Evidence-based Practice Center Systematic Review Protocol

Pressure Ulcer Risk Assessment and Prevention: A Comparative Effectiveness Review

I. Background and Objectives for the Systematic Review

Pressure ulcers are a common and painful health condition, particularly among people who are elderly or physically impaired.[1] In addition to patient suffering, pressure ulcers can impede patients' return to full functioning and can add to the length of hospitalization.[2] The length of hospitalizations for pressure ulcers is nearly three times longer than hospitalizations without diagnosis of pressure ulcers.[3] Pressure ulcers affect an estimated 3 million adults in the United States, with notable variation in incidence rates by medical care setting.[1] Estimates of the incidence of pressure ulcers range from 0.4 to 38 percent in acute care hospitals, from 2 to 24 percent in long-term nursing facilities, and from 0 to 17 percent in the home care setting,[1,4] with an overall prevalence in the United States of 13.5 percent in 2008 and 12.3 percent in 2009.[5] Data on the cost of treatment for a pressure ulcer vary, but some estimates range between $37,800 and $70,000, with total annual costs in the United States as high as $11 billion.[1,6] Pressure ulcers are caused by long periods of uninterrupted pressure exerted on the skin, soft tissue, muscle, and bone, leading to the development of localized ischemia, tissue inflammation, tissue anoxia, and necrosis. Numerous factors that increase the risk of developing pressure ulcers have been identified, including physiologic factors that may impede microcirculation and nonphysiologic factors such as age, mobility impairment, and urinary incontinence.[1]

A number of tools have been developed for the formal assessment of risk for pressure ulcers. The three most widely used scales are the Braden Scale, the Norton Scale, and the Waterlow Scale. The Braden Scale,[1,7,8] which is commonly used in the United States, consists of six items: sensory perception, moisture, activity, mobility, nutrition, and friction and shearing. The Norton Scale,[1,8] developed in the United Kingdom, consists of five items: physical condition, mental condition, activity, mobility, and incontinence. The Waterlow Scale[1,8,9] consists of nine items: build/weight for height, visual assessment of the skin in the area at risk, sex and age, continence, mobility, Malnutrition Screening Tool score, and special risk factors including tissue malnutrition, neurological deficit, and major surgery or trauma. Of the numerous risk factors included in at least one of these three tools, only some factors overlap, specifically activity, mobility, nutrition/malnutrition, incontinence, and cognition. Also, each scale assigns different weights to factors, adding to the heterogeneity of the scales.[8]

Although a number of guidelines recommend the use of standardized formal risk-assessment tools,[10-12] the evidence supporting their use is not clear. A recent update of a Cochrane Collaboration review[13] found only one randomized clinical trial[14] that evaluated the effect of a risk assessment tool on incidence of pressure ulcers, and that trial found no effect of the Braden Scale on ulcer incidence. A systematic review published in 2006 identified three studies from the 1990s that assessed the effect of the Norton Scale on ulcer incidence and also found no effect.[15] This same review reported sensitivities ranging from 46.8 to 82.4 and specificities ranging from

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27.4 to 67.5 for the Braden, Norton, and Waterlow scales.[15] Generally, usual care will involve the nonformalized use of a risk assessment instrument and will likely vary based on practice patterns and standards.

In addition to avoiding the pain and adverse health outcomes associated with pressure ulcers, strategies to prevent pressure ulcers may cost substantially less than treatment. By one estimate, treatment costs may be as much as 2.5 times the cost of prevention.[1] A number of guidelines recommend various preventive strategies, which generally fall into the categories of: repositioning/support surfaces (e.g., low air loss mattresses; alternating pressure mattresses; sheepskin, foam, and other types of overlay); skin care (including moisturizers and management of incontinence); and nutrition (i.e., nutritional supplements).[11,12] The underlying risks for pressure ulcers vary according to patient characteristics (e.g., physical impairment; body weight; nutritional status; incontinence; or specific medical comorbidities, such as diabetes or peripheral vascular disease); and setting (e.g., acute care hospital, operating room, or wheelchair user in the community). The effectiveness of particular preventive strategies may vary according to these patient characteristics and/or settings. For example, a nutritional supplement may be of limited use in a patient who is not malnourished, and concern about the appropriate fit of a wheelchair for an otherwise healthy patient with spinal cord injury would not apply to patients who do not use a wheelchair.

