

Wound outcomes in patients with advanced illness

Vincent Maida, Marguerite Ennis, Jason Corban

Maida V, Ennis M, Corban J. Wound outcomes in patients with advanced illness. *Int Wound J* 2012; 9:683–692

ABSTRACT

A prospective case series was studied to assess the potential for complete healing of wounds among patients with advanced illness referred to a regional palliative care program in Toronto, Canada. Two hundred and eighty-two patients, of which 148 were primarily diagnosed with cancer and 134 with non cancer advanced illness, were assessed and followed until their deaths. On the baseline initial referral date, 823 wounds were documented. The wound classes assessed included pressure ulcers, malignant wounds, skin tears, venous leg ulcers, diabetic foot ulcers and arterial leg/foot ulcers. Proportions of patients showing complete healing of at least one wound were calculated, stratified by patient's survival time post-baseline (1 week, 1 month, 3 months and 6 months). Proportions of patients showing complete healing of at least one wound increased the longer patients lived and ranged between 12.9% and 43.5% for stage I pressure ulcers, 0% and 60% for stage II pressure ulcers, 2.4% and 100% for skin tears, 10% and 100% for venous leg ulcers and 0% and 50% for diabetic foot ulcers. Only one person showed complete healing of a stage III pressure ulcer and no complete healing was observed with stage IV pressure ulcers, unstageable pressure ulcers, malignant wounds and arterial leg/foot ulcers.

Key words: advanced illness • palliative care • wound healing • wound maintenance • wound management • wound palliation • wound prevention

INTRODUCTION

Patients with advanced illness are defined as individuals diagnosed with incurable illness, cancer and/or non cancer, whose life expectancy is generally thought to be less than 6 months (1). As these patients traverse their illness trajectory, goals of care, guided by the principles of patient-centred care, generally transition from those achieved by Active and Aggressive Medical Management (AAMM = curative and potentially life-prolonging treatments) to those achieved by Conservative Palliative Management (CPM = treatments aimed

at improving comfort, dignity and quality of life) (2,3). Patients with advanced illness are particularly predisposed to developing wounds as they are usually elderly, and commonly present with poor and declining performance status, multiple medical comorbidities and iatrogenic factors (4–6). Thus, patients with advanced illness represent the cohort within healthcare experiencing the highest prevalence and incidence of all wound classes (1,7,8).

Patients afflicted with wounds experience multidimensional suffering. Wounds are commonly associated with several physical symptoms such as pain, exudation, odour and pruritus (9,10). They may also lead to the development of secondary sequelae such as anxiety, depression, social isolation, disfigurement and disability (5,11,12). Moreover, since wounds metaphorically represent 'windows' into the global health of patients, it is not surprising that they have been showed to be associated with reduced survival (13,14).

Wound Management encompasses multiple goals including wound healing, wound palliation (wound-related pain and symptom

Key Points

- patients with advanced illness are particularly predisposed to developing wounds as they are usually elderly, and commonly present with poor and declining performance status, multiple medical comorbidities and iatrogenic factors
- since wounds metaphorically represent 'windows' into the global health of patients, it is not surprising that they have been showed to be associated with reduced survival

Authors: V Maida, BSc, MSc, MD, University of Toronto, Toronto, ON, Canada, McMaster University, Hamilton, ON, Canada and Division of Palliative Medicine, William Osler Health System, Toronto, ON, Canada; M Ennis, PhD, PStat, Markham, ON, Canada; J Corban, HBSc, Faculty of Arts and Science, University of Toronto, Toronto, ON, Canada

Address for correspondence: Dr Vincent Maida, BSc, MSc, MD, Division of Palliative Medicine, William Osler Health System, 101 Humber College Boulevard, 9th Floor, Toronto, ON, M9V 1R8 Canada

E-mail: vincent.maida@utoronto.ca; drvincentmaida@wordpress.com

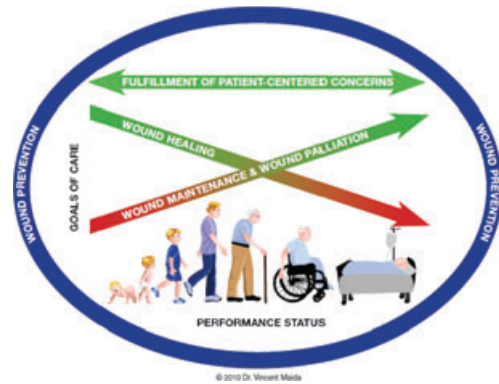


Figure 1. Wound management across life's continuum.

