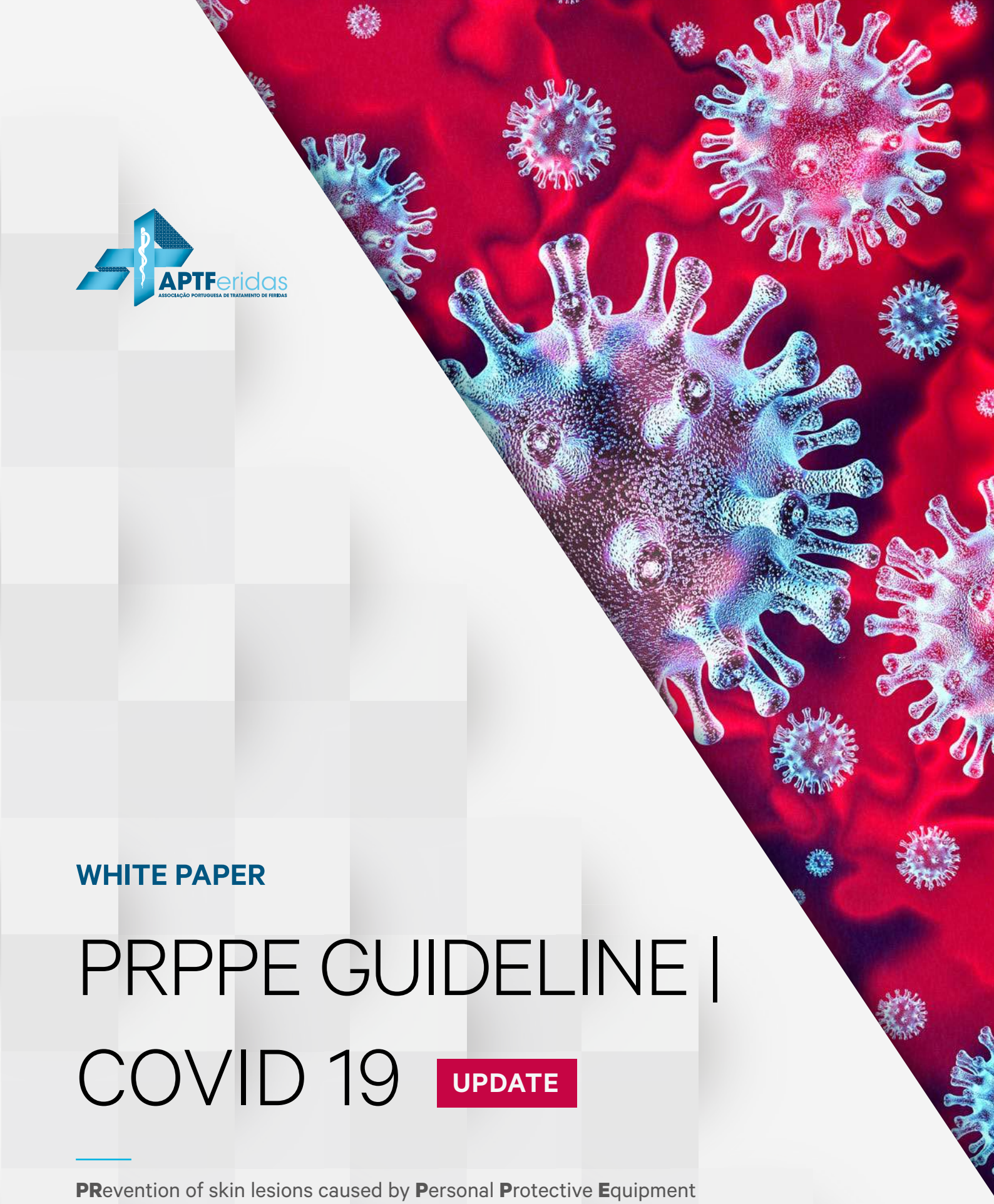

APTFeridas
ASSOCIAÇÃO PORTUGUESA DE TRATAMENTO DE FERIDAS

WHITE PAPER

PRPPE GUIDELINE | COVID 19 UPDATE

PRevention of skin lesions caused by **P**ersonal **P**rotective **E**quipment
(Face masks, respirators, visors and protection glasses)

