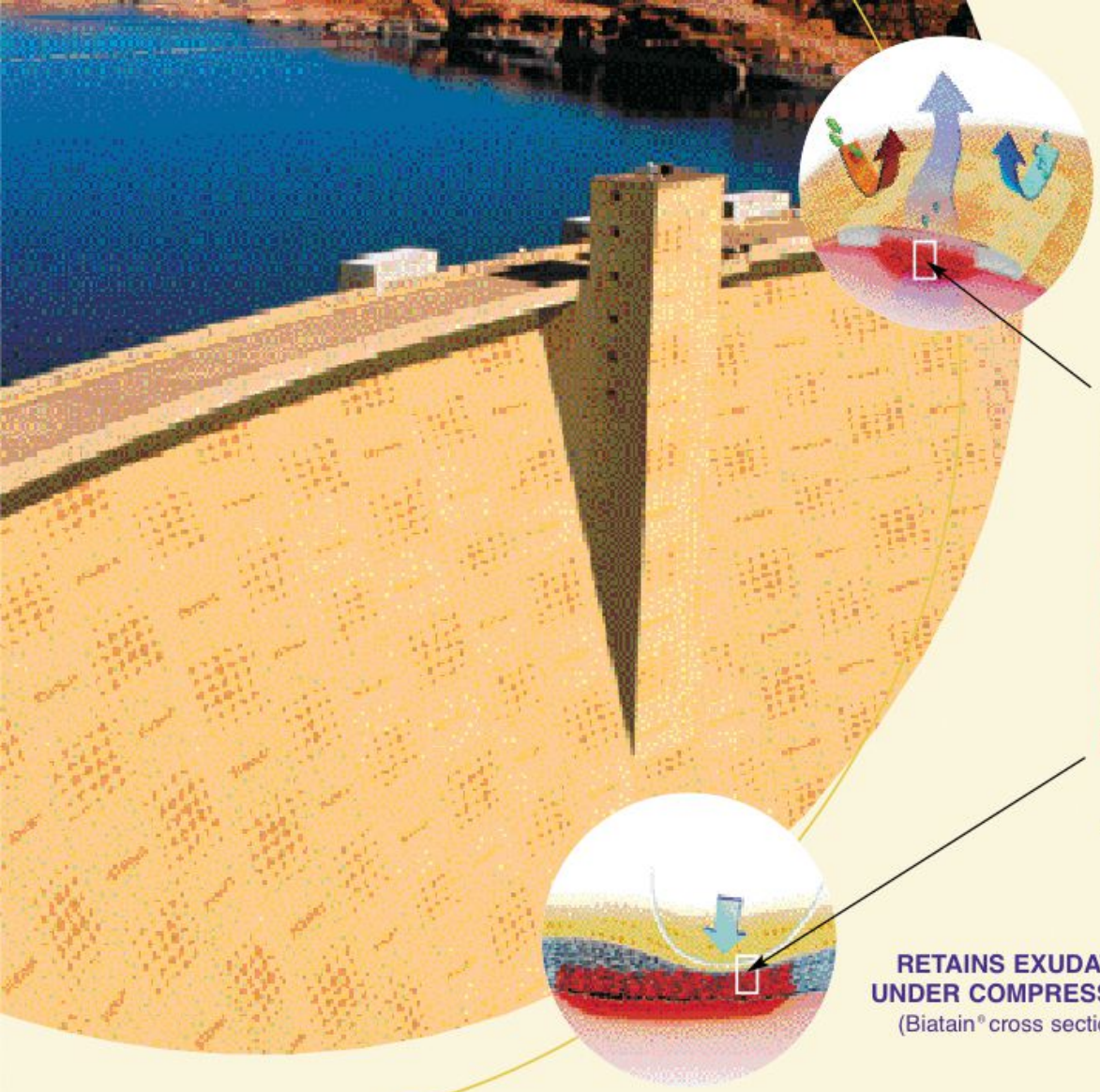

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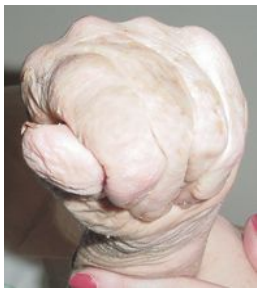
Innovative Treatm

for Elderly Patients with Contractures: A Clinical Experience

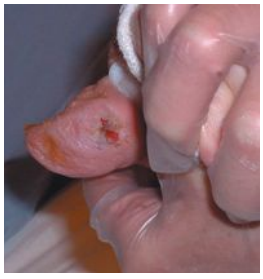
BY Theresa A. Hurd

This hand belongs to an elderly patient in a Canadian long-term-care facility. It was difficult to imagine that it once worked a long, hard day, gently stroked the forehead of a sick child or held another's hands close and intertwined. Now these hands are shriveled and wrinkled from years of living. The left hand held its own thumb in a tight, relentless grip, as a result of damage caused by a stroke. This led to continued, intense pressure over time, resulting in a stage-IV wound on the thumb that extended to expose the bone. The damage to the hand was extensive and the multidisciplinary team was unable to open the hand to release any of the pressure. The wound was constantly under pressure and, therefore, became chronic. Given the intensity and consistency of pressure, there was no opportunity for the wound to heal. This led to infection, a risk of complications such as osteomyelitis and an inability of the nurse to keep dressings on the wound. The length of time the wound existed had resulted in an intense odour and complete lack of mobility, as well as an extreme degree of constant pain. Amputation was thought to be the only intervention that would relieve the pain, reduce complications and eliminate a wound that would not heal.



As the Clinical Nurse Specialist for eight long-term care facilities and a Nurse Educator throughout the Province of Ontario, the author has noted an increasing frequency of cases such as this: severe contractures rendering the hands of elderly patients virtually immovable. Further, the traditional evidence-based methods utilized for local wound care simply were ineffective in providing any significant long-term treatment or relief. It is essential that innovative methods be created to manage these pressure wounds in this population of patients with contractures.

Protocols based on the best practice recommendations by the Canadian Association of Wound Care[1] have been implemented in the eight long-term care facilities at which the author practises. As a result, there is a consistent high standard of care available to patients. The basic premise of the recommendations is to encourage the delivery of a comprehensive, holistic program to all patients with wounds: "treat the wound, treat the patient and treat the cause" is the phrase that most succinctly captures the overall philosophy. The application of these recommendations to treat wounds related to severe hand contractures would require first removing the contracture – the root cause of the wound. The application of a splint would assist in maintaining an open hand and removing the pressure. This would prevent a recurrence of the wound, remove the etiology and ultimately prevent amputation.



Patient's wound on thumb: note exposed bone.

It is documented that *botulinum* toxin type A (BTX-A, commonly known as Botox) has been utilized in treating children with cerebral palsy, as well as in other medically useful purposes beyond the cosmetic

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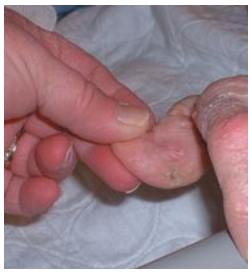

Patient's hand wound in the remodeling phase of healing: note increased range of motion.

applications that have received recent media attention[2]. Injections of BTX-A have been used as a safe and effective treatment for a variety of movement disorders, including muscle over-activity and spasticity. When injected into a muscle, *Clostridium botulinum* toxin type A (BTX-A) produces a local, temporary paralysis associated with a decrease in spasticity. *Botulinum* toxin has been used to treat many neuromuscular conditions including adult strabismus, local dystonias, muscle spasms such as blepharospasm (spasmic eye closure), hemifacial spasm, spasmosic orticolls and laryngeal dystonia[3].

The electrochemical communication between the muscles and brain results in muscle contraction and movement. This communication is transmitted from a nerve to the muscle by the neurotransmitter acetylcholine. Acetylcholine, when released in too large amounts, will produce an overactive response in the muscles. This overactive response induces the muscle to respond with spasm and then to tense. Botox, when injected into the muscle, will block the nerve from releasing acetylcholine. The outcome is relaxation of the spasm and symptomatic relief to the patient[4].

The biological effects of BTX-A are well understood. The injection of BTX-A into the muscle creates a localized muscle paralysis caused by the specific binding to presynaptic nerve terminals. When the toxin has infiltrated into the nerve terminals it inhibits the release of acetylcholine at the neuromuscular junction. When the axon terminal sprouts new nerve endings and forms new synaptic contact with the adjacent muscle, the neurotransmission is recovered[5]. The toxin effect begins within a period from 12 hours to seven days following treatment, and the duration lasts from three to four months in most cases. The duration has been reported to vary slightly longer or shorter, however, with effects lasting up to six months post injection[6].

> *"The injection of BTX-A in collaboration with the splinting system became an immediate and necessary component in the wound closure and pain reduction."*

The contracture suffered by the patient introduced above was the result of a stroke. In patients afflicted with strokes, doses of 50-300 U of BTX-A have been injected into elbow and wrist flexors with significant improvement as a result[7]. The abductor pollicis brevis and adductor pollicis were palpated and injected with 50 units of BTX-A, utilizing a 27-gauge needle. This resulted in the muscles becoming paralyzed. The range of motion of the thumb and fingers was increased and the hand became unclenched gradually. Eventually, the hand could be opened to a limited degree, at which point a splinting procedure, involving successive applications of splints, was required in order to ease the hand open and gradually stretch out the contracted muscles. This procedure was also used to implement proper anatomical limb position to improve comfort and to reduce spasticity. This, in turn, would allow the hand to

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remain open, thereby removing the etiology of the wound and resulting in local wound treatment (application of a silver calcium alginate and foam dressing) and a healing wound. Once the etiology was removed, bacterial burden reduced and moist wound healing implemented, the wound healed promptly and closed completely within 3.5 weeks.

Pre- and post-splint checks were implemented by nursing staff to ensure the safety of the patient. These splint checks included assessment of limb function, pulses, capillary refill, temperature and sensation. This graduated splinting procedure was repeated as the hand gradually continued to open and the range of motion was increased. Overall, the procedure was not only cost-effective but involved straightforward steps that could be mastered easily by nursing staff and implemented in a timely manner.

Outcomes

In this clinical experience, as of press time, this patient has not yet received a second Botox injection. The initial treatment, however, combined with the graduated splinting has allowed the hand to be opened gradually and, at the present time, she does have a full range of motion with her thumb. This procedure was of critical importance for this patient in this clinical experience. It has left the patient with a significant amount of relief from pain and discomfort. The wound no longer exists and the hand is no longer in a clenched, tight fist plagued with intense pressure. The procedure can be credited with saving a hand that, eventually, may have had to be amputated.

When monitoring outcome specifics, this splinting procedure proved to be cost-effective by reducing nursing time and the number of dressings. There was an immediate improvement in quality of life, including pain reduction, wound closure and the prevention of complications such as infection, sepsis and amputation. The ease of application of the splinting in the absence of pain has proven to be a treatment option to accelerate the rate of wound healing and improve range of motion in patients with contractures in long-term-care facilities. The ease of the application and cost effectiveness has made this an innovative, attractive nursing intervention/option for the treatment of contractures in long-term-care facilities. The addition of this innovation, in turn, will contribute to the comprehensive, holistic treatment of wounds, which not only results in a positive impact on healing but also decreases the frequency of transfers to hospitals and the subsequent length of stays related to wound management/amputations. The injection of BTX-A in collaboration with the splinting system became an immediate and necessary component in the wound closure and pain reduction.

Lincoln D'Souza, RN, BScN, is a Nurse Clinician, Surgical Out-Patient Department, McGill University Health Centre, Royal Victoria Hospital Pavilion. For over a decade he has worked in varied settings including the neuro ICU, plastic surgery, general surgery, transplant, vascular, urology and dialysis units. He is presently participating in the Graduate Diploma in Adult Education program at Concordia University, Montreal.

