

Supplemental Digital Content 1

SUMMARY OF INCLUDED STUDIES

Author	Objectives	Design/Length	Sample/Setting	Results
Incontinence-Associated Dermatitis				
Baatenburg de Jong and Admiraal ⁶	To compare the total cost of and prevention of skin breakdown of perianal/buttock skin in incontinent patients receiving a terpolymer pH-balanced barrier film and zinc oxide oil.	- Prospective randomized study - 14 d	40 patients with at least moderate skin damage resulting from incontinence	- The terpolymer pH-balanced barrier film resulted in significantly better skin improvement after 14 d of application compared with zinc oxide.
Beeckman et al ⁷	To compare 3-in-1 perineal care premoistened washcloth impregnated with a 3% dimethicone formula vs standard care consisting of water and pH-neutral soap	- RCT - 120 d	464 nursing home residents who experienced urinary or fecal incontinence	- The number of IAD significantly decreased in experimental group (day 1: 22.3%, day 120: 8.1%); IAD was less severe in the experimental group. The number of IAD increased in control group (day 1: 22.8%, day 120: 27.1%).
Beguín et al ⁸	To test the effect of a skin-adapted incontinence brief on epidermal functions including skin pH and corneometry	- Experimental, nonrandomized design - 21 d	12 volunteer patients suffering from IAD in long-term rehabilitation care.	- Skin acid mantle was preserved with pH 4.6 in the experimental group compared with skin pH of 7.1 in the control group. - At the end of the observation period, 8 patients had no skin lesions, and remaining 3 patients had only slight improvements.
Brunner et al ⁹	To compare a 1-step disposable wipe impregnated with 3% dimethicone (product A) with a 2-step pH-balanced cleanser containing glycerine dimethicone and a barrier film spray containing polymeric solution spray (product B)	- Quasi-experimental design - Patients were evaluated for an average of 4–5 d	64 incontinent patients with intact skin from critical care and acute care units	- Among those who developed skin breakdown, the average time to skin breakdown was significantly longer in product B (n = 6; 213.3 h) group vs product A group (n = 6; 91.1 h) ($F_{7, 11} = 5.27, P = .045$). - No significant difference between products with overall skin breakdown.
Clever et al ¹⁰	To determine if the use of perineal care washcloths impregnated with 3% dimethicone on residents with incontinence decreased the incidence of nosocomial PUs in the sacral/buttock area	- Quasi-experimental, retrospective study - Chart review	57 residents of a long-term-care facility	- No PUs among 30 residents with IAD following the use of perineal washcloths with 3% dimethicone. - There was a significant association between the use of skin protectant and the prevention of skin breakdown (McNemar $\chi^2_1 = 4.786, P = .015$).
Cooper and Gray ¹¹	To compare soap and water skin care to emollient skin cleanser regimens for incontinence	- RCT	93 incontinent patients were recruited from elderly or dependent service providers	- At the end of the trial, only 17 of the soap-and-water group maintained healthy skin, compared with 27 in the emollient cleanser group.
Cooper et al ¹²	To compare 2 commercial cleansers for the cleansing of skin following incontinence	- RCT - 14 d	27 patients with fecal or urinary incontinence and intact perineum skin	- The skin was visually inspected on days 1, 7, and 14. - Both groups maintained skin integrity throughout the study. Skin health improved in both groups as assessed by 3 experts in tissue viability.

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SUMMARY OF INCLUDED STUDIES, CONTINUED

