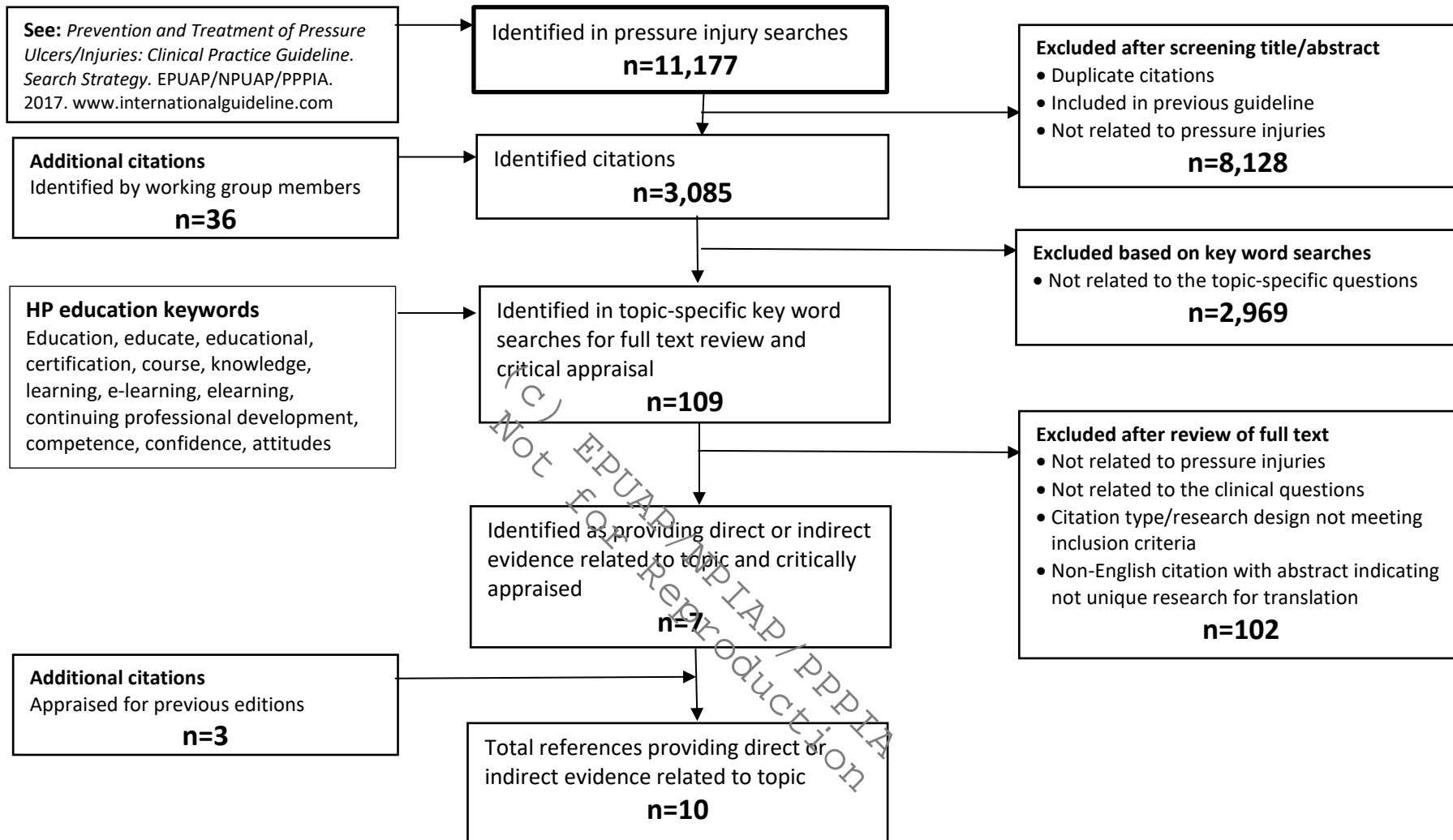


Health Professional Education: data extraction and appraisals

Search results for 2019 International Pressure Injury Guideline: Health professional education



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

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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	
<ul style="list-style-type: none"> • Clinical question 2: What interventions/programs are effective in attaining sustained improvements in health professional knowledge of pressure injury prevention and treatment? • Clinical question 3: What interventions/programs are effective in attaining sustained improvements in health professional competency in pressure injury prevention and treatment? 							
Education Programs							
Price, Kennedy, Rando, Dyer, & Boylan, 2017	Pre test/post test exploring effect of education intervention on wound prevalence	Participants were clinical staff recruited in two aged care facilities (n=164) RNs (n= 25, including 12 champions), ENs (n=41) a PCWs (n=98)	Participants were in two groups: multi-faceted educational intervention consisting of: <ul style="list-style-type: none"> • nurses and personal care staff access to wound expert • education sessions addressing needs informed by the pre-test education results (held separately for nurses and personal carers • wound book for nurses and pamphlets for care workers • online education • training in prevalence surveys 	<ul style="list-style-type: none"> • Knowledge test (unknown which test was used) conducted prior to education initiative and after 12 months of intervention • Diary of staff activities 	<p>pressure injury prevalence Significant reduction in pressure injuries (12.5% vs 6.8%, P=0.01)</p> <p>Change in task performance</p> <ul style="list-style-type: none"> • Personal care workers had significant increase in time spent on wound prevention and care (p<0.001) • PCWs had significant increase in time spent repositioning (p<0.05) • ENs had significant increase in time spent on wound prevention and care (p<0.001) • PCWs had significant increase in time spent repositioning (from 1.7mins/shift to 46mins/shift, p<0.001) • RNs spent significantly more time on risk assessment (p=0.02) • Pressure injury prevention plans increased from 92% of at risk residents to 95% of at risk residents, p=ns) 	<ul style="list-style-type: none"> • Non-validated diary collection of tasks performed was maintained by participants • Unclear whether the knowledge test was valid and reliable • Unclear if resident population was similar in both phases • Uncertain if other factors changed (e.g. type of support surfaces used) 	<p>Level of evidence: 2</p> <p>Quality: Low</p>

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
			<ul style="list-style-type: none"> RNS trained as champions Supported by resident engagement through bedside reviews, pamphlets and workshops, presentations at resident meetings, 		<ul style="list-style-type: none"> Significant increase in risk assessments (p=0.03) <p>Knowledge</p> <ul style="list-style-type: none"> Enrolled nurses and registered nurses showed significant increase in mean knowledge scores over 12 months (p<0.01 for both) Personal care worked had no change in knowledge scores (p=0.30). <p>Conclusion: Providing education is associated with a reduction in pressure injuries</p>		
Esche, Warren, Woods, Jesada, & Iliuta, 2015	Quasi experiment comparing two types PU education delivery on knowledge levels and behavior	<p>Convenience sample of registered nurses (RNs) recruited from 4 acute care units in a community teaching hospital in US (n=141 commenced, n=43 completed)</p> <p>Inclusion and exclusion criteria not reported</p> <p>Characteristics:</p> <ul style="list-style-type: none"> Mean age: 38.6 years (range 21 to 69) Mean years in nursing: 9.9yrs (range 1 to 18) Associate degree or diploma 56.7%, bachelor's degree 42%, master's degree 3.3% Preference for online learning 62.7% 	<p>Participants were randomized at the unit level to receive:</p> <ul style="list-style-type: none"> Computer based learning module developed by an external healthcare organization covering risk factors, skin anatomy, preventive strategies and classification taking 3-4 hours (CBL, 2 critical care units, n=8 completed) Traditional classroom learning – face-face teaching of the content included in the computer course taking 2 hours(TCL, 2 critical 	<ul style="list-style-type: none"> Demographics including preferred learning style 25 question knowledge test (non-validated) administered pre education (baseline), immediately following education (time 2), 3 months (time 3) and 6 months (time 4) Valid and reliable program evaluation instrument Chart review of PU documentation conducted at baseline, 3 and 6 months following education 	<p>Pressure injuries</p> <ul style="list-style-type: none"> No significant difference in prevalence of PUs between groups (computer based learning 10.5% versus 9.2%, p=0.654) <p>Assignment vs preference</p> <p>More in the CBL group were assigned to their preferred education method compared to TCL group (41.9% vs 25%, p=0.00)</p> <p>Knowledge</p> <ul style="list-style-type: none"> Compared to pretest, both groups had significantly improved knowledge scores at all posttests (p=0.01) with no statistically sig differences from time 2 to time 3 or 4 or between time 3 and 4 Mean scores were higher for TCL compared with CBL (TCL 73.3 vs CBL 79.5, p=0.013) at Time 2 No significant difference between groups at 3 or 6 months post intervention 	<ul style="list-style-type: none"> Power analysis indicated 70 participants per arm (n=140 total) required – this was not met due to very high attrition (no ITT analysis) Non validated knowledge test was used Unclear if groups were comparable at baseline for education level 	<p>Level of Evidence: 2</p> <p>Quality: Low</p>