A systematic review published in 2006 found that 51 of 59 included randomized controlled trials assessed preventive interventions targeting impaired mobility, with the remaining trials assessing interventions for impaired nutrition or skin health.[6] The authors of that review concluded that using support surfaces, optimizing nutritional status, and moisturizing sacral skin are promising interventions. However, they also noted that the overall quality of the included studies was "suboptimal," that the heterogeneity of the interventions and studied populations precluded the calculation of combined effect sizes, and that it was not clear which (if any) approach to prevention is more effective than any other approach. We conducted interviews and conference calls with Key Informants and a Technical Expert Panel (TEP) representing a variety of experts and stakeholder groups. Most of these informants confirmed that, aside from targeting the general domain for which an intervention is intended (e.g., nutritional supplements for patients who are malnourished), there is substantial uncertainty regarding which interventions are best for patients in particular settings.

II. The Key Questions

Public Comments

No substantial changes were necessary to the Key Questions (KQs) as a result of public comment or from TEP input. The Evidence-based Practice Center (EPC) clarified the KQs to "effectiveness and comparative effectiveness," since placebo-controlled trials will be included.

Final Key Questions

Question 1

For adults in various settings[*], is the use of any risk assessment tool[†] effective in reducing the incidence or severity of pressure ulcers, compared with other risk assessment tools, clinical judgment alone, and/or usual care?

a. Does the effectiveness and comparative effectiveness of risk assessment tools differ according to setting[*]?
b. Does the effectiveness and comparative effectiveness of risk assessment tools differ according to patient characteristics[‡], and other known risk factors for pressure ulcers, such as nutritional status or incontinence?

Question 2

How do various risk assessment tools compare with one another in their ability to predict the incidence of pressure ulcers?

a. Does the predictive validity of various risk assessment tools differ according to setting[*]?
b. Does the predictive validity of various risk assessment tools differ according to patient characteristics[‡]?

Question 3

In patients at increased risk of developing pressure ulcers, what is the effectiveness and comparative effectiveness of preventive interventions in reducing the incidence or severity of pressure ulcers?

a. Does the effectiveness and comparative effectiveness of preventive interventions differ according to risk level as determined by different risk assessment methods and/or by particular risk factors?
b. Does the effectiveness and comparative effectiveness of preventive interventions differ according to setting[*]?
c. Does the effectiveness and comparative effectiveness of preventive interventions differ according to patient characteristics[‡]?

Question 4

What are the harms of interventions for the prevention of pressure ulcers?

a. Do the harms of preventive interventions differ according to the general category of impairment the intervention is designed to address?
b. Do the harms of preventive interventions differ according to setting[*]?
c. Do the harms of preventive interventions differ according to patient characteristics[‡]?

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*Including acute care hospital, long-term care facility, rehabilitation facility, operating room, home care, and wheelchair users in the community.
†Such as the Braden Scale, the Norton Scale, the Waterlow Scale, or others.
‡Such as age, race or skin tone, physical impairment, body weight, or specific medical comorbidities (e.g., diabetes and peripheral vascular disease).

