Prevalence of Wet-to-Dry Dressings in Wound Care

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ABSTRACT

OBJECTIVE: This retrospective descriptive study explored the prevalence of wet-to-dry dressings ordered for wound care of open wounds healing by secondary intention. Research questions included the following: How frequently are healthcare providers ordering wet-to-dry dressings for wound care? Which specialties of healthcare providers are most frequently ordering wet-to-dry dressings? Are wet-to-dry dressings being ordered appropriately?

METHODS: A retrospective chart review examined admission orders for 202 randomly selected Florida home care and health maintenance organization patients from 2002 to 2004. All subjects in the study had open wounds healing by secondary intention (42 partial-thickness and 160 full-thickness wounds). Frequencies are reported as the main outcome measure.

RESULTS: Wet-to-dry dressings accounted for 42% of wound care orders, followed by enzymatic (7.43%) and dry gauze (6.93%). Most wounds treated with wet-to-dry dressings were surgical (69%), followed by neuropathic ulcers (10%) and pressure ulcers (5.9%). Surgical specialists preferred wet-to-dry dressings (73%). Mechanical debridement was not clinically indicated in more than 78% of wounds treated with wet-to-dry dressings. Therefore, wet-to-dry dressings were inappropriately ordered in these cases.

CONCLUSIONS: These findings suggest that wet-to-dry dressings (or dry gauze) are prescribed inappropriately in situations where there is little evidence to support their use. To achieve evidence-based practice in wound care, clinical decision making should be scientifically based. Future research should focus on which wound dressings are most effective in optimizing wound healing, as well as on investigating the reasons for the continued use of wet-to-dry dressings.

ADV SKIN WOUND CARE 2009;22:567–73

INTRODUCTION

The scientific literature regarding wound care of open wounds describes many advanced wound care modalities developed over the past 40 years.[1] Many of these wound care modalities have been well tested in repeated scientific studies.[1–8] Modern or "advanced" wound care products and modalities are designed to provide a variety of functions. Most researchers agree these functions should address the following: debridement of nonviable *t*issue, *i*nfection control, *m*oisture regulation, and attention to the wound *e*dges (TIME).[9–11] Carville[12] suggests adding "S" to the acronym (TIMES) to address the periwound *s*kin. National and international wound research organizations, such as the Wound Healing Society; European Tissue Repair Society; International Wound Bed Preparation Advisory Board; American Academy of Wound Management; National Pressure Ulcer Advisory Panel; World Union of Wound Healing Societies; American Professional Wound Care Association; Wound Ostomy, Continence Nurses Society; and others have provided evidence-based wound care or "best practice" guidelines for the treatment of many types of chronic wounds. Unanimously, these organizations recommend moist dressings for open wounds healing by secondary intention. Many of these treatment guidelines are available on the National Guideline Clearinghouse Web site sponsored by the Agency for Healthcare Research and Quality (formerly AHCPR [http://www.guideline.gov]).

MOIST WOUND HEALING VERSUS DRY WOUND BEDS

Moist wound healing has been accepted as the prominent and most advantageous principle of wound treatment modalities since George Winter's pivotal work in 1962 demonstrating that moist wounds heal 2 to 3 times faster than dry wounds.[6,9,13] Research has demonstrated that moist wound environments promote granulation and epithelial cell migration in wounds, whereas dry wounds impair fibroblast proliferation and prevent cell migration.[9,10,14,15] The primary purpose of wet-to-dry dressings is the mechanical debridement of necrotic tissue. However, it has been suggested that the use of wet-to-dry dressings over the past 50 years has become more or less a "default" dressing used for every type of wound regardless of the amount of necrotic tissue present in the wound bed or the amount of exudates present.[3,16–21] Modern wet-to-dry dressings are typically accomplished by moistening 8- or 12-ply cotton gauze with a solution (usually 0.9% normal saline) and placing it in the wound, allowing it to dry, then removing it dry from the wound bed, thus performing mechanical debridement. There are several reasons why this form of debridement is detrimental to the wound bed and unnecessary, with