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			care units, n=35 completed)		<p>Competency High and not significantly different rates of documentation of risk assessments completion following education (computer learning 93.9% versus 91.2% traditional, p=0.294)</p> <p>Satisfaction TCL group had significantly greater total satisfaction (97.6% vs 93.3%, p=0.042)</p> <p>Conclusions: RNs prefer online learning however they achieve greater satisfaction and better improvement in immediate knowledge from classroom teaching. There is no difference in sustainability of knowledge or improvement or patient outcomes.</p>		
Feng, Li, Xu, & Ju, 2016	Develop an educational program to increase knowledge of pressure injuries, improve its management and reduce incidence	<p>Participants were primarily nurses working in OR and emergency in a hospital in China (initial questionnaire: n= 280 potential respondents, n= 275 participants; training program for liaison officers n= 38; after training questionnaire, n= 312 participants; Braden Scale Initial Questionnaire n = 98 participants, Braden Scale Final Quest n = 82 participants)</p> <p>Inclusion criteria:</p> <ul style="list-style-type: none"> female nurses with average of 36 years old <p>Exclusion criteria:</p> <ul style="list-style-type: none"> not stated <p>Participant characteristics:</p>	<p>Educational Program</p> <ul style="list-style-type: none"> Steering committee took leadership Training was given to liaison officers to lead education Training modules offered Standardized practices for risk assessment, reporting, consultation and treatment were developed International wound expert providing education weekly Knowledge contest 	<ul style="list-style-type: none"> Outcome measures not clear, concerning questionnaire answers and interview content two tests baseline pre-test, before training and a post-test two years after training Braden Scale Awareness Classification/Staging system – not specified Follow up period: 2 years 	<p>Pressure injury incidence Knowledge intervention was associated with a decrease in pressure injuries (year 1 occurrence rate across hospital 0.07% versus year two occurrence rate 0.03%)</p> <p>Knowledge changes Questionnaire score improved significantly (pre-test 47% versus post-test 81%, p<0.001)</p> <p>Practice changes Use of Braden Scale improved significantly (pre-test 60.02±22.9 versus post-test 88.02±9.0, p<0.001)</p> <p>Author conclusions: nurses knew how to properly assess and prevent pressure injuries and also realized the</p>	<ul style="list-style-type: none"> Intervention was facility-wide and included medicine, surgery and emergency departments Non-validated questionnaire Unstated staging system Findings not based on the results presented (bias) 	<p>Level of evidence: 2</p> <p>Quality: Low</p> <p>Moderate quality QI reporting</p>

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
		<ul style="list-style-type: none"> Not specified 			<p>importance of nutritional balance for PU prevention</p>		
Ekama Ilesanmi & Morohun foluwa Oluwatosi n, 2016	A pre test/post test study exploring the effectiveness of an education program on knowledge retention.	<p>Participants a self-selected sample of nurses recruited in 3 teaching hospitals in Nigeria (n=193)</p> <p>Participant characteristics:</p> <ul style="list-style-type: none"> 68% registered nurses, 13.5% had a bachelor of nursing science, 16.6% had a Bachelor of education, 1% had a Master's degree. The intervention group has significantly more experience in nursing (p=0.03) 	<ul style="list-style-type: none"> Participants were randomized at the hospital level to prevent inadvertent spread of information. Intervention group received a 5 day (4 hours per day) workshop of face-face didactic training sessions with visual presentations, small group discussion, brainstorming. Participants were organized in "ward groups" to facilitate team building. At the conclusion participants received written transcript of the material (n=127) Control group received a 4 hour facilitated discussion on usual PU prevention practices and the written transcript of material (n=66) 	<ul style="list-style-type: none"> Pressure Ulcer Knowledge Test (PUKT) consisting of 47 items applied at in examination conditions at baseline, at conclusion of training and at 12 weeks. PUKT has been previously tested for reliability and validity (alpha = 0.82 in this study). 	<p>Knowledge score results</p> <ul style="list-style-type: none"> There was no significant difference in mean score between intervention group (mean 32.5±4.2) and control group (mean 30.8±5.0) at baseline <p>Post education</p> <ul style="list-style-type: none"> The intervention group had a significant improvement in knowledge scores immediately post education (mean 40.7±3.4, p<0.001) and the control group had no significant change (mean 31.2, SD 5.2, p=ns) in knowledge score <p>Retention score (12 weeks)</p> <ul style="list-style-type: none"> The intervention group had a further increase in knowledge at 3 months (mean 42.7±4.0, p<0.001) and the control group also had a significant increase from post-education (mean 37.8±6.3, p<0.001) Improvement in intervention group was greater, with intervention accounting for 38.5% of change in scores <p>Regression analysis</p> <p>Years' experience, professional level, previous exposure to PU lectures did not significantly influence scores.</p>	<ul style="list-style-type: none"> Minimal data given regarding participant background and experience in managing PU No detail on recruitment strategies – self-selecting participants may have more motivation or baseline knowledge No exploration of the impact on PU rates 	Indirect (PU not an outcome measure)
Lopez et al., 2017	Pretest/post test exploring impact of a computer-	Experiment conducted in three internal medicine units in Spain Pre test audit (n= 65 records) Post test audit (n=57 records)	specific training program administered to 197 nurses: theoretical and	<ul style="list-style-type: none"> assessed pre- and post-training by evaluating records of PU documentation 	<p>Competency</p> <ul style="list-style-type: none"> Documentation of pressure injury diameter increased from 23% to 40% (p=0.001) 	<ul style="list-style-type: none"> Self selection for training Documentation did not 	Indirect (PU not an outcome measure)

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
	based program on competency in documentation	Inclusion of audit records: Patients admitted for >48 hours Exclusion of venous, arterial and stage I PUs	practical training session computer based learning with simulation pressure injury assessment web based resources	<ul style="list-style-type: none"> Pre audit period was records over a 3 month period Post audit was for 3 months, commencing 6 months after the first period variables were ulcer type, location, stage, length and diameter, perilesional skin, products used number of actions taken in the records in correlation to the days of hospitalization nurse satisfaction survey 	<ul style="list-style-type: none"> Documentation of pressure injury length increased from 11% to 38% (p=0.001) Documentation of perilesional skin condition increased from 57% to 79% (p=0.04) PU assessment was updated more frequently in post period (p<0.001) No significant improvement in documenting treatment and products <p>Nurse satisfaction</p> <ul style="list-style-type: none"> Nurses' level of satisfaction with the training activity showed average score of 8.84 over 10. 	<p>necessarily match practice</p> <ul style="list-style-type: none"> Small number of records audited 	Quality: Low
Bredesen , Bjoro, Gunning berg, & Hofoss, 2016	Develop and test an e-learning program for assessment of pressure ulcer risk and pressure ulcer classification	<p>Participants were recruited in two hospitals and four nursing homes in Norway (n=18)</p> <ul style="list-style-type: none"> Participant characteristics: 97.7% female 81.8% worked in hospital setting Work experience ranged from 0-32 years Over half had 6 or more years work experience > 10% had post graduate specialization No significant difference with participant characteristics 	<p>Intervention: E-learning program</p> <p>Two training programs: one for use of Braden Scale and another for PU classification based on NPUAP 2014.</p> <p>Control: Classroom lecture training three tests baseline pre-test, before training, a post-test immediately after training and a three month follow up test. 2 training programs: one for use of Braden Scale and another for PU classification based on NPUAP 2014.</p>	<ul style="list-style-type: none"> Three tests baseline pre-test, before training, a post-test immediately after training and a three month follow up test. The outcome measures were the number of correct Braden subscale scores of patient cases and the number of PU photos correctly classified before and after training as compared to predetermined correct answers based on expert opinion 	<p>Classification of pressure injuries pre-training</p> <p>No significant difference was found for Braden subscale score in any of the 3 tests. Fleiss Kappa range 0.05 – 0.59</p> <p>Classification of pressure injuries post-training</p> <p>In immediate post training test the intervention group (e-learning) scored significantly higher than control on all categories except for staging pressure injury Category/Stage IV (when comparing the same photo set p = .006). Fleiss kappa for each photo set ranges from 0.13 to 0.29)</p> <p>The author found equal or better results for the e-learning program compared to classroom lectures. An e-learning program may be more efficient as can</p>	<ul style="list-style-type: none"> Very small numbers No power calculation performed prior to study Participants completing post tests may have been more interested in PIs than drop outs Photos were used instead of real patients Training programs were in Norwegian 	<p>Indirect (PU not an outcome measure)</p> <p>Quality: Low</p>

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
					be done at nurse's convenience and can be repeated until proficiency achieved.	<ul style="list-style-type: none"> High dropout rate in both groups of 59% 	
Morente, Morales-Asencio, & Veredas, 2014 Veredas, Ruiz-Bandera, Villa-Estrada, Rufino-González, & Morente, 2014 (two reports of the same study)	RCT evaluating the effectiveness of an e-learning technology for PU training	<p>Participants were recruited in Bachelor of Nursing program in a university in Spain (n=73)</p> <p>Inclusion criteria:</p> <ul style="list-style-type: none"> enrolled in the 'Nursing for Adult I' course Exclusion criteria: previous clinical or educational experience in pressure injuries <p>Participant characteristics:</p> <ul style="list-style-type: none"> No significant difference with participant characteristics aged 18-48 years old (no differences between groups) Primarily females 	<p>Intervention:</p> <p>E-learning program 1 training program for PU assessment (n=30) Online education program designed for undergraduates designed to improve decision-making regarding pressure injury wounds and promote active learning</p> <p>Control: Classroom lecture training 1 training program for PU assessment (n=40 commenced, n=1 lost to follow up)</p>	<ul style="list-style-type: none"> two knowledge test tests baseline pre-test, before training and a post-test immediately after training using a non-validated tool The outcome measures were the number of correct answers after observing each photo before and after training as compared to predetermined correct answers based on expert opinion 	<p>Pre-test results no significant difference between groups for the pre-test; average total score of 8.27 (SD1.39) for experimental versus control 8.23 (SD 1.23).</p> <p>post-test: the average total score of the experimental group was 15.83 which was significantly higher (p<0,01) than that obtained from the control group (11.6).</p> <p>The author found equal or better results for the e-learning program compared to classroom lectures. An e-learning tool improves the educational efficacy of the training process.</p>	<ul style="list-style-type: none"> No measure of sustained results. lacks longitudinal follow-up Does not measure impact on direct care Non validated knowledge test Content of education in both intervention and control is unclear 	<p>Indirect evidence (PU not an outcome)</p> <p>Quality: Low</p> <p>Note this study does not have a measure to demonstrate sustained results</p>
Wogamon, 2016	Pretest/posttest QI project to explore effect of CNA education in care facility for adults 55 and over on pressure injury incidence	<p>Participants were recruited in aged care in US (n=33)</p> <p>Inclusion criteria: full and part time CNAs (English and bilingual) working in a short stay facility</p> <p>Exclusion criteria (not defined)</p> <p>Participants:</p> <ul style="list-style-type: none"> Primarily aged 18-29 range (52.61%) Primarily Caucasian (45.16%) 	<ul style="list-style-type: none"> All CNAs were required to attend in-service education (PPT) for pressure ulcer prevention, cause and risk of developing pressure ulcers, staging of pressure ulcers, positioning patients to decrease risk, documentation and reporting. Education was based on NPUAP guidelines 	<p>Anonymous surveys administered before, immediately after, and 3 months later</p> <ul style="list-style-type: none"> Demographic questions: age, years of experience, PU prevention training "Initial CNA training" or "on the job" Pressure ulcer Incidence data in Medicare Nursing home Compare Quality Measures, before and 3 months after intervention was 	<p>Pressure injuries Reduction in pressure ulcers (12.3% before intervention to 0% post intervention)</p> <p>Reporting of skin breakdown CNAs reporting of skin breakdown increased by 68 % (8 reports to 17)</p> <p>Education Scores Education did not significantly improve knowledge scores (p=0.5387)</p>	<ul style="list-style-type: none"> Pressure injury incidence varies based on resident risk variability of facility. None of these variables were controlled small sample size. Unclear who measured prevalence and 	<p>Level of evidence: 2</p> <p>Quality: Low</p> <p>QI reporting standard: High</p>