PICOTS Criteria

Population(s)

Include:

- KQs 1 and 2: All adult patients, ages ≥18 years in the following settings: acute care hospital, long-term care facility, rehabilitation facility, operating room, palliative and hospice settings, home care, and wheelchair users in the community
- KQs 3 and 4: Adult patients, ages ≥18 years, at increased risk of developing pressure ulcers

Exclude:

- Children and adolescents
- Symptomatic individuals (those currently with pressure ulcers)

Interventions

Include:

- KQs 1 and 2: Pressure ulcer risk-assessment scales/tools
  - Braden Scale
  - Norton Scale
  - Waterlow Scale
  - Other scales/tools
- KQs 3 and 4: Interventions to prevent pressure ulcers
  - Pressure redistribution devices, including support surfaces (e.g., beds, overlays for mattresses, heel elevation devices, and boots)
  - Dressings
  - Skincare products (e.g., moisturizers and products to absorb moisture)
  - Nutritional support
  - Nursing interventions (e.g., turning, repositioning, and heel elevation with pillows)
  - Self-care education
  - Wheelchair features
  - Combined treatment modalities

Exclude:

- Nonpreventive treatment interventions (covered in a separate review)

Comparators

Include:

- KQ 1: Clinical judgment and/or usual care
- KQs 1 and 2: Different risk assessment tools and reference standard
- KQs 3 and 4: Usual care, placebo, no treatment, and different preventive interventions (including different preventive interventions within the same category; e.g., alternating pressure mattress vs. foam overlay)

Outcomes

Include:

- KQ 1:
  - Incidence of pressure ulcers, further examining effects of setting* and patient characteristics† on incidence
  - Severity/stage of pressure ulcers, further examining effects of setting* and patient characteristics† on severity/stage
  - Resource utilization (e.g., length of stay and number of hospitalizations)
- KQ 2:
  - Predictive validity of tools, further examining effects of setting*, and patient characteristics† on predictive validity
- KQ 3:
  - Incidence of pressure ulcers, further examining effects of risk level, setting*, and patient characteristics† on incidence
  - Severity/stage of pressure ulcers, further examining effects of risk level, setting*, and patient characteristics† on severity/stage
  - Resource utilization (e.g., length of stay and number of hospitalizations)
- KQ 4:
  - Harms of preventive interventions/strategies such as dermatologic reactions, pain, or infection, further examining effects of categories of impairment, setting*, and patient characteristics†

Exclude:

- Individual risk factors
- Nonpreventive treatment outcomes (covered in a separate review)

*Setting includes hospital, long-term care facility, rehabilitation facility, operating room, home care, and wheelchair users in the community.

†Patient characteristics include age, race or skin tone, physical impairment, body weight, specific medical

comorbidities (e.g., diabetes and peripheral vascular disease), and other known risk factors for pressure ulcers, such as nutritional status or incontinence.

Timing

We will not limit by duration of followup a priori.