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so many other forms of wound debridement available today. Increased pain, lack of procedural compliance, increased risk of infection, reinjury to healthy granulating tissue, and increased cost are several key reasons wet-to-dry dressings are inappropriate for wound care in most cases.[1,18–26]

Bolton[14] aptly stated, "There is ample evidence on how to give wounds the opportunity to heal by providing a moist physiological environment for the cells that do the work of healing. Yet practitioners thoughtlessly expose wounded tissue to desert environments that desiccate and kill healing cells. This dried tissue, often with gauze remnants acting as foreign bodies, is more prone to infection and pain and heals more slowly than if it were kept physiologically moist, placing patients at risk of amputation or longer hospital stays. The medical profession eradicated polio and smallpox, but often ignores the most basic evidence on how to heal wounds."[14]

METHODS

Study Design

This was a descriptive study. A retrospective chart review of 202 subjects with open wounds healing by secondary intention was performed during 2003–2004 (Table 1).

Setting and Participants

One hundred two subjects were randomly selected from a health maintenance organization (HMO) wound care management database covering the state of Florida; 193 additional subjects were randomly selected from a home healthcare organization in north Florida by their patient entry number in the database using a random-digits table. Clinical documentation and claims data were reviewed using a data collection sheet. The data collection sheet surveyed patient demographics in addition to wound size, wound bed description (amount of viable and nonviable tissue present), color and amount of drainage, infection present, type of initial dressing ordered by the healthcare provider, and specialty of the ordering healthcare provider. Patient charts were excluded from the analysis if the patient did not have an open wound (such as a closed surgical incision, ostomy, drain site, or chest tube). Patient charts were also excluded if they were missing 6 or more required items from the data collection sheet. A total of 202 eligible subjects were included in the study from the HMO (n = 74) and home health organization (n = 128). The data questionnaire was designed to collect data to answer the following questions: (1) Which wound dressings were most preferred? (2) What was the prevalence of wet-to-dry dressings versus other modalities? (3) What healthcare specialties ordered wet-to-dry dressings with the greatest frequency? (4) For what types of wounds were wet-to-dry dressings most frequently ordered? (5) What was the average amount of viable and nonviable tissue present in these wounds? (6) Was mechanical debridement indicated by the amount of nonviable tissue described in the wound bed? The data were collected on the Wound Data Collection Form and entered on a spreadsheet, double-checked, then copied into SAS for data analysis.

Analysis

Statistical analysis was performed with SAS statistical analysis software. Descriptive statistics were determined, and frequencies of dressings, physician specialties, types of wounds, and amounts of viable tissue described in the wound beds were recorded. Further analysis was done to determine if there were significant differences in the wet-to-dry-dressing group versus all other types of wound dressings and analyzed with the chi-squared test of significance. The level of significance was set at .05 for all analyses.

RESULTS

Table 1 displays the sample characteristics and wound characteristics. There were slightly more women (n = 114) in the sample than men (n = 88). More than 66% of the sample was white (n = 135), 16.34% African American (n = 33), and 3.96% Hispanic (n = 8). Most study subjects were older than 41 years (83.17%) and nondiabetic (>59%).

Wet-to-dry dressings were the most frequently ordered wound care modality for open wounds healing by secondary intention. Wet-to-dry dressings accounted for nearly 42% of all wound care (n = 84) (Figure 1) for both full-thickness and partial-thickness wounds, followed by enzymatic dressings (7.43%, n = 15) and dry gauze (6.93%, n = 14). Surgical wounds (69%, n = 58) represented the majority of wounds treated with wet-to-dry dressings (Figure 2). The location of the open surgical wounds treated with wet-to-dry dressings varied, but "abdominal" was the most frequent location cited (38 abdominal, 7 lower extremity, 4 chest, 3 perirectal, 2 groin, 2 neck, 1 upper extremity, and 1 buttocks). Neuropathic foot ulcers (11%, n = 9), pressure ulcers (PrUs) (6%, n = 5), and venous (4%, n = 3) and arterial ulcers (2%, n = 2) were also treated with wet-to-dry dressings (Table 2). In addition, dry gauze alone was the wound dressing ordered for 12 open surgical wounds (1 chest, 3 lower extremity, 5 abdominal, and 3 perirectal), 2 injury-related wounds, and 1 venous ulcer. Of the 58 surgical wounds for which wet-to-dry dressings were ordered, general surgeons accounted for most orders (55%, n = 32); other surgical specialties (eg, gynecology, gastrointestinal, orthopedic, cardiac, trauma, urology, and podiatry) accounted for only 13 of these surgical wounds (22%). In addition, nonsurgical specialists (rehabilitation medicine, family practice, internal medicine) ordered 5 of the 58 wet-to-dry surgical wound dressings (9%). These results imply that general surgeons were the healthcare providers most likely to order wet-to-dry dressings in this sample population (Figure 3).