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		<ul style="list-style-type: none"> 70% had worked with elderly for 0-10 years 30% had only 1-2 weeks training course <p>Facility:</p> <ul style="list-style-type: none"> Residents (short stay < 90 days) 		statistically analyzed using the t-test	Conclusions: Rate of pressure injury development was lower and documentation of skin assessment and interventions were higher after the intervention	<p>the methods used</p> <ul style="list-style-type: none"> Unclear if patient samples were similar for the pre and post education prevalence survey 		
Tweed & Tweed, 2008	Longitudinal repeated measures design investigating effectiveness of an education program in improving knowledge of ICU nurses	<p>Participants recruited from a 12-bed ICU in a teaching hospital in New Zealand (n=62)</p> <p>Inclusion: all nursing staff in unit</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> 27% RN2 level, 4% RN4 (most senior and 1% RN1 (most junior) 39% graduated in 1990s 55% had a nursing diploma or degree, 10% had postgraduate qualifications Mean time in ICU 83 months 53% no additional education on PU 	<ul style="list-style-type: none"> Educations program based on the Australian Wound Management Association guidelines for prediction and prevention of PU <ul style="list-style-type: none"> Delivered in small groups over 2 week period Interactive format based on oral presentation with 112 slides 3 hours session Key areas include guideline methods, PU epidemiology, aetiology, pathophysiology, risk factors, risk assessment, staging, equipment for prevention, documentation 	<ul style="list-style-type: none"> Knowledge level at baseline, within 2 weeks of an educational program and Knowledge test designed with input from EUPAP members using a modified Delphi technique consisting of 11 multiple choice and short answer questions piloted in a step-down unit at 20 weeks. 	<ul style="list-style-type: none"> Mean score at baseline (n=62) 84% Mean score at 2 weeks (n=38) 89%, (p=0.003 versus baseline). mean score 20 week (n=29) 85% (p=ns versus baseline) No association between years of qualification, length of time in the ICU or self-reported additional PU education and test scores at any time point Study conclusions: ICU had a strong baseline knowledge of PUs and this improved for a short period after a structured PU education session. Improvements in knowledge were not sustained at 5 months post-education. 	<ul style="list-style-type: none"> Use of 3 different tests may have accounted for differences in the scores. Baseline tests were observed while the participant was taking the test, but not the 2 or 20 week tests Use of nurses drawn from a single ICU Possible that knowledge improvement only occurred in those who already had a high knowledge 	Indirect evidence: no association made between knowledge and PU outcomes	
Kwong, Lau, Lee, & Kwan, 2011	pretest/post-test investigating a focused	Participants were recruited from a government-subsidised nursing home in Hong Kong (n=52)	The PU prevention program for nursing homes program that included training and a	<ul style="list-style-type: none"> Knowledge assessment with an adapted version of the validated Pieper and Mott's knowledge test that 	Knowledge and skills	<ul style="list-style-type: none"> There was a significant increase in the knowledge and skills of NLCPs 	<ul style="list-style-type: none"> Small sample One site Stated that RNs and un-licensed 	Level of evidence: 2 Quality: low

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	training course for PU prevention	<p>Inclusion/Exclusion criteria: not reported</p> <p>Characteristics:</p> <ul style="list-style-type: none"> Non-licensed care providers (NLCPs)(n=41) and nurses (n=11) <p>Demographics of NLCPs:</p> <ul style="list-style-type: none"> 58.5% aged 41-50 years, 68.3% had secondary education and 4.9% had associate diploma 36.6% had received previous PU training 	<p>evidence-based prevention protocol</p> <p>The focused training course involved:</p> <ul style="list-style-type: none"> 2 hour lecture 4 hours of skills training (turning, positioning, lifting, transfers, device use, skin and risk assessment training in etiology, assessment, risk factors, risk assessment, evidence-based interventions) 	<p>had been translated to Chinese</p> <ul style="list-style-type: none"> Pressure ulcer rates (no description of a staging system) but all PUs reported on discovery and verified by a researcher Data collection points: (prevalence and incidence was measured at each point) Before commencement (n=41, only NLCPs) After completion of skills training (n=41) 6 weeks post training (n=29, 71%) 12 weeks (prevalence and incidence only) 	<p>immediately after intervention compared with baseline</p> <ul style="list-style-type: none"> knowledge: $\chi^2=33.67$, $df=2$, $p=0.001$ skills: ($\chi^2=19.517$, $df=2$, $p=0.001$) <ul style="list-style-type: none"> At 6 weeks, there was a significant increase in the knowledge($p<0.001$) and skills ($p=0.001$) of NLCPs compared with baseline Six week knowledge scores were significantly lower than those immediately after the intervention ($p<0.001$) <p>PU incidence</p> <ul style="list-style-type: none"> baseline 2.5% 0 to 6 weeks 2.4% 6 to 12 weeks 0.8% <p>PU prevalence</p> <ul style="list-style-type: none"> commencement of training 9% protocol implementation 4% 6 weeks 3.3% 12 weeks 2.5% 	<p>workers were involved in training but only assessed knowledge of unlicensed workers</p> <ul style="list-style-type: none"> Unclear if matched samples were used for skill and knowledge assessments Possible Hawthorne effect PU rates before the intervention were unknown Patients assessed at each time point may not have been the same 	
Thomas, 2012	pretest/post-test investigating a focused training course for PU knowledge and documentation improvement	<p>Participants were a convenience sample recruited from 4 units in one US long term care facility (n = 10)</p> <p>Characteristics:</p> <ul style="list-style-type: none"> All aged > 35 years 7/10 had a diploma, 1 had a bachelors degree and 2 had other qualifications 80% had >2 years' experience 50% had >10 years' experience 	<p>The PU education consisted of two sessions held one month apart. The sessions included evidence-based information on assessment, prevention, offloading devices, treatment options and documentation strategies.</p>	<ul style="list-style-type: none"> Knowledge assessed using 15 multiple and true/false statements. Tests administered: <ul style="list-style-type: none"> Pre-education session 1 Post education session 1 Pre education session 2 Post education session 2 Audit of nursing documentation using the PUSH tool as a framework conducted: <ul style="list-style-type: none"> Pre-education session 1 	<p>Pre test knowledge</p> <ul style="list-style-type: none"> mean score 63.2 (SD 17.23) 50 patient wounds documented <p>Post test 1</p> <ul style="list-style-type: none"> mean score 80.2 (SD 8.53) 61 patient wounds documented documentation of wound size, exudate and tissue type improved, documentation of interventions did not improve <p>Pre test 2</p> <ul style="list-style-type: none"> mean score 73.80 (SD 11.39) 	<ul style="list-style-type: none"> Smaller standard deviations indicate increase in similarity of responses that could account for the increased mean Very small sample, unlikely to be adequately powered Non-validated data collection 	Indirect evidence: association made between knowledge and PU outcomes is not formally measured and reported