Key Points

- the purpose of this study is to quantify the potential for complete healing of a comprehensive range of different wound classes among patients with advanced illness referred for supportive and palliative care
- this study was performed at a regional palliative care program in Toronto, Canada

management), wound prevention (primary and secondary of wounds as well as prevention of wound-related complications such as wound infection) and fulfillment of patient-centred concerns (15). Although the prime and most fundamental goal is complete wound healing, this is not always possible (16). Goals of wound management change over a patient's lifespan (16–18). This has been depicted graphically by Maida in 2010 (Figure 1). When a patient is young and healthy, wounds have the greatest potential and likelihood to completely heal. However, as a patient becomes elderly, acquires advanced illness and approaches end-of-life, complete healing becomes less likely. Therefore, realistic goals of care must be discussed and negotiated with the patient, along with the development of appropriate treatment plans. Goals of care are not mutually exclusive as wound healing strategies may achieve wound palliation and vice versa (19).

Any given wound may experience a range of outcomes. Although the most desired outcome is complete wound healing, one must

acknowledge that with or without appropriate treatments wounds may also deteriorate, especially in the setting of patients with advanced illness. An intermediate outcome, that is in-between complete wound healing and wound deterioration, has been dubbed 'wound maintenance' (20) or wound stabilisation (21). The term 'maintenance wound' was originally defined to describe potentially healable wounds that were static or stalled owing to non compliance/non adherence by patients, and/or non availability of necessary therapies (22). A revised definition encompasses the latter together with those wounds, occurring in the setting of compromised patients, where deterioration is possible and where optimised wound management, including a time limited trial of healing strategies, achieves 'wound maintenance' (stabilisation) (20,21). This revised definition has been depicted graphically by Maida in 2011 (Figure 2).

There is a paucity of data published on wound outcomes in general, but an even greater dearth in relation to wounds occurring in patients with advanced illness referred for supportive and palliative care. The purpose of this study is to quantify the potential for complete healing of a comprehensive range of different wound classes among patients with advanced illness referred for supportive and palliative care.

METHODS

This study was performed at a regional palliative care program in Toronto, Canada. The palliative program comprises a community consultative service with linkage to



Figure 2. Outcomes in wound management.

a palliative care inpatient unit and associated hospital-based palliative consultative service. Collectively, the combined community and hospital-based components serves an estimated population of 750 000 within the northwest quadrant of Metropolitan Toronto, Canada. Recruitment for this study was commenced with new referrals on 1 May 2005 and ended on 30 June 2006. All patients were referred for consideration of supportive and palliative care. Referrals were received from community primary care physicians, community hospital oncologists, surgeons, internists as well as tertiary care oncologists. All patients or their substitute decision makers provided consent to have their clinical data registered in a research database. Patients were followed until their deaths except for a small number who were discharged from the programme. The focus of this study is patients with advanced illness, defined as patients who are expected to die within 6 months of referral.

All patients were examined within 24 hours of the initial referral. Data collected was entered on a customised Microsoft™ Access database by all research collaborators on an accrual basis. Patients were followed by serial clinical assessments throughout their palliative trajectory, culminating in their death either in the community or the hospital. Performance status was measured at initial referral (baseline) using the Palliative Performance Scale (PPSv2) (23). Risk for the development of pressure ulcers was measured using the Braden Scale (BS) (24). The degree of comorbid illness was measured at baseline using the Charlson Comorbidity Index (CCI) (25). The age-adjusted CCI was computed retrospectively (26). Pressure ulcers were classified according to the system developed by the National Pressure Ulcer Advisory Panel (NPUAP) (27). Given that data was collected prior to 2007, the new stage termed 'Deep Tissue Injury' was not employed. The research team classified pressure ulcers as stage I, stage II, stage III, stage IV and unstageable.

All wounds were managed by a specialist wound management team consisting of a specialist wound physician and advanced practice nurse. All wounds were managed employing the fundamentals of the wound bed preparation paradigm as per Falanga (28), Sibbald *et al.* (29) and Schultz *et al.* (30). Thus, all wounds were given treatment with the intent to heal. In addition, wound-related pain

and symptom management (wound palliation) followed best-practice guidelines (31–33). All patients that presented with stage IV or stage US pressure ulcers were also placed on support surfaces within 48 hours of the baseline date. Complete healing was defined as complete wound closure together with the restoration of complete epithelialisation over a former wound site. In the case of stage I pressure ulcers, complete healing was defined as the complete resolution of non blanchable erythema. The study protocol was approved by the research ethics board at the William Osler Health System in Toronto, Canada.

STATISTICAL ANALYSIS

Patients with one or more wounds present at referral were studied. Patients were stratified into four groups based on the time that elapsed from the day they were initially referred to the palliative care program, to the day they died. The first stratum consisted of patients who survived 1 week (7 days) or less, the second of patients who survived more than a week and up to a month (8–30 days), the third more than a month up to 3 months (31–91 days) and the fourth more than 3 months up to 6 months (92–182 days). These time frames are clinically meaningful and have been used in other studies involving patients with advanced illness. For instance, a life expectancy of less than 6 months serves as one of the admission criteria for Hospice Palliative Care programs in the USA (34). In addition, prognostic studies in patients with advanced illness have linked PPSv2 ranges with median life expectancies corresponding to 1 week, 1 month and 3 months (35). Patient characteristics (age, sex, primary diagnosis, PPSv2 score, BS score, CCI score and the age-adjusted CCI score) were summarised per stratum.