Response to the Use of Botox in Wound Management

BY Lincoln D'Souza

Several plastic surgeons at McGill University Health Centre in Montreal have successfully used *botulinum* toxin type A (BTX-A/ Botox) in the treatment of contractures such as the one described by Hurd. Other uses have included treatment of contractures related to severe burns, and scarring post-reattachment of fingers or toes.

Temporary paralysis is the effect of the toxin. The site of administration as well as the quantity of the toxin determines the duration of the effect. Keep in mind that whether the reduction in muscle spasticity is long or short term, the use of intensive occupational and physiotherapy to stretch shortened connective tissues and improve active range of motion is key in attaining and sustaining muscle strength, joint flexibility and voluntary control of joint movements.

A neurologist runs a specialty clinic at Montreal Neurological Hospital exclusively for the treatment of untoward side effects of neuromuscular disorders, such as muscular dystrophy. The clinic has been successful in helping many overcome the discomfort and limitations imposed by debilitating contractures.

Reimbursement remains an issue at this time, but progress is being made through the use of the Quebec Medication Insurance Plan.

Peri-wound Skin Protection

A Comparison of a New Skin Barrier vs. Traditional Therapies in Wound Management

BY/PAR Patricia Coutts, RN;
Douglas Queen, BSc, PHD, MBA;
R. Gary Sibbald, MD, FRCPC(MED)(DERM)

Abstract

The peri-wound skin has the potential to break down as a result of constant moisture exposure. Keeping the peri-wound skin intact has become a challenge for caregivers and patients alike. Traditionally, zinc oxide ointment or petrolatum preparations have been used as a protective barrier. These products are often messy and difficult to remove.

This study compared the protective function and clinical efficiency of a protective liquid acrylate skin barrier film to currently used barrier preparations.

This was a prospective open labeled case series study with each patient being used as their own control in a split wound model. We have evaluated a new protective liquid film-forming acrylate skin barrier (Cavilon™ No Sting Barrier Film, 3M Canada) with the traditional, currently used zinc oxide ointment or petrolatum-based barrier preparations in 30 patients. In a bid to determine clinical versatility, we have evaluated these products across several wound etiologies: venous stasis ulcers, diabetic foot ulcers and pressure ulcers. Each wound acted as its own control, where half the peri-wound area was treated with the new skin barrier and the other with one of the traditional products, with Steristrips™ (3M Healthcare) used to bisect the wound.

The results indicate all preparations to be similar in clinical efficacy. The new liquid acrylate skin barrier product (Cavilon™ No Sting, 3M) had statistically superior efficiency/performance benefits: it was more caregiver/patient friendly, allowed visualization of the wound edges and was quicker to apply in the clinical setting.

The authors are with the Toronto Wound Healing Centres, University of Toronto, Department of Medicine, Toronto, Ontario.

Les auteurs travaillent au Toronto Wound Healing Centres, Université de Toronto, Département de médecine, Toronto, Ontario, Canada.

Protection de la peau au pourtour d'une plaie

Une comparaison entre une nouvelle protection cutanée et les thérapies traditionnelles dans la gestion des plaies

Résumé

Exposée à une constante humidité, la peau au pourtour d'une plaie est sujette à se briser. Maintenir l'intégrité de la peau à cet endroit est devenu un défi pour les membres du personnel soignant autant que pour les patients. Traditionnellement, l'onguent d'oxyde de zinc ou les préparations à base de pétrole ont été utilisés à titre de protection cutanée. Ces produits sont souvent salissants et difficiles à enlever.

Lors de cette étude, le rôle protecteur et l'efficacité clinique d'un film protecteur liquide composé d'acrylate a été comparé aux autres produits couramment utilisés.

Ceci est une étude ouverte en perspective d'une série de cas dans laquelle chaque patient agissait comme son propre contrôle dans un modèle de plaie divisée. Nous avons évalué, auprès de trente patients, un nouveau film protecteur liquide en acrylate (Cavilon[MD], film protecteur No Sting, 3M Canada) avec le traitement traditionnel, l'onguent à l'oxyde de zinc ou les préparations à base de pétrole, couramment utilisés. Dans l'esprit d'avoir une polyvalence clinique, nous avons évalué ces produits sur des plaies d'étiologies différentes : ulcères de stase, de pied diabétique et de pression. Chaque plaie agissait à titre de contrôle puisqu'une moitié de la peau au pourtour de la plaie était traitée avec la nouvelle protection cutanée et l'autre *Suite à la page 48*

Web Connect

Abstracts may appear in both English and French in *Wound Care Canada*. The full article appears on the CAWC Web site at www.cawc.net in the language of the original.

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The Interdisciplinary Urgency Tool – A Comprehensive Wound-Care Referral Form

BY/PAR Richelle Gorst, BSc, PT;
Gillian Bagg, BSc, OT;
Martine Albert, BScN;
Nancy Couture, RN

Abstract

Successful and comprehensive wound-care management requires referrals to be appropriate and timely. The Skin and Wound Assessment and Treatment (SWAT) Team of Calgary Health Region's Care in the Community Program identified gaps within the referral process among home-care staff. The current process was inconsistent throughout the program, pertinent information was frequently not available at the time of referral and there was often a delay in recognizing the need to refer to the SWAT Team. Consequently, a preventative approach to providing wound care to the clients was hindered, and as a result, the Urgency Tool was devised. This Tool acts as a referral form, which is composed of a checklist of key risk factors that utilizes the modified VIP (vascular, infection, pressure) paradigm as a trigger for the wound-care clinician. The paradigm has been adapted to guide the practitioner in considering all interdisciplinary aspects of wound care prior to initiating the referral and to promote consistency when making a referral to the SWAT Team. Benefits of implementing the Urgency Tool are that the practitioner will recognize that a higher number of risk factors equals a more urgent referral.

The authors are members of the Skin and Wound Assessment and Treatment Team of Calgary Home Care, Calgary Health Region, Calgary, Alberta.

Les auteurs sont membres de l'équipe d'évaluation et du traitement de la peau et des plaies, Soins à domicile Calgary, région sanitaire Calgary, Calgary, Alberta.

L'outil interdisciplinaire d'urgence

Un formulaire global pour l'orientation d'un patient en soin de plaie

Résumé

Une gestion globale et efficace du soin des plaies nécessite une orientation du patient appropriée et au bon moment. L'équipe d'évaluation et du traitement de la peau et des plaies (SWAT) du programme de santé communautaire de la région sanitaire de Calgary, ont identifié des lacunes dans le processus d'orientation du patient parmi le personnel oeuvrant en soins à domicile. La procédure courante était inconsistante à travers le programme, l'information pertinente était fréquemment non disponible au moment de l'orientation du patient et il y avait souvent un délai pour reconnaître le besoin de faire appel à l'équipe SWAT. En conséquence, il devenait difficile d'avoir une approche préventive pour le soin des plaies, d'où la conception de l'outil d'urgence. Cet outil agit comme un formulaire d'orientation du patient, lequel dans lequel on retrouve une liste à cocher des facteurs de risque selon le paradigme modifié VIP (vasculaire, infection, pression) comme base décisionnelle pour le spécialiste en soin des plaies. Ce paradigme a été adapté pour guider le médecin à examiner tous les aspects interdisciplinaires pour le soin de la plaie avant d'initier l'orientation du patient et pour promouvoir une uniformité dans la démarche en vue d'une intervention de l'équipe SWAT. Un avantage à l'implantation de l'outil d'urgence consiste à ce que le médecin reconnaisse que l'urgence de l'orientation du patient augmente avec le nombre de facteurs de risques présents.

Il est vrai que le temps joue un rôle crucial pour les soins. Il est aussi essentiel que les soins appropriés ne soient pas seulement fournis au bon moment, mais aussi par le bon médecin.

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An Interview with **Dr. Keith Harding**:

A Demonstrated Leader in Global Wound Care

Dr. Keith Harding

INTERVIEWED BY Catherine Harley, Associate Editor, *Wound Care Canada*

Dr. Keith Harding graduated in medicine from the University of Birmingham, training in general surgery and family medicine. In 1990 he was appointed Director of the Wound Healing Research Unit within the University of Wales College of Medicine. This group has grown to 45 individuals undertaking clinical, educational and research activities in wound healing and tissue repair. In his clinical practice he sees only patients with wound-healing problems. He is currently Head of the Academic Department of Surgery, Professor of Rehabilitation Medicine (Wound Healing) at the University of Wales College of Medicine. He has authored over 250 publications and has written a number of books on wound healing. He was the first president of the European Pressure Ulcer Advisory Panel, first recorder of the European Wound Management Association and past president of the European Tissue Repair Society.

Q Why did you choose wound care to specialize in?

Defect in my character! Seriously, I was fascinated by wound healing and research when I was an undergraduate at the University of Birmingham in the 1970s. I spent my student elective looking at the effect of low-dose Heparin on wound healing and when I returned to Cardiff I was given an opportunity of being clinically involved in a wound clinic that had been set up in the hospital.

Q How long have you been involved in wound care?

Since 1977.

Q How did you go about setting up the wound-care team?

From 1977 to 1989 I and one or two other individuals were involved in providing a part-time outpatient wound clinic service. In 1989 I had a six-month sabbatical looking at wound healing set-ups in North America. When I returned to Cardiff I was given an opportunity by the University to set up an academic group in wound healing. My major objective was to make wound healing and wound care an accepted, legitimate aspect of clinical and academic work. We were the first, and remain the only, totally self-funded group within the University. There are currently 40 to 45 individuals within the team.

Q What role do you play in wound care?

I am the clinician involved in a large multidisciplinary university and teaching hospital-based group working in wound care. I am also currently the Head of the University Department of Surgery.

Q Please describe your wound team.

We are a large, multi-disciplinary group. Professor Patricia Price is the Director of the unit and deals with matters of administration and the research group, which covers the biology of wound healing, physical measurement in wound healing and health services research in wound healing. Vanessa Jones is a Senior Lecturer within the group who has developed the first diploma and master's course in the world, as well as providing a range of other educational opportunities for health-care professionals to be educated in wound care. We have, in addition, a large number of researchers and clinicians with both medical and nursing backgrounds. We also have a dedicated occupational therapist within the team. We have a large and efficient administrative team to support us as we run the group along business-like lines within a university and National Health Service hospital.

Q Who do you consider your greatest mentor in wound care?

Professor Les Hughes. The previous Head of Department at the University was a surgeon's surgeon and had research interests in subjects as diverse as breast cancer, melanoma, inflammatory bowel disease and wound healing. He

provided me with an opportunity to work in a wound clinic and stimulated an academic approach to the subject of wound healing.

Q How do you keep your team motivated?

A large stick! By convincing all members of staff that they are members of a true multidisciplinary team, with rewards, responsibilities and problems being shared by us all.

Q What is the biggest change you have seen in wound management?

The ability of a health-care professional to make a diagnosis of a cause of a wound, understand the pathophysiology and recommend sensible treatments to individual patients.

Q What do you see as the biggest challenge in wound care?

Raising the profile of the subject to get politicians, health-care professionals and patients to recognize wound care is as important a problem as cancer and heart disease in modern-day society.

Q What role have you played in wound care within Canada?

Acting as the 'warm up man' for Gary Sibbald et al at the Canadian Association of Wound Care (CAWC) meeting! In addition, for a number of years I, with the support of a commercial concern, undertook a lecture tour across Canada for a week in the fall, talking to doctors about the subject of wound care.

Q What did the practice of wound care look like in your past versus the present?

