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Diaper Dermatitis

What Do We Do Next?

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ABSTRACT

Diaper dermatitis is a major issue among hospitalized infants, leading to increased medical costs, pain, risk for infection, and distress among patients and caregivers. An evidence-based algorithm for prevention and treatment of diaper dermatitis was developed and introduced in a level IV neonatal intensive care unit (NICU). Two cases are discussed as examples of severe diaper dermatitis. The first case demonstrates the final case of severe diaper dermatitis since the introduction of the algorithm. The second case demonstrates a less severe, but equally frustrating, case of diaper dermatitis that occurred after the practice of using the algorithm was established. The need for consistency in the prevention and treatment of diaper dermatitis is paramount to providing quality care. There are a number of points within the bedside care regimen where breakdown in consistency occurs. The adherence to consistent and evidence-based treatment regimens has the potential to decrease the incidence and severity of diaper dermatitis in high-risk hospitalized infants. Initiation of an evidence-based algorithm to assist in the prevention and treatment of diaper dermatitis can be supported by data of the number of cases of diaper dermatitis collected before and after implementing the algorithm. The information can further assist in continued education and pursuance of investigation of other major skin injuries in NICU patients. The importance surrounding infant skin care and building awareness surrounding all of the facets of skin care in this vulnerable population demonstrate the benefits to quality outcomes and care.

Key Words: algorithm, barrier cream, consistency, diaper dermatitis, diaper rash, prevention and treatment

Diaper dermatitis is a serious and common issue among neonates and infants.[1,2] Data are lacking in the incidence and severity of diaper dermatitis in hospitalized neonates due to the inconsistent measurement of the condition and a lack of reporting.[3] The causes of diaper dermatitis are varied and relate to risk factors as well as common environmental factors. Several factors are taken into consideration when addressing each case of diaper dermatitis including skin pH changes due to excessive moisture or prolonged exposure to urine and stool, and further irritation as a result of friction resulting in redness and breakdown of the skin (Figure 1).[1,3] Diaper dermatitis causes pain, risk for infection, increased hospital costs, and distress among infants, the medical team, and parents.[1,3] Two case reports are discussed to illustrate the challenges in caring for both simple and complex cases of diaper dermatitis.

CASE REPORTS

Baby boy M.A. was born at $37^{6}/_{7}$ weeks' gestational age with the diagnosis of a tracheal mass requiring a tracheostomy and later the need for a gastronomy tube. Full enteral feedings were reached without difficulty, but he required increased caloric density formula/breast milk for poor growth. As caloric density was increased to 24 calories per ounce, he developed looser stools and a severe case of diaper dermatitis (Figure 2). A zinc oxide barrier cream was applied with each diaper change. However, variations in practice were noted in the application of the product among nursing staff. The initial plan using barrier cream was unsuccessful. Subsequently, multiple other topical products were trialed without success. The perianal area further developed a *Candida*-like appearance, and an antifungal ointment was added to the treatment regimen.

After failure of multiple therapies, a barrier cream containing zinc, copolymers, carboxymethylcellulose, and petrolatum, without alcohol was started, and further treatment followed an evidence-based algorithm for diaper dermatitis that was under development within the neonatal intensive care unit (NICU) (Figure 3). Mild improvement was noted on day 3. On the basis of the algorithm, the initial barrier cream was discontinued and a thick zinc oxide cream containing zinc, carboxymethylcellulose, and petrolatum was used. This product was used consistently for 24 hours; however, increased redness and excoriation again developed. Following the algorithm, therapy was returned to the barrier cream containing carboxymethylcellulose and copolymers (Ilex) with success. He was discharged home with the consistent use of this barrier cream to his diaper area.

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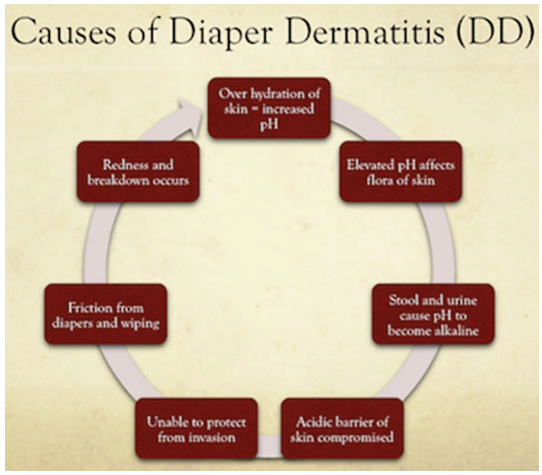
FIGURE 1



PowerPoint slide of the cycle of diaper dermatitis skin injury.