PRODUCED BY:
Associação Portuguesa de Tratamento de Feridas (APTFeridas)

TITLE:
PRPPE GUIDELINE | COVID 19 - UPDATE
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INTRODUCTION

Within the scope of the infection caused by the new Coronavirus (SARS-CoV-2), in the Fight against Pandemic COVID19, the Portuguese Wound Management Association (APTFeridas) tried to respond to the calls of health professionals in order to issue recommendations for the prevention of injuries such as skin tears, device - related pressure ulcers, friction injuries and irritant contact dermatitis related to frequent and continuous use for long periods of personal protective equipment (PPE), such as face masks, respirators, visors / goggles that are widely used in providing care to patients and which have been widely expressed at international and national level by personal reports and images/pictures showing the nature and impact of the problem (1).

These practical recommendations are important for the days approaching the peak of the outbreak where its use will be even greater and by a higher number of health professionals. Although, as there is no published evidence on these interventions, APTFeridas used the experiences of professionals who also fight this battle, such as colleagues from China, Italy, Australia and the United States, as well as scientific evidence to support the recommendations. We have UPDATED the first document due to some concerns related with safety when using the PPE.

These recommendations are only for protection and skin care before and after the use of PPE without putting health professionals or patients cared for at risk. The use of PPE is of essential importance and APTFeridas recommends that the use of PPE equipment must respect the recommendations of the manufacturers, General Health Directorate (DGS), European Center for Disease Prevention and Control (ECDC) and the Center for Disease Control and Prevention (CDC) and the World Health Organization (WHO).

WARNING: The recommendations are a general guideline for clinical practice, to be implemented by qualified health professionals, according to their clinical judgment, assessing each case individually and considering their preferences, patient needs and available resources. They must be implemented in a culturally conscious and respectful manner, in accordance with the principles of protection, participation and collaboration.

THEORETICAL FOUNDATION

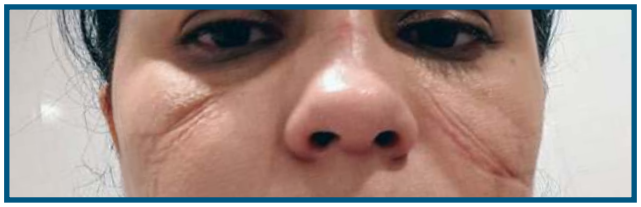
The skin is the first line of defense against the environment and is repeatedly subjected to mechanical forces and chemical impact (2), its protective characteristics are altered when constantly attacked, as is the case with the continuous use of medical devices / PPE. These are physical factors such as sustained pressure, shear, friction, as well as occlusion causing an increase of humidity and temperature next to the skin surface, which are directly associated with the development of Pressure Ulcers (PU), friction injuries and skin breakdowns (3).

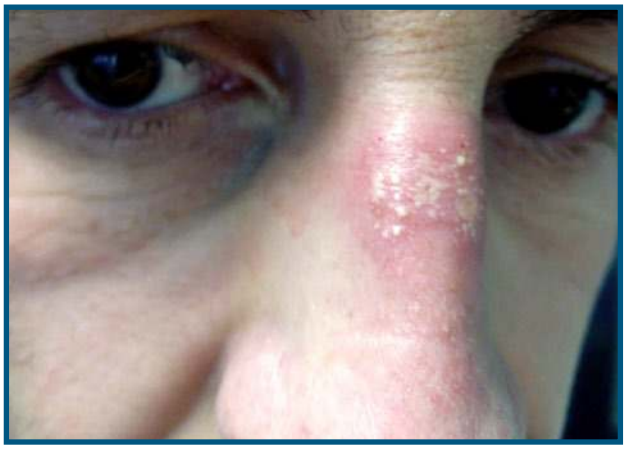
Research and recommendations in this field are predominantly developed for those individuals using healthcare (patients and their family) and not for those providing healthcare (healthcare workers) (4-6). The medical devices most referred to in the literature are endotracheal tubes, nasogastric tubes, oxygen tubes, ventilation masks, urinary catheters and cervical collars. These injuries can increase the risk of infection, cause pain and skin and tissue breakdown, which can be visible and cause distress; result in permanent hair loss, altered body image and / or reduced quality of life, as well as, increasing the length of hospital stay and consuming additional resources (time and materials) (7).