All wounds present at referral were documented in the database. The following non overlapping wound classes were defined: pressure ulcers (stages I, II, III, IV and Unstageable), malignant wounds, skin tears, venous leg ulcers, diabetic foot ulcers, arterial leg/foot ulcers, ostomies, iatrogenic wounds and inflammatory wounds. For each wound class except the last three we counted the number and percent of patients in each stratum who had one or more wounds of that class present at referral. Ostomies were excluded

Key Points

- the focus of this study is patients with advanced illness, defined as patients who are expected to die within 6 months of referral
- all wounds were given treatment with the intent to heal

Key Points

- six hundred and seven patients were enrolled during the recruitment period
- all patients were followed until their deaths except for 57 who were discharged from the program
- thirty-three patients who lived longer than 6 months were excluded as per the definition of advanced illness
- thus 517 patients were eligible for the study
- cancer was the primary diagnosis for 148 (52.5%) patients with 134 (47.5%) diagnosed primarily with advanced non cancer illness

from the analyses as they were permanent, while therapeutic and inflammatory wounds were excluded owing to heterogeneity and small numbers of lesions observed.

If a wound healed completely, the date that it was assessed as healed was also entered in the database. Thus we could calculate, among the patients with a particular wound type, the number and percentage of patients that experienced at least one completely healed wound. We decide to look at the individual patient as the basis for our comparison as this was felt to be more clinically relevant and applicable. We chose to present none versus any healing because the number of wounds that healed was low. The Fisher's exact test was used to test whether the percent of patients with complete healing of at least one wound differed across the survival categories. This was done for each wound type for which healing was observed.

RESULTS

Six hundred and seven patients were enrolled during the recruitment period. All patients were followed until their deaths except for 57 who were discharged from the program. The commonest reasons for discharge were transfers to other hospitals, nursing homes or hospices. Thirty-three patients who lived longer than 6 months were excluded as per the definition of advanced illness. Thus 517 patients were eligible for the study. Of the 517 patients, 235 patients presented with no wounds, while 282 patients presented with 1 or more wounds and represented the study

Table 1 Baseline patient characteristics

	<i>n</i> = 282
Number (%) of male patients	128 (45.4)
Number (%) of female patients	154 (54.6)
Mean age in years (range)	77.7 (29–103)
Number (%) of patients with primary diagnosis: cancer	148 (52.5)
Number (%) of patients with primary diagnosis: non cancer	134 (47.5)
Mean Palliative Performance Scale (range)	34.5 (10–80)
Mean Braden Scale score (range)	12.2 (6–22)
Mean Charlson Comorbidity Index (range)	8.1 (2–15)
Mean age-adjusted CCI (range)	11.4 (2–18)

cohort. Hundred and twenty-eight (45.4%) were male and 154 (54.6%) were female. The average age of the study cohort was 77.7 years. Cancer was the primary diagnosis for 148 (52.5%) patients with 134 (47.5%) diagnosed primarily with advanced non cancer illness. The commonest primary cancer diagnoses were gastrointestinal and pulmonary. The commonest primary non cancer diagnoses were cerebrovascular, neurodegenerative and cardiovascular. The study cohort had a mean PPSv2 of 34.5, mean BS of 12.2, mean CCI of 8.1 and an age-adjusted CCI of 11.4 (Table 1). The latter assessment tool scores, stratified by survival bands, are summarised in Table 2. There were 110 patients that survived 7 days or less, 98 patients that survived 8–30 days, 60 patients that survived 31–91 days and 14 patients that survived 92–182 days.

Table 2 Baseline characteristics of patients with at least one wound (*n* = 282)

	Time from referral to death			
	≤ 7 days, <i>N</i> = 110 patients	≤ 30 days, <i>N</i> = 98 patients	≤ 91 days, <i>N</i> = 60 patients	≤ 182 days, <i>N</i> = 14 patients
Number (%) of male patients	54 (49.1)	41 (41.8)	28 (46.7)	5 (35.7)
Number (%) of female patients	56 (50.9)	57 (58.2)	32 (53.3)	9 (64.3)
Mean age in years (median)	79.4 (81.3)	78.4 (80.8)	74.7 (76.2)	72 (76.3)
Number (%) of patients with primary diagnosis: cancer	44 (40)	53 (54.1)	43 (71.7)	8 (57.1)
Number (%) of patients with primary diagnosis: non cancer	66 (60)	45 (45.9)	17 (28.3)	6 (42.9)
Mean Palliative Performance Scale (median)	25.3 (20)	36.5 (30)	46.1 (50)	44.1 (45)
Mean Braden Score (median)	9.9 (9)	12.6 (12)	14.9 (16)	14.7 (15.5)
Mean Charlson Comorbidity Index (median)	8 (8)	8.2 (8)	8.3 (8)	7.1 (7)
Mean Age-adjusted Charlson Comorbidity Index (median)	11.4 (11)	11.6 (11)	11.3 (11)	10.9 (10.5)