Author	Objectives	Design/Length	Sample/Setting	Results
Fader et al ¹³	To examine the effect of frequent pad changing compared with less frequent pad-changing regimen on skin health	- Crossover design - 8 wk (4 wk each condition)	81 subjects from a residential setting	- No significant difference was noted in the severity of erythema or skin pH between regimens. Measurements of TEWL were significantly higher in the less frequent pad-changing regime ($P = .01$; 95% CI, 2.89–21.39).
Kerr et al ¹⁴	To test the efficacy of skin barrier cream in the management of uncomplicated IAD in elderly clients.	- Experimental: ultrasound and photographic evaluation	10 incontinent patients with signs of IAD were selected	- Statistical significance in favor of the skin barrier cream to reduce inflammatory signs
Lewis-Byers and Thayer ¹⁵	To compare the effect of soap and water, followed by application of moisturizing lotion to a no-rinse pH-balanced liquid cleanser on skin condition, pain, and caregiver time	- Prospective descriptive study - 3 wk	32 residents with incontinence living in a long-term-care facility	- Differences between control group and study group were not statistically significant.
Palese and Carniel ¹⁶	To assess the effects of a multi-intervention program consisting of absorbent products and structured skin care regimen	- Single-group, pre/post study - 14 d	63 patients with urinary incontinence and IAD from a nursing home	- The use of absorbent pads and structured skin care regimen reduced the relative risk of IAD to 0.24. - Advice from continence nurses diminished relative risk of IAD to 0.15.
Park ¹⁷	To measure the effect of a silicone border foam dressing on the development of PUs and IAD in intensive care patients	- Quasi-experimental study - 9 d	102 patients with a Braden Scale score of ≤ 16	- Incidence of PU development ($P < .001$) and IADS scores ($P < .033$) were significantly lower in the experimental group compared with the control group.
Park and Kim ¹⁸	To measure the effect of a structured skin care regimen consisting of no-rinse pH-balanced skin cleanser, a generic moisturizer, skin protectant (petrolatum, zinc oxide, dimethicone), and an indwelling fecal drainage system when indicated on IAD and PU development	- Quasi-experimental research design (comparison cohort) - 7 d	76 patients with fecal incontinence, in the intensive care units	- The structured skin care regimen decreased IAD scores and occurrence of PUs. - Higher IADS scores were associated with an increased risk for development of PUs (OR, 1.168; 95% CI, 1.074–1.271).
Sugama et al ¹⁹	To examine the efficacy of an improved absorbent pad against IAD. The control group ($n = 30$) used usual absorbent pad, and the experimental group ($n = 30$) used an absorbent polymer and pulp, located only in the frontal area of the pad	- Cluster RCT - 21 d	60 female inpatients aged ≥ 65 y, who had IAD	- Experimental group recovered significantly faster from IAD, as indicated by the Kaplan-Meier curve ($P = .009$, log-rank test).
Zehrer et al ²⁰	To examine whether skin barrier could affect the absorbency of incontinent brief. The 4 tested products were a pH-balanced polymer-based barrier film (Product A), a zinc oxide and dimethicone-based moisture barrier (product B), vitamin A and vitamin D ointment (product C), and Vaseline petroleum jelly (product D)	- Randomized, balanced-block design. Test products and mini-diapers were applied to forearms of 16 volunteers - Single visit	16 healthy volunteers aged between 18 and 45 y	- Less product A was transferred to the mini briefs than product B, C, or D ($P < .01$). - Mini briefs absorbed significantly less fluid on areas treated with products C and D than those areas that were treated with product B ($P < .01$).

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SUMMARY OF INCLUDED STUDIES, CONTINUED

Author	Objectives	Design/Length	Sample/Setting	Results
Peristomal				
Hosseinpour et al ²¹	To compare the protective effects of <i>Acacia senegal</i> to zinc sulfate ointment in peristomal skin of neonates	- Prospective controlled clinical study - 4 wk	60 neonates	<i>Acacia senegal</i> barrier resulted in less severe inflammation ($P = .05$).
Milne et al ²²	To determine the efficacy of topically applied cyanoacrylate to manage peristomal skin problems	- Case series	11 patients Acute care and outpatient settings	- Discomfort scores reduced from 9.5/10 at baseline to 3.5/10 after first wafer change and to no discomfort after the second wafer change. - Increased wear time of wafers between changes. - Epidermal resurfacing in outpatient population occurred within 10.2 d. - Epidermal resurfacing in acute care population occurred within 7 d.
Peri wound				
Brown-Etris et al ²³	To compare clinical performance of a transparent absorbent acrylic dressing and a hydrocolloid dressing in the management of Stage II and III PU	- RCT - 56 d or until complete healing had occurred	35 patients received the transparent absorbent acrylic dressing, and 37 received the hydrocolloid dressing in wound care clinics, home care, and long-term care	- Peri wound skin was visually inspected and photographed at weekly intervals. - Transparent absorbent acrylic dressing had better absorptive properties absorption and barrier properties ($P = .039$) and left less residue on peri wound skin ($P < .001$). - There was no statistical difference between the 2 groups considering peri wound skin.
Cameron et al ²⁴	To compare the efficacy and cost-effectiveness of 2 skin protectants: a pH-balanced polymer-based barrier film and zinc paste compound in the management of maceration and irritation of the peri wound area of venous leg ulcers	- RCT - 12 w	35 patients with venous leg ulcers and surrounding skin problems.	- The decrease in wound area was $5.11 \pm 8.39 \text{ cm}^2$ in the polymer-based barrier film group, and $4.59 \pm 5.83 \text{ cm}^2$ in the zinc paste group. - The pH-balanced polymer-based barrier film was easier to apply and less messy than the zinc paste.
Coutts et al ²⁵	To compare a pH-balanced polymer-based barrier film with traditionally used zinc oxide ointment or petrolatum-based barrier	- Case series	30 adult patients with chronic wounds of various etiologies	- No statistical significance between the two groups with respect to protecting the peri wound skin from moisture damage.
Cutting ²⁶	To evaluate the ability of a protease-modulating and moisture-managing dressing to promote a healing environment, including exudate management, protection of peri wound skin, and improving condition of wound bed	- Prospective, multicenter, case cohort evaluation - 4 wk	53 patients with wounds of mixed etiologies 42 wounds with high levels of exudate	- At the end of 4 wk, 30 (71.5%) had no maceration.
Durante et al ²⁷	To evaluate the therapeutic effects of a polyhexanide and propyl betaine-based gel in the treatment of chronic wounds	- Multicenter observational study - 60 d	124 patients presenting with wounds of mixed etiologies	- 17% had undamaged peri wound skin at baseline, whereas 75.8% had undamaged skin at final visit.