Personal protective equipment (PPE) must be in accordance with the level of care provided, respecting Guidelines No. 002/2020 of 25/01/2020 (8) and No. 007/2020 of 29/03/2020 (9). However, the prolonged and continuous use of face masks, respirators and goggles / visors leave to a constant friction and pressure forces on tissues causing skin lesions. Epidemiological data reveal that the injuries associated with the use of N95 masks most frequently reported by health professional's are facial pruritus (51.4%) and rash (35.8%) (10).

If we manage to reduce these mechanical forces, without changing the safety capacity of PPE, we can reduce the impact on tissues and improve the skin's ability to respond to constant aggressions. We know that the friction of the skin is determined by the properties of its surface (roughness, hydration status, among others), the properties of the materials in contact (rigid, soft, fibrous, etc.), as well as the influence of possible intermediate layers (creams, lotions, pastes, among others), combined with sweat and sebum, which are naturally excreted at the skin outlayer (11-13).

As the skin itself is a surface, it is very important to analyze it in order to understand the impact of these factors on the alteration of its properties. In the specific case of the various materials / fabrics in contact with the skin, frictional and pressure forces develop at that interface, which strongly depend on the moist level and are a necessary combination to break the adhesion bonds between the 2 surfaces and the forces that cause deformations in the contact area (14).





Friction is usually measured by the coefficient of friction (COF), which is calculated when one surface is brought into contact with another and dragged towards it. The COF between the skin and the external materials is influenced by the nature of the textile materials, the contact pressure, the mechanical properties of the skin, the type of movement, the humidity of the environment and the humidity of the skin itself (15, 16). This may explain the injuries that are being observed by clinicians in Portugal and in other countries. Since the mask materials, which already have a substantial COF with the skin and do not release moisture (sweat and Transepidermal water loss - TEWL) captured at the contact sites (further increasing the COF), cause high static frictional forces that damage the skin (11). Since the resistance of the skin decreases with humidity, it appears that the increased frictional forces, synergistically with the low resistance of wet skin, contribute to the appearance of pressure injuries, friction and skin breaks.

Since masks are being used, they will be used throughout the day and under extreme conditions, associated with sweating is high due to the increased workload and also mental stress, a practical solution is to protect the skin under the contact places of PPE.

The first aspect we want to protect is any damage to the skin of healthcare professionals, as the skin lesion under the mask will be a gateway for the coronavirus, as well as for other bacterial, viral or fungal infections acquired in hospitals, hence the importance of skin care and preventive measures.

From the review and the consultation of international experts, two major recommendations emerge:

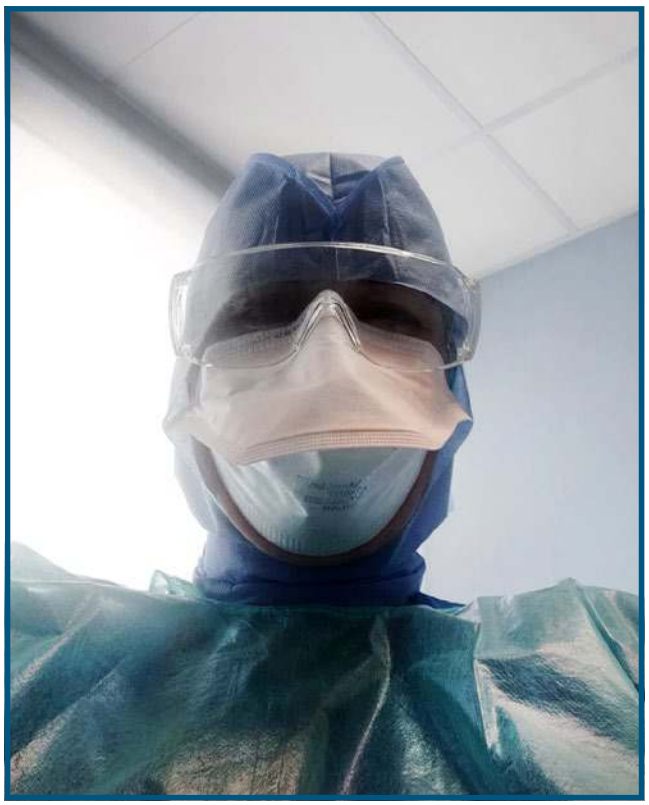
1. Adequate facial skin care before and after the use of PPE

We must reinforce facial skin care before and after work shifts, especially in this phase of intense use of PPE. The contact of these equipments with the face, which having a more sensitive skin than other areas of the body requires special attention. In conditions of prolonged use, without rest periods that allow the skin to recover, the occlusive, irritating and traumatic effect of the various PPE can cause various injuries and even facilitate exacerbations of some more common or latent pre-existing skin diseases, such as acne, rosacea to seborrheic dermatitis.

2. Application of an interface between the PPE and the skin in the areas of pressure / friction

The use of dressing material in the prevention of pressure ulcers is recurrent in clinical practice and has a level of evidence B (3, 17). It should be taken into account that not all dressing materials have the same characteristics and present different/diverse results. The interface material must be thin, non-traumatic when removed, absorb moisture, adapt to the contour of the face structures, always guaranteeing the correct sealing of the mask, without causing risk to the user.

GUIDELINE



A. ADEQUATE SKIN CARE BEFORE AND AFTER THE USE OF PPE

The better the conditions of the skin, the more resistant it will be to the aggressions induced by the prolonged and intensive use of this equipment. Loss of facial skin integrity creates a portal of entry for pathogens, such as the coronavirus, but also other hospital-acquired bacterial, viral or fungal infections. The general approach in dermatology 1. Protect, 2. Cleanse, and 3. Restore is, therefore, recommended.

1. Protect

Keep the skin dry and ensure a perfect fit of the mask with the facial skin:

- Use a moisturizing cream with a simple formulation, preferably without potentially irritating additives.
- Cosmetic procedures are not recommended, and makeup should be avoided.
- Consider the use of an interface between skin and PPE to protect against lesions (see section C. USE OF DRESSING MATERIAL / INTERFACE BETWEEN SKIN AND PPE).

2. Cleanse

Washing the face and neck carefully is one of the most important parts of the skin care routine:

- The skin should be washed gently with lukewarm water and dried carefully without rubbing, preferably using hypoallergenic, synthetic detergents.

3. Restore

Intensify skin care after using PPE and in-between work shifts:

- Use a restorative moisturizing cream with a simple formulation, preferably without potentially irritating additives (such as fragrances, exfoliants – acids, retinoids and depigmenting agents).
- In case of ulceration or blisters, good practices in wound care are advised. Restorative formulas and/or dressings may be considered.

B. USE THE PPE APPROPRIATE TO THE LEVEL OF CARE TO BE PROVIDED AND YOUR ANATOMY

Proper protection is the most important element when we are facing this risk level of infection. As previously said the use of PPE must respect the recommendations of the responsible entities [European Center for Disease Prevention and Control (ECDC) | Center for Disease Control and Prevention (CDC)] and the PPE manufacturers indications. They recommend not to use any kind of devices bellow, even make-up or the big size of the beard can be dangerous if there is a leak seal. However, a loss of skin integrity will be also a gateway for infection, pain and discomfort can lead to misuse or incorrect selection of protective materials. Since this is a new phenomenon we recommend always perform a seal test with the interface material on and if it fails, don't apply it.