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		<ul style="list-style-type: none"> 70% had received PU education within the preceding year 	Education was delivered via PowerPoint in a 1.5 hour session.	<ul style="list-style-type: none"> 4 weeks after first education 8 weeks after first education 	Post test 2 <ul style="list-style-type: none"> mean score 92.3 (SD 6.13) Knowledge increased by 30% versus baseline 51 patient wounds documented documentation of wound size, exudate and tissue type improved 20% from baseline 	tools (same test each time) <ul style="list-style-type: none"> States that incidence decreased by 6.8%, but does formally report the methods and results for PU auditing 	
Jill Cox, Roche, & Van Wynen, 2011	Pre/post-test study comparing didactic learning to computer-based learning for retention of PU knowledge	A convenience sample of staff nurses (RN) in a teaching hospital in USA (n=60, n=32 were in ICU) <p>Characteristics:</p> <ul style="list-style-type: none"> 57% aged > 40 years 95% sample female 53% White, 35% Asian/Pacific 68% highest degree was Bachelor's, 20% had a diploma 28% had less than 6 years' experience and 55% had greater than 10 years' experience 75% preferred a lecture learning environment 52% reported being visual learners 82% reported being unaware of PU clinical guidelines 37% had most recent PU knowledge > 4 years ago 	Participants were randomly assigned to: <ul style="list-style-type: none"> traditional class teaching: 1 hour long sessions presented by a wound ostomy nurse using oral presentation and slides. Sessions had defined learning objectives. Sessions were run over a two week period to allow all staff to attend (n=20) computer based learning: self-learning module developed by the wound ostomy nurse based on the same learning objectives as the class room teaching and containing the same slides. Nurses had two weeks to do the module. (n=20) control: no education (n=20)	<ul style="list-style-type: none"> Nurses were administered the Pieper Pressure Ulcer Knowledge Test (47 items) for which previous validation is reported Measures at baseline, post-test, 3 months and 6 months 	Pre-test knowledge <ul style="list-style-type: none"> No significant difference in three groups at pre-test knowledge measure (p=0.537) Post-test knowledge <ul style="list-style-type: none"> Significant differences between three groups from pretest to posttest (p<0.001) Lecture group had significantly greater increase in scores than the computer group (p=0.043) 3 month knowledge <ul style="list-style-type: none"> Significant differences between three groups from posttest to 3-month test (p=0.00) No significant difference between mean improvements for lecture versus computer groups (p=0.717) 6 month knowledge <ul style="list-style-type: none"> No significant differences for any group between 3- month and 6-month scores (p=0.405) Study conclusions: computer-based learning is a viable learning option and has greater flexibility. Increased knowledge of PU management was sustained over 6 months, with greatest knowledge loss in the first 3 months following education. 	<ul style="list-style-type: none"> Hawthorne effect is a potential limitation Self-selection may limit findings as may be a highly motivated group Independent learning may influence findings 	Indirect evidence: no association made between knowledge and attitudes and PU outcomes

Health Professional Education: data extraction and appraisals

Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
Clinical question one: What valid and reliable assessment methods are available to evaluate health professional knowledge of pressure injury prevention and treatment?							
Methods of Assessing Knowledge							
Manderli et al., 2017	To develop a tool to measure the knowledge of nurses on PU prevention	<p>Study conducted in Belgium</p> <p>Number of participants: Phase 1 Pilot study: Setting: 1 general hospital, 2 university hospitals and 2 nursing homes - two groups of experts : 1 nursing student and 4 nurses (one specialized in wound care)</p> <p>-Phase 2 – convenience sample of 342 participants (228 nurses and 114 nursing students)</p> <p>Characteristics of participants: <u>Nurses:</u> 86% hospital; 14% nursing home; 57.9% > 35 y; 55.7% > 10 y professional experience; <u>Students:</u> bachelor program – 62.3%; diploma program - 37.7%;</p>	<p>Three phase study: Phase 1- instrument development and validation with experts on wounds; Phase 2 – psychometric evaluation of the tool; Phase 3 – revision based on the psychometric evaluation)</p>	<ul style="list-style-type: none"> • PU knowledge assessment tool • Validity of the multiple-choice test items • Construct validity • 	<p>Outcome</p> <p><u>Nurses:</u> Total score on tool varied from 5 to 22, of a maximum of 25 (average score – 13) <u>Students:</u> Total score on tool varied from 1 to 17, of a maximum of 25 (average score – 9.63)</p> <p>Conclusion: The PUKAT 2.0 demonstrated good psychometric properties and can be used and disseminated internationally to assess knowledge about PU prevention in nursing education, research and practice.</p>	<ul style="list-style-type: none"> • It has to be taken in account that the assessment of participants' knowledge is a snapshot although knowledge is continuously affected by daily experiences and learning opportunities. 	Indirect evidence (PU not an outcome, psychometric study)
Pieper & Zulkowski, 2014	Cross-sectional study exploring development and testing of a pressure injury knowledge test	<ul style="list-style-type: none"> • Participants were recruited from pressure injury conference attendees (n=108) <p>Participant characteristics:</p> <ul style="list-style-type: none"> • Mean age 46-48 years • Between 50% and 56% of participants had read EPAUP/NPUAP guidelines • Phase 1 nurses had significantly more 	<p>Development of the knowledge test (PZ-PUKT) was based on content from research and guidelines</p> <p>Change were made to existing PUKT</p> <p>Phase 1 test: One cohort (n=54) completed the prevention/risk and staging questions (total 60 items)</p>	<ul style="list-style-type: none"> • Internal consistency (Cronbach's α) 	<p>Characteristics of test</p> <ul style="list-style-type: none"> • PZ-PUKT took 20-30 minutes to complete • Cronbach's α 0.80 for overall test • Staging questions: α = 0.67 • Prevention/risk: α = 0.56 • Wound description: α = 0.64 <p>Scores based on experience</p> <ul style="list-style-type: none"> • Nurses certified in wound care scored significantly better than non-certified 	<ul style="list-style-type: none"> • Small sample size • No test-retest reliability performed • Participants came from a range of backgrounds 	Indirect evidence (PU not an outcome, psychometric study)

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
		<p>certifications that those in phase 2 (61% vs 48%, p<0.05)</p> <ul style="list-style-type: none"> Access to research, guidelines and internet for information did not differ between two phases 	<p>One cohort completed the wound description questions (55 items)</p> <p>Phase 2 test: Participants all completed full test (72 items)</p>		<p>nurses for the full test (87% versus 77%, p<0.01)</p> <ul style="list-style-type: none"> There was also significant difference favoring certified nurses for all three sections on the test 		
Moya-Suárez, Morales-Asencio, Aranda-Gallardo, Enríquez de Luna-Rodríguez, & Canca-Sánchez, 2017	Development and psychometric validation of instrument for the evaluation of adherence to pressure injury prevention recommendations, the Questionnaire Adherence to Recommendations for Preventing Pressure Ulcers (QARPPU) ,	<p>On-line survey to nurses in multicenter study of 9 hospitals in several regions in Spain.</p> <ul style="list-style-type: none"> Phase 1: Content validation- 5 expert PhD nurses; pilot study with 20 hospital care nurses; Phase 2: Psychometric validation-instrument sent online to nurses in nine hospitals in Spain) <p>Participant characteristics:</p> <ul style="list-style-type: none"> 249 respondents majority were female with average of 19 years of professional experience. 80% held baccalaureate, 76.7% postgraduate studies on prevention (80.4% in previous 5 years). 	<p>Phase one: instrument design and content validation five experts on PI who were members other PI committee with experience in care, education, and research; content validity was calculated followed by a pilot (20 hospital nurses).</p> <p>Phase 2: psychometric validation of the instrument</p>	<ul style="list-style-type: none"> Questionnaire development Content validity Construct validity Reliability Discriminant power 	<p>Outcome: A valid and reliable instrument to evaluate nurse adherence to EBP recommendations to prevent PI</p> <p>Conclusion: The instrument is suitable for measuring or evaluating nursing adhering to PI prevention recommendations. Performing an evaluation of current practice and how decisions are made allows for identifying gaps of implementing EBP.</p>	<ul style="list-style-type: none"> Since the instrument was administered on-line the respondent's answers may be biased (desired rather than usual practice) Only evaluated for prevention in hospital setting This was designed to measure adherence to PI prevention, 	Indirect evidence (PU not an outcome, psychometric study)
Tulek, Polat, Ozkan, Theofanis, & Togrol, 2016	Evaluate the validity and reliability of the PUPKAI-T (Turkish version of PUPKAI)	<p>Conducted in one hospital in Turkey (n=150 participants with Re-testing: 46 nurses)</p> <ul style="list-style-type: none"> Participant characteristics: Age – 29.02±5.69 68% Bachelor Degree Work experience medium: 7,77 years 	N/A	<ul style="list-style-type: none"> Validity and reliability Knowledge assessment of correct answers in PUPKAI-T test and re-test two weeks after the first one 	<p>Psychometric qualities</p> <ul style="list-style-type: none"> Internal consistency reliability: KR-20 was 0.803. Item difficulty indices between p> 0.21 and p< 0.88. <p>Results</p> <ul style="list-style-type: none"> Nurses working in medical wards scored higher in Theme 2 	<ul style="list-style-type: none"> Sample characteristics' differences Further research needs to be conducted on larger scale 	<p>Indirect evidence (PU not and outcome)</p> <p>Quality: Moderate</p>

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
		<ul style="list-style-type: none"> Medical ward: 60% participants Surgical ward: 40% participants Previous training on PU: 75,3% Other Participant characteristics not specified 			<p>(classification and observation) ($z = -2424, p = 0.015$),</p> <ul style="list-style-type: none"> surgical nurses had higher scores in Theme 4 (nutrition) ($z = -3447, p = 0.001$), and Theme 6 (preventive measures to reduce the duration of pressure/shear) ($z = -1867, p = 0.062$). No statistically significant difference between the scores based on education level Moderately significant relationship between knowledge scores and years of clinical experience ($r = 0.179, p = 0.029$, for theme 1; $r = 0.145, p = 0.077$ for theme 2; $r = 0.254, p = 0.002$ for theme 2, and $r = 0.259, p = 0.001$ for overall instrument). No significant difference was found between the knowledge scores of those who use a pressure ulcer risk assessment instrument and those who do not. <p>Author conclusions: PUPKAI-T is a suitable instrument for measuring nurses' knowledge on PU prevention.</p>		
D. Beekman, Defloor, Demarre, Van Hecke, & Vanderwee, 2010	Psychometric study on validation of a tool for measuring attitudes to PU	<p>Convenience sample of nurses (n=258) and nursing students (n=291) in Belgium</p> <p>Characteristics 70% aged 25 to 50 years 54% had > 10 years' experience 65% working in a hospital, 17% working in mental healthcare</p>	<ul style="list-style-type: none"> Validation of a survey tool measuring attitudes of nurses toward PUs 	<p>APuP measures:</p> <ul style="list-style-type: none"> Personal competency Priority of PU care Impact of PU Responsibility in PU care Confidence 	<p>Internal consistency Cronbach's alpha = 0.79</p> <p>Test-retest reliability intraclass coefficient (ICC) = 0.88 (95% CI 0.84 to 0.91, $p < 0.001$)</p>	<ul style="list-style-type: none"> Used known groups to test and support validation Convenience sample that may not be representative of nurses as a group 	Indirect evidence: no association made between knowledge and PU outcomes
D. Beekman,	Psychometric study on	Convenience sample of nurses (n=312) and nursing students	Development and validation of a survey tool measuring	<p>APuP measures:</p> <ul style="list-style-type: none"> Personal competency 	Construct validity Known groups technique – groups with high level of expertise had a statistically	<ul style="list-style-type: none"> Used known groups to test 	Indirect evidence:

