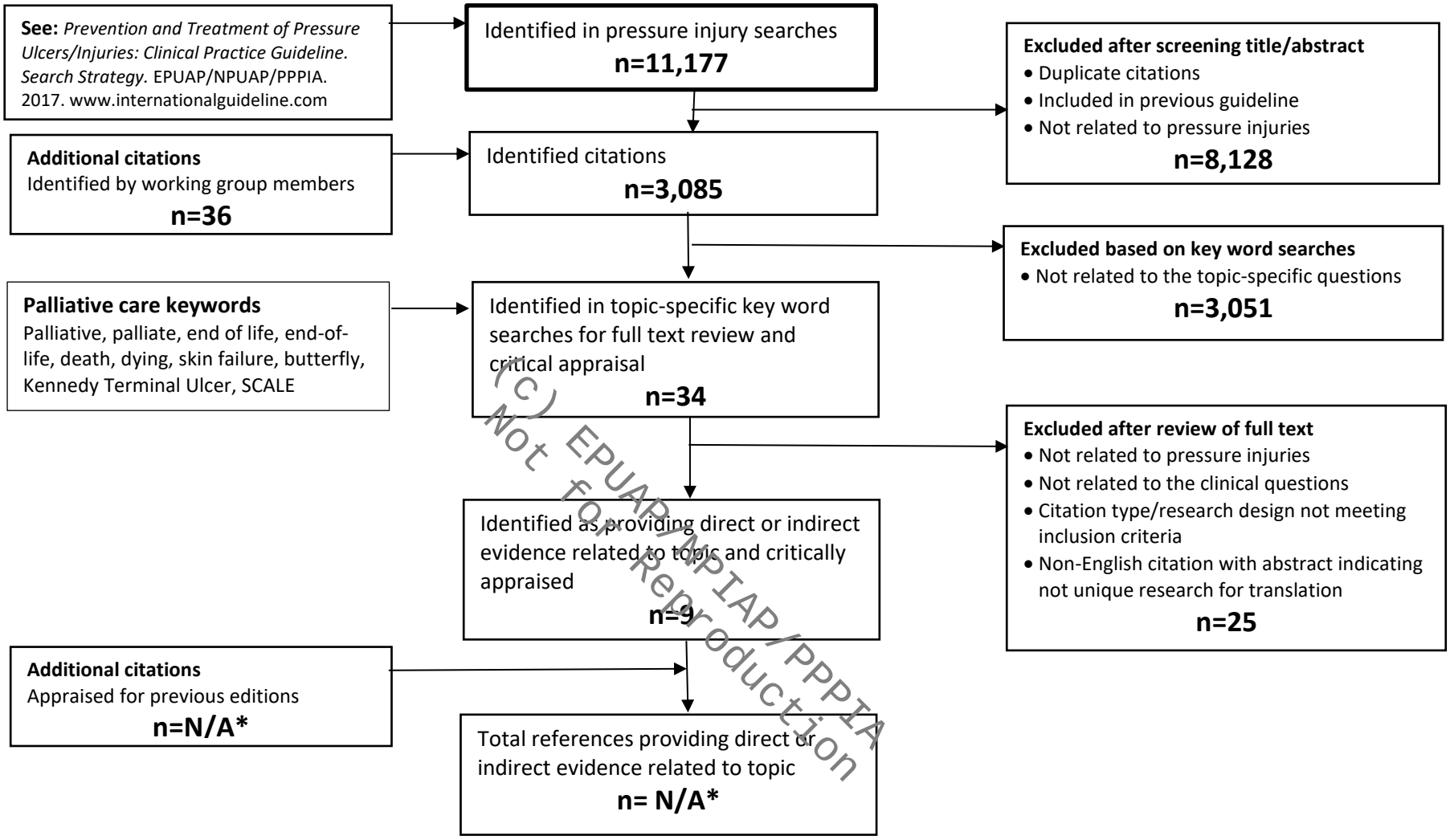
Search results for 2019 International Pressure Injury Guideline: Individuals in the Palliative care



* Recommendations related to all special populations are included in the topics to which the recommendation relates (e.g. support surfaces), and the references supporting these recommendations are included in the search reports for those topics.

European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers/Injuries: Clinical Practice Guideline. The International Guideline. Emily Haesler (Ed.). EPUAP/NPIAP/PPPIA; 2019

Articles Reviewed for International Pressure Injury Guideline

The research has been reviewed across three editions of the guideline. The terms pressure ulcer and pressure injury are used interchangeably in this document and abbreviated to PU/PI. Tables have not been professionally edited. Tables include papers with relevant direct and indirect evidence that were considered for inclusion in the guideline. The tables are provided as a background resources and are not for reproduction.

European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers/Injuries: Clinical Practice Guideline. The International Guideline. Emily Haesler (Ed.). EPUAP/NPIAP/PPPIA; 2019

Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
Clinical questions one: Risk factors for pressure injuries in palliative care							
Carlsson & Gunningberg, 2017	Retrospective cohort study exploring **risk factors for pressure injuries in people who died**	Data base of all patients in Sweden who died in 2014 and were recorded in a Register of Palliative Care(n=60,319 participants) Inclusion criteria: • Aged over 17 years • Recorded in the Palliative care database Exclusion criteria: Not stated Participant characteristics: • Mean age 81.7 years • 54.3% female • 84.5% of deaths were expected • 35.5% occurred in a nursing home, 35.3% occurred in hospital • 34% cancer, 31% heard disease, 19% dementia		• Pressure injuries classified by doctor or nurse at time of death using EPUAP/NPUAP scale	**Prevalence at admission** • 6.9% in nursing homes • 13.8% hospitals • 19% in specialized palliative care units • 11% home general palliative care **Prevalence at death** • 16.8% in nursing homes • 19.6% hospitals • 29.7% in specialized palliative care units • 18.6% general home palliative care **Logistic regression** • Adjusted for place of death using nursing home as reference ○ Hospital (OR 1.20, 95% CI 1.14 to 1.27, p<0.001) ○ Specialized palliative care (OR 2.09, 95% CI 1.96 to 2.23, p<0.001) ○ general home palliative care (OR 1.13, 95% CI 1.03 to 1.24, p<0.05) • Adjusted for place of death and age using nursing home as reference ○ Hospital (OR 1.23, 95% CI 1.16 to 1.29, p<0.001) ○ Specialized palliative care (OR 2.18, 95% CI 2.02 to 2.22, p<0.001) ○ general home palliative care (OR 1.15, 95% CI 1.04 to 1.26, p<0.001)	• Relied on retrospectively collected data • Specific to terminally ill individuals • Management strategies were not reported or considered as a confounding factor	**Level of evidence: 3 (prognostic)** **Quality: moderate**

Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
					○ age (OR 1.00 95% CI 1.001 to 1.005, p<0.05) Also includes data adjusting for medical conditions, length of stay and symptoms		
Sternal, Wilczynski, & Szewieczek, 2017	Retrospective cohort study exploring **risk factors for PU in palliative care setting**	Consecutive participant records over one year from one palliative care ward in Poland were reviewed (n=329 participants) Inclusion criteria: • Inpatient in a participating facility Exclusion criteria: Not stated Participant characteristics: • Mean age 70.4±11.8 years • 55.3% female • 95% had cancer	• Comprehensive PU prevention scale was in place that included regular daily assessment, best practice with respect to support surfaces, positioning, skin care, hydration and nutrition	• Patients were evaluated daily during admission • Waterlow scale within 2 hours of admission and then daily • Risk assigned based on Waterlow score ≥10 for risk, ≥15 high risk and ≥20 very high risk • For analysis, patients were analyzed as no PU developed (group A), admitted with PU (group B) and hospital acquired PU (group C)	**Prevalence** • 62.3% had no PU • 25.5% admitted with a PU • 11.8% HAPU **Multivariable logistic regression (assessed at admission)** • Waterlow score at admission (odds ratio [OR] 1.140, 95% CI 1.057 to 1.229, p=0.001) • mean Waterlow score (OR 1.194, 95% CI 1.092 to 1.306, p=0.001) • admitted from another hospital (OR 2.938, 95% CI 1.339 to 6.448, p=0.007) • hemoglobin level at admission (OR 0.814, 95% CI 0.693 to 0.956, p=0.012) • systolic blood pressure at admission (OR 0.976, 95% CI 0.955 to 0.997, p=0.023) **(assessed during hospitalization)** • mean systolic blood pressure (OR 0.956, 95% CI 0.929 to 0.984, p=0.003) • mean evening body temperature (OR 3.830, 95% CI 1.729 to 8.486, p=0.001) • lowest recorded hemoglobin level (OR 0.803, 95% CI 0.672 to 0.960, p=0.016) • lowest recorded sodium concentration (OR 0.880, 95% CI 0.814 to 0.951, p=0.001)	• Relied on retrospectively collected data • Specific to terminally ill individuals • Method of assessment and by whom conducted and any interrater reliability not reported • Unclear if risk factors preceded PU for those assessed during hospitalization	**Level of evidence: 3 (prognosis)** **Quality: Low**
Clinical question three: Assessment of pressure injuries in palliative care							
V. Maida, Ennis, & Kuziemsky, 2009	Observational case series **for development of Toronto Wound Assessment System for**	Participants were all new referrals to a palliative care program in Canada between 2005 and 2006 Inclusion:	Phase 1: All patients were examined within 24 hours Phase 2: TSAS-W scores were assessed at referral and 1 week later	• Phase 1: wound class, % of patients who reported each symptom at least once at any assessment (period spanned 24 months)	• The most prevalent wound-related symptoms included: pain, exudation, odor, itching, bleeding, aesthetic concern, swelling and mass and bulk effects from the wound and associated dressings	• Single setting • Pilot testing was of limited duration • TSAS-W needs to be validated in a	**Level of evidence: 4** **Quality: low**

Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
	Wounds (TSAS-W)	• Referral to the palliative care program • Cancer or noncancer advanced disease • Presenting with wounds or developing wounds during followup period Exclusion: • Lack of English proficiency Phase 1: n=531 patients with 2,102 wounds Phase 2: n=83 patients with 103 wounds, 21 participants with PU		• Phase 2: TSAS-W global wound symptom distress score • TSAS-W included an 11-point numerical rating scale for: pain, exudate, cosmetic appearance, odor, itchiness, bleeding, mass effect (swelling or edema around wound, bulk effect from wound, bulk effect from dressing), crusting, restricted movement • Findings were combined to give a mean global wound symptom distress scale (GWSDS)	• In Phase 2 (n=121 participants with PU) Mean GWSDS for participants with PU was 33.10 at baseline and 25.24 at 7-day follow up **Completion of tool** • 78.6% of assessments were carried out by participant alone • 14.6% of assessments were carried out by participant with caregiver • 6.8% carried out by the caregiver alone	number of clinical settings • Validity of patient self-assessment not reported	
Clinical question three: Assessing prognosis of pressure injuries							
V. Maida, Ennis, & Kesthely, 2014	A cohort study exploring **factors associated with complete healing of PUs in palliative care patients**	Participants were recruited via referral over a 12 month period at a palliative care hospital in Canada (n=607 enrolled, n=245 Stage II PUs followed)) Inclusion criteria: • Anticipated life expectancy ≤6 months Exclusion criteria: Not reported Participant characteristics: • Only 57 participants were not followed to death	• All wounds managed by a specialist wound management team and advanced practice nurse with intention to heal	• Serial clinical assessments using Palliative Performance Scale • Braden Scale • Pressure injuries s classified using NPUAP classification system • Complete healing defined as complete wound closure with restoration of complete epithelialization over wound site • Analysis considered Stage II PUs only	**Pressure injury rate and healing rate** • At referral 147 participants had a Stage II PU. Of these 16.3% had 5 or more PUs (any stage) from referral to death, 19% had 4 PUs, 17.7% had 3 PUs, 29.9% had 2 PUs and 17% had 1 PU • Of 245 Stage II PUs, 23 (9.4%) fully healed **Univariate analysis** Hazard of healing was significant for following factors: • Younger patients: HR 3.28 for age <80 versus age 80+ years, p=0.031 • Higher PPS score: HR 1.82 to 5.99, p<0.001 **Multivariate analysis**	• Single site • No information on management strategies • No consideration of wound size and depth, which are known prognostic factors • Inclusion criteria and recruitment were unclear	**Level of evidence: 1 (prognostic)** **Quality: Moderate**

Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
		• 55.8% female • 81% Caucasian • 56% aged > 80 years and 39% aged 60 to 79 years • 57% had one failing organ, 31% had two failing organs, 10% had 3 or more failing organs			Hazard of healing was significant for following factors: • Higher PPS score: HR 1.49 to 3.34, p=0.003 **Author conclusions: The Palliative Performance Scale is a key prognostic tool to evaluate likelihood of healing a Stage II pressure injuries in palliative care**		
Clinical question three: Standardized local pressure injury management protocols for palliative care							
Ruggeri et al., 2016	Case series report to **validate a specialist team for managing pressure injuries in advanced cancer patients** treated in their homes	All patients referred for home palliative services in one year period in one town in Italy (37 people recruited,20 people with 26 pressure injuries analyzed) **Inclusion criteria:** • Admitted to palliative care for advanced cancer • Category/stage II, III and IV pressure injury on initial assessment **Exclusion criteria:** • Death within two weeks of admission to study • Admission to hospice or hospital within two weeks of admission to study **Participant characteristics:** • Mean age 80 ± 9 years • Site of PI: 62% sacrum, 27% heel, other locations were back, hallux, and malleolus	• Participants were treated by an interdisciplinary team including nutritionist, doctor, oncologist, palliative doctor, nurses • Pressure Injury Treatment Protocol was evidence-based validated in literature for each stage and used for consistent care. • Treatment protocol included local wound care, rehydration and nutritional supplements when required (10% of patients) and pharmacological management	• Nutrition evaluation conducted by nutritionist including Karnofsky Scale Index, serum and urinary analysis, dietary questionnaire and calculation of food intake, BMI, calorie/protein balance • Pressure injury evaluation conducted every week that included ulcer site and dimensions, ulcer stage using NPUAP classification, clinical appearance and photography • Norton Scale conducted weekly by nurses	**Nutritional status** -90% of participants had a normal (BMI 22.6±2.3), 10% had moderate to severe malnutrition treated with oral nutritional supplementation **Pressure injury outcomes** • 42.3% of pressure injuries were healed, including 6/26 stage II pressure injures healed within 42 weeks, 3/26 stage II pressure injuries healed by 100 weeks and 2/26 stage III pressure injuries healed by 100 weeks • 46% of pressure injuries had a reduction of wound area of >25% (6 x stage II, 3 x Stage III and 3 x Stage IV) • 8% were unchanged • 4% had increase ulcer area of >25% **Median survival** Survival was longer in individuals who had a healed pressure injury (mean 404 days) **Conclusions: the study demonstrates that evidence-based management of pressure injuries in palliative care might lead to healing**	• Very small sample size • No comparison between individuals who died and were withdrawn • No reporting of confounding factors such as pressure injury size and severity at commencement • Quality and availability of general care and support not discussed. • Claim correlation to life expectancy and response to healing but not demonstrated or quantified in the outcomes	**Level of evidence: 4** **Quality: low**

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		• Category/stage of PI: 65% stage II, 23% stage III, 18% stage IV					
Sankaran et al., 2015	Prospective observational study **reporting outcomes for pressure injuries in home care cancer patients in India**	Convenience sample of patients recruited over a 3-year period from a homecare service in India (n=108). **Inclusion criteria:** • Receiving home care for cancer **Characteristics:** • Mean age 65 years, 61% sample male • 87% receiving care due to terminal progressive cancer disease and 11% due to poor performance or advanced age • 95.4% paralyzed • 36% incontinent • 57% below poverty line	• Trained nurse made a home care visit fortnightly to provide education on hygiene, nutrition and repositioning • Existing pressure injuries dressed with boiled cotton cloth strips and home made saline • Metronidazole tablets crushed and applied to wound if malodorous	• Incidence of new pressure injuries • Time taken for pressure injuries to heal • Influence of prognostic factors on healing of pressure injuries • Trained nurses documented pressure injuries on a fortnightly basis using NPUAP staging system.	**Pressure injury rate** 21% had pressure injury on admission to home care, 0% developed a new pressure injury **Pressure injury outcomes** 42.9% achieved completed healing, 23.8% achieved reduction in pressure injuries Category/Stage, 23.8% had no change to pressure injuries, 9.5% had increase in stage (from Category/Stage 1 to Category/Stage 2) **Duration of pressure injury** Mean persistence of pressure injuries was 56 days (95% CI 0 to 117) Median survival of patient with Category/Stage 1- 2 pressure injuries: 75 days Median survival of patient with Category/Stage 3- 4 pressure injuries: 37.5 days **Factors influencing healing** (logistic regression) Financial status (below versus above poverty line, p=0.006) Paralysis (p=0.02) Performance status (p=0.02) Age (above versus below 65 years, p=0.03) Cancer site, continence status, family type, gender did not influence healing **Conclusion: In home palliative patients receiving basic pressure injury treatment, 43% pressure injuries achieved complete healing, these were all Category/Stage I at entry into service.**	• Selection of participants is unclear and may be biased • Patients did not receive care that would be considered standard in a contemporary Western society • No reporting of pressure injury sizes	**Level of evidence: 4** **Quality: low**

Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
Clinical question three: Managing wound odor							
Bale, Tebbie, & Prince, 2004	RCT exploring **effectiveness of metronidazole gel for decreasing wound odor in different types of chronic wounds**	Participants were recruited in unknown facility and manner (n=41, n=26 completed) Inclusion: Wound with an odor rated at least 6 n a 10 point scale Participant characteristics: 50% participants had venous leg ulcer, 12% participants had pressure injuries and 38% participants had other wound types (arterial, surgical)	• Participants were randomized to received either: ○ Metronidazole gel (n=20 commenced, n=13 completed) ○ Placebo gel (n=21 commenced, n=13 completed)	• Wound odor measured on a 10-point scale • Patients, staff members and family members rated odor (blinded) • Odor rated on days 0, 1,3,and 7 • Also measured leakage, sleep and anxiety	**Wound odor rated by patients** Metronidazole gel group had faster improvement in odour reduction than placebo group, reporting good resolution by day 1 (from median score of 8 at day 0 to 3.5 at day 1 versus placebo group: median score of 6 at day 0 to 5 at day 1; p<0.01) **Wound odor rated by nurses** Metronidazole gel group had faster improvement in odour reduction than placebo group, reporting good resolution by day 1 (from median score of 7.5 at day 0 to 3.5 at day 1 versus placebo group: median score of 7 at day 0 to 5 at day 1; p<0.01) **Wound odor rated by relatives** Metronidazole gel group had faster improvement in odour reduction than placebo group, reporting good resolution by day 1 (from median score of 6 at day 0 to 3 at day 1 versus placebo group: median score of 8 at day 0 to 6.5 at day 1; p<0.01) **Author conclusion: Metronidazole significantly reduces wound odor.**	• Unknown methods of recruitment • Randomization and allocation concealment not reported • Blinded outcome measurement	**Indirect evidence: (mixed etiology wounds)**
Kalinski et al., 2005	Observational study exploring **effectiveness of metronidazole gel for decreasing wound odor in malodorous wounds**	Participants recruited in unknown location and manner (n=16) Inclusion: Large fungating tumor Exclusion criteria: • Receiving chemotherapy or radiotherapy	• Participants all received 0.75% Metronidazole gel made by putting 3.6g metronidazole into 10mL propylene glycol to make a gel that was then added to hydroxypropyl methylcellulose	• Wound odor measured on a 10-point scale • Patient and researcher rated odor • Odor rated on days 0, and then daily for 2 weeks	**Wound odor** • Statistically significant decrease in odor at one day compared to baseline for patient ratings and researcher ratings (p<0.05 for both) • Statistically significant decrease in odor at one 7 and day 14 compared to baseline for patient ratings and researcher ratings (p<0.05 for both)	• Very small observational study • Not pressure injuries • No blinded assessment • No participant characteristics reported	**Indirect evidence: (fungating tumors)**

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		• Taking systemic antibiotics	(prepared by a pharmacy) applied at 1.5mm thickness over entire wound surface on a daily basis • No wounds debrided • All wounds receiving saline cleanse, gel then an absorbent dressing		**Cost analysis** • Costs for compounded metronidazole gel was $0.028/gram ($US in 2005) • Costs of commercially prepared Metronidazole gel was $0.96/gram • Amount of product used in study suggests one dose was 38g **Author conclusion: Metronidazole reduces odor in fungating wounds. A product compounded by the hospital pharmacy is cheaper than commercial products.**		
Newman, Allwood, & Oakes, 1989	Observational study exploring **effectiveness of metronidazole gel for decreasing wound odor in malodorous wounds**	Participants recruited in unknown location and manner (n=68) Inclusion criteria: malodorous lesions	• All participants were treated with a topical 0.8% metronidazole gel and covered with gauze • Gel applied daily for periods varying from a few days to 15 months	• Wound odor measured on a 10-point scale	**Wound odor** Gel completely controlled the odor of 50% lesions; had a reasonable effect on 46% of lesions and no effect on 4% of lesions **Adverse events** One participant had skin irritation after 7 days of daily treatment	• Small observational study • Not pressure injuries • No blinded assessment • No participant characteristics reported	**Indirect evidence: (unknown etiology of wounds)**
Background information: Prevalence of pressure injuries							
Hoben et al., 2016	Cross sectional **exploring prevalence of pressure injuries and their burden and cost**	A retrospective review of patient records in a stratified random sample of Canadian nursing homes (n=30, n=6007 residents) Characteristics of facilities, patients and staff were not reported	• A literature review identified 20 symptoms described as common at the end of life, causing physical/psychological distress • Resident Assessment Instrument Minimum Data Set (RAI-MDS) 2.0 was collected from the last assessment before death for prevalence	• Prevalence • Burden of symptoms categorized as low, medium or high as voted by survey participants • Financial impact categorized as low, medium or high as voted by survey participants	**Pressure injury prevalence** • Prevalence of pressure injuries (Category/Stage 2 or greater) across the facilities was 10.8% • Pressure injuries represented the 14th most prevalent burdensome symptoms **Pressure injury burden** • Patient burden was ranked as medium by care staff • Financial burden was ranked as medium by care directors	• Very little information about the sample population provided • No information given on the care staff participating in the survey and their experience with symptoms • Relies on documentation for prevalence	**Level of evidence: 4** **Quality: low**