1. Skin evaluation and protection

Inspect the skin under and around of the PPE for signs of injury (pressure, redness, or moisture).

If the skin presents signs of friction in the area of contact of PPE, apply a skin-protecting product that reduces the coefficient of friction of the skin surface.

NOTE: Do not use products with high water content, because these products impair the skin barrier.

2. Use the PPE appropriate to the level of care to be provided

Select the PPE compatible with the level of risk and care you will provide.

Evaluate the possibility of selecting different PPE/masks with same level of protection, but with different shapes/forms reducing the mechanical forces in the same areas if possible, without reducing your level of security.

Avoid exaggerated force in the fixation sites, with the objective of guaranteeing optimal sealing, since it will increase the pressure and friction forces in these places, resulting in discomfort and the high probability of injury. Adjust the device to the shape of your nose / face before definitively applying PPE. By adjusting the PPE to the anatomy of the face, the sealing will be optimized and the mechanical forces will be more evenly distributed over the contact area between the PPE and the face. Confirm that you do not feel discomfort or pain at any specific point of contact between the skin and the device.

Identify key areas (forehead, nose, malar region/cheeks and ears) and the specific mechanical/physical factors for each one, to define different strategies (reduce friction or redistribute pressure).

VERY IMPORTANT: IN ADDITION TO THE REASONS MENTIONED ABOVE, SKIN LESIONS CAN ALSO BE CAUSED BY THE MISUSE / INAPPROPRIATE USE OF PPE.

C. USE OF DRESSING MATERIAL / INTERFACE BETWEEN SKIN AND PPE

Assess all contact areas between PPE and the skin. The nose, the cheeks, the forehead and the posterior region of the ear are pressure / friction zones.

NOTE: At this time, there is no skin protection product in the wound care industry which has been specifically tested for permeability to the coronavirus. With that said, there appears to be some confusion, that applying prophylactic dressings onto sensitive facial sites may compromise the seal of a medical face mask. From a bioengineering perspective, this is unlikely, and the example of gaskets may be the best to illustrate the reasoning for this. In mechanical engineering, gaskets are always made of flexible materials, which allow for "less-than-perfect" shape-mating, touching surfaces (including those with surface irregularities) to form a tight seal. Standard face masks are made in standard sizes (does the one size fit all?). Thus, standard face masks do not, and cannot precisely conform to the anatomical facial contours of each individual. Therefore, by definition, there would always be gaps or pores between the face and the mask, necessitating the very tight strapping to overcompensate this. Hence, it is our opinion that prophylactic dressings with a proven capacity to alleviate mechanical deformations and stresses in tissues, with their inherent flexibility (i.e. elasticity), will act like gaskets when applied at specific sensitive facial sites, such as the bridge of the nose, and may actually improve the seal, rather than compromise it. Confirmation of this through a regular scientific process would require experimental laboratory research and testing, however, university closures including drawing down of research activities overall in response to the coronavirus pandemic is slowing down the 'normal' research course. Given the highly unusual present circumstances, where clinicians require guidance here and now, the engineering and bioengineering theory is a good and solid foundation for such a recommendation. Specifically, prophylactic dressings for which published, peer-reviewed evidence demonstrating alleviation of mechanical tissue deformations and stresses exists, are very likely to act like tight-seal gaskets. Noteworthy is that in line with the same gasket theory, dressings which appear to be too thick and/or too stiff (and that would therefore be less effective in reducing facial tissue loads), may compromise the seal. This is because such dressings would lack the flexibility to conform between the mask and the contours of the face.