Baby boy J.W. was born at 35 weeks' gestation with very mild respiratory distress; he required nasal continuous positive airway pressure and weaned to room air by day 5 of life. He rapidly advanced to full enteral feeds via gavage and then oral feedings were initiated. After 1 week of life, he developed redness in the diaper area without involvement of skin folds (Figure 4). A protective barrier cream was applied for a few days without improvement. He then developed satellite lesions and flaking of skin of the perineal area involving the creases. An antifungal ointment was applied for 7 days without improvement. Flaking of the skin soon resolved, but redness with small papules continued throughout the diaper area. A different antifungal agent was prescribed. There was no improvement after 3 days. At this time, a discussion with the mother revealed a family history of sensitive skin. The decision was made to trial commercially available hypoallergenic products including diapers and cleanser and discontinued the second antifungal cream. Improvement was noted within 2 days at which time the antifungal was discontinued and a protective barrier cream was continued to perianal until discharge.

FIGURE 2

M.A.'s severe diaper dermatitis including denudement and excoriation with *Candida* involvement. Used with permission.

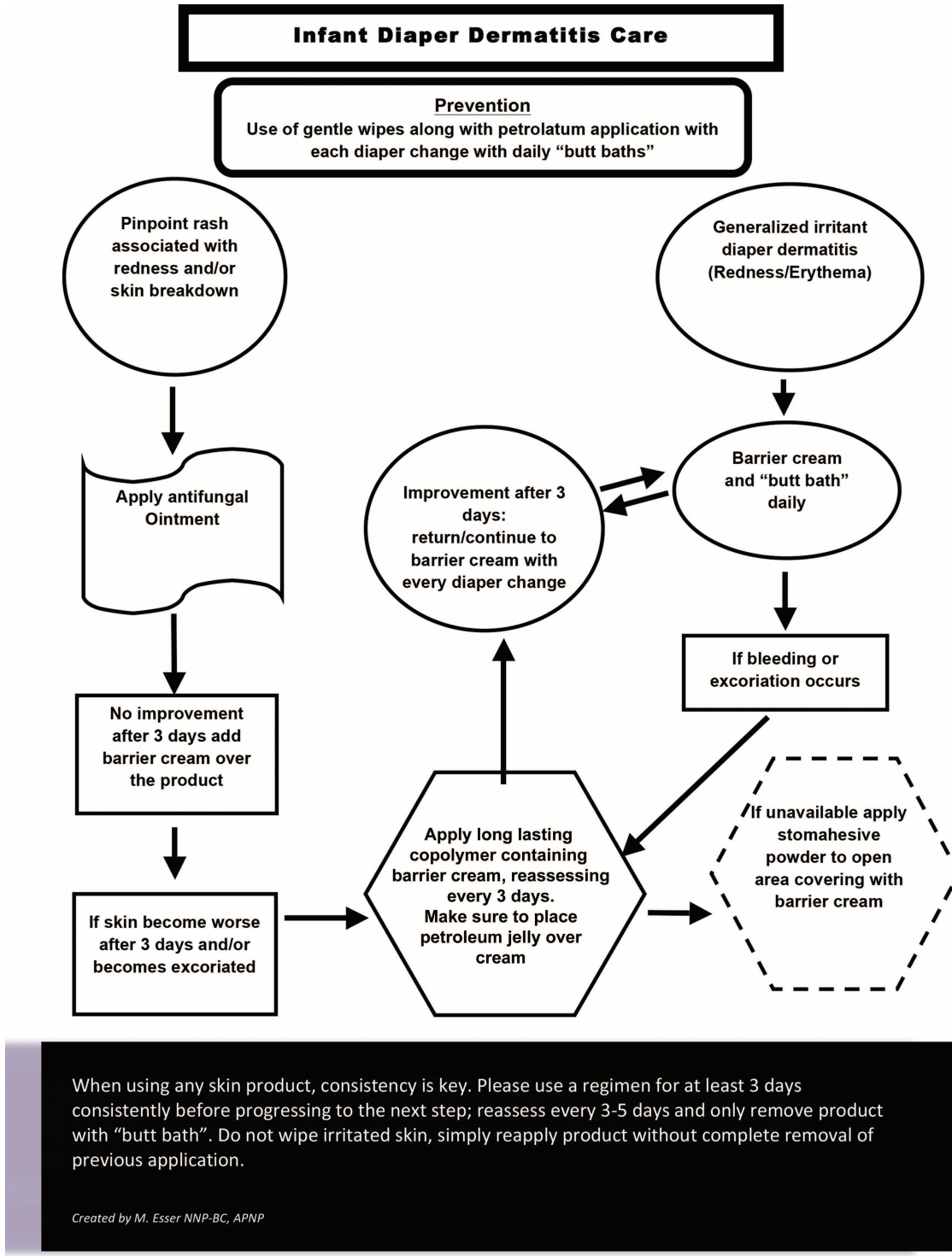
PATHOPHYSIOLOGY OF DIAPER DERMATITIS

Diaper dermatitis involves the uppermost layer of the epidermis, the stratum corneum, and develops as a result of the occlusion and overhydration of diapered skin. The overhydration of the skin promotes the development of a higher skin pH. Enzymes in stool include proteases and lipase, and these have increased activity when there is a rise in pH, leading to skin breakdown.[1] In addition, mechanical friction from the diaper, in conjunction with overhydration leading to changes in pH, causes skin breakdown (Figure 1).

The 2 types of diaper dermatitis demonstrated by the cases presented include irritant-associated dermatitis and *Candida* diaper dermatitis. Irritant diaper dermatitis is the most common type of diaper dermatitis. The usual presentation is often seen as poorly demarcated erythema, with occasional appearance of papules, vesicles, and erosion, sparing the groin folds.[4,5] A superficial inflammatory process demonstrated by scaling and erythema may also develop in cases of irritant diaper dermatitis.[5] The irritation is the result of moisture, heat, and friction within the diaper area.[5]

Candida diaper dermatitis is the result of an overproduction of *Candida* from normal skin flora that penetrates the skin barrier when the skin is vulnerable as a result of changing pH and breakdown of skin integrity. *Candida* diaper dermatitis often involves the folds of the groin and thighs, with clusters of reddened papules and pustules that display sharp borders and satellite lesions.[4,5] *Candida* diaper dermatitis can be seen in infants who develop a case of diaper dermatitis that is not resolved with consistent application of barrier creams. It is important to decipher between *Candida* as a cause versus contact irritant diaper dermatitis, as the appearance may be similar. Treatment of *Candida* diaper dermatitis often involves the administration of an antifungal cream or ointment at least twice a day.