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			• A range of staff (n=17) from 14 facilities participated in a survey to rate burden of symptoms • A second survey of directors of care (n=7) were surveyed about the cost burden of symptoms			• No analysis across multiple sites	
Queiroz, Mota, Bachion, & Ferreira, 2014	Cross sectional study to identify **prevalence of pressure injuries in people in home palliative care**	Participants were recruited from one homecare service in a metropolitan area of Brazil (n=90 recruited, n=64 analyzed, 26 lost to follow up due to death or moving location) Inclusion criteria: • Adults with advanced cancer at home	Not applicable	• The outcomes were measured by the Pressure Ulcer Healing Scale (PUSH) Karnofsky Performance Scale, the Katz Index, and the Lawton scale • Outcomes measured by researchers	• The prevalence of pressure injuries was 18.8%, mean PUSH scale score 9.05±5.38 • 47% of pressure injuries were stage III, 16% stage II, 5% stage 4, 11% stage I, 21% unstageable • No statistically significant differences were found in clinical variables (smoking and alcohol use, dependency levels, continence, cardiovascular problems, being underweight, received education) between those who had pressure injuries and those who did not • No statistically significant differences were found in demographic variables (age, gender, race, education level, religion, living with partner) between those who had pressure injuries and those who did not	• The sample size is too little • Management of pressure injuries is not reported • Data collection and recruitment methods not reported in detail • No detail on size of pressure injuries	**Level of evidence: 4** **Quality: moderate**
Estabrooks et al., 2015	A cross sectional study exploring the **prevalence of burdensome symptoms in the last year of life in older adults**	Participant records from 36 aged care facilities in Canada were reviewed (n=3647 participants) Inclusion criteria: • Inpatient in a participating facility Exclusion criteria: Not stated	• No intervention	• Data was taken for records and RAI-MDS 2.0 assessments • Recorded data on 7 selected conditions including pressure injuries Stage II or higher • Recorded data on organizational context including leadership	**Results relevant to pressure injuries** • Pressure injury prevalence was not significantly different between individuals with or without dementia • Residents who had 4 quarterly assessment before death were less likely to have a pressure injuries than those who were assessed for between 1 and 3 quarters before death (9.8% versus 12.1%, p=0.005) **Author conclusions: author concluded that there were significantly more pressure**	• Only peripherally related to topic and results do not support conclusions	**Level of evidence: 4** **Quality: Low**

Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
		Participant characteristics: • Mean age 88 years • 65.8% female • Mean length of stay 24.8±31.4 • 77.8% died in ward • 95.1% had cancer		type, culture, social capital, structure etc	**injuries in individuals without dementia compared to those with dementia, although the data did not support this conclusion**		
Aminoff, 2012	Cohort study **investigating 6-month outcomes for patients with end-stage dementia and PU**	Participants were recruited over a 3-year period from a geriatric centre in Israel (n=200) Inclusion: • Severe, end-stage dementia (of difference origins) • Communication difficulties • Complete dependency in ADLs and functional movement Characteristics: 102 males, 98 females Mean age 80.9±8.1 years (range 50 to 100)	• Comparison of two cohorts: ○ Cohort one: no PU on admission (n=80) ○ Cohort two: PU on admission (n=120)	• Mini-Suffering State Examination (MSSE, validated tool) that assesses for presence of conditions associated with suffering, of which PU is one. • Presence of PU (Stages I to IV) unclear how this was assessed Follow-up period of 6 month	• On admission participants with PU had a higher rate of: ○ male gender (p<0.009) ○ malnutrition (low albumin; p<0.0001) ○ high cholesterol (p<0.0001) ○ antidepressants (10.8% vs. 2.5%, p=0.028) ○ analgesia (23.8% vs. 11.7%, p<0.032) • Participants with PU had a significantly higher 6-month mortality rate compared with those without PU (71.3% vs. 45.8%, p<0.0001) • Participants with PU had a higher significantly higher MSSE score than those without PU (5.49±2.17 vs. 3.48± 222, p<0.0001) • On the MSSE, participants with PU had no significant differences for being not calm, screaming, pain, eating disorder, of suffering according to family opinion. • On the MSSE, participants with PU were more likely to have malnutrition, invasive actions, suffering according to medical opinion and unstable medical conditions. **Study conclusions: People with end-stage dementia that have concurrent PU have a high 6-month mortality rate. It is unclear if PUs arise from their multiple medical conditions or contribute toward them.**	• Unclear how outcome measures e.g. presence of PU was assessed • It is unclear whether the overall significant difference in MSSE score is attributable to presence of PU being one question on the MSSE	**Level of evidence: 3** **Quality: low**