In my own hospital and university there was chaos and confusion, but now we are recognized as part of the 'wound team' within the hospital, and I have responsibility for all aspects of wound prevention and treatment in the third-largest hospital trust in the United Kingdom. In addition, the subject of wound healing is recognized within the University as being a source of good-quality research and education.

Q What is the future of wound care?

Wound care has an exciting future. It is important, however, to recognize that we need to protect ourselves from becoming an exclusive group and excluding other health-care professionals who can provide significant input to the care of individual patients.

Q Any other comments?

The CAWC and wound care in Canada has developed rapidly and impressively in recent years and Canada is one of the leading countries in the world in addressing this subject area.

Assessing & Developing

Clinical Practical Guidelines

SUBMITTED BY:
THE PUBLIC POLICY COMMITTEE

Cathy Burrows, RN, BScN;

Heather Orsted, RN, BN, ET;

Laura Teague, RN, MN, ACNP;

Rob Miller, MD;

Christine Pearson, RN;

Sharon Evashkevich, RN, BScN, ET;

Wendy Marr, BSN, RN;

Delilah Guy, RN, BN, ET;

Wayne Gulliver, MD

Tools that guide best practice are not new. In fact, "in the fourth century BC, Plato explored the difference between skills grounded in practical expertise and those based solely on following instructions or obeying rules."[2] With the evolution of technology, the 21st century has placed demands on institutions, agencies and governments to provide best practices while maintaining cost-efficiency for wound care. Moreover, clinicians strive to develop and/or adopt tools to support their practice driven by such a demand. Hence, protocols, policies, recommendations for practice and clinical guidelines have been, and continue to be, developed to offer direction to clinicians — in particular, the novice.

In many cases, the terminology and expectations of the practice documents have, unfortunately, left the clinician confused and uncertain of which one they should adopt or adapt. The AGREE Instrument quotes Lohr et al as defining clinical practice guidelines (CPGs) as "… systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances."[3] Their purpose is "to make explicit recommendations with a definite intent to influence what clinicians do."[4] This definition applies to many of the tools clinicians are adopting to shape their practice. While there is a benefit to the development and adoption of such tools, the developers must be mindful to avoid restricting the ability of clinicians to make decisions based on the patient as a person, rather than an aggregate of patients. Choudry et al[5], assert that the content of the CPGs may be influenced by the authors, and the authors need to strive to avoid or declare conflict of interest. Editorial independence in regard to tools that influence practice needs to be maintained.

Backgrounder

Wound care has rapidly become a clinical practice area that has witnessed the non-stop addition of new wound care modalities, thus advancing wound care practices in Canada. With this comes a flurry of clinicians seeking information on tools that guide best practice. At the CAWC national meetings in Vancouver BC, 2002, the Public Policy Committee (PPC) surveyed its members regarding their expectations of this committee (the results can be viewed at www.cawc.net/open/library/public-policy/survey2002.html). The PPC decided that one of its mandates would be to provide clinicians, policy-makers and governments with an instrument that would enable them to critically appraise/evaluate tools that guide best practice, allowing for flexibility at the local, regional and national levels. The Appraisal of Guidelines for Research & Evaluation (AGREE) Instrument was chosen because of its generic methodology that, "… assesses whether developers have minimized the biases in creating guidelines and addressed the requirements for effective implementation."[1] According to Orsted et al[2], when referring to an evaluation tool, it is important that "… the tool looks at rigor of development, content and context, application and a final global assessment." This article will discuss the AGREE instrument and its format.

The AGREE Instrument

The purpose of the AGREE Instrument is to provide a framework to assist in the development of new clinical guidelines, appraising existing guidelines, or revising existing guidelines by local, regional, national or international groups or affiliated governmental organizations. The AGREE Instrument is a generic instrument intended for the following groups:

- **Policy makers:** "to help them decide which guidelines could be recommended for use in practice"
- **Guideline developers:** "to follow a structured and rigorous development methodology and as a self-assessment tool to ensure that their guidelines are sound"
- **Health-care providers:** to conduct "their own evaluation prior to adopting the recommendations"
- **Educators or teachers:** "to help enhance critical appraisal skills among health professionals"[1]

Instructions for Using the AGREE Instrument

The structure and content of the AGREE Instrument "consists of 23 key items organized in six domains. Each domain is intended to capture a separate dimension of guideline quality."[1] The AGREE document lists the following domains with their key items:

- **Scope and Purpose** (items 1–3) is concerned with the overall aim of the guideline, the specific clinical questions and the target patient population.
- **Stakeholder Involvement** (items 4–7) focuses on the extent to which the guideline represents the views of its intended users.
- **Rigour of Development** (items 8–14) relates to the process used to gather and synthesize the evidence, and the methods to formulate the recommendations and to update them.
- **Clarity and Presentation** (items 15–18) deals with the language and format of the guideline.
- **Applicability** (items 19–21) pertains to the likely organizational, behavioural and cost implications of applying the guideline.
- **Editorial Independence** (items 22–23) is concerned with the independence of the recommendations and acknowledgement of possible conflicts of interest from the guideline development group.

The AGREE document makes the following recommendations:

- **Documentation:** "Appraisers should attempt to identify all information about the guideline development process prior to appraisal…. It is recommended that appraisers read the guideline and its accompanying documentation fully before starting the appraisal."
- **Number of Appraisers:** A minimum of two appraisers, and preferably four, is recommended for effective assessment of the protocol.

The AGREE Instrument can be viewed at www.agreecollaboration.org.

- **Response Scale:** Appraisers should use the response scale for each domain. Items are rated on a four-point scale ranging from 4 – "Strongly Agree" to 1 – "Strongly Disagree," with two mid points: 3 – "Agree" and 2 – "Disagree."
- **User Guide:** Appraisers should make use of the provided User Guide to better "understand the issue and concepts addressed by the item."
- **Comments:** The comments area next to each item should be used to explain the reasoning behind responses.
- **Calculating Domain Scores:** The formula for calculating the scores for each domain is provided. The six domain scores are independent and should not be combined into a single score.

A section for overall assessment is included at the end of the instrument. This contains a series of options: "Strongly recommend," "Recommend (with provisos or alterations)," "Would not recommend" and "Unsure." This overall assessment requires the appraiser to make an overall judgement as to the quality of the guideline, taking each of the appraisal criteria into account.

The AGREE Instrument is a tool to assist clinicians, policy-makers and governments to systematically develop or evaluate guidelines or tools used to support and guide practice. Reliability, validity and ease of use of the AGREE Instrument were demonstrated at the first PPC tutorial. Initially, it required approximately two hours to complete the AGREE Instrument on designated clinical practice guidelines, and the second tutorial lasted one hour. This demonstrated that the AGREE Instrument is user-friendly.

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Wound Care Reimbursement

Focus on: The Alberta Aids to Daily Living (AADL) Program

Description

The AADL Program assists in providing authorized basic medical equipment and supplies to people with a chronic disability or illness and those who are terminally ill. The objective is to assist individuals to "function more independently in their home or in a home-like environment" (see chart).

Eligibility

AADL clients must:

- have a long-term disability lasting six months or more, a chronic illness or a terminal illness
- be an Alberta resident
- have a valid Alberta Personal Health Care Number

AADL Basic Medical Equipment and Supplies Pertinent to Wound Care

Back supports	Injection supplies *
Bathing and toileting equipment	Patient lifters
Catheter supplies	Mastectomy prostheses**
Compression garments	Ostomy supplies
Custom-made footwear	Oxygen
Dressing supplies	Orthotic braces**
Electro-larynx	Prosthetic devices**
Hearing aids (under 18 & over 65 years)	Respiratory equipment
Hospital beds	Specialized seating devices
Incontinence supplies	Wheelchair cushions
Walkers	Wheelchairs (manual and power)

* Not provided for insulin injections.
** Provided through Alberta Blue Cross for Seniors Program, for people age 65 years and over.

The Process

The individual must contact the regional health authority's home-care program to make arrangements to see an AADL authorizer. The authorizer will assess the needs of individuals and their eligibility for AADL benefits. The AADL authorizer may be a nurse, physical therapist, occupational therapist, respiratory therapist, audiologist, speech pathologist or other health-care professional who works in a community health-care centre, a hospital, a continuing-care centre or a home-care program.

If an individual has purchased equipment and supplies prior to being authorized for the AADL, they will not receive reimbursement. An AADL authorizer must assess patient needs and eligibility for AADL benefits before equipment and supplies are received. The authorized medical equipment must be purchased through an approved AADL vendor. Authorizers can provide vendor names or vendor names can be obtained by contacting AADL at 780-427-0731.

AADL Contact Information

For more information, contact client services at the AADL office in Edmonton – **Alberta Aids To Daily Living,** Seventh Street Plaza, 10030 – 107 Street, Edmonton, AB T5J 3E4. Tel: 780-427-0731. Outside Edmonton, dial Information at 310-0000 and ask the operator for 780-427-0731.

The information in this article was sourced from the Government of Alberta Web site at www.health.gov.ab.ca/coverage/benefits/aadl.html.

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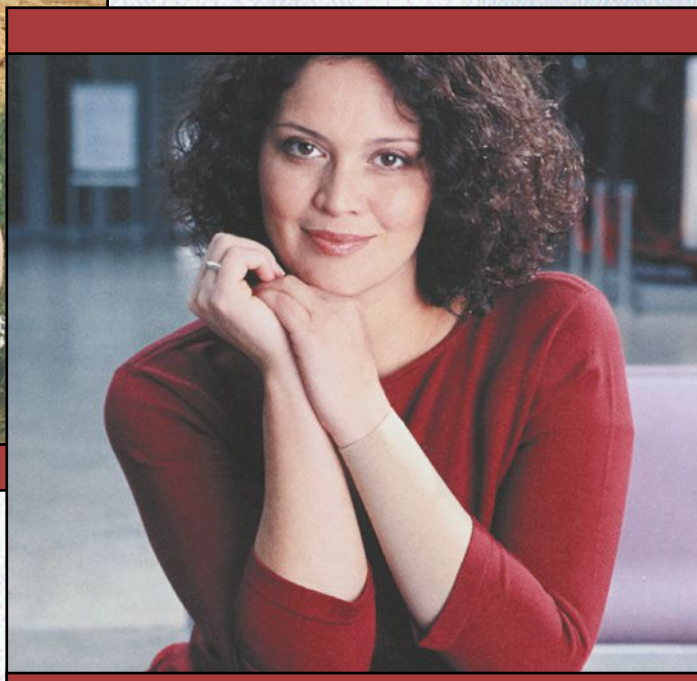

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Web Connect

Overview of Wound Care Education in Canada

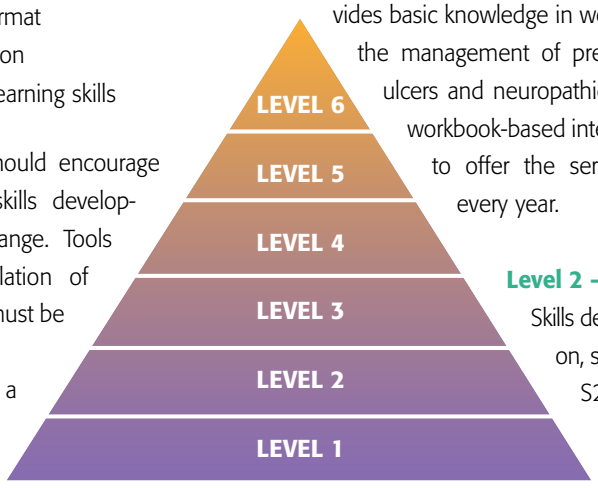
BY David H. Keast

Formalized education for wound care clinicians in Canada is in its infancy. Wound caring is a complex activity that requires the co-ordinated skills of many disciplines. While discipline-specific education has been present to some extent in some medical subspecialties and in nursing, specifically for enterostomal therapists, interdisciplinary education is novel not only for wound care but also in other areas of health care. The Canadian Association of Wound Care (CAWC) supports and encourages this approach. All continuing health educational activities should conform to the principles of adult learning. These include:

- Recognition and valuing of existing funds of knowledge and experience
- A representative planning group
- Prior needs assessment
- Clearly defined educational objectives
- Participatory learning format
- Opportunity for evaluation
- Promotion of life-long learning skills

Educational objectives should encourage knowledge acquisition, skills development and attitudinal change. Tools that facilitate the translation of knowledge into practice must be included in any activity.