[6] The use of an ointment is preferred because of its ability to penetrate the stratum corneum more effectively, delivering the medicine to the skin structure more reliably. Some strains of *Candida* may be resistant to an agent, and another antifungal topical agent should be used if there is no response in 24 to 48 hours of using the first product. It is possible to combine the application of an antifungal ointment and a barrier cream in the more severe cases of diaper dermatitis to provide added barrier protection.

FIGURE 3



Evidence-based algorithm to assist in the prevention and treatment of diaper dermatitis in the hospitalized infant.

BARRIER PRODUCTS

There are numerous products on the market specifically created to treat diaper dermatitis, with the most common products containing zinc oxide. Zinc oxide has been found to be beneficial for its ability to provide antiseptic, antibacterial, and astringent properties.[3] It repels fluids and cannot be absorbed into the skin unless specifically labeled as a nanoparticle. Zinc oxide is often suspended in a carrier such

FIGURE 4

J.W.'s diaper dermatitis. Note the involvement of skin folds and how the affected area appears to be representative of where the diaper comes into contact with the skin. Used with permission.

as petrolatum or other oil-based ingredients. Petrolatum serves to enhance skin integrity with its ability to travel through the spaces in the stratum corneum and has been studied as a beneficial component of neonatal skin care with its ability to enhance skin integrity.[7] A study by Alonso and colleagues[5] found petrolatum to assist in the prevention of diaper dermatitis, with a lower incidence of diaper dermatitis when petrolatum was applied prophylactically in comparison with no application with diaper changes.[7]

Product selection can be overwhelming, as there are several products in the market containing similar ingredients. The challenge lies in deciphering what product best fits the goals of prevention and treatment of the main types of diaper dermatitis present in the NICU. Gathering information including product ingredients, indications, and best practice evidence can be beneficial in assisting in determining the best product.

ALGORITHM

Several studies describe consistency of practice as beneficial in providing success in the reduction of diaper dermatitis. Heimall and colleagues[1] demonstrated how the creation of an algorithm for diaper dermatitis care streamlined product selection, reduced inconsistencies in application, and decreased the rate of diaper dermatitis at a large children's hospital. A study by Ratliff[3] demonstrated the reduction of redness in the diaper area with better consistency of barrier cream application. Pasek et al[4] demonstrated a decrease in the incidence of diaper dermatitis with the creation of an algorithm among a wide-scale pediatric population. These algorithms were developed because of observed struggles with consistency in application of products, increased incidence of diaper dermatitis, and lack of guidelines specific to diaper dermatitis care. Similar struggles were experienced in our NICU and led to an action plan of creating a standardized method for the prevention and treatment of diaper dermatitis in our NICU.