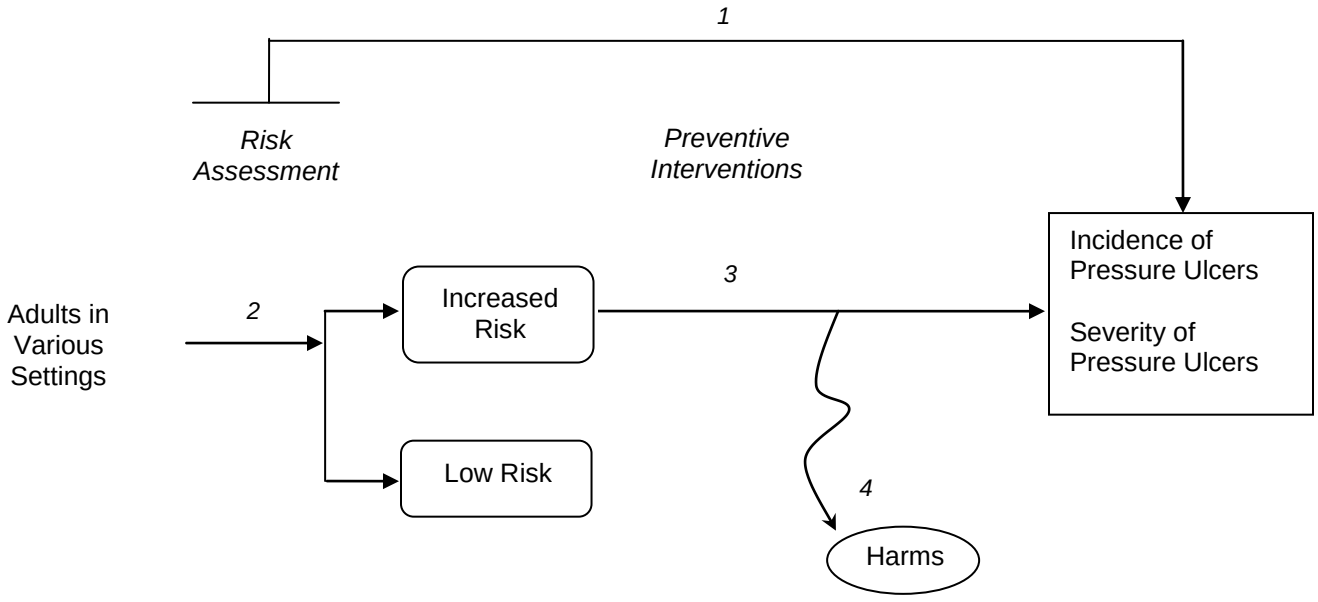
Settings

Include:

- Acute care hospital, long-term care facility, rehabilitation facility, operating room, home care, and wheelchair users in the community

III. Analytic Framework

Figure 1. Analytic Framework



IV. Methods

A. Criteria for Inclusion/Exclusion of Studies in the Review

The criteria for inclusion and exclusion of studies will be based on the KQs and are described in the previous PICOTS section. Below are additional details on the scope of this project.

Study Designs

The following study designs will be included:

- KQ 1: controlled or comparative randomized and nonrandomized trials and controlled or comparative observational studies
- KQ 2: studies of predictive validity
- KQ 3: controlled or comparative randomized and nonrandomized trials and controlled or comparative observational studies
- KQ 4: randomized trials, cohort studies, and large intervention studies

Systematic reviews will be used as primary sources of evidence if they address a KQ and are assessed as being at low risk of bias.

Sample Size

Case studies with only one patient or very small numbers of patients (e.g., <20 patients) will not be included. If there are large numbers of includable studies for the KQ(s), we may determine a minimum sample-size cutoff.

Publication Date Range

Searches will not be limited by date. Library searches will be updated while the draft report is posted for public comment and peer review to capture any new publications. Literature identified during the updated search will be assessed by following the same process of dual review as all other studies considered for inclusion in the report. If any pertinent new literature is identified for inclusion in the report, it will be incorporated before the final submission of the report.

Non–English-Language Studies

Non–English-language studies will be included in the searches and translated for full-text review if they meet the inclusion criteria. If a sufficient body of English-language evidence is available, non–English-language studies may not be translated or used; however, their existence will be noted in the report so readers can assess how their inclusion might affect results and conclusions.

Grey Literature

Grey literature will be solicited and included if it will add meaningful data or other information beyond what is found in the published literature.

Contacting Authors

In the event that important information appears to be omitted from the published results of a study, or if we are aware of unpublished or important in-press data, we will query the authors.

B. Searching for the Evidence: Literature Search Strategies for Identification of Relevant Studies To Answer the Key Questions

Literature Sources

We will search Ovid MEDLINE®, CINAHL®, EBM Reviews, including the Cochrane Central Register of Controlled Trials and the Cochrane Database of Systematic Reviews, and Health Technology Assessments.

Additional literature will be identified by reviewing the reference lists of articles and from recommendations from the TEP and peer reviewers.

Device manufacturers will have the opportunity to submit data for this review by using the portal for submitting scientific information packets on the Effective Health Care Program Web site (http://effectivehealthcare.ahrq.gov/index.cfm/submit-scientific-information-packets/).