The pyramid shows a conceptual model for wound care education first proposed by Dr. Gary Sibbald. As one advances up the pyramid, the level of knowledge and skills becomes more complex. A description of the levels follows with current activities.



Level 1 – Traditional Knowledge-based Courses

This level represents the traditional knowledge-based courses. These may be as simple as local in-service education in an institution or may occur on a regional or national level and are usually offered to large groups.

The national conference of the CAWC has provided education for wound-care clinicians from novice to expert for nine years. Industry has also sponsored many knowledge-based courses for their customers. Many of these courses have received continuing medical education (CME) accreditation. To supplement this, the Education Committee of the CAWC developed the Seminar Series (S1, S2 and S3). The S1 course provides basic knowledge in wound bed preparation and the management of pressure ulcers, venous leg ulcers and neuropathic diabetic foot ulcers in a workbook-based interactive format. The goal is to offer the series regionally in Canada every year.

Level 2 – Skills Development

Skills development requires hands-on, small-group workshops. The S2 course offered by the CAWC provides exposure to debridement, lower

David H. Keast, MSc, MD, FCFP, is at Parkwood Hospital, St. Joseph's Health Care, London, Ontario. He is Chair of the Education Committee of the CAWC.

limb assessment and compression therapy skills. The S1 and S2 courses have now been offered in Toronto and Vancouver, and more are planned for other regions of the country. Actual skills practice must occur under the guidance of an experienced clinician and within the scope of practice and institutional policies of the learner. Many agencies or institutions have developed specific skills training for their employees.

Level 3 – Preceptorship, Self-directed Learning, Mentoring

The next level links knowledge and skills to practice. This may take the form of problem – or case-based-learning, observerships or mentoring. The S3 component of the CAWC S-series is currently under development. This will take the form of a self-directed learning workbook and resources to aid in the completion of individual learning goals. A one-day problem-based course with a practice-reflective exercise for family physicians has been developed and has received CME credits. Industry also sponsors preceptorships with expert clinicians or teams.

> *"Tools that facilitate the translation of knowledge into practice must be included in any educational activity."*

Level 4 – Certificate Courses

The eight-month International Interdisciplinary Wound Care Course (IIWCC) offered through the University of Toronto utilizes residential weekends and self-learning modules to develop critical appraisal skills and advanced clinical knowledge. The selective component links knowledge to the learner's practice. This course is for expert clinicians and is designed to create wound-care opinion leaders through intensive education.

Other certificate courses are offered through community colleges or privately. Few of these offer the intensity of the IIWCC.

Level 5 – Postgraduate Level Courses

A Masters of Health Science in wound care is under development at the University of Toronto, which will link to the IIWCC with the option of continuing up the educational ladder to the broader and more comprehensive expertise required by an opinion leader. Candidates would not only acquire discipline-specific advanced knowledge but also pursue skills in adult education, epidemiology or research and health promotion.

Level 6 – Expert Panel (Knowledge Translation)

As a guide for the educational activities, an expert panel (international, national, and regional) would help interpret the evidence base. Part of this process may include formalized guideline evaluation, educational research and evaluation of health-care professional behavior and patient outcomes.

The last level of the pyramid will link with several groups of experts:

- The World Union of Wound Healing Societies Education Committee
- The Canadian Association of Wound Care Board of Directors
- The International Interdisciplinary Wound Care Course Faculty
- The Registered Nurses Association of Ontario Best Practice Advisory Board

These groups could review guidelines and help establish education activities at all levels based on selected curriculum, as well as foster education and patient-care outcome research.

Web Connect Please visit www.cawc.net for more in-depth information about educational opportunities in Canada and around the world.

The Extent of Chronic Wounds in Canada

SPONSORED BY A RESEARCH GRANT FROM THE CAWC

BY
Pamela E. Houghton
AND

M. Gail Woodbury

Many of us who work in wound care appreciate how much the lives of individual Canadians are disrupted by caring for their wounds or by pain, and by the costs associated with treating these wounds. While the management of chronic wounds is often a passion for many wound-care specialists, in reality, the majority of Canadians are unaware of the problem and most health-care professionals place little emphasis on identifying and treating skin ulcers.

For wound-care specialists the number of individuals seeking our services is ever-expanding, leading some to suggest that chronic wounds are relatively common health-care concerns and that the problem is growing. In fact, there is little information available about the number of individuals in Canada who have chronic wounds. We currently do not have national estimates for the prevalence and incidence of different types of common wounds in various health-care settings in regions across Canada. Without this information we cannot even begin to estimate the costs to the Canadian health-care system associated with managing chronic wounds.

Chronic wounds are not nationally recognized as an important health-care problem. Currently, there is little national or provincial funding to provide co-ordinated health-care delivery programs for the prevention and management of chronic wounds or to promote the development of educational programs for health-care professionals. Furthermore, nationally funded grants to support research programs directed toward identifying the underlying cause of chronic wounds and establishing new interventions and innovative health-care delivery models are few and far between. We feel that in order to focus national attention and resources on this serious and growing health-care problem we must raise national awareness about chronic wounds. To do so, it is absolutely essential to gather facts and statistical data that describe the extent of the problem in Canada, so that they may be used when lobbying health-care administrators and relevant government officials and for informing the general Canadian population.

Prevalence: The proportion of a group that has a wound (count patients not ulcers) at a given time; which may be a single point in time or a time period during which the cases are counted. The number of patients with wounds and the size of the group assessed could be provided.

Incidence: The proportion of a group initially free of ulcers that develop them during a specified period of study (e.g., a three-month period). The number of patients with new wounds and the size of the group assessed could be provided.

Recently, the National Pressure Ulcer Advisory Panel (NPUAP) in the U.S. published a report that described the prevalence of pressure ulcers in the U.S[1]. This exercise involved a 10-member panel and took over two years to complete. In Canada, many national organizations that support other common disease conditions such as diabetes, cardiovascular disease and cancer have invested enormously in both human and financial resources toward the development and maintenance of large national registries. Clearly, to gather this information is no small task. It takes years to organize, collect and collate the data.

Given the size of the task we felt it an important first step to design a project to systematically search and identify existing research data on the prevalence and incidence of chronic wounds in Canada. Specifically, the

goal of this project was to determine what current information is available on the extent — i.e., the prevalence and incidence — of each of the types of non-healing skin ulcers (pressure sores, diabetic foot ulcers, venous leg ulcers and other common types of chronic wounds) in different health-care settings (acute care, chronic care, long-term care, community) in all regions across Canada.

We presented this idea to the CAWC board in January of the year and were delighted that they elected to sponsor this project by providing an unrestricted research grant and by promoting this research project to its membership and corporate sponsors.

Since taking on this project in January 2003, we have been very active, searching for existing data in several sources. To begin, we performed a systematic search of all peer-reviewed published studies that included information about the prevalence or incidence of chronic wounds in Canada. In addition, an exhaustive search of unpublished sources of Canadian studies on this subject has also been performed. Some of you may have heard from us directly as we followed up with authors who had presented their data at previous CAWC and other wound-care conferences. Others were gracious enough to respond to our request for information through members of the CAWC board of directors or via the CAWC Web site. We thank you all for your overwhelming response!

The goal of this project was to determine what current information is available on the extent of each of the types of non-healing skin ulcers.

From these published and unpublished studies that we have gathered and reviewed to date we have found, in general, that estimates of the prevalence and incidence of chronic wounds in local facilities and regions are quite variable and that vastly different research methodology and definitions have been employed. To address this we have employed an objective and systematic review of the data in which methodologies employed in each study have been critically appraised using previously established criteria[2]. This objective approach will allow us to select which data to include in our analysis and decide how and when data can be collated and compared.

In addition to searching the traditional literature sources for research data, numerous Web sites were searched and contacted. Our most exciting result of these efforts is a request being made to the Canadian Institute for Health Information (CIHI) for Minimum Data Set (MDS) data. The MDS data are collected in all the chronic-care facilities and are sent to CIHI. The data are collected by the facilities to determine 'quality indicators' (QIs), which are used for clinical and policy decision-making purposes. Ontario is the first province to mandate collection and there are 140 facilities in this jurisdiction; this provides a unique opportunity to use this recently developed large data set for research purposes. If our request to CIHI is successful, we will complete a secondary data analysis of individual record data to ascertain the prevalence and incidence of pressure ulcers and 'stasis ulcers' and determine what, and if, information can be gleaned from the MDS data about diabetic foot ulcers.

We are very excited about the links we have made with several wound-care companies that have conducted numerous and extensive prevalence and incidence studies on all types of chronic wounds in various types of facilities right across Canada. For example, one company has amassed aggregate data about the number of pressure ulcers that existed from 1997 to 2002 in 58 acute-care facilities located across Canada and numerous long-term facilities across Ontario. We are grateful that one of three companies that have gathered information in this area (KCI Medical Canada, Inc.) is expending great efforts to reach out to their individual consumers to address the proprietary and confidentiality issues so that they will be able to share the information with us.

While we have been pleasantly surprised with the amount and regional distribution of data available about the extent of chronic wounds in Canada, we fully expect that there will be many pieces of information that are lacking and much work that has yet to be done. Through identifying these gaps in our knowledge we hope to provide direction for much-

Continued on page 48

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The Mexican Challenge

Dr. Lira writes about his clinic and the obstacles he and his colleagues face in the prevention and treatment of wounds.

BY
Luis Fernando Lira

About the Clinic

The HELP clinic is located in the City of Monterrey, in the State of New León, with a population of five million inhabitants. Approximately 450,000 are diabetic. Nine thousand new cases of diabetic foot ulcers are diagnosed every year.

HELP is five years old. It receives ambulatory patients with acute and chronic wounds. Therapy is done on an out-patient basis.

Between May 1999 and May 2003 the health-care professionals of the clinic treated 2,250 patients, primarily for venous ulcers (55%) and diabetic foot ulcers (40%). Other wounds accounted for about 5% of the patients treated.

Patients entering the clinic require a range of treatments, from preventative consultation for lesions to treatment of serious problems that require tertiary resolutions including the surgical procedures of debridement and amputation. In cases of ulcers due to diabetic neuropathy, the average rate for the salvage of extremities is 93%. The cases of ischemic ulcers are variable, from lesions smaller than 2 cm to wounds larger than 15 cm. Digital amputation (one or more digits) is required in 40% of the cases, and partial amputation of the foot in 8% of the cases. In relation to the cases of venous ulcers, the rate of healing of lesions is approximately 96% in less than 12 weeks; the remaining 4% heal within six months of treatment.

Because the number of patients requiring amputations has been reduced at our facilities, the impact of this program in our local population has been very favorable. However, at the state, regional and national levels improvement is needed as there continues to be unnecessary amputations of extremities.

Obstacles

- In Mexico, the culture of the prevention of illness doesn't exist as it does in developed countries; there is no national program of education on the prevention of chronic wounds.
- A significant problem is the lack of reliable statistical data on prevalence; usable patient data are not collected upon registration in hospital and records of treatment and follow-up are not accessible.
- No more than 20 specialized clinics exist in all of Mexico. The HELP clinic was the first one in the country.