Table 3 Number and types of wounds

Wound type	Number of wounds (%)
Pressure ulcer stage I	218 (26.5)
Pressure ulcer stage II	239 (29)
Pressure ulcer stage III	21 (2.6)
Pressure ulcer stage IV	28 (3.4)
Pressure ulcer unstageable	55 (6.7)
Malignant wounds	78 (9.5)
Skin tears	118 (14.3)
Venous leg ulcers	36 (4.4)
Diabetic foot ulcers	17 (2.1)
Arterial leg/foot ulcers	13 (1.6)
Total	823 (100)

Table 4 Number of wounds per patient

Number of wounds	Number of patients (%)
1	86 (30.5)
2	66 (23.4)
3	41 (14.5)
4	41 (14.5)
5	23 (8.2)
≥6	25 (8.9)
Total	282 (100)

The study cohort of 282 patients presented with 823 wounds at baseline. The wound types are given in Table 3. Patients showed between 1 and 13 individual wounds, and the multiplicity of wounds is summarised in Table 4. Data on complete wound healing, stratified by survival bands, are summarised in Table 5. There were 148 patients with one or more stage I pressure ulcers; 18.9% (28 patients) experienced complete healing of at least one stage I pressure ulcer, and this ranged between 12.9% for those who died 7 days or less post-baseline referral date and 43.5% for those patients surviving between 31 and 91 days post-baseline referral date ($P = 0.017$). There were 144 patients with one or more stage II pressure ulcers; 10.4% (15 patients) experienced complete healing of at least one stage II pressure ulcer, and this ranged between 0% for those who died 7 days or less post-baseline referral date and 60% for those patients surviving between 92 and 182 days post-baseline referral date ($P = 0.0001$). There were 13 patients with one or more stage III pressure ulcers and only 1 patient (7.7%) experienced complete healing of at least one stage III pressure ulcer. There were 83 patients with one or more skin tears;

14.5% (12 patients) experienced complete healing of at least one skin tear, and this ranged between 2.4% for those who died 7 days or less post-baseline referral date and 100% for those patients surviving between 92 and 182 days post-baseline referral date ($P = 0.0001$). There were 25 patients with one or more venous leg ulcers; 56% (14 patients) experienced complete healing of at least one venous leg ulcer, and this ranged between 10% for those who died 7 days or less post-baseline referral date and 100% for those patients surviving between 31 and 182 days post-baseline referral date ($P = 0.0004$). There were 11 patients with one or more diabetic foot ulcers; 27.3% (three patients) experienced complete healing of at least one diabetic foot ulcer, and this ranged between 0% for those who died 7 days or less post-baseline referral date and 50% for those patients surviving between 8 and 30 days post-baseline referral date ($P = 0.2$). There was no complete healing among 19 patients with one or more stage IV pressure ulcers, 34 patients with one or more unstageable pressure ulcers, 54 patients with one or more malignant wounds and 11 patients with one or more arterial leg/foot ulcers.

DISCUSSION

Despite the commonly held view that dying patients are unable to heal wounds, this study shows that marginal levels of complete healing are possible. The overall low levels of healing do support the hypothesis that patients with advanced illness not only suffer from acknowledged organ failure such as cardiac, respiratory, hepatic and renal, but also from 'skin failure' (6). This is the first prospective study that assessed the potential for complete healing for a comprehensive profile of wound classes, reflective of the commonest wound issues, within the setting of supportive and palliative care for patients in their last 6 months of life.

Pressure ulcers were the most prevalent wound class in this study. The stages of pressure ulcers that showed the highest levels of complete healing in this study were stages I and II. Statistically significant trends related increased levels of complete healing with prolonged survival in pressure ulcers of stage I and II. In our study, 18.9% of patients showed complete healing of at least one stage I pressure ulcer. This is significantly less than the

Key Points

- despite the commonly held view that dying patients are unable to heal wounds, this study shows that marginal levels of complete healing are possible
- the overall low levels of healing do support the hypothesis that patients with advanced illness not only suffer from acknowledged organ failure such as cardiac, respiratory, hepatic and renal, but also from 'skin failure'
- pressure ulcers were the most prevalent wound class in this study
- the stages of pressure ulcers that showed the highest levels of complete healing in this study were stages I and II
- in our study, 18.9% of patients showed complete healing of at least one stage I pressure ulcer