Dual Review

Pre-established criteria will be used to determine eligibility for inclusion and exclusion of abstracts. To ensure accuracy, all excluded abstracts will be dual reviewed. All citations deemed appropriate for inclusion by at least one of the reviewers will be retrieved.

Each full-text article will be independently reviewed for eligibility by two team members. Any disagreements will be resolved by consensus.

Sample Search Strategy (Ovid MEDLINE®)

	Concept	Search String
1	Pressure ulcers	Pressure Ulcer/ or ((pressure or decubitus) and ulcer$).mp. or ((pressure or decubitus) and sore$).mp. or (bed sore$ or bedsore$).mp.
2	Risk assessment	Risk Assessment/ or Risk Factors/ or Nursing Assessment/ or "Predictive Value of Tests"/ or ROC Curve/ or "Sensitivity and Specificity"/ or "Reproducibility of Results"/ or "Severity of Illness Index"/ or (risk adj2 (factor$ or assess$)).mp.
		1 AND 2
		Limit: all adult (19 plus years)

humans

Note: The comprehensive search strategies are available in the Appendix.

C. Data Abstraction and Data Management

After studies are selected for inclusion, data will be abstracted into categories that include but are not limited to: study design, year, setting, country, sample size, eligibility criteria, population and clinical characteristics, intervention characteristics, and results relevant to each KQ as outlined in the previous PICOTS section. If available, other information may be abstracted, such as the number of patients randomized relative to the number of patients enrolled and how similar those patients are to the target population. All study data will be verified for accuracy and completeness by a second team member.

A record of studies excluded at the full-text level with reasons for exclusion will be maintained.

D. Assessment of Methodological Quality of Individual Studies

Predefined criteria will be used to assess the quality of individual controlled trials, systematic reviews, and observational studies by using clearly defined templates and criteria as appropriate. Randomized trials and cohort studies will be evaluated with appropriate criteria and methods developed by the U.S. Preventive Services Task Force.[16] These criteria and methods will be used in conjunction with the approach recommended in the chapter, Assessing the Risk of Bias of Individual Studies When Comparing Medical Interventions[17] in the *Methods Guide for Effectiveness and Comparative Effectiveness Reviews* developed by the Agency for Healthcare Research and Quality.

Individual studies will be rated as "good," "fair," or "poor." Studies rated "good" will be considered to have the least risk of bias, and their results will be considered valid. Good-quality studies include clear descriptions of the population, setting, interventions, and comparison groups; a valid method for allocation of patients to treatment; low dropout rates and clear reporting of dropouts; appropriate means for preventing bias; and appropriate measurement of outcomes.

Studies rated "fair" will be susceptible to some bias, though not enough to invalidate the results. These studies may not meet all the criteria for a rating of good quality, but no flaw is likely to cause major bias. The study may be missing information, making it difficult to assess limitations and potential problems. The fair-quality category is broad, and studies with this rating will vary in their strengths and weaknesses. The results of some fair-quality studies are likely to be valid, while others may be only possibly valid.

Studies rated "poor" will have significant flaws that imply biases of various types that may invalidate the results. They will have a serious or "fatal" flaw in design, analysis, or reporting; large amounts of missing information; discrepancies in reporting; or serious problems in the delivery of the intervention. The results of these studies will be least as likely to reflect flaws in the study design as the true difference between the compared interventions. We will not exclude

studies rated as being poor in quality a priori, but poor-quality studies will be considered to be less reliable than higher quality studies when synthesizing the evidence, particularly if discrepancies between studies are present.

Each study evaluated will be dual reviewed for quality by two team members. Any disagreements will be resolved by consensus.

E. Data Synthesis

We will construct evidence tables identifying the study characteristics (as discussed above), results of interest, and quality ratings for all included studies. We will review studies by using a hierarchy-of-evidence approach, where the best evidence is the focus of our synthesis for each KQ. We will prioritize studies comparing a different prevention intervention or placebo for KQ 3 and will prioritize studies comparing different risk -assessment tools to each other or a valid reference standard for KQs 1 and 2, but we will be less restrictive for studies examining harms (KQ 4).