Including all wounds (surgical and nonsurgical), family practice physicians accounted for 23 of the total wound care orders

Table 1.

SAMPLE CHARACTERISTICS AND WOUND CHARACTERISTICS

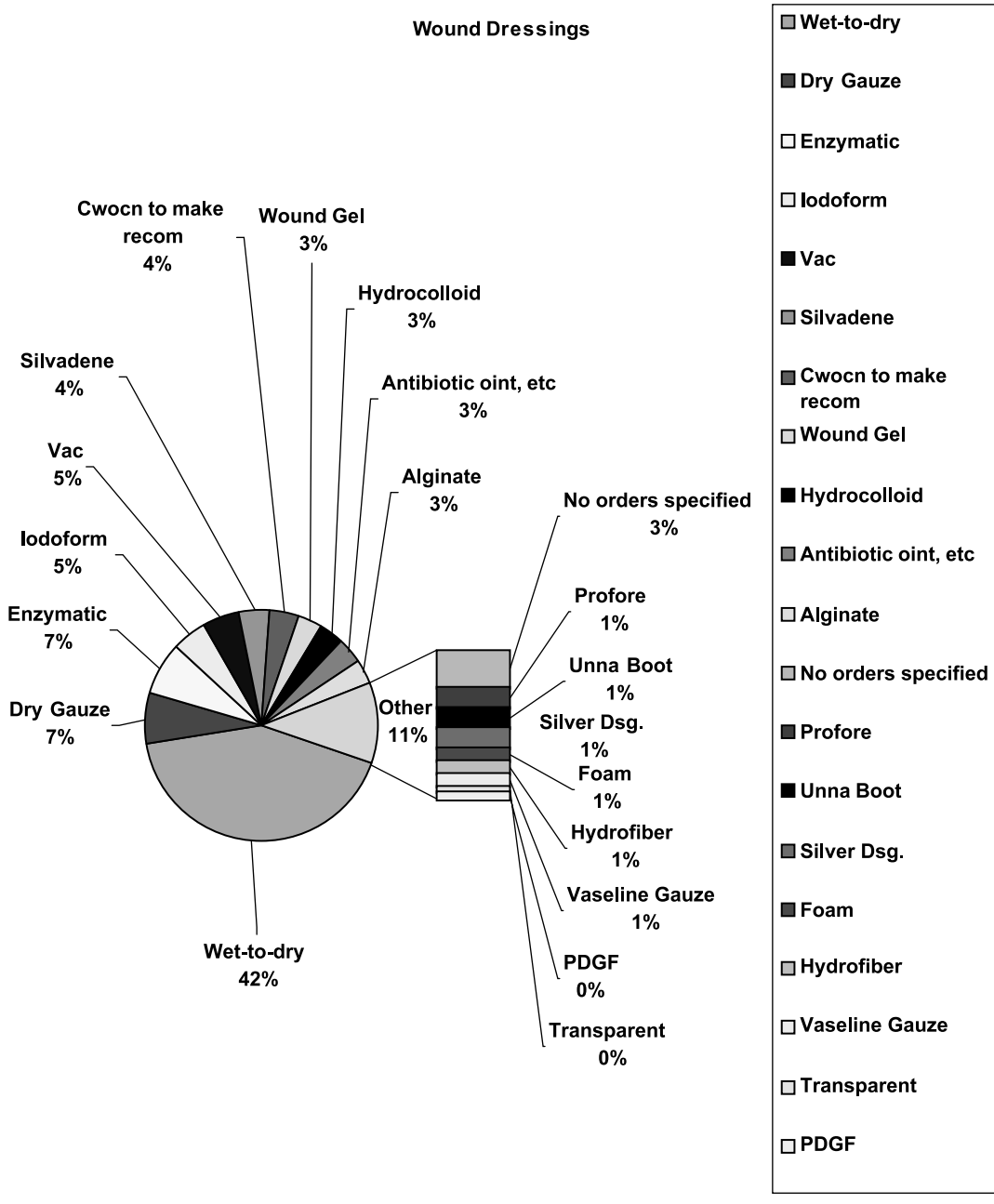
Demographics[a]	No.	%	Wound Characteristics	No.	%
Sex			**Location**		
Male	88	43.56	Lower extremity	92	45.54
Female	114	56.44	Upper extremity	7	3.47
Ethnicity			Abdomen	58	28.71
White	135	66.83	Sacral	11	5.45
African American	33	16.34	Buttocks	10	4.95
Hispanic	8	3.96	Perirectal	7	3.47
Other	1	0.50	Groin	5	2.48
Not documented	25	12.38	Chest	6	2.97
Age, y			Neck	2	0.99
<20	1	0.50	**Exudates**		
21–40	32	15.84	None	17	8.42
41–60	67	33.17	Small	90	44.55
>60	101	50	Moderate	63	31.19
Not documented	1	0.50	Large	25	12.38
Smoking			Copious	4	1.98
Current smoker	20	9.90	**Thickness**		
Smoked in past	27	13.37	Full-thickness	162	80.20
Never smoked	69	34.16	Partial-thickness	39	19.31
Not documented	86	42.57	**Wound type**		
Diabetes mellitus			Surgical	99	49.01
Type 1 diabetes	22	10.89	Pressure	30	14.85
Type 2 diabetes	54	26.73	Neuropathic	23	11.39
No history of diabetes	120	59.41	Venous	21	10.40
Not documented	5	2.48	Injury—not burn	18	8.91
			Insect bites	4	1.98
			Arterial	3	1.49
			Cellulitis	2	0.99
			Pilonidal cyst	1	0.50
			Wound duration, wk		
			0–4	118	58.42
			5–8	39	19.31
			9–12	14	6.93
			13–20	10	4.95
			>20	17	8.42