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SUMMARY OF INCLUDED STUDIES, CONTINUED

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Faucher et al ²⁸	To evaluate the clinical efficacy and absorbent capacity of a high-absorbent dressing with superabsorbent particles	- Multicenter, prospective, observational study - 7 d	13 patients	- At day 7, maceration reduced from 46.7% to 6.7%. - After 3 d, dressing change frequency reduced from once daily to twice weekly in 80% of patients.
Hunter et al ²⁹	To examine the effectiveness of a silicone-based dimethicone skin protectant containing olivamine and methylsulfonylmethane (product B) and a polymer-based moisturizing lotion (product A) on venous ulcer periwound skin	- Prospective, descriptive, comparative study - Retrospective patient charts	Retrospective group of 50 patients and a prospective group of 28 patients with venous ulcers	- Both products decreased periwound and ulcer size ($P = .01$) when compared with retrospective cases. - Product B resulted in a reduction in the size of the periwound 3 times faster than product A.
Jørgensen et al ³⁰	To compare the effect of a sustained silver-release foam dressing and a hydrocellular foam dressing without added silver in critically colonized venous leg ulcers with delayed healing	- Multicenter, open, block RCT - 4 w	129 patients with chronic venous or mixed venous/arterial leg ulcer	- There were significantly fewer dressing changes associated with leakage in the sustained silver-release foam group (19%) compared with 49% in the hydrocellular foam group.
Lázaro-Martínez et al ³¹	To demonstrate the effectiveness in the periwound skin maceration reduction with the use of a pH-balanced polymer-based barrier film	- Observational study - 30 d	Included 40 patients with diabetic foot ulcers	- 70% of the ulcers showed healthy edge after 30 d of treatment ($P < .05$).
Maume et al ³²	To compare the effects of a new self-adherent soft silicone dressing and a self-adherent hydropolymer dressing on stage II PUs	- RCT - 4 w	38 residents from nursing homes	- No statistically significant difference in granulation tissue, epithelialization, or exudate between the 2 groups - Exudate leakage was reported on 13 occasions in the soft silicone dressing group and on 18 occasions in hydropolymer dressing group.
Münter et al ³³	To compare the effect of the sustained silver-releasing foam dressing with local best practices on delayed healing ulcers using a real-life setting	- RCT - 4 w	619 patients with ulcers of varying etiologies	- Researchers visually assessed the wound for level of exudate and periwound skin condition. - At final visit, the silver foam dressing group had lower level of exudation, whereas the local best practices group remained unchanged ($P = .0055$). - Silver foam was rated to have better exudate handling capacity than local best practices ($P < .0001$). - Reduction of periwound itching and discomfort was reported.
Reyzelman et al ³⁴	To evaluate a nonabsorptive polyolefin foam for the protection of the periwound skin from exudate	- Case series - 2 d to 3 mo	14 subjects with chronic nonhealing wounds of mixed etiologies	- pH-balanced polymer-based barrier film has a significant protective effect when compared with no treatment or placebo.
Schuren et al ³⁵	To evaluate the effectiveness of a pH-balanced polymer-based barrier film for the protection of the periwound skin of chronic ulcers	- Systematic review and meta-analysis	9 studies were included (7 RCTs, 463 participants and 2 case-control studies, 41 participants)	- A 5-point scale was used to evaluate exudate leakage and periwound residue.
Vanscheidt et al ³⁶	To compare the attributes of a foam composite dressing with those of a hydrocellular foam dressing in the management of venous leg ulcers	- RCT - 12 wk	107 patients with venous leg ulcers	- No difference between foam composite and hydrocellular foam with respect to wound exudate levels, skin maceration, erythema, eczema, lipodermatosclerosis, cellulitis, and dermatitis

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SUMMARY OF INCLUDED STUDIES, CONTINUED