The CAWC-Mexico Connection

The CAWC can support Mexican health-care workers in the following ways:

- Provide training for medical personnel; offer a wide range of specific educational programs from basic wound-care practices to diverse specialties.
- Provide a model for the treatment of chronic wounds that could be adapted to the Mexican environment.
- Share established guidelines and protocols for use by health-care professionals diagnosing and treating chronic wounds.

Dr. Luis Fernando Lira is General Surgeon, Plastic Surgeon, and Director of HELP (Wounded Free of Problems INC) of CV, Monterrey, Mexico

Web Connect

For background information on the state of diabetes in Mexico, visit the CAWC Web site at www.cawc.net and click on *Wound Care Canada*.

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Le soin des plaies

PAR Yvette Moulin

Yvette Moulin, inf., M.Sc, travaille aux services courants dans un CLSC de la banlieue de Montréal, après avoir exercé en chirurgie, en soins de longue durée, à l'urgence, en santé du travail, en santé scolaire et aux soins à domicile. En 1999, elle a suivi la première formation interdisciplinaire et internationale en soin de plaies, donnée à L'Université de Toronto, en collaboration avec les universités Johns Hopkins de Baltimore (É.-U.) et Cardiff de Wales (G.-B.). Elle s'intéresse au soin des plaies depuis plus de cinq ans.

Oeuvrant dans le domaine de la santé communautaire, j'étais profondément touchée par les besoins des personnes sous mes soins. L'accroissement de la complexité dans le soin des plaies, la disparité dans les pratiques et le manque de support clinique furent des éléments déclencheurs pour ma réflexion. Je me retrouvais confrontée à deux dilemmes. Devrais-je poursuivre dans ce champ d'intervention ou m'orienter autrement ? Devrais-je n'exécuter que les soins prescrits alors que ma clientèle en demandait plus ou parfaire mes connaissances dans un but d'optimisation de la cicatrisation tout en concourant à l'amélioration de la qualité de vie de cette clientèle ?

C'est ainsi que je me suis inscrite, en 1997, à un premier cours portant sur le soin des plaies, offert par l'Université de Sherbrooke. En 1999-2000, j'ai suivi une seconde formation à l'Université de Toronto intitulée International Interdisciplinary Wound Care Course. Dans cette dernière formation, le dixième module consistait en un travail sélectif défini par un contrat d'apprentissage.

Le but de mon contrat était de produire un travail sur le processus de cicatrisation en vue d'une publication potentielle. Je désirais, à ce moment, partager l'acquisition de mes connaissances avec les infirmières de la province de Québec. Forte de l'encouragement des docteurs Diane Krasner et Gary Sibbald lors de mon évaluation pour le travail produit, j'ai alors fait une proposition à l'équipe de rédaction de la revue officielle de mon ordre professionnel, l'Ordre des infirmières et infirmiers du Québec (OIIQ).

La longueur de ma production écrite dépassant les exigences requises pour une publication, la rédactrice en chef me proposa de scinder le texte en six parties pour en faire une série d'articles. Une parution bimestrielle était prévue à partir du mois de septembre 2001 pour se terminer en août 2002.

Les six articles furent donc publiés selon cette proposition.

- Le premier, ***Comprendre le processus de cicatrisation***, traite du processus biologique de la cicatrisation et des avantages de cette dernière en milieu humide contrôlé.
- Le second, ***Survol sur la classification des plaies***, aborde la classification des plaies à titre d'outil précieux de communication entre les différents intervenants dans la pratique clinique.
- Le troisième, ***Les facteurs nuisibles à la cicatrisation***, explique les principaux facteurs susceptibles de nuire à la cicatrisation d'une plaie.
- Le quatrième, ***Cicatrisation anormale et complications cutanées***, met l'emphase sur les complications infectieuses, inflammatoires, dégénératives, traumatiques, néoplasiques et prolifératives.
- Le cinquième, ***Les pansements***, décrit les principales classes de pansements et les règles de base pour effectuer un choix judicieux.
- Le sixième, ***Les pansements bioactifs***, survole le sujet des facteurs de croissance et des substituts cutanés en tant que traitement de plaies rebelles.

Les principaux messages véhiculés dans ces articles visent une meilleure qualité de soins et de vie pour le patient. Ils sous-tendent entre autres:

- La connaissance de l'état de santé du patient et de l'évolution de sa plaie, normale ou anormale.
- La participation active du patient (et/ou de ses aidants naturels) au traitement de sa plaie (autosoins) et sa collaboration pour signaler toute anomalie ou symptôme pouvant entraver le processus de cicatrisation.
- Une communication efficace entre les intervenants de l'équipe multi ou interdisciplinaire.

Intéressés par cette série sur le soin des plaies, les membres du Conseil des infirmières et infirmiers du Québec ont recommandé qu'un tiré à part des six articles soit publié. Le Comité de rédac-

Suite à la page 48

For the complete article in English, please visit the CAWC Web site at www.cawc.net and click on *Wound Care Canada*.

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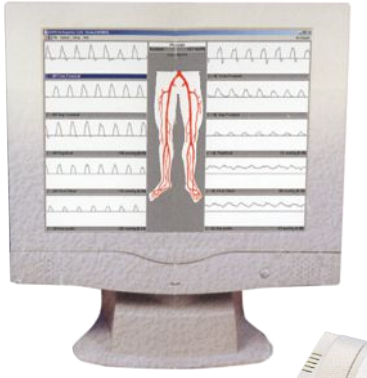

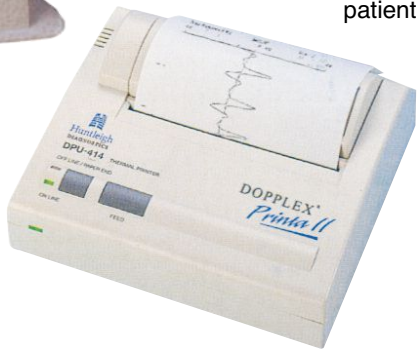

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Development of a Wound/Skin Program

A Model for Wound Caring in the Central East Region of Newfoundland

BY
Delilah Guy

The development of a wound/skin-care program can be a challenging process that requires strong co-operative, collaborative and communicative efforts among team members — from administrators, nurses, doctors, the rehabilitation disciplines to home support and, most especially, patients with wounds.

This article illustrates how the Central East Region of Newfoundland has faced the challenges and changes in wound caring and effectively adopted current evidence-based and best practices in wound care.

Background

The Central East Health Care Institutions Board in Newfoundland was founded in 1994 and covers six facilities with acute and long-term-care settings that provide a range of services across the region. James Paton Memorial Hospital (located in Gander) is the regional referral centre. With a population of about 12,000, Gander serves a catchment population of 53,000 for primary care and 117,000 for specialized services in ophthalmology and orthopedics. The hospital has a rated capacity of 92 beds, with an occupancy level of 90%.

James Paton Memorial Hospital.

The Regional Wound/Skin Care Committee was formed in 1995, with a chair and six members. Amalgamation of services across the region resulted in better representation and an increased number of members. Over time, sub-committees for product evaluation, support surfaces and policy-making emerged, and a vascular surgeon joined the team. The committee identified and prioritized such issues as increase of services, duplication of wound/skin-care products, complicated and compromised wounds, aging population and inconsistent wound-care management across the region in acute, long-term and home-care settings.

One Person Can Make a Difference

My consistent attendance at the CAWC and CAET conferences has allowed me to share relevant information about current trends in wound care with my colleagues. As a result, information on best practices has been shared and adopted throughout the region. Becoming an ET Nurse in 1999 greatly increased my involvement in wound care, and I became the Chair of the Regional Wound/Skin Care Committee and Resource Nurse in 2000.

What Is Our Concept?

We use a comprehensive, patient-centred approach to guide our efforts in wound caring. To meet the needs of a patient with a wound, a collaborative, communicative, co-operative and multidisciplinary team approach is encouraged in all acute, long-term and home-care settings. Each discipline has roles and responsibilities. Overall, an effective treatment plan is devised and implemented with a best-designed, best-planned and best-assigned approach to which each of the team members adheres. Compliance to the specialized

Delilah Guy, RN, BN, ET, is the Chair of the Regional Wound/Skin Care Committee of the Central East Health Care Institutions Board in Newfoundland. She is the Patient Educator and Discharge Planner, Surgical Floor, James Paton Memorial Hospital. She has been honoured by the CAWC for her contributions to wound caring in Canada.

treatment protocol is encouraged for both the patient and the health-care provider. In this model, nurses become more directive and decisive, resulting in a more nurse-driven process, and there is a strong and consistent link regarding wound caring within the community-care setting.

To ensure this approach remains effective, we promote empowerment through education. Through continual educational upgrading and the following of the principles of wound care based on research and best practices, our wound/skin-care management and intervention have changed significantly. We believe in the strategy that education of a patient, caregiver and health-care provider is the key to a proactive program of prevention and timely and appropriate interventions.

We make sure we are constantly exposed to different trends in wound-care management and best practices by participating in research, case studies, poster presentations and product evaluation. Due to innovation and the high-tech health care we provide, we consider ourselves to be advanced wound carers. We have turned to both science and art to guide us in caring for our patients with wounds. We consistently demonstrate a commitment to our patients, their families and health-care providers, and are bound to a high standard of practice.

Regional Wound/Skin Care Committee. From left to right. **Sitting:** Goldie Bath, Nurse Manager; Delilah Guy, Chair; Madeline Adams, Team Leader; Edith Norman, Staff Educator. **Standing:** Wanda Curlew, Team Leader; Joan Stoyles, Dietitian; Karen Bennett, Occupational Therapist; Eydie Parsons, Nurse Manager; Shirley Nolan, Supervisor, Long-term Care; Dr. John Haggie, General-Vascular Surgeon; Marlyce Green, Facility Manager, Long-term Care. **Absent:** Faye Best, Surgical Team Leader; Arlene Martin, CCU/ICU Team Leader; Nancy Wright, Continuing Wound Care Nurse; Brenda Howell, Nurse Manager, Long-term Care.

What Have We Accomplished?

As the governing body, we have made great changes in wound caring in our region. The following are the highlights:

As a team, we have turned to both science and art to guide us in caring for our patients with wounds.

- Adaptation of the regional wound/skin-care manual
- Creation of the regional poster aimed as a guide for wound/skin-care management
- Regional standardization of categorized products for cost effectiveness
- Regional standardization of wound support surfaces and appropriate mattresses for wound prevention
- Purchase of specialized beds for compromised sites (ICU/palliative orthopedics units) for wound prevention as well as accessibility and availability of wound carts to all units to save nurses time and effort
- Consistent educational development in the area of wound care for RNs and LPNs
- Creation of a regional computerized wound/skin tool guide for consistent assessment and documentation
- Policy on Photography 2002 for accurate wound assessment and documentation
- Policy on Skin Breakdown Prevention, Braden Scale by Computer 2003 for prevention and intervention
- Regional Prevalence Study 2002 (first in Newfoundland) for quality assurance and Pressure Ulcer Prevention (Study results: Acute care: 4.9% compared with AHCPR of 9.2%; Long-term care: 4.2% compared with AHCPR between 9% and 23%)

Summary

The changes we have made in wound care throughout our region have had a significant positive impact on our patients with wounds. As a team, we will continue to be committed to helping patients with wounds by optimizing the healing process, using a consistent, current, co-operative and co-ordinated patient-centred approach.

The advancements in wound care in our region have made us all very proud of our accomplishments. We are hopeful that our story can serve as an inspiration to others.