[a]Sample size = 202.

(11%) in the sample (5 wet-to-dry orders, 18 ''other dressing'' orders). Internal medicine physicians accounted for 25 wound orders (12%; 12 wet-to-dry and 13 other dressings). Vascular surgeons wrote 6 wound care orders (3%; 4 wet-to-dry and 2 other dressings). General surgeons accounted for 48 total wound care orders (24%; 32 wet-to-dry and 16 other dressings). Physicians at wound care centers accounted for 18 of wound care orders (9%) for open wounds. Interestingly, none of these physicians ordered wet-to-dry dressings. Unfortunately, the number of separate physicians in each specialty was not collected. This is a limitation of the study, although study subjects included physician locations scattered over the entire state of Florida, so more than just a few different physicians in one area were represented.

Furthermore, it is important to note that most of the wounds (78%) where wet-to-dry dressings were ordered had greater than 75% granulating tissue noted in the wound bed (Table 3) at the time of the initial wet-to-dry order. More than 42% of the wet-to-dry-dressing group had 76% to 99% granulating wound bed, and an additional 36% of the wet-to-dry-dressing group had 100% granulating tissue documented in the wound bed at the time of the initial wet-to-dry orders. Only 3 wounds in the wet-to-dry dressing group had 25% to 50% granulation tissue documented; 3 others were documented with 50% to 75% granulation tissue. The scientific literature supports mechanical debridement by wet-to-dry dressings *only* when the benefit of removing nonviable tissue from the wound bed outweighs the risks of detrimental disruption of healthy granulating tissue in the wound bed (such as when >50% nonviable tissue is present in the wound bed).[1,3,21,23,26–28] Therefore, even excluding wounds without granulation tissue documented, 82% of all wounds (n = 69) with wet-to-dry dressings ordered in the study had greater than

