

# Skin injuries associated with severe life-threatening situations: A new conceptual framework

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## Abstract

**Purpose:** To create a conceptual framework for skin injuries developing in patients whose lives are severely compromised or who are expected to die within a short period of time. To name and classify these types of skin injuries. To describe the clinical features of the different types of skin injuries that may occur in terminally ill and/or dying patients.

**Design:** A sequential design with several different phases (a literature review, a nominal group, and a consensus conference) was used.

**Methods:** Six experts with extensive knowledge of these types of injuries were selected for the nominal group. The traditional eight-phase nominal group technique was followed. The consensus conference consisted of participants voting on different options based on the statements elaborated with the expert panel summarizing the best scientific evidence available.

**Findings:** Using all these elements, a conceptual framework was constructed to identify *skin injuries associated with severe life-threatening situations* (SI-SLTs), defined as unpredictable and therefore unpreventable injuries indicating a serious threat to life or even imminent death. These injuries can occur in two forms: (a) as *skin injuries associated with multiple organ dysfunction syndrome* (SI-MODSs) or (b) as *skin injuries associated with severe vasoconstriction* (SI-ESVs). SI-MODSs develop very quickly and suddenly. They progress from superficial to deep stages abruptly, even within hours. The severity of the injuries does not reflect the care provided to the patient. Individuals suffering from these injuries have an irreversible clinical condition. SI-ESVs also appear in individuals who are in a very critical, even terminal, clinical condition. They are frequently treated in the ICU and may exhibit severe vasoconstriction due to their disease process (e.g., shock), sometimes exacerbated by vasoconstriction caused by various drugs (e.g., noradrenaline).

**Conclusions:** We have developed a conceptual framework for skin injuries developing in patients whose lives are severely compromised or who are expected to die within

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a short period of time and have named them SI-SLTs, distinguishing between SI-MODSs and SI-ESVs.

**Clinical relevance:** This new conceptual framework may help clinicians understand the mechanisms and the pathophysiology of skin injuries that develop in terminally ill and/or dying patients associated with multi-organ failure. Through this new framework these injuries can be identified and differentiated from pressure injuries or other dependence-related skin lesions.

#### KEYWORDS

conceptual framework, end of life, skin injuries

## INTRODUCTION

The skin is a major organ in humans, accounting for 12%–15% of the body's total weight, that performs some vital functions in the protection against external agents, immunity, and the connection with the environment through the sensory receptors (Blasco-García et al., 2016). The skin is a highly vascularized tissue that regulates metabolism, temperature, and blood pressure by receiving up to 30% of the body's total blood volume (Lepak, 2012). Skin injuries can happen in association with different external or internal factors.

The 2014 conceptual model of dependency-related skin injuries (DRSIs) showed that the category hitherto known as pressure injuries (PIs) (Lepisto et al., 2006) actually encompassed a group of at least seven different types of injuries (Garcia-Fernandez et al., 2014). Since then, a new paradigm has emerged, moving beyond mere conceptualization to establish differential characteristics between injuries and allow clinicians to improve their preventive and therapeutic management of these injuries (Garcia-Fernandez et al., 2014). However, this new theoretical framework is not static and may be enriched with advances in the field (Garcia-Fernandez et al., 2016); some types of injuries such as skin tears that were not initially included in this model could be considered for inclusion in future revisions.

There are also some controversies about if other injuries developed by end-of-life patients, which were first explored with the definition of a variant of PIs by Karen Kennedy (Kennedy, 1989), could be included or not in the theoretical framework for DRSIs. There has been considerable debate about the inevitability of PIs throughout history. Hibbs's seminal study on PI prevention (Hibbs, 1982) concluded that the vast majority of PIs were predictable. There is a high degree of consensus among scientific societies that most PIs are preventable (García Fernández et al., 2014; National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, & Pan Pacific Pressure Injury Alliance, 2010). However, no intervention that can consistently and reproducibly reduce their incidence to zero has yet been reported (Edsberg et al., 2014).

The occurrence of PIs in any care setting has important implications in terms of pain, suffering, self-esteem, and quality of life, as well as legal ramifications (Silverman, 2012; Soldevilla Agreda & Navarro, 2006). Prevention is the key to avoiding their occurrence,

but it is also acknowledged that certain PIs may be unavoidable (Edsberg et al., 2014). According to the NPUAP, an unavoidable PI or pressure ulcer (PU) "develops even though the provider evaluated the individual's clinical condition and PU risk factors; defined and implemented interventions consistent with individual needs, goals, and recognized standards of practice; monitored and evaluated the impact of the interventions; and revised the approaches as appropriate" (Edsberg et al., 2014).

At the first US National Pressure Ulcer Advisory Panel (NPUAP) conference, the term "Kennedy terminal ulcer" (KTU) (Kennedy, 1989) was introduced and is now the benchmark for this type of injury. As the author herself explained years later, "the Kennedy Terminal Ulcer (KTU) is a pressure ulcer that some individuals get as they are dying" (Kennedy-Evans, 2009). The author defined it as a variant of PIs matching Charcot's description of "decubitus ominousus" more than 100 years earlier (Charcot, 1881). However, this classification as a variant of PIs has been challenged by a number of authors (Latimer et al., 2019; Yastrub, 2010).