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
Vanderwee, et al., 2010	development and validation of a tool for measuring attitudes to PU	(n=296) in Belgium and Netherlands Characteristics: <ul style="list-style-type: none"> • Approx half the sample was aged > 35 years • More than 55% nurses had > 10 years' experience • Half the students were in first year 	attitudes of nurses toward PUs Tool was developed based on literature review and face and content validity by 9 PU experts <ul style="list-style-type: none"> • Final version has 26 items in 6 themes 	<ul style="list-style-type: none"> • Priority of PU care • Impact of PU • Responsibility in PU care Confidence	significantly higher score on APuP, as expected. Internal consistency Cronbach's alpha = 0.77 for overall Lowest internal consistency in 'risk assessment' (Cronbach's alpha = 0.40) Highest consistency in 'reduction of magnitude of pressure and shear' (Cronbach's alpha = 0.87) Test-retest reliability intraclass coefficient (ICC) = 0.88 (95% CI 0.79 to 0.93, p<0.001)	and support validation <ul style="list-style-type: none"> • Convenience sample that may not be representative of nurses as a group 	no association made between knowledge and PU outcomes
Dimitri Beekman, Schoonhoven, Boucque, Van Maele, & Defloor, 2008	RCT investigating the effect of a PUCLAS2 e-learning package	Convenience sample of nursing students (n=214) and qualified nurses (n=212) from hospitals, aged care, community care and a nursing school in Belgium Characteristics: <ul style="list-style-type: none"> • no significant difference in age (p=0.62), self-attributed expertise (p=0.82), work experience (p=0.86), wound care experience (p=0.72), work location (p=0.80) or education (p=0.98) between controls and experimental group as a whole or for nurse sub groups or for student subgroups 	<ul style="list-style-type: none"> • Nurses and students randomly assigned to receive either the PUCLAS2 or standard education • Experimental group received e-learning in a private computer class using PUCLAS2 • Control group received a standardized lecture using a PowerPoint that included the same content • Web education for both groups, 1 hour Pressure Ulcer Classification (PUCLAS2) includes: <ul style="list-style-type: none"> • classification of PUs • differentiation between PU and moisture lesions • variations of task difficulty 	<ul style="list-style-type: none"> • Participants classified PUs presented in digital photos • Photos had been previously validated by an expert group and had 100% agreement on PU classification • Two sets of 20 photos were alternated in the post test 	Pre-test (100% completed) <ul style="list-style-type: none"> • No statistically significant difference in Interobserver reliability between experimental group and control group (35% agreement (fair) in both groups, p=0.93) Post test one (1 month, 100% completed) <ul style="list-style-type: none"> • Interobserver reliability increased compared to pretest in both groups (p=0.003) Post test 2 (2 months, 60 to 64% completed) <ul style="list-style-type: none"> • Significantly worse interobserver reliability for both groups vs first posttest (p<0.001 both groups) • Significantly better interobserver reliability vs pretest for (both groups p<0.001) Post test 3 (3months, 57% completed) <ul style="list-style-type: none"> • Significantly worse interobserver reliability for both groups vs first posttest (p<0.001 both groups) • Significantly better interobserver reliability vs pretest for (both groups p<0.001) 	<ul style="list-style-type: none"> • Comparison between control and experimental groups is not made • Impact of self-education and work experience throughout timeframe of study is not discussed • No relationship between education and practice is explored 	Indirect evidence: no association made between knowledge and PU outcomes

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
Knowledge Levels (Background information)							
Meesterberends, Wilborn, Lohrman, Schols, & Halfens, 2014	Cross sectional study to determine nurses knowledge and use of prevention of pressure injuries in perioperative patients.	<ul style="list-style-type: none"> Participants were recruited in nursing home in Netherlands (n=10, n=600 staff) and 11 homes in Germany (n=578 staff) 	N/A	<ul style="list-style-type: none"> PUQ-2003 includes two parts. The first part requires the respondents to evaluate the usefulness of the preventive measures; second part asks the respondents to judge their practice in terms of preventive measure 	<ul style="list-style-type: none"> only 19.2% (the Netherlands) and 24.6% (Germany) of preventive measures were judged correctly as non-useful. Significant difference between nurses in the two countries on most items Meesterberends et al., 2014 	Self-evaluation might not be reflective of reality	<p>Indirect (PU not an outcome)</p> <p>Quality: Moderate</p>
J. Cox, Roche, & Gandhi, 2013	Cross sectional study to determine physicians knowledge and use of prevention of pressure injuries in perioperative patients.	<ul style="list-style-type: none"> Participants were physicians recruited in critical care (n=65) <p>Characteristics:</p> <ul style="list-style-type: none"> 75% male 69.6% between 30 and 50 years of age 	N/A	<ul style="list-style-type: none"> Pieper Pressure Ulcer Knowledge Tool New survey tool to collect information on attitudes/beliefs section of (14 questions with responses ranked using an ordinal, 5-point Likert-type scale.) 	<p>Access to education</p> <ul style="list-style-type: none"> 69% of physicians had experienced poor to adequate basic medical education training on pressure injury prevention and treatment. 60% had never received a pressure injury lecture. 71.4% physicians reported their role to be important to very important in the areas of PrU prevention 67.9% physicians reported their role to be important to very important in the areas of treatment <p>Knowledge levels</p> <ul style="list-style-type: none"> The mean score on the knowledge test was 18.1 (range, 12–24; SD, 2.26), equating to a percentage score of 75% 	Small sample size Limited generalizability	<p>Indirect (PU not an outcome)</p> <p>Quality: Moderate</p>
Trinkoff et al., 2015	Cross sectional study (secondary)	<ul style="list-style-type: none"> 2004 national Nursing Home Survey (NNHS) was used for data on leadership and facility 	N/A	Leadership variables Education and certification of DONs and administrators	<ul style="list-style-type: none"> Education and certification of nursing home administrators was 	Relied on self-report data	Level of evidence: 4

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
	analysis) investigating relationship between administrator/director of nursing (DON) education and PU	<p>characteristics. Data was collected from a representative sample (n=1500) nursing homes in the US.</p> <ul style="list-style-type: none"> Administrators at 1174 nursing homes completed computer assisted data collection (response rate 81%) Of these 1142 had useable data on the facility (MDS 2.0) that could be linked to administrator responses. <p>Characteristics: Certification</p> <ul style="list-style-type: none"> 72.2% of administrators and 57.5% of DONs had no form of certification <p>Education</p> <ul style="list-style-type: none"> 32.2% of administrators and 7.4% of DONs had Master's or higher 50.4% of administrators and 35.6% of DONs had bachelor's or higher 		<p>Nursing home resident outcomes</p> <ul style="list-style-type: none"> High risk pressure ulcers: proportion of residents with stage I to IV PUs who have impaired bed mobility or transfer or comatose of malnutrition Low risk pressure ulcers Any resident not at high risk <p>The analysis controlled for facility size, and profit vs non-profit</p>	<p>not significantly associated with high or low risk pressure ulcers.</p> <ul style="list-style-type: none"> Nursing homes led by DONs with any certification had significantly less in high-risk pressure ulcers (7.4% decrease, p = 0.001) Nursing homes led by DONs certified by ANCC-gerontological nursing had 13.4% lower rate of high-risk pressure ulcers (p<0.001) but were significantly more likely to have higher rates of low risk PUs (p=0.010) <p>Study conclusions: Specialty certification of DONs is linked to reduction in adverse resident events.</p>	<p>Analysis did not adjust for case-mix as confounding variable</p> <ul style="list-style-type: none"> 	Quality: moderate
Simonetti, Comparcini, Flacco, Di Giovanni, & Cicolini, 2015	To determine nurse students knowledge and attitude regarding the prevention of pressure injuries	<p>Cross sectional study in seven Italian nursing schools (n=742)</p> <p>Inclusion: Bachelor of Science in Nursing students</p> <p>Characteristics:</p> <ul style="list-style-type: none"> Mean age 22.1 years Primarily female (74.3%) Primarily first year of course (40.6%) 		<p>Knowledge Assessment Instrument APUP</p>	<ul style="list-style-type: none"> overall Knowledge 51.1% (13.3/26) overall Attitude score 76.7% (39.9/52) Significant correlation between attitudes and knowledge (p<0.001) Years of education, training experience were significantly related to both knowledge and attitudes 	<ul style="list-style-type: none"> Small convenience sample Use of self reported data Inability to generalize data 	<p>Indirect (PU not an outcome)</p> <p>Quality: Moderate</p>