1. Wash and dry the face, specifically in the places where the dressing material will be applied.

2. Cut and adjust the material to the application site. The proposed materials are thin foams with silicone (preferably), in the absence of these; the alternative will be films and hydrocolloids under the risk of not performing the best management of humidity or temperature, as they are occlusive.

3. The use of an interface (whichever one is chosen) must be continuously evaluated, monitored and reviewed by users in order to find the solution that best suits each professional (Table 1).

4. Apply gently to the respective areas, stretched without too much tension but avoiding wrinkles or folds.

5. After applying PPE, confirm the correct application of it on the interface material, without increasing unnecessary pressure / tension in the contact areas.

6. Check the sealing of the PPE, with the interface and with the skin. Ensure that the PPE fits correctly so that the device provides the intended protection.

NOTE: Some clinical tests associated with seal leaks and the use of dressings, verified that thick and stiff dressings don't seal.

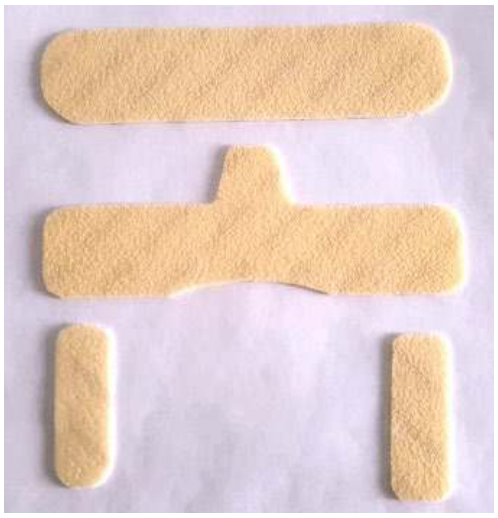
VERY IMPORTANT: ENSURE THAT THE PPE FITS CORRECTLY SO THAT THE DEVICE PROVIDES THE INTENDED PROTECTION.

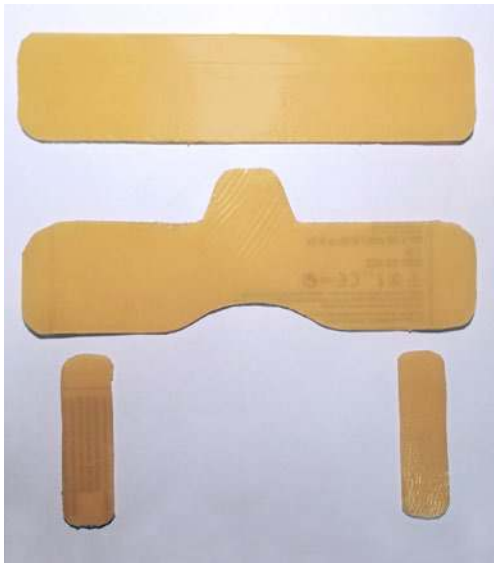
D. PRESSURE RELIEF

During each shift, the health professional must respect the institutional guidelines for changing shifts in the risk area and replacing PPE. At that time, the pressure / tension in the respective areas must be relieved, which must be carried out within a maximum interval of 4 hours.

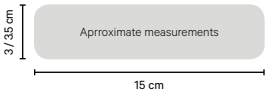
NOTE: If the interface material or PPE is wet or damaged, it must be changed immediately.