For more than twenty years, there has been intense debate about whether KTUs are or not a subtype of PI, as injuries resulting from lack of optimal care. In 2006, Langemo and Brown defined the concept of skin failure as "an event in which the skin and underlying tissue die due to hypoperfusion that occurs concurrent with severe dysfunction or failure of other organ systems" (Langemo & Brown, 2006). This concept of skin failure and its difference with PIs have been discussed by multiple authors since then (Bain et al., 2020; Delmore et al., 2020; Kottner et al., 2019; Nowicki et al., 2018).

In 2008, a panel of 18 experts met in Chicago for a consensus conference on Skin Changes At Life's End (SCALE) and defined them as "physiologic changes that occur as a result of the dying process (days to weeks); may affect the skin and soft tissues and may manifest as observable (objective) changes in skin color, turgor, or integrity, or as subjective symptoms such as localized pain" (Sibbald et al., 2009). SCALE is a broad term encompassing all alterations occurring at the end of life, regardless of whether or not they are unavoidable. The panel of experts argued that the pathophysiological phenomenon known as skin failure may occur at the end of life and that certain unavoidable injuries may occur at this life stage as a result. A few years later, in 2012, Brennan and Trombley described a type of injury they named as

“Trombley-Brennan terminal tissue injury” (TB-TTI), occurring in end-of-life patients like KTUs. According to the authors, TB-TTIs are “spontaneously appearing skin alterations, rapid evolution, speed of enlargement and progression, appearance in areas of little to no pressure such as skins, thighs, and mirror imaging found in patients at the end of life” (Trombley et al., 2012).

It is not clear if all these denominations for skin injuries associated with the end-of-life refer to the same type of lesions, if they can be prevented or avoided and if they could be conceptualized or not within PIs. First, the mechanisms of production of the end-of-life associated injuries differ from that of PIs, because skin failure has a major role. Levine said that at the end of life there is a “state in which tissue tolerance is so compromised that cells can no longer survive in zones of physiologic impairment such as hypoxia, local mechanical stresses, impaired delivery of nutrients, and build-up of toxic metabolic by-products” (Levine, 2017). The end-of-life lesions have in common the fact that they appear in the hours or weeks prior to the patient's death, but these lesions are not the cause of death but a manifestation of dying. Most cases occur in patients admitted to palliative care or long-term care units; but the lack of awareness of this pathological entity among clinicians may have led to it being underdiagnosed in other care settings (Lepak, 2012).

Clinicians may also be confused about if these injuries could be avoided by PI preventive care. Differential diagnosis between avoidable and unavoidable injuries is key to setting achievable care goals in practice.

The development of a clear conceptual framework for these end-of-life injuries would help to identify, classify, prevent, and manage them. This framework may be used for education purpose and as a classification system to facilitate the recognition of these injuries and lead to a more appropriate approach. Because these injuries are mostly unavoidable with standard preventive care, a correct diagnosis and classification could help clinicians and family caregivers to know that they are not a result from poor or suboptimal care.

## OBJECTIVES

The aims of this study were: (a) To create a conceptual framework for skin injuries developing in patients whose lives are severely compromised or who are expected to die within a short period of time; (b) To name and classify these types of skin injuries; and (c) To describe the clinical features of the different types of skin injuries that may occur in terminally ill and/or dying patients.

## METHODS

A sequential design with different phases was used: literature review, a nominal group of experts and a consensus meeting. A team composed of four researchers, members of the Spanish Pressure Ulcers and Chronic Wounds Advisory Group, conducted the research.

A literature review of all aspects of end-of-life skin injuries was carried out to prepare for the conceptual discussion with the experts.

### A nominal group

Six experts, with extensive knowledge of this type of injuries were selected for the group. All of them were nurses with a PhD in wound research and with more than 15 years of experience in wound care. Two experts were full-time clinicians (one in primary care and another in nursing home), three experts were full-time university lecturers in nursing with previous clinical experience and one expert was part-time clinician in primary care and part-time university lecturer in nursing school.

The traditional eight-phase nominal group technique (Delbecq & Andrew, 1971) was followed and coordinated by the project leader: (1) Brainstorming, where participants noted their thoughts on the topic in question based on their individual reflections. (2) Sequential, public presentation of ideas, and comments by the participants. (3) Discussion of ideas by generating debate and introducing the possibility of discarding ideas, redefining them, grouping them, rearranging them, breaking them down, etc. (4) Preliminary, independent vote on the importance of the proposals outlined in order to summarize and prioritize participants' preferences in a single ranking. (5) A break aiming to briefly “oxygenate” the group before resuming the discussion process. (6) Discussion of the results obtained in the first round of voting, analysis of any inconsistencies, and group reflection. (7) Second independent vote following the procedure outlined in phase four. At this point in the process, the number of proposals considered was smaller than in the first vote as a result of prior “filtering,” which undoubtedly helped to obtain greater specificity. (8) Listing and agreeing on the final proposal and the rearranged priorities.