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Hendrichova et al., 2010	Retrospective records **analysis of PU prevalence in cancer patients**	Records were analysed from patients with cancer admitted within a 6-month in 2008 to a palliative care service in Italy (n= 414) Characteristics: • Karnofsky Performance Scale (KPS) index lower than 50% indicating a high risk of PU • Mean age 74 years • 65% admitted from home and 35% from another palliative service	Individualized prevention strategies were used for all participants including: • higher specification foam mattress • an active support surface for patients with highest risk • regular turning and repositioning • observed skin regularly • used skin emollients to hydrate dry skin and reduce the risk of skin damage	• Presence of PUs determined using European staging system	• Prevalence of PUs of 22.9% • Incidence of PUs of 6.7% • Karnofsky Performance Scale (KPS) Index scores, age and length of stay were significantly related to the pressure sore development (p<0.001) • Patients who developed PUs were significantly older than those who did not develop them (79.9±6.8 versus 73.4±11.5 days) • Patients who developed PUs were cared for a significantly greater number of days (57.2 versus 37.4 days, p=0.027)	• Retrospective design • Single site study • Lacks generalizability	**Level of evidence: 4**
V. Maida, Ennis, & Corban, 2012	Prospective observational sequential case series cohort comparison **of PU incidence in palliative care patients**	Participants were sequential patients referred from a community and hospital based palliative care program in Canada (n=593 with 1036 wounds were assessed) Characteristics: • 70% of participants had a cancer diagnosis • Mean age was significantly older for non-cancer patients (80.5±11.1 versus 72.4±13.2 years, p<0.001) • Primarily Caucasian • Mean Braden score was significantly lower for non-cancer patients (10.1±2.9 versus 15.8±3.8, p<0.001) • Non-cancer patients had more comorbidities	• Participants were followed by serial clinical assessments every 24-48 hours throughout their palliative trajectory • Performance status was measured at baseline and then weekly until death • Risk was measured using the Braden Scale	Observational period spanned 24 months PUs were classified according to the National Pressure Ulcer Advisory Panel (NPUAP)	• During the 24 month assessment period 891 new wounds developed • PUs accounted for 60.6% of all wounds • Most common anatomical site for wounds was the coccyx/sacrum • non-cancer patients experienced a higher prevalence of PUs • cancer patients had a higher point prevalence of malignant wounds and iatrogenic wounds **Study conclusions: palliative care patients have a high rate of wound development, with PUs accounting for 60.6% of wounds and the most common site being the sacrum/coccyx region. Non-cancer patients have a higher risk of PU, with a lower mean Braden score and higher level of co-morbidity.**	• Participants all were recruited from a single health care organization in a single country • Reassessment occurs at 24 and 48 hour intervals resulting in some degree of error in assessing the onset date of particular wounds	**Level of evidence: 3** **Quality: moderate**

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		(9.1±3.1 versus8.3±3.3, p=0.01)					
Vincent Maida, Ennis, Kuziemsky, & Corban, 2009	Cohort study investigating the **association between wounds and survival in cancer patients**	Participants were cancer patients (n=418) of which 90% were followed to their death) Characteristics: • Mean age 73±13 years • Primarily Caucasian (86.1%)	• Assessment on admission to study	• Cancer type classified per body system • Wound types were classified within 24 hours of admission	• Participants with wounds were less likely to have gastrointestinal cancer than those without wounds (37.4% versus 62.6%, p<0.0001) • PUs were the most common wound class observed (22.7%) • Participants with wounds at referral had a significantly worse prognosis (23 days versus 43 days, p<0.0001) **Study conclusions: there was a statistically significant increase in risk of death for female patients with PUs (HR 2.00, p=0.0002)**	• Participants all were recruited from a single health care organization in a single country • Reassessment at 24 and 48 hour intervals leads to degree of error in assessing the onset date of wounds	**Level of evidence: 3** **Quality: moderate**
V. Maida et al., 2012	Prospective case series **assessing potential for complete wound healing in in patients with advanced illness.**	Participants were recruited from a palliative care program in Canada. (n = 282 with 823 wounds of mixed aetiology) Characteristics: • patients with cancer (n=148) and non-cancer (n=134) • Mean Braden score 12.2 (range 6 to 22) • Wounds were primarily PU: ○ Stage I n=218 ○ Stage II n=239 ○ Stage III n=21 ○ Stage IV n=28 ○ Unstageable n=55	• All patients were examined within 24 hours of the initial referral • Risk for developing PUs was measured using the Braden Scale • All wounds were managed by a specialist wound management team with intet to heal • All patients with a stage IV or stage US PU were also placed on support surfaces within 48 hours of baseline.	• Complete wound healing	• Proportions of patients showing complete healing prior to death: ○ 18.9% for stage I PUs ○ 10.4% for stage II PUs ○ 7.7% for stage III PU ○ 0% for stage IV PU and unstageable PU • Participants lived for 7 to 182 days, with majority not surviving beyond 7 days **Study conclusions: for patients with advanced disease who develop PUs, the likelihood of complete wound healing before death is low for most PU stages, particularly for patients with less than 7 days to live.**	• Lack of standardized wound assessment • Use of referral date as baseline • Since many wounds had incomplete wound dimension data, the validated PUSH guidelines were not employed	**Level of evidence: 4** **Quality: low**
Bonaldi, Parazzini, Corli, &	Multicentre-observational study **providing**	Participants recruited from seven publically funded palliative care centres in Milan. (n=1081)	MD completed a 2-part questionnaire: • socio-demographic characteristics	• Presence of pressure ulcers (AHCPR classification tool)	1081 patients followed: • 687 died at home (63.6%) • 178 (16.5%) died in a palliative care unit • 140 (13%) died in hospital	• Patient sub-groups often small precluding detailed analysis	**Level of evidence: 4** **Quality: low**

Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
Lodetti, 2009	**information on PU epidemiology across a range of people receiving palliative care**	Inclusion: • Diagnosis of end-stage cancer where no curative treatment available • Did not require admission for intensive care • Not expected to live longer than 90 days.	clinical data including • information regarding presence and severity of PU	• Self-evaluated pain ad self-reported dyspnea using VAS with both outcomes assessed as moderate-to- severe where the VAS score was greater than 5. • Assessments twice weekly • Patients followed until death or withdrawal from the study	• 67 withdrew from the study. PU prevalence: • 10.5% reported to have PU • mean PU/ participant 1.5±1.2 • 1.3% reported stage III or IV PU • 9.6% males had PU • 11.4% females had PU	of PU by cancer type and location at time of death • Local variation in palliative care services across Italy perhaps limiting generalisation from the data to services in Italy and beyond.	
Masaki, Riko, Seiji, Shuhei, & Aya, 2007	Retrospective cohort study investigating pressure injuries in cancer patients	Participants were 202 patients with cancer (n=202) and without malignant disease (n=217) recruited in a medical center in Japan over a 2-year period Inclusion criteria: Developed a pressure injury Participant characteristics: • Patients with cancer ranged from 3 month –94 years (mean=66.2) patients without cancer were 28-92 years (mean=68) • 36% of cancer group died and 15% of non-cancer group died • Most pressure injuries in both groups were Category/Stage I at 1st discovery	All 419 individuals with pressure injury were treated until healed or patient died	Ohura Scale for pressure injury risk assessment	**Healing times** There was no significant difference in mean healing time between the for cancer group and non-cancer group (19 days versus 18.8 days, p=0.92) **Pressure injury risk** Individuals with cancer had a significantly greater pressure injury risk OH scale score 3.28 versus3.84, p=0.04) **Conclusions: Patients whose underlying disease is cancer more likely to develop pressure injuries but time to healing is not different**	Retrospective format limited to accuracy & completeness of documentation Minimal reporting of methods including selection criteria Aim is not clear	**Level of study: 3** **Quality: low**

Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
		• Sacrum was site for 76 to 77% of pressure injuries					
Background information: Relationship of pressure injuries to other outcomes							
Dincer et al., 2016	Retrospective study **exploring factors influencing duration of stay in palliative care**	Participant records from one geriatric palliative care center in Turkey over a 30-month period were reviewed (n=120 participants, n=111 included) Inclusion criteria: • Aged > 65 years • Admitted during study timeframe Exclusion criteria: Missing data in records Participant characteristics: • Mean age 78.0±7.2 • 54.1% female • 42% neurological disease, 23.4% cancer, 41.4% chronic systemic disease, 10.8% infection • 40.5% pressure injuries	• No intervention	• Palliative Performance Scale (PPS) indicating level of dependency • Demographics and prevalence of various conditions • Length of stay	Median duration in facility was 24 days (range 6 to 212) **Factors influencing length of stay** • Individuals with pressure injuries had a significantly longer length of stay (38 IQR 64 days versus 20 IQR 22 days, p=0.001 • Nutrition problems was the only other factor associated with length of stay • Gender, marital status, cancer, neurological disease, infection, chronic systemic disease and pain were not associated with length of stay • Individuals with pressure injuries were also less likely to express willingness to be discharged (p<0.001) **Author conclusions: Individuals with pressure injuries have longer duration of stay in palliative care facilities and are less likely to be willing to be discharged**	• Pressure injury assessment methods not reported • Severity and duration of pressure injuries not reported • Management strategies not reported • Pressure injuries present on admission and may not have been assessed thereafter • Retrospective study • It was unclear how death during admission was managed	**Level of evidence: 4** **Quality: moderate**
Gozalo et al., 2011	Retrospective observational study **investigating association between burdensome health care transition and outcomes indicating of poor quality in end-of –life care**	Participants were retrospective record reviews of Medicare Minimum Data Set and claims from files 2000 to 2007 for deceased nursing home residents in USA (n= 474,829) Inclusion: • Nursing home resident before death Characteristics:	Authors examined whether there was an association between regional rates of burdensome transition and the likelihood of presence of a stage IV PU and hospice enrolment in the last 3 days of life	• Burdensome transition defined as: ○ Transfer in last 3 days life ○ Lack of continuity of nursing home facilities before and after hospitalization in last 90 days life ○ Multiple hospitalizations in last 90 days life	• 19% of participants had at least one burdensome health care transition (range 2.1% to 37.5% between regions) • 5,176 (13.6%) had a stage IV pressure injury • Adjusted risk ratio for a stage IV PU in last 30 days of life ranged from 1.48 (95% CI 1.31 to 1.66) in the region with the lowest quintile for burdensome transitions to 2.28 (95% CI 2.04 to 2.54) in regions in the highest quintile of burdensome transitions	• Retrospective design relying on record entries • No information regarding patient preferences for care or transfer • Large variability between USA states reduces generalizability within and	**Level of evidence: 4** **Quality: moderate**

Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
		• Mean age 85.7±7.6 years • 78% females • 83% White race • 73% had a DNR order • 54% had swallowing problems • 43% had unstable cognitive or ADL status			• **Study conclusions: a burdensome health care transition may be associated with indicators of poor end-of-life care, including pressure injuries.**	between countries	
Background information: Experience of pressure injuries in palliative care							

Kayser-Jones et al., 2008	Prospective, anthropological study **reporting on the experience of terminally ill residents admitted with or acquiring PUs in a nursing home**	A purposive sample of residents receiving end-of-life care in two nursing homes in USA (n=117, n=64 with PU)
		
		Characteristics:
		• Of residents with PU, 37.5% had acquired PU whilst in facility and 59.4% had acquired them at home before admission.
		• Mean age of residents with PU was significantly higher than those without PU (81 vs. 76 yrs, p=0.033)
		• Mean length of stay was longer for residents with PU (112 vs.52 days, p=0.0033)
		• Residents with PU had higher requirement for ADL support (p=0.022) and were less likely to have cancer (p=0.01).
		• 64 residents had a total of 171 PU.
			Records review for quantitative descriptive statistics
			Interviews, events analysis for qualitative data
			(primarily a qualitative study)
				Data were collected during a 30-month period spent in the research settings observing daily activities, asking appropriate questions, identifying and interviewing key informants, and taking detailed field notes.	• 81.3% of residents with PU at time of study still had a PU at time of death.
					• 47.3% of the PUs were on lower extremities.
					• Healed PU occurred in:
					  ○ 17% stage I PU
					  ○ 29.8% stage II PU
					  ○ 20% stage III PU
					  ○ 0% stage IV PU
					  ○ 29.4% of all PUs
					• A significant finding was that the residents with PUs had a mean weight loss of 30 pounds, whereas those without PUs had a mean weight loss of 6.9 pounds.
					• Qualitative interviews identified organizational factors that led to the development of PU:
					• Inadequate staffing and lack of supervision led to inadequate assistance with meals, infrequent repositioning and inadequate incontinence care. These factors led to weight loss, unrelieved pressure and moist, irritated skin. As a result a high rate of resident who were dying developed PUs.
					• Absence of family advocates and inability to speak English were factors that contributed to the above model of PU development in residential aged care.
						Limitations include the small sample and that data were collected in only two nursing homes. This study was not initially designed as an investigation of PUs, thus the data are not comprehensive for the PU experience.	**Level of evidence: 4**
							