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
Tallier et al., 2017	To determine nurses knowledge attitude, behaviors and barriers regarding the prevention of pressure injuries in perioperative patients.	<p>Participants recruited in perioperative setting across 10 acute care hospitals in the US (n=62)</p> <ul style="list-style-type: none"> Inclusion: <ul style="list-style-type: none"> Employed as full or part time RN in perioperative services experience in perioperative area for > 1 year <p>Participant characteristics:</p> <ul style="list-style-type: none"> 33% aged between 40-49 yrs, 25% 50-59yrs, 82% female >50% had associate degree, 37% bachelor degree, 5% master's degree. 84% had >5yrs experience. 	N/A	<p>3 self reported questionnaires</p> <ol style="list-style-type: none"> Demographic survey Pressure Ulcer knowledge test (PKUT) Pressure ulcer questionnaire 	<p>Nurse's knowledge</p> <p>Knowledge deficit as performance of PUKT was below recommended 90% on all aspects including prevention/risk subscale, wound description subscale and ulcer staging subscale</p> <p>Knowledge as measured by the PUKT and availability of pressure injury staging tool were statistically significant predictors of pressure ulcer prevention behavior (p<0.05)</p> <p>The study findings indicate perioperative nurses have a knowledge deficit about pressure ulcer prevention that may have predicted behavior requiring education intervention aimed at lowering pressure ulcer incidence and improving patient outcomes in the perioperative area.</p>	<ul style="list-style-type: none"> Small convenience sample Lack of external and internal validity Use of self reported data Inability to generalize data 	<p>Indirect (PU not an outcome)</p> <p>Quality: Low</p>
Lee & Yeun, 2016	To assess the relationship between home care workers knowledge of pressure ulcers	<p>Participants were nurses recruited in home care settings in Korea (n=129)</p> <p>Inclusion criteria</p> <ul style="list-style-type: none"> Nurses working in community setting in 3 centers <p>Participant characteristics</p> <ul style="list-style-type: none"> 52.7% were aged 50-59 years, 31.85 aged older than 60 years, 14% aged 30-49 years Only 33% had high school graduation or higher <p>Over 70% had more than 4 years' experience in home care provision</p>	N/A	<p>Knowledge Concerning Pressure Ulcer tool to measure knowledge Performance Concerning Pressure Ulcer tool – Cronbach's alpha reported Participant descriptive data reported in % Mean and SD used for knowledge and performance in PU knowledge</p>	<p>Knowledge</p> <ul style="list-style-type: none"> Statistically significant difference based on education levels (p<0.001) and attendance at pressure injury event in preceding 12 months (p=0.044) No differences in knowledge based on age of nurses, working experience, hours worked/week. <p>Pressure Injury Care Performance</p> <ul style="list-style-type: none"> Performance of pressure injury care was statistically related to: <ul style="list-style-type: none"> age (p<0.001), education level (p=0.005) number hours worked/week (p=0.033) 	<ul style="list-style-type: none"> Used pressure ulcer knowledge measurement instrument (reliability and validity not reported though cited) 	<p>Indirect: PU not an outcome</p> <p>Quality: High</p>

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
					<ul style="list-style-type: none"> ○ attendance at pressure injury event in preceding 12 months (p=0.033) ○ No differences in performance based on working experience. <p>There was a significant correlation between:</p> <ul style="list-style-type: none"> • performance and knowledge (r=0.256,p=0.003) • performance and knowledge of risk factors (r=0.193,p=0.0028) • performance and knowledge of pressure injury healing and prevention (r=0.207,p=0.019) <p>Author conclusions: Education for staff on PU is important</p>		
Kaddourah, Abu-Shaheen, & Al-Tannir, 2016	Cross sectional study reporting current knowledge and attitudes about pressure ulcer prevention in acute rehabilitation seeing among a group of interprofessional colleagues	<ul style="list-style-type: none"> • Participants were recruited in an acute rehabilitation in Saudi Arabia (n=120 invited, n=105 participated) <p>Inclusion criteria:</p> <ul style="list-style-type: none"> • Direct care providers (nurses, physical and occupational therapists, and physical medicine in rehabilitation) working directly with patients in the rehabilitation hospital • At least one year of clinical experience 	<p>Invitation letter to all eligible staff, a copy of questionnaire, cover page describing the nature and voluntary study.</p> <p>Research coordinator immediately collected the survey.</p>	<ul style="list-style-type: none"> • Pressure injury was not a direct outcome measure • Surveys included Pressure Ulcer Knowledge Test • Staff Attitude Scale survey for demographics 	<p>Attitudes</p> <ul style="list-style-type: none"> • Majority of participants possessed over all knowledge but unsatisfactory attitudes for prevention of pressure ulcers. (mean score 71.5%) • Physiotherapists were the least interested in preventing pressure injuries • All believed risk assessment to be an important component of plan, <p>Authors recommended that although participants had average knowledge for the prevention of pressure injury their attitudes about prevention pressure injury were unsatisfactory.</p>	<ul style="list-style-type: none"> • Assessed mean knowledge score according to general characteristic using the personal profile. • Used a cut off ≥ 70 point for the knowledge concerning PU prevention 	<p>Indirect evidence: PU not an outcome measure</p> <p>Quality: moderate</p>
Douglas et al., 2016	A consensus Delphi survey to determine nurse opinion	Participants were senior acute care registered nurses in one tertiary hospital in Australia who were purposively selected (n=35)	<ul style="list-style-type: none"> • An initial panel of 150 nurses developed a list of 	N/A	<p>Core skills accepted by the group</p> <ul style="list-style-type: none"> • Inspect skin integrity 97.1% agreement that this is a core skill 	<ul style="list-style-type: none"> • Only one clinical site 	<p>Indirect evidence: PU not an</p>

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	on core skills for nurses in acute care	Participant characteristics: Grade 5 (60.7%) and Grade 6 (30.7%) nurses Mean experience level 11±9.4 years 86% female Mean age 37 years (range 21 to 65) 24% internal medicine, 36% surgical/preop, 11.3% critical care , 16% cancer care	40 skills that could be considered core skills for acute care nurses <ul style="list-style-type: none"> The expert panel of 35 nurses engaged in focus groups to discuss the core skills Three Delphi rounds were conducted with participants voting using a 5-point Likert scale regarding whether they considered each skill a core skill Skills were eliminated when <80% of participants agreed 		<ul style="list-style-type: none"> Inspect and palpate skin for signs of pressure injury 91.4% agreement that this is a core skill 	<ul style="list-style-type: none"> No evidence that performing these core skills decreases PU 	outcome measure
Romero-Collado, Homs-Romero, & Zabaleta-del-Olmo, 2013	Cross sectional survey to determine what primary care nurses and physicians know about items related to prevention and treatment of pressure injuries	Participants recruited in 10 primary care services in Spain through written invitation (n=127) Inclusion criteria: <ul style="list-style-type: none"> Nurse or physician working in study area Participant characteristics: 64.8% nurse participants and 46% physicians	Both groups completed a self-administered questionnaire in presence of researcher	<ul style="list-style-type: none"> Univariate descriptive analysis for qualitative and quantitative variables. Statistical significance established as P<0.05 Single questionnaire – 2 parts completed concurrently 	<p>Outcome 1 Both nurses and physicians agreed that professional responsibility for pressure injuries and wound care was the nurses' (p= 0.015) Both groups indicated that patients would benefit if nurses prescribed pressure injury and wound care products p=0.113</p> <p>Author conclusions: Nurses have experience to prescribe appropriate medications and healthcare products for the prevention and treatment of pressure injuries and should take that responsibility</p>	<ul style="list-style-type: none"> The instrument was not validated No external validity Less physicians participated than nurses Voluntary participation of health professionals might be response bias 	Indirect (PU not an outcome measure)

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
Saleh, Al-Hussami, & Anthony, 2013	To ascertain nurse knowledge, implementation, and utilization of PU prevention/treatment based upon PU guidelines	<p>Nurses recruited in acute care setting in Jordan (n=460)</p> <p>Inclusion criteria:</p> <ul style="list-style-type: none"> • baccalaureate, or 3 year program nurses or associate degree nurses • Hospitals with > 200 medical, surgical and critical care beds (government, private, military, and university) • Three random units (one surgical, one medical, and one critical care) were randomly chosen from each of the hospitals. 	Three part questionnaire to assess nurse's knowledge and practice of PU prevention and treatment.	<ul style="list-style-type: none"> • Level of PU knowledge and treatment in relationship to established PU guidelines. • Frequency of PU prevention and treatment interventions • Variation in nursing practice. 	<p>Pressure injury interventions</p> <ul style="list-style-type: none"> • Teaching and private hospitals had higher level of implementation than government or military hospitals. • Implementing pressure injury treatment was significantly higher for nurses with more years of experience $p = 0.03$. • Higher level of education significantly positively affected implementation of prevention ($p = 0.01$) • Nurses with associated degree had higher scores than those with BSc, MSc and PhD. <p>The author concluded that prevention and treatment of pressure injuries was depended on knowledge; this may be affected by the use of risk assessment instruments and grading scores.</p>	<ul style="list-style-type: none"> • Possible response bias due to imbalance in positive /negative responses in survey. • Questionnaire developed by authors was not tested. • Large sample size • First study of knowledge of pressure injury prevention and treatment in Arab countries. 	Indirect (PU not an outcome measure)
Smith & Waugh, 2009	Descriptive study investigating professional knowledge of PU	Convenience sample of nurses in a range of US health facilities (n=96)	No intervention – knowledge survey	<ul style="list-style-type: none"> • Pieper Pressure Ulcer Knowledge Test (PPUKT) 	Nurses who had self-reported exposure to pressure ulcer education scored significantly better	<ul style="list-style-type: none"> • Self-selecting sample group may favor those with more knowledge and/or confidence 	Indirect (PU not an outcome measure)
Chianca, Rezende, Borges, Nogueira, & Caliri, 2010	Descriptive study investigating professional knowledge of PU	Convenience sample of nurses in one hospital in Brazil (n=106)	No intervention – knowledge survey	<ul style="list-style-type: none"> • Pieper Pressure Ulcer Knowledge Test (PPUKT) 	<ul style="list-style-type: none"> • Participants had greater knowledge of prevention versus assessment (mean score 79% versus 57.4%) Recent graduates scored significantly better than nurses with longer experience ($p = 0.033$) 	<ul style="list-style-type: none"> • Self-selecting sample group may favor those with more knowledge and/or confidence • Limited to one facility 	Indirect (PU not an outcome measure)