The RNAO's Evolution of a Best Practice Guid for Venous Leg Ulc

BY
Patricia Coutts

Patricia Coutts is a Registered Nurse with a background in psychiatry, medicine, surgery and family practice. She is a graduate of the University of Toronto's International Interdisciplinary Wound Care Course. She has worked for the past six years as a Wound Care Specialist and Clinical Trials Co-ordinator in a private practice in Mississauga, Ontario.

In 1999 the Centre for Professional Development of the Registered Nurses Association of Ontario (RNAO) had funding allocated from the provincial Ministry of Health and Long Term Care. It was decided that best practice guidelines for nursing practice that would include venous ulcer management were to be developed using the funding. The first cycle developed a total of 11 best practice guidelines (BPG). The second cycle developed seven guidelines, and the third cycle developed a further six guidelines. The venous leg ulcer guideline was developed within this third cycle. From the work that had previously been done on pressure ulcer guidelines, the development of the venous leg ulcer guideline was a natural evolution in the continuum of the development of guidelines for chronic wound care.

Each of the BPG committees consisted of eight to 10 members who were recognized as experts in their field within the nursing community from across the province of Ontario. The panel members also represented different sectors of the nursing community with particular areas of expertise.

The Venous Leg Ulcer Best Practice Guideline panel consisted of community-based nurses, enterostomal therapists and personnel from private practice, long-term care and acute care. These nurses were asked to participate on this development panel by the RNAO project team co-ordinators. Their names were gathered from the recommendations of their peers within the professional organization.

The process of development began with a 'development launch retreat' where the members of the panel were able to meet face-to-face for an orientation and introduction to each other. The calendar for meeting dates and

Steps in Developing the Guideline

1. Allocate funding
2. Organize multidisciplinary panel of experts
3. Conduct a developmental launch retreat
4. Search literature for existing guidelines
5. Evaluate existing guidelines
6. Short-list existing guidelines
7. Determine headings for new guidelines
8. Break into small groups to work on individual headings
9. Conduct panel review of new recommendations
10. Refine first draft
11. Involve other stakeholders
12. Run pilot based on revised draft guidelines
13. Evaluate pilot implementation
14. Revise guidelines based on pilot evaluation
15. Communicate final guidelines to potential users

eline ers

The Venous Ulcer Best Practice Guideline may be accessed through the Registered Nurses Association of Ontario's Web site at www.rnao.org.

the type of meeting — such as face-to-face or conference call — was determined.

A literature search was conducted for existing venous ulcer guidelines as well as articles related to venous leg ulcers. Eight existing guidelines on venous leg ulcers were chosen for critical appraisal using the appraisal instrument for the Canadian Clinical Practice Guidelines[1]. An orientation for the use of this tool was given to the panel members who individually rated the selected guidelines using this appraisal process.

The data collected from this process were then analyzed, and recommendations concerning the use of the assessed guidelines were given to the panel.

Through this appraisal process, the existing venous ulcer guidelines were narrowed down to three. These three guidelines would form the foundation for the BPG that the panel would go on to develop.

We then determined the layout of the headings for the venous ulcer guideline. The panel then broke into smaller working groups to concentrate on one or more of these headings. The recommendations were brought back to the panel as a whole, and a process of consensus took place to determine which recommendations would be included.

A first draft was circulated to the committee for comment. As the drafts evolved, the venous ulcer guideline began to come together. As this process occurred, a list of stakeholders covering all areas of health care, including the patient, was developed. These stakeholders were then asked to comment on the content of the guideline, and their responses were incorporated into the final document.

After many teleconferences, e-mails, face-to-face meetings and drafts, the Venous Leg Ulcer Best Practice Guideline was ready to be implemented through a pilot project. The pilot implementation phase was completed this summer, and followed by an evaluation process and a panel review of any new literature, the gathering of feedback from the implementation phase and the results of the evaluation.

Once the evaluation process has been completed and the venous leg ulcer guideline is published, nurses and other health-care providers will be able to access it through the RNAO Web site at www.rnao.org. It is hoped that the guideline, which has been developed using a strong evidence base and expert opinion with a multidisciplinary team approach will improve and standardize the care a patient with a venous leg ulcer receives, whether they live in a remote or populated area of the province. Its accessibility will allow this venous ulcer guideline to be implemented by health-care providers across Canada.

Reference

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Articles of Interest
Literature Review

Reviewers

Dr. Shane Inlow reviews two articles on the treatment of diabetic peripheral neuropathy.

Dr. David Keast and **Heather Orsted** review articles on wound infection.

Static Magnetic Therapy for Symptomatic Diabetic Neuropathy: A Randomized, Double-Blind, Placebo-Controlled Trial

Author: Weintraub MI, Wolfe GI, Barohn RA, Cole SP, Parry GJ, Hayat G, Cohen JA, Page JC, Bromberg MB, Schwartz SL, the Magnetic Research Group

Publication: *Arch Phys Med Rehabil.* 2003;84:736-46

Reviewer: Shane Inlow, MD

This is the first scientific study exploring the therapeutic use of insole magnets in medicine. Dr. Weintraub, a neurologist, organized a randomized, double-blind study in 48 centres involving 375 diabetic patients. The objective of this study was to determine if static insole magnets can reduce the painful symptoms of diabetic peripheral neuropathy (DPN).

The article starts with an excellent review of the pathophysiology of DPN. A review of the oral medications currently used show them to have disappointing results, with significant side effects.

Next is a detailed description of the methods of enrolment, randomization, materials, outcomes and statistical analysis. Important to note is that the insoles used are 450 gausse in strength, with a triangle pattern of continuous magnetic poles in every direction, sold under the brand name Magsteps by Nikken Inc. Outcome measures were both subjectively (up to 3x/day) and objectively followed weekly with neurologic exam and three different electrophysiological tests, including nerve conduction velocities.

The results show statistically significant reduction in neuropathic pain in DPN, most pronounced in the third and fourth month. Discussion covers various methods of possible influence by the static magnetic fields. The anti-nociceptive effect was the most significant, but several other mechanisms of action are theorized. Further studies involving epidermal nerve fibre biopsy are needed to confirm the mode of action.

The present study provides convincing data confirming that the constant wearing of static magnetic insoles produces statistically significant reduction of neuropathic pain after two months. The results are comparable or superior to those observed with various conventional drugs, with the advantage of being non-invasive, less expensive and with no side effects.

The 10^5 Bacterial Growth Guideline: Reassessing its Clinical Relevance in Wound Healing

Author: Bowler PG

Publication: *Ostomy/Wound Management* 2003;49(1):44-53

Reviewer: Heather Orsted, RN, BN, ET, Clinical Specialist: Skin and Wound Management

The hot topic at wound conferences currently is wound bioburden — and why not?

"In war, you must know your enemy because in knowledge there is power. You can only defeat your enemy if you know how and why he acts as he does." — *Author unknown*

Phil Bowler, through this article, explores the nature of bacteria and their reaction (both helpful and harmful) with their environment. He describes the symbiotic relationship that bacteria have with the body (skin, mouth and gut) and then demonstrates how the relationship changes as the bacteria are introduced into a new ecosystem, the wound.

The complex challenge of bioburden management is reviewed through discussions revolving

around microbial virulence factors (isolates, numbers, synergies and increased pathogenicity), location (superficial or deep), host response (in chronic and acute wounds), diagnosis of infection (clinical signs and symptoms, sampling and analysis) and treatment methods based on both clinical and microbiological findings. Bowler encourages the reader to be aware of the "Microbial Continuum," which follows the microbial progression to wound infection through a series of stages that reflect on host control vs. microbial control. Through the use of figures and a clinically applicable discussion, this article provides an informative and excellent resource for the wound-care clinician.

Preventing Foot Ulceration and Amputation by Decompressing Peripheral Nerves in Patients with Diabetic Neuropathy

Author: Dellon AL

Publication:
Ostomy/Wound Management. 2002;48(9):36-45

Reviewer: Shane Inlow, MD

The article starts with a comprehensive review of the pathophysiology of peripheral nerve compression in people with diabetes (PWD). The treatments for neuropathy are reviewed, acknowledging the poor outcomes and frequent side effects of current medications. Selection of patients for surgical decompression is then discussed. While the monofilament #5.07 is useful in identifying the loss of protective sensation, by the time the monofilament test is positive, axonal loss is severe and most often past the point of successful surgical intervention. The author uses the Pressure-Specific Sensory Device (PSSD), which measures two-point discrimination and can identify the earliest degree of chronic nerve compression.

But what if you don't have access to a PSSD? In the author's opinion, "The most valid prognostic indication for a good result from decompression of a nerve in the person with diabetes with symptoms of neuropathy is the presence of a positive Tinel's sign."

The results of surgical decompression of peripheral nerves in carefully selected people with diabetes is then discussed. The author reports that, on average, pain was "relieved in 86% of patients, and 72% recovered useful two-point discrimination." Of great interest is that, of the 43 patients currently in this ongoing study, none has developed an ulcer or amputation on the surgically decompressed side, while seven ulcers and two amputations occurred in the contralateral leg of this same group.

The conclusion discusses the importance of evaluating a limb for the presence of a Tinel's sign over sites of peripheral nerve compression (back to the anatomy/neurology texts!). The next step is to refer to a surgeon trained in peripheral nerve decompression techniques. This procedure offers the hope of preventing ulcers or amputations in PWDs at risk.

The Validity of Clinical Signs and Symptoms Used to Identify Localized Chronic Wound Infection

Author: Gardiner SE, Frantz RA, Doebbeling BN

Publication:
Wound Rep Reg. 2001;9:178-186

Reviewer:
David H. Keast, MSc, MD, FCFP

The diagnosis of wound infection in chronic wounds remains a significant challenge for clinicians. Classically, wounds with $>10^5$ cfu per gram of tissue are considered to be infected, but this diagnostic tool is unavailable to the majority of wound-care clinicians. Surface swabs are fraught with many difficulties and are the subject of much debate. While the classic signs and symptoms of infection (pain, erythema, edema, heat and purulence) may be present in grossly infected acute wounds, more subtle signs of infection in chronic wounds were postulated by Cutting and Harding in 1994[1]. These included increased serous exudate, delayed healing, discoloration of granulation tissue, friable granulation tissue, pocketing at the base of the wound, foul odour and wound breakdown. Bowler[2] has also suggested that not only the number of bacteria in the wound but also their virulence and host defenses must be considered in diagnosing infections (see Orsted review of Bowler article).

Gardiner and her colleagues developed a 12-item clinical signs and symptoms checklist to test the validity of these signs and symptoms in identifying wound infection. The checklist was tested for content validity and inter-rater reliability. The wounds were biopsied for quantitative culture. In all, 36 wounds were studied. Arterial ulcers were excluded. Thirty-one per cent of the wounds were found to be infected. Increasing pain, friable granulation tissue, foul odour and wound breakdown were found to be valid clinical markers of infection, based on sensitivity, specificity, discriminatory power and positive predictive value.

This is a landmark study. It provides clinicians with a validated practical set of clinical signs and symptoms for the diagnosis of infection in chronic wounds.