Figure 1.
PREVALENCE OF WET-TO-DRY DRESSINGS IN 202 WOUND CARE SUBJECTS

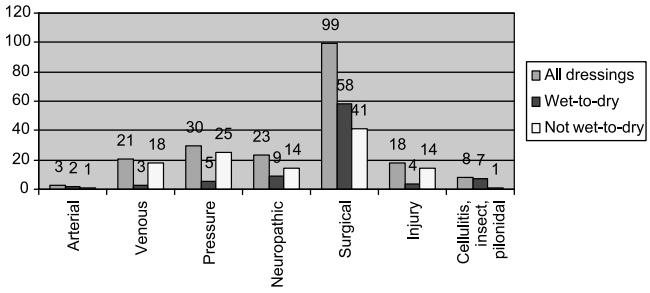


50% granulation tissue documented in the wound bed and were *not* appropriate for this method of mechanical debridement.

Finally, to determine if there were significant differences in the wet-to-dry dressing group and the group composed of all other dressings, the chi-squared test of significance was used. General surgeons, more than any other healthcare provider in the study, ordered wet-to-dry dressings for wound care ($P < .01$). Wounds with wet-to-dry dressings ordered versus all other types of

Figure 2.

WET-TO-DRY VERSUS OTHER TYPES OF DRESSINGS BY WOUND TYPE BY NUMBER OF SUBJECTS



dressings were more likely to be abdominal wounds ($P < .01$). Surgical wounds versus all other types of wounds were more likely to have wet-to-dry dressings ordered ($P < .01$). Wet-to-dry dressings were more likely to be ordered for full-thickness wounds than partial-thickness wounds ($P < .01$). High amounts of granulating tissue (76%–99%) in the wound bed of the wet-to-dry-dressing group versus all other types of dressings were a meaningful finding ($P = .11$), indicating that mechanical debridement was not clinically indicated in most wounds where wet-to-dry dressing was ordered. However, statistical significance was not achieved because wounds with 76% to 99% granulating tissue in the wound bed or 100% granulating wound beds were analyzed in 2 separate groups. This also is a limitation in the study.

DISCUSSION

Healthcare provider preferences for choosing dressing materials should be evidence based, matching specific needs of the wound bed with the most appropriate wound care products. Although numerous products maintain a moist wound environment and have reported successful wound healing results in clinical trials, it is evident that healthcare providers continue to order wet-to-dry dressings for wound care despite scientific data against the practice.[17,29] As the name implies, wet-to-dry dressings ultimately result in dry wound beds (even if for limited amounts of time), and the practice of using them is no longer evidence based.[2–4,9,10,13,14,18,19,22,23,30–34] The scientific literature reports that dry gauze dressings in open wounds (whether used dry or used as wet-to-dry) disrupt granulating tissue,[3] impair epithelial cell migration and histological activity,[9,14,23] leave foreign bodies in the wound bed,[14] increase the risk of infection, aerosolize bacteria,[14,22,35] cause severe pain upon removal,[24,36] and are less effective and more costly than other forms of debridement such as collagenase, fibrinolysin, and autolysis.[25,26,37] To reiterate, wet-to-dry dressings are used primarily for mechanical debridement, and they are not described in any current scientific literature as having another purpose. The use of wet-to-dry dressings is usually reserved for "heavily necrotic wounds"[1,16,21,28] (suggesting those with >50% nonviable tissue present in the wound bed). Wet-to-dry dressings (and dry gauze) were ordered with disturbing frequency (>48%) by physicians for a variety of open wounds recorded by this study. Furthermore, wet-to-dry dressings were used most often in wounds with more than 75% granulating wound beds where mechanical debridement was not indicated.