							Quality: moderate

Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
Searle & McInerney, 2008	Interpretative description **qualitative study about nursing experiences in palliative care**	Participants were nurses with recent experience in providing end-of-life care (n=12 nurses)	• Semi-structured interviews were used to collect data, including preventing for pressure injuries • Interviews were audio-taped, transcribed verbatim and imported into the software NVivo	Outcomes not assessed with qualitative design – looking for themes to emerge and data saturation	Themes that emerged: • Moral agency • Disagreements about best care between nurses • Disagreement between nurse, patient and family members on best end of life care • Disagreements about best care between nurses on difference shifts or wards • Moral distress	• Focuses on nurses in one setting • Restriction to health service • Small sample size with minimal contradictory data sought out of presented	**Level of evidence: 5** **Quality: moderate**

Table 1: Level of Evidence for Intervention Studies

Level 1	**Experimental Designs** • Randomized trial
Level 2	**Quasi-experimental design** • Prospectively controlled study design • Pre-test post-test or historic/retrospective control group study
Level 3	**Observational-analytical designs** • Cohort study with or without control group • Case-controlled study
Level 4	**Observational-descriptive studies (no control)** • Observational study with no control group • Cross-sectional study • Case series (n=10+)
Level 5	**Indirect evidence**: studies in normal human subjects, human subjects with other types of chronic wounds, laboratory studies using animals, or computational models

Table 2: Levels of evidence for diagnostic studies in the EPUAP-NPUAP-PPPIA guideline update

Level 1	Individual high quality (cross sectional) studies according to the quality assessment tools with consistently applied reference standard and blinding among consecutive persons.
Level 2	Non-consecutive studies or studies without consistently applied reference standards.
Level 3	Case-control studies or poor or non-independent reference standard.
Level 4	Mechanism-based reasoning, study of diagnostic yield (no reference standard). Low and moderate quality cross sectional studies.

Table 3: Levels of evidence for prognostic studies in the EPUAP-NPUAP-PPPIA guideline update

Level 1	A prospective cohort study.
Level 2	Analysis of prognostic factors amongst persons in a single arm of a randomized controlled trial.
Level 3	Case-series or case-control studies, or low quality prognostic cohort study, or retrospective cohort study.

APPRAISAL FOR STUDIES PROVIDING DIRECT EVIDENCE (i.e. ELIGIBLE FOR SUPPORTING AN EVIDENCE-BASED RECOMMENDATIONS

Each criteria on the critical appraisal forms was assessed as being fully met (Y), partially met or uncertain (U), not met/not reported/unclear (N), or not applicable (NA). Studies were generally described as high, moderate, or low quality using the following criteria: (please review full methodology for classification of risk factor studies)

- High quality studies: fully met above 80% of applicable criteria from each reviewer
- Moderate quality studies: fully met at least 70% of applicable criteria from each reviewer
- Low quality studies: fully met less than 70% of applicable criteria from each reviewer

CROSS SECTIONAL/SURVEY/PREVALENCE STUDIES/OBSERVATIONAL

Endnote ID	Author/year	Focussed question	Sampling method	Representative sample	States number invited participants	Clear outcome measures	Valid reliable outcome measurement	Comparable results for multiple sites	Confounders identified and accounted for	Minimal bias	Reliable conclusions	Level of evidence	Quality
8065	Sankaran et al., 2015	Y	N	N	N	U	Y	NA	U	N	N	4	low
10652	Hoben et al., 2016	Y	N	U	Y	Y	Y	N	N	U	U	4	low
12997	Dincer et al., 2016	Y	Y	Y	Y	Y	U	NA	N	U	Y	4	Moderate
8544	Estabrooks et al., 2015	Y	N	U	Y	Y	Y	U	N	U	N	4	Low
2990	Queiroz et al., 2014	Y	U	U	Y	Y	Y	NA	Y	U	Y	4	Moderate

CASE SERIES

Endnote ID	Author/year	Focussed question	Participant characteristics reported	Inclusion criteria defined	Consecutive recruitment	Participants entered at same disease stage	Intervention clearly reported	Outcomes relevant and defined apriori	Valid, reliable outcome measurement	Per cent drop out reported and acceptable	Estimates of random variability	Comparable results for multiple sites	Minimal bias	Reliable conclusions	Level of evidence	Quality
16431	Ruggeri et al., 2016	Y	Y	Y	U	Y	Y	Y	Y	Y	N	NA	N	N	4	low

PROGNOSTIC STUDIES

	Author/year	Adequate description of baseline characteristics	Satisfactory study attrition	Clear outcome measures/prognostic factors	Range of prognostic factors/confounders measured identified and	Method of measuring prognostic factor is reported, valid and	Same method of measure of prognostic factor for all	Continuous variables or appropriate cut offs	Percent participants with complete data acceptable	Appropriate imputation method	Confounders/prognostic factors accounted for in analysis	Selective reporting avoided	Adequate sample size (10 PIs per factor)	Level of evidence	Quality
2984	V. Maida et al., 2014	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	1 (prognostic)	Moderate
14329	Carlsson & Gunningberg, 2017	Y	NA	Y	Y	Y	U	Y	Y	U	Y	Y	U	3 (prognostic)	Moderate
14320	Sternal et al., 2017	Y	U	Y	Y	N	Y	Y	U	NA	U	N	U	3 (prognostic)	Low

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