### A consensus conference

This is a method used to reach consensus about complex issues that has been described in the literature with three criteria for adequacy: (a) A controversy that can be clarified by data (end-of-life injuries, their classification and relationship with PIs) and opinions that can be discussed in a public debate. (b) The need to address a public health concern, which is determined by the importance of the issue in terms of frequency and/or severity, the level of interest expressed by health professionals, and its potential impact on clinical practice in terms of resource allocation (identification, frequency, preventive measures of the end-of-life injuries). (c) Availability of published scientific information on the subject of sufficiently good quality to ensure that recommendations are not the result of the subjective judgement of the conference jury alone (current literature about end-of-life injuries to inform the debate) (Asua Batarrita, 2005). In brief, participants in a meeting receive a description of the topics

and the list of statements or recommendations from the expert group, after which a focused debate about the most controversial points take place and, finally, all the participants can choose between several options on each topic or express agreement through an anonymous vote. (Agence Nationale pour le Développement de l'Évaluation Médicale, 1990). This context provides participants with the best possible information to answer the questions posed and allows the most accurate, valid, and credible solutions to be proposed on controversial issues.

The consensus conference was held during the 9th Spanish National Pressure Ulcer Commissions Meeting in November 2019 (La Rioja, Spain) where 90 participants, mostly nurses, met to share experiences on PI prevention and management. In a 90-min session, the consensus method took place and all the participants had the opportunity to express their opinion on-site by voting using an app with their smartphones. The different options and the number of votes received were recorded and analysed by the research team, and compared with the statements of the experts to build the conceptual framework.

The options most voted by the meeting participants were considered as a representation of the current views of clinicians to inform the framework, but the team also took into account the statements of the experts and the overall coherence of the model. The research team was ultimately responsible for making the decisions to build the framework.

## RESULTS

### Results of the nominal group

Four topics were discussed.

1. What would be the most suitable name for injuries occurring in individuals with a severe life-threatening illness, regardless of whether or not the cause of those injuries is potentially reversible? After two rounds of discussion and several proposals, it was agreed that the most appropriate name encompassing all these injuries would be: skin injuries associated with severe life-threatening situations (SI-SLTSs). This term indicates that the individual's life is severely compromised, generally due to irreversible circumstances (terminal illnesses), although these injuries may exceptionally occur in potentially reversible situations such as severe shock.
2. What name could encompass what has so far been called KTU, SCALE, TB-TTI, Charcot's decubitus ominusus, 3:30 syndrome, and skin failure? The experts decided that the name that could encompass all the aforementioned injuries was: skin injuries associated with multiple organ dysfunction syndrome (SI-MODSs) (Cohen et al., 2017; Delmore et al., 2020; Levine, 2016). In light of the first discussion, this name would be the most appropriate as these injuries are not related to a poor or inadequate care, but to skin failure due to severe heart failure or multi-organ failure.

3. What name could encompass skin injuries occurring in the distal extremities of critically ill patients using potent vasoconstrictors (such as noradrenaline) in an attempt to maintain cardiac output? The debate was more heated and there were several strong suggestions. The extent to which vasoconstriction was physiological and/or pharmacological in nature or a mixture of both was debated. It was finally agreed that they should be referred to as skin injuries associated with severe vasoconstriction (SI-ESVs), regardless of their pathophysiological or pharmacological cause.
4. Do you think that this type of injury could be included in the middle-range theoretical model of DRSIs or should a different conceptual model be developed? After analysing all the evidence, references, and discussions, it was unanimously agreed in the first round of voting that they should have their own conceptual framework. One of the key criteria in differentiating between injuries is their avoidability or unavoidable. While DRSIs are considered mostly preventable, the injuries associated with severe life-threatening situations do not appear to be preventable and herald the patient's impending death. Therefore, it was deemed inappropriate to include them in the same conceptual framework and require a new one of their own.

### Consensus conference

79 (87.78%) of the 90 meeting attendees accepted to participate in the session and voted using their devices. Participants were asked to express their views on each of the questions posed by voting at the end of each discussion.

The questions posed were as follows:

1. What do you think of the name "skin injuries associated with severe life-threatening situations" (SI-SLTSs)?

79.10% of the participants considered it to be an appropriate name to encompass all the injuries occurring in patients who are in an extremely serious or terminal condition. 5.95% considered it to be inappropriate and 14.95% preferred not to respond.

2. What would you call peripheral skin injuries occurring in critically ill patients requiring vasoconstrictors?

The most voted option was "peripheral injuries due to severe life compromise and use of drugs" (49.3%), followed by "peripheral injuries due to critical condition and use of drugs" (23.2%), "severe life-threatening peripheral injuries" (18.8%), and "peripheral injuries due to critical condition" (8.7%).

3. Do you think any of the aforementioned names encompass KTUs, TB-TTIs, SCALE, and others?

Most of the attendees believed that two of the names could encompass all injuries of this type: "skin injuries associated with

multiple organ dysfunction syndrome” (SI-MODSs), which was the most voted name with 38.7% of the votes, and “skin injuries in terminally ill patients” (32.3%). The name “skin injuries due to critical condition” also came relatively close (27.4%). The option “others” received only 1.6% of the votes.