Table 5 Wounds present on referral and whether any of them healed

Wound class	Time from referral to death				P-value*	Totals
	≤7 days, N = 110 patients	≤30 days, N = 98 patients	≤91 days, N = 60 patients	≤182 days, N = 14 patients		
Number (%) of patients with one or more <i>stage I pressure ulcers</i>	62 (56.4)	58 (59.2)	23 (38.3)	5 (35.7)	–	148
Number (%) of patients in whom none healed	54 (87.1)	49 (84.5)	13 (56.5)	4 (80)	–	120
Number (%) of patients in whom some or all healed	8 (12.9)	9 (15.5)	10 (43.5)	1 (20)	0.017	28 (18.9)
Number (%) of patients with one or more <i>stage II pressure ulcers</i>	67 (60.9)	46 (46.9)	26 (43.3)	5 (35.7)	–	144
Number (%) of patients in whom none healed	67 (100)	41 (89.1)	19 (73.1)	2 (40)	–	129
Number (%) of patients in whom some or all healed	0 (0)	5 (10.9)	7 (26.9)	3 (60)	0.0001	15 (10.4)
Number (%) of patients with one or more <i>stage III pressure ulcers</i>	2 (1.8)	4 (4.1)	5 (8.3)	2 (14.3)	–	13
Number (%) of patients in whom none healed	2 (100)	4 (100)	4 (80)	2 (100)	–	12
Number (%) of patients in whom some or all healed	0 (0)	0 (0)	1 (20)	0 (0)	1.0	1 (7.7)
Number (%) of patients with one or more <i>stage IV pressure ulcers</i>	4 (3.6)	11 (11.2)	2 (3.3)	2 (14.3)	–	19
Number (%) of patients in whom none healed	4 (100)	11 (100)	2 (100)	2 (100)	–	19
Number (%) of patients in whom some or all healed	0 (0)	0 (0)	0 (0)	0 (0)	–	0 (0)
Number (%) of patients with one or more <i>unstageable pressure ulcers</i>	14 (12.7)	14 (14.3)	6 (10)	0 (0)	–	34
Number (%) of patients in whom none healed	14 (100)	14 (100)	6 (100)	–	–	34
Number (%) of patients in whom some or all healed	0 (0)	0 (0)	0 (0)	–	–	0 (0)
Number (%) of patients with one or more <i>malignant wounds</i>	18 (16.4)	14 (14.3)	18 (30)	4 (28.6)	–	54
Number (%) of patients in whom none healed	18 (100)	14 (100)	18 (100)	4 (100)	–	54
Number (%) of patients in whom some or all healed	0 (0)	0 (0)	0 (0)	0 (0)	–	0 (0)
Number (%) of patients with one or more <i>skin tears</i>	41 (37.3)	32 (32.7)	7 (11.7)	3 (21.4)	–	83
Number (%) of patients in whom none healed	40 (97.6)	26 (81.2)	5 (71.4)	0 (0)	–	71
Number (%) of patients in whom some or all healed	1 (2.4)	6 (18.8)	2 (28.6)	3 (100)	0.0001	12 (14.5)
Number (%) of patients with one or more <i>venous leg ulcers</i>	10 (9.1)	9 (9.2)	5 (8.3)	1 (7.1)	–	25
Number (%) of patients in whom none healed	9 (90)	2 (22.2)	0 (0)	0 (0)	–	11
Number (%) of patients in whom some or all healed	1 (10)	7 (77.8)	5 (100)	1 (100)	0.0004	14 (56)

Table 5 (Continued)

Wound class	Time from referral to death				P-value*	Totals
	≤7 days, N = 110 patients	≤30 days, N = 98 patients	≤91 days, N = 60 patients	≤182 days, N = 14 patients		
Number (%) of patients with one or more <i>diabetic foot ulcers</i>	4 (3.6)	6 (6.1)	0 (0)	1 (7.1)	–	11
Number (%) of patients in whom none healed	4 (100)	3 (50)	–	1 (100)	–	8
Number (%) of patients in whom some or all healed	0 (0)	3 (50)	–	0 (0)	0.2	3 (27.3)
Number (%) of patients with one or more <i>arterial leg/foot ulcers</i>	5 (4.5)	5 (5.1)	1 (1.7)	0 (0)	–	11
Number (%) of patients in whom none healed	5 (100)	5 (100)	1 (100)	–	–	11
Number (%) of patients in whom some or all healed	0 (0)	0 (0)	0 (0)	–	–	0 (0)

*Fisher's exact test was used to test whether the percent of patients with healed wounds differed across the survival categories.