This evidence-based diaper dermatitis algorithm standardized the provision of diaper dermatitis care and increased prevention as well as streamlined product usage and evaluated product availability (Figure 3). Consistency of prevention and treatment regimens was found to be an important factor in the reduction of diaper dermatitis along with the creation of a consistent guide for practice as seen with the initial case presented. Prior to the introduction of the algorithm into clinical care in the NICU, education was provided to the nurses and focused on the steps of the algorithm using case study examples with descriptive images. A revision of the NICU skin care policy reflecting use of the algorithm also occurred during implementation of the algorithm.

A key component of the algorithm was the focus on prevention as the initial and primary step. Prevention included the consistent application of petrolatum to the diaper area, beginning upon admission as well as during daily cleaning of the diaper area. The practice of once a day cleansing with mild cleanser and water of the diaper area or "butt" baths, labeled as such by our nursing staff, is recommended and should continue from admission through discharge.[5,8] A barrier wipe was also incorporated into the prevention section of the algorithm due to its availability in the NICU. The barrier wipe is meant to be used for each diaper change in an effort to clear the stool and urine from the area. The combined use of the barrier wipe, "butt" baths, and application of petrolatum is encouraged and recommended in our unit. These can be adjusted to fit the needs of any unit based on product availability and preference of the unit's culture.

The next steps of the algorithm provide a guide to the care of the changing skin of the diaper area. Once the diaper area develops a change such as redness or *Candida*-like appearance, an intervention occurs and the provider or bedside nurse follows the appropriate algorithm track. With the appearance of redness, the application of a protective barrier cream is indicated for a minimum of 3 days with continued monitoring. If despite the barrier cream application severe breakdown occurs, another barrier that has the ability to adhere to the injured skin longer is indicated. Special instructions include the need for the diaper to be coated with petrolatum to prevent sticking, daily cleansing of the area with mild cleanser and water, and with each diaper change stool should be blotted off the barrier cream and more cream applied on top, with an emphasis that the barrier cream should not be completely removed.

Summary of Recommendations for Practice and Research	
What we know:	• Diaper dermatitis is a common problem in neonates and newborns. • Prevention-focused care is important. • Barrier products to prevent, protect, and treat the diaper area are numerous. • Consistency in practice results in fewer cases of diaper dermatitis.
What needs to be studied:	• Factors predictive of diaper dermatitis in the neonatal population. • Effectiveness of infant wipes, cleansers, and diapers to decrease the incidence and severity of diaper dermatitis. • The need for an efficient grading scale for diaper dermatitis to provide consistent measurement and guide care more effectively.
What we can do today:	• Provide preventative care to all infants including interventions that minimize skin barrier dysfunction. • Establish clinical guidelines to ensure consistency in care with targeted products. • Evaluate the number and type of products used to treat diaper dermatitis based upon the evidence.

In most cases, once this product has been applied, improvement is demonstrated within 3 days at which point the protective barrier is then brought back as a consistent product and the stronger barrier is discontinued. The use of the stronger barrier may be needed again if severe breakdown reappears, moving back to this step in the algorithm. Infants with more severe cases and risk factors may require the continued use of protective barrier until the time of discharge. Some infants without worrisome risk factors or reoccurrence of diaper dermatitis may be able to return to the use of petrolatum.

CONCLUSION

Diaper dermatitis is common, frustrating, and occurs often in the NICU. The 2 cases presented demonstrate common practices in the care of diaper dermatitis. Literature demonstrates efficacy in the reduction of diaper dermatitis with the use of an evidence-based algorithm. The process of creating an evidence-based algorithm may include evaluation of products, assessment of current practice, and development of a unit policy or revision of current policy. Our NICU has seen increased consistency in the care of diaper dermatitis that has led to a decrease in the severity of diaper dermatitis with the introduction of an algorithm. Continued evaluation of current practice is important in the maintenance and adherence to new methods. Our unit has developed weekly skin rounds and chart audits to further assess the need for support in caring for diaper dermatitis and other skin injuries.

FURTHER CONSIDERATIONS

The choice of products for this algorithm was based on availability and success within a specific unit. Each NICU or newborn nursery should evaluate current and available products for effectiveness, evaluate the role of products in the development of an algorithm, investigate the incidence of diaper dermatitis, and evaluate current practice as part of an action plan. Consideration of the transition to familiar products found in local stores may be useful and should be included in a unit-specific algorithm as appropriate. Education and clarity of process and care are important in the initiation of such a practice change along with the development of ongoing audits to assess effectiveness.

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