Author	Objectives	Design/Length	Sample/Setting	Results
Woo et al ²	To evaluate pain during dressing changes comparing a soft silicone foam dressing with an adhesive hydrocellular polyurethane foam dressing	<ul style="list-style-type: none"> - Randomized crossover study - Seen for 5 visits with a maximum of 30 d 	32 patients ambulatory outpatients with below-the-knee leg ulcers	<ul style="list-style-type: none"> - Wounds treated with silicone foam were associated with a lower proportion of necrotic tissue or slough ($P = .0123$) and greater proportion of new epithelialization ($P = .0110$) than those treated with adhesive foam.
MASD, Other Hoggarth et al ³⁷	To assess the barrier and skin hydration properties of 6 skin protectants with different formulations. zinc oxide-, water-in-oil-, non-aqueous-, glycerin-, and petrolatum-based formulations	<ul style="list-style-type: none"> - Controlled 3-phase study - Products and known irritants were applied to forearms of participants over 5-d period 	18 healthy volunteers	<ul style="list-style-type: none"> - Glycerin-treated site was significantly improved ($P < .0001$, 95% CI) with respect to hydration, compared with untreated sites. - Oil-in-water- and non-aqueous-based product sites were significantly better than untreated sites related to their ability to moisturize the skin ($P < .0001$). - Solvent-free formulation had lower mean scores of erythema (day 5, $P < .05$), TEWL (day 5, $P < .05$) and redness (day 4 and 5, $P < .05$) vs daily solvent-containing formulations or no treatment. - There was no statistically significant difference between products in terms of pain on application or discomfort during removal of medical adhesive tape.
Shannon and Chakravarthy ³⁸	To compare the efficacy of a solvent-free skin barrier and a solvent-containing skin barrier as methods of protecting skin from medical adhesive trauma	<ul style="list-style-type: none"> - RCT - Barrier products applied to 2 of 4 possible sites on the backs of participants - Procedure repeated for 5 d 	12 volunteers made up of healthy white women and men aged 18–55 y	<ul style="list-style-type: none"> - Routine care: average cost/wk for MASD was \$46.20 and for stage II PUs \$18.04 - Cyanoacrylate barrier: average cost/wk for MASD was \$12.26 and for stage II PUs \$8.18. - Cost savings of using cyanoacrylate was estimated to be 73.5% for MASD and 55% for stage II PUs. - Cyanoacrylate polymer film was significantly better at protecting the skin from abrasion, resulting in lower TEWL. - Mean TEWL was significantly lower at sites treated with cyanoacrylate ($\alpha = 4.16$, $P < .05$).
Woo ³⁹	To determine the cost difference between routine care and cyanoacrylate barrier during the treatment of superficial skin damage	<ul style="list-style-type: none"> - Cost analysis conducted 7 d before and 7 d after application of cyanoacrylate barrier film 	12 patients	<ul style="list-style-type: none"> - Routine care: average cost/wk for MASD was \$46.20 and for stage II PUs \$18.04 - Cyanoacrylate barrier: average cost/wk for MASD was \$12.26 and for stage II PUs \$8.18. - Cost savings of using cyanoacrylate was estimated to be 73.5% for MASD and 55% for stage II PUs. - Cyanoacrylate polymer film was significantly better at protecting the skin from abrasion, resulting in lower TEWL. - Mean TEWL was significantly lower at sites treated with cyanoacrylate ($\alpha = 4.16$, $P < .05$).
Woo and Chakravarthy ⁴⁰	To investigate the ability of a cyanoacrylate polymer film to protect human skin against moisture and abrasion and to compare cyanoacrylate material to a traditional barrier film	<ul style="list-style-type: none"> - Experimental study - Barrier products applied to the arm of subject and synthetic urine applied to the test sites 	12 subjects	<ul style="list-style-type: none"> - Mean TEWL was significantly lower at sites treated with cyanoacrylate ($\alpha = 4.16$, $P < .05$). - The mean change in capacitance as measured by corneometer was 13.9 for a barrier with cetyl dimethicone and antioxidants, 10.3 for the aloe vera-based skin conditioner, 8.7 for natural aloe and vitamin E cream, 1.6 for 6% dimethicone- and petrolatum-based barrier, and 0.8 for the control site.
Young and Chakravarthy ⁴¹	To compare the skin capacitance after application of 4 topical skin creams	<ul style="list-style-type: none"> - RCT - Products applied to 1 of 5 sites on forearms of participants. 	21 subjects	<ul style="list-style-type: none"> - The mean change in capacitance as measured by corneometer was 13.9 for a barrier with cetyl dimethicone and antioxidants, 10.3 for the aloe vera-based skin conditioner, 8.7 for natural aloe and vitamin E cream, 1.6 for 6% dimethicone- and petrolatum-based barrier, and 0.8 for the control site.

Acronyms: CI, confidence interval; IAD, incontinence-associated dermatitis; IADS, Incontinence-Associated Dermatitis and Its Severity; MASD, moisture-associated skin damage; OR, odds ratio; PU, pressure ulcer; RCT, randomized controlled trial; TEWL, transepidermal water loss.