64.5% healing of stage I pressure ulcers seen in a prospective study of nursing home residents (36). In our study, 10.4% of patients showed complete healing of at least one stage II pressure ulcer. This is significantly less than the 81% healing rate seen in a prospective study involving nursing home patients (37), and the 37% healing rate seen in a retrospective study of long-term care patients (38). Only one patient (7.7%), from a total of 13 patients with stage III pressure ulcers, showed complete healing of at least one stage III pressure ulcer. This is comparable to the 5% healing rate seen in a retrospective study of long-term care patients (38), but less than the 9% of stage III pressure ulcers healed in a prospective study involving nursing home patients (37). Another retrospective study involving residents of a Veterans Affairs hospital saw no healing of stage III ulcers in patients who died within 180 days of ulcer onset (39). Our study did not show any complete healing of stage IV and unstageable pressure ulcers. This is less than the 5% of stage IV and 5% of unstageable pressure ulcers healed in a prospective study involving nursing home patients (37). A retrospective study involving long-term patients reported healing in 5% of stage IV pressure ulcers (38), while a retrospective study from a Veterans Affairs hospital saw no healing of stage IV ulcers in patients who died within 180 days of ulcer onset (39).

Skin tears, the second most prevalent wound class in this study, were associated with a

14.5% complete healing proportion across the four survival bands. In addition, there was a statistically significant trend to observe higher levels of healing with progressively longer survival. Although there is no other study that looks specifically at traumatic skin tears among patients with advanced illness referred for supportive and palliative care, a randomised controlled study comparing the efficacy of Octylcyanocrylate (OCA) versus Standard Wound Closure (SWC), in lacerations and incisions, reported no difference in complete healing at the 3 month follow-up (OCA, 82% versus SWC, 83%; $P = 0.67$) in the setting of ambulatory patients (40).

Venous leg ulcers were the fourth most prevalent wound class in this study and showed the highest levels of complete healing with 56% of patients achieving complete healing of at least one wound. A possible explanation may relate to patients in the final weeks of life becoming increasingly bedbound thereby decreasing venous leg pressures and associated oedema. Our levels of complete healing exceeded the 40% of venous leg ulcers healed during a prospective study at a subacute hospital wound unit (41). Our healing proportions are comparable to the 67% healing rate reported from a retrospective study of an outpatient program (42), and a 58% healing rate reported from a prospective study at a tertiary care hospital wound program (43).

Key Points

- our study did not show any complete healing of stage IV and unstageable pressure ulcers
- venous leg ulcers were the fourth most prevalent wound class in this study and showed the highest levels of complete healing with 56% of patients achieving complete healing of at least one wound

Key Points

- marginal levels of complete wound healing are possible in the setting of patients with advanced illness as they traverse the final phases of their lives
- wounds showing at least some cases of complete healing in this study include venous leg ulcers, diabetic foot ulcers, stage I pressure ulcers, skin tears, stage II pressure ulcers and stage III pressure ulcers
- recognising the negative effect that wounds impact on patient's comfort, dignity and quality of life, and given the fact that the healing rates remain quite low, greater efforts must be dedicated towards primary and secondary prevention
- when healing is not likely other positive outcomes such as wound maintenance and wound palliation should be targeted and emphasised

Diabetic foot ulcers showed the second highest levels of complete healing with 27.3% of patients achieving complete healing of at least one wound, but this represents only 3 patients out of a total of 11. This makes it hard to draw conclusions. A possible explanation may relate to patients in the final weeks of life becoming increasingly bedbound thereby reducing pressure, friction and shearing forces that occur during ambulation. A randomised clinical trial that most closely approaches the complete offloading (by virtue of patients becoming bedbound) of patients in our study, employed total contact casting in otherwise ambulatory patients with superficial non infected, non ischemic diabetic foot ulcers where the healing rate was 89.5% (44).

Malignant wounds were the third most prevalent wound class in this study. None of the malignant wounds in this study showed complete healing. This is the expected outcome as the patients in question had advanced malignancies that were beyond consideration for disease modulating therapies or definitive surgical resection.

This study documented no complete healing of arterial leg/foot ulcers. This is the expected outcome as the patients in question were in the final phases of their lives and were not candidates for revascularisation or hyperbaric therapies. A prospective study that assessed healing rates at two hospital-based outpatient clinics and a subacute hospital wound unit showed that arterial ulcers had the lowest potential for complete healing of all wounds classes studied, across all settings (41).

Although this is the first study to look at complete healing in a comprehensive set of wound classes, in the setting of patients with advanced illness referred for supportive and palliative care, it nonetheless has a number of significant limitations. The most obvious limitation relates to the lack of standardisation with respect to treatment modalities. Unfortunately, in the palliative care setting, where patients are often deteriorating precipitously, it is challenging to adhere to rigid treatment protocols while attempting to adhere to principles of patient-centred care. Another limitation related to the use of the referral date as the baseline. This occurred as the actual onset dates for many of the wounds was not known with a high degree of certainty. In addition, the research team

did not document 'deep tissue injury' as the study data was collected prior to the 2007 NPUAP amendments. Furthermore, since many wounds had incomplete data pertaining to wound dimensions, the validated Pressure Ulcer Scale for Healing guidelines (37) were not employed, and thus healing rates could not be computed. Future studies should track wounds that are increasing or decreasing in size as well as assessing the level of pain and polysymptom burden.