TABLE 1. Cutting molds and adaptation to the areas of greatest pressure/friction

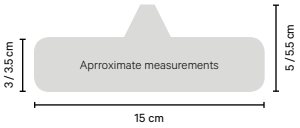


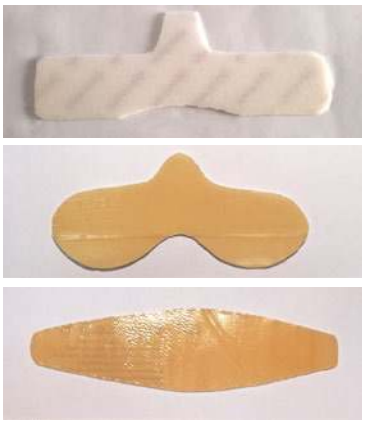


Forehead

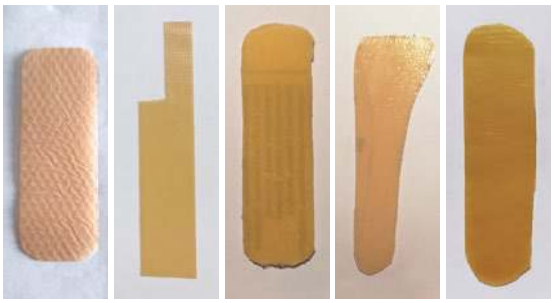


Nose and face





Ears



Thickness

Some of the examples of the dressings cuts were adapted from the: HEBEI nursing association; Department of Orthopaedics, West China Hospital, Sichuan University - Wound care team; and Beijing Nursing Association

E. SKIN CLEANSING AND HYDRATION

At the end of your shift, you must remove all PPE and interface material, respecting institutional safety recommendations.

Consider the indications of Cleanse (pag.4). If the skin is dry, apply an water-in-oil-emulsion in a thin layer to help the stressed skin to regenerate until the next shift.

Avoid alcohol based products on that areas

Skin care, with daily applications of hydration and protection, will reinforce areas that are at risk and provide greater protection for the next shifts where tensions will remain in the same places - Adequate skin care before and after the use of PPE.

NOTE: Appropriate diet and fluid intake are important to stay healthy, but there is no evidence, that increased fluid intake increases skin hydration. Skin dryness is determined by the state and function of the stratum corneum.

F. SKIN AND TISSUE BREAKDOWN TREATMENT

In case of lesions, blisters or ulceration we have increased risk of a gateway for infection and we need to protect the area. Antisseptic solutions with broad spectrum (include Virus), can be used.

Select the most appropriate wound dressing based on goals and specific needs at this particular time where occlusion is essential.

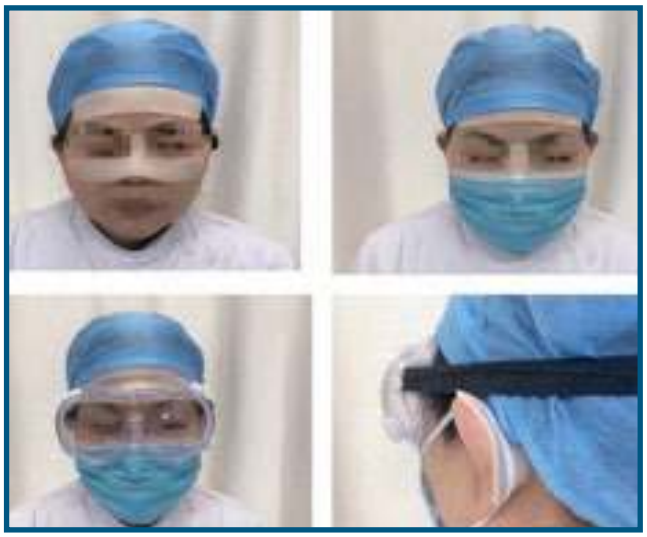
Select a dressing with diameter, shape, stiffness and thickness that simultaneously contribute to healing and prevent infection.

We recommend changing the dressing every time you substitute the PPE and every shift due to high risk of contamination of the material and spread to other person/places.

Always confirm the integrity of the dressing, because it will deteriorate over time under these severe conditions. If doesn't maintain integrity, replace it.

We recommend the appropriate local treatment, according to the existing scientific evidence, in order to prevent permanent scars on the face that may have aesthetic and self-image implications.

In these images provided by Hongyang Hu (China) from HEBEI Nursing Association, It can be verified the correct application of the interface materials in regions of friction, humidity and pressure is verified.



Font: HEBEI Nursing Association - China

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