#### 4. Do you think that SI-SLTs should be included within the model of DRSIs?

Fifty percent of the participants thought that they did, while 37.9% thought that they should have their own conceptual framework, 9.1% responded that they did not know, and 3.0% did not respond to the question. Although the most voted option was to include SI-SLTs within the model of dependence-related injuries, the research team decided not to consider this option, but the second most voted (to include them in a specific model). This decision was made for several reasons. First, there is some contradiction if one considers the SI-SLTs as associated with dependency with the previous three questions from the meeting to characterize injuries associated with life-threatening situations. It is possible that some of the participants did not fully understand the goal of the new theoretical framework, as stated in the meeting. Second, there is still a strong tradition among nurses to consider most skin lesions developed in bedridden patients as pressure ulcers, irrespective of their etiology. In this case, if necessary to consider that the SI-SLTs are unavoidable

injuries with the preventive measures that are commonly used to prevent PI or moisture-associated skin damage and the main factor is not patient dependence but a severe life-threatening situation that produce skin failure. Based on these reasons, the team considered as the most coherent option to follow the recommendation of the expert panel and not include the SI-SLTs in the DRSL model, but in a new framework.

### New conceptual framework for SI-SLTs

Based on the literature review, the recommendations of the expert group and the input from the consensus meeting, the team developed a conceptual framework for SI-SLTs, grouping this type of skin injuries according to the concept map shown in Figure 1.

SI-SLTs could be defined as unpredictable and therefore unpreventable injuries associated with a serious threat to life or even imminent death. These injuries can occur in two forms: as skin injuries associated with multiple organ dysfunction syndrome (SI-MODSs) or as skin injuries associated with severe vasoconstriction (SI-ESVs).

SI-MODSs develop very quickly and suddenly, progressing from superficial to deep stages abruptly, even within hours. The failure of the skin as an organ, in the context of MODS, could be the main mechanism. The severity of the injuries does not reflect the care provided to the patient (Dagleish et al., 2020; Sibbald & Ayello,

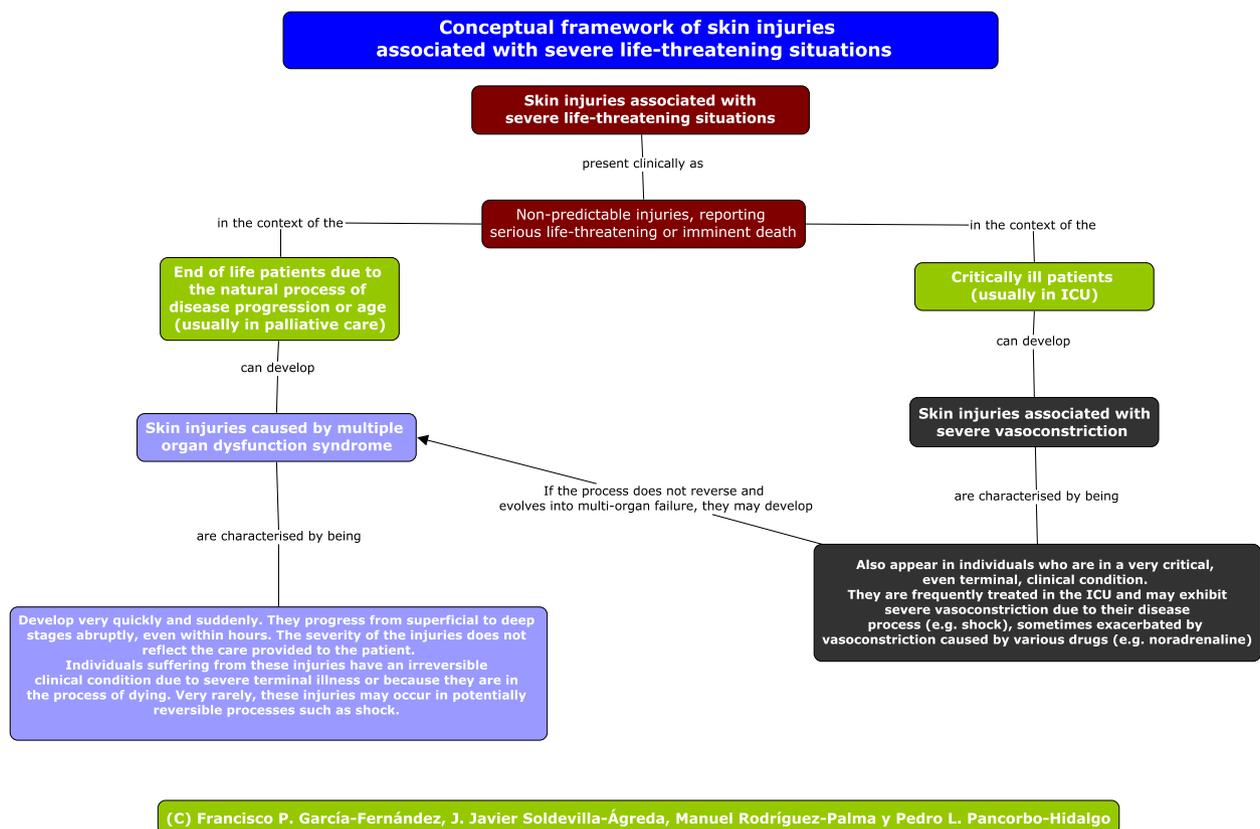


FIGURE 1 New conceptual framework for skin injuries caused by severe life-threatening situations

2020). Individuals suffering from these injuries have an irreversible clinical condition due to terminal illness or because they are in the process of dying. Very rarely, these injuries may occur in potentially reversible processes such as shock. These injuries would encompass all the clinical features known so far under different names such as KTUs, TB-TTIs, SCALE, skin failure, 3:30 syndrome, and Charcot's decubitus ominusus (Ayello et al., 2019; Beldon, 2011; Sibbald & Ayello, 2020).