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
Iranmansh, Rafiei, & Foroogh Ameri, 2011	Descriptive study investigating professional knowledge of PU	Convenience sample of critical care nurses in 5 hospitals in Iran (n=126) Characteristics: <ul style="list-style-type: none"> • 88.1% female, 11.9% male • mean age 30.23 (SD 5.97) • mean years' experience 6.07 (SD 5.29) 	No intervention – knowledge survey	<ul style="list-style-type: none"> • Translated version of Pieper Pressure Ulcer Knowledge Test (PPUKT) 	<ul style="list-style-type: none"> • Approximately 54.36% of questions answered correctly • Nurses scored highest on categorization/staging questions • No association between years of experience and test result No association between knowledge of pressure ulcers and test result	<ul style="list-style-type: none"> • Self-selecting sample group may favor those with more knowledge and/or confidence 	Indirect (PU not an outcome measure)
El Enein & Zaghloul, 2011	Descriptive study investigating professional knowledge of PU	Convenience sample of nurses in one hospital in Egypt (n=122) Sample characteristics Most nurses had less than five years' experience in nursing and had received no additional training in pressure ulcer prevention.	No intervention – knowledge survey	<ul style="list-style-type: none"> • Questionnaire developed using Delphi technique 	<ul style="list-style-type: none"> • Mean score (63% ± 8.6%) considered to be poor result 	<ul style="list-style-type: none"> • Self-selecting sample group may favor those with more knowledge and/or confidence • Limited to one facility • Non-validated measurement tool 	Indirect (PU not an outcome measure)
Aydin & Karadağ, 2010	Descriptive study investigating professional knowledge of PU	Convenience sample of nurses in 3 health facilities in Turkey (n=237)	No intervention – knowledge survey	<ul style="list-style-type: none"> • Questionnaire developed by the researchers 	<ul style="list-style-type: none"> • Nurses who had a Bachelor's or Masters degree scored significantly better (p=0.004) Nurses who attended post-graduation PU prevention and management training scored significantly better (p=0.012). No association between years' experience and knowledge levels	<ul style="list-style-type: none"> • Self-selecting sample group may favor those with more knowledge and/or confidence • Non-validated measurement tool 	Indirect (PU not an outcome measure)
Zulkowski, Ayello, & Wexler, 2010	Descriptive study investigating professional knowledge of PU	Convenience sample of nurses in health facilities in US (n=460)	No intervention – knowledge survey	<ul style="list-style-type: none"> • Pieper Pressure Ulcer Knowledge Test (PPUKT) 	<ul style="list-style-type: none"> • Nurses with wound certification scored significantly better on the test than those who did not (89% versus 76.5%, p< 0.0) • Nurses with wound certification were more likely to report attended lectures, read journal articles, sought internet information and read recent PU clinical practice guidelines 	<ul style="list-style-type: none"> • Self-selecting sample group may favor those with more knowledge and/or confidence 	Indirect (PU not an outcome measure)

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
Gupta, Loong, & Leong, 2012	Descriptive study investigating professional knowledge of PU	Convenience sample of nurses (n=39) and registrars (n=13) working in two SCI units in Australia Characteristics: <ul style="list-style-type: none"> Rehabilitation registrars had either 6 months experience (n=6) or no experience (n=7) in SCI The majority of nurses in both units had > 10 years experience 	No intervention – knowledge survey	<ul style="list-style-type: none"> 24-item questionnaire developed by the researchers 	<ul style="list-style-type: none"> No significant difference in overall scores between doctors and nurses (mean 12.54 vs 12.33, p>0.05) Nurses with > 10 years' experience had highest scores (mean 12.15) but there was no significant difference (p>0.05) No significant difference between areas of work (both had SCI patients) for prevention knowledge(p>0.05) but one unit had better results on management knowledge (p<0.001) Registrars scored better in prevention questions than in management questions	<ul style="list-style-type: none"> Self-selecting sample group may favor those with more knowledge and/or confidence Non-validated measurement tool 	Indirect (PU not an outcome measure)
Miyazaki, Caliri, & Santos, 2010	Descriptive study investigating professional knowledge of PU	Convenience sample of nurses (n=136) and auxiliaries (n=250) recruited in an aged care hospital in Brazil. Characteristics: 65% nursing auxiliaries, 35% BSN nurses mean age approx. 38 years 63% had between 5 and 15 years of experience 30% had worked in the hospital less than 5 years	No intervention – knowledge survey	<ul style="list-style-type: none"> Pieper Pressure Ulcer Knowledge Test (PPUKT) 	<ul style="list-style-type: none"> Mean scores for nurses was 79.4% (SD 8.3%) Mean score for auxiliaries was 73.6% (SD 9.8%) Scores for auxiliaries decreased with time since previous education (p = 0.009) and with time working in the hospital (p=0.049) No significant difference for nurses based on time since education or time in the hospital	<ul style="list-style-type: none"> Self-selecting sample group may favor those with more knowledge and/or confidence 	Indirect (PU not an outcome measure)
Gallant, Morin, St-Germain, & Dallaire, 2010	Descriptive correlational study describing nurse knowledge and its relationship to practice	A convenience sample of nurses was recruited in one university hospital in Canada (n=256) Inclusion: <ul style="list-style-type: none"> Full or part time worker Exclusion criteria: <ul style="list-style-type: none"> Working in emergency services, obstetrics, neonatology, pediatric or psychiatric units 	No 'intervention'; this was an observational study consisting of survey of nurse demographics and PU knowledge correlated with observed behavior gathered from nurse charting.	Nurse knowledge: Adapted questionnaire based on the Pieper and Mott Pressure Ulcer Knowledge Test Chart review of patient records to identify: <ul style="list-style-type: none"> Initial evaluation within 24 hours of admission Braden scale score 	Knowledge <ul style="list-style-type: none"> Nurses who reported attending a 7 hour and 25 minutes continuing education session had significantly greater knowledge scores than those who had attended either a one hour training session or no additional training (p<0.0037) Preventative care	<ul style="list-style-type: none"> Single site study No interrater reliability for chart review method No multivariate modeling used to measure the magnitude of knowledge impact on intervention 	Indirect evidence: no association made between knowledge and PU outcomes

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
		A randomly selected sample of patients in the units from which nurses were recruited (n=256)		<ul style="list-style-type: none"> Follow up of Braden Scale assessments Application of preventative care as related to Braden score 	<ul style="list-style-type: none"> Despite high knowledge on prevention measures there was low performance of prevention activities Knowledge of initial evaluation 97% but implementation was 24% Knowledge of Braden scale score was 86% but implementation was 3% Knowledge of support surfaces was 84% but implementation was 57% <p>Conclusions: despite having good to excellent knowledge of aspects of PU care, implementation of this knowledge in practice was low</p>	<ul style="list-style-type: none"> performance. This lack of analysis also prevented control for other demographic characteristics. Relied on documentation Self-reported training 	
Demarré et al., 2012	Observational study exploring the relationship between knowledge, attitudes and practice	<p>A convenience sample of nurses (n=54) and nursing assistants (n=91) from 18 nursing home wards in Belgium</p> <p>Characteristics:</p> <ul style="list-style-type: none"> 93% sample female 53% aged > 35 years 60.7% received previous in-service training 19% < 5 years' experience (higher in students 9% versus 25%) <p>615 nursing home residents 75% aged >80 yrs</p> <p>Characteristics:</p> <ul style="list-style-type: none"> 42% residents were at risk of PU according to Braden scale > category I prevalence 6.7% category I prevalence 14% 	No 'intervention'; this was an observational study consisting of survey of nurse demographics and PU knowledge correlated with observed behavior gathered from nurse charting.	<p>Nurse knowledge measured using the Pieper Pressure Ulcer Knowledge Test (PPUKT)</p> <ul style="list-style-type: none"> 26 items content validity 0.78 to 1.00 <p>Nurse attitudes to PU care measured using the Attitude towards Pressure Ulcers (APuP) tool</p> <ul style="list-style-type: none"> 13 items internal consistency reliability 0.79 intra-rater reliability 0.88 <p>Observational environment survey conducted in nursing homes to determine adequacy of PU prevention for each resident. 2 observers for each resident and care checked against EPUAP guidelines</p>	<p>Practice</p> <ul style="list-style-type: none"> Only 6.9% of resident at risk received fully compliant preventative care 26.6% of residents at risk received no preventative care PU prevention was worse for sitting out of bed (54.8% non-compliance) than when in bed (24.7% non-compliance) <p>Knowledge</p> <ul style="list-style-type: none"> Mean score was 28.9% Highest knowledge was risk assessment (57.9%) and lowest was in nutrition (9%) No significant difference between nurses and nursing attendants (29.3% vs 28.7%, p=0.73) <p>Attitudes</p> <ul style="list-style-type: none"> Mean attitude score 74.5% Nurses had significantly higher scores than nursing assistants (78.3% vs 72.3%, p<0.001) No significant correlation between knowledge and attitudes (p=0.84) 	<ul style="list-style-type: none"> 5 nurses from each ward were used to determine the overall knowledge and attitudes of the ward. Representation of the total population is unknown. 	Indirect evidence