The findings of this study are consistent with those found by Helberg et al[29] and Armstrong and Price,[17] who found that wet-to-dry dressings (or dry gauze) are used most frequently in situations where there is little evidence to support their use. In the study of Helberg et al[29] comparing scientific evidence and actual wound care practice for PrUs in 51 hospitals and 15 nursing homes in Germany (11,584 patients with PrUs), they revealed that the treatment of PrUs was consistent with current evidence in less than 50% of the time. In addition, according to a literature review and descriptive study conducted by Armstrong and Price, "Wet-to-dry and gauze dressings are the most widely used primary dressing material in the United States." Armstrong and Price[17] sent a 3-part questionnaire to a convenience sample of 127 general surgeons in New Hampshire and Vermont. The response rate was

Figure 3.

WET-TO-DRY DRESSINGS ORDERED BY HEALTHCARE PROVIDER SPECIALTY TYPE

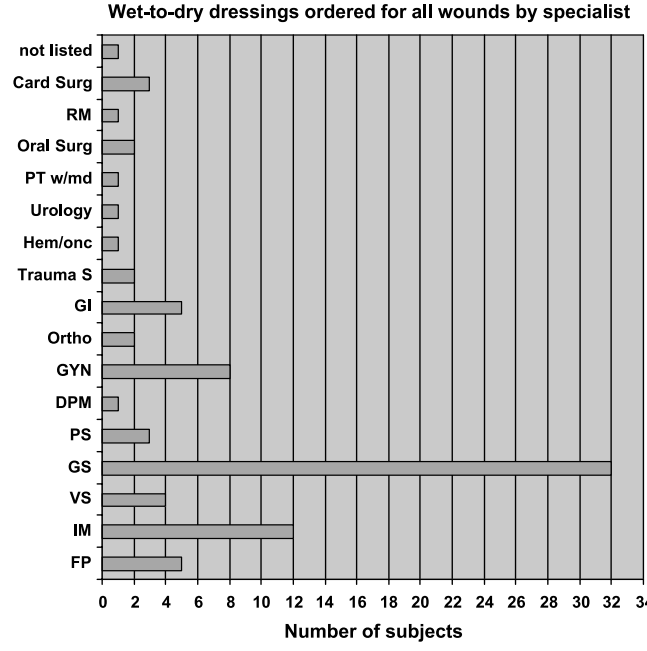


Table 2.

ALL DRESSINGS LISTED BY WOUND TYPE AND PERCENTAGES (ALL OPEN WOUNDS)

	No. of Subjects						
	Arterial	**Venous**	**Pressure**	**Neuropathic**	**Surgical**	**Injury**	**Cellulitis, insect, pilonidal**
All dressings	3	21	30	23	99	18	8
Wet-to-dry	2	3	5	9	58	4	3
Dry gauze	0	1	0	0	12	2	0
Not wet-to-dry or dry gauze	1	17	25	14	29	12	5
	Percentages						
	Arterial	**Venous**	**Pressure**	**Neuropathic**	**Surgical**	**Injury**	**Cellulitis, insect, pilonidal**
Wet-to-dry	67%	14%	17%	39%	59%	22%	38%
Dry gauze	0%	5%	0%	0%	12%	11%	0%
Other dressings	33%	81%	83%	61%	29%	67%	62%