SI-ESVs may appear in individuals who are in a very critical, unstable clinical condition, usually admitted to the ICU and may exhibit severe vasoconstriction due to their disease process (e.g., shock), sometimes exacerbated by vasoconstriction caused by various drugs (e.g., noradrenaline). Critical ischemia in the distal areas of the skin, whether drug-related or not, could be the main mechanism.

### Pathophysiology of SI-SLTs

The skin as an organ can fail just like the heart, liver, lungs, or kidneys. However, there is a big gap in our knowledge about skin failure (Levine, 2016). For instance, skin failure has been insufficiently studied as part of multiple organ dysfunction syndrome (MODS), which can affect individuals of all ages, including children (Cohen et al., 2017; Reitz & Schindler, 2016). MODS is usually defined as the presence of impaired organ function in a patient in a way that homeostasis cannot be maintained without intervention (Cohen et al., 2017).

Like other types of failure in major organs, skin failure has been described in a number of studies, but there is not yet a significant body of knowledge or established diagnostic criteria for the phenomenon (Delmore et al., 2015; Langemo & Brown, 2006; Sibbald et al., 2009). The term skin failure was defined in the scientific literature by Irvine (Irvine, 1991). However, it was not until 2006 that the concept was defined as it is understood today: "an event in which the skin and underlying tissue die due to hypoperfusion that occurs concurrent with severe dysfunction or failure of other organ systems" (Langemo & Brown, 2006).

This would be a "state in which tissue tolerance is so compromised that cells can no longer survive in zones of physiologic impairment such as hypoxia, local mechanical stresses, impaired delivery of nutrients, and build-up of toxic metabolic by-products" (Levine, 2017), all in the context of an MODS.

Skin failure does not appear to occur in the same way in all patients. A recent literature review (Dalgleish et al., 2020) revealed that different authors distinguish between skin failure and acute skin failure, with leading authors even distinguishing between three types of skin failure: acute, chronic, and end-of-life (Langemo & Brown, 2006). We believe that this differentiation is relevant because it would support the concept map described above.

As a framework, we propose to consider two pathophysiological mechanisms occurring when the body's organs shut down or are severely compromised. In these circumstances, as a protective mechanism, human body diverts blood to the vital organs in an attempt

to keep them functioning, leaving the less important tissues (skin) without sufficient blood flow. This could lead to the following:

- Acute skin failure: This may result in injury to and/or death of skin tissues due to severe hypoperfusion over a period of time secondary to critical illness (acute myocardial infarction, acute cerebrovascular accident, shock of any kind, sepsis, trauma, or polytrauma, complicated surgery, etc.) or to severe vasoconstriction. In the early stages of the process, it usually leads to SI-ESVs. This usually occurs in an ICU setting.
- End-of-life skin failure: This can cause injury to and/or death of skin tissues due to systemic hypoperfusion secondary to a terminal illness resulting in heart, kidney, respiratory, liver, etc. failure, although it is usually multi-organ in nature (MODS). There is often widespread destruction of tissues in areas under stress, such as the sacrum, calf, arms, elbows, or heels, and injuries appear within hours resulting in SI-MODSs. This usually occurs in palliative care settings, both in cancer and non-cancer patients.

### Clinical features of SI-SLTs

The main clinical features of the two types of lesions are described below:

- SI-ESVs: These lesions usually develop suddenly in distal areas (fingertips, toes, nose and ears), resembling frostbite injuries. In the initial stages, these lesions appear as erythema or swelling with induration and oedema; but later, if ischemia is maintained, the area of skin becomes harder and colder than the surrounding areas, and blisters develop; eventually, the skin becomes darker as tissue necrosis occurs (Dalgleish et al., 2020; Delmore et al., 2020; Nowicki et al., 2018). These injuries are always very painful, but as they tend to occur in ICU or in terminally ill patients who are often sedated, sometimes the pain may not manifest itself.
- SI-MODSs: These lesions can be very polymorphic and appear on different areas of the body. They can appear on pressure areas, such as sacrum or coccyx (where would be confused with PIs), but also on non-pressure areas, such as the buttocks, the thighs, calves or arms (Mahoney & Rozenboom, 2019). These lesions start as small abrasions with darkened areas and progress very quickly into the deep tissues, sometimes within a few hours. They are pear-, butterfly-, or horseshoe-shaped (usually symmetrical or mirror-like), with changes in turgor and colour (predominantly red, yellow, or black as they progress), and are often painful (Ayello et al., 2019; Latimer et al., 2019; Sibbald & Ayello, 2020).