References

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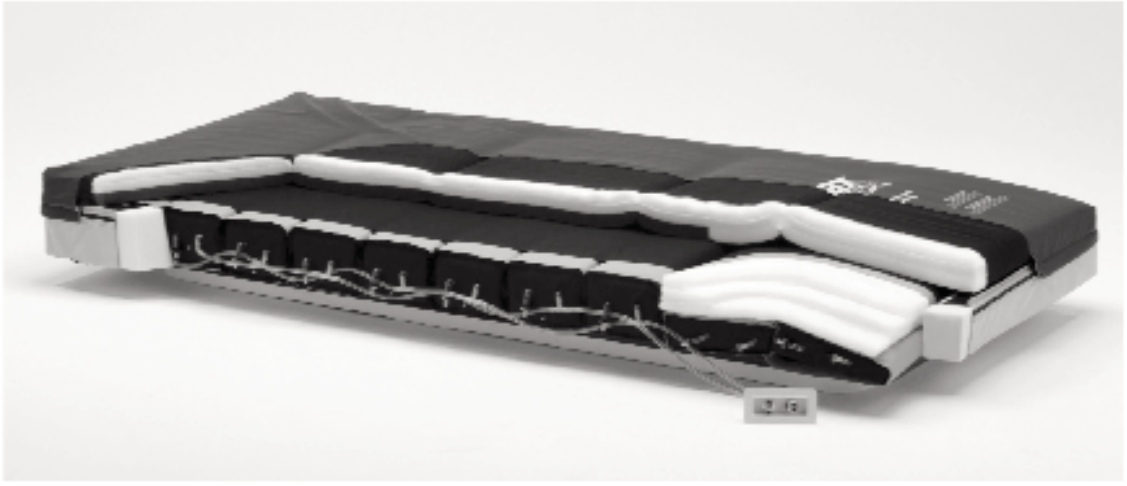

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Dr. Gary Sibbald Addresses the Challenges of Compression

R. Gary Sibbald

R. Gary Sibbald, BSc, MD, FRCPC (Med, Derm), MACP, DABD, is the Associate Professor of Medicine and Director of Continuing Medical Education, Department of Medicine, University of Toronto. He is a board-certified internal medicine and dermatology specialist in both Canada and the U.S. based at the University of Toronto and in private practice in Mississauga. He has had a special interest in wound-care education, research and patient care for the past 15 years. He is the clinical section editor for *Wounds*, an international advisor for the *Journal of Wound Care* and co-editor of the third edition of *Chronic Wound Care: A Clinical Sourcebook for Healthcare Professionals.*

Q Can I apply compression to a leg with:

A) An active infection?
B) Deep thrombophlebitis?
C) Pain?

A Traditional teaching has often stated that we should not compress an extremity with active infection or thrombo-phlebitis. Patients will not let us squeeze legs that are extremely painful!

A. An Active Infection

Infection is the result of a complex relationship as outlined in the following equation:

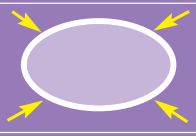
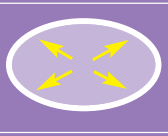
$$\text{Infection} = \frac{\text{Bacterial numbers} \times \text{Virulence}}{\text{Host resistance}}$$

The most important factor is host resistance. We know that there are systemic and local factors that contribute to host resistance. One of the local factors that promote bacterial growth is uncontrolled edema. To treat edema we need to first assess the cause. If edema is the result of congestive heart failure or low albumen, the treatment is systemic. If, however, local factors such as venous insufficiency are the cause, a patient will benefit from external compression.

Infections can be in the superficial wound bed deep compartment (critical colonization), in the surrounding skin (cellulitis) or present in bone (osteomyelitis). All deep infections usually require systemic antimicrobial agents. The trick for compression therapy is to use a system that allows frequent examination of the surface skin. This is usually translated into using a reusable system – elastic bandage, short-stretch or long-stretch bandages. Local skin examination should be performed daily for acute infections and every second to fourth day for subacute or chronic cases as control of bacterial burden is obtained.

B. Deep Thrombophlebitis

Deep thrombophlebitis usually presents with an extremely painful leg due to a clot in the deep

	COMPRESSION	SUPPORT
Type of system pattern of pressure	Elastic	Inelastic
		
Rest	High pressure	Low pressure
Muscle Contraction	High pressure but less	High pressure
Low Compression	Single layer elastic bandages	Unna's boot
High Compression	Long-stretch four layer	Short-stretch Modified Unna's boot (Duke boot)

venous system (clots below the knee are less likely to cause pulmonary emboli). Diagnosis is made with the non-invasive duplex Doppler and there is little need for an invasive venogram. There is no evidence that applying external pressure will increase the likelihood of clot mobilization. Either elastic systems or increasing edema will increase local pain. Inelastic systems (short-stretch bandages, thromboembolic stockings) can be used for edema control. A short-stretch system will not exert pressure at rest but only with muscle contraction. The pressure comes from within against a fixed resistance as outlined in the diagram below.

There is a difference between compression and support. Compression is an elastic system with high pressure at rest and high but less pressure with muscle contraction. A support system is relatively rigid (inelastic) giving very little pressure at rest and high pressure with muscle contraction against a fixed resistance.

C. Pain

Painful legs especially those with open, oozing wounds and uncorrected edema create a clinician's nightmare! The edema will aggravate the pain. If nothing can be applied externally, start with the legs up to the level of the heart. This is often accomplished with a two-seater couch and two pillows below the couch arm with nothing under the knees. Burgers exercises can be performed every 30 to 60 minutes, rotating the ankle 10 times and then dorsiflexing the foot a similar number of times. Patients should be encouraged to sleep in bed at night with their legs up on pillows or the foot of the bed elevated 30 degrees. If they cannot lie flat, patents need to be checked for congestive heart failure.

The periodicity and character of the pain should also be assessed. Pain should be characterized as episodic (with debridement), intermittent (with dressing changes) or continuous, and the timing of pain control medication should be tailored to the corresponding need. Aching pain is nociceptive (normal nerve function) and needs to be approached with the World Health Organization ladder: acetaminophen or aspirin progressing to mild and stronger narcotics. Most chronic wounds also have a burning, stinging, stabbing or shooting pain component as well. This type of pain is neuropathic (nerve irritation or injury) and requires tricyclics (second-generation agents such as Nortriptyline, 10 to 30 mg at

Continued on page 48

Canadian Association of Wound Care News

First of Its Kind

The Canadian Association of Wound Care is very excited about the launch of *Wound Care Canada*. This project has been in development for more than two years, and it is our hope that this new publication will provide a strong communications mechanism for wound-care providers across Canada. It is also a way for wound-care providers to publish their experiences and research and address clinical issues in a national wound-care publication. By sharing expertise, we will all contribute to the ultimate outcome — better patient care for Canadians.

Education

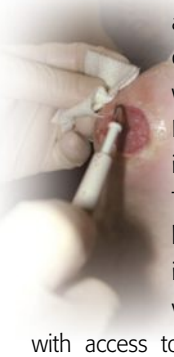
S1, S2 and S3 Seminar Series. Launched in May 2002 in Toronto, Ontario, to a sold-out audience, the S1 and S2 seminar series, Best Practice Recommendations for Wound Management, Putting Knowledge into Practice, has been designed to integrate CAWC best practice initiatives into daily practice. The S1 and S2 include both a theoretical and 'hands-on' component, while the S3 involves participating in a clinical setting in a wound management 'mentorship' program. Pre-reading assignments are posted on the CAWC Web site in advance of each program. The second S1 and S2 were held in Vancouver in June 2003 and others are planned for Montreal, Halifax, Toronto, Winnipeg and Yellowknife in spring 2004. For those individuals who have already taken S1 and S2, the CAWC Web site has further information on the S3.

Research

A New CAWC-Funded Study: Chronic Wounds in Canada. The CAWC is funding a study to explore the extent of the problem of chronic wounds in Canada. The complete results of this study will be available in 2004 once the study has been published; an overview of the study was presented at the 2003 conference in Toronto. Please see the abstract written by Dr. P. Houghton and Dr. G. Woodbury in this issue of *Wound Care Canada*.

Clinical Practice

The Directors of the CAWC have written and published articles covering the recommendations for best practices in the areas of diabetic foot ulcers, pressure ulcers, venous leg ulcers, preparing the wound bed and the principles of wound healing. With the kind permission of *Ostomy/Wound Management* (www.o-wm.com), these articles are reproduced on our Web site at www.cawc.net (as PDF documents) in their entirety. They are currently being translated into French to provide francophones with access to these important educational materials. The French translations will be complete and posted on the CAWC Web site by the end of December 2003.



The CAWC Annual Conference

The Ninth Annual Conference of the CAWC held in Toronto, November 6-9, 2003, was organized by the CAWC's Chairman Emeritus Dr. Gary Sibbald and conference Co-Chair Connie Harris. They worked with the rest of the organizing committee to develop an innovative and exciting agenda and faculty.

The 10th anniversary of the CAWC conference will be held in Calgary, November 2004 and will be chaired by outgoing CAWC president Heather Orsted. Further information will be posted on the CAWC Web site at **www.cawc.net**

CAWC Membership

There has never been a better time to become a CAWC member and to experience the benefits that being a CAWC member offers. Your decision to join the CAWC should be fueled by the belief that together, as an organized community-based association, we can improve wound care for patients, clinicians, caregivers and related organizations. We need your ongoing support to build your association and realize our objectives.

Membership Benefits

Networking/Communication/Access to Education

Opportunity to apply for CAWC scholarships

CAWC interactive Web site – full access

CAWC monthly e-bulletin

CAWC networking directory – published electronically

Access to the CAWC interactive bulletin board

E-mail notification of important events/news in wound care

Right to sit on CAWC committees and the CAWC Board of Directors.

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25% discount on subscription rates for *Ostomy/Wound Management* and *Wounds*.

We encourage you to become a member in order to be a part of Canadian wound management innovation. Become a member today. Join online at **www.cawc.net**.

CAWC Board Nominations

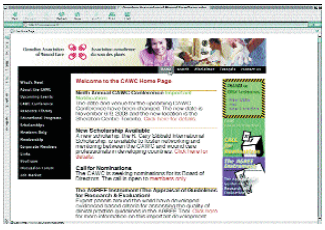
Nominations for the new CAWC Board of Directors have been made throughout the fall and were announced at the 2003 CAWC Conference in Toronto, November 6-9.

The CAWC looks forward to your participation and encourages you to contact us at **cawc@sympatico.ca** and begin making a difference in Canadian wound care.

The complete roster of CAWC directors is available online.

International Partnerships

The CAWC will be participating in the World Union of Wound Healing Societies meeting in Paris, July 8-13, 2004. Further information will be posted on the CAWC Web site at www.cawc.net. We have also launched our first international scholarship; the R. Gary Sibbald International Scholarship is designed to foster networking and mentoring between the CAWC and wound-care professionals in developing countries. Complete information is available on the CAWC Web site.



CAWC Scholarships

The Canadian Association of Wound Care is dedicated to the advancement of wound care in Canada by co-ordinating a collaborative, interdisciplinary effort among individuals and organizations involved with wound caring. **The CAWC wishes to encourage these individuals by offering a group of six scholarships valued at $2,500 each, which will serve to help educate, inform and promote best practice within the wound-care community and improve patient care.** There is also a new international scholarship to be awarded for the first time at the 2003 CAWC conference (see above). These scholarships are awarded in the form of educational and research grants and are usually presented to the recipients at the annual conference. There is also a New Investigators Award for outstanding achievement in clinical and laboratory research by a new investigator. For further information on how to apply for a CAWC Scholarship or Award, please check out our Web site at **www.cawc.net**

Public Policy

There is a need for an evidence-based approach to wound management. The CAWC will be using a new tool to rate the evidence base and process of guidelines, protocols and best practices. Please see the article on the AGREE Instrument written by the CAWC's Public Policy committee in this issue of *Wound Care Canada*.

The Extent of Chronic Wounds in Canada

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needed research in this area. From our analysis of the existing Canadian and international information on this subject we intend to provide a template of recommendations and propose a standardized format to help guide future prevalence and incidence studies on chronic wounds performed in Canada. In this way prevalence and incidence data about chronic wounds might be more easily collected, collated and combined from across Canada to provide national statistics.