Meta-analyses will be conducted to summarize data and obtain more precise estimates on outcomes for which studies are homogeneous enough to provide a meaningful combined estimate. The feasibility of a quantitative synthesis will depend on the number and completeness of reported outcomes and a lack of heterogeneity among the reported results. To determine whether meta-analysis could be meaningfully performed, we will consider the quality of the studies and the heterogeneity among studies in design, patient population, interventions, and outcomes. When meta-analysis cannot be performed, the data will be summarized qualitatively in summary tables and descriptive text.

As outlined in the subsets of each KQ and in the PICOTS, preidentified subgroups related to setting and patient characteristics will be explored to explain potential heterogeneity in effects.

F. Grading the Evidence for Each Key Question

The strength of evidence for each KQ will be assessed by one researcher for each applicable outcome by using the approach described by Owens, et al.[18] To ensure consistency and validity of the evaluation, the grades for each review will be reviewed by the entire team of investigators for:

- Risk of bias (low, medium, or high)
- Consistency (consistent, inconsistent, or unknown/not applicable)
- Directness (direct or indirect)
- Precision (precise or imprecise)

We will also estimate publication bias by examining whether studies with smaller sample sizes tended to have positive or negative assessments of pressure ulcer treatment.
The strength of evidence will be assigned an overall grade of high, moderate, low, or insufficient according to a four-level scale:

- High—High confidence that the evidence reflects the true effect. Further research is very unlikely to change our confidence in the estimate of effect.
- Moderate—Moderate confidence that the evidence reflects the true effect. Further research may change our confidence in the estimate of effect and may change the estimate.
- Low—Low confidence that the evidence reflects the true effect. Further research is likely to change the confidence in the estimate of effect and is likely to change the estimate.
- Insufficient—Evidence either is unavailable or does not permit estimation of effect.

G. Assessing Applicability

Applicability will be estimated by examining the characteristics of the patient populations, the sample size of the studies, and clinical settings and countries (e.g., patients in developing countries, or patients at low risk of pressure ulcers) in which the studies are performed. Variability in the studies may limit the ability to generalize the results to other populations and settings.

V. References

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18. Owens D, Lohr KN, Atkins D, et al. AHRQ Series Paper 5: Grading the strength of a body of evidence when comparing medical interventions—Agency for Healthcare Research and Quality and the Effective Health Care Program. J Clin Epidemiol 2010;63(5):513-23. PMID: 19595577.

VI. Definition of Terms

Not applicable.

VII. Summary of Protocol Amendments

In the event of protocol amendments, the date of each amendment will be accompanied by a description of the change and the rationale.

VIII. Review of Key Questions

For all EPC reviews, KQs were reviewed and refined as needed by the EPC with input from Key Informants and the TEP to assure that the questions are specific and explicit about what information is being reviewed. In addition, for Comparative Effectiveness reviews, the KQs were posted for public comment and finalized by the EPC after review of the comments.

IX. Key Informants

Key Informants are the end-users of research, including patients and caregivers, practicing clinicians, relevant professional and consumer organizations, purchasers of health care, and others with experience in making health care decisions. Within the EPC program, the Key Informant role is to provide input into identifying the KQs for research that will inform health care decisions. The EPC solicits input from Key Informants when developing questions for systematic review or when identifying high-priority research gaps and needed new research. Key Informants are not involved in analyzing the evidence or writing the report and have not reviewed the report, except as given the opportunity to do so through the peer or public review mechanism.

Key Informants must disclose any financial conflicts of interest greater than $10,000 and any other relevant business or professional conflicts of interest. Because of their role as end-users, individuals are invited to serve as Key Informants and those who present with potential conflicts may be retained. The Task Order Officer and the EPC work to balance, manage, or mitigate any potential conflicts of interest identified.