## DISCUSSION

This article aims to conceptualize and elaborate a framework for end-of-life skin injuries as a type of wounds frequently encountered in nursing practice. The term "skin lesions associated with severe

life-threatening situations” was established and integrated into a framework defining types, potential mechanisms of production and clinical features. Two main types were considered: injuries associated with vasoconstriction (SI-SEV) and injuries associated with multi organ failure (SI-MODS). This conceptual model also differentiates SI-SLT from dependency-related injuries such as PI or MASD.

The differentiation between DRSI, which can be prevented, and SI-SLTS, which cannot be avoided by standard preventive measures, is an important contribution of this framework. Langemo and Brown (Langemo & Brown, 2006) also mention a form of chronic skin failure leading to chronic hypoperfusion in a slow, prolonged manner due to chronic illness (diabetes, heart or respiratory failure, comorbidities, or multimorbidities) among elderly people with ageing skin and organs, which is often accompanied by a decrease in functional capacity, loss of muscle mass and fat, and even malnutrition. We propose to conceptualize that situation as a factor that decreases the tissue tolerance, as a facilitating factor for the appearance of DRSIs (pressure, friction, and moisture-related injuries). But not to classify them as a SI-SLTSs, as external factors were the causal agent and they could be prevented with an appropriate care plan.

Therefore, two criteria have to be considered to differentiate SI-SLTSs from DRSIs: (1) the mechanism of production, and (2) the response to preventive measures. Regarding the mechanism of production, the SI-SLTSs are associated to severe hypoperfusion (skin failure) established in a short period in severe illness, intense vasoconstriction, MODS and/or terminal condition. The DRSIs are associated with external agents, such as mechanical forces (pressure-shear, friction) (Garcia-Fernandez et al., 2014) or chemical irritants associated with moisture (Rodriguez-Palma et al., 2021), that may damage the tissues by secondary hypoperfusion, but this is not the first mechanism of production. Regarding the response to preventive measures, the SI-SLTSs may occur even if standard preventive measures, such as pressure relief and skin care, are being applied; so they can be considered as unavoidable. By contrast, the DRSIs may be avoided by appropriate preventive measures (pressure relief and skin protection); so they are mostly avoidable.

This framework opens up several ways of future implementation in practice and research. There are several perspectives to consider: quality of care, epidemiological and clinical. From the point of view of the quality of care provided to patients at the end of life, the sudden onset of a skin lesion often raises concerns about the quality and the adequacy of preventive care. In addition, if the patient dies, clinicians sometimes make an erroneous association between death and a complication of the skin lesions, if these have been classified as PIs, which has been reported to occur as often as 11% of all dying patients (Tsokos et al., 2000). But SI-SLTSs should be considered as a sign of nearing death, due to a terminal situation; thus death is not related to any complication of the skin lesion (as is sometimes the case with PIs). Another important point for clinicians and managers is the consideration of SI-SLTS as not preventable with standard pressure injury prevention measures, so they should not be considered as a failure of care. This issue should be further taken into account in the development of prevention guidelines, in the future. Of

course, this point can in no way be used as a justification for the lack of preventive measures for PIs in palliative or dying patients.

From a research and epidemiological point of view, the correct diagnosis, identification and classification of SI-SLTS is important. At present, these lesions are probably under-diagnosed in studies, mostly classified as PIs or other DRSLs. This lack of reliable data on the frequency of these injuries in health systems makes it difficult to measure their real magnitude.

From the clinical nurses' point of view, knowledge of these injuries, and their correct identification, can help in the rational and appropriate use of resources. In palliative or end-of-life patients, a balance between prevention, treatment and comfort must be considered. Healing would be the goal if the patient's condition improves. Therefore, any aggressive measure causing pain or discomfort to the patient should be avoided, the number of treatments should be spaced out as much as possible, and all appropriate materials for symptom control should be used.

Some limitations should be considered. First, this is a theoretical model based on published literature and expert opinion, although we have tried to be as rigorous as possible in its development. However, this model needs clinical validation in different settings, such as ICU, hospice or palliative units. Testing this model in observational and validation studies is the way to confirm, refine or reject it. Second, we conducted a robust and structured literature review to develop the concepts, but this was not a formal systematic or scoping review, so it is possible that some related literature was not included.

## CONCLUSIONS

We have developed a conceptual framework for skin injuries occurring in patients whose life is severely compromised or whose death is to be expected within a short period of time. The denomination “Skin injuries associated with severe life-threatening situations” is proposed for this group of lesions.

The model includes two type of injuries: skin injuries associated with multiple organ dysfunction syndrome (SI-MODSs) and skin injuries associated with severe vasoconstriction (SI-ESVs). This framework describes the potential mechanisms of production, pathophysiology and clinical features of these lesions.

SI-MODSs are sudden-onset injuries, generally irreversible, and encompass KTUs, TB-TTIs, or 3:30 syndrome. SI-ESVs resemble frostbite and result from severe vasoconstriction due to the patient's clinical condition and the use of vasoconstrictors.

The SI-SLTS should be differentiated from the pressure injuries or other dependence-related skin lesions.

## CONFLICT OF INTEREST

None.