65 (51.2%). The study was designed to discover how many physicians would prescribe 4 types of gauze dressings (including wet-to-dry) rather than 4 alternatives (alginates, foams, gels, and hydrocolloids) for each of 8 types of hypothetical wounds. All 8 were wounds healing by secondary intention and included open surgical wounds, abscesses, donor sites for skin grafts, skin grafts, venous leg ulcers, partial-thickness burns, necrotic PrUs, and necrotic wounds needing debridement. The results described by Armstrong and Price[17] demonstrated that gauze dressings were prescribed far more than modern alternatives for all wounds except venous leg ulcers. Of 65 physicians responding, 30 (46%) chose wet-to-dry for open surgical wounds healing by secondary intention. More than 55 of the 65 respondents selected some form of gauze dressing for surgical wounds as well as abscesses. The second part of Armstrong and Price's[17] questionnaire asked participants to select 1 of 7 choices for performing a wet-to-dry procedure. Twenty respondents selected "A wet-to-dry dressing should not be moistened before removal" + "the type of gauze is important" + "must be allowed to dry before dressing is replaced."[17] Eleven respondents selected "A wet-to-dry dressing should be moistened before removal" + "the type of gauze is not important" + "should not be allowed to dry before dressing is replaced."[17] Other respondents selected other options, yet there were less than 9 respondents in any other wet-to-dry procedure option. Armstrong and Price concluded that wet-to-dry dressings are not only being prescribed inappropriately, but also being used inconsistently. The third part of the Armstrong and Price[17] questionnaire looked at participants' reasons for not using modern wound care products. Cost appeared to be the predominantly cited barrier, with only 7 general surgeons believing that alternatives to gauze were cost-effective. However, as Armstrong and Price[17] noted, unit cost and cost-effectiveness are not necessarily the same thing. If a hypothetical cost comparison (using prices from a common medical supply catalogue) is prepared for wet-to-dry dressings used twice a day (dosage suggested by the literature) versus a wound gel used daily, or other modern alternatives such as hydrocolloids, alginates, foams, and so on, then costs for performing wet-to-dry dressings are greater than costs for these alternative wound modalities.

OTHER CONSIDERATIONS

In addition to the above findings suggesting an inappropriate use of wet-to-dry dressings, it is remarkable to note how frequently cytotoxic solutions[38] (Dakin solution, hydrogen peroxide, povidone-iodine, acetic acid, alcohol, or mafenide acetate) were ordered as wound cleansers or as part of the wet-to-dry dressings in this sample. Five subjects had Dakin solution prescribed as the "wet" solution in their wet-to-dry dressings. One subject had wet-to-dry dressings ordered with 25% acetic acid—this order was probably written in error but certainly should have been clarified with the physician, because household vinegar is only a 6% acetic acid solution, and acetic acid is cytotoxic to fibroblasts and keratinocytes at even a 0.25% solution.[38] Gentamicin-clindamycin-polymyxin B solution, diluted povidone-iodine, and mafenide acetate were ordered in other wet-to-dry dressings in this study. In addition, hydrogen peroxide was ordered as a daily cleansing agent for 5 subjects with various primary dressings. All of these listed

Table 3.

AMOUNTS OF GRANULATING TISSUE NOTED IN THE WOUND BEDS

Wet-to-Dry (n = 84)			**All Other Dressings (n = 118)**		
76%–99% Granulating tissue	100% Granulating	% Not documented	76%–99% Granulating tissue	100% Granulating	% Not documented
n = 36	n = 30	n = 12	n = 61	n = 32	n = 8
43%	36%	14%	52%	27%	7%

solutions are known to be cytotoxic. Interestingly, only 3 of the subjects described above had any signs or symptoms of infection documented (erythema, edema, warmth, purulent exudates, increasing pain, hypergranulation tissue, or necrosis) before or after any antimicrobial solution was ordered.

SUMMARY

The results of this descriptive study indicate wet-to-dry dressings were used with inappropriate frequency in the treatment of open wounds healing by secondary intention, especially open surgical wounds. Armstrong and Price's[17] research evaluating physician intentions in the use of wet-to-dry dressings supports these findings. Their results also suggest that ''wet-to-dry dressings and gauze are commonly prescribed for situations where there is little evidence to support their use. . .'' and ''inconsistency . . . on how the technique should be performed.''[17] Furthermore, a wound care knowledge survey of 692 nurses from 48 states, 5 Canadian provinces, and 7 countries[39] indicated that 26% of respondents did not know that moist wound healing is the criterion standard[1,9,14,40] for chronic wound management, and 38% of nurse respondents incorrectly stated that wet-to-dry dressings are best used to treat clean granulating chronic wounds. In addition, 70% of nurse respondents indicated they believed they had not received sufficient education on chronic wound care in their basic nursing educational background.

A great knowledge deficit exists among healthcare professionals related to the use of wet-to-dry dressings versus modern wound modalities for the care of open wounds healing by secondary intention. Further research, as well as improvements in the standardizing of interdisciplinary wound care education curricula, is needed. ●

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