CONCLUSIONS

Marginal levels of complete wound healing are possible in the setting of patients with advanced illness as they traverse the final phases of their lives. Given the compromised state of patients in this context any level of complete healing must be regarded as an extraordinary achievement. Wounds showing at least some cases of complete healing in this study include venous leg ulcers, diabetic foot ulcers, stage I pressure ulcers, skin tears, stage II pressure ulcers and stage III pressure ulcers. All the latter wound classes, except for diabetic foot ulcers and stage III pressure ulcers, showed an increasing trend towards complete healing associated with longer survival. Recognising the negative effect that wounds impact on patient's comfort, dignity and quality of life, and given the fact that the healing rates remain quite low, greater efforts must be dedicated towards primary and secondary prevention. This may be achieved through aggressive identification of high risk groups coupled with timely and appropriate intervention. Moreover, when healing is not likely other positive outcomes such as wound maintenance and wound palliation should be targeted and emphasised.

ACKNOWLEDGEMENTS

The authors wish to thank Linda Trozzolo for her work in data collection, and Darren Hamilton and Anna Mann for assistance with literature searches and editing. The authors declare no conflict of interests.

REFERENCES

- 1 Maida V, Corbo M, Irani S, Dolzhykov M, Ennis M, Irani S, Trozzolo L. Wounds in advanced illness: a prevalence and incidence study based

- on a prospective case series. *Int Wound J* 2008;5:305–14.
- 2 Ciemens EL, Stuart B, Gerber R, Newman J, Bauman M. An evaluation of the advanced illness management (AIM) program: increasing hospice utilization in the San Francisco Bay area. *J Palliat Med* 2006;9:1401–11.
 - 3 Maida V, Peck J, Ennis M, Brar N, Maida AR. Preferences for active and aggressive intervention among patients with advanced cancer. *BMC Cancer* 2010;10:592. doi:10.1186/1471-2407-10-592.
 - 4 Alvarez OM, Meehan M, Ennis W, Thomas DR, Ferris F, Kennedy KL. Chronic wounds: palliative management for the frail population. *Wounds* 2002;14:5S–27S.
 - 5 Barnabe C, Daeninck P. Beauty is only skin deep. *J Pain Symptom Manage* 2005;29:419–22.
 - 6 Langemo DK, Brown G. Skin fails too: acute, chronic, and end-stage skin failure. *Adv Skin Wound Care* 2006;19:206–11.
 - 7 Tippett AW. Wounds at end of life. *Wounds* 2005;17:91–8.
 - 8 Reifsnnyder JA, Magee HS. Development of pressure ulcers in patients receiving home hospice care. *Wounds* 2005;17:74–9.
 - 9 Maida V, Ennis M, Kuziemsy C, Trozzolo L. Symptoms associated with malignant wounds: a prospective case series. *J Pain Symptom Manage* 2009;37:206–11.
 - 10 Maida V, Ennis M, Kuziemsy C. The Toronto Symptom Assessment System for Wounds (TSAS-W): a new clinical and research tool. *Adv Skin Wound Care* 2009;22:468–74.
 - 11 Cherny N, Sapir R, Catane R, Kaufman B, Isacson R, Segal A, Wein S. Symptom prevalence and severity among ambulatory cancer patients attending an integrated oncology-palliative care day hospital. *Proceedings of ASCO* 1999;582a.
 - 12 Brechtel JR, Murshed S, Homel P, Bookbinder M. Monitoring symptoms in patients with advanced illness in long-term care: a pilot study. *J Pain Symptom Manage* 2006;32:168–74.
 - 13 Maida V, Ennis M, Kuziemsy C, Corban J. Wounds and survival in noncancer patients. *J Palliat Med* 2010;13:453–9.
 - 14 Maida V, Ennis M, Kuziemsy C, Corban J. Wounds and survival in cancer patients. *Eur J Cancer* 2009;45:3237–3244.
 - 15 Maida V. A paradigm for the components of Wound Management. URL www.vincentmaida.com [accessed on 1 November 2011].
 - 16 Ferris FD, Al Khateib AA, Fromantin I, Hoplamazian L, Hurd T, Krasner DL, Maida V, Price P, Rich-Vanderbijl L. Palliative wound care: managing chronic wounds across life's continuum: a consensus statement from the International Palliative Wound Care Initiative. *J Palliat Med* 2007;10:37–9.
 - 17 Maida V. A paradigm for Wound Management across life's continuum. URL www.vincentmaida.com [accessed on 1 November 2011].
 - 18 Ennis WJ, Meneses P. Palliative care and wound care: 2 emerging fields with similar needs for outcomes data. *Wounds* 2005;17:99–104.
 - 19 Liao S, Arnold RM. Wound care in advanced illness: application of palliative care principles. *J Palliat Med* 2007;10:1159–60.
 - 20 Maida V. A paradigm for Outcomes in Wound Management. URL www.vincentmaida.com [accessed on 1 November 2011].
 - 21 Alvarez OM, Kalinski C, Nusbaum J, Hernandez L, Pappous E, Kyriannis C, Parker R, Chrzanowski G, Comfort CP. Incorporating wound healing strategies to improve palliation (symptom management) in patients with chronic wounds. *J Palliat Med* 2007;10:1161–89.
 - 22 Norton L, Coutts P, Sibbald RG. Choosing between a healable, non-healable and maintenance wound. *Rehabil Commun Care* 2011;20:25–7.
 - 23 Anderson F, Downing GM, Hill J, Casorso L, Lerch N. Palliative performance scale (PPS): a new tool. *J Palliat Care* 1996;12:5–11.
 - 24 Braden BJ, Maklebust J. Preventing pressure ulcers with the Braden scale: an update on this easy-to-use tool that assesses a patient's risk. *Am J Nurs* 2005;105:70–2.
 - 25 Charlson ME, Pompei P, Ales KL, MacKenzie R. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chron Dis* 1987;40:373–83.
 - 26 Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *J Clin Epidemiol* 1992;45:613–9.
 - 27 Cuddigan J, Berlowitz DR, Ayello EA; National Pressure Ulcer Advisory Panel Board of Directors (NPUAP). Updated Pressure Ulcer Staging. Washington DC: NPUAP, 2007.
 - 28 Falanga V. Classifications for wound bed preparation and stimulation of chronic wounds. *Wound Repair Regen* 2000;8:347–52.
 - 29 Sibbald RG, Williamson D, Orsted HL, Campbell K, Keast D, Krasner D, Sibbald D. Preparing the wound bed—debridement, bacterial balance and moisture balance. *Ostomy Wound Manage* 2000;46:14–35.
 - 30 Schultz GS, Sibbald RG, Falanga V, Ayello EA, Dowsett C, Harding K, Romanelli M, Stacey MC, Teot L, Vanscheidt W. Wound bed preparation: a systematic approach to wound management. *Wound Repair Regen* 2003;11:1–28.
 - 31 Schim SM, Cullen B. Wound care at end of life. *Nurs Clin North Am* 2005;40:281–94.
 - 32 McDonald A, Lesage P. Palliative management of pressure ulcers and malignant wounds in patients with advanced illness. *J Palliat Med* 2006;9:285–95.
 - 33 Hatsfield-Wolfe ME, Rund C. Malignant cutaneous wounds: a management protocol. *Ostomy Wound Manage* 1997;43:56–66.
 - 34 Hutcheson A. Hospice care in the United States. *Prim Care* 2011;38:173–82.
 - 35 Glare P, Sinclair C, Downing M, Stone P, Maltoni M, Vigano A. Predicting survival in patients with advanced disease. *Eur J Cancer* 2008;44:1146–56.
 - 36 Sato M, Sanada H, Konya C, Sugama J, Nakagami G. Prognosis of stage I pressure ulcers and related factors. *Int Wound J* 2006;3:355–62.