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## REFERENCES

- Agence Nationale pour le Développement de l'Évaluation Médicale. (1990). *Les Conférences de Consensus. Base méthodologique pour leur réalisation en France*. ANDEM.
- Asua Batarrita, J. (2005). Entre el consenso y la evidencia científica. *Gaceta Sanitaria*, 19(1), 65–70. <https://doi.org/10.1157/13071820>
- Ayello, E. A., Levine, J. M., Langemo, D., Kennedy-Evans, K. L., Brennan, M. R., & Gary Sibbald, R. (2019). Reexamining the literature on terminal ulcers, SCALE, skin failure, and unavoidable pressure injuries. *Advances in Skin & Wound Care*, 32(3), 109–121. <https://doi.org/10.1097/01.ASW.0000553112.55505.5f>
- Bain, M., Hara, J., & Carter, M. J. (2020). The pathophysiology of skin failure vs. pressure injury: Conditions that cause integument destruction and their associated implications. *Wounds: A Compendium of Clinical Research and Practice*, 32(11), 319–327. <https://www.ncbi.nlm.nih.gov/pubmed/33465042>
- Beldon, P. (2011). Skin changes at life's end: SCALE ulcer or pressure. *British Journal of Community Nursing*, 16(10), 491–494.
- Blasco-García, C., Santamaría-Andrés, E., Martínez-Correas, S., & Alos-Moner, M. (2016). La Piel: anatomía y fisiología. In F. García-Fernández, J. J. Soldevilla-Agreda, & J. E. Torra-Bou (Eds.), *Atención Integral de las Heridas Crónicas (2ª Edición)* (pp. 129–135). GNEAUPP-FSJJ.
- Charcot, J. (1881). *Clinical lectures on senile and chronic diseases*. Translated by WS Tuke. The New Sydenham Society.
- Cohen, K. E., Scanlon, M. C., Bemanian, A., & Schindler, C. A. (2017). Pediatric skin failure. *American Journal of Critical Care*, 26(4), 320–328. <https://doi.org/10.4037/ajcc2017806>
- Dalgleish, L., Campbell, J., Finlayson, K., & Coyer, F. (2020). Acute skin failure in the critically ill adult population: A systematic review. *Advances in Skin & Wound Care*, 33(2), 76–83. <https://doi.org/10.1097/01.ASW.0000617844.69248.92>
- Delbecq, A., & Andrew, V. (1971). A group process model for problem identification and program planning. *The Journal of Applied Behavioral Science*, 7(4), 466–492.
- Delmore, B., Cox, J., Rolnitzky, L., Chu, A., & Stolfi, A. (2015). Differentiating a pressure ulcer from acute skin failure in the adult critical care patient. *Advances in Skin & Wound Care*, 28(11), 514–524; quiz 525–516. <https://doi.org/10.1097/01.ASW.0000471876.11836.dc>
- Delmore, B., Cox, J., Smith, D., Chu, A. S., & Rolnitzky, L. (2020). Acute skin failure in the critical care patient. *Advances in Skin & Wound Care*, 33(4), 192–201. <https://doi.org/10.1097/01.ASW.0000604172.69953.23>
- Edsberg, L. E., Langemo, D., Baharestani, M. M., Posthauer, M. E., & Goldberg, M. (2014). Unavoidable pressure injury: State of the science and consensus outcomes. *Journal of Wound, Ostomy & Continence Nursing*, 41(4), 313–334. <https://doi.org/10.1097/WON.0000000000000050>
- García Fernández, F. P., Soldevilla Agreda, J. J., Pancorbo Hidalgo, P. L., Verdú Soriano, J., Lopez Casanova, P., & Rodríguez Palma, M. (2014). *Prevención de las úlceras por presión y otras lesiones relacionadas con la dependencia. Serie Documentos Técnicos GNEAUPP nº I*. Grupo Nacional para el Estudio y Asesoramiento en Úlceras por Presión y Heridas Crónicas.
- García-Fernandez, F. P., Agreda, J. J., Verdu, J., & Pancorbo-Hidalgo, P. L. (2014). A new theoretical model for the development of pressure ulcers and other dependence-related lesions. *Journal of Nursing Scholarship*, 46(1), 28–38. <https://doi.org/10.1111/jnu.12051>
- García-Fernandez, F. P., Soldevilla Agreda, J. J., Pancorbo-Hidalgo, P. L., Verdu-Soriano, J., Lopez Casanova, P., & Rodríguez-Palma, M. (2016). Classification of dependence-related skin lesions: A new proposal. *Journal of Wound Care*, 25(1), 26–32. <https://doi.org/10.12968/jowc.2016.25.1.26>
- Hibbs, P. (1982). Pressure sores: A system of prevention. *Nursing Mirror*, 4, 25–29.
- Irvine, C. (1991). 'Skin failure'—A real entity: Discussion paper. *Journal of the Royal Society of Medicine*, 84(7), 412–413. <https://www.ncbi.nlm.nih.gov/pubmed/1865448>
- Kennedy, K. L. (1989). The prevalence of pressure ulcers in an intermediate care facility. *Decubitus*, 2(2), 44–45. <https://www.ncbi.nlm.nih.gov/pubmed/2787655>
- Kennedy-Evans, K. (2009). Understanding the Kennedy terminal ulcer. *Ostomy Wound Manage*, 55(9), 6. <https://www.ncbi.nlm.nih.gov/pubmed/20560217>
- Kottner, J., Sigaudo-Roussel, D., & Cuddigan, J. (2019). From bed sores to skin failure: Linguistic and conceptual confusion in the field of skin and tissue integrity. *International Journal of Nursing Studies*, 92, 58–59. <https://doi.org/10.1016/j.ijnurstu.2019.01.007>
- Langemo, D. K., & Brown, G. (2006). Skin fails too: Acute, chronic, and end-stage skin failure. *Advances in Skin & Wound Care*, 19(4), 206–211. <https://doi.org/10.1097/00129334-200605000-00014>
- Latimer, S., Shaw, J., Hunt, T., Mackrell, K., & Gillespie, B. M. (2019). Kennedy terminal ulcers: A scoping review. *Journal of Hospice & Palliative Nursing*, 21(4), 257–263. <https://doi.org/10.1097/NJH.0000000000000563>
- Lepak, V. (2012). Avoidable & inevitable? Skin failure: The Kennedy terminal lesion. *Journal of Legal Nurse Consulting*, 23, 24–27.
- Lepisto, M., Eriksson, E., Hietanen, H., Lepisto, J., & Lauri, S. (2006). Developing a pressure ulcer risk assessment scale for patients in long-term care. *Ostomy Wound Manage*, 52(2), 34–46.
- Levine, J. M. (2016). Skin failure: An emerging concept. *Journal of the American Medical Directors Association*, 17(7), 666–669. <https://doi.org/10.1016/j.jamda.2016.03.014>
- Levine, J. M. (2017). Unavoidable pressure injuries, terminal ulceration, and skin failure: In search of a unifying classification system. *Advances in Skin & Wound Care*, 30(5), 200–202. <https://doi.org/10.1097/01.ASW.0000515077.61418.44>
- Mahoney, M. F., & Rozenboom, B. J. (2019). Definition and characteristics of chronic tissue injury: A unique form of skin damage. *Journal of Wound, Ostomy & Continence Nursing*, 46(3), 187–191. <https://doi.org/10.1097/WON.0000000000000527>
- National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, & Pan Pacific Pressure Injury Alliance. (2010). *Prevention and treatment of pressure ulcers: Quick reference guide*. Cambridge Media.
- Nowicki, J. L., Mullany, D., Spooner, A., Nowicki, T. A., McKay, P. M., Corley, A., Fullbrook, P., & Fraser, J. F. (2018). Are pressure injuries related to skin failure in critically ill patients? *Australian Critical Care*, 31(5), 257–263. <https://doi.org/10.1016/j.auc.2017.07.004>
- Reitz, M., & Schindler, C. A. (2016). Pediatric Kennedy terminal ulcer. *Journal of Pediatric Health Care*, 30(3), 274–278. <https://doi.org/10.1016/j.pedhc.2015.12.001>
- Rodríguez-Palma, M., Verdu-Soriano, J., Soldevilla-Agreda, J. J., Pancorbo-Hidalgo, P. L., & García-Fernandez, F. P. (2021). Conceptual framework for incontinence-associated dermatitis based on scoping review and expert consensus process. *Journal of Wound, Ostomy & Continence Nursing*, 48(3), 239–250. <https://doi.org/10.1097/WON.0000000000000754>