X. Technical Experts

Technical Experts comprise a multidisciplinary group of clinical, content, and methodological experts, the TEP, who provide input in defining populations, interventions, comparisons, or outcomes as well as identifying particular studies or databases to search. They are selected to provide broad expertise and perspectives specific to the topic under development. Divergent and conflicted opinions are common and perceived as healthy scientific discourse that results in a thoughtful, relevant systematic review. Therefore study questions, design, and/or methodological approaches do not necessarily represent the views of individual technical and content experts. Technical Experts provide information to the EPC to identify literature search strategies and recommend approaches to specific issues as requested by the EPC. Technical Experts do not do analysis of any kind nor contribute to the writing of the report and have not reviewed the report, except as given the opportunity to do so through the public review mechanism.

Technical Experts must disclose any financial conflicts of interest greater than $10,000 and any other relevant business or professional conflicts of interest. Because of their unique clinical or content expertise, individuals are invited to serve as Technical Experts and those who present with potential conflicts may be retained. The TOO and the EPC work to balance, manage, or mitigate any potential conflicts of interest identified.

XI. Peer Reviewers

Peer reviewers are invited to provide written comments on the draft report based on their clinical, content, or methodological expertise. Peer review comments on the preliminary draft of the report are considered by the EPC in preparation of the final draft of the report. Peer reviewers do not participate in writing or editing of the final report or other products. The synthesis of the scientific literature presented in the final report does not necessarily represent the views of individual reviewers. The dispositions of the peer review comments are documented and will, for CERs and Technical Briefs, be published 3 months after the publication of the evidence report.

Potential Reviewers must disclose any financial conflicts of interest greater than $10,000 and any other relevant business or professional conflicts of interest. Invited peer reviewers may not have any financial conflict of interest greater than $10,000. Peer reviewers who disclose potential business or professional conflicts of interest may submit comments on draft reports through the public comment mechanism.

XII. EPC Team Disclosures

There are no conflicts of interest.

XIII. Role of the Funder

This project was funded under Contract No. 290-2007-10057-I from the Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services. The Task Order Officer reviewed contract deliverables for adherence to contract requirements and quality. The authors of this report are responsible for its content. Statements in the report should not be construed as endorsement by the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human Services.

APPENDIX

Comprehensive Search Strategies

Overall

Database: EBM Reviews - Cochrane Database of Systematic Reviews
1 ((pressure or decubitus) and ulcer$).ti,ab.
2 ((pressure or decubitus) and sore$).ti,ab.
3 (bed sore$ or bedsore$).ti,ab.
4 or/1-3

Risk Assessment

Database: Ovid MEDLINE® and Ovid OLDMEDLINE®
1 Pressure Ulcer/
2 ((pressure or decubitus) and ulcer$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
3 ((pressure or decubitus) and sore$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
4 (bed sore$ or bedsore$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
5 or/1-4
6 Risk Assessment/
7 Risk Factors/
8 Nursing Assessment/
9 "Predictive Value of Tests"/
10 ROC Curve/
11 "Sensitivity and Specificity"/
12 "Reproducibility of Results"/
13 or/6-12
14 (risk adj2 (factor$ or assess$)).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
15 13 or 14
16 5 and 15
17 "Severity of Illness Index"/
18 5 and 17
19 16 or 18
20 limit 19 to "all adult (19 plus years)"
21 limit 20 to humans

Database: EBM Reviews - Cochrane Central Register of Controlled Trials
1 Pressure Ulcer/
2 ((pressure or decubitus) and ulcer$).mp. [mp=title, original title, abstract, mesh headings, heading words, keyword]
3 ((pressure or decubitus) and sore$).mp. [mp=title, original title, abstract, mesh headings, heading words, keyword]
4 (bed sore$ or bedsore$).mp. [mp=title, original title, abstract, mesh headings, heading words, keyword]
5 or/1-4
6 Risk Assessment/
7 Risk Factors/