If the magnitude of the problem of chronic wounds in Canada and the cost of care can be confirmed, it would help to build the rationale for additional funding to support educational and research initiatives in wound care; to identify gaps for specifically targeted future research projects; to provide benchmarking levels from which the efficacy and effectiveness of implementation of 'best practices' guidelines or interventions can be compared; and to provide the rationale for advocating for future funding to assist individuals with chronic wounds.

We look forward to sharing our findings with attendees, through an oral presentation, at the ninth annual conference of the CAWC in Toronto in November 2003. It is anticipated that the CAWC and others will use the information derived from this project to advocate for the needs of patients with chronic wounds, their caregivers and researchers.

Dr. Gary Sibbald Addresses the Challenges of Compression

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night) or gabapentin (neurontin). Optimal pain relief is often obtained by combining nociceptic and neuropathic treatment agents.

For compression, it is important to start with minimalist bandaging such as a continuous cotton roll (cling) or Tubigrip® with a single layer, and then multiple graduated layers may be added for edema and pain control. Inelastic systems can be replaced with elastic bandages as the pain and edema come under control.

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Le soin des plaies

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tion de l'Ordre des infirmières et infirmiers du Québec a donné suite à cette recommandation.

Le document est actuellement disponible à l'adresse de l'ordre provincial soit au 4200, boulevard Dorchester Ouest, Montréal (Québec) H3Z 1V4. Il est intéressant de préciser que les deux premiers articles ont fait l'objet du concours Magazine de la revue L'Infirmière du Québec et qu'ils ont reçu le premier prix à titre d'article préféré publié au cours de l'année 2001.

Protection de la peau...

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moitié, avec l'un des produits traditionnels, des bandes Steristrips[MD] (3M Healthcare) servant à diviser la région en deux.

Les résultats indiquent que toutes les préparations sont similaires au point de vue efficacité clinique. Le nouveau protecteur liquide en acrylate (Cavilon[MD] No Sting, 3M) s'est avéré statistiquement plus avantageux pour l'efficacité et le rendement : il était plus convivial pour le personnel soignant et le patient, permettant la visualisation des bords de la plaie et étant plus rapide à appliquer en milieu clinique.

Spiders, Goats & Wound Care?

BY
Catherine Harley
AND
David Moore

Spider webs were used by ancient Greeks to close wounds. Over the centuries, many civilizations have attempted to duplicate the healing properties recognized in spider silk. In the 21st century, at least one company has attempted to achieve this. They have developed a product — with potential wound care applications — that is a recombinant spider silk extracted from the milk of transgenic goats that is then spun into fibres.

If the material lives up to its promise it has great potential in the wound-care market because spider silk is thinner than traditional fibres and offers greater strength and flexibility. Its impact could be felt in three areas:

1) Microsutures

The microsutures may be the first product available due to the simplicity of microsuture design. Attributes desirable to microsutures used in surgeries requiring minimal scar tissue formation, such as in ophthalmic, neurological and reconstructive procedures, include strength and flexibility with knot security, and fineness. The new microsutures could significantly increase positive patient outcomes due to increased flexibility and reduced incidence of slipping knots and fibre breakdown.

2) Surgical Meshes

Surgical meshes are important to wound care in that they strengthen areas of surgical repair, reducing the incidence of recurrence, and are key in treating patients with hernias. The development of a stronger and thinner surgical mesh would allow surgeons to benefit from greater ease of use and reduced healing time due to the less invasive profile of this new technology.

If the recombinant spider silk lives up to its promise, it will have great potential in the international wound-care market.

3) Artificial Ligaments

The third concept, which is the most complex due to braiding, is the development of artificial ligaments. This three-dimensional design idea stemmed from the lack of any appropriate medical synthetic materials currently available that are sufficiently elastic and can withstand the tremendous sheer and abrasion forces to which ligaments such as the ACL are subject. This new technology may provide a suitable fibre as it is extremely strong and has the elastic properties that are required in ligaments. This would eliminate the need for surgeons to replace ligaments with segments of ligament from other locations, such as the hamstring, saving the patient from the resulting weakness in donor ligaments.

The potential impact on wound healing of products developed using recombinant spider silk technology is something 'future watchers' will want to follow.

Catherine Harley is a Registered Nurse and graduate of the University of Toronto International Interdisciplinary Wound Care Course. She is the Marketing Director of the Canadian Association of Wound Care and the Associate Editor of *Wound Care Canada*.

David Moore specializes in marketing and is a graduate of McGill University. He currently works as a health-care marketer for Global Healthcare Projects Inc., Montreal, Quebec.

The SARS Experience

Diary of a Wound-Care Clinician

BY Nancy Parslow

I first became aware of the serious consequences of SARS in March 2003 when I tried to meet with a patient and family for discharge teaching at the Grace site of the Scarborough Hospital. When I arrived I noticed that everyone was wearing masks, and so I stopped to inquire about the situation. I was immediately ushered into an infection control command centre. I was pulled aside to a private room by a public-health representative and was interviewed about my contacts at the hospital. They told me that some patients and, subsequently, staff were becoming ill with SARS and that I must leave the hospital immediately, wear a mask wherever I went and cancel a seminar I was planning to lead the next day.

Due to my recent contact with nurses on an affected unit I was sent home into quarantine for 10 days. I felt shock and fear and couldn't believe what was happening. I made immediate arrangements for my son to stay elsewhere for two weeks. Isolating yourself from your family within your own home is a challenge, especially for parents who must struggle to provide care while wearing a mask and staying a safe distance away. My life was turned upside-down. I missed my son and I couldn't go anywhere. I cancelled my participation in everything that I had previously committed to and missed several opportunities.

Others in this situation had to cancel vacations and a co-worker even had to rearrange her daughter's wedding. Friends dropped off needed supplies on my porch. The only contact I had with others was by telephone or e-mail. I felt dirty, isolated and alone — as well as helpless to help my co-workers cope with this crisis.

Navigating and successfully overcoming the SARS crisis at the Scarborough Hospital in Toronto is an outstanding example of the heroism, courage and dedication that health-care providers bring to their place of work every day. Despite personal fear, anxiety and frustration, care providers persevered to meet the needs of patients and each other. Responsibilities frequently fluctuated, as we were redeployed to unfamiliar areas that required assistance. Stress levels remained high. Even break-time was strained as everyone was forced to sit at least two arm-lengths apart for fear of possible transmission of any infection.

Patients within the hospital became trapped as surgeries, investigations and many treatments were cancelled, and they became cut off from the support of family and friends. I had been involved in caring for a middle-aged woman who was deaf and relied on lip reading to understand what others were saying. With everyone wearing masks it was impossible for her to understand what was being said unless it was written out for her, which she found to be very time-consuming and frustrating.

Getting to and from work was a real challenge. Use of public transit wasn't permitted unless a mask was worn. Some buses would just drive by without stopping if they saw someone with a mask on. Some taxis declined to come to the hospital. Careful planning was required to ensure that stops for gas could be avoided.

Despite feeling like outcasts many of us got together to organize car pools to support each other to get to work. Some hospital clinics and services even relocated outside the hospital to minimize disruptions for employees and patients.

Throughout the experience we were all witness to the true spirit and resilience of health-care providers as we struggled to learn many valuable lessons and we became stronger as a group as we triumphed over this overwhelming crisis.

Nancy Parslow, RN, ET, is an Enterostomal Therapist/Wound Care Clinician at the Scarborough Hospital and Scarborough Grace Hospital in Toronto, Ontario. She is the co-author of *Caring for Oncology Wounds – Management Guidelines and Wound Care – A Comprehensive Guide for Community Nurses*.

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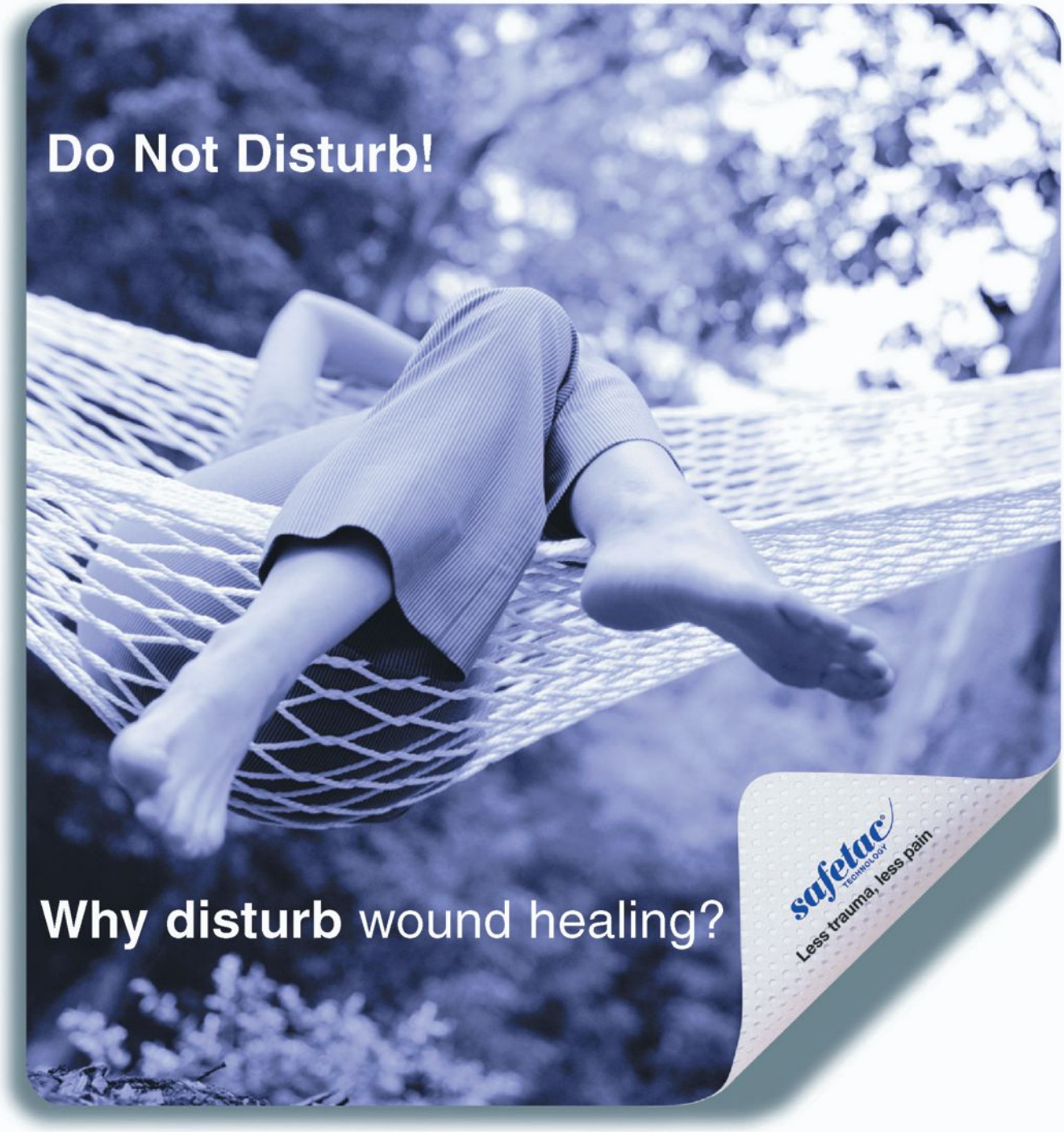
Schultz GS, Sibbald RG, Falanga V et al (2003) *Wound Rep Reg*; **11**:1-28



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