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments	
					<ul style="list-style-type: none"> • Knowledge was not a significant predictor of full compliance in practice • Attitude was a significant independent predictor of full compliance (p=0.015) 		
Nurse experience of the PU carer role							
Varga & Holloway, 2016	Qualitative research study exploring the lived experience of being a PU nurse in order suggest practical solutions to practice	<p>Purposive sample of wound care nurses in the UK (n=5)</p> <p>Inclusion criteria:</p> <ul style="list-style-type: none"> • Wound care nurse in any care setting • Worked with individuals with PU for ≥ 3 years • Communicate in English <p>Participant characteristics:</p> <ul style="list-style-type: none"> • 4 participants had undergraduate degrees and one had a Master's degree in wound healing • Aged > 50 years • Experience in wound care ranged from 3 to 20 years 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Semi structured interviews with thematic analysis guided by interpretative phenomenological analysis 	<p>Eight themes with 25 sub themes established that broadly focused on:</p> <ul style="list-style-type: none"> • Challenge involved in wound care and health care environment • Senseless wounds • Coping and self-care including concerns and coping defenses • Using knowledge and technology to answer questions, make a difference and guiding others • Knowing what the outcome will be • Holistic caring • Frustrations <p>Recommendations for practice:</p> <ul style="list-style-type: none"> • Opportunities for genuine caring in the wound care role are imperative for nurses and patients • Health authorities need to plan for increased need for experienced wound care and to support relationships • Clinical supervision should include empathetic support and promotion of therapeutic relationship skills • Structures should be in place for self-care for nurses • Reflective practice should be encouraged • Wound care nurses should acknowledge and share their challenges and emotional responses in order to debrief 	<ul style="list-style-type: none"> • Rigor was promoted through researcher diary, reflexivity and informant validation of transcriptions • Potential influence of research bias • Possible that informants responded in ways they believed were expected 	Indirect (PU not an outcome measure)

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Ref	Type of Study	Sample	Intervention(s)	Outcome Measures & Length of Follow-up	Results	Limitations and comments
Attitudes of Health Professionals						
Aslan & Yavuz van Giersbergen, 2016	Cross sectional study exploring nurses attitudes to pressure injuries	Self-selecting sample of nurses from a university hospital in Turkey (n=660 eligible, n=426 responded)	n/A	Attitudes to Pressure Ulcer Prevention (APuP) tool Cronbach alpha value for internal consistency 0.79, Cronbach alpha values for factors 0.70 to 0.90	<p>Sources of knowledge</p> <ul style="list-style-type: none"> 85% of the nurses (n = 362) acquired information during nursing education 8.5% (n = 79) followed journals and books 19.7% (n = 84) gained information from conferences and congresses 16.3% (n = 69) benefited from the internet <p>Attitudes</p> <ul style="list-style-type: none"> Attitude scores of the nurses who had read the 2009 EPUAP/NPUAP guideline were higher than those who had not (p<0.05) Nurses "strongly agreed" with the priority of pressure ulcer prevention at the highest rate (43.9%) Total attitude scores of nurses who had last received training 0-6 months previously were significantly higher than those who had last received training > 2 years previously (p < 0.01) 	Indirect (Pressure injury not an outcome measure) quality: High

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Table 1: Level of Evidence for Intervention Studies

Level 1	Experimental Designs <ul style="list-style-type: none"> • Randomized trial
Level 2	Quasi-experimental design <ul style="list-style-type: none"> • Prospectively controlled study design • Pre-test post-test or historic/retrospective control group study
Level 3	Observational-analytical designs <ul style="list-style-type: none"> • Cohort study with or without control group • Case-controlled study
Level 4	Observational-descriptive studies (no control) <ul style="list-style-type: none"> • 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).

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:

- High quality studies: fully met at least 80% of applicable criteria
- Moderate quality studies: fully met at least 70% of applicable criteria
- Low quality studies: did not fully meet at least 70% of applicable criteria

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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
6700	Simonetti et al., 2015	Y	Y	U	Y	Y	U	N	Y	Y	Y	Indirect evidence	moderate
13730	Tayyib, Coyer, & Lewis, 2016	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Indirect evidence	High
10760	Avsar & Karadag, 2016	N	Y	U	Y	Y	N	Y	N	N	N	Indirect evidence	low
10798	Aslan & Yavuz van Giersbergen, 2016	Y	U	U	Y	Y	Y	Y	N	Y	Y	Indirect evidence	moderate
10979	Kang, Kim, & Lee, 2016	Y	U	U	Y	Y	N	NA	N	N	N	4	Low
11066	Hurtado, Berkman, Buxton, & Okechukwu, 2016	Y	U	U	Y	N	U	N	N	U	U	4	Low
15575	Ünver, Findik, Özkan, & Sürücü, 2017	Y	N	Y	Y	Y	Y	N	N	Y	Y	Indirect evidence	Moderate
16199	Tulek et al., 2016	Y	Y	Y	N	Y	Y	NA	N	Y	Y	Indirect evidence	Moderate

RCTS

Endnote ID	Author/year	Focussed question	Assignment randomised	Adequate concealment method	Subjects and investigators blinded	Groups comparable at commencement	Only difference btw groups was treatment	Valid, reliable outcome measure	% drop out in study arms is reported and acceptable	Intention to treat analysis	Comparable results for multiple sites	Minimal bias	Reliable conclusions	Level of evidence	Quality
10876	Bredesen et al., 2016	Y	Y	Y	N	Y	Y	Y	N	N	U	Y	U	NA	moderate

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QUALITATIVE STUDIES

Endnote ID	Author/year	Clear statement of aims	Qualitative method is appropriate	Appropriate research design	Recruitment appropriate to research and sample justified	Clear, explicit and appropriate methods for data collection	Researcher's role in data collection and analysis and potential bias addressed	Ethics clearance	In-depth description of analysis technique indicates rigorous process	Clear findings stated	Research contributes to the existing knowledge	Level of evidence	Quality
6328	Alexander, 2014	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	5	High
14578	Garrigues, Cartwright, & Bliss, 2017	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	5	high
2816	Chaboyer & Gillespie, 2014	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	5	High
15654	Kaba, Kelesi, Stavropoulou, Moustakas, & Fasoi, 2017	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	5	high
8957	Shepherd, Wipke-Tevis, & Alexander, 2015	Y	Y	Y	N	Y	N	Y	Y	N	Y	5	Moderate

COHORT STUDIES

	Author/year	Focused question	Comparable source populations	States number invited	Likelihood of outcome at enrolment	Per cent drop out in study arms is	Comparison btw drop outs and participants	Clear outcome measures	Assessment blinded, or discuss potential bias	Valid, reliable assessment with supporting reference	More than one measure of exposure	Confounders identified and accounted for	Provides confidence intervals	Minimal bias	Reliable conclusions	Level of evidence	Quality
16701	Feng et al., 2016	Y	U	Y	U	N	N	N	U	N	Y	N	N	N	N	3	Low

QUASI EXPERIMENTAL STUDIES

	Author/year	Focused question	Subjects and investigators blinded	Groups comparable at commencement	Only difference btw groups was treatment	Valid, reliable outcome measurement	Per cent drop out in study arms is reported and acceptable	Intention to treat analysis	Comparable results for multiple sites	Minimal bias	Reliable conclusions	Level of evidence	Quality
6696	Esche et al., 2015	Y	N	N	Y	U	Y	N	N/A	Y	U	2	Low
1475	Romero-Collado et al., 2013	Y	N	U	U	N	N	U	U	N	Y	2	Low
16298	Wogamon, 2016	N	N	U	U	U	N	NA	NA	N	N	2	Low
2772	Sving, Högman, Mamhidir, & Gunningberg, 2014	Y	N	Y	U	U	NA	Y	NA	U	Y	2	Low

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SYSTEMATIC REVIEWS FOR DISCUSSION

RATING CRITERIA:	
1	Partial yes: states review question, search strategy, in/exclusion criteria and risk of bias were a-priori; full yes: meta-analysis/synthesis plan, investigation of heterogeneity and justification for protocol deviation
2	Partial yes: At least 2 databases, provides keywords and search, justifies publication restrictions; full yes: searched reference lists of included studies, searched trial registries, consulted experts in field, searched grey literature, search within 24 months of review completion
3	At least two reviewers independently agreed on selection of studies to include or reviewers achieved 80% agreement on a sample of studies
4	Either two reviewers did data extraction and had >80% agreement, or two reviewers reached consensus on data to extract
5	Partial yes: list of all relevant studies that were read and excluded; full yes: every study that was excluded is independently justified
6	Partial yes: described populations, interventions, comparators, outcomes and research design; full yes: detailed descriptions of same plus study setting and timeframe for follow-up
7	FOR RCTS Partial yes: appraised risk of bias from unconcealed allocation and lack of blinding; full yes: appraised risk of bias on true randomisation, selection of reported result from multiple measurements/analyses
	FOR non randomised studies: Partial yes: appraised confounding and selection bias; full yes: appraised methods to ascertain exposures and outcomes, selection of reported result from multiple measurements/analyses
8	Must include reporting of the source of funding of individual studies, or reports that the reviewers considered this even if individual funding sources aren't listed in review

Endnote ID	Author/year	PICO research question and inclusion criteria	Explicitly states a-priori protocol ¹	Rationale for selection of study designs	Comprehensive search ²	Duplicate study selection ³	Duplicate data extraction ⁴	Excluded studies listed ⁵	Adequate description of included studies ⁶	Risk of bias assessed ⁷	Source of funding reported ⁸	Appropriate meta-analysis including weighting and adjustment for heterogeneity	Meta-analysis considers risk of bias of studies	Discussion consider risk of bias of studies	Assessment of publication bias if quantitative analysis is done	Potential conflicts of interest of authors reported and managed	Review Quality	Type of evidence included in review	Studies included in the guideline
2797	Samuriwo & Dowding, 2014				Y			N		N		NA		N	N		Exclude		

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