8 Nursing Assessment/
9 "Predictive Value of Tests"/
10 ROC Curve/
11 "Sensitivity and Specificity"/
12 "Reproducibility of Results"/
13 or/6-12
14 (risk adj2 (factor$ or assess$)).mp. [mp=title, original title, abstract, mesh headings, heading words, keyword]
15 13 or 14
16 5 and 15
17 "Severity of Illness Index"/
18 5 and 17
19 16 or 18

Database: EBSCO CINAHL Plus®
S1 (MH "Pressure Ulcer")
S2 "pressure ulcer*"
S3 "decubitus ulcer*"
S4 "bedsore*"
S5 "bed sore*"
S6 S1 or S2 or S3 or S4 or S5
S7 (MH "Risk Assessment") OR "risk assessment"
S8 (MH "Risk Factors") OR "risk factors"
S9 (MH "Nursing Assessment")
S10 (MH "Predictive Value of Tests")
S11 (MH "Sensitivity and Specificity")
S12 (MH "Reproducibility of Results")
S13 (MH "ROC Curve")
S14 S7 or S8 or S9 or S10 or S11 or S12 or S13
S15 "risk factor*"
S16 "risk assess*"
S17 S14 or S15 or S16
S20 Limiters - Exclude MEDLINE records
S19 Limiters - Age Groups: All Adult
S18 S6 and S17
S21 S18 and S19
S22 S18 and S20
S23 S21 and S22

Risk Assessment – Prognosis

Database: Ovid MEDLINE® and Ovid OLDMEDLINE®
1 Pressure Ulcer/

2 ((pressure or decubitus) and ulcer$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
3 ((pressure or decubitus) and sore$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
4 (bed sore$ or bedsore$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
5 or/1-4
6 Risk Assessment/
7 Risk Factors/
8 Nursing Assessment/
9 "Predictive Value of Tests"/
10 ROC Curve/
11 "Sensitivity and Specificity"/
12 "Reproducibility of Results"/
13 or/6-12
14 (risk adj2 (factor$ or assess$)).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
15 13 or 14
16 5 and 15
17 "Severity of Illness Index"/
18 5 and 17
19 16 or 18
20 limit 19 to "all adult (19 plus years)"
21 limit 20 to humans
22 Prognosis/
23 16 and 22
24 limit 23 to "all adult (19 plus years)"

Prevention

Database: Ovid MEDLINE® and Ovid OLDMEDLINE®
1 Pressure Ulcer/
2 ((pressure or decubitus) and ulcer$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
3 ((pressure or decubitus) and sore$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]

4 (bed sore$ or bedsore$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
5 or/1-4
6 5 and pc.fs.
7 5 and prevent$.mp.
8 6 or 7
9 limit 8 to "all adult (19 plus years)"
10 limit 9 to humans

Database: EBM Reviews - Cochrane Central Register of Controlled Trials
1 Pressure Ulcer/
2 ((pressure or decubitus) and ulcer$).mp. [mp=title, original title, abstract, mesh headings, heading words, keyword]
3 ((pressure or decubitus) and sore$).mp. [mp=title, original title, abstract, mesh headings, heading words, keyword]
4 (bed sore$ or bedsore$).mp. [mp=title, original title, abstract, mesh headings, heading words, keyword]
5 or/1-4
6 5 and pc.fs.
7 5 and prevent$.mp.
8 6 or 7

Database: EBSCO CINAHL Plus®
S1 (MH "Pressure Ulcer")
S2 "pressure ulcer*"
S3 "decubitus ulcer*"
S4 "bedsore*"
S5 "bed sore*"
S6 S1 or S2 or S3 or S4 or S5
S7 "prevent*"
S8 S6 and S7
S9 S6 and S7 Limiters - Exclude MEDLINE records
S10 S6 and S7 Limiters - Age Groups: All Adult