- Sibbald, R. G., & Ayello, E. A. (2020). Terminal ulcers, scale, skin failure, and unavoidable pressure injuries: Results of the 2019 terminology survey. *Advances in Skin & Wound Care*, 33(3), 137–145. <https://doi.org/10.1097/01.ASW.0000653148.28858.50>
- Sibbald, R., Krasner, D. & Lutz, J. et al. (2009). The SCALE expert panel: Skin changes at life's end. Final Consensus Document. <https://www.epuap.org/wp-content/uploads/2012/07/SCALE-Final-Version-2009.pdf>
- Silverman, J. (2012). Pressure sores and the law. *Journal of Legal Nurse Consulting*, 23(1), 28–31.
- Soldevilla Agreda, J. J., & Navarro, S. (2006). Aspectos legales relacionados con las úlceras por presión. *Gerokomos*, 17(4), 203–224.
- Trombley, K., Brennan, M. R., Thomas, L., & Kline, M. (2012). Prelude to death or practice failure? Trombley-Brennan terminal tissue injuries. *The American Journal of Hospice & Palliative Care*, 29(7), 541–545. <https://doi.org/10.1177/1049909111432449>
- Tsokos, M., Heinemann, A., & Puschel, K. (2000). Pressure sores: Epidemiology, medico-legal implications and forensic argumentation concerning causality. *International Journal of Legal Medicine*, 113(5), 283–287. [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list\\_uids=11009064](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=11009064)
- Yastrub, D. J. (2010). Pressure or pathology: Distinguishing pressure ulcers from the Kennedy terminal ulcer. *Journal of Wound, Ostomy & Continence Nursing*, 37(3), 249–250. <https://doi.org/10.1097/WON.0b013e3181d737fa>

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