- 37 Gardner SE, Frantz RA, Bergquist S, Shin CD. A prospective study of the Pressure Ulcer Scale for healing (PUSH). *J Gerontol* 2005;60A:93-7.
- 38 Bergstrom N, Horn SD, Smout RJ, Bender SA, Ferguson ML, Taler G, Sauer AC, Sharkey SS, Coble Voss A. The national pressure ulcer long-term care study: outcomes of pressure ulcer treatments in long-term care. *JAGS* 2005;53:1721-9.
- 39 Brown G. Long-term outcomes of full-thickness pressure ulcers: healing and mortality. *Ostomy Wound Manage* 2003;49:42-50.
- 40 Singer AJ, Quinn JV, Clark RE, Hollander JE. Closure of lacerations and incisions with octylcyanoacrylate: a multicenter randomized controlled study. *Surgery* 2002;131:270-6.
- 41 Ennis WJ, Lee C, Vargas M, Menses P. Wound outcomes from a single practice at a subacute wound care unit and two hospital-based, outpatient clinics. *Wounds* 2004;16:164-72.
- 42 Granowitz EV, Szostek R, Burns P, Carmel J, Emhoff TA, Brown RB. Aetiologies and outcomes of wounds in an outpatient programme. *J Wound Care* 1998;7:378-9.
- 43 Sholar AD, Wong LK, Culpepper JW, Sargent LA. The specialized wound care center-A 7 year experience at a Tertiary Care Hospital. *Ann Plast Surg* 2007;58:279-84.
- 44 Armstrong DG, Nguyen HC, Lavery LA, van Schie CHM, Boulton AJM, Harkless LB. Off-loading the diabetic foot wound - a randomized clinical trial. *Diabetes Care* 2001;24:1019-22.